

Poster Presentation

The Three-Year Capstone: A Progression of Learning in Purdue University's Theatre Engineering Program

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Abstract—Purdue University's Theatre Engineering Program capstone combines the yearly production work of the College of Liberal Arts with the final senior design format used in the Colleges of Engineering. By starting their production work after gaining admission to the program, students work on progressively more involved projects throughout their time at Purdue. This poster presentation will examine the lessons learned and challenges faced by Leigh Witek, a recent Theatre Engineering graduate, as she completed each role in the program. She will share how each project informed her understanding of the design process and how a three-year immersion in production work benefitted her final project. The roles held by students as they progress through the program begins by working in the scenic shop. As carpenters, Deck Carpenters, Assistant Technical Directors, and Technical Designers, students grow from building the designs of peers to creating designs of their own.

Experiencing the design process in stages leads to an understanding of the impacts of design and prepares Theatre Engineering students for the intensity of their final project. This format also encourages students of all years to interact with each other and provide a perspective from every role. The format of this process and program encourages a community within Theatre Engineering that fosters mentorship among the student cohort. This poster will present a student's perspective of the effectiveness of this process and provide insight for how learning objectives are received and interpreted.

Keywords—Student, production work, technical design, engineering, pedagogy, capstone, senior design.

I. BIOGRAPHY

Leigh Witek is a Controls Engineer at Wenger | J.R. Clancy. She graduated from Purdue University in December 2020 with a B.S.E. in Multidisciplinary Engineering (Concentration: Theatre Engineering) and a

B.A. in Theatre Design and Production. As a student, she completed internships with PRG Scenic Technologies and Creative Conners. Her research with Purdue's College of Engineering Education investigated how institutional culture impacts pedagogical change in engineering colleges.

This will be Leigh's 3rd time at SEEE and she is excited to participate as an industry professional!

II. CAPSTONE COURSE CONTEXT

Purdue University's Theatre Engineering Program capstone combines the yearly production work of the College of Liberal Arts with the final senior design format familiar to the Colleges of Engineering. Production work begins immediately after gaining admission to the program and students work on progressively more intense projects throughout their time at Purdue. As a graduate of the program in December 2020, this informed my understanding of the design process through a three-year immersion in production work that benefitted my final project. The lessons learned as a scenic carpenter, Deck Carpenter, and Assistant Technical Designer exposed me to all aspects of design and supported me in my senior year as a Technical Designer for a main-stage production. Experiencing the design process in stages lead to an understanding of the impacts of design and prepares Theatre Engineering students for the intensity of our final project. This format also encouraged me to interact with my peers, acting as both a mentor and mentee. The format of this program encourages a community within Theatre Engineering that fosters community among the student cohort, ultimately creating connections that I have kept in my post-graduation career.

III. STARTING STRONG IN THE SHOP

The first exposure every Theatre Engineering student gets to

Purdue's production environment is as a carpenter in the scenic shop. Students learn fabrication skills for carpentry, steel work, and CNC, ensuring a strong foundation in existing practices. During my time at Purdue, I worked on 8 productions after coming into the program with no construction experience. My time in the shop helped me learn what construction techniques and materials are available. I didn't know we were limited to 4'x8' sheets of plywood and wasn't familiar with common rigging practices. This made my design tasks much easier down the line because I had a good understanding of our shop's capabilities. This also applied to load-in and strike, understanding workflow of a high-intensity environment. I experienced how design decisions impact the shops work. Issues with access to bolts or fabrics that are too thin to staple became cautionary tales for my designs down the line. Sometimes these difficulties were for good reasons. I learned why decisions were made not only from my faculty, but also from my peers that were in years ahead of me. Their knowledge helped me learn why we use certain manufacturing techniques.

The Deck Carpenter position brings students from the shop into the rehearsal and performance space. Once the set is finished and tech rehearsal starts, the set is handed to the Deck Carpenter for maintenance and training the cast and crew. My production, *She Kills Monsters*, was a show that combine realism and fantasy using large puppets and moving set pieces. I got to see the full life cycle of a set and understood the wear it experiences during tech and for each performance. There were multiple adjustments to the set asked for during rehearsal by the designers and I understood the reasons behind any changes from an artistic perspective. The show also included large puppets resting on the shoulders of actors. I received feedback about the comfort of these puppets and how the engineer's design impacted the performance. Overall, the experience shed light on who the end users are for a technical designer's choices and seeing how quickly design decisions can be made during the rehearsal process.

