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The implication of interdisciplinary approach in education – An exploratory study

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Abstract: The changing environment in the teaching-learning interface has paced and many different learning styles have been coined by different researchers and experts in the field. One such new approach that has been witnessed is the interdisciplinary approach. The interdisciplinary approach is been implemented in educational institutions for teaching-learning interface, team building, subject enhancement, research development, etc.

In this paper, the researcher has made an exploratory study on the implication of the interdisciplinary approach for delivering the concepts, in areas of research in education and skills required in terms of academic qualities for best results in teaching-learning with the usage of an interdisciplinary approach, an attempt is made to highlight the future of interdisciplinary approach in education. The paper covers a vast range of articles, journals, books, and research studies extract from the field. The paper provides a wide scope for analytical research and conducting practical studies.

"Learning is best conceived as a process, not in terms of output".

Keywords; Interdisciplinary approach, Learning styles.

Theoretical background

The learning styles concepts are gaining acceptance and recognition as an important tool for teaching and learning (Kolb1971, Kolb, Rubin and McIntyre,1971). One of such learning styles popular today is the interdisciplinary approach. The interdisciplinary approach has become a prominent and challenging technique in the curriculum, synthesizing the students and teachers(Jones,2000). One of the key factors is the increased urge of learning and teaching in higher education with a sense of collaboration among the stakeholders for enhanced learning (Cowen &Kolb, 1995; Baxler Magolda, 1999; Bransford, Brown and Cocking, 2000; Keeton, Sheckely & Griggs, 2002; Zull, 2002; King, 2003).

Furthermore, the continuous research in the field has immensely highlighted the limitation of traditional teacher center pedagogy in fostering the holistic development

of students' intellectual and emotional intelligence (Freirz P.,1973; Palmer,1998; Terenzini,1994; S R Woodard 2003).

The modern era has been witnessing a significant change in education leading to a focus on participative learning. The interdisciplinary approach has been one such pedagogy of the teaching-learning interface. The idea of synthesis and integration is defined as an interdisciplinary approach (Richards, 1996). Defining interdisciplinarity and determining its objectives is complex (Barry and Born, 2013; Klein, 2006; Siedlok and Hibbert, 2014). The interdisciplinary approach and the multidisciplinary approach have a thin line of differentiation in usage and are often interchanged. But the latter refers to teaching topics from more than one discipline in parallel to the other, nor is it a cross-disciplinary approach, where one discipline is crossed with the subject matter of another. Interdisciplinary techniques go beyond these two techniques by allowing students to see different perspectives, work in groups, and make the synthesizing of disciplines the ultimate goal.

A broad and commonly used definition of interdisciplinary work is provided by the OECD, "interaction between two or more different disciplines. The interaction may range from simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organization of research and education in a fairly large field" (OECD, 1972 p. 25)

In the present paper, the researcher has attempted to unfold the theories, learning outcomes, and the implication of the interdisciplinary approach in education.

Objectives of the study

1. To explore the usage of interdisciplinary approaches in various streams of education.
2. To study the interdisciplinary approach in the area of education research.
3. To understand the future of interdisciplinary approaches in education.
4. To understand the skills required for an interdisciplinary approach to education.

Objective 1: To explore the usage of interdisciplinary approaches in various streams of education.

From teaching to learning, from early childhood to adolescence, from primary to higher education the approach has made its mark and been getting popularity at all levels. For

some level the interdisciplinary approach is said to be needed and not preferred, it has led to an integration of methodology and pedagogy for much more needed lifelong learning.

Using the interdisciplinary approach can be defined as crossing different ways (McComas, 2009) it focuses on teaching common themes without restricting students' thinking to a specific discipline of knowledge and provides an opportunity for the development of problem–solving skills (Beane 1997, Bybee1997) as most of the solution require interdisciplinary approach (Cohen & Staley, 1982; McComes, 2009).

The integration of Geography and History revealed that "teachers rarely teach the two subjects in an integrated fashion, and American children's understanding of both subjects suffers (Boehm, 2003). Whereas in a study by Youngblood states that interdisciplinary is beneficial because "They may within the one discipline cover physical and social sciences as well as humanities as they focus on considering interrelations between realms of knowledge" (2007,p.2). Staples explained that Environmental Sciences need an interdisciplinary approach due to the poor "state of environmental education and the need for improvement in ecological literacy" (2005, p.6).

One study shows that integrating science with various disciplines makes the subject more interesting, and more realistic (Cohen & Staley, 1982; McComas, 2009). It is found that students find reading science increased when infused with literature. (Fang et al.,2008) literacy. Additionally, students who wrote creatively about science (rather than writing a typical report) felt that they had learned about both English and science during the project (Alexander et al., 2008). The integration of Maths with Science had a positive impact on students and increased their scoring (Czerkniak et al,1999).

