Hey Teach...Make It Real, Will You???

A study of the impact of incorporating biotechnology virtual labs, computer resources, case studies, and hands-on biotechnology laboratory activities into the Biology classroom on student knowledge, interest, and participation.

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ABSTRACT:

The action research titled, Hey Teach...Make It Real, Will You, will investigate the effect of incorporating biotechnology virtual labs, computer resources, and case studies into the Biology classroom on student knowledge, interest, and participation. Students will participate in biotechnology virtual labs and TedEd discussions using one of the school computer labs. In addition to TedEd talks in the computer lab, students will be exposed to similar presentations in the classroom to attempt to capitalize on their association with computers and to access the vast amount of resources available via the Internet. Students will also be divided into cooperative learning groups to review and discuss case studies available and appropriate for use in the high school biology classroom. Student attitudes toward science in general and biology in particular will be measured at the beginning of the school year and the end of each semester using questionnaires, surveys, and journals. Observations and student work will be used to record the number of students that are on task and participating in class. Pre and post tests will be administered to determine student learning gains. Additional forms of assessing student learning will district based assessments

RATIONALE:

All teachers crave students that are excited to learn, enthusiastic about the subject, and ready to take advantage of the fabulous learning activities that have been prepared for them. Utopia does not exist here in the real world of education and frankly, might actually become a bit boring over a period time as change and innovation pass by. Educators would, simply put, like for their students to engage in learning.

How many times have we heard students say: “Why do I have to learn this?”; “Why do we have to do this?”; “Why can’t we just do labs?”; “Why can’t I talk to my friends?” and one of my favorites, “My parents think this is stupid. I don’t have to do anything in this class.”

As the world around us changes, education undergoes its own metamorphosis to incorporate changes in science, changes in technology, and changes in the clientele that we serve. In a society where computer technology plays an ever-increasing role in the lives of its members, education must adapt to meet the needs and interests of society. Educators are continually asked to activate the background knowledge of students and to actively engage them in the learning process. Since most of the students in the
United States today have some sort of computer exposure, whether through video games, social networking, or viewing on-line videos, educators are encouraged to incorporate such activities within daily classroom instruction. In theory, this proposal sounds great, but what does the research say and how do we overcome computer availability and time to develop or shop around for appropriate activities?

Numerous studies have been conducted to address the effectiveness of incorporating technology into the classroom. It has been shown that technology enhanced instruction increases academic performance. (Dori & Belcher 2005, Hake 2007, Shieh 2010). Lowerison, Sclater, Schmidt, and Abrami conducted research in 2006 and concluded that there is a connection between computer based technologies, active learning, and perceived effectiveness. Shieh conducted additional work released in 2012 that collected qualitative data from student interviews, teacher interviews, researchers’ journals, and observations in addition to quantitative data from pre and post tests. The qualitative findings were supported by the quantitative data attained from testing; student learning gains were increased when technology-enabled active learning strategies were employed.

An additional strategy that will be incorporated into some lessons in order to help make the curriculum more relevant to students is the use of scientific/medical case studies in cooperative learning groups. Sezak (2012) found that a group of undergraduate biology students scored higher on assessments, including the Biology Achievement Test, than the students that did not participate in cooperative learning groups.

The administration at our high school would like to see all teachers incorporate the use of technology into the daily instruction of our students. We are fortunate to have three computer labs and two mobile laptop carts available for our use. Last year, I taught Biology for the first time and was blessed with a group of students that were extremely difficult to engage in learning activities. I employed numerous teaching strategies to attempt to engage them, but was not as effective as I am accustomed to being. As a more veteran educator, I have not been as exposed to computer applications as many younger teachers, and have taught myself what computer skills I do possess. I also have not had an overabundance of time to be able to search out video clips and other educational enhancements available from the Internet, therefore I have not included many computer based instructional activities other that student research. I am excited to have been connected to some biotechnology computer resources that will enable me to bring more computer enhanced instruction into my classroom and hopefully capitalize on my students’ fascination with computers to increase their participation, learning gains, and interest in science.

Students are more likely to engage in learning if they see a relevance to their own lives. In an attempt to help make it real to them, I will be including various case studies throughout the school year for the students to read and discuss in cooperative learning groups.

The purpose of this study is to assess the effect of incorporating biotechnology computer applications and case study cooperative learning groups into the biology classroom upon student learning gains, interest in science, and participation in classroom activities.
ACTION RESEARCH INTERVENTION:

I have elected to concentrate upon Biology I students as the participants in this study. Biology I is currently one of the science courses that has been identified by the state of Florida for end of course testing. Beginning with the 2012-2013 school year, students in Florida must pass the State End of Course Exam in order to receive credit for Biology I. During the 2011-2012 school, the majority of Florida students did not perform well on the state assessment and the scores were assigned a curve when calculating the score to insert into the 30% weight of students’ final course grade. With the stakes so high and students’ inclination to engage in the curriculum so low, teachers need to find a way to connect students to the material using methods that will increase retention.

