Creating a talent pipeline in biomedical engineering

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What is Biomedical Engineering?

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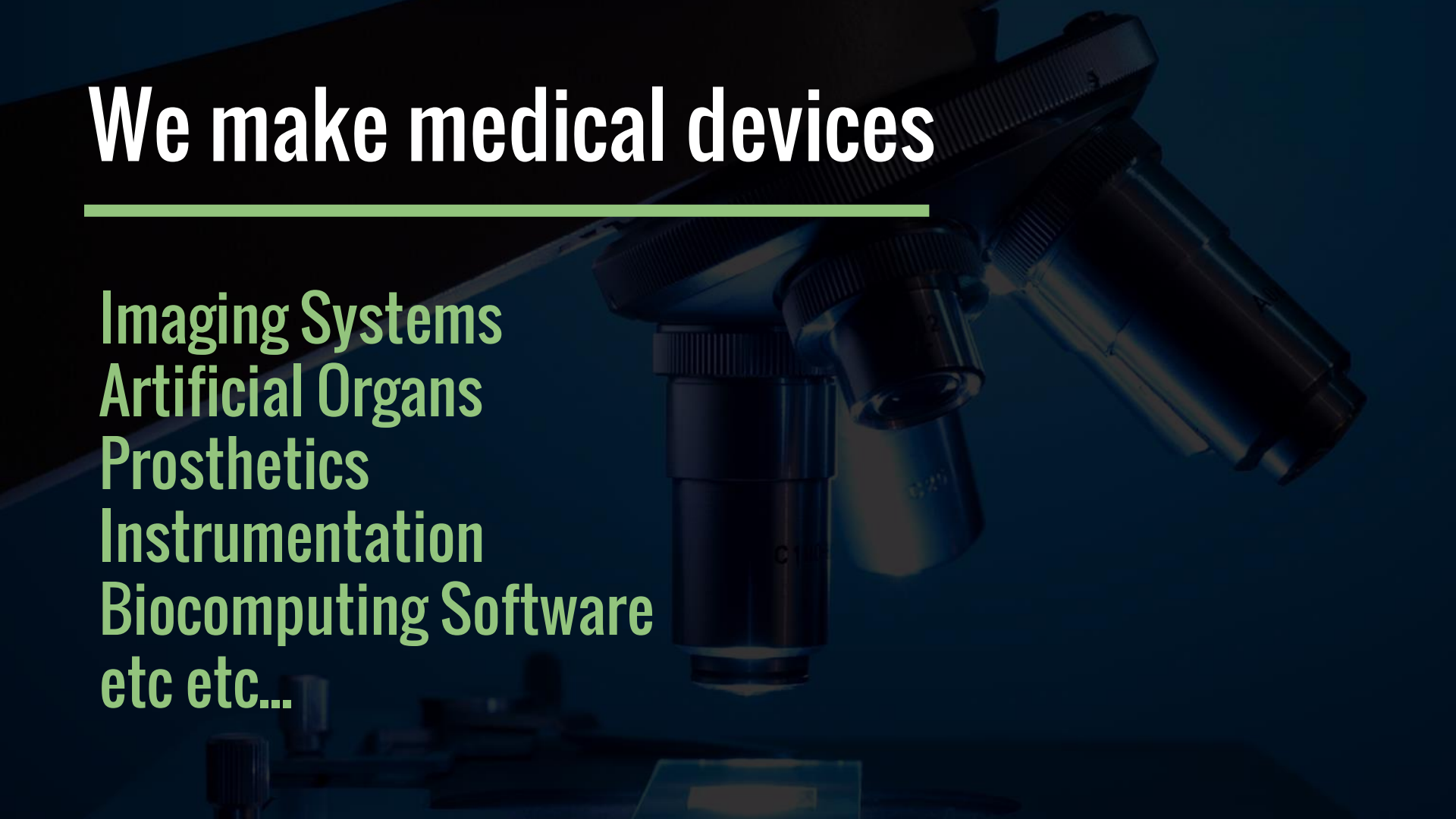
We ask questions

So What?
What can we do?
How can we make something?

We work on solutions

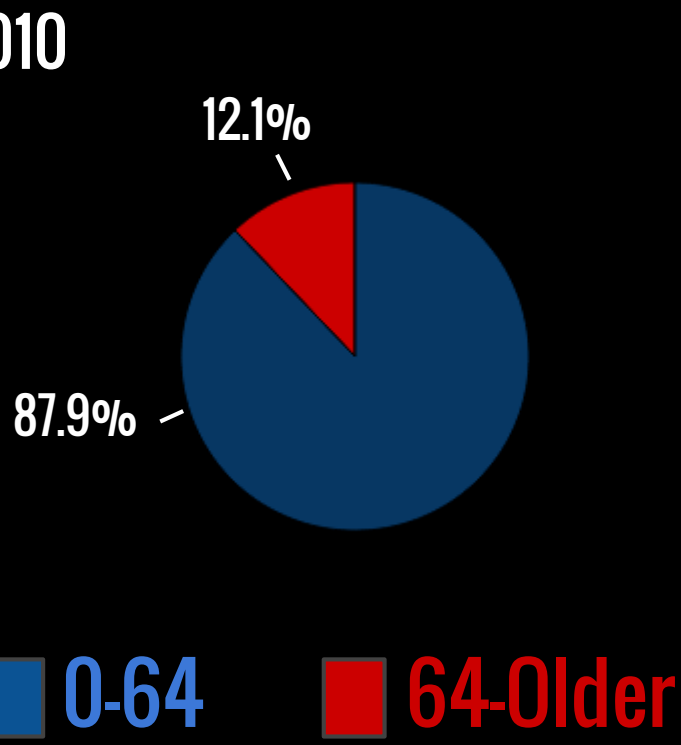
research and DEVELOPMENT



We make medical devices

Imaging Systems
Artificial Organs
Prosthetics
Instrumentation
Biocomputing Software
etc etc...

