A RESEARCHER NEEDS PANORAMIC VIEW PLUS SYNTHESISING MIND

"We are not students of some subject matter, but students of problems. And problems may cut right across the borders of any subject matter or discipline."

- Karl Popper

If you think of disciplines as organs, true interdisciplinarity is something like blood. It flows. It is a liquid. It is not contained. There is no inside and outside.

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Introduction

In today's society we are facing problem in one area or subject but its solution is available in other disciplinary area and we have to combine the essence of both the discipline with their own essence and we have to develop new ways and approach for the available problems. In such a situation we cannot limit our self to the research in one particular discipline we have to think more about interdisciplinary approach of research. This type of research is the demand of today's as well as future scenario.

In recent decades, the growth of scientific and technical knowledge has prompted scientists, engineers, social scientists, and humanists to join in addressing complex problems that must be attacked simultaneously with deep knowledge from different perspectives. Students show increasing enthusiasm about problems of global importance that have practical consequences, such as disease prevention, economic development, social inequality, and global climate change—all of which can best be addressed through Interdisciplinary Research (IDR). A glance across the research landscape reveals how many of today's "hot topics" are interdisciplinary: nanotechnology, genomics and proteomics, bioinformatics, neuroscience, conflict, and terrorism. All those invite and even demand interdisciplinary participation. Similarly, many of the great research triumphs are products of interdisciplinary inquiry and collaboration: discovery of the structure of DNA, magnetic resonance imaging, the Manhattan Project, laser eye surgery, radar, human genome sequencing, the "green revolution," and manned space flight. There can be no question about the productivity and

effectiveness of research teams formed of partners with diverse expertise. The authors would like to focus on the concept of interdisciplinary research, other concepts surrounding it, its need, objectives, process and a toolkit needed for development of interdisciplinary approach.

The issue of achievability deserves emphasis. Interdisciplinary research projects and interdisciplinary programs are often held to a false standard. While the greatest breakthroughs in scientific understanding can be attributed to interdisciplinary, it cannot be expected that every exercise in interdisciplinarity will result in a startling new breakthrough. In the terminology used by Thomas Kuhn, interdisciplinarity need not be (though it can be) *revolutionary science*, but can proceed as *normal science*: identifying weaknesses in existing insights, searching for compensating insights from other communities of scholars (or non-scholars), and striving to overcome disagreements between disciplinary insights. Notably, normal science within disciplines proceeds because of the shared understandings that revolutionary science transcends; normal science in interdisciplinary research will also be aided by shared understandings of how to proceed, but these must not constrain interdisciplinarians from revolutionary thought. Many interdisciplinarians would worry that we cannot have both shared process and revolutionary imagination.

Interdisciplinary Research

The terms "interdisciplinary" and "multidisciplinary" have often been seen as synonymous and, consequently have caused much confusion. Multidisciplinary refers to the placing side by side of insights from two or more disciplines as, for example, one might find in a course that invites instructors from different departments to explain their discipline's perspective on the course topic in serial fashion but makes no attempt to integrate the insights produced by these perspectives into an Interdisciplinary understanding of the topic. " Here the relationship between the disciplines is merely one of proximity, "explains Joe Moran (2002); "there is no real integration between them"(p.16). Merely bringing insights from different disciplines together in some way but failing to engage in the hard work of integration is multidisciplinary studies, not interdisciplinary studies. The main difference between them lies in the mechanism of the research process and the end product (Rogers et al., 2005, p. 276).

Concepts surrounding interdisciplinarity

Two metaphors effectively illustrate the essential difference between these two terms: the fruit salad and the smoothie. Multidiscilinary studies can be compared to a fruit salad containing a variety of fruits, each fruit representing a discipline and each fruit being in close proximity to the others. The number of fruits used and the proportions of each in the salad may not be based on anything more than visual appeal. This is not so with interdisciplinary studies, however, which MotiNissani (1995) compares to a "smoothie." The smoothie is "finely blended so that the distinctive flavour of each [fruit] is no longer recognizable, yielding instead the delectable experience of the smoothie" (p. 125). The metaphor of the smoothie, while limited, illustrates four essential characteristics interdisciplinary studies.

- The selection of fruits (i.e. disciplines) was not random but purposeful with the end product clearly in view.
- The process was integrative, meaning that it changed the contribution of each fruit (i.e. disciplinary insight) (Newell, 1998, p. 548).
- The product, compared to the ingredients used, was something new and comprehensive.
- The activity was limited in time and space to creating this new and single product (an integrated result).

