

Thesis Project Portfolio

**The American Society of Civil Engineers
National Concrete Canoe Competition 2024**
(Technical Report)

**How Engineering Education Can Improve and
How Design Competitions Provide Concrete Solutions**
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

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My capstone project addresses the need for innovative solutions in concrete canoe design to meet the requirements of the annual American Society of Civil Engineers (ASCE) Concrete Canoe Competition. In particular, the client's intent was to focus on sustainability and develop a method to produce 100 prototypes. To solve this problem our team used new sustainable construction practices, innovative concrete mix design, and improved technical analysis to push the boundaries of what the club can accomplish. Our project aims to push the boundaries of the traditional design approach and leave a strong foundation of research that future years of the club can continue to innovate in future years. Considering the human and social dimension of this technology is important to understand the greater value of the club to engineering.

The concrete canoe provides engineering students the opportunity to engage with the ASCE Concrete Canoe Competition, improve their professional portfolio, and expand their professional network. The club asks students to not only focus on technical issues but organizational and social ones as well. Through engagement students become part of a network where Actor-Network theory provides instruments to understand the complex interactions between different actors and the technology they all interact with. This approach acknowledges different perspectives and values within the network, shaping the technology and technologies roles in shaping the actors.

My research method involved analyzing a combination of interviews and questionnaire responses with both students, faculty, and professional engineers that engage with the Concrete Canoe Competition. I then used Actor Network Theory to better understand the motivations and values my participants associate with the concrete canoe. Using the insight and perspective gained from the participants in my study I synthesized a set of values and traits that can be uniquely attributed to this competition as an educational tool. The values that were most attributed to the Concrete Canoe Competition as an educational experience were interdisciplinary, technically challenging, realistic, and project focused. I then mapped these traits onto existing engineering education curriculum with a specific focus on the Capstone project as a model case for improvement. My undergraduate thesis highlights the potential of experiential learning in engineering education. Together they act as a case study on demonstrating the power of hands-on learning experiences in shaping the interdisciplinary, collaborative, and problem-solving engineers of the future.