



SAN DIEGO STATE UNIVERSITY

# Dexcom®

## NEEDLE HUB FEASIBILITY PROJECT

San Diego State University ME 490, Spring 2021



Dexcom Dream Team  
Senior Design Project

### PROJECT OVERVIEW

The team has developed and performed feasibility of a new needle hub design for the next generation Dexcom continuous glucose monitoring device, consisting of a snap-in needle hub design that is more straightforward, significantly cheaper, easier to manufacture, and enables a decrease in technical failures, thus being more reliable and efficient.

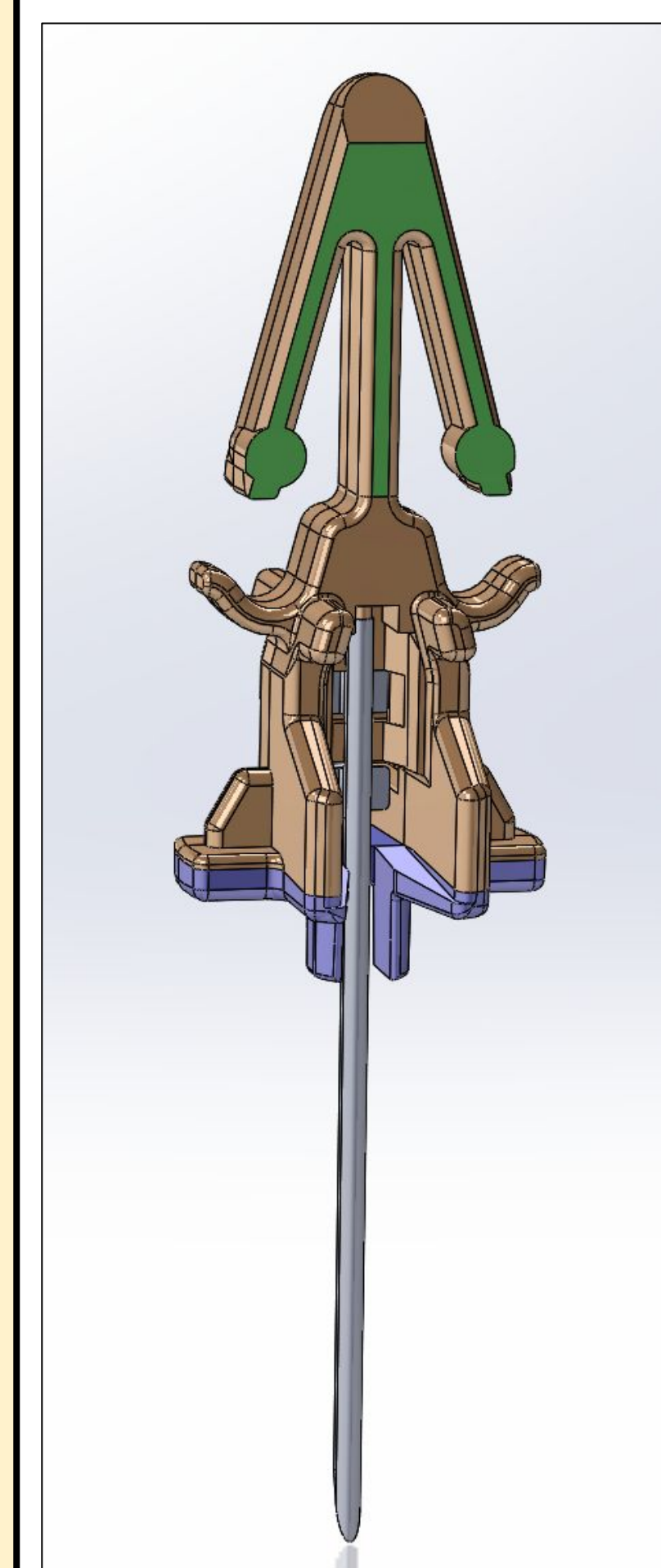
### DESIGN PROCESS

The team began with familiarizing themselves with the Dexcom applicator and the current needle hub design. From there, the team began compiling a list of requirements of specifications for the feasibility project.

