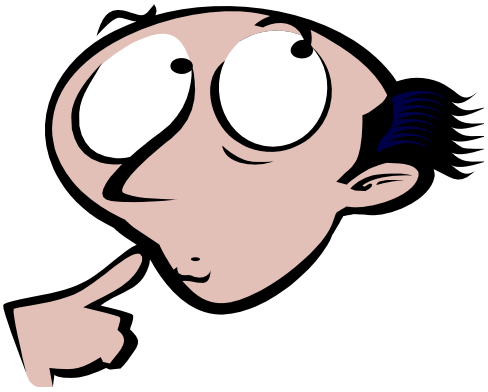
Attitude Is Everything - A Study of the impact of biotechnology inquiry based activities on 9th grade student attitudes and achievement in science.

Bench to Bedside Action Research Proposal



7/2/2010
Columbia High School
By Nicole M. Sasnett

Abstract

The study will investigate the use of biotechnology inquiry based activities on student attitudes toward science. The methodology will be a comparison of students treated with biotechnology inquiry based activity vs. those treated with non-biotechnology inquiry activities. The students will be ninth graders. The goal is to compare students with similar reading proficiency according to the Florida Comprehensive Achievement Test. The main assessment instrument is an attitude survey provided by the mission biotech program coordinator. Other data sources will include learning styles, FCAT scores, pre/post unit tests and student surveys. Evaluations occur frequently. The purpose of this study is to introduce ninth grade integrated science students to the field of biotechnology while increasing their interest in the subject area.

Rationale

Students seem be able to demonstrate oral and formative knowledge of a topic, but perform poorly on summative and unit assessment. My objective is to improve student success on formative and summative tests focused on Biotechnology. I set out to discover some best practices of teaching that translate into student achievement. I found a relationship between student achievement and their attitude toward a subject area. Studies show that many students generally have negative attitude toward science. Some students describe it as boring or hard and many fail to see its application to real life.

Biotechnology can be translated as "life technology". It involves manipulating and using organisms to benefit society in many ways. So, students can see real life examples (Ahmed, 1996). It is a relatively new form of science with which many high school students are unfamiliar. Biotechnology's practical uses include DNA fingerprinting, paternity testing and diagnosis of doping agent in athletes. Biotechnology is a growing field. Many students are unaware of the career opportunities that exist in biotechnology.

The Florida Department of Education recommends the use of inquiry in the science classroom. Student attitude toward a subject is shown to be directly linked to achievement in the subject area (Freeman, 1997). A direct link is also shown between the use of inquiry in the science classroom and the improvement of student attitudes toward the subject and their achievement. Biotechnology provides several inquiry based activities to pique student interest. It is the belief of the researcher that using biotechnology inquiry will improve students' attitudes toward science. The improvement in attitude should result in higher student achievement.

I also find that many of my students possess a high level of computer technology skills. I am amazed by the work that students produce when given an opportunity to work with computer technologies. Students seem to enjoy innovative practices in learning especially the opportunity to play. I plan to incorporate the use of the mission biotech gaming system to allow additional levels of exposure and play at learning about biotechnology. Play is considered a socially acceptable means of learning. Some argue that for games to benefit educational practice and learning they need to combine fun elements with aspects of instructional design and system design that include motivational, learning and interactive components (Adams, Naicker, Vincent & Amory, 1999). After reviewing Dr. Troy Sadler's game I have found it is an appropriate educational gaming system. My experience and biotech is very limited. The game actually helped me to feel more comfortable in the lab through my gaming. I want to share that knowledge with my students.

The purpose of this investigation is to describe the impact of biotechnology inquiry activities on students' attitudes and achievement in science.

Action Research Intervention

The intervention method or treatment will be biotech inquiry. Students will learn about PCR, DNA Extraction and DNA fingerprinting. I will use it as part of an extension of my chemistry unit for integrated science. I will also use mission biotech as part of my curriculum for a research course. In integrated science students learn about some of the molecular component of matter and how they interact. PCR allows students to use real world applications of this science in order to do DNA finger printing. Students will then take that knowledge to solve a CSI case for their semester project. Biotechnology activities equip student with knowledge to help them actually perform some duties of a scientist. In research, students will follow the coursework that goes along with mission biotech to learn new skill and career opportunities. The objective is that students better understand the nature of DNA fingerprinting and viruses. The time line is two week in December.