We're not getting any younger...



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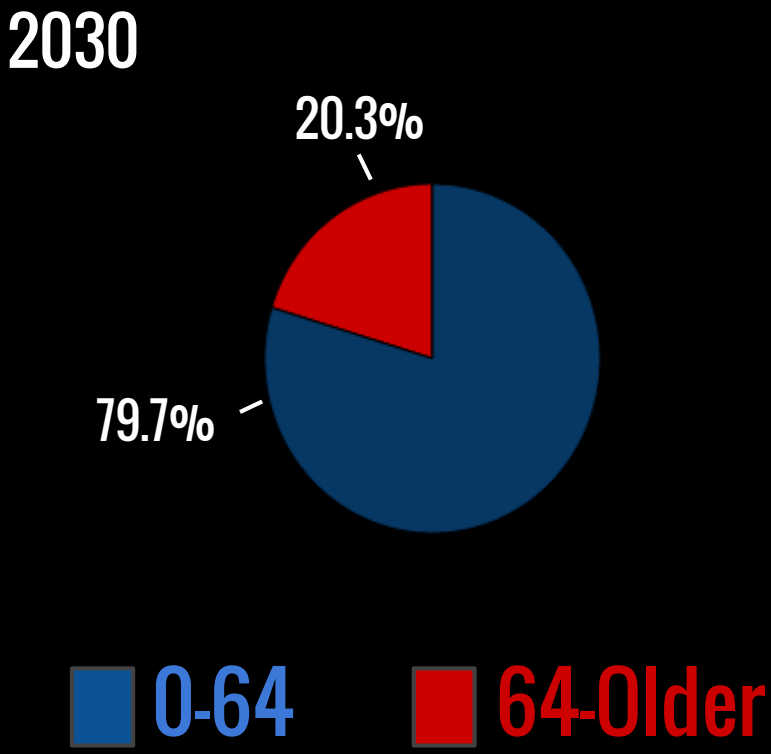


Biomedical Engineering by the numbers

26.6%

Projected employment change in Biomedical Engineering from 2012-2022 the Bureau of Labor Statistics estimates to meet future demand

$53,800

Starting salary for Biomedical Engineers according to the BLS.
According to Forbes.com this makes it the #1 most valuable college major.

Program Examples

(Middle School, High School, College)

What are our objectives?
How do we engage key stakeholders in overall program design?
How have we defined our student learning outcomes?
What successes and perceived barriers have been encountered?

Middle School

Pilgrim Park Middle School, Elmbrook School District

Why biomedical engineering for middle schoolers?

Introduces students to the process of engineering

Provide all students experience in engineering - especially the area of biomedical engineering - unfamiliar to many students.

From this experience...

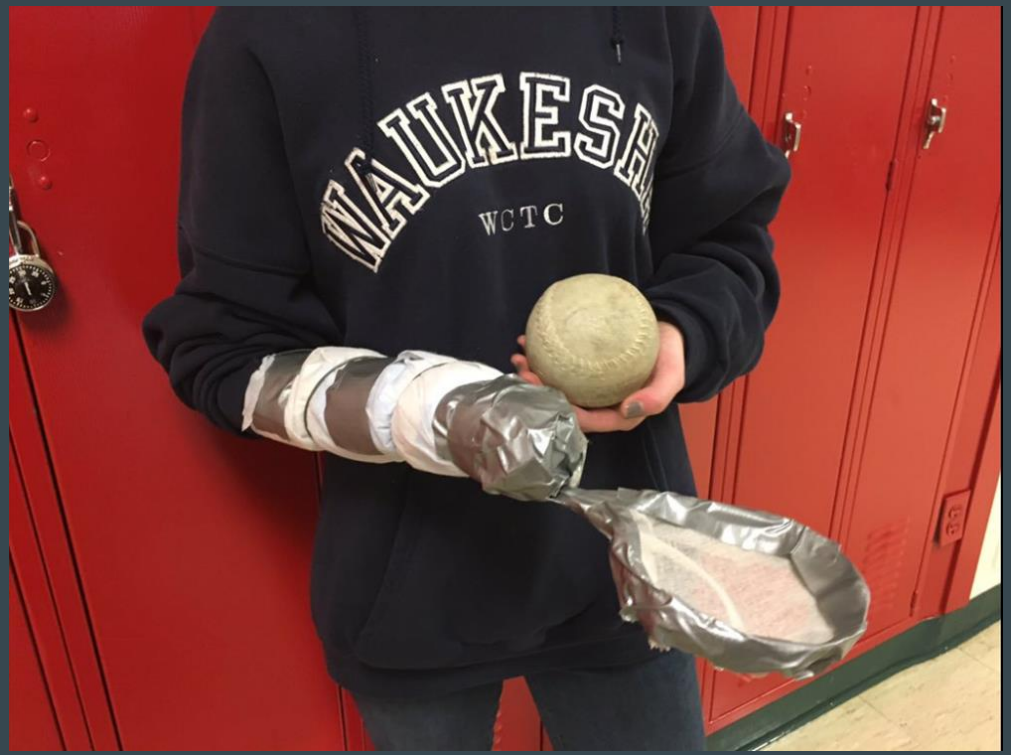
- Students use critical thinking, problem solving, and interpersonal skills
- Increases engagement for students who know they like engineering
- Some students discover interest once exposed to engineering - especially for some because it connects to areas of interest, such as the human body.
- Students authentically apply standards to project - creates more in-depth learning

