In Brief

New form of Education—
An Interdisciplinary Studies

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Introduction

The development of the ever-growing technology in various fields, education system has also evolved. Previously with the beginning of education academically, emphasis was given mostly on core topics of various subjects like chemistry, physics, mathematics etc. In recent times, many unsolved questions are being solved. For example, recently a team of astrophysicists have produced an image of black hole. This work would not have been possible if people of various backgrounds didn't come forward with their knowledge of core subjects along with knowledge in various other related fields. Here the term "astrophysicists" gives us the view of a combined study of two subjects i.e. physics and astronomy. In order to gain insights knowledge in applied subjects a multidisciplinary form of study and research is required. Interdisciplinary is the form of study of two or more disciples. It helps us giving insights on various correlated works.

Interdisciplinarity

Interdisciplinarity is form of bringing together distinctive components of two or more disciplines. In academic discourse, interdisciplinarity typically applies to four realms: knowledge, research, education and theory. Interdisciplinary knowledge involves familiarity with components of two or more disciplines. Interdisciplinary research combines components of two or more disciplines in the search or creation of new knowledge, operations, or artistic expressions. Interdisciplinary education merges components of two or more disciplines in a single program of instruction. Interdisciplinary theory takes interdisciplinary knowledge, research, or education as its main objects of study.

The National Academy of Sciences defines interdisciplinary research (IDR) as "one of the most productive and inspiring of human pursuits—one that provides a format for conversations and connections that lead to new knowledge" (National Academies, 2005). It links and integrates theoretical frameworks from two or more disciplines and employs methods and skills from them (Aboelela, 2007). Interdisciplinary thinking and the creation of interdisciplinary programs, research groups, centers and institutes are rapidly becoming integral features of academia as the issues and challenges facing society become more global and complex. Such global and complex problems require the collaboration of multiple disciplines. The definition of interdisciplinary research as set forth in a National Academics report by Committee on Facilitating Interdisciplinary Research, Committee of Science, Engineering and Public Policy(2004) -"Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts and/or theories from two or more disciples or bodies of specialized knowledge to advance fundamental understanding or to

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solve problems whose solutions are beyond the scope of a single discipline or area of research practise."

Benefits for Interdisciplinary study and Research

The interdisciplinary approach has become an important and challenging technique in the in the modern curriculum. The interdisciplinary approach synthesizes more than one discipline and creates teams of teachers and students that enrich the overall educational experience. Many researchers find many advantages, as well as disadvantages, of interdisciplinary studies. Student education has suffered the inferior pedagogy of traditional methodologies that concentrate specifically on only one discipline. The interdisciplinary approach provides many benefits that develop into much needed lifelong learning skills that are essential to a student's future learning.

Team Teaching: Often the definition of interdisciplinary integrates team-teaching as a technique in which teachers from multiple disciplines work with each other to design a curriculum, instruct the class, and grade teams of students for time periods that can possibly extend to more than one year. Though it seems like a great idea, having more than one instructor can create problems in the sharing of responsibilities. In the book, *Innovations in Interdisciplinary Teaching*, Donald Richards is quoted as arguing "team-taught courses that lay a claim to interdisciplinary often fail to achieve their objectives precisely because the individual members of the instructional team themselves never really begin to understand their common concerns in a fashion that may properly be called interdisciplinary" (2002, p. 16).

Lifelong Learning:
Barriers to Interdisciplinary Research and Education

A number of authors have identified a variety of factors which can contribute to failure of IDR (Interdisciplinary Research) (Sidolk and Hibbert, 2009; Golde and Gallagher, 1999; National Academies, 2005; Rhoten, 2003; 2004; Feller, 2002, Institute of Medicine, 2002). Some of the main barriers are:

University structure: Clark (1995) identified over 8,530 disciplines and fields of knowledge, and many more are being created as more and more specialization develops. Most funds flow into and are allocated to the disciplinary units. Faculty are hired into this the unit, and buildings or floors of buildings often physically delineate the departmental division of knowledge.

The current academic structure has led to a lack of historical interdepartmental or crossdisciplinary cooperation, and to turfism and over-sized egos (Golde and Gallagher, 1999). Disciplines have been dividing knowledge into components which served as the basis for organizing academic institutions and put professionals into autonomous fiefdoms (Gass, 1979) This has led to turf wars among colleges and departments over allocations of resources and course credits, and over development of new courses. Often loyalty to the department or college leads to irrational and anti-interdisciplinary decisions

The current structure and lack of collaboration between the various academic silos has the following consequences:

1. Students are unable to transfer what they are learning from course to course, or discipline to discipline. (For example students studying a calculus course in a math department cannot effectively use the same concepts in their physics classes, etc.).
2. Faculty lack experience in developing and assessing course offerings that cut across disciplinary boundaries.
3. A lack of shared mental models, common language and assumptions and even the desire to collaborate may prove problematic, particularly when participants in a collaborative team have a particularly strong affiliation to their own groups (Jacobs, 2010).

A Communication Barrier: Another complaint by discipline-specific researchers is that, in learning another field of knowledge, the time devoted to their own discipline will be compromised. Often there is a feeling that disciplines are watered down to train interdisciplinary scientists and graduates are often considered somehow less

competent than focused specialists (Naiman, 1999).

Pride in One's Discipline. Nearly all university faculty members are trained in disciplinary programs with specific majors and departmental affiliations; their values and methods are instilled during graduate school. As a consequence, other disciplines might be viewed as less rigorous or important. Disciplinary areas have their own pecking order, and social sciences are seen as easier and less quantitative. Each one considers his/her discipline as the most rigorous and most important.

Personal Barriers. Personality traits which appear to matter in interdisciplinary work include willingness to accept alternative methodologies, the ability to learn rapidly, good leadership skills and an interest in real world issues that have long term impacts (Jacobs, 2010).

Amabilie *et al.* (2001) defined three characteristics which may impact the success of IDR. These are (1) collaborative skills, (2) project relevant skills, and (3) attitude and motivation.

Additional important elements for collaboration include trust (absence of hidden agenda); mutual respect of other members; appreciation, understanding, and respect for other disciplines; and the ability and the willingness to develop a common language.

Case Studies

Conclusion
As the interdisciplinary approach continues to synthesize the characteristics and methods of multiple disciplines while developing lifelong learning skills, they will have met the goals that Newell has laid out. Interdisciplinary curricula is time consuming and takes collaborative team work to create, which can seem like a hard and exhausting disadvantage, but in the end, the interdisciplinary approached inhibits many favored skills that are sought by future colleges and employers. Students and their teachers will advance in critical thinking, communication, creativity, pedagogy, and essential academia with the use interdisciplinary techniques.

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