The term interdisciplinary can often be confused with others such as, multidisciplinary and trans-disciplinary. So what is the difference?

Disciplinary: what is generally understood by discipline – taking a disciplinary perspective on problems – is what disciplines do best; research is focused, theoretically informed and internally coherent; answers to questions and issues come from within that perspective.

Multi-disciplinary: the world has many different disciplines each of which attempts to explain "the same" phenomena from their respective disciplinary viewpoints. It is therefore important that students be made aware of this fact, so that they develop a rich, nuanced understanding of their own discipline in a broader context.

Interdisciplinary: looking at "the same" issue/s from multiple disciplinary perspectives, in a way that tries to integrate or make holistic sense of the various explanations of "the same" phenomona that are generated from each of the disciplinary perspectives; an interdisciplinary perspective might

be more than merely multi-disciplinary because of an attempt to think through the relations between the various disparate disciplines" explanations.

Trans-disciplinary: drawing together the concepts, theories and approaches from different disciplines in a shared conceptual framework, a complete integration of the discipline perspectives (e.g. molecular biology which combines chemistry / bio-chemistry with cellular biology to explain biological phenomena).

Difference between multidisciplinary and interdisciplinary:
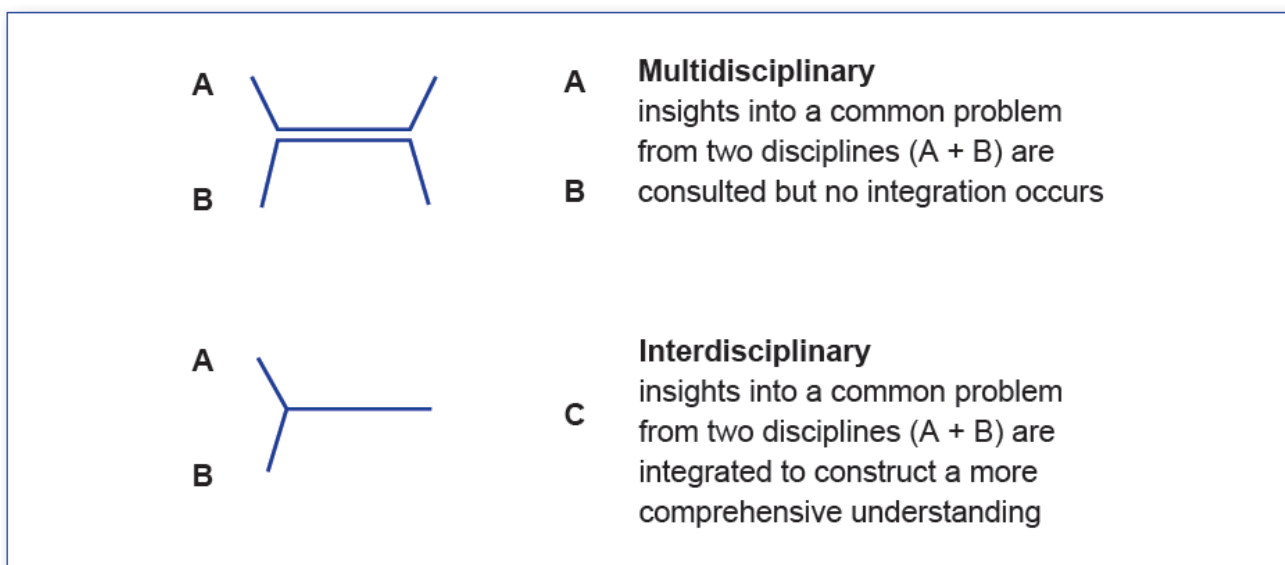
Interdisciplinary approach can be defined as, the conceptual and practical integration of more than one discipline to find solutions to a complex problem that require the participation and interaction of different disciplines and has a common object.

Need for interdisciplinary approach in research:
- We are living in the era when change takes place every second.
- We are facing challenges which are out of our think box.
- We are facing problems in one discipline which is created by other discipline or area.
- We are living with the subjective and objective reality which itself is not constant for one particular discipline.
- Our student's study the problem related to their discipline but they have to face the problem in real world which is generated by more than one discipline.

