Sruthi Buddai

Professor Jody Cohen

Multicultural Education

15 April 2011

Rationale for Inquiry Project: STEM Curriculum

In this curriculum project, my focus was to integrate scientific analysis with real-world problem solving of community and social justice issues. These four lesson plans just graze the surface of the depth of what may be covered through the integration of chemistry, earth science, environmental science, public policy, international politics, and human rights. Being aware that I was designing an innovative STEM-based curriculum, I used the following national science education standards for grades 12 as a guide.

[NATIONAL SCIENCE EDUCATION STANDARDS: GRADE 12](http://www.starhop.com/library/pdf/studyguide/standards/NSEsum.pdf)

A1. IDENTIFY QUESTIONS AND CONCEPTS THAT GUIDE SCIENTIFIC

INVESTIGATIONS.

A2. DESIGN AND CONDUCT SCIENTIFIC INVESTIGATIONS

A5. RECOGNIZE AND ANALYZE ALTERNATIVE EXPLANATIONS AND

MODELS

A6. COMMUNICATE AND DEFEND A SCIENTIFIC ARGUMENT
SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVE F
F1. PERSONAL AND COMMUNITY HEALTH
F4. ENVIRONMENTAL QUALITY
F5. NATURAL AND HUMAN INDUCED HAZARDS
F6. SCIENCE AND TECHNOLOGY IN LOCAL, NATIONAL, AND GLOBAL

This curriculum involves small and large group discussions, real-world case studies, web-based interactive assignments and articles, google earth exploration of local watersheds, the use of various sources of media such as film and interactive software, and self-reflective analysis in order to diversify the approaches to learning and target diverse strengths typical of a varied student population. The lessons and this curriculum in general weigh heavily on the strength of the teacher’s and students’ integrative and connective abilities as evidenced by the numerous self-reflections, discussions, and concept map activities. Much of my reasoning and interest in formulating a heavily integrative, real-world analysis based approach of learning in a science course is based upon my extensive research in the numerous innovative STEM Education practices and developments outlined below.

A study conducted in a Midwestern university science classroom using the project Case It! – a NSF sponsored project that focuses on emphasizing project, research, and case-based learning showed interesting results in effective student involvement and learning. This study concluded that having a case-based approach allowed for students to further develop in the following areas: being curious and interested in a topic, having local and global relevancy in their learning, expertise and evident enhancement of skills, active learning using personal discovery, engaging in topics with greater human relevance, developing effective communication skills, and provoking more overall interest and learning.[[1]](#footnote-1) Following the success of this implemented project, I wanted to focus on providing opportunities for students to have concrete real-world analysis through multiple ways – participating in a real-world case scenario (Exxon vs. NH), analyzing test results of a personally relevant science experiment with sincere and serious consideration of next steps involving collaboration with local community members and elected officials, and discussing current global issues related to water crises and connecting these issues with human rights concepts.

One of my largest focuses in this project involved integrating numerous different disciplines and encouraging students to find connections between their personal lives and the numerous disciplines that they encounter in the course. In *Successful STEM Education* published by the National Research Council For this reason, author Alexandra Beatty states that a good approach to education involves “curriculum integration, in which links among academic disciplines are explored and students have opportunities to learn about the real-world applications.[[2]](#footnote-2)” I have implemented various independent writing projects such as self-reflections and connective concept maps. These individual ideas are then shared with the larger group through discussion and focused discussion questions which examine interconnectivity between topics – allowing for both depth and breadth of understanding.

 In traditional public school science classrooms involving my own personal experience, the methods and tools of teaching are limiting. Generally the class follows a textbook format with occasional experiments and group projects. Although textbooks serve as useful resources, they should not serve as the main focus of the course if the course intends to offer both breadth and depth of knowledge as well as be significantly meaningful in the lives of students. In order for learning to be significantly meaningful in the lives of students, the content of study should be personally relevant. In *STEM the Tide,* author David Drew writes in expanding the course to benefit and serve students from diverse backgrounds, “It is important to consider that…students have opportunities to learn with understanding, to develop an identity as a science learner while also developing their own cultural and linguistic identity, and to develop a sense of agency in their education[[3]](#footnote-3).” He also states that “equitable learning environments are those in which (1) the experiences that all students bring from their homes and communities are valued, (2) their cultural and linguistic knowledge is integrated with the disciplinary learning they face at school[[4]](#footnote-4).” For this reason, I have chosen to implement various activities not typical in a traditional science classroom using student-centered learning tactics such as self-reflection, extensive discussion, and a focus on daily life and real-world applications of the course material.

I enjoyed researching and learning more about innovative science education in the newly developing STEM fields. I found myself being so engrossed by the research and the numerous ideologies and pedagogies being implemented that I had little trouble delving deep into my research. The final curriculum project is a product of looking through hundreds of different materials and resources – cumulating in an integrative and holistic approach to the science and ethics of water in local, national, and international scales. I hoped that through this curriculum, students could enjoy multiple lens and perspectives into an overarching issue and enjoy a challenging but deeply rewarding and personally relevant course. This was a deeply rewarding exercise for me and I am very satisfied with the end product.

Works Cited

Wolter, Bjorn H.K. *What Makes Science Relevant?: Student Perceptions of Multimedia Case Learning in Ecology and Health*. Publication. 1st ed. Vol. 14. N.p.: n.p., 2013. Journal of STEM Education.

Beatty, Alexandra. *Successful STEM Education: A Workshop Summary*. National Academies Press, 2011.

Drew, David E. *STEM the tide: Reforming science, technology, engineering, and math education in America.* JHUP, 2011.

1. Wolter, Bjorn H.K. *What Makes Science Relevant?: Student Perceptions of Multimedia Case Learning in Ecology and Health*. Publication. 1st ed. Vol. 14. N.p.: n.p., 2013. Journal of STEM Education. [↑](#footnote-ref-1)
2. Beatty, Alexandra. Successful STEM Education: A Workshop Summary. National Academies Press, 2011. P.17 [↑](#footnote-ref-2)
3. Drew, David E. STEM the tide: Reforming science, technology, engineering, and math education in America. JHUP, 2011 p.29. [↑](#footnote-ref-3)
4. Drew, David E. STEM the tide: Reforming science, technology, engineering, and math education in America. JHUP, 2011.p.30 [↑](#footnote-ref-4)