

Linking the Two Worlds: Science and Art for Understanding.

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Abstract

The second-year, shared experience curriculum for Iowa Wesleyan College, Mount Pleasant, Iowa is an Integrated Science course linking science and art. The Integrated Science Linking Science and Art promoted a better understanding of basic scientific principles and literacy, by initially showing linkages to art. As the course developed, it became more holistic and encompassing of all of the humanities. Students reported that they developed a greater appreciation of how science is present in all aspects in their lives and how science shapes how they view the universe.

The Shared Experience Curriculum

Iowa Wesleyan College implemented a shared experience curriculum course in science. The purpose of the shared experience curriculum was to provide learning communities to provide optimal learning environments. The students represented in our courses varied widely, from science majors to arts and humanities majors. The non-science majors probably benefited most from this course because it gave them an appreciation for the amount of science and math content inherent in studying art and art history. With a broad student mix we found that all students were interested and challenged, although not always in the same manner. While the mathematical and scientific content was less challenging to the majors in these fields, these students found the art connections new and stimulating. They also interested in seeing real connections between their majors and the new material. These smaller, yet more focused classes provided experiences molding literacy in science that enhanced one's view and understanding of the universe and its place in the human intelligence.

The Integrated Science Course

An interdisciplinary theme to link science with art was the theme of this integrated science course. This course focused on promoting a better understanding of basic scientific principles, and how to use science to better understand our world. The integrated science course was divided into three topics: general scientific topics, physical science topics, and biological science topics.

- The general scientific principles that were discussed included the scientific method, the history and philosophy of science and pseudoscience, such as astrology and feng shui. Applications of science and technology on society were emphasize in this setting. Sculptures and works of art that depicted the interaction between the human experience and spirituality are discussed with issues of the interaction between science, technology and society.
- The physical science principles that were discussed included the laws of motion, heat and the laws of thermodynamics, electricity, magnetism, waves, electromagnetic radiation, atomic structure, chemical bonding, and astronomy. Connections with art were strongly linked with examples from architecture,

construction and materials design. Discussions and experiments on concepts of sound and color and their impact on human emotion and behavior was an interesting topic researched by students. Students had previously had not had the opportunity to delve into this idea. The theories of magnetism and its “effects” on human health. Students were encouraged to research and present their results in small groups and laboratory. Student’s perceptions were challenged and reformed.

- The biological science topics included ecology and the environment, organization of cells, the genetic code, cloning, human biology and infectious diseases. This segment drew on using ideals from films, special effects in television, and the works of the masters in painting, sculpture and other depiction of biological organisms. Attention was called to how modern health professionals have used paintings to discover the ailments of the past and even discover long forgotten treatments for diseases today.

The main difficulty with the design and development of this course was linking it exclusively with art, yet this proved to be a benefit to the course as it brought in other schools of thought and integrated science across the curriculum. The other disciplines besides art, that were included topics from history, literature and social problems. Other faculty from other departments, other guest lecturers from the campus and in the community was invited to contribute to the course. The various interdisciplinary themes/topics that were involved were scientific ethics, scientific photography, analysis and restoration of paintings, use of color in human design and applications, history of quantum theory, history of the Human Genome Project, moral issues involved in medical concerns, cloning and genetic engineering, development of pharmaceuticals and their distribution by economic need and prioritizing, and the history of nuclear power/weapons in the United States. One outcome of the multidiscipline format was that different perspectives emerged on a single topic as each guest instructor discussed aspects of the subject from the viewpoint of his/her discipline. This format allowed the students to experience the roots of genuine scientific disagreements

as well as the various methodological approaches specific to each discipline (Duchovic et al. 1998).

The Course

At the first class meeting, students wrote a brief essay on their understanding of the connections among the fields of art and natural science, we discovered that a few students sensed connections, most felt that two academic areas (art and science) were apart and saw a very weak if not an artificial connection at best between the two fields. Like other professors, we found that “many students believed that science/math and art belong in separate intellectual boxes without any meaningful connection” (Papacosta et al. 1998). Toward the end of the semester, we returned these essays to the students and they were astonished how their views may have changed during the course. Overwhelmingly, the students felt a new appreciation for and a stronger understanding of the interconnectedness of these topics.

One of the most significant discoveries for the students was how science and art are both based on “data” and “facts.” Students often carry preconceptions that math and science are objective whereas history and the humanities are more subjective. This course challenged this paradigm since the students witnessed the objective aspects of art and saw that science can be viewed much like historical research. All of these disciplines rely on data that need to be interpreted, and an individual is responsible for making creative leaps and subjective judgments in bringing these “two cultures” together (Snow 1959).