What works...

Students choose a project.

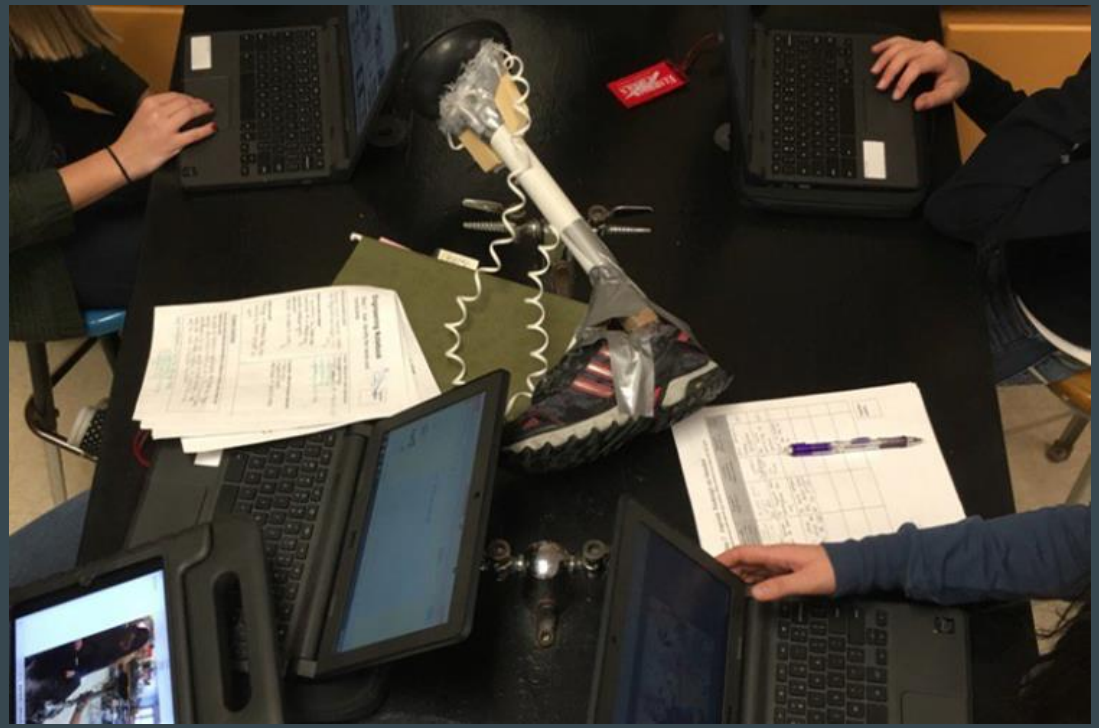
Choices I've used for this unit:

- Prosthetic leg
- Artificial Heart Valve
- Facemask
- "Pill" coating
- More...

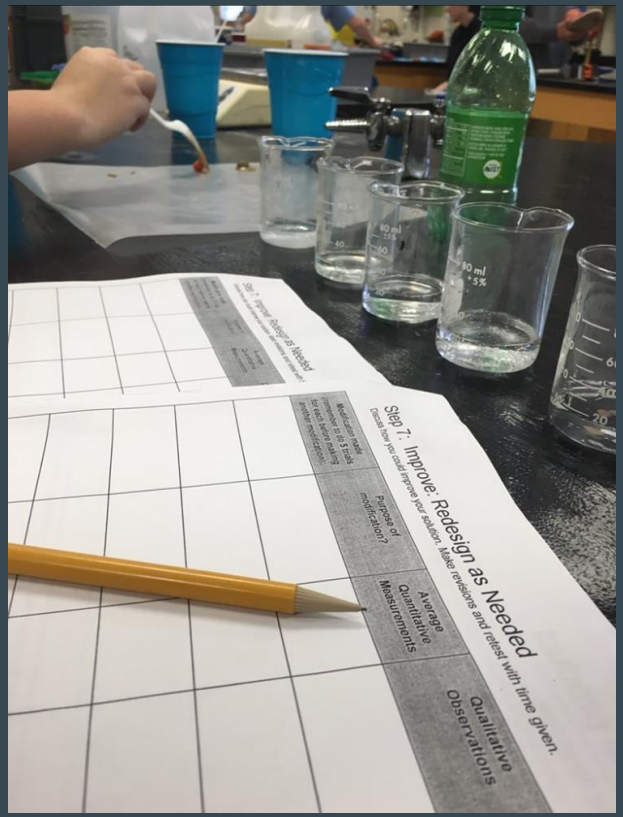


(projects were modified from Teachengineering.org)

Students collaborate around a common, high interest goal.