Connections to Bench to Bedside Summer Institute:

The Bench to Bedside program changed my entire pedagogy about teaching. The program is a model of teaching's best practices. The program modeled the use of inquiry in order to teach a concept. It also modeled exposing a subject area to learning in different ways. I learned about the grand resources of professor at UF, their work and their willingness to share their studies. I learned how to collaborate with my fellow teachers to achieve a common goal. I learned about the use of gaming in instruction. More specifically, I learned about PCR, crystallization, gene therapy, the possible careers in biotechnology and opportunities at UF.

Data collection and Analysis

I will collect data using an attitude survey focused on student's attitude toward science prior to biotechnology inquiry activities. (Mills, 2007)I will use a Likert scale using numbers 1-5 to describe varying feelings about the subject area. The survey will be 25 questions. Data will be analyzed in the form of percents and correlated with other data sources including FCAT scores and learning styles. The learning style will be assessed through a learning style inventory. At the end of the intervention a similar attitude survey will be given. I will look for changes in student attitudes, and who is changing. Data will also be collected through formative exams and daily journaling. The teacher will record daily observations during the treatment period and reflections concerning the treatment methodology. Students will provide daily reflections on the treatment to qualitative information on their attitudes toward science.

Literature Cited

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Adams, C., Naicker, K, Vincent, J & Amory, A., (1999). The use of computer games as an educational tool. *British Journal of Educational Technology, Vol. 30 No 4 1999* 311–321

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Budget and Budget Justifications

- 6 DNA Kits- $120
- Strawberries $7.00
- 6 large conical tube of extraction solution (solution A)
- Shampoo $1.50
- Salt $1.00
- 12 test tubes- $10.00
- 12 small flip-top tubes- $7.00
- 6 plastic cups $3.00
- 6 funnels $8.00
- 6 pieces of cheesecloth $ 5.00
- 6 pairs of scissors $5.00
- 2 bottles of Ethyl Alcohol $3.00
- 1 box of paper clips $1.00
- Computer with internet connection- (Free)
- PowerPoint on PCR (Free)
- Student PCR worksheet (School Supplied)

Action Research Proposal Draft

Teacher: Mrs. Nicole Sasnett

Dates: December 12-21st

Subject area / course / grade level: Integrated Science

Standard:

The Nature of Science

Benchmark: Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. pose questions about the natural world,
2. conduct systematic observations,
3. examine books and other sources of information to see what is already known,
4. review what is known in light of empirical evidence,
5. plan investigations,
6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),
7. pose answers, explanations, or descriptions of events,
8. generate explanations that explicate or describe natural phenomena (inferences),
9. use appropriate evidence and reasoning to justify these explanations to others,
10. communicate results of scientific investigations, and
11. evaluate the merits of the explanations produced by other

Essential Question:

How do scientist investigate for gene related problems?

Materials/Vocabulary

- Technology, virus, pcr, elisa, Observations, light, investigations, pipette,
- computer ,DNA Kits, Strawberries, large conical tube of extraction solution (solution A)
- Shampoo, Salt, 12 test tubes,12 small flip-top tubes, 6 plastic cups, 6 funnels, 6 pieces of cheesecloth
- 6 pairs of scissors, 2 bottles of Ethyl Alcohol, 1 box of paper clips, Computer, PowerPoint ,Student PCR worksheet

ENGAGEMENT

DNA Extraction of a strawberry
Date:_____ 1block

EXPLORATION

Bones and the Badge-web quest (Group exploration) Date:_____ 3-5 blocks
EXPLANATION Explain the nature of PCR and DNA fingerprinting PCR-video Reading Strategy: Cornell Notes Date: _____1/2 block
ELABORATION DNA finger printing lab- Find your own DNA Date:_____1 block
EVALUATION Concept Test / CSI-Crime scene investigation Date:_____1-2 blocks