

# Design Review 4

## Team 506

### MeWee Table

---

February 4, 2020

Alec Ellis, Rieley O'Brien, Kyle Innis,  
Lauren Smith, Anthony Muniz



# Team Introductions



**Alec Ellis**

Project Manager/  
Human Factors  
Engineer



**Kyle Innis**

Geometric  
Integration  
Engineer



**Lauren Smith**

Materials Science  
Engineer



**Rieley O'Brien**

Systems Engineer



**Anthony Muniz**

Mechanical Systems  
Engineer



# Visionary, Sponsor, and Advisor



Mr. Bill Lindner  
Campus Reimagined (CRI)



Mr. Peter Butler  
Campus Reimagined (CRI)



Dr. Patrick Hollis  
FAMU-FSU College of  
Engineering

Alec Ellis





# Objective

- To design and build a multipurpose table allowing for collaborative/group work and individual work

Alec Ellis





Alec Ellis







Alec Ellis







# Everyone's Problem

- We have all been to a location that did not have enough seats or had inefficient use of the available space
  - For us students it is the libraries, where thousands of students go to get assignments done, and usually there isn't enough space
  - For others this is going to a coffee shop and there not being anywhere to sit

Alec Ellis

# Libraries Are for Studying

- Gensler research found that libraries rank highest for both individual and group study, above these others:
  - Dorm/apartment, lounge, café, outdoors, lab space, classroom
- Avg. **13.5** hours/week **alone** vs. **4.3** hours/week **collaborative/group**
- Highest performing students count on libraries for a peaceful, isolated study environment



Alec Ellis



## Previous Work

- Customer needs obtained
- Project scope established
- Research
- Targets and Metrics
- Sponsor collaboration
- Adviser collaboration
- CAD Prototype
- Began physical modeling

Alec Ellis

# Previous Work

## Targets and Metrics

Function	Target	Metric	Tools
Writing/Drawing Space	A whiteboard that is 24x30 cm in size	Size (cm)	Tape measurer
Separates Workspace	Each section of the table will be 0.5m <sup>2</sup>	Size (m <sup>2</sup> )	Tape measurer
Stores Items	The storage space is 280 cm <sup>2</sup>	Size (cm <sup>2</sup> )	Tape measurer
Dampens Sound	dampen sound to within 20-40 dBA	Sound energy	Microphone
Supplies Power	Provides 120 Volts at 60 Hz	Electric potential (V and Hz)	Multimeter
Innovative	The table is inviting to the public	Opinion (survey)	Survey what people think of the table
Compactable	Reduce size to 75% of the original size	Size (m <sup>3</sup> )	Tape measurer
	Weighs no more than 40kg	Size (kg)	Scale
	Covers between 1.5m <sup>2</sup> -3m <sup>2</sup>	Size (m <sup>2</sup> )	Tape measure
	Supports 350 kg	Weight (kg)	Scale

Alec Ellis



# Previous Work Concept Selection

- We utilized a Pugh chart and an analytical hierarchy as well as a house of quality

Relative Weight	Customer Importance	Direction of Improvement	Functional Requirements										
			Customer Requirements	Writing/drawing space integration	Time to setup table	Power integration	Workspace size	Time to divide workspace	Ease of transportation	Sound dampening	Injury risks	Ability to store items	Consensus of table design
26%	5	Functionality	●	▽	●	●	○	▽	○	▽	●	▽	▽
21%	4	User's Simplicity	▽	●	▽	▽	●	○	▽	●	▽	○	▽
5%	1	Safety	▽	▽	▽	▽	▽	▽	▽	●	▽	▽	▽
16%	3	Compactability	▽	●	▽	○	○	●	▽	▽	▽	▽	▽
11%	2	Aesthetics	▽	▽	▽	▽	▽	▽	▽	▽	▽	●	▽
11%	2	Cost	○	▽	●	○	▽	▽	○	▽	○	▽	●
11%	2	Weight	○	▽	○	●	▽	▽	○	▽	○	▽	○
Importance Rating Sum (Importance			352.63	395	416	447	353	268	195	311	353	226	205.3
Relative Weight			11%	12%	13%	13%	11%	8%	6%	9%	11%	7%	6%

