

Using Biotechnology to Motivate High School Students to Study Science

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Abstract: With the rise of technological advancement, it is important for teachers to stay inform on issues related to technology. As a result, there is a need to impart knowledge on biotechnological skills to students. It is the role of a school to impart knowledge and inform students about the technological advancements that are used in society and arm them with the right tools to be competent individuals. As a science teacher, the CPET program has definitely outlined a variety of techniques and lectures that will empower me as a teacher to impart knowledge and real world skills on motivating students to study science. Selected students at Duncan U. Fletcher High School were presented with a variety of biotechnology techniques to determine if these techniques motivated them to study science rather than another subject area. Questionnaires were developed for the students and a few biotechnology techniques and articles were introduced to the students. 80% of the students had an incredible change of attitude about science and technology. As a result of this short program, they are eager to learn more about science and aspire to view careers in the science field.

Rationale: With the rise of technology, I implemented some of the biotechnology techniques in my Honors Biology class to determine with these techniques assist students in understanding biological standards. Zeller(1994) discusses buzzwords such as gene cloning, recombinant DA that should be included in all biology courses. Cox (2007) presents an interesting article about self-reported diabetes and exposure to organochlorine pesticides among Mexican Americans . Barnett(2001) also discusses a model of pedagogical context knowledge. When using the scientific method, some of these biotechnology techniques will be implemented. I used reading articles related to DNA and gel electrophoresis, game simulation which we encountered great difficulty, the ELISA method as well as powerpoints to inform students about diabetes, wound healing, and a stem cells lab. This study provided

students with an opportunity to view real life applications between the scientific world and research. Oftentimes students are disconnected because they do not see the connection between theory and the real world. With the rise of new technological advancements, teachers are responsible for delivering and presenting standards mandated by the State of Florida. During the school year, I implemented some biotechnology applications to graph student interest as well as provide a sound and firm knowledge and technological approach.

Action Research Intervention: When I taught a two weeks unit on the scientific method, I interviewed my Biology Honors students using a questionnaire from the University of Florida to formulate their attitudes toward science. Using my state curriculum guide, I embedded biotechnology into the unit on the characteristics of life. I gave the students a questionnaire on their interest in biotechnology, learning, and ideas about science. I collected questionnaires and implemented various biotechnology techniques in the classroom when we worked on the scientific method. Although I made various attempts the Mission Biotech program did not work on the computer at Duval Schools. We read an article on rBGH and rBST from the website www.sustainabletable.org to give students a reading assignment with questions about the controversy surrounding whether or not rBGH is safe for cows and humans. We also read *The Healing Power Within* which discusses how extracellular matrix allow for tissue regeneration. Next we completed an ELISA procedure activity from the University of Florida equipment locker. This activity truly sparked the student's interest. They were very excited about this lab. For preparation, the students practiced micropipetting techniques from a lab activity generated from the University of Florida where they made a gator as well as UF. The students also completed a Diagnosing Diabetes Science Take Out kit on diabetes. I also utilized powerpoints, google scholar articles, video games and a variety of biotechnology techniques utilized during the Bench to Bedside institute. I provided snapshots of a variety of techniques and topics specifically , diabetes, microarray, and ELISA method so that students will understand how scientists really work. I will revisit some of these techniques again when I specifically work on genetics (DNA gel electrophoresis),

Connection to Bench to Bedside Summer Institute: When I first came to the Bench to Bedside institute I was unaware of how many more technological instruments could be used in the classroom. I used the movie Extraordinary Measures which I saw at the University of Florida this summer in addition to the ELISA Procedure, as well as Science to Go Kit on Diabetes.. I also used the powerpoints by the various lecturers. I feel empowered to utilize some of these activities in the classroom so that students can see the connections between science standards and the real life applications.

Data Collection and Analysis: I conducted pretest and post test with my students. The pretest included interviews as well as a questionnaire from the University of Florida and my own teacher made questions. I also used exit quizzes, student journals, lab quizzes, chapter quizzes, tests and projects for evaluation.

Interview Questions:

Prepared by Teacher, Elizabeth Searl

- Q1. What do you do when a program that deals with a scientific issue is turned on after watching your favorite show?
- Q2. What do you think a scientist does on a daily basis?
- Q3. Do scientific interventions influence society?
- Q4. How is science related to everyday life?
- Q5. When you read a newspaper are you interested in scientific articles?
- Q6. Are you interested in learning about the history of science?
- Q7. What is your attitude about science?
- Q8. How often have you done labs in your science classroom?

