PODS AND MODS
Modularity as a response to the “Skills Gap” in manufacturing
Introduction
Ship these:

In these:

On this:

To make THIS!:

For girls like her & boys like him
How can we equip our youth in schools, both urban and rural, with the technological and architectural resources needed to mitigate the manufacturing “skills gap”, while also fostering apprenticeship styles of learning.
Research
The popular conception about China is that companies come to China to do business because of low labor costs. However the truth is China stopped being the nation with the lowest labor costs many years ago. That is not the reason to come to China from a supply point of view. **The reason to come to China is because of the skills and the quantity of skills in one location.**

Tim Cook, Apple
“The products we produce require really advanced tooling and advanced manufacturing. We require highly skilled personnel to operate state of the art equipment in order to manufacture our products. In the U.S., we wouldn’t be able to fill up a room with specialized tooling engineers, however in China you could fill up multiple football fields with specialized tooling and manufacturing engineers.

Tim Cook, Apple
The Skills Gap
“Mike Rowe’s passion these days is drawing attention to what he sees is a dangerous disconnect between the work that he says needs to be done in America, on a physical blue-collar level, and the way that all aspects of American society seems to demonize and push people away from the sort of dirty jobs that don’t require a college degree anymore.

Nick Gillespie, Reason TV
“We are doing everything we can to push every kid to go to a four year college, what is wrong with that?”

Nick Gillespie, Reason TV
“If we (our nation) are lending money that we don’t have, to college students who have no hope for paying it back, to train them for jobs that don’t exist… I might suggest that we (our nation) have gone-around-the-bend a little bit”

Mike Rowe, Reason TV
It isn’t working because…

1. One Trillion dollars in student loan debt
2. There is a growing Skills Gap

Mike Rowe, Reason TV
The Skills Gap
(Research Continued)
Reasons for the SKILLS GAP include:

1. A negative perception of the manufacturing industry that is disconnected from the reality of the working environment and the importance of the industry as a whole.

2. Baby Boomers are retiring whom currently make up a large portion of workers within manufacturing related industries and are in the majority for highly-skilled highly seasoned job positions.

3. Loss of Manpower & Embedded Knowledge

4. Lack of a talent pipeline that is engaging & equipping students, prospective employees, and even current employees will the relevant skillsets needed to succeed in tomorrows manufacturing warehouses.
Solutions for the SKILLS GAP include:

1. Educating the public about modern manufacturing and the benefits of these jobs.

2. External training and certification programs.

3. Apprenticeship programs and involvement with local schools.
Top Industry Sectors & Technology
Transportation & Equipment Manufacturing
#1 – Number of people employed & #1 – Value of Shipments

- Less People → More People
- Lower $ → Higher $$
- Less Companies → More Companies
- Less $ per/Shipment → More $$$ per/Shipment

- Best Pay but less Value of Shipments
- Right down the middle
- Value of Shipments is higher but less pay

- Most people employed but fewer companies
- In Between
- More people employed but fewer companies

- Fewest people employed & # of companies
- More companies but fewer people employed

- Most people employed & # of companies

- Highest overall pay & highest value of Shipments
- Less overall pay & fewest value of Shipments

- Least overall pay & fewest value of Shipments

Pay per employee
- Lower $$ → Higher $$$

# of establishments
- Less Companies → More Companies

Value of shipments
- Less $ per/shipment → More $$$ per/shipment
Fabricated Metal Manufacturing

#3 – Number of people employed & #6 – Value of Shipments

- **# of people employed**
  - Less People
  - More People
  - Less Companies
  - More Companies
  - Lower $$
  - Higher $$

- **Pay per employee**
  - Lower $5
  - Higher $5

- **# of establishments**
  - Less Companies
  - More Companies

- **Value of shipments**
  - Less $ per/Shipments
  - More $$ per/Shipments

Better Pay but less Value of Shipments

In Between

Right down the middle

Value of Shipments is higher but less pay

Least Overall Pay & Fewest Value of Shipments

Highest Overall Pay & Highest Value of Shipments

More people employed but fewer companies

Fewest people employed & # of companies

More companies but fewer people employed

Highest people employed & # of companies

In Between

In Between

In Between

In Between

In Between
Machinery Manufacturing

#4 – Number of people employed & #5 – Value of Shipments

- **# of people employed**
  - Less People
  - More People

- **Pay per employee**
  - Lower $$
  - Higher $$$

- **# of establishments**
  - Less Companies
  - More Companies

- **Value of shipments**
  - Less $ per/Shipments
  - More $$$ per/Shipments

Map showing the distribution of these statistics across different states in the USA.
Computer & Electronic Product Manufacturing

#5 – Number of people employed & #7 – Value of Shipments

- **# of people employed**
  - Less People ➔ More People
  - Lower $$ ➔ Higher $$
  - Less Companies ➔ More Companies

- **Pay per employee**
  - Lower $$ ➔ Higher $$

- **# of establishments**
  - Less Companies ➔ More Companies

- **Value of shipments**
  - Less $ per/Shipments ➔ More $$$ per/Shipments

Map showing distribution across the United States.
SPECIALTY TRADES CONTRACTING

Map showing the distribution of people employed, pay per employee, number of establishments, and company earnings across the United States.