It is the methodology of the integration that brings in success. The Interdisciplinary techniques are not only important for a student to learn any one single discipline or solve the problem in a synthesized manner, but it also enriches a student's lifelong learning habits, academic skills, and personal growth.

Objective 2: To study the interdisciplinary approach in the area of education research.

The National Academics defines "Interdisciplinary research as a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives,

concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice." On the same line E O Wilson says that the “jumping together of knowledge” across disciplines “to create a common groundwork of explanation”—is the most promising path to scientific advancement, intellectual adventure, and human awareness (Wilson 1998: 8).

Today, some analysts claim that academic science has already embraced the idea of consilience and that a transformation is well underway from the traditional manner of doing research—homogeneous, disciplinary, hierarchical—to a new approach that is heterogeneous, interdisciplinary, horizontal, and fluid (Cooke 1998; Etzkowitz and Leydesdorff 1998; Gibbons et al 1994).

Interdisciplinary research and education (IDRE) hold center stage in current academic discussions. An interdisciplinary approach is a proven vehicle for addressing complex issues of scientific and societal importance (NRC, 2001; Lin et al., 2006). Therefore, interdisciplinary research and education (IDRE) are now at the forefront of academic research and education.

The fact is, universities have tended to approach interdisciplinarity as a trend rather than a real transition and thus undertake their interdisciplinary efforts in a piecemeal, incoherent, catch-as-catch-can fashion rather than approaching them as comprehensive, root-and-branch reforms. As a result, the ample monies devoted to the cause of interdisciplinarity, and the ample energies of scientists directed toward its goals, have accomplished far less than they could, or should, have.

The topic of interdisciplinarity is not entirely new to Complicity. In the lead editorial of the 2005 issue of Complicity: An International Journal of Complexity and Education, Phelps and Davis suggest that education ought to be understood as a transphenomenal enterprise since even something as “simple” as a personal understanding of a physical event is likely rooted in biological structure (genetic predisposition), framed by bodily activity (personal experience), elaborated within social interactions (symbolic tools), enabled by cultural tools (societal usages), and part of an ever-unfolding conversation of humans and the biosphere. (p. 2).

Researchers have attempted to measure interdisciplinary outcomes in ways such as i) the diversity of the journals in which a researcher has published (Carayol and Nguyen Thi, 2005); ii) the successful integration of knowledge and understanding through the forging of new fields or disciplines (Borrego and Newswander, 2008; Corley et al., 2006; Golde and Gallagher, 1999); or iii) the production of new knowledge, and the quality and quantity of that knowledge as measured by publications, grants, awards and citations (Carr et al., 2017; Porter et al., 2006; van Rijnsoever and Hessels, 2011; Wagner et al., 2011; Klein,2006, 2008) notes how objectives from interdisciplinary projects vary. New knowledge is one type of goal, but others may be the development of new approaches or products (e.g. medicines or measuring devices).

The findings of these studies generally reveal that interdisciplinary programs are leading to a variety of outcomes. However, we do not know enough about how these outcomes are emerging, what the factors are that support their development, and ultimately, how we can increase the quality and quantity of interdisciplinary research. A framework is needed that can capture the outcomes, and couple them with the processes taking place within a program that is leading to their achievement.

Objective 3: To understand the future of the interdisciplinary approaches in education.

The interdisciplinary approach paves way for students to a higher order of thinking, discovery, and innovation (Youngblood, 2008). Here it would be appropriate to bring to the limelight the Nobel prize winner Willard Libby for integrating Chemistry with Archaeology. Further, Newell connects chemistry with culture for his studies on acid rain.

Boyer and Bishop quote Stanley Hall who said "the future of humankind was, in large measure, determined by the quality of education received" (2004, p.2). Today the higher education players are implementing more interdisciplinary courses into the “education” they provide because interdisciplinary courses are viewed as necessary for attracting the best students (Kleinberg, 2008, p.1).

Duerr, of “Interdisciplinary Instruction”, explains the importance that broadness has to student’s futures in the way that “Their cognitive development allows them to see relationships among content areas and understand principles that cross-curricular lines. Their psychosocial development gives them the ability to understand people and to look

at situations from various viewpoints" (Duerr, 2008, p.177). Though interdisciplinary techniques have many sought-after benefits that will last a lifetime. The landscape of higher education contains multiple areas where such a process might run afoul.

Substantive changes are expected in the field of higher education institutions to challenge dominant epistemologies and discourses and to unsettle current ways of thinking about, and acting about, the environment. The interdisciplinary approach to work to build capacities in students for critical and reflective thinking requires genuine transformative learning within a constructivist informed pedagogical approach to teaching for sustainability, more effective environmental actors and thinkers, who can critically engage with the complexity of environmental problems. And include a more effective and socially just higher education for sustainability (Holley and Karri, 2009).

Objective 4: To understand the skills required for an interdisciplinary approach to education.