- Whatever we are teaching in the classroom will not be applicable in the society at large.
- Limitations of one discipline open the boundary of other discipline.
- We have seen that problem of society at large is solve with disciplinary approach will not fulfil society's demand.
- Assumption of Theory of one discipline generates the new problem for the other discipline.

Students need an interdisciplinary perspective on their main discipline to provide them with the broad perspective required for becoming an effective citizen and being prepared for the varied and transitional nature of working life. DeZure (1999) provides a list of six reasons to pursue interdisciplinarity:

1. Pressing social problems (crime, poverty) that cannot be resolved by a single disciplinary perspective;

2. Students and faculty asking for more connected learning and coherence in the curriculum;

3. Employers seeking graduates who are prepared to meet the multidisciplinary needs of the work world, integrating what they have learned in disparate fields;

4. Administrators hoping to make more efficient use of resources and equipment by sharing them across disciplines;

5. Dynamic changes in knowledge construction which is blurring disciplinary boundaries across fields, e.g., cultural studies. Scientific breakthroughs, research and funding patterns for research have transformed disciplines such as neuroscience and bioengineering (Klein, 1990);

6. Electronic technology and the Internet which are transforming the way we organise and seek knowledge, replacing linear models with hypertext links that disregard disciplinary boundaries.

Above reasons emphasize the need for interdisciplinary approach in research. Interdisciplinary approach is different from what might be called a multidisciplinary subject. In multidisciplinary Multiple perspectives on the same topic are taken without integration. Interdisciplinary involves a synthesis or balance of multiple perspectives to produce such things as a deeper understanding or illumination, a balanced judgement, viable solution or a product that creatively accommodates the different perspectives. The generic objectives of Interdisciplinary research needs to be understood.

What are the generic objectives of interdisciplinary approach?

Students should have interdisciplinary skills, understandings and attitudes. In particular, students should:

- should be able to occupy and understand different disciplinary perspectives;

- should be able to critically evaluate knowledge from a broad range of disciplines;
- should be able to engage in interdisciplinary inquiry and problem-solving, employing multiple ways of knowing;
- should have a meta-disciplinary understanding of the nature of knowledge and the disciplines;
- should be able to integrate, synthesise, balance and accommodate knowledge from multiple disciplines.
- should produce something greater than would be possible from any one disciplinary perspective.

There are three main epistemic positions that Perry has shown that university students tend to take. The first two are inadequate to support interdisciplinary learning, and so interdisciplinary student needs to take the third epistemic position.

1. Dualism: From the dualist position, knowledge is objective, certain and absolute. The dualist classifies multiplicity in dualist categories such as right-wrong, true-false, correct-incorrect or good-bad. They tend to see the world in terms of matters of fact.

2. Relativism: From the relativist position, there is no objective knowledge, as belief, theories and values are inherently and wholly or culturally relative opinions. They tend to see the world in terms of matters of preference and taste.

3. Critical pluralism: The critical pluralist takes knowledge to be objective, as does a dualist while rejecting the certainty and absolutism associated with that position. They also retain the pluralism of relativism without drawing the relativist conclusion that "anything goes". The critical pluralist classifies multiplicity as more or less warranted or unwarranted and sees the world in terms of more or less well reasoned judgements. When presented with a range of alternative conceptions, the critical pluralist applies reflective critical and inter subjective thinking to judge them as better or worse.

The implication of critical pluralism is a necessary foundation for interdisciplinary work. Because the multiple perspective involved in interdisciplinary subjects cannot simply be categorized as true, false or mere opinion, the classification methods of dualist and relativist epistemic positions cannot support learning in these subjects. Dualist and relativist students have a conception of 'reasoned judgement' where ideas are judged better or worse depending on the quality of reasoning supporting them (Paul, 1994, p.347-348). Without this understanding that only comes with critical pluralism they cannot make sense of the complex judgements needed to balance, accommodate and synthesize the findings from multiple disciplines.

