

“What Do You Expect? I’m From Mulberry!”

Raising the level of confidence – using biotechnology to build science success.

An Action Research Proposal

Stace Alcala
Mulberry Senior High
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Focus Statement: The purpose of this research is to see if the use of student inquiry and biotechnology in AP Biology will create an increased knowledge of science (in general) as well as translating into other subjects, and in doing so, will it generate an “ownership” that gives students confidence in themselves and their future educational training.

Rationale: Upon arrival at my current position I quickly found that the general attitude of the students were, what seemed to me, quite lackadaisical and indifferent toward their learning. When assessed to determine knowledge acquisition, those that did poorly often replied with a statement that suggested they really weren’t capable of doing better. “Why?” I asked them, the student’s answer with a repeated phrase that it was because they came from Mulberry. The implication was that this quant, rural, mining town was really the problem. How could they possibly progress when faced with such an environment? My rhetorical answer generally followed as such, “then change Mulberry, by changing what makes up Mulberry, you!” The notion that Mulberry was the cause is a scapegoat toward their lack of intellectual confidence. Their lack of intellectual confidence is a self-propagating attitude/emotion that drives (or failure to drive) the indifference that results in lack of motivation and thus success. As well, many students have indicated that they really didn’t need science for their future. This has been a common denominator for much of education. According to studies done in Australia, this is also a prevailing attitude amongst other student populations. “The need for attitudinal research in biotechnology is paramount. Researchers have shown that becoming a scientific literate person is not a high priority for many students” (Kidman 2009- (Atwater, Wiggins, & Gardner, 1995; Zacharia, 2003)). A potential solution (and purpose of this research) is to determine if stimulating interest with different teaching pedagogies (such as hands-on biotechnology and more student inquiry-based learning techniques) will produce a more motivated student. This motivation and attitude “adjustment” may translate into success which will produce increased confidence. As suggested by research instructor Cheryl Hudson, “The workshop experience had the effect of boosting my confidence and excitement to include the labs into my high school biology courses. If I have become excited and empowered through this experience of learning new lab techniques, could my biology students become more interested and therefore, motivated to learn science through similar exposure to biotechnology labs?” (Hudson, 2011, p. 2). Attitudes are of great importance in all areas of life. Nieswandt states, “Teachers and students alike often complain about the lack of interest in topics, and schooling in general, which results in students’ boredom, apathy, and disruptive behavior or, particularly in science, in dropout from advanced science classes. Thus, researchers promoting interest focus on learning environments, features of the task or students’ self-regulation strategies in order to alter students’ interests” (Nieswandt, 2007, p. 910).

An additional and somewhat peripheral question is that does this confidence “bleed over” into other subject disciplines? The rationale for this effect is that the student will now possess a generalized new attitude and approach toward their education. And that the methodologies learned in the science lab will translate into classroom techniques needed in other subjects (perhaps a more thorough approach to their once superficial learning behaviors.) As noted by the National Postsecondary Education Cooperative, “The quality of the academic experience and intensity of the high school curriculum affect almost every dimension of success in postsecondary education. Indeed, those students who are best prepared coming out of high school are best positioned to do well in college, regardless of who they are, how much money they have, or where they go (Florida Department of Education 2005; Gladieux and Swail 1998, Horn and Kojaku 2001; Martinez and

Klopott 2003; Warburton, Bugarin, and Nunez 2001). This research investigation would like to answer the question, does biotechnology translate into other subjects in the attainment of successful preparation for collegiate or career success?

In summary, my research will investigate whether more student inquiry and incorporation of biotechnology within the AP biology classroom will produce a heightened knowledge base, translation of ability into other subjects and build a greater confidence in their science abilities for future educational prospects.

Research Questions:

- 1 How do I change my teaching style to incorporate more student inquiry and responsibility and generate more student “ownership” that causes confidence?
- 2 By introducing new biotechnology lab experiences (pipetting, gel-phoresis, PCR, microarray, and gene silencing techniques), will students be more engaged with the class as a whole?
- 3 Will the building of a biotechnology repertoire cause the student to grasp scientific concepts (beyond the lesson goal) with an increased knowledge?
- 4 Does the attainment of science knowledge translate into additional “success” within other school subjects?

