Implementing Human Rights Education in the Science Curriculum

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Should it be the Science of Magic or the Magical Science?

Science has endowed people living in developed countries with instant access to global information and networking, while advanced technologies—a byproduct of scientific development—drains earth's resources in order to maintain the unsustainable way of life of these people. Surprisingly though, countries leading this technological revolution are not the leaders in math, technology and science education (STEM). In these countries, an average person may spend hours of every day navigating through an environment governed by intricate networks of integrated circuits designed to reduce mechanical workload, provide on-demand entertainment, and emotional connectivity with people all over the world. This entire feast is possible for the individual without him or her knowing a smidgeon of how the system itself works—no need to know math or science, the tools by which these technologies are created. "This is the latest model, with the most up-to-date software, a user-friendly product; this is why I bought it." In certain ways, we are not so very different from ancient groups living thousands of years ago, being told by priests or spiritual leaders how to behave in response to the environment. A thunderstorm was no less mysterious for them than the workings of a smart phone for an average person today.

Although basic knowledge of science is lacking, appreciation for science and math is on the rise, and has captivated audiences of popular science shows, of sci-fi channels, and in the popular sitcom "The Big Bang Theory." This popularity, however, has not resulted in more students—especially females—changing their career goals and populating science classrooms, increased student retention rates, or reduced achievement gaps in science education. "I hate Math!" or "Are you going to use any Math in this course?" are common sentences heard on opening days of a GE science course. So is "science is interesting, I need it to fit in, but learning this stuff is not for me!" As in the past, when esoteric groups kept knowledge of lunar cycles, architectural developments, and agriculture technology in the hands of the few as a way to exert control over the many, the production of modern-day esoteric high-tech devices is also left in the hands of an elite of few employed by mega-corporations. We follow their yearly release of magical wonders without any questioning. Chesa Caparas, leading the presentation "*Human Rights Curriculum for the Digital Age*," shows how Human Rights Education helps to break the passive automatic

mode in which we react to new technological releases, leading us to investigate sources of production and manufacturing. We need more of this scientifically-inquiring skeptical state of mind and less of the passive, almost religiously-accepting state of mind of a believer when new products are about to be released. We need to implement more of the science of magic and less of the magical sciences in our classrooms.

Human Rights Education: Bringing Inquiry to the Classrooms, Implementing Contracted SLO's, and Breaking Myths about Science Education

Science and math teachers of middle and high school, as well as STEM professors in institutions of higher education are aware that success in teaching science is limited when students openly avoid math. We are a high tech society where individuals know less mathematics, but enjoy commenting on the latest findings of science—one can't go without the other. Professors are aware of this problem, and attempt their best not only to invest time during lecture hours "reviewing" basic math, but also highlighting the connections of applied math with real world situations. In addition, Community College (CC) professors are required, under articulation agreements between CC's and State Universities, to follow a meticulously detailed course content constrained by CI-D code numbers and SLO's. "It is the new law of the land," we are told, and "if you don't follow the law you should not be earning a pay check". Students are supposed to get into a CC and out to a 4-year institution in the least amount of time, ideally following a planned AS-T program.

How can traditional course content be delivered using attractive platforms, and inspire students to the extent that some might even turn around and embrace a science career? We, STEM professors, experience the consequences of students' lagging math skills not only in gateway courses, but also in entry-level descriptive GE science courses with students demonstrating very little patience with numbers and graphics display. How is it possible to teach science if the language in which science rests is, in general, unappreciated and disregarded as too difficult and boring to be used or understood? In this report, we demonstrate how Human Rights Education provides a solution to this very urgent problem.

We present two lessons plans that incorporate Human Rights Education in a currently articulated science course, designed not only to increase student learning of the hardcore science materials of a GE course, but also to produce better human beings engaged in responsible activism as they apply scientific knowledge learned in class to resolve real world situations.