Of 100 students surveyed,

Q1. 75% stated that they change the channel when a program about a scientific issue is shown.

Q2. 90% of the students surveyed stated that scientists worked in a lab all day long and 10% believe that they work out on the field.

Q3. 80% of the students believe science does not influence society. 20% believe that science influence society.

Q4. Students stated that they use science everyday from using toothpaste which they stated was a chemical reaction, to chemical reactions in foods, to scientific experiments in the classroom

Q5. 100% of the students surveyed stated that they are not interested in reading newspaper articles on science.

Q6. 100% of the students stated that they are not interested in the history of science.

Q7. 50% stated that they have a positive attitude towards science and 50% stated that they have a negative attitude towards science.

Q8. 80% of the students stated that they have completed science labs in middle school while 20% stated that they have not completed any science labs in middle school.

How familiar are you with the concept of:

	Willing to explain concept	Familiar with concept	Not Familiar with concept
DNA extraction			
Biotechnology			
ELISA method			
Glucose/Wound Healing/Glucocorticoid dynamics			
Pipetting			
Diabetes			

Of 100 students surveyed 100% stated that they were not familiar with any of the concepts. 0% were willing to explain the concept and 0% were willing to explain any of the concept.

Prepared by Teacher, Elizabeth Searl

Pre Test

Q1. Have you heard about the use of genetically altered microbes?

40% Yes 60% No

Q2. Would you take a drug made from an animal?

37% agree 40% disagree 23% DK

Q3. What do you understand about the term genetically modified foods?

67% answered correctly while 33% answered incorrectly

Q4. If you had a need for regenerative tissue, would you use a new biotechnology technique?

3% agree 7% disagree 90% DK

Q5. Do you think a thumb can be regenerated?

30% agree 24% disagree 46% DK

Q6. Do you think that people can use animal parts for a cure?

34% agree 20% disagree 46% DK

Q7. Do you read scientific magazines?

31% agree 40% disagree 29% DK

Q8. Do you drink milk that is hormone free?

95% said no and 5% said yes

Q9. What is cloning?

90% of the students answered this question correctly and 10% did not answer the question correctly

Q10. Do you eat only organic foods?

2% answered yes and 98% answered no

I utilized this survey I acquired from the University of Florida when I attempted to use the Mission Biotech Program.

Section 1: Ideas About Learning

Q1. I enjoy learning science

50% SD 20% D 10% A 20% SA

Q2. School science has improved my decision-making

10% SD 30% D 5% A 55% SA

Q3. I enjoy using technology to solve science problems.

50% SD 50% SA

Q4. I plan to take more science classes in school.

60% SD 10% D 5% A 25% SA

Q5. Technology helps me learn science.

10% SD 90% SA

Q6. More time in school should be devoted to science.

10%SD 10%D 10% A 70%SA

Q7. Computers make learning science more interesting.

5%SD 2%D 13% A 80%SA

8. Learning science is interesting.

0%SD 0%D 46% A 54%SA

9. I enjoy using technology to learn science.

100% SA

10. More time in science classes should involve the use of technology.

100% SA

Section II Ideas about careers.

11. I would be more likely to take a job if I knew it involved working with technology

10% SD 20%D 33% A 37%SA

12. Working in technology would be interesting.

37%SD 30%D 24% A 9%SA

13. I would like to become a scientist.

50%SD 10%D 20% A 20%SA

14. I would like to get a job in technology.

67%SD 23%D 4% A 6%SA

15. I would like to work in a field related to biotechnology.

56%SD 10%D 20% A 14%SA

16. I would like to work with people who make discoveries in biotechnology.

90%SD 2%D 3% A 5%SA

17. I would enjoy a job in biotechnology.

44%SD 7%D 2% A 47%SA

18. I will probably choose a job that involves using technology.

67%SD 23%D 5% A 5%SA

19. I would enjoy working in a biotechnology laboratory.

90%SD 2%D 3% A 5%SA

20. I would like to work in a science laboratory.

59% SD 6%D 12% A 23%SA

Section III: Ideas about biotechnology

21. Biotechnology helps create solutions to the world's problems

23%SD 24%D 33% A 20%SA

22. Biotechnology is important for a country's development

10%SD	10%D	60%A	20%SA
23. Biotechnology discoveries improve our ability to treat diseases.			
1%SD	3%D	70%A	26%SA
24. Biotechnology is important in modern life.			
0%SD	3%D	60%A	37%SA
25. Biotechnology is useful for the problems of everyday life			
10%	3%D	40%A	47%SA

The students wrote an essay about the movie *Extraordinary Measures*. Then they answered the following questions:

1. Why was the movie titled Extraordinary Measures?
2. What is the disease in this movie?
3. What information do we know about Pompe Disease?
4. After viewing this movie, do you see the significance of becoming a researcher?
5. After viewing this movie, are you more interested in becoming a scientist? Why or Why not?

