

Abstract

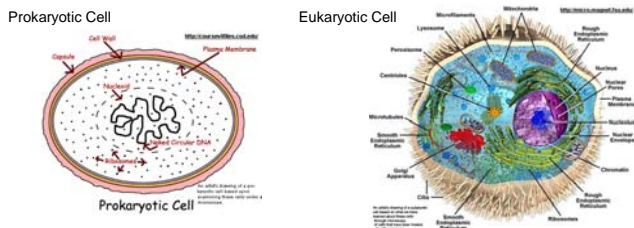
Project STEP. The objective of the National Science Foundation-funded Science and Technology Enhancement Program (STEP) is to provide training within the field of secondary education to engineering and science graduate students with the goal that the fellows will continue to bring their expertise to high school classrooms throughout their careers. This is facilitated through a year-long collaboration of the graduate fellow and a team of four teachers within a given high school.

Fellow responsibilities. As a fellow, I am to design lessons pertaining to a topic within the established curriculum, placing the content within the context of engineering, my personal research, and Cincinnati, demonstrating to the students that their current studies are applicable to their daily lives.

The lesson. Students often have trouble remembering which cell features are present in distinct cell types. This lesson illustrated that understanding the differences between prokaryotic (bacterial) and eukaryotic (animal) cells leads to the development of antibiotics, whose purpose is to kill the bacterial cells while leaving our cells intact. Students applied their previous knowledge of cellular differences by engineering their own antibiotic. As my research pertains to the unique response of *E. coli* O157:H7 to antibiotics, students discussed their conclusions referring to a slide I had used when I presented my research at the start of the year, ultimately identifying actual antibiotics that use the same mechanisms they had just identified. Prompting the students to discuss the pros and cons of free distribution of antibiotics (with prescription) at Kroger and Meijer allowed them to recognize that this subject matter pertains to their lives outside the class.

Assessment. Analysis of the identical pre- and post- activity quiz given to the 35 students who participated in the lesson (2 classes total) indicated that content knowledge increased by an average of 25%. Individual results categorized by class and student can be found in the results section.

Introduction



Problem: Students have a hard time remembering the structural differences between prokaryotic and eukaryotic cells.

Background: Antibiotics target prokaryotic-specific cellular components.

The lesson: Students designed their own antibiotics, then discussed the fact that patients can now receive free antibiotics with a prescription at Kroger and Meijer.

Activity

Gaining attention:

- Students were to find a tangible piece of information on the free distribution of antibiotics with prescription in Cincinnati.

Group activity:

Students filled out a worksheet in which they:

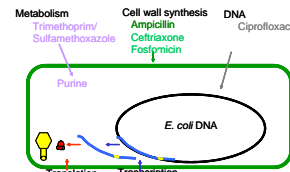
- Discussed the purpose of antibiotics.



- Identified bacterial features that a new antibiotic could target.



- Identified an actual antibiotic that targets the feature selected.



- Discussed antibiotic resistance.



- Discussed the pros and cons of free antibiotic distribution.



Student Feedback

Class One

Liked best:

- Working in groups
- Sharing info as a class
- Learning more about the antibiotics that I use
- Learning how antibiotics kill bacteria
- Learning how bacteria become resistant

Liked least:

- The homework
- The pretest
- Not hands on

Class Two

Liked best:

- It was tied back and we got to put our opinions in
- Learning that antibiotics target specific parts of the bacteria.
- Learning that bacteria can evolve to become resistant
- Learning why some antibiotics are free and others are not

Liked least:

- The homework
- The pretest
- Not hands on

Figure 1. Student activity feedback forms. Immediately following the activity, students filled out the activity feedback form in which they were asked what they liked and disliked about the lesson. Representative answers are listed by class.

Assessment Results

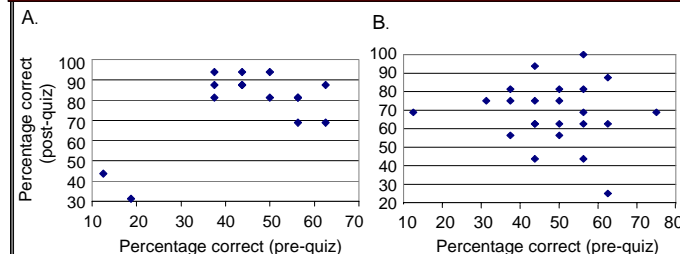


Figure 2. Post-quiz results. A) Class one and B) Class two completed a quiz both before and 1-2 weeks after the activity. The percentage correct on the pre-quiz (x-axis) is plotted versus the percentage correct on the post-quiz (y-axis). Each diamond represents the both pre- and post- scores of one student.

Conclusions

- Class quiz scores increased by an average of 25% post-activity
- Although Class one scores increased by 33% while Class two scores increased by only 20%, students in class one commented most frequently on their approval of the group work technique and the concepts at a basic level while students in class two described the content with more sophisticated detail.
- Lower quiz scores for class two is likely due to the administration of the post-quiz to class two one week after class one (due to OGT testing) .

Acknowledgments

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