Destroying Myths with Science and Implementing Inquiry-Based Lesson Plans

There are two myths rooted in students' brain circuitry preventing them from openhearted engagement in a GE science course. First, the myth that doing or developing science is restricted to science geeks having no connection with "real life." "Scientists are serious, no-fun type of people, spending significant hours of their lives enshrouded in their own thoughts and interests which will eventually lead them to madness." The second myth relates to math, the language of science: "Since elementary school, I always struggled in my math courses, so how can I succeed in a subject whose language is mathematics?"

Student Empathic Engagement – The Key of Human Rights Education

Inquiry-Based lesson plans incorporating elements of Human Rights have the virtue of using students' empathy to establish connections with topics to be learned. These lesson-plans require little or no effort from the professor to be implemented and engage students. We all have this important and powerful social bonding agent: empathy. Students' empathy alone not only provides raw materials to build bridges between their passive states of mind to one of seeking for positive solutions to world problems, but also provides the emotional energy to keep them connected to the subject-matter, moving them forward towards project completion. Once the connection is made, professors immediately indicate what skills or scientific knowledge learned in classroom are needed to tackle the problem. I would refer to the presentations of all SHREI fellows, in particular Lesley Louden (photography), Erica Onugha and Jordan Hayes (English Composition), each exploring different creative lesson plans but with an identical HRE model in which students' empathy is employed as a "sticky" mechanism to link the course content to a real world situation, bring about students' action and social activism.

In the STEM area, the HRE model was implemented in the Earth Sciences course (CI-D 120) at Evergreen Valley College, using two lesson plans presented to students on the first day of class. Particulars of both lessons are gradually explored as course content is introduced according to the scheduled course calendar (in this case, earth's natural resources and climate change). Class debates and online chats are incorporated to help enrich the delivery of course materials associated with lessons. Implementation of HRE is achieved without adding to already contracted course content, or modifying SLO's.

How are myths destroyed? Once a student becomes aware of a real-world problem AND cares to find solutions, s/he realizes that science and technology—rather than simply praying for supernatural help or shutting the senses down and ignoring the reality of facts—are important allies to bring transformative measures to the table. As the student progressively embraces the project chosen at the beginning of class, s/he becomes aware that the power needed to bring a project to completion requires critical and skeptical minds engaged 24 hours in the process of finding solutions. It demands a mind flexible in exercising collaborative approaches with peers

to develop sensible and sound strategies. In other words, s/he must become a scientist from within.... "Science is cool after all!" and this epiphany brings the student face to face with the horrendous monster of "using math," for if scientific solutions are to be incorporated to resolve real world situations, the student must communicate findings using numbers and graphics. Although the requisite communication skills cannot be fully developed in 4 months of 3 hours of weekly interactions, students' engagement and passion gives them a hint of the discipline required to present evidence using the precise language of mathematics. "I might hate math, but I need it and I will use it!" The students' improvement in communicating their projects' findings can be measured by the quality of their articulation when presenting evidence with memorization of numbers and rates, and concatenation of different pieces of physical science course materials into a coherent flow of ideas supporting their findings. Again, science is experienced as a wonderful and engaging process and math is just the needed language to express results.

Lesson One: Minerals, Rocks, and Exploration of Earth's Resources.

A course on Earth Sciences incorporates the study of minerals and the rock cycle. Students enjoy identifying minerals using the properties of cleavage, hardness, specific gravity and others. A side product of the study of rocks and minerals is the colorful universe of gemstones, their formation and usages. Quite often, earth science books show superb images of some of the most common crystals and minerals, as well as regulated mining industry with well dressed workers who probably have labor contracts and good health benefits. Human Rights Education goes a step further by exploring images that are not shown in books. Students' empathy is awakened when visuals of mining sites lacking efficient safety systems, or of children being used as part of the labor force, or a labor force deprived of basic human rights are presented. We break out of the classical lecture flow at this moment and allow students to explore the subject, reminding them at all times to use elements of physical sciences to express their opinions. Professors should not forget that they are supervising a STEM course where the social sciences aspect of it—or the HRE side of it—is only used to trigger student participation.