Interdisciplinary Research: Process and Theory

Repko (2008) wrote the first book-length treatment of the interdisciplinary research process. Repko draws in turn on a variety of works by scholars of interdisciplinarity: Klein (especially 1990), Newell (especially 2007), Szostak(2002, 2004), and Bal (especially 2002). He also draws heavily on works in cognitive science and social psychology. Most important, for each step in his recommended research process, Repko provides examples of application from the humanities, social sciences, and natural sciences. And for each step, he suggests a handful of strategies or guidelines that might usefully be applied. Repko proposes 10 broad steps:

1. State the problem or focus question.

2. Justify using an interdisciplinary approach.

3. Identify relevant disciplines.

4. Conduct the literature search.

5. Develop adequacy in each relevant discipline.

6. Analyze the problem and evaluate each insight into it.

7. Identify conflicts between insights and their sources.

8. Create or discover common ground.

9. Integrate insights.

10. Produce an interdisciplinary understanding and test it.

In order to develop the steps described above by Repko (2008) a researcher will have to acquire the skill of critical pluralism as well as sets of skills given below.

Skill required for interdisciplinary researcher:

This toolkit, together with others in the series (as shown in the following table) can be accessed via the Griffith Institute for Higher Education webpage, the URL of which is listed on the following page.

GRADUATE ATTRIBUTES	DESCRIPTOR	TOOLKIT
(1) Knowledgeable and Skilled in their Disciplines	Comprehensive knowledge and skills relating to their disciplines	n/a
	An interdisciplinary perspective	**Interdisciplinary Skills**
	Capacity to find, evaluate and use information	**Information Literacy**
	Ability to apply discipline/professional skills and knowledge in the workplace	**Professional Skills**
(2) Effective Communicators and Team Members	Capacity to communicate effectively with others orally	**Oral Communication**
	Capacity to communicate effectively with others in writing	**Written Communication**
	Capacity to communicate effectively with others using ICTs, multimedia, visual, musical and other forms appropriate to their disciplines	**ICT and Other Discipline-Related Communication Skills**
	Capacity to interact and collaborate with others effectively, including in teams, in the workplace, and in culturally or linguistically diverse contexts.	**Teamwork Skills**

Level	Description
Level 1	Students enrol in courses from different discipline areas. At this level there is no formal requirement for the student to connect what they learned in one context to what was learned in another.
Level 2	Students are able to share their insights from the different disciplines in a formal setting such as a capstone seminar course. At this level the student is responsible for integration of this learning.
Level 3	Students are exposed to the different disciplines through multi-disciplinary team teaching. At this level students synthesise knowledge from the different disciplines but interpret the problems and issues through their own discipline.
Level 4	Students and staff make a conscious effort to integrate the discipline perspectives into a coherent framework requiring an understanding of methodologies etc. and building a shared language. An example is biophysics which integrates physics with chemistry and biology.

Course work plan for Interdisciplinary research:

If we want the researcher to develop paoramic view and a synthesizing mind we will have to expose them to such experiences in their graduation, post-graduation and Ph.D course work.

The Ph.D course work can have eminent scholars come and share their disciplinary inputs on certain issues gripping the nation in particular and globe in general. Such a panel discussion will broaden the horizons of the research scholars.

For additional reading they can be given a small research to look of review in various areas discussed thus they will develop information literacy.

The research scholars can be asked to develop articles and also make presentations based on their understanding, where a panel of guide can help them in developing panoramic view, synthesizing mind and critical pluralism.

At the end of course work a small team project can also be given as part of their course assessment.

Conclusion:

In short we are living in the world where everything is connected to one another and change in one perspective leads change in other perspective in such situation we need to focus on the interdisciplinary approach for more applicable research for society at large. In an interdisciplinary approach, students explore and integrate multiple perspectives from different disciplines, sub-disciplines and areas of expertise. In this era of change linear disciplinary understanding may not help us in solving complex problems. In order to meet this challenge it is necessary that we develop panoramic view and a synthesizing mind in our researchers along with critical pluralism to get necessary and important breakthrough.

References:

1. ARNOLD AND MABEL Beckman " Initiative for Macular Research

http://www.beckmanmacular.org/site/DocServer/Info_on_IDR.pdf

2. Chris M. Golde* and Hanna Alix Gallagher

http://chris.golde.org/filecabinet/ecosystem.pdf

The Challenges of Conducting Interdisciplinary Research in Traditional Doctoral Programs

3. http://www.sagepub.com/upm-data/43242_1.pdf
4. http://www.cshe.unimelb.edu.au/resources_teach/curriculum_design/docs/Interdisc_Guide.pdf
5. http://www.griffith.edu.au/__data/assets/pdf_file/0010/290773/Interdisciplinary-perspective.pdf
6. http://www.sagepub.com/upm-data/39459_Chapter1.pdf