IV. BEYOND THE BUILD-LEARNING FROM EACH OTEHR

Once students are assigned to productions, they begin attending THTR 597: Production and Design Seminar. This is where all the technical design-focused students share work with peers and our faculty mentor. Receiving feedback allows for judgements to be made and defended before bringing work to the production's design team. Younger students are giving feedback to older students and vice-versa. Younger students also benefit from seeing the thinking process of students in roles that they will take into the future. This class was important to me because it mentally prepared me for my future roles. It gave me a space to practice defending my design decisions and speaking coherently about complex engineering challenges. This was also an excellent environment where I was never afraid to fail or be incorrect, because my peers and I understood that we were there to question everyone's design process.

V. THEATRE CLIENT-CENTERED ENGINEERING DESIGN EXPERIENCE

Junior year, I was an Assistant Technical Director for *These Shining Lives*. At Purdue, Assistant Technical Directors support cost estimation, material acquisition, are given a "mini" design project, help plan load in and strike, and lead a team for strike. I was responsible for the design of custom gear-shaped platforms, one of which needed a fire curtain pocket driven by pneumatics. For me, this was a great practice for my capstone. You work through every part of the coming project with the guidance of the technical director. I saw it as a practice round that built my comfort level with design and piqued my interest in designing a mechanical effect and control system for my senior design. You also start going to design meetings before the set is finalized. This helped me understand the priorities of the designers and the process leading up to the technical design. The gear-shaped platforms in this show were exponentially more difficult to design than a 4'x4' triscuit, but the shape had thematic importance to the show.

VI. PULLING IT ALL TOGETHER- SENIOR CAPSTONE DESIGN EXPERIENCE

My capstone project was the culmination of all these experiences. I developed, designed, estimated, and built a roll drop for *Nell Gwynn*. This was controlled by an Arduino. For my capstone, I could choose if I wanted to make this more of a mechanical or controls-based challenge. I decided keep the mechanics simple and put most of my time into the controls system because I did not do many controls-based practical projects in my time at Purdue. My capstone allowed me to explore a discipline that I was interested in and felt I needed more practice with before I graduated. My gradual exposure to the design process in my previous roles allowed me to practice all parts of the design process before this project. What I wasn't prepared for was the isolation of working as an individual. Being an older student, I was acting as a mentor much more than a mentee. I had to find a new way to seek out resources and help from students who had graduated, from other schools, business owners that I have connected with over the years. Since younger students and most faculty couldn't help me on the more challenging aspects of my design, I had to learn to find these other resources and go out of my comfort zone to ask for help from sources outside of the Theatre Department. Since my senior design was designed and built during COVID, I graduated before the load in, run, and strike of my show. I had to leave documents that could be easily followed by those left responsible for my design.

VII. EXPERIENCE VALUE FOR INDUSTRY

I have found this type of capstone best applies to students seeking roles as Technical Directors in theatres; being a "technical expert" on an artistic team. In my post-graduation role as a Controls Engineer, I find that I am more surrounded by resources that can quickly give me help and more time is put into the design and troubleshooting processes. I find myself doing more technical work and less direct interaction

with end users. Overall, it moves slower than a production setting. The biggest lessons I took from the four-year capstone into my career is to never hesitate to ask for help from my plethora of resources and that I better understand the mindset of end users.

This progressive method of exposing students to the design process brilliantly prepared me for Purdue's Theatre Engineering capstone project. An increase in responsibility in each role helped me learn to tackle complicated challenges without throwing me into the deep end. Working in the shop gave me a solid foundation for construction techniques and experiencing the impacts of design. My time as a Deck Carpenter helped me understand the mindset of end users. I experienced the design process with a helping hand as an Assistant Technical Director.

The capstone combined these experiences into a project that complimented my interests and challenged my resourcefulness as a designer. Notably, the cycle of mentorship among the student cohort created a sense of community where I felt comfortable to seek and eventually give guidance. I left Purdue and have taken my growing network of Purdue Theatre Engineers with me. A group of students that has closely worked and grew together through this program and will be a source of mentorship for life.

VIII. ACKNOWLEDGMENTS

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