

Onshape Case Study

TUFTS UNIVERSITY SCHOOL OF ENGINEERING

The Challenge

Senior capstone design at Tufts University's School of Engineering is a culminating academic experience where students are expected to integrate years of coursework into a single, complex engineering project. Teams receive a short design prompt and must deliver a fully functional prototype by the end of the semester. Projects often involve multiple subsystems, tight integration requirements, and team members working across different locations.

While students are exposed to multiple CAD tools throughout their undergraduate curriculum and are free to choose the platforms that best support their senior capstone projects, collaboration at this scale can be difficult with traditional file-based CAD systems. Students described challenges with version control, assembling distributed parts, and ensuring everyone was working from the most current design. Many of the senior design teams chose Onshape and successfully brought their designs to reality.



"I think it's super important for students to be able to access their CAD files and models while they are actually prototyping, especially additive manufacturing with 3D printing. It's huge to be able to sit by the 3D printer, see your design coming off the build plate, and instantly be able to make modifications. A lot of times they're working on it together, they're working on it at the same time in different locations. One's in the makerspace, one's in their dorm, one's in another facility. And so being able to sit there and have these instantaneous updates as they're happening is really huge."

**– Dr. Briana Bouchard, Assistant Teaching Professor,
Mechanical Engineering, Tufts University School of Engineering**



Results

◆ **Improved Collaboration Across Teams**

Students were able to work simultaneously within shared design documents, helping teams stay aligned as subsystems were developed in parallel and ensuring that everyone felt equally involved in the project.

◆ **Reduced Friction from File Management**

By working in a shared, cloud-based environment, teams avoided many of the version-control and file-sharing challenges students had previously experienced with traditional, file-based CAD tools.

◆ **Faster Iteration During Prototyping**

Students used Onshape to support rapid design changes during fabrication and testing, allowing students to move quickly from CAD to physical prototypes and adjust designs in real time.

◆ **Increased Accessibility to CAD Tools**

Students could access their CAD models wherever they were working - in makerspaces, dorm rooms, libraries, or labs - supporting more flexible and continuous design work.

◆ **Enhanced Faculty Insight and Feedback**

Faculty mentors were able to review in-progress designs directly, providing timely, contextual feedback while students were actively working rather than after decisions had already been finalized.

◆ **Stronger Preparation for Professional Engineering Practice**

By collaborating on complex systems, managing precise assemblies, and designing with requirements and user needs in mind, students gained experience that closely mirrors modern engineering workflows.

From Prompt to Prototype: How Tufts Engineering Capstone Students Collaborate Using Onshape

*How Tufts University supports real-world, team-based design
using cloud-native CAD*



The team developing the GPS-denied navigation package demonstrating their system at the Senior Design Showcase.

Capstone Design at Tufts

For Dr. Briana Bouchard, senior design is where everything comes together.

“The goal of this program is to allow senior students to leverage all of the skills and knowledge that they’ve learned throughout their academics here at Tufts in a final culminating capstone experience,” she explains, “where they’re applying all of those skills and knowledge to a real-world problem.”

Each semester, teams begin with a short design brief—sometimes only a few sentences—and are tasked with delivering a functional prototype by the end of the term. “They are going from nothing, from maybe a five-sentence design prompt to a working prototype at the end of the semester,” Bouchard says. “And that really is a huge accomplishment.”

Projects in this cohort ranged from an automated jumper wire cutter to a visual navigation system, as well as Onshape Pen Pal, an industry-partnered project in which Onshape provided the design prompt and worked directly with the student team as technical mentors throughout the semester.



| The two Pen Pals teams designed pen-dispensers for the Onshape team to bring to tradeshow.

