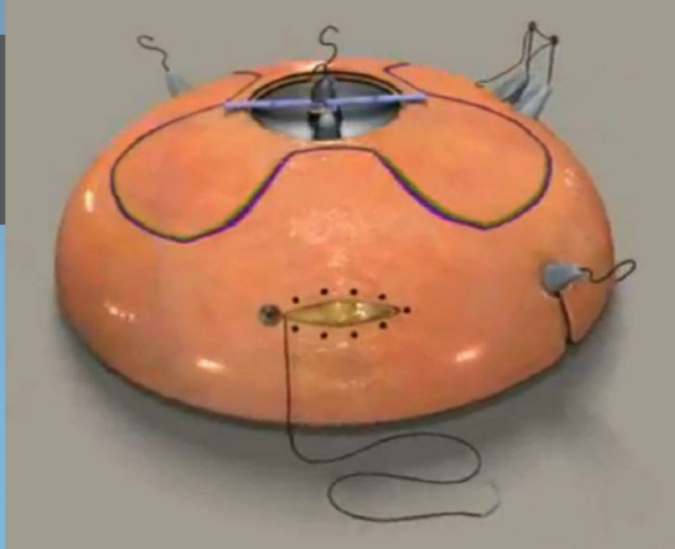


The making of:



**In the fall of 2012, a team of biomedical engineering students made a product**

# MINIMALLY INVASIVE SURGERY SIMULATOR

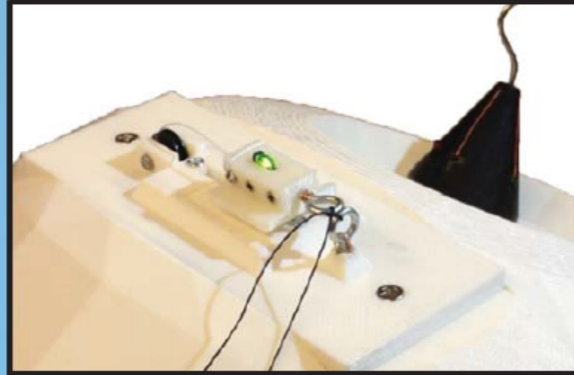


## ***Surgery residents and students:***

Practice and improve robotic and laparoscopic surgery skills without putting patients at risk. Simulator assesses skills in 5 key areas of minimally invasive surgery and allows for FRS and FLS exam training.

## **Skills Assessment:**

- Ring Tower Transfer
- Knot Tying
- Railroad Track
- Cloverleaf Dissection
- Vessel Energy Dissection



## **Knot Tying task measures:**

- Eyelet approximation
- Knot integrity (at 2.5 lbs force)
- Task time

## **Ring Tower Transfer task measures:**

- Ring to tower contact
- Tool to tower contact
- Contact duration
- Task time

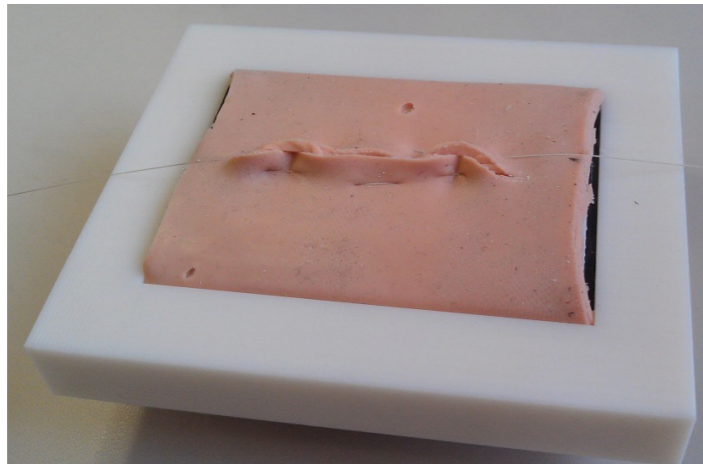


**Purchase a modular task for \$250 each  
or dome with all tasks for \$1200.**

Complete platform with warranty and replacements  
available for simulation centers.

