Abstract: Societal benefit depends on the general public’s understandings of biotechnology (Hanegan, 2009). A predictive assessment reveals that incoming Anatomy and Physiology students have not mastered scientific inquiry. Although authentic inquiries provide the best opportunities for cognitive development and scientific reasoning, guided and simple inquiries are more often employed in the classroom (Crawford 2000). Translational bioscience incorporates biotechnology and models scientific inquiry. The research question to guide this study is: how will the study of translational bioscience impact student knowledge and skills as they model the inquiry process used in biomedical research? Teacher efficacy in teaching biotechnology and inquiry skills will be determined through content assessment, attitudinal surveys, and student evaluations.
**Rationale:** National Science Education Standards require that inquiry be an essential component of the science curriculum. Based on my observations and pre-assessment evaluations, I consistently find that the 11th grade students coming into my classes do not have a clear understanding of what scientific inquiry is nor have they had much experience, if any, in authentic inquiry. These findings have been further verified through the use of the Discovery Education Predictive Assessment. This evaluative instrument has shown that the majority of my incoming students are unable to demonstrate mastery of the process of science or scientific inquiry. It is apparent by these formal and informal assessments that inquiry instruction and experiences are lacking in their effectiveness for these students. According to Crawford (2000), authentic inquiries provide the best opportunities for cognitive development and scientific reasoning, yet guided and simple inquiries are more often employed in the classroom. For the purposes of this study I will refer to simple inquiry as those experiences in which the research question is provided for the student, guided inquiry as those where the student is directed to collect specific data, and authentic inquiry as those experiences which encourage the students to generate their own research question. Reflections into my own teaching reveals that I also tend to use guided and simple inquiry much more than authentic inquiry instruction. For this reason I have chosen to research the efficacy of my own methods of presenting inquiry-based learning experiences.

With the recent advent of the Human Genome Project (HGP), the Tree of Life Project, Genetically Modified Organisms, and stem cell research, biotechnology has become integrated into personal decisions, politics, and industry (Hanegan, 2009). Biotechnology is causing such rapid changes that it is now imperative that it be incorporated into the science curriculum as societal benefit depends on the general public’s understandings of biotechnology and affects the development of government policy on issues such as genetic testing, agricultural applications of recombinant DNA, as well as medical research (Hanegan, 2009). In addition biotechnology careers are essential to agricultural services, drug manufacturing, and health services, which are expected to grow 39 (more than twice the average for all industries), 24 and 25% respectively within the next decade (Reaser 2002). The field of translational bioscience, the process of taking research discoveries from the laboratory bench to medical treatments and therapeutics, by its very nature, models scientific inquiry. Based on the tremendous need for biotechnology education and the mastery of scientific inquiry, I have selected translational bioscience as the vehicle to test my action research. The purpose of this study is to determine
the impact of a translational bioscience unit on student knowledge and skills as they model the inquiry process used in biomedical research.

**Action Research Intervention:** To address the need for biotechnology instruction and mastery of scientific inquiry, I will develop a series of lessons around translational bioscience, specifically producing a gene therapy. The two week unit will be used to facilitate the testing of the efficacy of my teaching strategies of scientific inquiry. It will be incorporated into the Human Anatomy and Physiology curriculum and presented to the 11th and 12th grade students enrolled in both the regular and Honors courses. The Unit will include but not be limited to biotechnology labs, lessons, and activities that involve research into genetic diseases, using bioinformatics for indentifying disease genes, genetic screening, gene cloning, clinical trials, and bioethics. Though the labs will initially be presented as guided inquiry activities, they will include a component that will require the students to develop their own research questions for further investigation. With each lesson and activity I will facilitate a review of prior knowledge by using higher order questions to encourage student directed discussions and to reinforce the components of inquiry (Mills, 2011).

**Connections to Bench to Bedside Summer Institute:** The action research plan and the corresponding translational bioscience study unit will draw directly from the presentations of Dr. David Weinstein, Dr. Peggy Wallace, Dr. Joe Fantone, Dr. Barry Byrne, and Dr. Katherine Harfe. The laboratory experiences will be modifications of Experiment 1: Detecting mutations, modes of inheritance, and Experiment 2: Producing a Therapy which were developed by Julie Boker, MAE and Kim Golart, Ph.D. of CPET. The game “Medopoly” (modified by Kim Golart, Ph.D.) will be incorporated into activities surrounding clinical trials.

**Data Collection and Analysis:** Cognitive knowledge and mastery of inquiry will be assessed through a pre- and post-test content assessment, research posters, student presentations, and seminar style discussions. A pre- and post-unit survey of Likert scale items will be used to collect data on attitudinal items and career awareness. Students will also be asked to evaluate the unit. A daily log will be kept to document teacher reflection as the unit progresses.

**Literature Cited:**


**Budget and Budget Justification:** TBD

**Permissions:** TBD