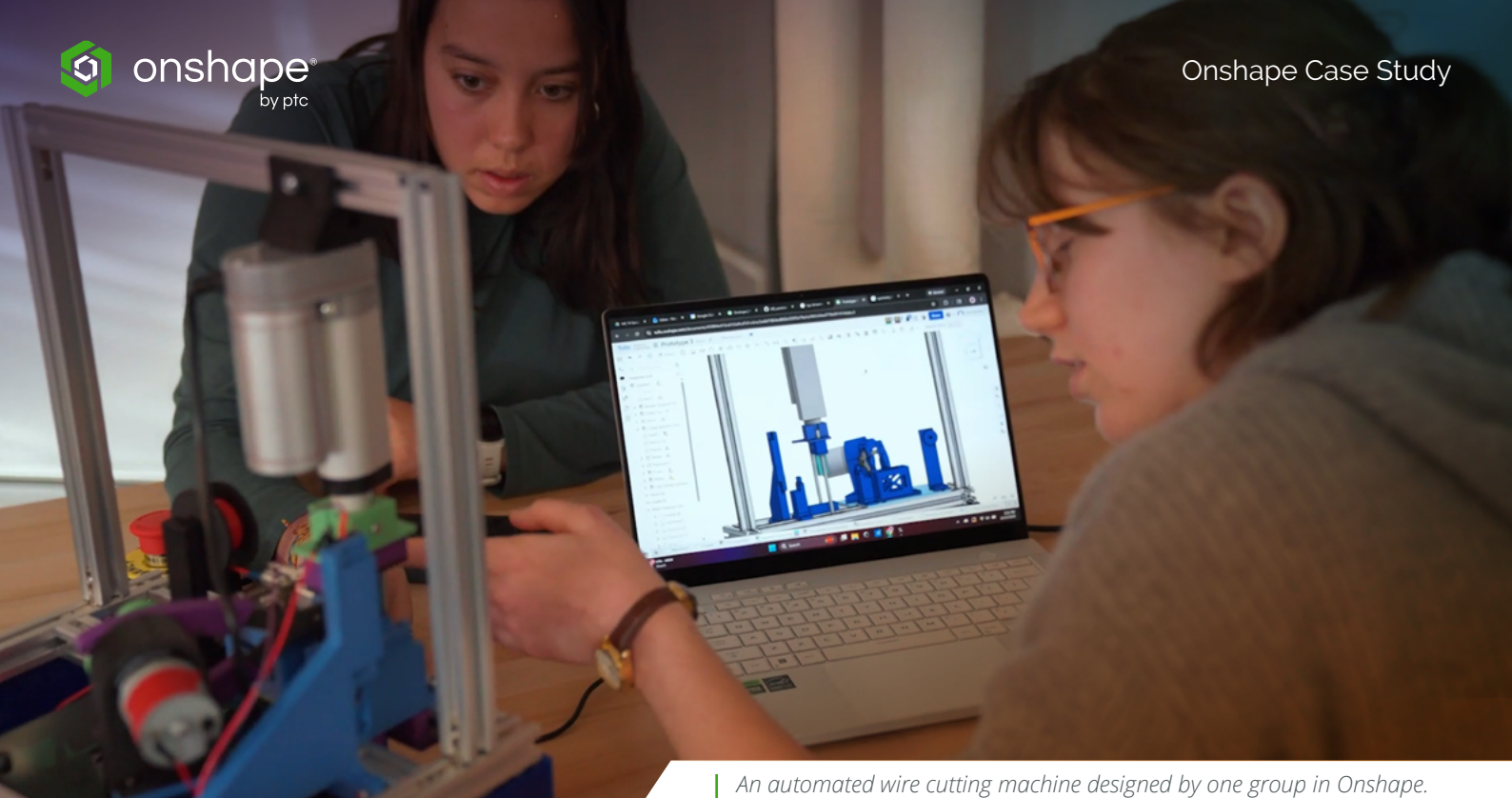
Why Teams Chose Onshape

Tufts students encounter multiple CAD platforms during their coursework and are free to choose the tools that best support their capstone projects. For several teams, Onshape was the preferred option due to the collaboration and iteration demands of capstone.

