

Project Summary

The Teaching Engineering Concepts to Harness Future Innovators and Technologists (TECHFIT) ITEST strategies project seeks to foster middle school student enthusiasm for STEM disciplines. This will be accomplished by equipping teachers with skills and tools to engage their students and show them how engineering technology knowledge can help them become innovators of interesting, fun, and valuable products. The TECHFIT team will recruit teams of 2-5 science, technology, math, and physical education teachers from partner schools to complete a 6-day, professional development summer workshop. The workshop will provide teachers with the information, instruction, lessons, and practice required to deliver a ten-week afterschool program for 6th to 8th grade students in which they design and build exergames.

The TECHFIT project will show teachers how to collaboratively create fun, technology-focused fitness games that teach the value and interdependencies of STEM subjects. The TECHFIT after-school programs will employ the team approach to learning, similar to the highly successful FIRST robotics program. Students will be assigned to teams (Science & Lifestyle, Math & Assessment, Promotion & Graphics, Build & Technology) that will collaborate to design and implement their product: the exergame.

The TECHFIT team has targeted schools with large underserved populations in Indiana and South Carolina. These schools will enable TECHFIT to deliver exciting, educational programs to target groups. Partnerships with afterschool organizations and an advisory board will provide guidance throughout the program development and delivery process. The evaluation plan will examine the change in interest in STEM subjects as well as the change in behavior regarding future elective courses. The outcomes from the delivery of TECHFIT to these schools will be used to expand the program offering to other schools.

Intellectual merit: Programs are needed to make study in STEM areas more appealing to America's youth. TECHFIT will address this need by equipping middle school teachers with the skills and tools to educate students and spark their students' interest in STEM by showing how these skills contribute to the creation of interesting and functional technology-based fitness games. The project team includes faculty in Information Technology, Manufacturing Technology, Teacher Education, and Exercise Physiology. An advisory board comprised of science and technology education faculty, experienced secondary school teachers, a learning center director, afterschool program directors, and industry experts guides the team.

Elements of the program were designed using two successful models: SPIRIT (NSF-ITEST, DRL-0737679) and FIRST (US FIRST, 2008). Additionally, a pilot study and independent study college course were used as proof of concept of TECHFIT and the technology toolkits, respectively. In the first year of the program and with input from the advisory board, the team will develop educational materials for the six-day, professional development program for interdisciplinary teams of teachers from partner schools. In year two, TECHFIT will collect impact data on the after school programs and showcase competition delivered by the first cohort teacher group. This data will be used to further improve the TECHFIT program for the second group of teachers. The team will collaborate with the after school program staff to identify the second cohort of teachers. The third year will mirror the second year and provide additional data to further improve the program for the third cohort group as well as refine the model for cost-effective implementation by others who wish to employ the TECHFIT model. TECHFIT will apply engineering design principles from game concept descriptions through implementation of the actual fitness games.

Broader impacts: The TECHFIT program is designed to enrich the knowledge base of young students by stimulating their interest in STEM subjects through an after school program run by TECHFIT-trained teachers. By partnering with schools that have large underrepresented, underserved populations, TECHFIT can reach the populations in greater need of programs to interest student in STEM. By giving students an important, appealing reason to pursue these often neglected STEM subjects, students who may not have considered STEM careers will begin to take these subjects more seriously and will be more likely to study STEM in college, thus addressing society's future workforce needs. A TECHFIT community website will be developed to: 1) facilitate ongoing collaboration among participating TECHFIT teachers and their students, 2) promote cyberlearning of TECHFIT activities, and 3) disseminate the TECHFIT model to the broader K-12 community by providing materials for others interested in administering similar afterschool programs. In addition to using the website to disseminate TECHFIT-related information, each TECHFIT team member will also present the results of this project at teacher education conferences (HASTI, ISTM, and TEI), college educator conferences (ASEE, ASME, SITE), and publish journal articles (J-STEM, JET) describing the impact of the after-school program and showcase competition on student learning and interest in STEM subjects. The team will also encourage teacher participants to co-author papers to provide them with another avenue to share the lessons learned and further broaden the impact of the program.