Making Makers: Students at the Center of Education, Technology, and Innovation

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What is a Maker Project?

Talk about one student you know [or you heard about] who *made* something academically meaningful.

Bonus points if they made this thing on your campus!
So...

What is the “Maker Mindset”?
“We’re still living with the historical division of liberal arts from the illiberal arts, with the belief that the only reasons to study fabrication are for pure art or profane commerce, rather than a fundamental aspect of personal liberation.”

-Gershenfeld, *Fab*, pg. 42

Bigger motivators than money:
Access, Autonomy, Mastery
It’s up to you to iterate and move your project forwards.
"The result would be a revolution that contains, rather than replaces, all of the prior revolutions. Industrial production would merge with personal expression..."
Fail Faster
and
Fail Smarter!
“...learning by actively constructing knowledge through the act of making something sharable....”
-Maritnez and Stager on Papert, *Invent to Learn*

Deep self reliance within an active community.

**LEARNING HOW TO LEARN!**
Wellesley Makers

Project Description

What does the project provide the student?

What type of training enabled students to work on these projects?
Shane Cox
Classics and
Media Art & Sciences ‘18

Specializes in...
3D scanning
3D modeling in Blender
Licensed Drone Pilot
Aerial Photogrammetry
Carrying Super Heavy Equipment

Working on...
VR Application in Unity
Aubrey Simonson
Political Science and
Media Art & Sciences ‘19

Specializes in...
VR Environments
3D modeling in Maya
3D Printing
Audio Recording
3D Printed Audio Recordings

Working on...
VR Application in Unity
Shane in 2015

Project:
Aerial imaging in Greece

Student Benefits:
Specialized skillset

Training Technique:
Learning together
Shane and Aubrey in 2016

Project:
High-res 3D scanning

Student Benefit:
Interdisciplinary collaboration

Training technique:
Team documentation
Aubrey in 2016

Project:
3D Printing Audio Recordings

Student Benefits:
Expert command over toolset, Collaboration

Training Technique:
Peer Instruction
Shane in 2017

Project:
Supervising portable makerlab

Student Benefit:
Project management

Training technique:
Scaled distribution of learning
Aubrey in 2017

Project: VR Anna Karenina Train

Student Benefit: Confidence without fear of failure

Training technique: Iterative design
For Credit vs For Pay

Training Technique: Partnering with Faculty
MakerLab Student Worker Training Curriculum

MakerLab Maintenance (Every Shift)
- Resetting the room to default
- Keeping the lab presentable (think impromptu tours)
- Keeping dangerous or expensive equipment in the cabinet
- Organizing the room and cabinet
- Writing a centralized re-supply list
- Knowledge base rental form

Customer Service
- MakerLab ethos: what is it and how to apply and encourage it to the community
- Managing collisions and customer expectations in an overcrowded space
- Correct escalation procedures when things go wrong: humans and machines

MakerLab tour workflow
- MakerLab tabling: for events and conventions
- Basics of interacting with walk-ins and community: importance of names and remembering projects. - wording? Want to stress it's important to introduce yourself, get to learn who comes in, and keep in mind of projects and what people know in order to introduce them to other people with needed skill

Computer Support
- Troubleshooting theory - Basics of computer anatomy, how hardware and software work
- How filesystems and networks work
- How the internet works
  - IP range, reg, tracer, i2, speed

- How to image a PC
- How to image a Mac

- How to backup and restore a system
- How to build and maintenance a custom PC

Digital Fabrication
- 3DPrinter Anatomy: Applying Troubleshooting Theory to 3D Printers (cannibalize the CreatorX's)
- CreatorX 3DP Training
- i3 3DP training
- Operating the Z-Corp color 3D Printer
- Overview of how to operate (and interact with) Deis3D hardware
- How our filament inventory system works
- How filament recycling works
- Different types of filament and experimenting to learn each
- Print example prints that have walked away from display shelf - Make ML THINGIVERSE
- Learning Eduardo's Molecule 3DP workflow
- Overview of all CAD tools, Tinkercad training
- Autodesk Fusion360 or Onshape training
- Resources for Solidworks certification, sketchup tutorials
- Netfabb and Meshmixer overview - why post processing matters

Digitization
- How to operate a DSLR - lighting and exposure basics - how photogrammetry works
- Xbox Kinect w Skanect 3D Scanning for people scale
- Artec Spider High Resolution object 3D Scanning
- DPI-8 Room Scale 3D Scanning
- Autodesk Remake overview, testing, and 123D catch testing
- Agisoft Photoscan photogrammetry rendering
- NextEngine Desktop 3D Scanner
- David 3D Scanner operation