“In terms of which CAD platform to use, Onshape just made the most sense,” says Adam Mitchel, reflecting on his team’s decision.

Students contrasted this experience with earlier collaborative work using file-based CAD systems. “In the past, I’ve used SolidWorks to collaborate on all my class assignments,” explains Haley Leimbach. “That made it very hard to send files to each other once each of us divvied up the parts and then had to put them in one assembly. We had to make sure we had the correct version on all the updates, which made it very challenging.”

Working within a shared, cloud-native document changed how teams operated. “We had to do lots of fast prototypes using Onshape,” says Jana Dia. “We could all be on the same document whenever needed, which made it really helpful for all of us to be productive at the same time and feel like we were equally contributing to the project.”



| An automated wire cutting machine designed by one group in Onshape.

Designing in Parallel with Prototyping

As projects moved from concept to fabrication, access to CAD during prototyping became critical—particularly for teams working with additive manufacturing.

Dr. Briana Bouchard emphasizes that having CAD readily available during prototyping makes a meaningful difference for students. When they can watch a part come off a 3D printer and immediately adjust the design, iteration becomes faster and more intuitive.

She also notes that capstone teams often work in parallel from different locations across campus. With students spread across makerspaces, dorm rooms, and other facilities, real-time updates to shared designs help teams stay aligned and move forward together as changes happen.

For students, that flexibility quickly became second nature. “I basically CAD everywhere,” says Leia Hannes. “Sitting in makerspaces at Tufts, sitting in the library—I’ve CADed in my bed. Anywhere and everywhere.”

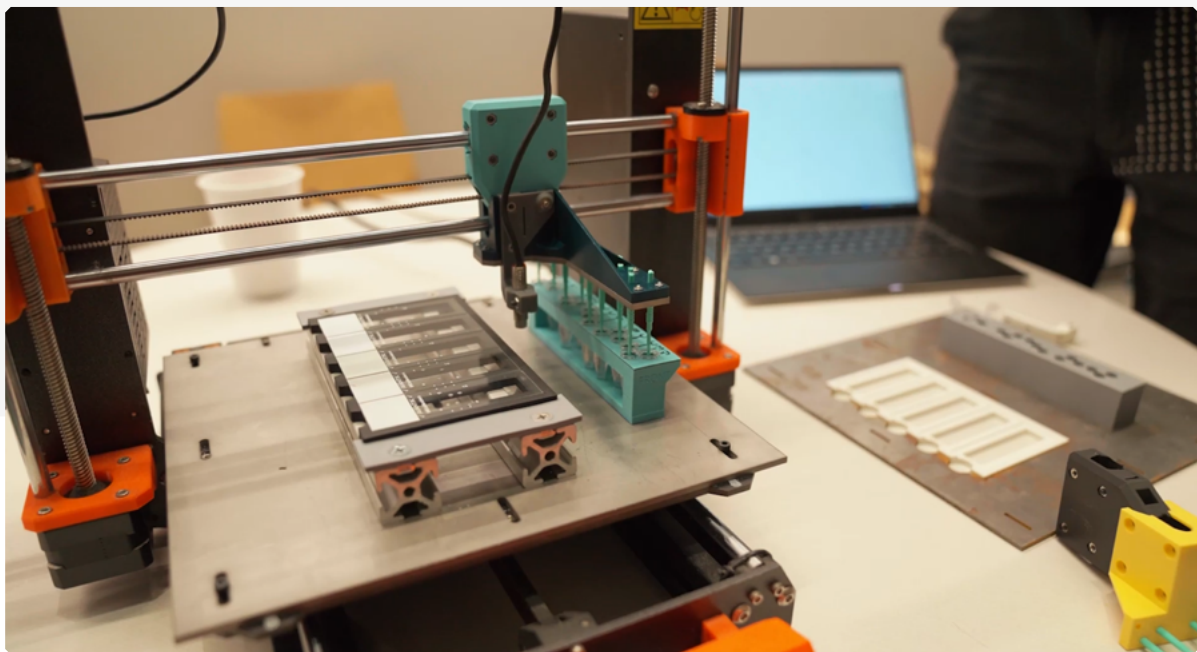
Faster Iteration on Complex Systems

Students repeatedly emphasized how Onshape supported rapid iteration as designs evolved. “I feel like I can make a whole Onshape part in the time it takes me to open up SolidWorks on a virtual machine,” says Natalie Dell’Immagine.