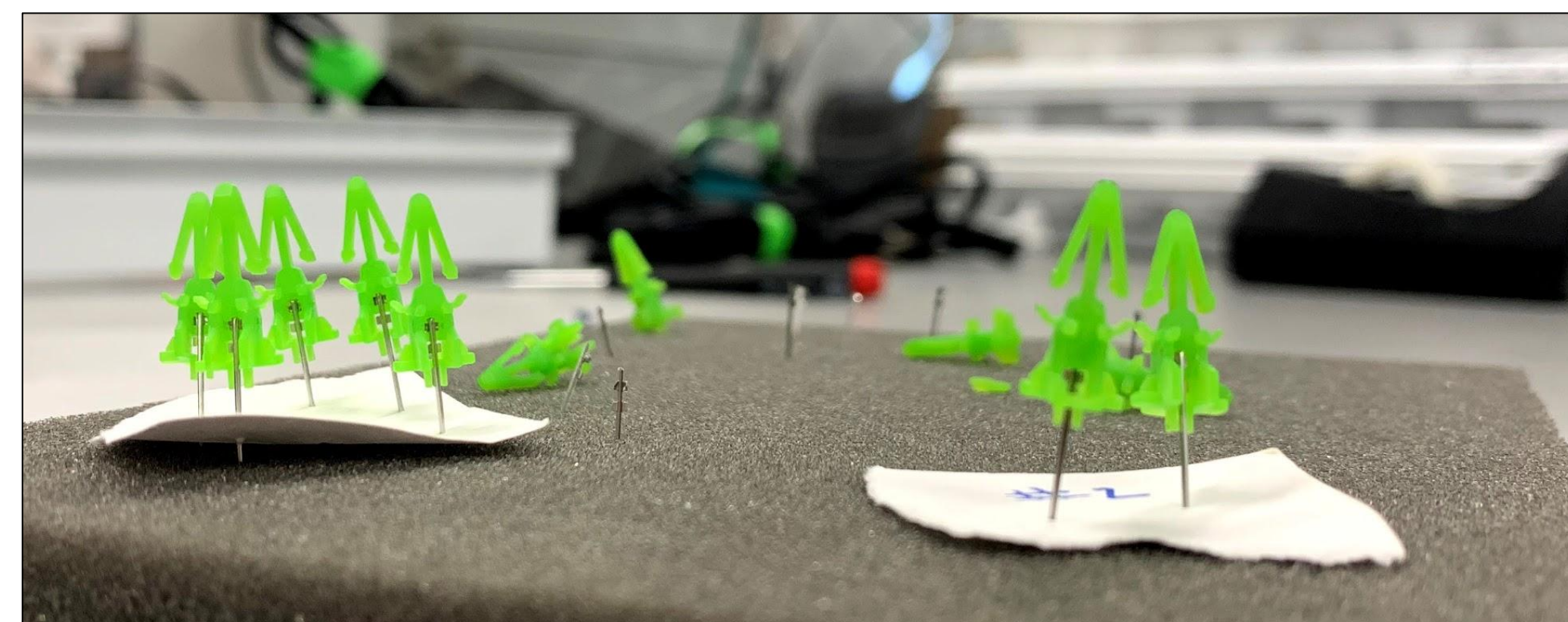


Next, the team began the iterative design process:

- The team came up with 12 different snap-in needle hub concepts
- Through physical prototyping (3D printing at both extra large sizes) the team came up with 3 feasible designs
- After additional FEA, materials analysis, manufacturing and assembly feasibility analysis, and nominal prototyping, the team settled on the design pictured to the left



Nominal prototypes of the final design were 3D printed and assembled, as shown below. These prototypes were then used to gather testing data and validate the project requirements and specifications.