Students are required to collect data.



Students compare and tests designs.

Students present process and end result to each other

Let's hear from the students!

This group of students is composed of

- A student who struggles with attention and organization
- A student who does does often reach her full potential
- A student who feels lost in school.
- A student who rushes through things to just get them done.

Barriers and how to overcome

Assure that students are also learning content and not simply engineering a product

Students making a presentation that connects content their product. These students had to explain how the structure of the related (and product) organ helps its function. Jig-saw this.

Barriers and how to overcome

Time. When adding major projects like this, there is less content that can be covered

We cut out specific body systems we used to include in the unit. Instead, students focus on big ideas (structure-function & levels of organization) and apply big ideas to one body system.

Barriers and how to overcome

Students often use “trial and error” and don’t really think through what they are doing.

Include an engineering notebook. Do not let students move on to the next step in the process until current step has been approved. Require students to think ahead of time what data they will collect and hold them to it!

Barriers and how to overcome

You will have chaos.

Set up guidelines from the start.

- Groups set up their own norms.
- Students directly address conflict with each other (teacher helps).
- Set up a “danger zone” for cutting/sawing/drilling.

High School

Kettle Moraine High School
Kettle Moraine School District

High School of Health Sciences

High School

...

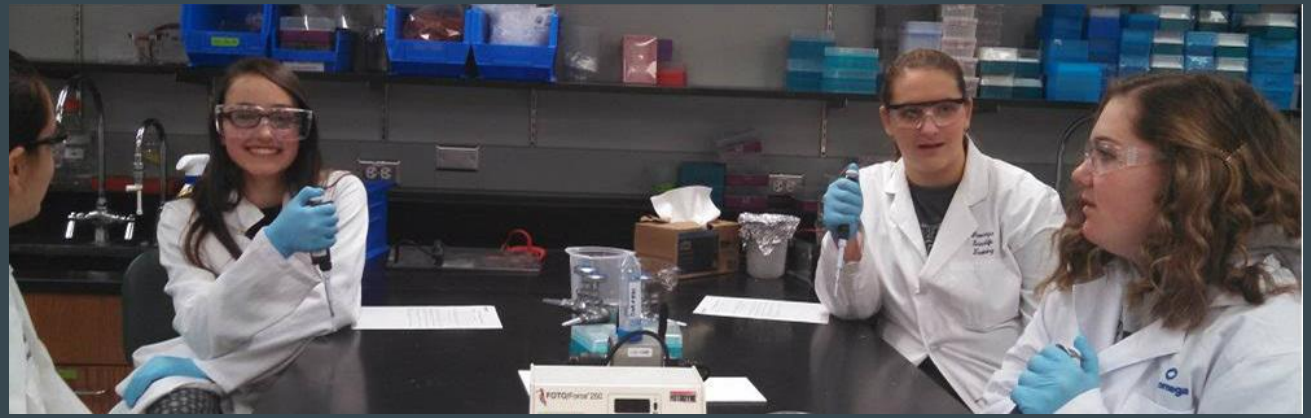
Kettle Moraine High School Campus
Kettle Moraine School District

KMGlobal
SCHOOL FOR GLOBAL LEADERSHIP & INNOVATION

Biomedical Science Objectives:

- Providing Transformative Learning Experiences
- Design solutions real-world problems
- “Work” as a biomedical professionals

PROJECT LEAD THE WAY
PLTW



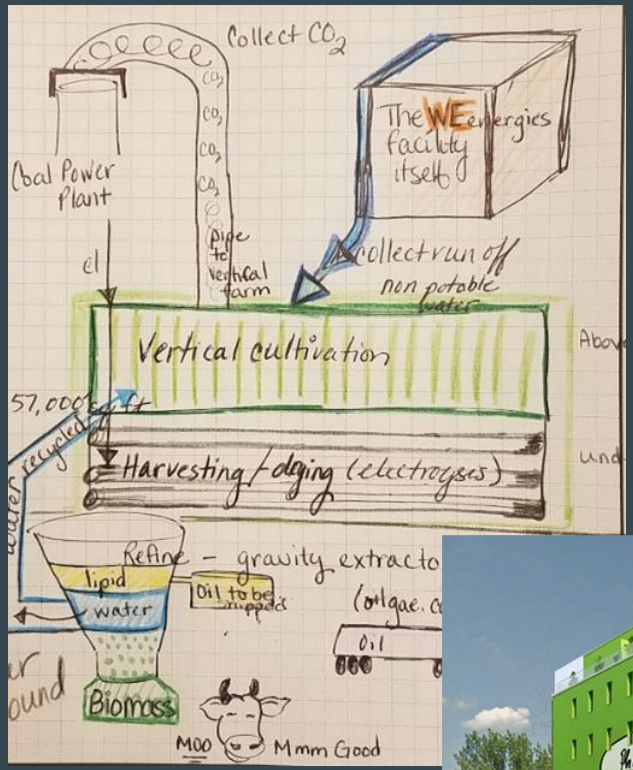
Outcomes:

