

Breast Tissue Engineering Module for Girl Scout STEM Career Enrichment Event

S. Rowlinson¹, W. Bridges¹, and K. Burg¹

¹Clemson University, Clemson, SC

Introduction: Informal Science, Technology, Engineering, and Mathematics (STEM) education is often over-looked and underappreciated [1]. The US continues to lose students in the pipeline of STEM education and ultimately in STEM careers, especially females and minorities. Once a year, Clemson University’s Women in Science and Engineering office hosts an outreach program with South Carolina (SC) Girl Scouts called “Introduce a Girl to Engineering Day.” This informal STEM education event attracts at least 80 Girl Scouts from across SC.

Materials and Methods: Girl Scouts attending the Spring 2014 “Introduce a Girl to Engineering Day” were divided into groups and cycled through bioengineering, civil, biology and computer engineering modules. A bioengineering module, based on in-house laboratory research, was created to introduce the idea of breast tissue engineering for breast cancer research applications. The students were introduced to breast tissue anatomy, engineering technical drawing, 2D vs. 3D, breast cancer and bioengineering. Groups of students were asked to work together to create 2D and 3D models of breast tissue using supplies such as Zoobs, K’nex, pipe cleaners, Play-Doh, yarn, scissors, and Trio blocks. Each group presented their work and sessions concluded with class discussion. Surveys were given to students at the beginning and end of the event. The principles of social cognitive career theory were used to design the survey questions. The surveys included 15 multiple choice questions, with a five-point Likert scale, and five short-response questions.

Results and Discussion: All supplies used during the module were materials readily found in school environments. The module curriculum was within the framework of Next Generation Science Standards (NGSS). Five of the thirteen multiple choice questions revealed a statistically significant increase in student self-efficacy. This module provided a comfortable and nurturing environment for the girls to openly discuss a topic paramount to women’s health. This environment was facilitated by an all-female staff and small-group dynamics.

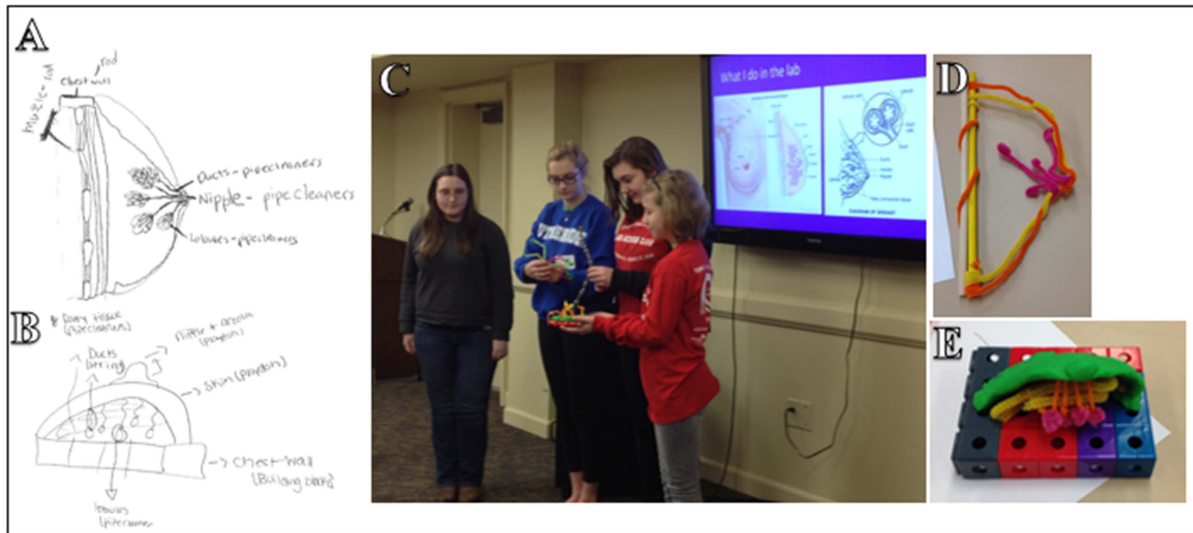


Figure 1. A-B) Technical drawings of the models, C) Students presenting their model and D-E) corresponding 2D and 3D models

Conclusions: Workshops, even for such a short duration, are important for elementary through high school aged students; they provide an opportunity for females to better understand the role of scientists and engineers and the educational requirements it takes to pursue such careers. Future studies include performing more in-depth statistical analysis of surveys and publishing this module in a journal accessed by teachers.

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References: [1] Ramey-Gassert, L. Elem. School J. 1997, 97(4), 433-50 [2] Brotman, JS, Moore, FM, J. Res. Sci. Tch. 2008, 45(9), 971-1002