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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.

Interdisciplinary Approach: Advantages and Disadvantages and the Future of Interdisciplinary Studies

In the 1930's, advocates attempted curriculum integration through joint teacher planning and block scheduling. Today, the interdisciplinary approach is a key concept to the advancement of school curriculum at all levels. It has now become debated as to whether an interdisciplinary approach is the best course for a curriculum. Though it has many advantages such as, expanding student understanding and achievement between all disciplines or enhancing communication skills, it also has disadvantages, such as integration confusion and time-consuming curriculum preparation. The interdisciplinary approach has been defined by Executive Director of the Association for Integrated Studies William H. Newell and William Green (1982) as "inquiries which critically draw upon two or more disciplines and which lead to an integration of disciplinary insights" (Haynes, 2002, pg17). The interdisciplinary approach is uniquely different from a multidisciplinary approach, which is the teaching of 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. Many interdisciplinary scholars debate weather the specific interdisciplinary technique of "team-teaching" is the best approach for student progress in the classroom.

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). Richards concludes that "team teaching is a poor vehicle for interdisciplinary undergraduate education" (Haynes, 2002, p.16). Julie Klein warns that team

teaching can be associated with problems such as "lack of 'sufficient time for collaboration work'", "lack of training In group dynamics", "overlapping roles", "territorial and status conflicts", and "inadequate funding" (Haynes, 2002, p.18) Although having disadvantages, interdisciplinary team teaching remains a popular approach with many benefits.

In a study done by Boyer and Bishop titled "Young Adolescent Voices", 77 students from three middle schools where asked what they thought about their interdisciplinary team program. Boyer and Bishop found interdisciplinary teaming not only had a positive effect on students learning, but also inhibited personal growth (2004, p.1). Students learned tolerance for their peers as well as leadership and collaboration skills. The study found that the majority of students found the experience beneficial and that the students "spoke of long-term relationships and of a democratic learning environment that honored their voices and empowered them as learners" (Boyer and Bishop, 2004, p.6).

Staples, author of "Biomimicry in Environmental Education", commented briefly on the importance of teams by saying, "True adoption of a biomimicry based view of business and industry takes innovative and interdisciplinary teams" (Staples, 2005, p.9). In Boehm's instruction plan for interdisciplinary taught history and geography, there are three times that the instructions call for the teacher to gather the students into teams of 2-6 students (Boehm, 2003). In an article titled "Teaching Literacy Across the Curriculum", Jim Paterson, highlights the beneficial effect that a student team had on the discussion of medical health issues within a fictional novel (Paterson, 2007, p.13).

The interdisciplinary approach used in the Boyer and Bishop study was unique in that it implemented a technique in which the students learned to be teachers by connecting with peers of other grades rather than just their own. An eighth grader responded to the program by saying "We are a six, seven, and eighth grade team which is very important because the younger students can get help from the older students and the older students—eighth-graders can take a large leadership role on the team.. . . We stick together and work together" (Boyer and Bishop, 2004, p.6). An eighth grade girl comments on the benefits she found with this particular approach by stating that "Portfolios are another big part of [our team]. We put them together pretty much by ourselves. It's a work reflection of all the things we've done that trimester" (p.9). The students agree that the interdisciplinary approach inhibits personal growth through team teaching and one student concludes, "It's helped me to be a better people person I think and to communicate better" (2004, p.9).

One student mentioned that the team taught program had specific disadvantages. The student wanted further integration of more disciplines and more challenges. This eighth grader says "I myself don't like the learning style structure of [Team name]. I feel that it has many loopholes. I really want to do science experiments right, since sixth grade we've done 1 experiment for about 10 minutes. I feel [Team name] should combine structured learning in general subjects such as math, writing, grammar, social studies, and science" (p.11). Despite the small percentage that found disadvantages with interdisciplinary teaming, overall, students felt that working in teams beyond their own grade level gave them a sense of community and that by keeping a journal and making portfolios, they gained a sense of personal growth. Klein also mentions that while interdisciplinary teams have disadvantages, they also have benefits such as "wider knowledge base", "wider personality base", and a "wider design, teaching, and assessment methods to draw on and thus more balance in the overall approach" (Haynes, 2002, p.19). Many interdisciplinary techniques are developed, not as much with the consideration of team teaching, but more so, they are developed with the consideration of their method of pedagogy.

The Importance of Methodology

The Interdisciplinary approach has been used in many ways and at all levels of Education. From early childhood to graduate school, interdisciplinary studies are becoming more and more popular. Boehm explains fundamental disciplines such as Geography and History by stating, " teachers rarely teach the two subjects in an integrated fashion, and American children's understanding of both subjects suffers (Boehm, 2003). Boehm's "The Best of both worlds" is designed to be used by students from kindergarten to High School. For some disciplines the interdisciplinary approach is said to, not only be preferred, but needed. Youngblood states that interdisciplinary are 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). Boehm warns that we must consider other teaching methods such as interdisciplinary techniques because "We learn from the National Assessment of Education Progress, from surveys by the National Geographic Society and from a hundred other sources that American student's knowledge of history and geography is lamentably thin, and their comprehension of the world out the United States is skimpy indeed" (Boehm, 2003). Dawn Youngblood, the author of "Interdisciplinary Studies and the Bridging Disciplines", and Laura L. Duerr, author of "Interdisciplinary Instruction", both agree that methodology is the key to interdisciplinary success, not the domain of subject material or textbooks alone. Interdisciplinary techniques are not only important for a student to learn any one single discipline or solve problem in a synthesized manner, but it also enriches a student's lifelong learning habits, academic skills, and personal growth.

