Connecting Learning with Students' Interests and Daily Lives: "It is My Project."

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Abstract

To foster creative expression of students in a science course and to connect students' learning to their personal areas of interest, academic major programs, and daily lives, '*Periodic Table*' project is assigned in the General Chemistry Course. Students are to research a chemical element they select, to design concise representations for a collective display, and to present informative, creative projects using media of their own choice. In course portfolios and an end-of-semester survey, students indicated that these assignments become enjoyable course work and learning projects they are attached to in a personal way. This project is one of my teaching strategy tools to respect a variety of learning styles, to connect chemistry into our daily lives, and to engage students learning with their own talents and insights.

Introduction and Objectives

One of the seven principles of good practice in undergraduate education by Chickiering and Gamon's is to respect diverse talents and ways of learning[1]. I have used the VARK(Visual, Aural, Read/Write, Kinesthetic) learning styles survey by Bonwell and Fleming[2] to recognize different leaning styles among my students and observed kinesthetic style as predominant learning style among engineering technology students as reported earlier[3]. The general chemistry course is a required or elective science course for engineering technology programs at K-State, Salina and is also considered university UGE (undergraduate general education) course (http://www.k-state.edu/catl/uge/). UGE courses are to incorporate an active learning environment, an experiential context for whatever is studied, and to provide an opportunity for students to connect ideas.

The periodic table is one of most important chemistry references, displayed in almost every chemistry classroom and laboratory, and presented in most chemistry textbooks.

The standard periodic table lists atomic symbol, atomic number and atomic mass for each element. With only symbol in the periodic table (e.g. potassium expressed to as $_{19}K^{39.10}$), students sometimes have difficulty in connecting the symbol, K, to the potassium metal. My goals in a hands-on periodic table project and creative presentation are: (1) to make students illustrate the chemical symbol in personal way based on collected information and what they have learned about the element, (2) to connect student learning to personal interests and to have them enjoy an "ownership" of learning, and (3) to foster connection between the basic science and engineering courses students take.

Assignment and Students' Work Examples

This assignment is introduced with the following information: *To complete this project successfully, you will need to thoroughly research the element that you choose and utilize your personal creativity. Your first task is to design a concise yet informative presentation in 10 cm by 10 cm block of a designated element from the periodic table. You can design your block as " cool" as you want as long as it has the atomic number, the element symbol, and the mass number. Secondly, you are to convey the information about the element in a creative report, such as a short story, poem, song, poster, pamphlet, model, mobile, CD, video clip and etc. Keep in mind that the project is to connect us to and help us understand our world around us in our every day life.*

Each student chooses his or her element at least one week before the assignment due date. The student element presentations are assembled as a wall display periodic table in the Science Center at K-State, Salina. Each student is asked to do a *better expression than the previously displayed element* to avoid similarity and redundancy of well-known elements. The creative presentations are shared in the class, at public outreach activities, and through the online course web site (http://Online.ksu.edu) to exhibit student work and to encourage diverse expression. Examples of students' periodic table blocks are shown in Figure1.

Figure 1:
Connecting abstract symbol to daily life examples (e.g. fluoride containing toothpaste, neon light, nickel battery).

Student creative reports have included:
Power point presentations, short stories, poems, rap songs, posters, pamphlets, models, mobiles, video clips, wind chime, quilt, computer programming, games, puppet shows and others.

Figure 2: Francium quilt and Arsenic display

Many students in engineering technology programs have connected the project to their major programs. For example, one student in the electronic engineering technology program designed and milled a square of single sided circuit board with the front side solid sheet of copper, without sealing the copper intentionally so that it could oxidize naturally. One student in mechanical engineering technology program worked on a milling project with an aluminum sheet with the CNC (Computer Numerical Control) mill code to express the symbol, Al. Another student in mechanical engineering technology designed a metal welding display for Ar, indicating the use of argon gas in welding. Students in computer systems technology utilized Visual Basic and C++ programming as tools to present information about their elements.

Outcomes

The outcomes from this non-traditional teaching strategy were very rewarding. The students were motivated and enjoyed gathering and presenting information, and indicated that the assignment enhanced their learning. In a survey from 22 students in the CHM 110 (general chemistry) course in Spring 2004, 73 % replied they either strongly agreed or agreed that working on the Periodic Table project (gathering and presenting information) enhanced their learning. Additionally, 68 % answered as either strongly agreed or agreed that working on Creative Project helped them connect their learning about chemistry to their personal interests.

Many students selected this project as a key piece in their course portfolio. In annotation, students described recognizing the responsibility for learning, utilizing previous learning from engineering courses, and that they enjoyed different approach. Following are a few excerpts from their annotations and comments, in their own words: *" Loved it! Really learned a lot about the element that way! It is my project." "This allowed me to work other area of expertise into my life that I haven't been able to use for long time." "I researched for reliable information to use in my projects --" "I learned a lot from this experience because I got to research an element to make my web page." " I was happy with this because my classes were relating to each other and I was finally seeing a correlation." "The poster project that I have done increased my interest about the subject." "Quilting is my most favorite hobby and I thoroughly enjoyed taking a very fun, creative and original way for me to present my research on francium by making the francium quilt." "It allowed me to use my computer skills from previous classes."*

I use this project as instructional demonstration tool when teaching relevant topics. For example, I take the copper periodic table piece to the classroom when discussing about oxidation and reduction and electron configuration. I show the francium quilt with its unit cell drawing to talk about crystal structures. I display the projects to promote science and diversity awareness during public outreach activities, such as College Open House and TWIST (teen women in science and technology) career day.

Discussion

Many students in engineering technology programs come to chemistry class with little personal interest and take it only because it is required in their curriculum. The goal of this assignment is to transfer the excitement students have in a personal "hobby" to learning about chemistry. This project was successful in motivating students to combine their personal interests studying chemistry and in incorporating kinesthetic learning styles. It has also increased my enthusiasm to know my students on a personal level with observing the unique interaction between their personal interests with talents and chemistry learning.

Bibliography

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