We also completed an ELISA lab. The students were not graded on this assignment. In this experiment, the students tested for the following allergens: Pollens: Oak Pollen, Timothy Grass, Ragweed, Mold Spores, Foods: Nuts, Seafood, as well as House Dust Mite and Cat Dander.

After the activities on biotechnology, the students' attitudes changed completely.

Post Test survey

Q1. Have you heard about the use of genetically altered microbes?

60% Yes 40% No

Q2. Would you take a drug made from an animal?

67% agree 30% disagree 3% DK

Q3. What do you understand about the term genetically modified foods?

80% answered correctly while 20% answered incorrectly

Q4. If you had a need for regenerative tissue, would you use a new biotechnology technique?

90% agree 7% disagree 3% DK

Q5. Do you think a thumb can be regenerated?

97% agree 3% disagree 0% DK

Q6. Do you think that people can use animal parts for a cure?

100% agree 0% disagree 0% DK

Q7. Do you read scientific magazines?

78% agree 22% disagree 0% DK

Q8. Do you drink milk that is hormone free?

50% said no and 50% said yes

Q9. What is cloning?

90% of the students answered this question correctly and 10% did not answer the question correctly

Q10. Do you eat only organic foods?

87% answered yes and 13% answered no

I utilized this survey I acquired from the University of Florida when I attempted to use the Mission Biotech Program.

Section 1: Ideas About Learning

Q1. I enjoy learning science

80%SD 10% D 10% A 0%SA

Q2. School science has improved my decision-making

0%SD 5%D 25%A 70%SA

Q3. I enjoy using technology to solve science problems.

10%SD 90%SA

Q4. I plan to take more science classes in school.

0% SD 6%D 22%A 72%SA

Q5. Technology helps me learn science.

10% SD 90%SA

Q6. More time in school should be devoted to science.

0%SD 0%D 10% A 90%SA

Q7. Computers make learning science more interesting.

0%SD 0%D 0% A 100%SA

8. Learning science is interesting.

0%SD 5%D 5% A 90%SA

9. I enjoy using technology to learn science.

100%SA

10. More time in science classes should involve the use of technology.

100%SA

Section II Ideas about careers.

11. I would be more likely to take a job if I knew it involved working with technology

0% SD 5%D 15% A 80%SA

12. Working in technology would be interesting.

0%SD 5%D 5% A 90%SA

13. I would like to become a scientist.

0%SD 5%D 10% A 85%SA

14. I would like to get a job in technology.

0%SD 5%D 5% A 90%SA

15. I would like to work in a field related to biotechnology.

8%SD 10%D 10% A 72%SA

16. I would like to work with people who make discoveries in biotechnology.

5%SD 2%D 13% A 80%SA

17. I would enjoy a job in biotechnology.

0%SD 5%D 3% A 92%SA

18. I will probably choose a job that involves using technology.

3%SD 10%D 15% A 72%SA

19. I would enjoy working in a biotechnology laboratory.

0%SD 0%D 17% A 83%SA

20. I would like to work in a science laboratory.

0% SD 0%D 3% A 97%SA

Section III: Ideas about biotechnology

21. Biotechnology helps create solutions to the world's problems

6%SD 10%D 10% A 74%SA

22. Biotechnology is important for a country's development

2%SD 10%D 7% A 81%SA

23. Biotechnology discoveries improve our ability to treat diseases.

3%SD 10%D 20% A 67%SA

24. Biotechnology is important in modern life.

0%SD 0%D 2% A 98%SA

25. Biotechnology is useful for the problems of everyday life

9% 5%D 5% A 71%SA

The students wrote an essay about the movie *Extraordinary Measures*. Then

they answered the following questions:

1. Why was the movie titled Extraordinary Measures?
2. What is the name of the disease in this movie? What are the symptoms?
3. What information do we know about Pompe Disease?
4. After viewing this movie, do you see the significance of becoming a researcher?
5. After viewing this movie, are you more interested in becoming a scientist? Why or Why not?