Life Long Learning

Julie Anne Taylor explains why the integration of the performing arts and social studies enhances both the teaching and learning of the disciplines throughout a lifetime. A history teacher in her study says "I feel that arts integration is important in the overall educational experience. The cultural benefits are one reason that I favor the inclusion of the arts. Another reason is the cognitive enhancement that music and arts education offers students of all ages" (Taylor, 2008, p.236). Taylor concludes that "Interdisciplinary work by both educators and students may broaden students' knowledge of history and diverse cultures. Including the arts in social studies instruction may have pedagogical benefits as well because the inclusion would facilitate differentiated instruction" (Taylor, 2008). While there are many statistical reports which conclude that students of interdisciplinary techniques have higher test scores in both core knowledge and critical thinking problems, there is also a need for interdisciplinary techniques to better remember basic discipline lessons later in life. In an article titled "Interdisciplinary Instruction", Laura Duerr explains the importance of an interdisciplinary approach to the life of a student by stating, "With interdisciplinary instruction, students can become more involved in their learning and teachers can work toward eliminating discipline lines. Students can become independent, confident individuals who 'learn how to learn' and develop lifelong learning skills" (Duerr, 2008, p.177). The interdisciplinary approach is a team-taught enhancement of student performance, an integration of methodology and pedagogy, and a much needed lifelong learning skill. Students who have the skills that interdisciplinary courses provide are so valuable to our future that they are now sought out by colleges and businesses.

Future Benefits

Students who are taught with an interdisciplinary technique in which the students master higher order thinking skills and integrated pedagogy become very attractive to top colleges and wealthy business. Youngblood explains that the foundation of interdisciplinary techniques will lead to a future of discovery and innovation. For example, the chemist Willard Libby who discovered radiocarbon dating, applied his findings in Chemistry to the discipline of Archeology and won the Nobel Prize the discovery in 1960 (Youngblood, 2008, p.2). Youngblood says Libby's technique is a great foundation for interdisciplinary studies but a true interdisciplinary approach should be taught by going beyond Libby's technique. Youngblood highlights Newell's demonstration of a Geographer who is involved with a team that tries to solve the problem of acid rain. Newell says "In order to be successful, she may find it just as necessary as will the practitioner of interdisciplinary studies to develop an understanding of issues ranging from chemistry to culture" (Youngblood, 2008, p.3). 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). Every year colleges around the country are implementing more interdisciplinary courses into the "education" they provide because as Ethan Kleinberg says, interdisciplinary courses "are viewed as necessary for attracting the best students" (Kleinberg, 2008, p.1). Though highly praised, Kleinberg's examples of interdisciplinary studies are not without criticism. Kleinberg also warns that interdisciplinary studies have become so popular that in order to offer them, some schools have sacrificed the quality of the interdisciplinary methodology. Kleinberg says "interdisciplinary studies became complicit, if not responsible, for the fragmentation of the university into a series of localized specializations isolated from, and in competition with, one another to attract niche customers/students" (2008, p.1). If the methodology is reduced to specialization, then future students of interdisciplinary techniques will no longer be sought after, nor will they have the synthesis of a broad range of disciplines. To overcome this problem, Kleinberg suggests two models of interdisciplinary courses, one that covers a very broad range of disciplines and another that is a project based group that focuses more than one discipline on a specific issue. Kleinberg suggests that "The benefits will include the production of knowledge through innovative scholarship, the creation of working networks across the disciplines and departments throughout the university, and most important, the fostering of an informed and critical public" (Kleinberg, 2008, p.11). 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, there are many concerns about the quality interdisciplinary studies as they are now.

Concerns

The benefits of interdisciplinary studies are not without their disadvantages. Rahul Kanakia, author of the article titled "Talk tout benefits of interdisciplinary approach, as well as some pitfalls", quotes Donald Barr as saying "professors who focus on interdisciplinary studies isolate themselves from the core of their field," "In contrast, interdisciplinary studies focus on the fringes of a field, which lowers an academic's reputation in the eyes of his peers and hurts his chances for tenure" (Kanakia, 2007). The academic system is still very much structured on the concentration of specific majors as disciplines and the integration of interdisciplinary studies have become unusual to the traditional fields of study. Rick Szostak, author of "How and Why to Teach Interdisciplinary Research Practice" explains that the methodology of the practice of interdisciplinary is lost when a

single interdisciplinary course is then considered as a major field of study. Szostak is quoted as saying "Most centrally, faculty members within interdisciplinary programs generally identify themselves primarily in terms of a particular interdisciplinary theme or question, rather than with interdisciplinary itself" (Szostak, 2007). The specialization in an interdisciplinary field thus creates a barrier for further integration. Szostak is also worried that new interdisciplinary teachers "lack both interest and expertise in interdisciplinary research practice" (2007). Szostak argues against the interdisciplinary approach when noting that "It is sometimes argued (and I have witnessed these arguments myself) that the suggested material is too meta-theoretical, too far removed from the real-world problems that interdisciplinary research usually addresses" (2007).

In the defense of the interdisciplinary approach, Laura L. Duerr argues that the interdisciplinary approach has the exact opposite effect for real-world applications. In "Interdisciplinary Instruction", Duerr relies on a study by Vacca and Vacca that outlines students with interdisciplinary integration prevailed in the "application to real-world scenarios" (Duerr, 2008, p.176). Hilary Staples, author of "Biomimicry in Environmental Education", also notes that the integration of interdisciplinary studies offers students "advanced thinking skills leading to discovery and real-world problem solving" (2005, p.16).

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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