For more information, contact:  
MRD Lab  
111 Church Street SE  
Minneapolis, MN 55455  
email: [mrdlab@umn.edu](mailto:mrdlab@umn.edu)

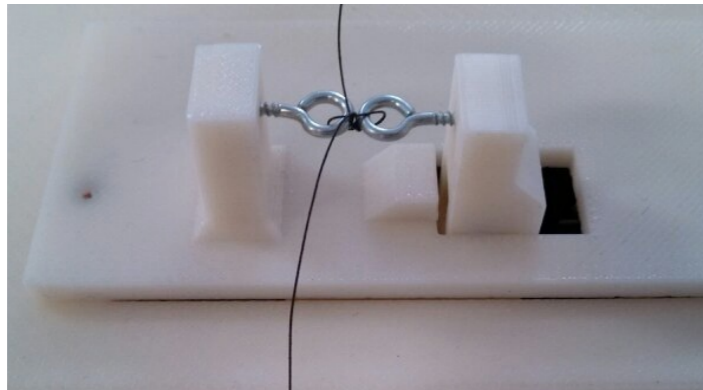
**What they had was a set of skills trainers for various surgical skills.**



## Suturing

Wound Approximation

Quantify Tissue Eversion



## Knot Tying

Knot Integrity

Time to Tie

Excessive Force



## Tool Articulation

Psychomotor Dexterity

Obstacle Contact

Contact Time

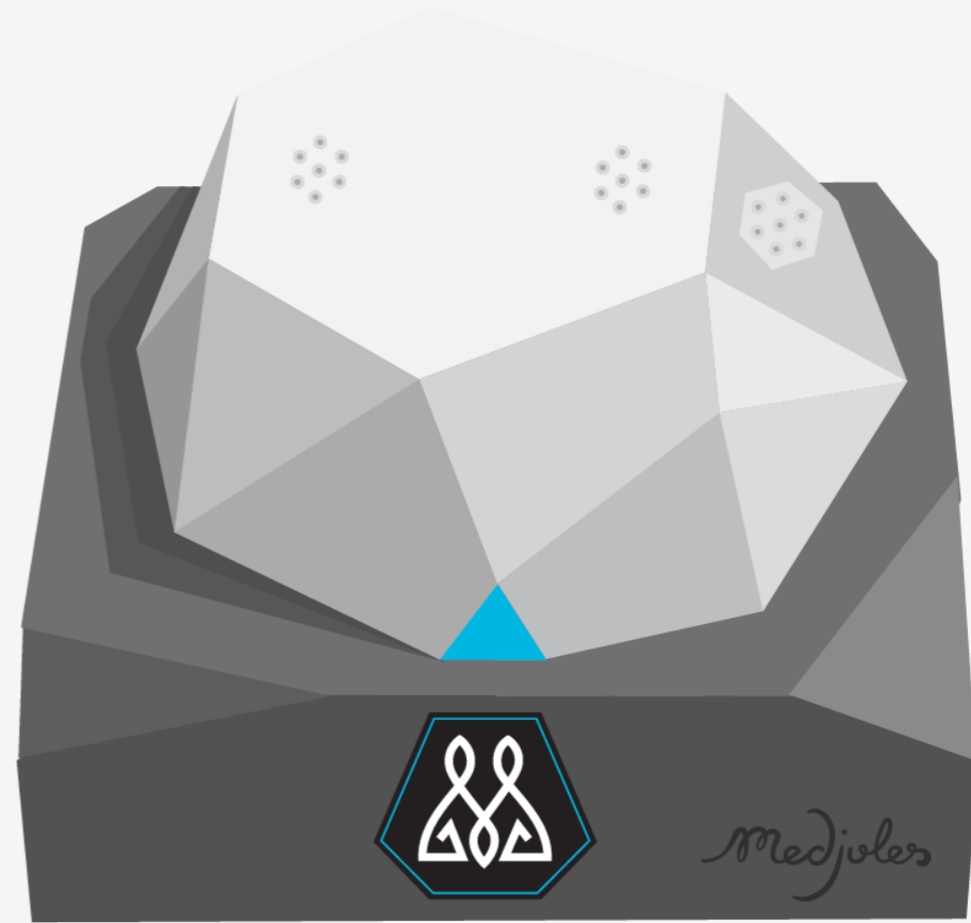
Time to Perform

**What they needed was design.**

Magnet attachment points for modules

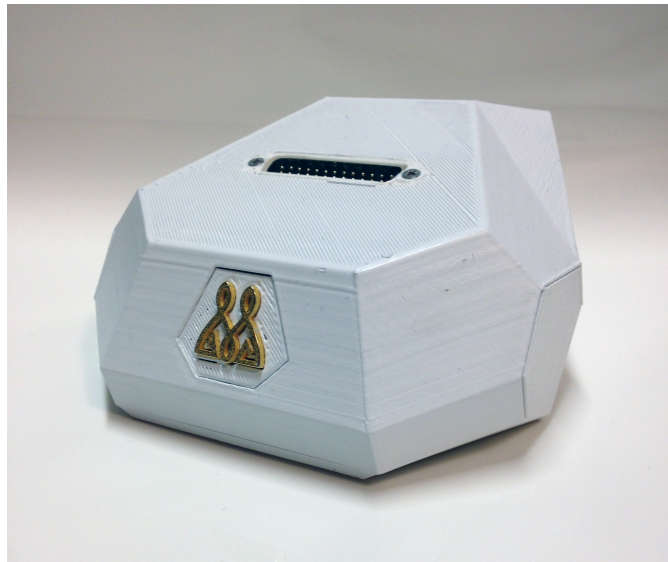


Blue glow for "ready", pink for "recording"



