That’s my story and I am sticking to it:

The impact of narrative teaching utilizing biotechnology concepts on students’ attitude towards chemistry, their understanding of the practical applications of chemistry and related careers.

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Abstract:

This action research addresses the concept of teaching chemistry from the framework of narratives as opposed to traditional lectures to determine its impact on the attitudes of high school chemistry students. The narrative approach is intended to expose students to the practical applications of chemistry and careers which utilize chemistry. A survey will be administered at the beginning of the school year and at the end of each quarter thereafter to assess student attitudes, their understanding of the practical applications of chemistry and related careers. Biotechnology related lab activities, pretest/posttest that specifically address branches of chemistry and careers related to each branch as well as case studies will be used to gather additional data to assess student understanding of the practical applications of chemistry and careers for which chemistry is essential. The data generated will be analyzed (comparative analysis) and interpreted to determine if the strategies implemented had any effect on the components being measured (attitude, practical applications of chemistry and related careers).

Rationale:

As a high school chemistry teacher, one of my greatest challenges has been to stimulate an interest in my students for chemistry and get them to understand and appreciate the pivotal role that chemistry plays in their daily lives. The questions : “Why do we need to learn this?” and When I am ever going to use this?” have been echoed so often that as a chemistry teacher I have come to realize how little students value chemistry and how irrelevant they deem it as having any practical application to anything that they do in real life. Many students are unable to make any connections to careers that call for the use of a knowledge in chemistry, and students cannot be faulted for this because we teach chemistry in isolation.

As teachers we are desirous of having students buy into what we are teaching them and show a healthy enthusiasm towards the content that is being presented. According to Kurtek, Sampson and Williams (2011), “Student attitudes can have a positive or negative effect on learning” (p. 40). Students’ perception and their attitude towards a subject are definitely contributing factors in determining how much effort they are willing to exert. The authors of the article further state that “In our classrooms, we have seen firsthand how student attitudes can influence learning. We, like all teachers, have students with poor attitudes toward science, who therefore exert little effort in class” (Kurtek, Sampson, and Williams, p. 40). Attitudes can either be positive or negative feelings about people, objects or issues, and once formed they tend to persist or endure (Koballa and Glynn, 2007, p. 78). Since student attitudes seem to influence how much effort they are willing to put forth, it would then be safe to hypothesize that if we as teachers can help to foster a positive attitude in our students toward science then we may be able to stimulate more interest in not only our respective science courses (in my case, chemistry) but we may also generate interest in their pursuing careers with a heavy science emphasis. Attitudes can either be positive or negative feelings about people, objects or issues, and once formed they tend to persist or endure.
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Students may come with their preconceived notions about chemistry but as a teacher it is my responsibility to design and execute the chemistry content in such a manner that it will alter the negative perception that students tend to hold towards chemistry. Researchers have also come to recognize the pivotal role that attitudes play and “After a lull in the 1990s, research on students’ science-related attitudes is receiving increased attention due to the disturbing decreases in science enrolments at the secondary and tertiary levels, particularly in Western counties” (Osborne et al., 2003). In an attempt to create lessons that have a more real world application I will infuse biotechnology concepts into the chemistry curriculum which will hopefully help students to make a connection to the practical applications of chemistry and some of the purposes it serves in their everyday life. This idea is predicated on research findings which indicate that “Students who have positive experiences or success in science believe they can continue to succeed in the subject” (Koballa and Glynn, 2007). In an attempt to address less than enthusiastic attitudes towards chemistry I will be deviating from the standard lecture format and incorporating the use of narratives in my lessons. Students seem to dislike the traditional teaching methods which tend to be more teacher dominated (Piburn, 1993 p 394), their preference is more towards contextualized content and classroom activities which emphasizes the learners to direct their learning (Coll et al., 2002, p 309). Norris et al. points out in their article that Millar and Osborne in their paper Beyond 2000 (p. 2013) argue that “narratives in science can prove useful in “communicating ideas, and in making ideas coherent, memorable, and meaningful… narratives, they claim, emphasize interrelated sets of ideas. In contrast, science education too often focuses on ideas in isolation, and consequently obscures the major themes at the core of the science.” (Norris, 2005, p. 536) Through the use of narratives I am hoping that students will be able to make more meaning out of chemistry which in turn will lead to a better attitude towards the subject. According to Norris et Al. Many proposals for the use of narrative in science education highlight the positive results such as improved memory for content, enhanced interest in learning, and greater comprehension of what is learned. (p. 552). Based on this information, there are clear implications that the use of narratives in chemistry could help to enhance students’ attitudes and thus their interest in chemistry as well as careers involving chemistry. Researchers have been able to establish that there is a close association between students’ attitudes towards science, their science subject selection and subsequent career choice (Oliver and Venville, p. 2298). There have also been results from an international research programme that examined student attitudes towards science, the ROSE Project (Relevance of Science Education), which revealed a very strong inverse relationship between the level of development of a country and the interest students expressed in learning about science in schools (Sjoberg, 2005). As teachers we see firsthand how students’ attitudes impact their actions and therefore determine their success or failure in a particular subject (we refer to this as the self-fulfilling prophecy). The purpose of my action research is to examine the impact of narrative teaching utilizing the biotechnology concepts on students’ attitude towards chemistry, their understanding of the practical applications of chemistry and related careers.
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**Action Research Intervention:**

For my research I will be focusing on one regular chemistry class which I anticipate will consist of approximately 35 students. The use of narrative will be implemented in all my chemistry classes, however; I will only be focusing on the data from those students whose survey results indicate that they have a negative attitude towards chemistry to determine if the narrative approach had any impact on their attitude towards chemistry. I will be utilizing this strategy throughout the year and if it proves successful I will continue to refine and use it.