Besides the students, the participating faculty benefited by being introduced to new areas of study, one of the advantages of interdisciplinary courses (Ogren et al. 1971 and Kelly, C. et. al. 2001). As we were teaching and being exposed to new material and fresh linkages among these fields of study, we were able to re-experience the renaissance of our own learning. As

professors, we felt a positive influence on our overall teaching, since both content-wise and pedagogically, this course enabled us to grow and learn.

The evaluation of this course was extremely positive as shown by Table 1. Students surveyed (96%) said that the course organization was excellent or very good. Eighty-two percent of the students reported that the course met its intended objectives and sixty-seven percent expressed that they were interested in the course. Anecdotal commentary offered by students reflected a high degree of satisfaction in the course and its topics. Several students offered the comment that at the beginning, they saw no relevance between science and art, but after time the links became apparent. A number of students were awed by the sophistication of special effects in television shows and in movies over the years. A number of students reported that they believed that (52%) the course addressed life skills needed to be discussed and thought over. Over 74% of the students said that the course was excellent or very good.

Table 1. Course Evaluations for Integrated Science. (Reiter, 2003)

(Data provided by actual student numbers T=47.)

	5	4	3	2	1	0
Organization	35	11	0	1	0	0
Objectives	24	18	3	0	2	0
Interesting	27	11	4	3	2	0
Appropriate	25	19	1	0	0	0
Important ideas	25	20	2	0	0	0
Life skills	17	13	13	2	2	0
Overall	21	14	10	2	0	0

Course Rating System:

5= excellent, 4= very good, 3= good, 2= ok, 1= poor and 0= not applicable.

Students expressed interest in learning more about art and science after they had taken this class. Students when watching their favorite show viewed commentary on special effects and “viewed science practices” more critically. Many of the students were citing the links between literature and science as well. The novel “Frankenstein” was read in a new light by the students, and when the 1931 version of the film was viewed, students were impressed by its “cutting edge” ideals. Students were drawing attention to structure and function of architecture design in construction of bridges and other structures. Art and design had definitely taken a new meaning for the students in this course. Students had embraced Robert Crease’s (2002) thoughts about the similarities between the arts and science - the need for inspiration, creativity and hard work, the willingness to experiment and be brave, and the conviction that you are searching for or creating work that says something meaningful about the world or nature is “more than pretty pictures”

Course Improvements

The major course improvement that was noted by the faculty, that it should involve additional connections with the community and community resources. For new instructors seeking to develop a similar course, we recommend that each participating instructor have a passion for learning and teaching, be dedicated to working as a team, and have the appropriate knowledge base. This course requires consistent, open communication. And although the toughest challenge is finding the time to invest in this type of course, the reward was the content that each professor learned and the camaraderie that was formed among the professors. However not all of the members of the science faculty bought into this course. Some still yet believe that this course should be made optional for science majors (biology, chemistry, or life science). Based on our experiences, this course needs to be developed further and enhanced with a greater campus wide support. A greater literacy of science is needed for our society to advance and maintain its humanity.

Conclusion

“The beings on Earth depend on one another. Life on Earth is an intricately woven tapestry or web. Yank out a few threads here and there, you can’t be sure whether that’s all the damage you’ve done or whether the whole fabric will unravel” (Sagan and Druyan, 1992).

The quote offered by Sagan and Druyan provided the authors and lecturers the theme for the Integrated Science course, to guide students to view and experience science and art, as an integral part of their experience. There continues to be a need for expansion for holistic science experiences for all students at all levels of education. This course is an example how scientific literacy can be improved and provided to all students across the campus curriculum.

Cited References

- Creases, R. 2002. More than Pretty Pictures. *Physics World*. November 2002 p19,
- Duchovic, R.J., D.P. Maloney, A. Majumdar, R.S. Manalis. 1998. Teaching science to the nonscience major—An interdisciplinary approach. *Journal of College Science Teaching* 27: 258-261.
- Kelly, C, Jordan, A., Roberts, C. 2001. Finding the Science in Art, *Journal of College Science Teaching*. Vol. 31 No. 3, p. 162-166. November 2001
- Papacosta, P., and A. Hanson 1998. Artistic expressions in science and mathematics. *Journal of College Science Teaching* 27: 250-252.
- Reiter, W. 2002. Course Evaluations for Sci 200 Integrated Sciences. Iowa Wesleyan College. Mount Pleasant, IA.
- Sagan and Druyan, 1992. *Shadows of Forgotten Ancestors, A Search for Who We Are*. Random House, NY. NY.
- Snow, C.P. 1959. *The Two Cultures and the Scientific Revolution*. New York: Cambridge University Press.