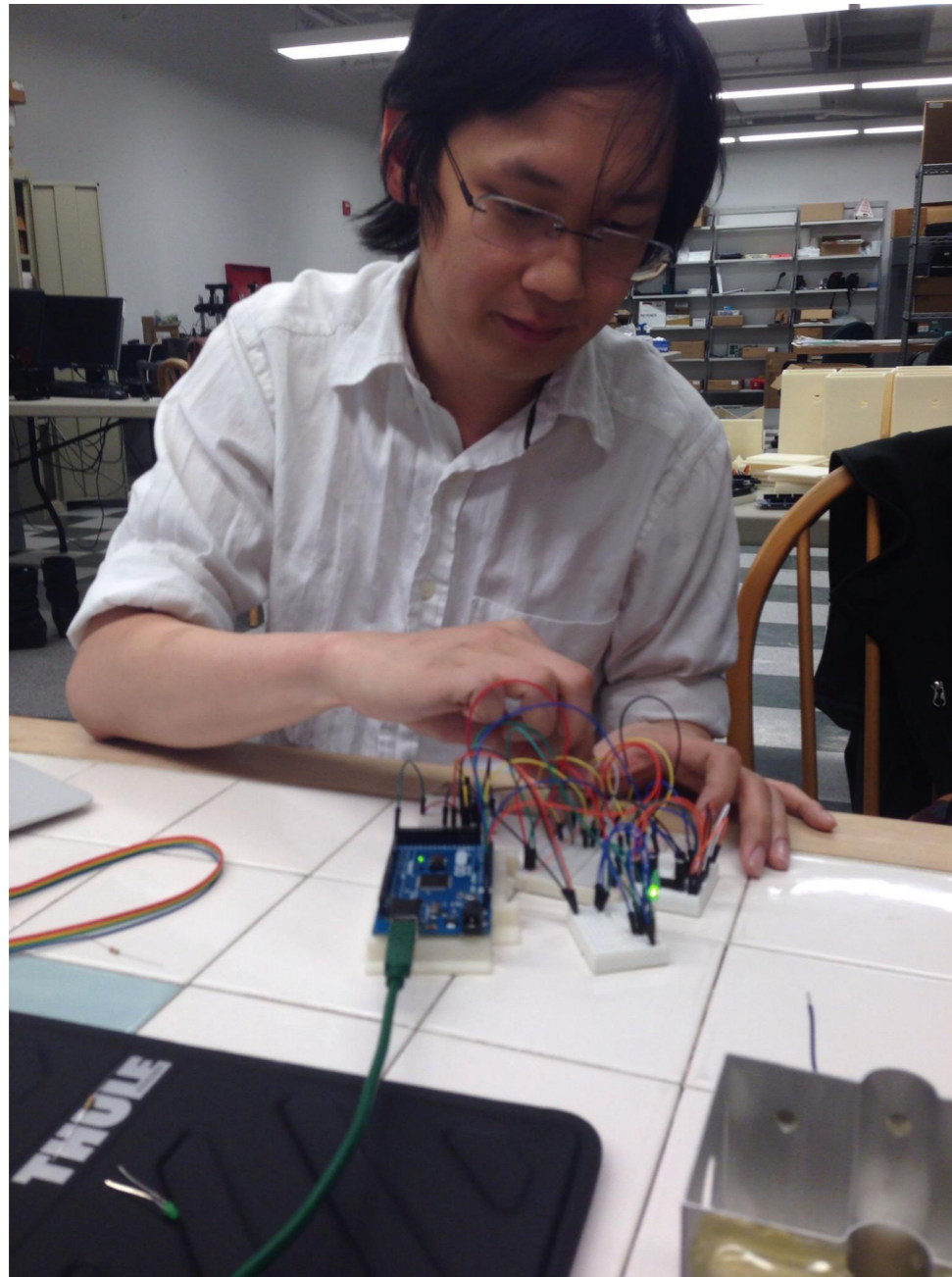
Medjoles

# I spent months learning CAD and 3D printing





# We assembled a team of designers and engineers



**We