

AN ABSTRACT OF A THESIS

IMPACT OF WATER RESOURCES RISK ANALYSIS ON ENGINEERING EDUCATION IN RURAL COUNTIES

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Hands-on engineering education is an upcoming trend among K-12 schools throughout the United States to stimulate interest in Science, Technology, Engineering, and Mathematics (STEM). This study used unconventional methods to stimulate interest in STEM fields among high school students in a rural county of Tennessee. First, the study began by assessing enrollment data from each of Tennessee's 95 counties to determine the factors that influenced the decision by applicants from high schools to choose engineering at Tennessee Technological University (TTU) as freshman. The findings revealed that, while there were statistically insignificant difference between the ACT scores of applicants from rural and urban counties, TTU had a higher representation of freshmen from urban counties. This indicated that motivational programs targeted at counties with low population, income level, and education level were needed to boost enrollment from rural counties. TTU responded by introducing a hands-on engineering class at Jackson County High School (JCHS). With JCHS lying in a rural setting along the Cumberland River, a study was completed using the L-Moment Ratio Diagram to analyze hydrologic risk of Wolf Creek Dam in Kentucky, which lies upstream of Jackson County High School. The idea was to leverage a real-world engineering infrastructure and a natural hazard phenomenon (overflowing) that had direct and visible implications on the lives of the county, as a way to promote the societal value of engineering. This study also included a historical research lesson of the problems encountered at Wolf Creek Dam throughout its history. These efforts were monitored through a series of pre- and post-tests on a group of control and experimental students to determine the effectiveness of the hands-on teaching methods. The testing efforts showed a significantly positive impact of applying a hands-on curriculum to stimulate STEM subjects in a high school setting. The results of the pre- and post-testing showed a 26% improvement in the hands on engineering class. This improvement is much greater than the 5% increase shown by the control class which was not exposed to the hands on curriculum. Student assessment of perceptions of engineering proved that the use of real-world water risk analysis as a motivational tool in a rural high school setting was very effective.