Lesson SLOs

At the end of this activity students will be able to

- List physical sciences mechanisms responsible for creating the earth resource chosen by the group
- Indicate Human Rights articles violated in the production of such resource
- List actions globally concerned citizens should embrace to reduce human exploitation associated with the mining of natural resources

SLO Assessments

- Presentation of weekly group or individual reports done on subject listed in lesson SLOs
- Group poster presentation at the end of semester

Web Based Resources

- The Berkeley Pit—http://www.pitwatch.org/
- Serra Pelada—http://www.colossusminerals.com
- Diamond mining all over the world – http://www.amnestyusa.org/our-work/issues/business-and-human-rights/oil-gas-and-mining-industries/conflict-diamonds
- Sulfur mining in Indonesia http://www.meridian.org/component/k2/item/1368-the-cinematic-exploration-of-indonesian-sulfur-mining
- Weekly news media and web resources provided by students (abundant sources)

Every break-out session should have handouts with specific landmarks to be achieved. Example of Class Activity based on a semester-wide course:

First month, divide class in groups containing up to 4 students. Each student receives a complete set of the Declaration of Human Right articles, and list of minerals and ores to be researched.

- Identify mineral or particular ore to be focused on, and community group affected by mining such resource
- Research physical and chemical processes responsible for mineral formation.
- List environmental problems associated with the mining of such resource
- Identify UDHR article(s) to be focused on in project. Use Julie Maia's rainbow summary of the Universal declaration of Human Rights (see panel "From Dignity to Global Citizenship: A Feminist Approach to Human Rights Education")

At the end of third month, students must have completed:

- Identification of physical science evidence affecting community AND Human Rights articles challenged by unregulated commercial exploration of earth's ores. They also should…
- List actions that globally concerned citizens should embrace to improve workers conditions on mining sites

At the end of semester, students must submit their group work and communicate findings to their college community.

Lesson Two: Climate Change and its Impact on Economically Vulnerable Societies

For the first time in earth history one of its species is responsible for introducing a new force in the biosphere, altering its properties and perhaps causing the 6th great mass extinction. According to current scientific findings, our way of life is supported by energy harvest based primarily on fossil fuels, which releases significant amounts of CO_2 into the atmosphere. This gas is a primary source of global warming, which is already causing numerous natural disasters worldwide and affecting the lives of economically vulnerable groups.

Lesson SLOs

At the end of this activity students will be able to

- List scientific data supporting global warming and enunciate evidence-based opinions about Climate Change
- Indicate Human Rights articles that are being violated in regions impacted by Climate Change, and populated by low income communities.
- Enunciate actions globally concerned citizens should embrace to minimize the impacts of Global Warming on economically vulnerable communities

SLO Assessments

- Weekly group or individual reports of research done on subject matter of Climate Change.
- Group poster presentation at the end of semester

Web Based Resources

- http://www.ipcc.ch "The fifth assessment report released by the Intergovernmental Panel on Climate Change"
- TED Talk on Climate Change (various – student research, and communicate to class)
- http://www.epa.gov/climatechange/—Regional Impacts of Climate Change
- Weekly news and web-based research done by students

Example of Class Activity based on a semester-wide course:

First month, divide class in groups containing up to 4 students. Each student receives a complete set of the Declaration of Human Right articles, and EPA projection of areas affected by Climate Change, and a hand out listing specific landmarks to be achieved.

- Identify the community to be focused on, indicate population size, and explain why this community was chosen. This choice is in general dictated by empathy: students may have a historical connection with the region. Ideally, this community should not be located in the US to help students think globally. Some students might prefer to tackle more domestic communities, in which case the student should explain why.
- Based on the EPA report, define the physical science issue (heat, flooding, sea level rise, hurricanes, etc.) that will affect the community
- Identify HR article(s) to be focused on using suggestions given in handout. Use Julie Maia's rainbow summary of the Universal Declaration of Human Rights.

At the end of third month, students must have completed:

- Identification of physical science evidence affecting community AND Human Rights articles challenged by incoming natural disasters. They also should…
- List the series of causes/effects connecting the burning of fossil fuels with the particular problem affecting their chosen community. 95% of scientists working in the field suggest that humans are driving Climate Change with extraordinary release of carbon dioxide in the atmosphere.

At the end of semester, students must submit their group work and communicate findings to their college community.