

# A Study of the Impact of an Integrated Approach to Geometry using Biotechnology

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## **Abstract**

The purpose of this action research proposal is to measure the effectiveness of an integrated approach to geometry using biotechnology. Throughout the typical geometry course students are taught what many teachers like to call the “art of arguing without yelling.” Over this past summer there were many activities which we were exposed to that I could envision students using this technique. Because many of our sophomores are enrolled in both biology and geometry simultaneously, I am going to work with one of our biology teachers to develop a cross curricular lesson in which our students will take the biological concepts of electrophoresis and the art of arguing by completing the Crime Scene Investigator DNA activity.

## **Rationale**

The dreaded question “when are we ever going to have to use this” is constantly brought up in my mathematics classroom. And after speaking with colleagues, math is not the only course where students ask this question. After the past two weeks in Bench to Bedside we have been introduced to so many connections that could eliminate this question from student’s minds. By developing an integrated unit with both math and science in biotechnology, students will have the opportunity to see how math and science work together in the real world daily.

There has been a big push in the past several years of my teaching to work with colleagues to develop cross curricular lessons and even units. However there has not really been much buy in because many teachers wonder if there is any significance to doing so. I have often wondered the same thing. What better time to research this method than for this action research proposal.

Researcher Mary Ann Huntley developed a continuum method to integrate math and science in her article entitled, *Design and Implementation of a Framework for Defining Integrated Mathematics and Science Education*. The continuum has five steps on it; “independent math, mathematics focus, balanced mathematics and science, science focus and independent science.” With independent math and science the course is taught in just that fashion, purely focused on the given context. With focused math and science, the focus is still mostly on the given course, but activities are introduced that involve the other. For example in a math class, a science activity is incorporated with the intentions to enhance the math concepts. With a balanced mathematics and science there is equality with the amount of math and science activities that enhance one another. (Huntley, 322) There is a significant emphasis throughout other articles as well as this one that it is not necessary to have a completely integrated curriculum; there are actually many cases in which a connection cannot be made. We need to focus on how we can best teach a concept rather than how we can integrate. (Lonning and DeFranco, 215) This is an idea that I will keep in mind while developing and delivering the lesson.

While researching the idea of an integrated approach to biotechnology I also found that there are many factors that will need to be taken into consideration to ensure that the unit is organized and presented well enough to ensure that any results are not skewed. Time is something that will play

a huge role. There needs to be time built in the curriculum for delivery of each lesson, time set aside for planning the unit, and time to reflect with the other teacher after each lesson.

Resources will also play a huge role in a successful implementation. Bench to Bedside has given me the opportunity to have these resources for use.

### **Action Research Intervention**

I plan to work together with the AP Biology teacher to develop a cross curricular unit integrating statistical concepts with biotechnology. There is always about a month left after the students take their AP tests where they shut down because AP is over and teachers struggle to keep the students engaged. Thus the unit would be developed for this time frame. After speaking with several of this year's biology teachers, we discussed making the connection between geometric proof and basic electrophoresis. Because it is difficult to have to have a control group for the given situation, the students who will participate in this cross curricular lesson will instead be monitored throughout the lesson. They will be given both a pre and post test as well as many summative and formative assessments. The design of the unit will be based upon the continuum model of integration as mentioned in the rationale.

### **Connections to Bench to Bedside Summer Institute**

There have been so many incredible connections that could be implemented in our classrooms this coming school year. Since the school year has just begun and we are a DA school, the new biology teacher and I have not had the time to plan the entire lesson out, but we are going to use the Crime Scene DNA activity and develop the lesson based around geometric proof and its connections to electrophoresis.

### **Data collection and Analysis**

#### **Literature Cited**

Lofining, Robert A, DeFranco, Thomas C. (1997). Integration of Science and Mathematics: A Theoretical Model. *School Science and Mathematics* 97( 4), 212–215

Huntley, Mary A., (1998). Design and Implementation of a Framework for Defining Integrated Mathematics and Science Education. *School Science and Mathematics* 98(6), 320-327

Kari, Lila. DNA Computing: Arrival of Biological Mathematics. 19(2), 9 - 22

### **Budget and Budget Justification**

Crime Scene Investigator DNA Kit

## **Permissions**

Once a principal is appointed at our school I will need his/her approval to develop and teach the integrated lesson.