Experience as a biomedical professional
Build relationships with community partners
Practice working in teams

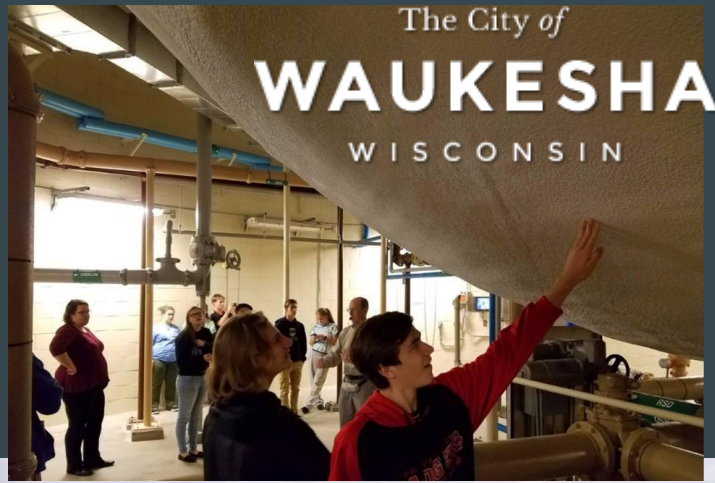
Design innovative solutions for preventing, diagnosing, and treating disease

more...

Community partners and innovations



Students use community experience to create ideas for their own!



Define Success

Creativity

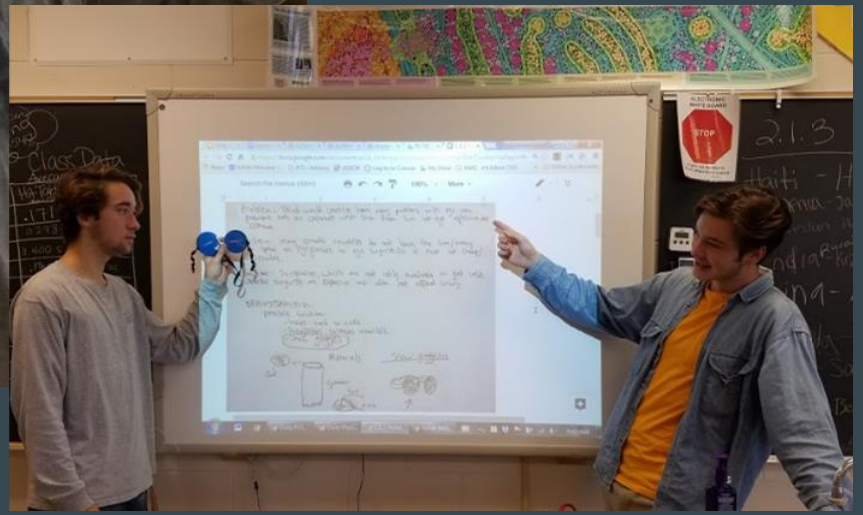
Community Involvement

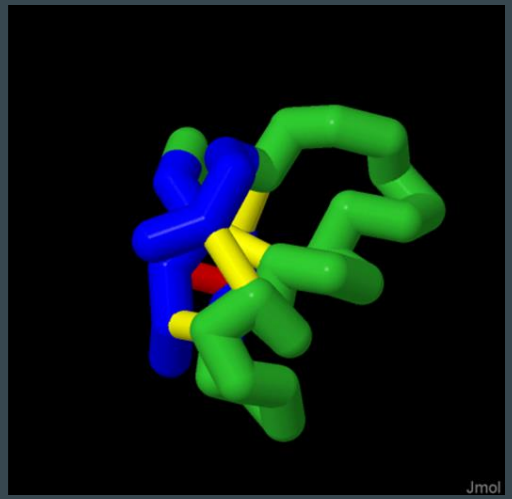
a. Job Shadowing
b. Volunteer work
c. Patents

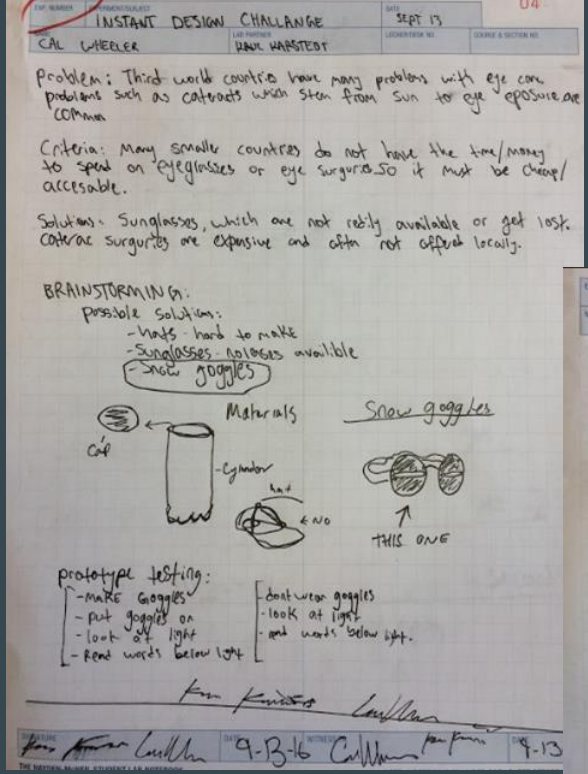
Biomedical Skill developme

Career Interest/Paths

Team Building, Innovations, and Research/design






INSTANT DESIGN CHALLANGE

SEPT 13

CAL WHEELER

RAUL WARSTEDT

Problem: Third world countries have many problems with eye care. problems such as cataracts which stem from sun or eye exposure are common

