EXAMPLE ABSTRACT

Main Contact: Alysha Kishan, alyshakishan@sfb.com

Group Member Information:
Jenny Robinson, jennyrobinson@sfb.com
Mary Beth Browning, mbbrowning@sfb.com
Elizabeth Cosgriff-Hernandez, cosgriffhernandez@sfb.com

Chapter/University Name: Texas A&M University

University Address: 101 Bizzell St, College Station, TX 77843

Biomaterial Applications Database for Primary and Secondary Education

Statement of purpose: In an effort to enhance our impact outside of our monthly science club meetings at the local middle school, the Cosgriff-Hernandez lab is additionally generating biomaterial modules to produce a middle-school level biomaterials database for educators. These modules are have been tested during our middle school lessons and consist of a video for instructors, experiments and assessments that are aligned to specific biomaterial objectives. In addition to including worksheets for each experiment, each module consists of a video tutorial focused on providing the teacher background knowledge on the experiment and guidance through the demo. The video demo includes checks for understanding that the teacher may implement in the classroom to give a quick evaluation of the classroom's engagement. To supplement the video lessons, we have created end of lesson assessments that teachers can use to track their students' understandings and align objectives with the state subject curriculum. While these modules target a middle school level, they can be manipulated to match the rigor of the desired grade level. Ultimately, we hope to create a database of teacher-friendly tissue engineering modules that are available to educators and utilized in their classrooms, thereby bridging the gap between higher level academia and the foundations set in both primary and secondary classrooms.

Methods, Materials, & Budget: Recently, the Cosgriff-Hernandez laboratory has fully developed 2 biomaterial modules: Hydrogels for Wound Dressings & Hydrogels for Medicine Delivery. The Hydrogels for Wound Dressings module introduces concepts of hydrophilicity/hydrophobicity, ionic and covalent bonding, viscosity, and device design. Within this module, students are introduced the design requirements involved with a wound dressing for a diabetic ulcer: the dressing must be easy to implement, fill the wound, keep the wound bed moist, and must be easy to remove. Students are provided with sodium acrylate polymer powder and their goal will be to determine how much water must be added to the dry polymer to make an effective wound dressing that satisfies the design requirements. Because this gel is formed via ionic bonding, students will then experiment by adding different concentrations of salt water and observe the effects on the gels. The assessment for this lesson addresses objectives aligned with chemical bonds, hydrophilicity/hydrophobicity, and viscosity. **Materials**: Sodium acrylate, water, cups, popsicle sticks, felt, spoons. **Budget**: $15

Our second module, Hydrogels for Medicine Delivery, is designed to discuss the application of hydrogels for medicine release. Students will be asked to help design a pill to deliver a new medication that can be taken orally to treat cancer, Cancer-No-More. Using crosslinked gelatin containing a colored dye, students will track diffusion rates. Their goal will be to determine the effects on release time of taking two small pills compared with one large pill. By participating, students will gain an understanding of how pills can be designed to deliver medicine in their bodies at the proper time. The assessment for this module is aligned to objectives involving polymers, hydrophilicity and diffusion. This module contains extension questions investigating the effect of coatings on drug release rates. **Materials**: Gelatin, food coloring, cups, clock, spoons, vaseline, sugar, vinegar, water. **Budget**: $10

Assessment methods and results: The assessments for each module involve a lab write up consisting of introductory questions, observations taken during the experiment, and discussion questions. The introductory questions typically also include two questions regarding the lessons taught in the previous class as a warm up. Together, these lab write ups allow students to become familiar with experimental design and further support the

scientific method. The assessments incorporate scaffolding, with incrementally increasing rigor, thereby allowing for facilitated mastery of the material. The end of lesson assessment involves four short questions directly addressing mastery of the introduced subject. These short assessments can be used to track student's progress throughout the year. For module 1, our students showed 90% mastery over hydrophilicity, 70% mastery over viscosity, and 72% mastery over chemical bonds. For module 2, our students showed 80% mastery over polymers, 90% over hydrophilicity, and 70% over diffusion. These results can then be used to modify the lesson for the following class and allow for facile reflection over lesson efficacy.