- **# of people employed**
  - Less People: Light colors
  - More People: Dark colors

- **Pay per employee**
  - Lower $$: Light colors
  - Higher $$: Dark colors

- **# of establishments**
  - Less Companies: Light colors
  - More Companies: Dark colors

- **Company Earnings**
  - Less $: Light colors
  - More $$$: Dark colors
The are organizations changing the perception through:

1. Manufacturing day events which expose students to the industry & career facts.
2. Facility Tours
3. Establishing curriculums for educators to teach their students about modern manufacturing

Robotics Trainers  Hydraulic Trainers  CNC Trainers  Machine Simulators
Module 1
Advanced Robotics

Module 2
3D Printing

Module 3
3D Scanning

Module 4
Manufacturing Trainers

Module 5
Computers & Data Analytics

Module 6
Simulators

Module 7
CNCs

Module 8
Wood Shop

Module 9
Metal Shop
1st Concept
(prior to research & new case studies)
Building Pad 1
Building Pad 2
Something Orange
New large wood & metal shop
A bunch of new designed & built net zero housing
Critiques on 1st Concept

- Theoretical Premise
  - Proof?

- Site Location
  - Why central Minnesota?

- Case Studies
  - Successful urban examples for maker spaces, after school skills training programs and hyper collaborative manufacturing spaces
    - N.I.M.B.Y (Not In My Backyard) - St. Paul, MN
    - Ponyride - Detroit, MI
    - Urban Boat Builders - St. Paul, MN

- Other Inspiration
  - Royal Wolf
  - Hoonigan Racing HQ
Previous Design Process

Masterplan → Building → Details
My New Design Process

Details

Building

Masterplan
Case Studies
1. Highly Collaborative Spaces
2. Implied Boundaries
3. Large communal working spaces vs. Medium – Small private working spaces
4. Shipping Containers to create space
Macro Scale Concept
Legend

- Smaller rural manufacturing base & apprenticeship camp
Legend

- Individual school or organizational site.
- Urban or Rural
Legend

- Large urban manufacturing base & apprenticeship camp
- Distribution of PODS and MODS. Could be via train, truck, or plane.
Legend

- Large urban manufacturing base & apprenticeship camp
- Smaller rural manufacturing base & apprenticeship camp

Distribution of PODS and MODS out to rural bases. Likely transported via trucks.
Legend
- Smaller rural manufacturing base & apprenticeship camp
- Individual school or organizational site.

Urban or Rural

Distribution out to these sites would happen primarily via truck and trailer
SITE 1 – Camp Joy at Star Lake (near Dent, MN)
SITE 2 – Park Christian School (Moorhead, MN)
SITE 3 – Ace Tech School (Chicago, IL)
The Design Process
Implications of Thesis Premise (Iteration 2)

In regards to site:
- **Not Site Specific**
- Solution has to work in both Urban & Rural environments
- Seeking to primarily function near schools and serve youth

In regards to typology:
- Transportable
- Adaptable
- "Maker Space / Skills Based Educational Structure" that is scalable based on need, function & technology.
What if I... replaced corrugated walls with windows & openings?
What if I... got rid of the walls altogether to make a “space creating pod”?
What if I... began to standardize each face with columns to allow rotations & a common joining effect?

Sheetrock wall

Add columns for perpendicular joining & standardization
What if I... began to standardize some faces with columns & open other faces up for windows or modifications?

No wall

Add columns for perpendicular joining & standardization
What if I... began to standardize all faces?
What if I... cut a hole in the existing wall, but left enough to be welded to?

The irregular surfaces of the container required me to develop a standardized frame.
What if I... added interior metal furring columns to create a standard width of openings?

Metal furring column meant to standardize the openings for proper alignment of materials when rotated.
What if I... lifted the floor with treated studs? This would allow flooring to align from container to container.
Then... add decking.
Then... add the standardize frame that will be welded to the outside of the existing corrugated metal walls.
InSoFast Continuous Foam Panels with embedded studs
R-Value = 10 @ 2.5"

Can add Rigid Insulation to achieve any desired R-Value

Ceilings = R48
Walls = R21
Floors = R38
Final Kit Of Parts
Hydraulic Jack
Steel Frame

Built-in Interlocking system
Plug-n-use modular decking & railing system
Modular Doors
Modular windows & mechanical unit
Various Modules
Building Timelapse
SITE 1 – Camp Joy at Star Lake (near Dent, MN)
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Legend
- Smaller rural manufacturing base & apprenticeship camp
- Individual school or organizational site. Urban or Rural
#FINALLY

Questions?