Criteria: Many smaller countries do not have the time/money to spend on eyeglasses or eye surgeries so it must be cheap/ accesable.

Solutions: Sunglasses, which are not really available or get lost. Cataract surgeries are expensive and often not offered locally.

BRAINSTORMING:

Possible Solutions:

- Hats - hard to make
- Sunglasses - no lenses available
- Snow goggles

Materials

Snow goggles

Cap

Cylinder

Hat

& NO

THIS ONE

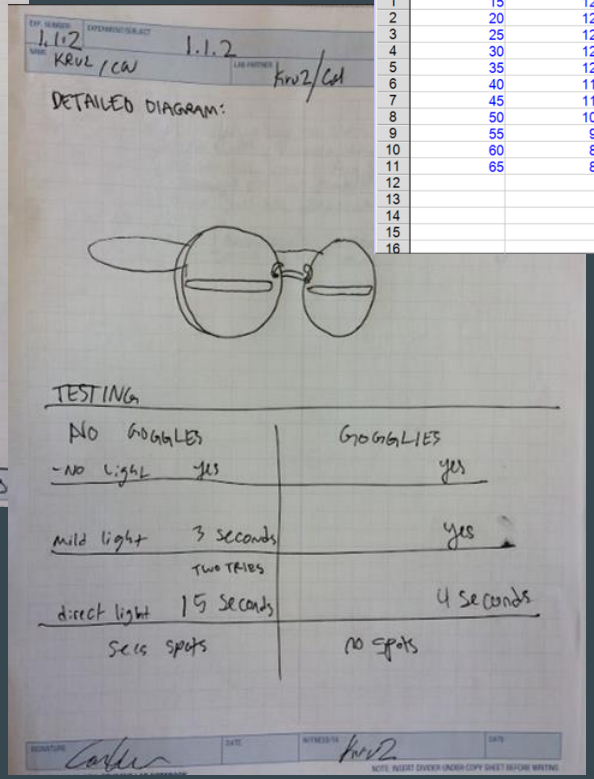
prototype testing:

- make Goggles
- put goggles on
- look at light
- Read words below light

- don't wear goggles
- look at light
- read words below light.

9-13-16

9-13


1.1.2

KRV2 / CW

1.1.2

KRV2/CW

DETAILED DIAGRAM:

TESTING

	NO GOGGLES	GOGGLES
-NO Light	yes	yes
Mild light	3 seconds	yes
	TWO TRIES	
direct light	15 seconds	4 seconds
	Seis spots	no spots

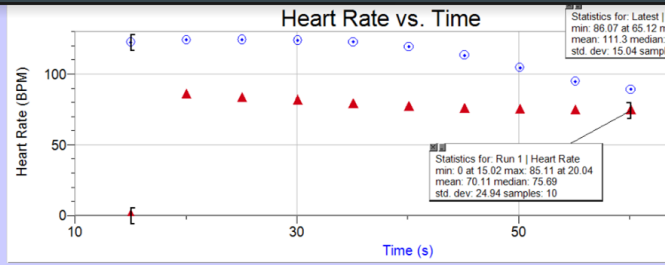
KRV2

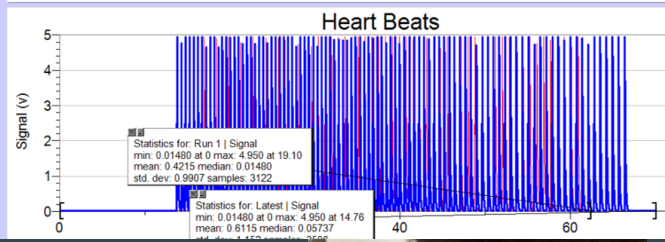
NOTE: INSERT DIVIDER UNDER COPY SHEET BEFORE WRITING

Heart Rate
86 BPM

Heart Rate data will appear
15 seconds after collection starts.