Others highlighted how easy it was to share work and get feedback. “Sometimes I just wanted to have a professor check out what I was doing,” explains Adam Mitchel. “I was able to send a view-only link and get their thoughts right away.”

As projects increased in complexity, students emphasized the importance of staying aligned as a team. “When you’re doing such a complex system, everyone needs to be on the same page,” several students noted. “A lot of the parts have to fit together very precisely.”

Students also reflected on how much their skills developed over the semester. “From the beginning of the semester to now, I’ve gotten really proficient at CAD,” says Haley, who worked on one of the Pen Pal teams. “Creating a project from start to finish with requirements and user needs in mind was a really great experience that I’ll take with me.”



| One team used Onshape while developing a system for microarray printing automation

Faculty Engagement in Real Design Contexts

For faculty mentors, capstone design is defined not only by the final prototype, but by the process students use to get there. As systems grow more complex and deadlines approach, timely access to student work becomes critical for effective guidance.

“I do spend a lot of time messaging with students after hours as they’re running into issues,” says Dr. Briana Bouchard. “That’s where Onshape really comes in handy. I can pull up their document as they are working on it, see exactly what they’re talking about, and even follow them around.”

Because designs remain accessible throughout the semester, faculty feedback happens in context—while students are actively working through design decisions rather than after the fact.



Dr. Briana Bouchard reviewing the model for one of the Pen Pal capstone teams.

“They can show me the different features that they’re struggling with,” Bouchard explains, “and then we can talk about the best way that I would design around that problem.”

This shared design environment becomes especially valuable as teams move into system integration. Multiple subsystems must align precisely, and small design changes can have cascading effects. Continuous access to shared CAD models allows faculty to support not only individual components but system-level thinking across the entire project.

For teams that chose to use Onshape as part of their workflow, these interactions supported faster iteration, clearer communication, and better alignment as designs evolved toward a final solution.

The Capstone Outcome

The semester concludes with a public showcase celebrating student achievements. By that point, teams can demonstrate systems that work and solve real problems—a milestone that reinforces both technical capability and professional pride.

As Dr. Briana Bouchard explains, the capstone showcase is designed to celebrate not just the final artifact, but the process students used to get there. “The showcase is about celebrating everything that you’ve accomplished this year,” she says. “At the end of the semester, they can say, ‘Hey, I have something that works, that solves a problem.’ And the final result is always so amazing and something that they can be truly proud of.”

That outcome reflects months of iteration, integration, and collaboration. For students, reaching this point means they’ve successfully translated a short design prompt into a functional, real-world system—while managing complexity, precision, and teamwork along the way.



Teams presented their final prototype and shared their process at the Senior Design Showcase.

Several students emphasized how shared access to CAD models supported this process through the final stages of the project. “When you’re doing such a complex system, everyone needs to be on the same page,” students noted. “A lot of the parts have to fit together very precisely, so it was super useful to be able to look at each other’s parts and get measurements and parameters.”

Faculty engagement through shared design context helped ensure that teams arrived at the showcase confident in how their systems functioned—not just individually, but as integrated solutions.

For students, that confidence translated into pride. “When you build something that works, you feel an immeasurable sense of pride in what you’ve made,” says Adam Mitchel. “It’s making dreams come true.”

In this way, Onshape supports student teams by facilitating collaboration, iteration, and faculty mentorship throughout the process so that students can focus on the ultimate goal of senior design: delivering engineered systems that work.

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