Interdisciplinary skills combine knowledge, analysis, and critical thinking which are cognitive skills that require the skill of digging into the content or defining the problem by combining the knowledge and experience from various avenues. It is best to think about interdisciplinarity as a way of thinking, which allows one to draw insights from diverse disciplines and eventually apply them to the area of focus at hand. It is an approach that can remove barriers between sciences, knowledge fields, and even practices. Thus, interdisciplinary thinking promotes innovation, open-mindedness, and creativity (https://reboot-project.eu/).

This skill cannot be satisfactorily addressed using single methods or approaches (Klein, 1990, p. 196). To successfully engage in interdisciplinary, it is required to take a critical stand on disciplinary limitations, solve complex problems across disciplines, communicate across disciplines, handle interdisciplinary collaboration and teamwork, as well as use integrative potentials to create innovations (Brassler & Dettmers, 2017).

The approach cannot be defined to have skills from one single roof but as an umbrella that does not fit into neatly packed mutually exclusive subjects (Palmes, 1983). Broadly speaking though interdisciplinary studies may be defined as a process of answering a question, solving a problem, or addressing a topic it is not a simple supplement but a complementary and corrective discipline(Klein and Newell, 1997).

The skills that need to be pruned for implementing an interdisciplinary approach therefore cannot be put into a nutshell but require a range of skills from academic abilities to emotional intelligence to cognitive learning. A study revealed the following six skills which more or less address all the areas.

1. Depth of knowledge in one discipline or field of study

2. Ability to recognize the strengths and weaknesses of multiple disciplines

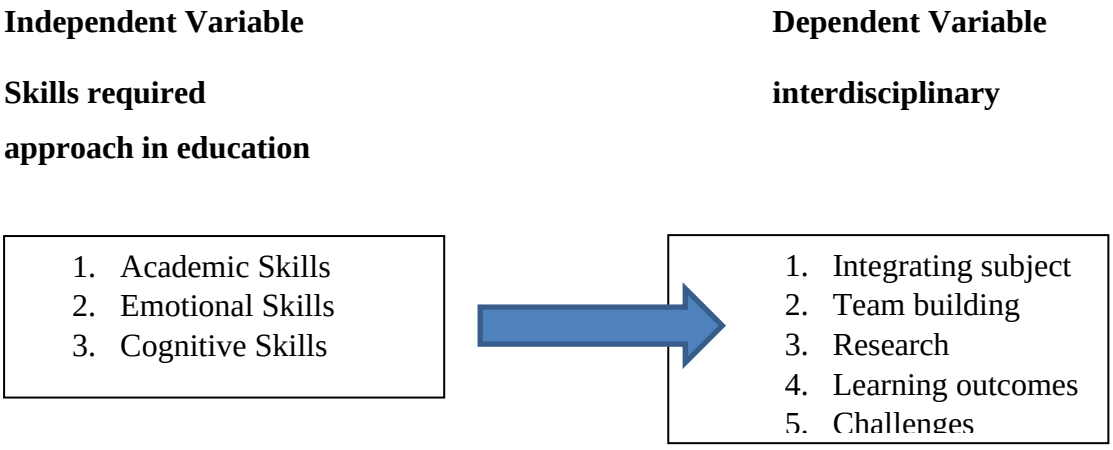
3. Ability to apply the approaches and tools from multiple disciplines to address a problem

4. Ability to work in a team with individuals trained in different disciplines

5. Ability to communicate

Conceptual Model

Based on the review of literature a conceptual model has been developed to explain the interrelatedness of the interdisciplinary approach in education and the skills required for developing skills.



Education institutions today have accepted that they require to implement different types of teaching-learning styles to develop and meet the new zen methodology. One such approach becoming popular is the interdisciplinary approach. The interdisciplinary approach can be applied in integrating the subject provide exposure to different curricula and enhance the conceptual knowledge of the students. It also paves way for team building and the extensive review of literature by the researcher has revealed that the approach is taking a high role in areas of research and has become a popular field of study both in education and in the industry. Further, the

interdisciplinary approach brings in challenges but at the same time leads to excellent learning outcomes. To develop the interdisciplinary approach to teaching-learning the faculty requires a set of skills. The research revealed that academic, emotional, and cognitive skills would lead to the enhancement of interdisciplinary usage.

The above conceptual model is based only on the review of the literature.

Conclusion

The present study was carried out with the objectives of understanding the usage interdisciplinary approach in education, the review from the study clearly showed the path to developing the conceptual model of how the approach is used in various fields of education. The model also depicts are skills required to enhance its implication. Even though the model is a novel idea its practical application requires extensive research to be conducted and also a constant reiteration of the perception of the researcher.

Scope for further research

The present study is theoretical. Hence there is scope for taking it to an empirical or analytical using the developed model. Further, there can be inclusion or exclusion of other variables.

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