(1) The students in this project will be asked to participate in several biotechnology virtual laboratory activities throughout the school year in an effort to strengthen their knowledge through use of computer simulations, connecting to biology education through student experiences with computer gaming. The biotechnology virtual laboratory activities will be immediately followed by computer based talks such as those available through TedEd. Students will be asked to respond to prompts following these experiences and record the responses in a student journal or exit card provided by the instructor.

(2) Since the time available for laboratory activities is limited during the school day, I will provide students with the opportunity to engage in hands-on laboratories after school to reinforce the concepts under current investigation. Students participating in these events will be able to earn extra credit and will be able to share their experiences with their friends.

(3) Attempting to help students build their connection to Biology can also be achieved through the inclusion of case studies that will be read and discussed in cooperative learning groups. Each student will have specific roles within the group and will be responsible for ensuring that all members of the group grasp the main ideas. Case study papers will be reviewed by the instructor prior to the activity and reworded to address reading levels only when necessary. (Additional reading development goals can also be addressed through the use of case studies.) Case studies, including Viral Quest, and various websites provided in the 2012 Bench to Bedside program will be utilized for these activities.

(4) Likert type surveys will be developed in an attempt to determine student interest and feelings about science. The surveys will be administered during the first week of school and at the end of each semester.

(5) I would like to insert another variable into the study and present one unit of instruction that will include a case study unit introduction, virtual lab simulation, and a wet lab presented by the CPET personnel. Comparison of student data collected for this unit of study to other unit treatments will be possible and potentially enlightening. (see lesson plan on evolution)

Case study on MRSA. (2 days)

Virtual lab simulation (1 day)

PGlo Transformation (1-2 days)
CONNECTIONS TO BENCH TO BEDSIDE SUMMER INSTITUTE:

Since our administrators have requested that we incorporate technology based instruction into our classrooms, I was extremely excited to be introduced to the virtual labs and TedEd during Bench to Bedside this summer. I will also be utilizing the case study resources that were also provided to us.

My objective is to use these strategies to help students see the relevance to biology and how they might be affected by the research that is currently under investigation. Although I will be including several components from Bench to Bedside into all of my courses, activities mentioned above will be the ones tracked closely for the action research study. I would like to supplement our classroom activities with guest speakers/laboratory facilitators from the University of Florida.

DATA COLLECTION AND ANALYSIS:

Data collected for this research will be both qualitative and quantitative. Qualitative data will include observations, surveys, and student journaling. The student surveys will be completed at the beginning of the school year and at the end of each semester. Students will respond to items such as; Science is my favorite subject, I am a good test taker, and I learn well using computers. Observations will be made by the teacher during the computer based and cooperative learning group activities to determine the number of students engaged in the activity through a tally of the time on task, number of students not engaged, questions asked, and the number of questions answered by students. Students will be given various writing prompts through the year following the “new” activities to reflect upon their engagement in learning. Writing will reflect upon what the student learned and his/her evaluation of the activity.

Quantitative data collected will include pre and post tests, performance on district based assessments, and student projects. Individual and peer review of student projects will be used to assess the level of understanding of the concept. (The concept should be evident and able to be identified by reviewers. A scale of 1-4 will be used with 1 indicating the concept is not explained and 4 indicating the topic was thoroughly explained and easily understood.) County FCA tests and chapter tests/quizzes will be compared to the pre-test to determine learning gains.

We will also be offering wet labs after school for students and will keep track of the number of students participating in and returning to participate in these extracurricular biotechnology laboratory experiences. Student participation in these extra-curricular laboratories will indicate interest in the subject.

As another interpretive part of the analysis, I will compare the results of male and female students as well as the data between various classes if multiple sections of Biology are taught by the researcher this school year. Data will be displayed in graphs and tables.
LITERATURE CITED:


BUDGET AND BUDGET JUSTIFICATION:

Copies
Composition books
Index cards
Miscellaneous art/office supplies
Laboratory consumable supplies

PERMISSIONS:

The majority of the activities that will be utilized will not require permission from parents or administrators.

✔ The teacher will need to schedule one of the computer labs in advance in order to conduct the virtual labs and TedEd activities.

✔ Permission to incorporate after school laboratory activities will be presented to the school administration for approval. It will be the responsibility of parents to arrange for their child to have transportation home. The majority of our target audience is tenth graders that do not drive to school and rely upon bus transportation provided by the school district.

✔ Additional funding for the project can be requested from the School Advisory Committee in necessary and funds are available from the SAC.