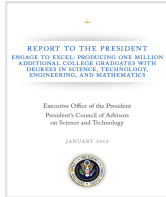


# Implementing authentic research experiences into honors freshman biology courses through the Small World Initiative

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## Engage to Excel: A call for pedagogical reform



**The Issue:**  
Fewer than 40% of intended STEM majors graduate with a degree in the sciences

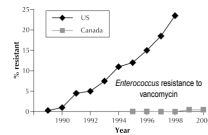
**The Solution:**  
Use **evidence-based teaching practices** and authentic research experiences to “hook” students in introductory science courses

## A response: The Small World Initiative

Use the pressing need for the **development of new antibiotics** as a running theme for lab

“Crowd-source” drug discovery by creating an international network of student / faculty collaborators and peers

Make introductory biology labs **exciting, relevant, and inspiring**



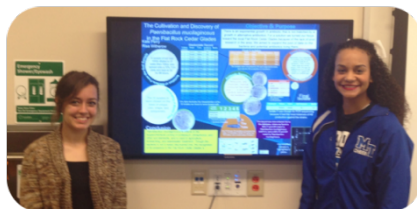
## The MTSU SWI pilot: Fall 2014

Replaced traditional labs with the SWI model for two honors introductory biology sections: Biology 1111H (majors) and Biology 1031H (non-majors)

Assessed **student interest in STEM, project ownership, and ability to meet prescribed learning objectives** via pre/post surveys (compared to a traditional Bio 1111H section)

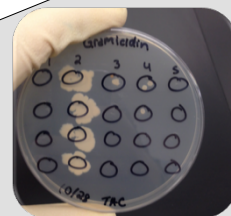


The 1111H Small World Initiative class



Students presenting research during a capstone “virtual poster” session

Screen isolates for resistance to common antibiotics



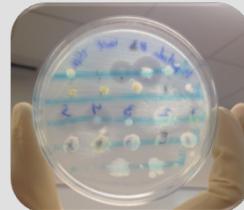
## SWI @ MTSU



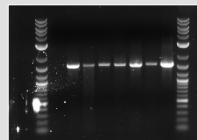
Harvest soil from Cedar Glades



Isolate bacteria from soil samples



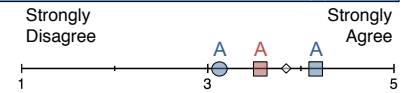
Screen isolates for antibiotic production



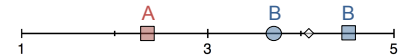
Identify bacteria using 16s rRNA sequences

## Changing student perceptions about biology

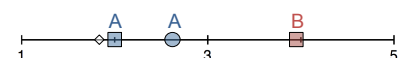
“My curiosity about the living world led me to study biology” (P = 0.16)



“Learning biology changes my ideas about how the natural world works” (P < 0.001)



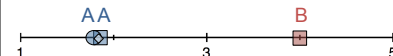
“To learn biology, I only need to memorize facts and definitions” (P = 0.004)



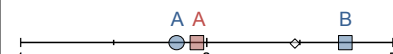
“The general public misunderstands many biological concepts” (P < 0.001)



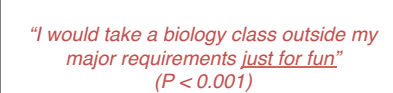
“Biology that is not directly relevant to human health is not worth my time” (P < 0.001)



“I want to study biology because I want to make a contribution to society” (P = 0.017)



“I would take a biology class outside my major requirements just for fun” (P < 0.001)



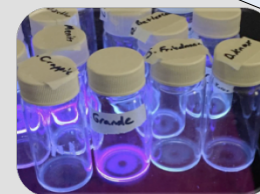
Strongly Disagree Strongly Agree

Legend:  
 ■ = Bio 1111 (majors) with SWI  
 ■ = Bio 1111 (majors) taught traditionally  
 ● = Bio 1031 (non-majors) with SWI  
 ◇ = Average pre-course ranking

Post-course student views on biology, ranked on a 5 point Likert Scale. Statistical differences among sections denoted by letters above each shape (1-way ANOVA w/ Tukey post-test, P < 0.05, n = 7-11)

## The SWI model encourages students to:

1. Learn from *experiences* instead of memorization
2. Be more civically engaged
3. Stay in STEM fields



Fractionate bacterial compounds to isolate new medicines