The intervention methods which I will be using include the following:

1. The use of narratives which may be in the form of a short video clip (approximately 5 minutes), newspaper article, or case study that deals with a relevant issue or problem that employs the use of chemistry. The chemistry content will then be taught in relation to this narrative. This thematic approach will maintain continuity where the content is not being taught in isolation and the students are able to make connection to solving real world problems using chemistry as well as jobs that involve the use of chemistry. One source that I will be using is a case study located on Open Learning Initiatives (Carnegie Mellon) that deals with the Arsenic problem in Bangladesh (deals with arsenic in water). This activity will address topics such as physical and chemical properties, solubility, density, significant figures, metric conversions, data collection, data analysis, measurement. Students will also be working in teams which also lends itself to the idea that scientist often do not work in isolation and as such need to be a able to work with team members to achieve the desired outcome. The teams will consist of students who have varied learning styles and academic achievement as indicated by GPA (grade point average) and FCAT results.

2. I will also be incorporating the water molecules kits to help provide visual reinforcement for concepts such a physical change vs. chemical change and also to address the properties of water that makes it such an excellent solvent. I will also be implementing a portion of the Pompe predicament lesson plan (specifically the portion on protein folding rules) to show that an understanding of chemistry is needed in the diagnosis and subsequent treatment of diseases. Knowing the properties of water will establish that it plays a significant role in folding of proteins, which determines the shape and ultimately the function of the protein.

3. I am seriously contemplating a visit to the university to address the related career component of my action research. In addition to hearing from me I want students to see some the different labs and learn about what type of work is being done by scientists. I
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am hoping that this will reinforce that scientific work is not some mysterious, magical, out of this world process that happens in a secret underground tunnel and that the work that is being done is being used to advance the health and well being of society (this should address the practical application piece).

4. I will be inviting guest speakers in to address the related career piece but I need the less traditional scientists (doctors, pharmacists). I am thinking more along the lines of RTI, careers in science that does not necessarily focus on a heavy academic course load but offers on the job training.

5. helpful to provide, also, a timeline with objectives, teaching strategies, and specific activities

Timeline:

• Administer Learning style inventory the first day of class, August 21, 2012

Objective:

1. Students will be able to better understand how they best learn and maximize on their preferred learning style to be successful academically
2. Teacher will be able to acquire student data that will help tailor lessons to meet the learning styles of students

• Administer Likert survey at the end of the first quarter

Objective:

1. Students will be given the opportunity to reflect on their perception of chemistry
2. Teacher will be able to obtain feedback data from students regarding their interest in chemistry

• Invite guest speakers once every nine weeks

Objective:

1. Students will be exposed to various careers with a strong emphasis on science
2. Teacher will be able to engage students in discussions about the importance of science and it application in various careers.

Connections to Bench to Bedside Institute:

The framework for the use of narratives was something that I have really wanted to do for some time but the wealth of resources such as virtual labs and case studies that I have gained access to through the bench to bedside institute has converted that thought into action. I will be implementing various labs which include but are not limited to: The water molecule lab, and the Pompe predicament lesson were also activities that were introduced during the institute.

Data Collection and analysis:

As a means of gathering data, I will be administering a Likert survey that will address: student attitude toward science, students’ perception of the practical application of science and
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students interest in careers that require science. The survey will also consist of open ended questions for students to explain their previous experience with science and why they perceive that they may or may not succeed in science. The survey will be administered the first day of school, and at the end of each quarter. I will also be doing a pretest/posttest that deals specifically with branches of chemistry and jobs that are in those branches to gain an understanding of students’ knowledge about related careers. The pretest will be given within the first week of school and the post test will be given very early in the first quarter. I will also continue to place a question on each unit test that specifically addresses a particular career. I will also be keeping a tally of the students who indicated that they have a negative attitude towards chemistry as it relates to them: asking for help or clarification from either me or their peers and coming in for free after school tutoring. I will be analyzing the data by comparing the initial responses given on the survey to those given after subsequent administration. I will also compare the pretest and posttest results and also the number of students who are answering the career related questions that I will post on each test. The quantitative data will be displayed in the form of tables and graphs.

Literature cited


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Piburn, M. D. (1993) If I were the teacher ... qualitative study of attitude toward science, *Science Education, 77*(4), 393–406.


**Budget justification:**

I will be purchasing the six cup water kit set from molecular designs to use for various lab activities. The cost of the set is $232 before any potential discount.

**Permissions:**

I will need to request permission from administration to allow guest speakers to come in and present to my students.

I will need permission from school administrators and parents in order for students to travel to the University of Florida.

No additional permission is necessary.