We also completed an ELISA lab. The students were not graded on this assignment. In this experiment, the students tested for the following allergens: Pollens: Oak Pollen, Timothy Grass, Ragweed, Mold Spores, Foods: Nuts, Seafood, as well as House Dust Mite and Cat Dander.

After the activities on biotechnology, the students' attitudes changed completely.

Post Test survey indicated that the students are extremely interested in Biotechnology. They were extremely pleased with all of the activities we performed in the classroom. Based on the survey, a significant amount of students changed their attitude from not being interested in science to becoming interested in science as a result of the biotechnology activities.

Questions from the article on rBGH and rBST

1. Define somatropin?
2. What is the purpose of bovine somatropin?
3. What does BST represent?
4. Why is rBGH used in cows?
5. When did the U.S. Food and Drug Administration approve rBGH/
6. Which countries have banned the use of rBGH? Why?
7. What report in 1991 caused concern?
8. How do dairy industries prevent and treat mastitis outbreaks?
9. How is the use of antibiotics negatively impacting the dairy industry?
10. How have rBGH injections cause severe mastitis?
11. How are cows who produce unnaturally high quantities of milk become malnourished?

Lesson Plan

School: Fletcher High School

Course: Biology/Biology(Honors) Unit: Characteristics of Life

Days/Date: September 12, 2011 – September 23, 2011

Instructor: Elizabeth Searl

Standard(s): SC.912.N.1.6 Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Outcome: Students should be able to distinguish between observations and inferences, observe and classify objects as living or nonliving based on the characteristics of life.

Guiding Question: What inferences can we make about living things from our observations?

Enduring Understanding: Observations lead to inferences ; inferences can be tested. All biological life is interconnected and dependent

Continuous Improvement Focus: Reading and Writing Skills using a student journal. Students will be prompted when to write in their journals.

Materials: hand lens, sanitizer, beans, plant, nonliving items, fish, brine shrimp

Diabetes Kit

PowerPoint on Diabetes

ELISA kit for the University of Florida

Reading article on rBGH and rBST

Reading article on The Healing Power Within

Micropipettes and food coloring

New Vocabulary: observation, biosphere, inference

Time	Activity	Teacher notes
Entering the class	Anticipation Guide 1-3 What is Biotechnology? How does biotechnology influence our world? Is technology an important aspect of science? How do we use biotechnology in everyday life? Survey on Attitudes about Science and Technology/Biotechnology	Don't forget lab supplies and hand sanitizer
Focused Lesson	Characteristics of Life/Observations and Inferences What is biotechnology? What is the significance of biotechnology in the world today? What is diabetes? What is Pompe Disease?	Standard: S.C.912.N.1.6
Workshop Language Arts: Warm-up, Mini-Lesson, Work Period Math: Launch, Explore, Summarize	Mini-Lesson: PowerPoint on Characteristics of Life: Students will fill in the blanks PowerPoint on Diabetes and Wound Healing from the University of Florida Video on Tissue Regeneration of a Finger Modeling/Guided Practice: Reading from text on Characteristics of Living Things Reading of article on rBGH and rBST Reading article on The Healing Power Within Teacher: Show students video It's Alive Part 1; It's Alive Part 2 from Prentice Hall Website Complete all checkpoints on the website	Extensions/Re-teach/Enrichment Use of Prentice Hall website Differentiation: Allow students to write in their journals about their opinions about Tissue regeneration Blooms/Webbs Reference:

	<p>Independent Practice: Section 3-1; Worksheet 1-2</p> <p>Students : Students will observe and classify objects as living or nonliving based on the characteristics of life</p> <p>Engage: Anticipation Guide 1-3</p> <p>Explore: Quick Lab pg. 19 Diagnosing Diabetes Science Take-Out Kit</p> <p>Explain: Characteristics of Life PowerPoint</p> <p>What is Ecology PowerPoint</p> <p>Extend: Energy Pyramid Activity</p> <p>Evaluate: Short quiz on Thursday/Friday</p> <p>Section 3-1 and Section 1-3 worksheet</p>	<p>Knowledge-list</p> <p>Comprehension-Classify objects as living or nonliving</p> <hr/> <p>Evaluation/Assessment:</p> <p>Daily exit quiz</p> <hr/> <p>Reflections:</p> <p>Allow students to work in groups of two rather than 4</p>
<p>Closing/ Wrap-up</p>	<p>Review of Vocabulary words; review of characteristics of life</p> <p>Students will answer questions from the Science Take Out Kit on Diagnosing Diabetes including the graph.</p> <p>Students are required to write in their journals about glucose levels in blood plasma samples</p>	<p>Homework:</p> <p>Section 1-3 Worksheet and Section 3-1</p>

Cross-Curricular Connection: Writing in Science Write about your thoughts on rBGH and rBST. Do you have a difference in opinion about eating organic foods and drinks?