developed a product to be used by  
medical residents around the world**



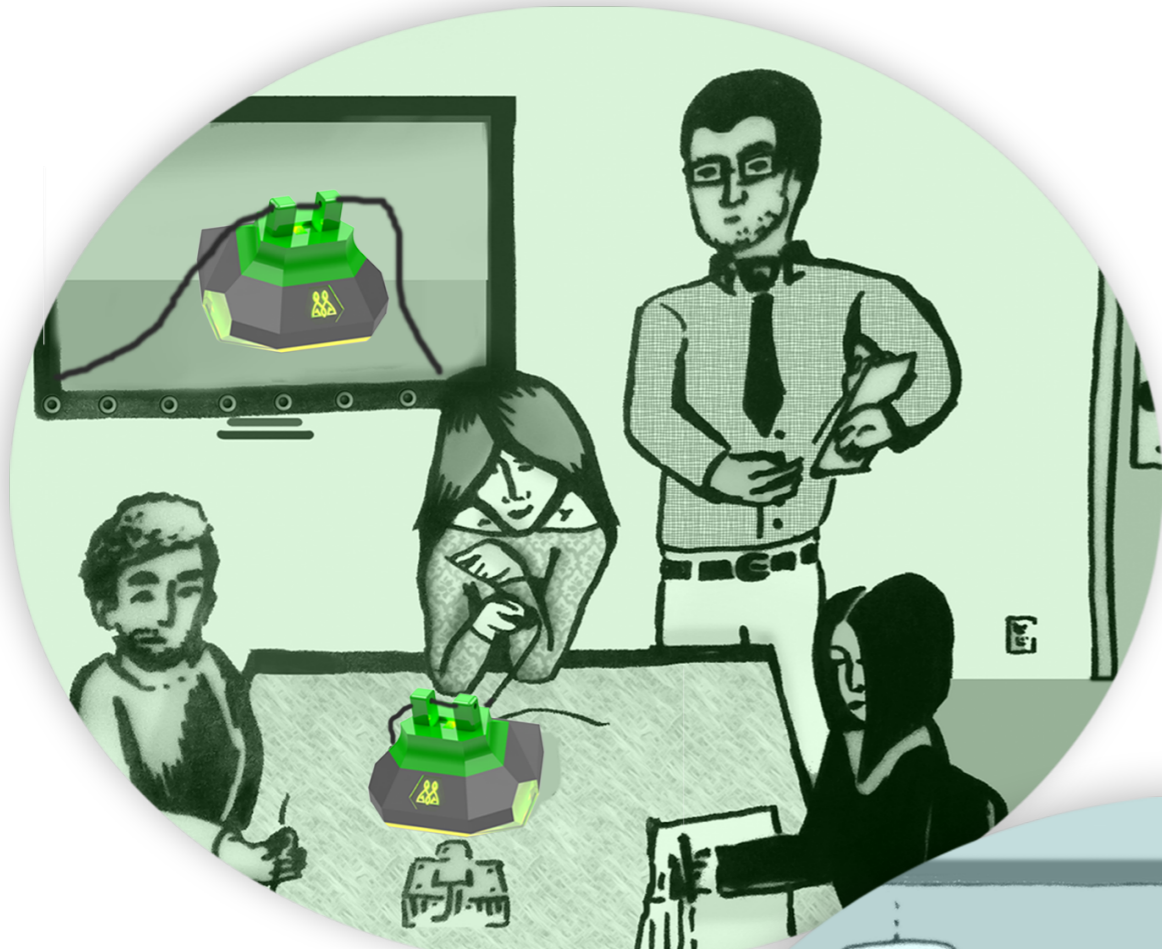
**Makerere University, Kampala, Uganda**