	Latest	
	Time (s)	Heart Rate (BPM)
1	15	122
2	20	124
3	25	124
4	30	124
5	35	123
6	40	119
7	45	113
8	50	104
9	55	95
10	60	89
11	65	86
12		
13		
14		
15		
16		

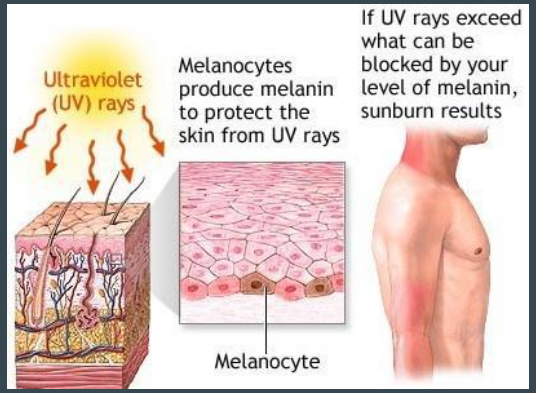




Experience with documentation, data collection

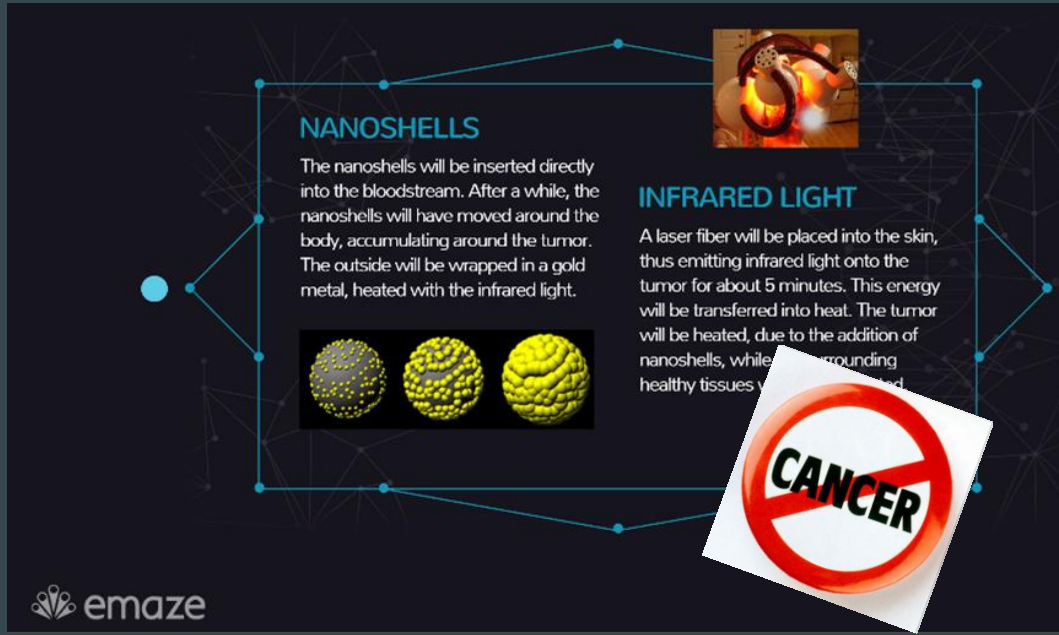
Biomedical Skills Development

PLTW - Biomedical Innovations

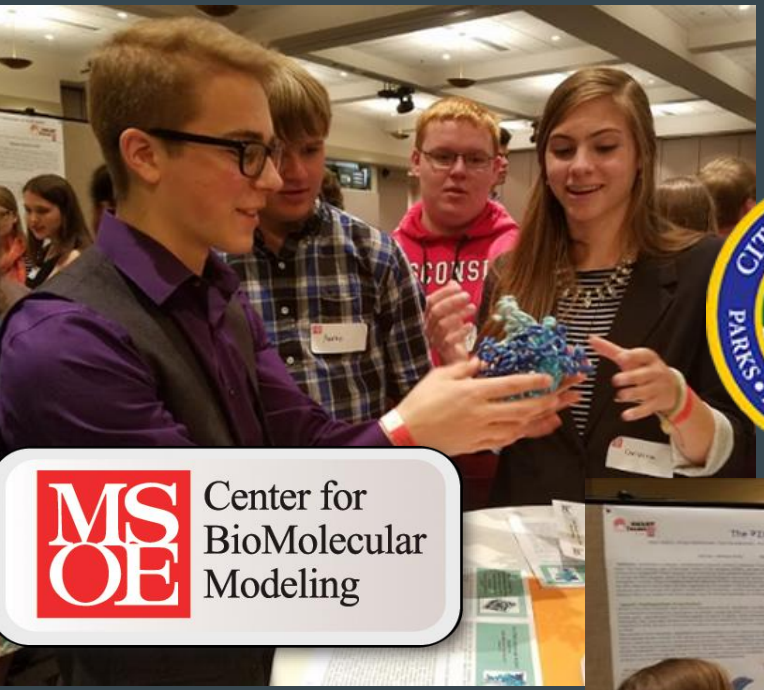


"This final project in class was an opportunity for us to research something that we were passionate about and find a way to possibly help people struggling with their health around the world."

