Action Research Proposal

The Effects of Biotechnology Based Case Studies Combined with Biotechnology Laboratory Experiences on Student Interest and Knowledge/Skills in an Advanced Placement Environmental Science Class in Florida’s Accountability, Grade-Driven Education System.

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Abstract:

The focus of this action research project to find out if the combination of pre-unit biotechnology based case studies combined with real life biotech laboratory experiences will increase student interest in my AP Environmental Science unit curriculum, mastery of bio-technology lab skills, thus showing increase knowledge of content. Pre-interest survey followed by a biotechnology-based case study will be given to my AP Environmental students prior to the Genetically Modified Organism unit in order to stimulate interest in the content area. An on-task checklist will be given during the case study. By incorporating real world biotechnology laboratory experiences, students’ affinity to the subject will also be assessed. A lab skill practicum will be incorporated. At the end of the unit a post interest will be given followed by a content based post-test.

Rationale:

We are now in a political climate where the emphasis is on accountability at every level of education including federal, state, district, school administration, teacher, and finally; last but not least: the student. In recent years we have gone from the dreaded President Bush’s “No Child Left Behind” to President Obama’s “Elementary and Secondary Education Act” which in the words of President Obama is designed "To help states, districts and schools that are ready to move forward with education reform, our administration will provide flexibility from the law in exchange for a real commitment to undertake change. The purpose is not to give states and districts a reprieve from accountability, but rather to unleash energy to improve our schools at the local level,"(Whitehouse, 2011, p.1). This continual effort of the government pushes the districts and schools to increase the level of grading and evaluation onto the schools, teachers and students. States insist that high performing districts receive federal funds. These districts in turn want high performing schools that need state funds which require high performing teachers. However, to be successful, these teachers need high performing students which results, again, in the students who continue to get tested by one form or another of a standardized test.

At the high school level there are multiple components to receiving points to achieve the school’s grade. Schools search for any points they can receive in order to get the highest grades. One of the criteria is “Accelerated coursework performance: the measure of weighted successful completions in accelerated coursework divided by the count of accelerated coursework participants. Weighted at 1.25. (125 points)” (FLDOE, 2012, p.4), which includes Advanced Placement Courses. The desire to have such accountability has many ramifications in the education system. One such ramification is the placing of students in Advanced Placement classes that ordinarily would be enrolled in lower level or standard level courses. These students may not be prepared for such classes for a multiple of reasons but are placed in them because the
school needs a higher volume of students in the course to increase the opportunity for the school to receive desired points.

“In the eyes of American parents, college admissions officers control the single most important gate their children will ever pass through. Nearly all parents hope their child will go to college. Perceptions of what it takes to get into preferred colleges and universities profoundly affect the courses students take, the standards teachers set and the effort students put out. . .They also induce administrators to offer rigorous courses (eg. AP and IB courses)” (Bishop, 1999, p. 1). This pressure on children sometimes guides them to take multiple AP and dual enrollment classes that require a lot of rigor on the part of the student. Once in these classes they feel overwhelmed and find it very difficult to keep up the workload. Combined with original misplacement based on ability level, students become disinterested in the actual content, must prioritize their workload, and often complete work for a different course during the current lesson. Consequently, teachers are left to find ways to pique students’ interest in the content of their courses in order to engage students and stimulate their desire to truly learn the content.

This coming year I will be teaching AP Environmental Science under the aforementioned circumstances and I feel that it is imperative to enrich my students with a unit themed activity in which to stimulate their interest to want to learn the lesson of the unit. I will further enrich the learning by incorporating biotechnology activities which will coincide with the theme of the unit. “This enriched environment can actually help build a more complex neural network and studies prove that there are verifiable and even remarkable benefits to an enriched environment. The studies also confirm that an enriched environment can actually provide some protection from stress-related disorders.” (Jensen, 2006, p. 52) By participating in an enriched environment, students learn ways to enrich their lives and skills to combat the stressors of reality and be successful in my AP class. The purpose of this study is to describe the effects of using biosciences-based Case Studies on student interest prior to starting Advanced Placement Environmental Science units while incorporating unit themed biotechnology laboratory activities in the unit to enrich the curriculum experience.

**Action Research Intervention:**

This year I will be incorporating bio-technology based Case Study activities at the beginning of each AP Environmental Science topic to pique student interest in the unit in which we are about to cover. To further enrich the concepts of the unit, I will incorporate bio-technology lab activities in the unit to give my students the experience of real world biotechnology laboratory techniques. The goal of this intervention is to enrich the learning experience for my students which I am hoping these experiences will not only stimulate them to get the extra GPA boost, but actually want to learn the content.
To accomplish this I will introduce a relevant case study at the beginning of the lesson. A case study concerning recent use of genetically modified organisms in our food supply will be utilized to increase student interest and pertinence. Students will use a close reading activity to ensure engagement, comprehension, and thorough analysis of the case study over one class period. The case study will be followed by more traditional teaching methods including lecture, active reading of the text, use of graphic organizers, and interpretation of textbook graphics for the following week. To reinforce the concepts in the unit, a biotechnology laboratory activity will be conducted by the students. In particular, the pGLO Transformation Kit to analyze DNA will fit well for the unit on Genetically Modified Organisms and will take two class periods for students to complete. The culmination of the unit will be in the form of a unit assessment and evaluative posttests.

Connections to Bench to Bedside Summer Institute:

My experience at the Bench to Bedside Summer Institute has given me insight as to how biotechnology has a role in almost every aspect of most environmental issues today. I will be able to incorporate multiple lab activities provided by CPET into my curriculum. In the Advanced Placement curriculum, a number of the CPET laboratory activities match the units of study. The units of human population, population ecology, food and soil resources, toxicology, and pest management all provide excellent opportunities to integrate biotechnology to emphasize and reinforce critical concepts and ideas. Some of the laboratory activities that will be utilized are Stem Cells, Edheads – Create a Stem Cell Line, Nature’s Dice, and pGLO/GFP Purification. All are essential to demonstrating the application and integration of biotechnology into the world around us. The information from the various presenters will also be invaluable reference source in classroom discussions and stimulation of student curiosity and engagement.

Data Collection and Analysis:

I will be collecting multiple data sets. First I will be giving a teacher created interest survey prior to each unit, followed by a content knowledge pre-test. During the Case Study Activities I will do an on-task/engagement checklist to record which students are involved in the activity at set time intervals. A rubric will used to assess mastery on laboratory skills and the accompanying student produced laboratory report. Finally, at the end of the unit, post-tests will be given to demonstrate the growth in biotechnology content knowledge, environmental science knowledge, and student interest. By triangulating the data sets, correlations will be evaluated and analyzed to determine the effectiveness of the case studies and CPET laboratory activities in stimulating student interest, performance, and academic growth. These findings will be reported in both written and graphic formats and shared with other science teachers through professional learning communities.
Literature Cited:


Budget and Budget Justification:

- Biotech Labs – Free
  - Provided by University of Florida’s Bench to Bedside Summer Institute
- Copies of case studies and lab procedures – Free (District allowance)
- pGLO GFP Purification Kit – $238 plus shipping
  - Bio-Rad.com with required accessories
  - Centrifuge will be borrow from CPET through University of Florida
- Amino Acid Starter Kit with side chains - $349 plus shipping
  - 6 group starter kit from 3dmoleculardesigns.com

Permissions:

- Lee County School District
- Island Coast High School Administration.