

COMMUNITY BASED AUTHENTIC STEM 8TH GRADE EDUCATION

By Caleb Stewart



- ▶ Allows students to interact in a scientific environment
- ▶ Stresses student use of Engineering design process (EDP)
- ▶ Engages students by working on current, local, real life problems
- ▶ Forces collaboration between various types of science and mathematics



COMMUNITY BASED AUTHENTIC STEM EDUCATION

▶ Authentic Education

Definition: Learning knowledge and skills that's are useful in real life, link the classroom theories with real world practices, develop problem solving skills, and construct knowledge during the authentic activity learning process (Jalil 2013).

Background: Authentic learning was the most traditional type of learning when students began to learn initially it was solely for the purpose of creating useful skills. As the education system evolved students began to learn in a less practical manner. Recently due to STEM education authentic learning is making a resurgence due to a greater need for students prepared to enter the STEM fields with applicable and usable skills (Bicer 2015).

▶ STEM Education

Definition: STEM education refers to teaching and learning in the disciplines of science, technology, engineering and mathematics. (Bicer 2015)

Background: STEM education was created to combat two problems. The deficit of students going into the STEM fields and the gap in STEM abilities between western and Asian nations. These reasons created an increased interest in educating students who would be capable and interested in entering the STEM fields. This need influenced Barack Obama to launch the educate and innovate initiative which provided funding to educate and increase interest in the STEM fields at the k-12 level (Bicer 2015).



THEORETICAL BACKGROUND

- ▶ Community-School partnerships allows students to learn in a natural environment (situated learning), learn by seeing how what they learn is applicable in the real world (social constructivism), and allows them to have a more active role in the learning process (student centered instruction) (Willems 2012).
- ▶ Authentic learning gives students the skills to distinguish reliable from unreliable information, the patience to follow longer arguments, the ability to recognize synthetic patterns in unfamiliar context and the flexibility to work across discipline and cultural boundaries to generate innovative solutions (Jalil 2013).
- ▶ STEM education allows students to have a deeper understanding of the material than standard teacher centered education. STEM allows a more effective way to teach math and science in the applicable field of engineering or technology. STEM also provides students active engagement in their learning and allows students realize the meaning of their learning and its application (Capraro 2014)



BENEFITS OF COMMUNITY BASED AUTHENTIC STEM EDUCATION

- ▶ Time- authentic education, STEM education, and community based education all demand more time than a typical teacher centered classroom can provide, that is the cost of deeper learning (Tofel-Grehl 2014).
- ▶ Test scores- Due to the extra time needed to create community based authentic education students who participated in this type of community showed no significant test score gains (Gehler 2015).
- ▶ Curriculum- One of the most difficult aspects on the teacher side of STEM education is creating a lesson that will allow students to use grade appropriate relevant information to solve the problem at hand. Many times students use material beyond what they have learned in the classroom and then the activity becomes something that uses large quantities of time but can not easily be tied back to the curriculum and therefore can not easily be justified (Fantz 2013).



LIMITATIONS

- ▶ EDP –Engineering design process is a systematic way of solving a problem from an engineering stand. Teaching the students the system of EDP will not only teach them how to solve problems in the classroom but will allow them the problem solving skills in the future.
- ▶ Local Community involvement- Allowing the class to work on creating a solution for a local problem will only add the authenticity of the problem and will increase the likelihood of students being able to talk to all parties involved from the scientists on the job to the community members being affected.
- ▶ Semester long activities- Authentic problems are not solved in one week, and neither will the problem the classroom is focusing on. Dedication on one lecture and one lab throughout the week will both allow students to stick tight to the curriculum but also experience the full engagement and learning power of a community based authentic STEM activity over the course of a semester.
- ▶ Complimentary curriculum- Using a standard curriculum based off of state standards alongside a Community-Based Authentic STEM education (CASE) allows all the deeper learning of CASE education without the drawbacks of time and curriculum implementation.



IMPLEMENTATION

- ▶ This project is the creation of a complimentary curriculum that takes place during select laboratory designated periods. It allows the use of a standard test preparatory curriculum alongside a community-based authentic STEM education (CASE) curriculum. This allows students a broad understanding for the entire curriculum while allowing students to experience what science outside of the classroom is truly like. The limitations of both curriculums are combatted by having collaboration of two separate curriculum styles in one designated classroom. To provide students with the experience and information they will need to fill the ever growing STEM job market this complimentary curriculum sets the perfect stage for success.



RATIONALE

- ▶ Jalil Safuan, H. h., & Soh, R. r. (2013). THE INTEGRATION OF AUTHENTIC LEARNING PRINCIPLES AND FACEBOOK IN SERVICE LEARNING. *Turkish Online Journal Of Educational Technology*, 12(4), 192-199.
- ▶ BICER, A. a., NAVRUZ, B. b., CAPRARO, R. r., CAPRARO, M. m., ONER, T. t., & BOEDEKER, P. p. (2015). STEM SCHOOLS VS. NON-STEM SCHOOLS: COMPARING STUDENTS' MATHEMATICS GROWTH RATE ON HIGH-STAKES TEST PERFORMANCE. *International Journal On New Trends In Education & Their Implications (IJONTE)*, 6(1), 138-150
- ▶ Willems, P. p., & Gonzalez-DeHass, A. R. (2012). School--Community Partnerships: Using Authentic Contexts to Academically Motivate Students. *School Community Journal*, 22(2), 9-30.
- ▶ Capraro, R. r., & Han, S. (2014). STEM: The Education Frontier to Meet 21st Century Challenges. *Middle Grades Research Journal*, 9(3), xv-xvii.
- ▶ Tofel-Grehl, C., & Callahan, C. M. (2014). STEM High School Communities: Common and Differing Features. *Journal Of Advanced Academics*, 25(3), 237-271. doi:10.1177/1932202X14539156
- ▶ FANTZ, T. t., & GRANT, M. m. (2013). AN ENGINEERING DESIGN STEM PROJECT t-shirt LAUNCHER. *Technology & Engineering Teacher*, 72(8), 14-20.