

SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)  
Space Education and Outreach (8)

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COLLABORATION BETWEEN ACADEMIA AND INDUSTRY TO PROMOTE STEM EDUCATION  
VIA THE DESIGN AND DEVELOPMENT OF LEARNING TOOLS**Abstract**

Senior capstone engineering design classes provide the opportunity for undergraduate students to garner invaluable design, research, analyses, team-building and communication skills – all critical to develop prior to entry into the professional workforce. At the University of Alabama in Huntsville (UAH), Mechanical and Aerospace Engineering (MAE) design students have been provided an opportunity to further accelerate the learning outcome of the senior design experience by designing unique and innovative products that are integrated into secondary education classrooms. The impetus is to encourage the younger students to pursue an education and career in a Science, Technology, Engineering and Mathematics (STEM) field. Via sponsorship and mentorship from industry representatives, the UAH students have designed and fabricated various hands-on STEM tools. Past UAH designed STEM tools include a fluid flow circuit, trebuchet catapult, ballistic pendulum, interactive solar system and a mechanically activated race car launching mechanism. The current effort focuses upon a mechanical pulley system and earthquake simulation table. The aforementioned designs have been delivered to various schools in the North Alabama region. The project requirements and constraints are initially specified by the secondary classroom teachers and are further refined by the MAE students as the conceptual, preliminary and detail design phases are implemented. The MAE design teams conduct outreach visits to the STEM tool recipient classrooms. As a result of these visits, the MAE design teams are able to conduct market surveys whereby the younger students are queried with respect to various design aspects they would like to implement within the STEM tool design. The student interaction and involvement in the design process further accelerates interest in STEM as the students are actively integrated into the design process. Upon completion of the design and fabrication of the STEM tools, the products are delivered to the schools where key factors such as functionality, performance, ergonomics, features, maintainability, safety, durability and reliability are monitored by the UAH students to ensure a quality product. The hands-on STEM learning tools developed by UAH students have proven to enlighten and encourage the secondary education students with respect to various STEM fields. The present paper describes the collaborative effort between UAH and industry representatives to develop STEM tools, the design phases – including the involvement of the younger students in the design process - and survey results that clearly demonstrate the benefit of hands-on STEM learning tools.