Content Specific Techniques Learning Strategies (Including ESOL)

Vocabulary Strategy: A-Z word sheet; word mapping Cornell Notes/ Two Column Notes

Reading/Reading Strategy (KWL) Skilled Questioning, Socratic Seminars, Quick-

Writing Daily/Lab Reports/Word Problems write/Discussion

Free Response Writing SQ5R, KWL, Think Ahead

Modeling Cooperative/Collaborative Learning: peer-tutoring

Other (Anticipation Guides) small group work

Modified Curriculum: Personalize Lesson

ESE Accommodations: Language Experience Approach: draw examples

Instructional Methods and materials: implements from the experience of the student

changes to teaching methods Essential vocabulary: identify and teach essential

Assignments and assessments: changes the way students vocabulary

practice and demonstrate learning in assignments like Oral Strategies: speak slowly with facial

projects, worksheets, homework and class tests expressions and gestures to add meaning

Time demands & scheduling: assists students who need to work Visual Advance Organizers: use visual aids

at a different pace Whole language: simplify grammatical structure

Learning Environment: maintains a barrier-free classroom and paraphrase, summarize sections and

Use of special communications system: encourages students highlight or underline key words

to express themselves and understand others to participate Word

Pronunciation & Meaning: model key

fully in the classroom or difficult words in lesson

__Study habits Reinforced: teach study skills and use of textbooks, skimming and scanning techniques

__Interventions: Allow groups of two to ensure hands-on experience

XMonitoring Student Progress: Use formal and informal type of evaluation. Ask students to perform simple tasks and observe their understanding

XUse manipulative materials, hands-on activities, Problem-solving, learning centers, and multi-media materials to support content (Quick Lab)

Literature Cited

Cox, S., Niskar, A. S., Narayan, K. M. V., & Marcus, M. (2007). Prevalence of self-reported diabetes and exposure to organochlorine pesticides among mexican americans: Hispanic health and nutrition examination survey, 1982-1984. *Environmental Health Perspectives*, 115(12), pp. 1747-1752. Retrieved from <http://www.jstor.org/stable/4540024>

Barnett, J., & Hodson, D. (2001). Pedagogical content knowledge: Towards a fuller understanding of what good science teachers know. *Science Education*, 85(4), 426-453.

Zeller, M. F. (1994). Biotechnology in the high school biology curriculum: The future is here! *The American Biology Teacher*, 56(8), pp. 460-464. Retrieved from <http://www.jstor.org/stable/4449889>

Budget and Budget Justification:

Science to Go Kits on Diagnosing Diabetes from U.F.	\$0.00
2 Micropipettes from Fischer	\$240.00
ELISA Kit from University of Florida	\$ 0.00
Yogurt	\$ 10.00
Additional micropipettes borrowed from Ponte Vedra High School	\$0.00

Permission: I spoke with my principal about my implementation of my action research project. I shared the information with the other teachers in my department. I also went to see my district science supervisor to talk with her about starting a program at Fletcher High School. I sent a letter out to my parents informing them about my action research proposal. My principal was really impressed with my biotechnology work so I was able to go to another DNA Workshop in Gainesville.

Learning from you Action Research: My students were extremely well behaved when I worked on the biotechnology activity in the classroom. I enjoyed using the micropipettes because it gave me an opportunity to practice too. I wrote a grant to get a greater push on implementing biotechnology at Fletcher High but I was not awarded the grant. Students love new activities and were extremely thrilled to do all of the activities. I learned that it is my role as a teacher to continually spark interest in students so they can look in the future at new possibilities in science. I wish I had the opportunity to revisit some of the labs when I worked on DNA but time did not permit since this is the first time the students are administered the Biology EOC.

Dissemination:

I spoke with members of my administration as well as teachers in the classroom. I tried to get a new course going at Fletcher High School on biotechnology. When we met in collaborative sessions on early release days, I shared it with the teachers about my implementation in the classroom. I am interested in doing more at a conference but if I don't have grant money I can't move forward and I was turned down when I applied for a recent grant.

