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# *Careers in Biotechnology*

*A study of career interest of female students in middle school.*

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**Abstract:** Not everyone is interested in the same things, so a teacher has to present information to make information relevant to the student. It can also be noted that boys and girls learn differently through a variety of teacher instructional techniques. By administering a multiple intelligence test to the students at the beginning of the school year, I am able to determine the range of student learning types in my class -- my students also learn about themselves. Because of this bit of information, I am more able to determine ways to differentiate my instruction. The information that has been made available to me through Bench to Bedside has been tremendous and can be easily tied to the Florida Next Generation Sunshine State Standards. The vastness of designed lessons organized and available, and the opportunity for modeled hands on labs have been tremendous. The thoroughness of presentations by experts and their lecture notes provide an enormity of resources to draw upon in a variety of modalities. The knowledge I received while a participant in Bench to Bedside allows me to provide a greater depth, not just information, but instruction for my students.

## **Rationale:**

The beginning of the year rolls around and the class roll are developed. Same old, same..... but not actually. In fact, there should not be any rut or routine to the school year, or the school day that the teacher or student is in. Each day should be a unique opportunity for a teacher to provide instruction and improve the achievement of the students. Nearly 70% of the students in Everitt Middle School are on free and reduced lunch, with a high minority population. We are located in a city with a median income of \$27,000. Our school has met Adequate Yearly Progress, however our school achievement grade is a mediocre "C". The need to change vision, of the students and of the teachers, is necessary for successes to really take place.

### **Why do you come to school?**

Students – to learn; Teachers – also, to learn

### **What is your job at school?**

Students – try, work hard, and do your best; Teachers – help each child develop skills for understanding of material so students can be successful in life.

So, when school begins, I have to insist that the students understand their job. The tone is set then for me to create the atmosphere for this to take place. I

could be swayed by the students to go in directions not necessarily in a “planned” order, but what would allow student questions to allow for detours of the traditional teaching program designed by an obscure author with no knowledge of my students or community.

Now, I must emphasize that I learned several years ago that the textbook really was one of the sources of instructional delivery for the curriculum. Generally, these books include everything a teacher would need to present the information to the students as well as the tools to assign grades for the student assessments. The only problem is, the fit is not always great for the teacher and the text, nor the text and the student. Ultimately, it is necessary for the teacher to develop and design the curriculum so all children can be engaged in the topic, investigate in a meaningful way, be able to clarify their understanding, be able to make generalizations, and ultimately evaluate their knowledge, skills and abilities.

When I found out that our school was going to create focus calendars and a pacing guide for the courses I teach, I felt insulted. I thought I had been teaching the requirements well. The idea of a pacing guide was to restrict my teaching. All this order was going to take the human out of the instruction; any well designed guide could be facilitated by someone smart enough to keep up with the pace. I know that not every student learns the same material, at the same pace, or in the same fashion.

My job, my desire to understand the students in my class and to learn about each as individuals, led me to have the students take a multiple intelligence test. From this, I found relevant information, but the question puzzling me now: How is this information going to be important in a class using pacing guides and common assessments AND the textbook the district purchased for instructional use (which already has a pacing guide, so to speak)? I reluctantly gave into the idea of a pacing guide to ensure that I cover all the course requirements as determined by the state. I realized that this plan did not have to be a sterile presentation of information, but my instruction, if creative and purposeful, could be dynamic and open learning opportunities for my students.

First of all, I looked at the textbook order for presentation. The flow of the course, in my mind, needed to follow a science organization. For instance, if we want students to understand organization in animals, (i.e., system, organ, tissues, cells) then instruction needs to be a similar pattern (large to small). In a middle school life science class, I think the obvious of large to small would be an order of instruction of environments, ecosystems, Kingdoms of living things, organisms, etc. to then get to cells and smaller yet.

The reality is the seventh graders who are in life science class will not be studying biotechnology at great lengths. This is not because of pacing guides, but it is because of depth of knowledge and the course requirements. That however, does not preclude the inclusion of biotechnology activities into the course. And it may seem that any study in biotechnology would be somewhere in the later end of the course. Well, I think I have figured out why it should be included earlier and just how that will be accomplished.

The course requirements, outlined by state standards, are at the heart of what needs to be covered and taught. When the pacing guides were created, our team of teachers designed the flow of benchmarks. The emphasis for the first several weeks of instruction would be the Nature of Science. This is a broad idea, actually Big Idea 1, might be the spot for the addition of biotechnology careers and techniques into my class instruction.

However, making these additions into the curriculum does not traditionally enhance the course requirements as described through Florida's Sunshine State Standards. Or, does it? I say it definitely will augment the curriculum through every aspect of the 5 E model or any other lesson planning tool. Relevance of instruction will be enhanced with real world applications. The life science curriculum will no longer be replicating old news, but students will be finding significance in their class through an enhanced curriculum. I hope these inclusions will motivate my middle school students to become more involved in current events and studies and delve deeper, to question and inquire more. The purpose of this study is to ask and determine: Does an emphasis of biotechnology (i.e., introduction of techniques – measurement, tools, how to manipulate materials; or careers – biotechnologist, scientist, lab technician, researcher,) during nature of science study affect career interest of female students? Through the inclusion of biotechnology related careers, I will determine from Likert Surveys whether female student schema change based on the activities.

So, how will this be accomplished? I will implement a standards based lessons of Nature of Science around careers in micro and biotechnology to teach scientific method, variables, investigation, experimentation, replication of others' experiments to repetition or multiple trials. Mission Biotech is a single player video game where each student will have to accomplish the objectives of the level to move to the next level. Students from every style of multiple intelligence will have opportunity to utilize their learning modality to help them complete tasks. The simulation will have students in a lab setting using instruments they are not familiar with, but they will develop skill with during the game. For me to evaluate this will prepare a student survey to rate their abilities before commencing the game and after finishing. Hopefully this inclusion will provide foundation for questioning by students about research, and job opportunities, as well as the skills necessary for being successful in a setting such as MBT. Video taping of students during participating in the video game will identify student performance

All seventh graders in our county will travel to E.O. Wilson Biophilia twice during the fall to study this nature sight. One of the focus lessons is on water quality. The inclusion of antibody microarray into my curriculum will be an opportunity to extend water study inquiry. This will be a great time to reflect into the ecosystems, maybe kingdoms of living creatures, maybe spreading of disease, maybe just investigating simply what is in the water. There will be flexibility in the purpose, however, the exposure to biotechnology in the middle grades I think will be great. I do feel the students will be capable of understanding and will have a desire to learn about antibody microarrays. Student reflection writing in their journals will be an excellent source for student understanding.

Labs and activities designed to showcase women in science will be easy to include into the life science curriculum in middle school. For the young women in my classes, I feel they will be motivated and hopefully inspired to realize they can reach for similar goals. A variety of assessments could be done from these studies.

Through inquiry, I will be able to enhance the curriculum for example, by including: Mission Biotech Video Game to spotlight protocol, skills and techniques necessary in a lab setting. Antibody Microarray emphasizing qualitative and quantitative measurements and I especially like the idea of having students look at water quality – very important in life science! Later in the year, I can easily include Women in Science Role Models to stress the importance of these highly regarded female scientists. The analysis of female participation and achievement will be the assessed criteria. Although most judgment of student study will be valued by qualitative assessments, the possibility of quantitative measurements can be derived via an end of unit project in which students would present a biotechnology career. Evaluation, a comparison of female/male student performance would be a justification in my action research question of career interest of female students.

Rubric for Career Project

<http://facweb.eths.k12.il.us/ast/careerrubric.htm>