Working Together: The impact of cooperative learning through DNA-focused biotechnology labs on interest in Medical Sciences and Biotechnology of Biology students.

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Abstract:

Biology students at a lower lever face greater challenges when faced with harder scientific concepts and investigations. Student motivation in the course can drop during lecture and lab activities. This can lead to poor performance and lower the students’ confidence in their abilities and lead to a decline in interest as well. The goal is to implement more hands on biotechnology labs based on DNA that also incorporate cooperative learning and peer support in order to raise students’ awareness of Medical and biotechnology careers. This will be done in the first semester of the 2012-2013 school year. Student interest will be measured by a survey/questionnaire at the beginning of the semester and at the end of the semester. I will also monitor academic progress with a pre and posttest on the designated labs.

Rationale:

Regular biology students tend to have very limited prior knowledge of careers in the Medical or Biotechnology fields. The main reason being that these students have not been given a solid background of possible medical and biotechnology careers. Most of these students have a negative attitude toward science as well for various reasons, or they think it’s just too hard or boring altogether. Dawson (2007) stated that our schools should educate students about biotechnology issues to ensure that young people have the knowledge and skills to enable them to contribute to public debate and make informed decisions about biotechnology issues. In addition the students enjoy doing the hands on labs that we do during the year; however with a very limited budget there are constraints as to which labs we can do.

The goal is to increase the opportunities students have to work together through different biotechnology labs. Severiens, Knipples van Mil, and Ten Dam (2010) stated active learning as a process where students engage in higher-order thinking tasks such as synthesis, evaluation, and analysis are key components to understanding. Through cooperative learning the biotechnology lab students will get a better understanding of the material and be able to process this information in a more realistic pattern. It is essential that our students develop a deep understanding of the natural world around them to engage in discourse, Dawson (2010).

Students need to be challenged in different ways. They are accustomed to being able to get information in an instant by using technology, so why not introduce them to other types of technology that can benefit them later in their lives and get them interested in science and hopefully further their careers in science at the same time. In addition we can eliminate any misconceptions the students may have about biotechnology.

Sadler, Schwart, Sonnert, and Tai (2008) reported that teaching high school science in depth appeared to have more of an advantage than teaching concepts in breadth. I completely agree with this statement. Students will always do better with cooperative learning labs and lecture over the traditional lecture. Our curriculum covers a wide range of materials in a relatively short period of time. Giving students hands on experience through cooperative learning labs forces the students to think more about what they are learning and apply that knowledge in a different situation other than a test.
As a teacher I must teach the standards set by the state that coincide with the End of Course exam each year. The standard that must be taught for biotechnology is SC.912.L.16.10. This concentrates on the evaluation of the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.

The purpose of this study is to increase Biology students’ achievement and interest in Medical Sciences and Biotechnology through cooperative group learning and DNA focused Biotechnology Labs. This study will be based on the DNA portion of the curriculum and tie in any biotechnology aspects from bench to bedside, such as in depth knowledge of DNA, gene therapy, and laboratory skills. These skills will hopefully increase my students’ interest in medical sciences and biotechnology, in addition to giving them a greater appreciation for science over all.

**Action Research Intervention:**

I will be collecting data from one of my Biology classes (25 students) at Freedom High School. I will be collecting data throughout the first semester based on pre/post-tests, as well as student questionnaires. I will be incorporating Bench to Bedside throughout the DNA unit as well as the Genetics unit.

**Teaching Strategies:**

- Incorporate additional cooperative learning labs
- Reduce the amount of lecture time
- Encourage students to rely on their peers before asking me for help

**Activities:**

- DNA Model Construction virtual lab (second 9 weeks)
- Stem Cell Lab (second 9 weeks)
- DNA Extraction Lab (end of 1st 9 weeks)
- Pipetting Lab (early 1st 9 weeks)

**Analysis of Data:**

- I will track student pre and post tests on the current topic being taught
- The data will be put into a excel spreadsheet for easy tracking

**Objectives:**

- I would like to develop stronger student inquiry and student discovery
- I would like to promote cooperative learning through inquiry based labs.
- I would like to have shortened lecture time and focus more on related activities

**Connections to Bench to Bedside summer institute:**

- Pipetting Lab
Data Collection and Analysis:

Data will be collected from knowledge and skills –based pre and post-tests as well as pre and post student questionnaires that address student interest in the biotechnology field as well as the medical field. The data will then be studied both in a qualitative and quantitative format. The questionnaires will be given at the beginning of the school year during the 3rd week of the first quarter, as well at the end of the first semester. At the beginning of each unit the students will be given the pre-test in order to check their understanding on the current material. They will then receive a post-test at the end of the unit in order to re-check their understanding on the material that was covered, including any lab skills that would have been displayed during the labs.

The data will be analyzed and formatted into graphs for easier visual interpretation of the data. This data will help show student understanding of materials before and after each lab and unit. The data will also reflect the students’ interest in biotechnology and medical sciences from the beginning of the school year to the end of the first semester. I have incorporated a teacher centered reflection for myself as well. I am keeping personal notes in this journal on what data I have collected, as well as how I taught the material.

Literature Cited:


Budget:

I plan on using the $200 stipend for materials for DNA extraction labs.

Permissions:

None: Field trips are not permitted.