Below is my grant application:

**Elizabeth Searl
Duncan U. Fletcher High School**

2011 Excellence in Biotechnology Education Awards Application

A Meeting with Biotechnology

Proposal Summary

I believe students lack insight into a variety of careers in science. As a science teacher this summer had been my first experience learning about biotechnology. I would like to give students an opportunity to learn new techniques simply because there is new technology available and students should be given an opportunity to connect with these concepts. I do not believe that students are exposed to biotechnology at Fletcher High School in Duval County. I would like to implement an afternoon or weekend program on biotechnology. I would like students to learn about micropipetting techniques, ELISA method, DNA extraction from plant tissue, viral immunoassay as well as DNA electrophoresis. I would also like students to view powerpoints on genetic diseases affecting the current populations and the significance of how biotechnology impacts their lives. I would also have a variety of field trips to view the local health clinics such as the Mayo clinic and the University of Florida. By purchasing micropipettes, ELISA Kits, viral microarray kits, as well as DNA kits, the students will learn about biotechnology techniques. I would send out a community flyer in the community to students interested in a biotechnology program. Once I have received the registration forms I will meet after school or on Saturdays to instruct the students on the various biotechnology

techniques. I will administer a number of quizzes and lab technique quizzes to the students.

Instructional Objectives

I would like students to have an understanding of biotechnology techniques such as ELISA, DNA extraction from plant tissue and viral microarray techniques. I would like students to learn about viruses affecting plants so my focus will also be on viral microarray techniques. I think that the population should grow plants organically so I would love students to learn about viruses that may affect their plants. This project will definitely interest students.

Project Description

This project is important because students should have an opportunity to practice these biotechnology techniques. They are the future leaders of tomorrow and they should be equipped with the best knowledge and hands on experience necessary to learn and build upon the present biotechnology techniques. They will learn about micropipetting, the ELISA method, viral microarray, and extraction of DNA from plant tissue. The students will not only learn about biotechnology techniques but will also identify crops with viral diseases and grow organic vegetable plants that are locally infected in Jacksonville. I believe exposing students to growing organic molecules is also important. All the students exposed to this project will soon become adults who will have a deeper understanding about organic foods as well as how to grow organic foods. I believe I could impact the entire community learning about biotechnology since there is no program presently at Fletcher High School.

Evaluation Criteria

I will give students a variety of teacher generated quizzes based on questions about the ELISA method, viral microarray, and the extraction of DNA from plant tissue. They will also grow organic vegetables as part of this project. I will give a pre biotechnology survey and a post

biotechnology survey. I will also give students a pre biotechnology content survey as well as a post biotechnology content survey based on the various methods used in the program.

Implementation Plan

I would like this project to take place for a period of two to three months. I will conduct labs on the ELISA method, viral microarray, an extraction of DNA from plant tissue for two months. I will also have then plant various local Floridian plants organically so that they can do DNA plant tissue extraction. I will present various powerpoints to the students.

Budget

Quantity	Item	Cost (per kit)	Total
5	Real Time PCR Lab Activity	139.00	695
5	Bio Rad Elisa Kit	124.00	620
5	BioRad pGLO	89.00	445
5	Plant Tissue Culture Kit using Soybeans	110.00	550
5	WARDS Micropipette 0.5-10microliters	140	700
5	WARDS Micropipette 2-20 microliters	140	700
5	WARDS Micropipette 20-200 microliters	140	700
5	WARDS Micropipette 100-1000microliters	140	700
5	Agarose Gel	56.75	283.75

	Electrophoresis Kit		
2	Agarose Dye Markers	12.50	25.00
1	Electrophoresis Power Supply	202	202.00

Total Cost: \$5620.75

These items will allow me to perform the various labs on biotechnology. The students will be able to perform these labs using high tech equipments making them more ready to participate in other biotechnology classes or programs. I will seek additional help from the community for the \$620.00

Professional Profile

My name is Elizabeth Searl and I have been a Biology/Biology Honors teacher for 21 years. I enjoy teaching Biology. This summer I attended a two week Biotechnology Workshop at the University of Florida and it has opened my eyes to a different perspective in science. I am also a 2000 Presidential Awardee recipient in Science. I believe that through my experience this summer at the University of Florida I will be equipped with the experience to provide this program to high school students.