Embedded Systems & Robotics
- Soldering Training
- Intro to Arduino
- Intro to Raspberry Pi
- Intro to bench power and how a robot works and how batteries charge
- How to fly a drone Line of Sight
- How To fly a DJI drone
- How to fly a FPV racing drone (LOS, and simulator first)
- Resources and overview of topics for 107 FAA sUAS licensing

WebDev
- Overview of how brandesmakelab.com 's architecture works
- Configuration of an endpoint to edit the website - creation of all relevant accounts
- Logos and branding
- Social media accounts - hootsuite automation
- Blog development and content

VR/AR
- Overview on tours/tabling VR/AR demos
- Set-up, use, and troubleshooting: Oculus Rift, Vive, Samsung Gear, Google Cardboard, Hololens
- Overview of Blender and Unreal Engine
- Managing Steam accounts and games
- Unity Or Unreal tutorials
|   | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
| 1 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8 | Resource Guide (Google) |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 | CRM |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 | Email |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 | Knowledge Base |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9 | Closing Doors |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10 | Signing Equipment Out Digitally |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10 | Signing Equipment In Digitally |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 11 | MakerLab Maintenance |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 12 | Resetting the room to default | H | H | Tim 3/20/17 | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| 13 | Keeping the lab presentable | H | H | Tim 3/20/17 | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| 14 | Makerlab Cabinet | H | H | Tim 3/20/17 | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| 15 | Organizing the room and cabinet | H | H | Tim 3/20/17 | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| 16 | Writing a centralized re-supply list | H | H | Tim 3/20/17 | H | H | H | H | H | H | H | H | H | H | H | H | H | H |
| 17 | Customer Service |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 18 | MakerLab ethos | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan |
| 19 | Atmospheres Management | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan |
| 20 | Escalation | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan |
| 21 | Tour Workflow | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan |
| 22 | Tabling | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan |
| 23 | Walk-ina | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan | lan |
| 24 | Building/Giving Trainings | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan |
| 25 | Writing workflow runbook | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan |
| 26 | Writing a screenshot tutorial | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan | 1/2 Done - lan |
| 27 | Computer Support |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**Digital Fabrication**: ***in order***
Eduardo Beltrame

Specializes in...
- 3D Printing Biomolecules
- 3D modeling
- Molecular visualization

Working on...
- PHD at CalTech in Bioengineering
Eduardo
Eduardo
Eduardo
Eduardo

Training Technique: Resource Stewardship
Eduardo
Danni Dimitrova

Daniella Dimitrova
Art History and
Computer Science ‘17

Specializes in...
VR Environments
3D modeling in Blender
3D Printing Sculpture

Working on...
IBM VR projects
Bringing the maker spirit to software development
Helen Wong

History and Classics Majors
Legal Studies and CS minors
Class of 2019

Specializes in...
3D Scanning
Artec and DPI-8
Photogrammetry
Studio Photography

Working on...
Research funded by Jerome A Schiff Fellowship
Eunice M Lebowitz-Cohen Fellowship in Classical Studies
Legal implications of 3D data in Archeology
at Harvard Berkman Klein Center
Helen
Photoshop Workflow for 2D Object Digitization

Camera Settings:
Operate the camera from Nikon Capture Control

Manual mode
ISO 100
F-stop largest aperture value (F22)
Use the meter to pick a Shutter Speed to match exposure at largest aperture

Adobe Camera Raw
Open the RAW file in Adobe Camera Raw (this will happen automatically if you open it with Photoshop):
Some great documentation on Adobe Camera Raw
Some documentation on how to use a Histogram

- Set white balance by using the White Balance Tool (i-key shortcut) to click on a pure white area.
- Adjust clarity up slightly (+5 to +15)
- Balance Exposure, Contrast, Highlights, Shadows, Whites, and Blacks according to the image.
Training Strategies

- **Learning Together**
  - Students and faculty/staff learn something new alongside each other
  - Witnessing the learning process first hand

- **Peer Instruction**
  - Students offer workshops to their own community
  - Must be a culturally/academically relevant topic

- **Team Documentation**
  - Assigned creation of instructions for new tool/workflow
  - Repository is kept and review for occasional updates
  - Library of resources is shared amongst community

- **Scaled Distribution of Learning**
  - Defined workflow from “easier” tools to “more difficult” tools
  - Scaffold this over three years

- **Iterative Design**
  - Allow students to fail
  - Learning through the process of doing

- **Partnering with faculty to offer independent study for development of research projects**
  - Offer credit (or money)

- **Resource Stewardship**
  - Centralized support for unique instruments/machines
  - Students directly supervise and train lab equipment across campus
THANKS
&
Survey Reminder

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