Data Collection (and analysis):

1. A pre and post assessment survey (Likert, open-ended) will give a basis for student interpretation of their growth during the action research (as well as provide me with a variable of comparison to demonstrate research outcome).
2. Quantitative and Qualitative Statistical data will be collected from quizzes, tests, investigations and assignments, as well as student surveys and interviews throughout the study.
3. An “end of lesson” (daily, weekly, or perhaps unit) synopsis will be prepared by each student and submitted for completion grade. This will help student collect lesson “thoughts” or main themes for comprehension analysis (often used as a “ticket out the door” activity to “cap” a day’s lesson.) In some ways, this is like an “academic salutation” to the end of a discussion.
4. Tally sheets will often be used as a means of student involvement. These will primarily be “checklists” that produce both individualistic involvement and accountability. These checklists will include areas such as: skill acquisition, activity responsibilities, teacher-based student behavior assessment (i.e. appearance of motivation), amongst potential others.

Interventions: As a veteran instructor for over 25 years I have attempted to adjust my teaching styles according to my audience and subject matter. Having taught “factual-based” instruction and “bulk memorization” in classes such as Anatomy and Physiology the teacher directed style has become the default. This is certainly an effective means when progressing through large quantities of new vocabulary and linear sequences of pathways. However, it seems that although many students find the distribution of this information to be to their “liking” (probably due to the ease) it doesn’t always seem to translate into their long-term knowledge acquisition. It is my conclusion that they are not taking “part” and “owning” the learning because I am doing a great majority of the work. In addition, there seems to be significant failure in students practicing this information in situations outside of class (they don’t study).

1. I will be incorporating more student involvement in their initial vocabulary and content building by providing a “backbone” to the chapter’s primary themes (an outline), they will gather information from their student sources (textbook, computers, dictionaries, internet etc...). Rather than “spoon feeding” the students new content, they will be responsible for acquiring the information. In this setting, students will group in small numbers of 4-5 members. After a designated amount of time I will regroup the class and assess content through Q and A, summarizing and filling in areas of weak content and literally checking individual progress through observation of groups as they work through the process. A rubric to assess individuals and maintain accountability will be used (see appendix A). This research approach will be alternated with my traditional approach (used as a control comparison (in subsequent content units throughout the study)).

Students learn from many different teaching styles and approaches. The big “three” include visual, auditory, and kinesthetic. Combinations of each of these will “hit” most students, and arguably many will be more attracted to the kinesthetic. Although my teaching style is generally “teacher-directed” it is composed of all three approaches and more heavily weighted in the visual/auditory areas. Incorporation of activities and lab investigations is common in all of the subject units, yet, these were sometimes limited to student levels of understanding, equipment deficiencies, and often, time. Incorporating more kinesthetic applications will give the students more practice, ownership, individualistic variation, and allowance for peer interaction.

2. A primary focus in this action research is the incorporation of biotechnology. The students will not have done any of the techniques (unless immigrating in from other schools) prior to this class. We will perform as many techniques as applicable; including, pipetting, gel-phoresis, DNA extraction, PCR, microassays, and protein crystallization (and others that I deem appropriate). These techniques will be appropriately matched with the unit lesson (i.e. central dogma and protein crystallization). During these investigations the students will utilize pre-made lab models and instruction, as well as student inquiry (self developed). The AP Biology curriculum has been revised this year to highlight student inquiry, promoting this learning style in a much greater fashion than previously attended. Although this technique will be more heavily employed than my previous years, it is my intention to follow suggested laboratory investigations from pre-made sources and supplement additional investigations with student-directed/inquiry-based investigations.

Initial Survey – Answer the questions by placing a check mark ✓ in the space provided (indicating the level you feel best represents you).

	Survey Question:	Yes	No	0 None	Low A few(somewhat) 1-3	Moderate A fair amount 4-5	High Numerous (well) >5
1	How well do you know science?						
2	Are you confident in your Knowledge level?						
3	Do you plan on attending post high school education?						
4	Do you plan on entering a career field that is science-based?						
5	Do you feel like you are not being prepared “properly” because you are at Mulberry?						
6	If you answered yes (above) why do you think MHS is inferior to other schools such as GJHS or LHS etc...? (answer in free response below)	X	X	X	X	X	X
7	How is it that you think you don’t know what there is to know if you don’t know [what there is to know]? (answer in free response below)	X	X	X	X	X	X
8	What amount of experience have you had in biotechnology?						
9	Do you think that what you learn in this Class will translate into your other classes? (i.e. Does AP Biology help your English Lit success?)						
10	Does the incorporation of biotechnology cause you to be more interested in this class (and science in general)?						

Free Response #6 _____

Free Response #7 _____