**We exhibited the devices at multiple events  
and conferences.**



**We designed and developed a learning management system to interface with the physical devices.**



for group practice



for independent practice



for instructor feedback





medjules

DASHBOARD

STATISTICS

MEDJULES

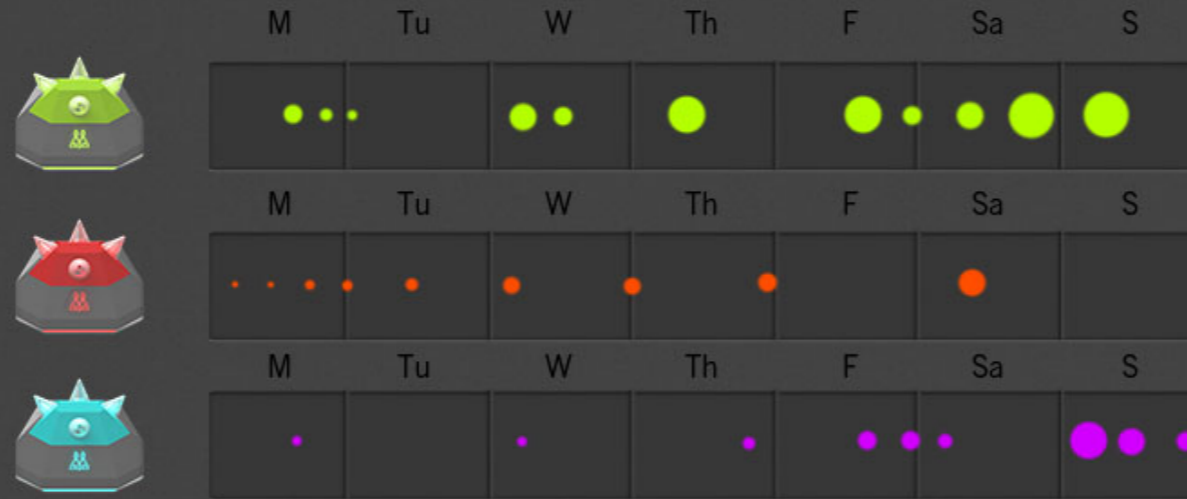
KNOT TYING

SUTURING

TOOL ARTICULATION

RESOURCES

SETTINGS

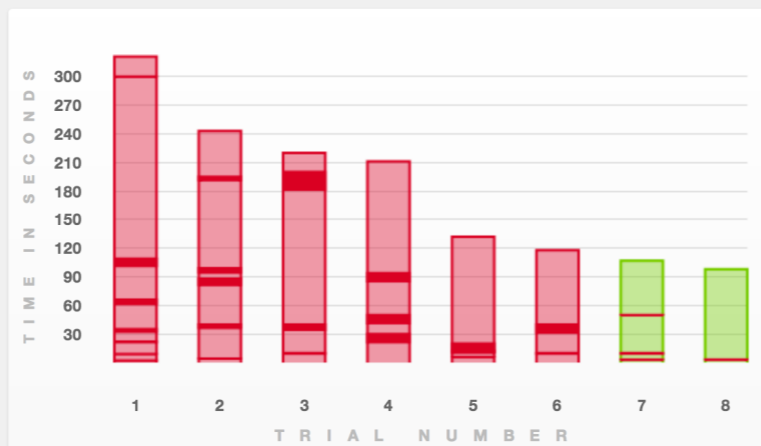


### Triangulation: Natalie Doud

8 attempts

2 of 3 consecutive successes

Errors per trial: Less than 10 to pass — = error

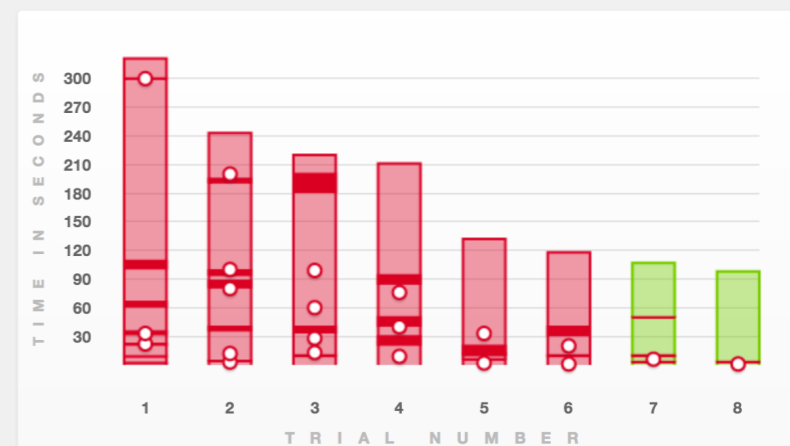


### Bimanual Dexterity: Natalie Doud

8 attempts

2 of 3 consecutive successes

Errors per trial: Less than 10 to pass — = error ○ = drop





**We connected with surgeons in a variety of specialties  
and expanded the trainers for use in cardiac surgery**

## Instructions

This course contains five modules each representing a separate task in cardiac surgery.

Each module includes instruction video(s), a guide on how to set up the Loor-Rosselli box, a task to complete, and a link to submit your attempts. Do not curate your video content but please submit any and all practice sessions in sequential order.

For more information on the Loor-Roselli parts, visit the [Tool Descriptions](#).

Deliberate Practice Curriculum

## Cannulation Purse-String Station

### Aortic Cannulation



### Venous Cannulation





# Cardiac Trainer Manual

## WHAT YOU'LL NEED



## MITRAL VALVE STATION



For the mitral valve exercises, position the construct in anatomical position. And rotate to increase complexity. You should just barely see the anterior portion of the annulus.

## TASK

Use a 4-0 prolene segment (6 cm) to practice the angles needed for mitral valve annuloplasty and replacement. Practice everting and inverting techniques. To increase the challenge, sew a ring to the annulus with a running 4-0 prolene. Watch for symmetry, tactile force, angles, and needle handling.



# Cardiac Trainers Tools

MAIN BOX



ACCESSORIES BOX



TRAINER



CORONARY MOUNT



MITRAL MOUNT



AORTIC VALVE



AORTIC GRAFT MOUNT



CORONARY HOLDERS



LIGHT



**These trainers are currently in a multi-site validation study for use in surgical education.**