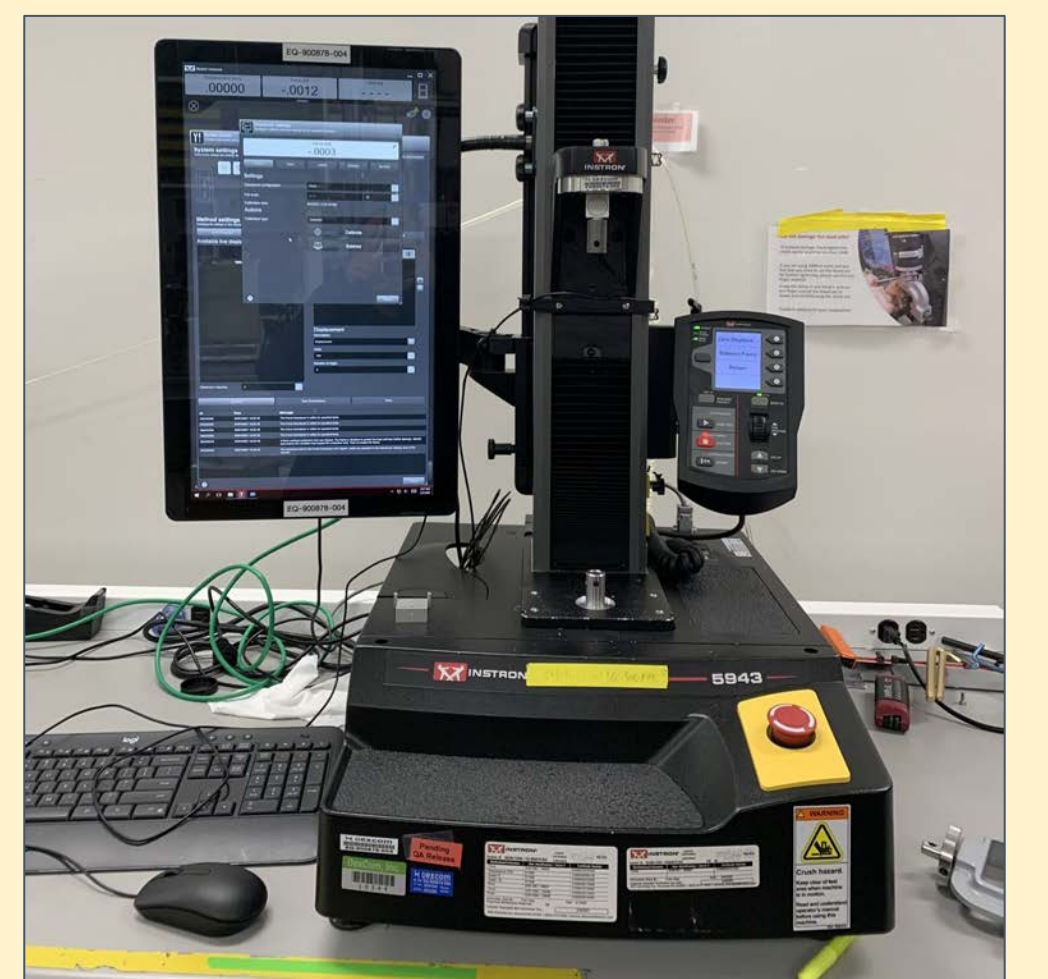


### TESTING PROCESS

The team conducted component level tests, which include the assembly of the needle and the needle hub, and system level tests where the needle hub assembly was added to the G7 product. All of these tests are standard testing procedure for Dexcom's past products.

Component Level Tests	System Level Tests
Pull Force Test	Deployment Test-Cycle Speed Test
Pierce Force Test	Deployment Test-Sensor Depth Test
Quality Inspection of Needle Hub Assembly	Sensor Inspection Test
Weight of Needle Hub Assembly	Safety Probe Test

Data was collected from several rounds of testing the needle hub assembly prototypes, and the project requirements were verified by all the results.



Instron Machine used for Pull and Pierce Force Testing pictured on the right

### TEAM MEMBERS



**Casey Fischbach**

Quality Lead, Materials Specialist, Risk Management



**Sonia Goetschius**

Team Lead, Design Lead, Task Management



**Maria Morgan**

Testing Lead, Budget Management



**Gilbert "Angel" Munoz**

Manufacturing Lead, Schedule Management

**Faculty, Dexcom Product Experts, Dexcom Advisors (not pictured):**  
Dr. Scott Shaffar, Dr. Milind Rao, Lenny Barbod, Warren Terry, Henrique Baroni, Rossanna Resendez, Jessica Seibel

### NEXT STEPS

- Perform design for manufacturing analysis (DFM) and injection mold of polycarbonate hubs
- Shelf life evaluation to simulate part effectiveness over long periods of time
- Automating assembly the process for the next generation assembly
- Patent process pursued by Dexcom's legal team