Product: Melanin Enhancer



Industry Partners

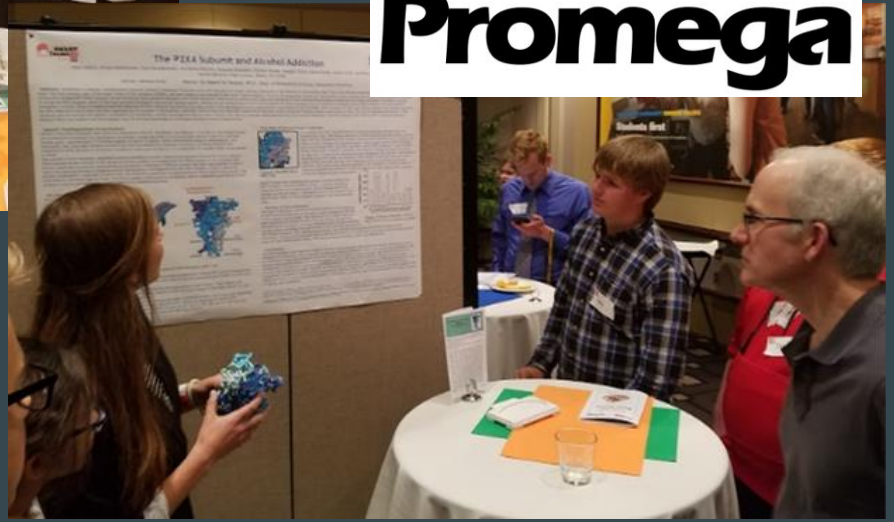


MSOE Center for BioMolecular Modeling

City of Waukesha Parks • Recreation • Forestry

Medical College of Wisconsin

Promega



Aurora Health Care®

UW-Waukesha Field Station

College

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Marquette University

Our theme

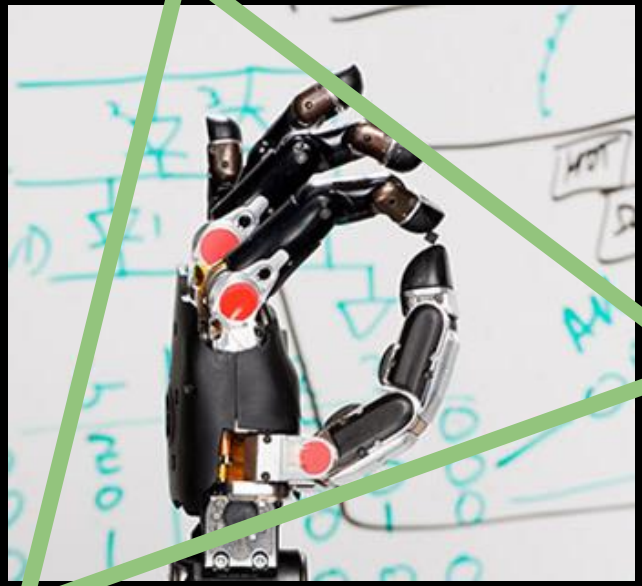
"Curis Personalis"

Our objective

Create world class biomedical engineers

DARPA Built Prosthetic that can Feel

Biomechanics



Bioelectronics

Biocomputing

Our Approach

Leverage partnerships with industry

Strong engineering core

Flexible, curriculum is updated as industry changes

Companies represented on our IAB include

We define success by job placement.

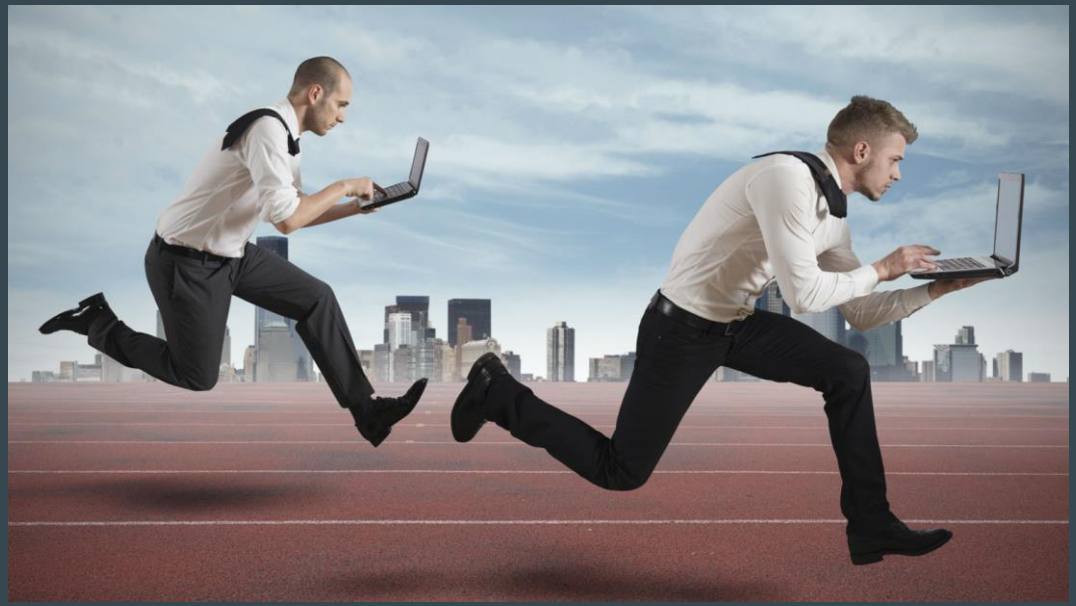
96%

Of students employed or in graduate school one year after graduation.

20 +

Number of companies hiring MU CO-OP students and interns

Our biggest problem: competition with other majors



Biomechanics vs Mechanical

Bioelectronics vs Electrical

Biocomputing vs Computer Science

Questions?

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Contact Information

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