Alec Ellis

# Previous Work Concept Selection

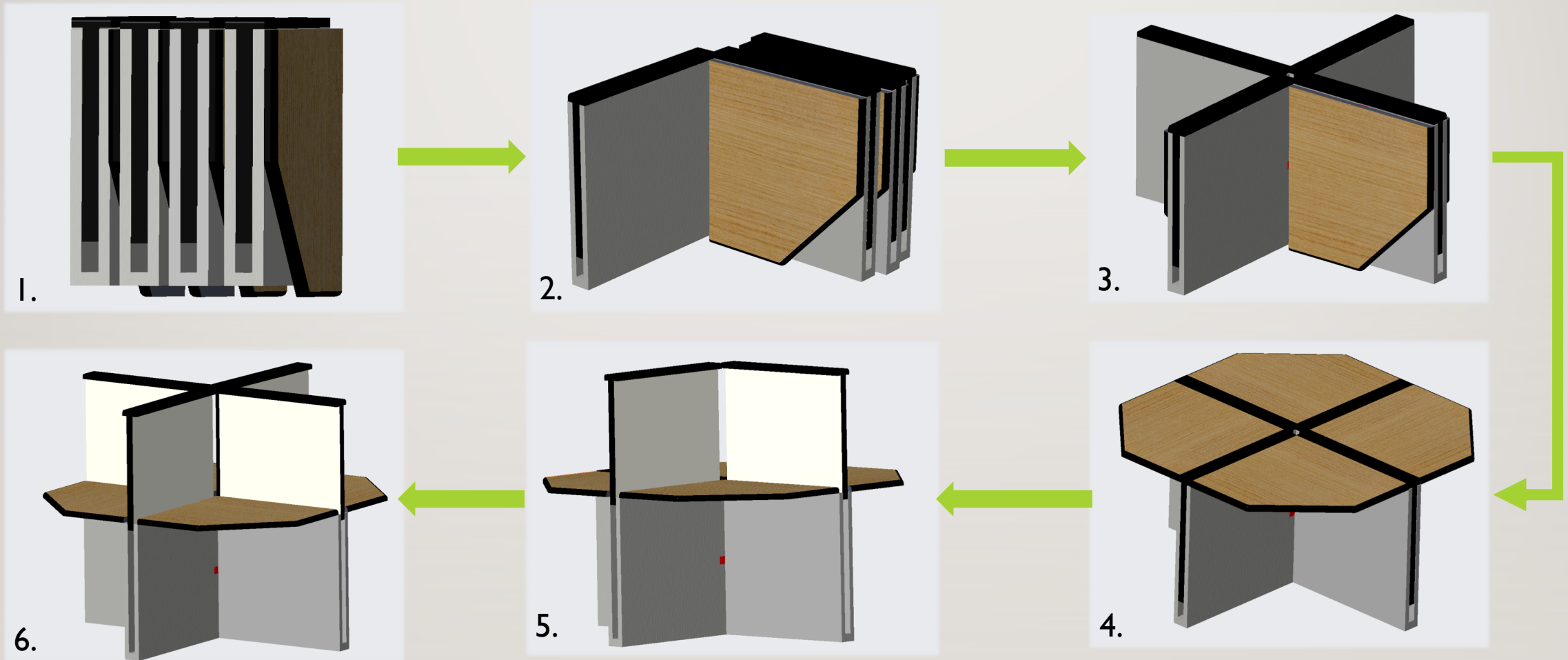
- The house of quality illustrates which functional requirements satisfy the customer needs

Relative Weight	Customer Importance	Customer Requirements	Functional Requirements										
			Direction of Improvement	Writing/drawing space integration	Time to setup table	Power integration	Workspace size	Time to divide workspace	Ease of transportation	Sound dampening	Injury risks	Ability to store items	Consensus of table design
26%	5	Functionality	●	▽	●	●	○	▽	○	▽	●	▽	▽
21%	4	User's Simplicity	▽	●	▽	▽	●	○	▽	●	▽	○	▽
5%	1	Safety	▽	▽	▽	▽	▽	▽	▽	●	▽	▽	▽
16%	3	Compactability	▽	●	▽	○	○	●	▽	▽	▽	▽	▽
11%	2	Aesthetics	▽	▽	▽	▽	▽	▽	▽	▽	▽	●	▽
11%	2	Cost	○	▽	●	○	▽	▽	○	▽	○	▽	●
11%	2	Weight	○	▽	○	●	▽	▽	○	▽	○	▽	○
Importance Rating Sum (Importance			352.63	395	416	447	353	268	195	311	353	226	205.3
Relative Weight			11%	12%	13%	13%	11%	8%	6%	9%	11%	7%	6%

Alec Ellis



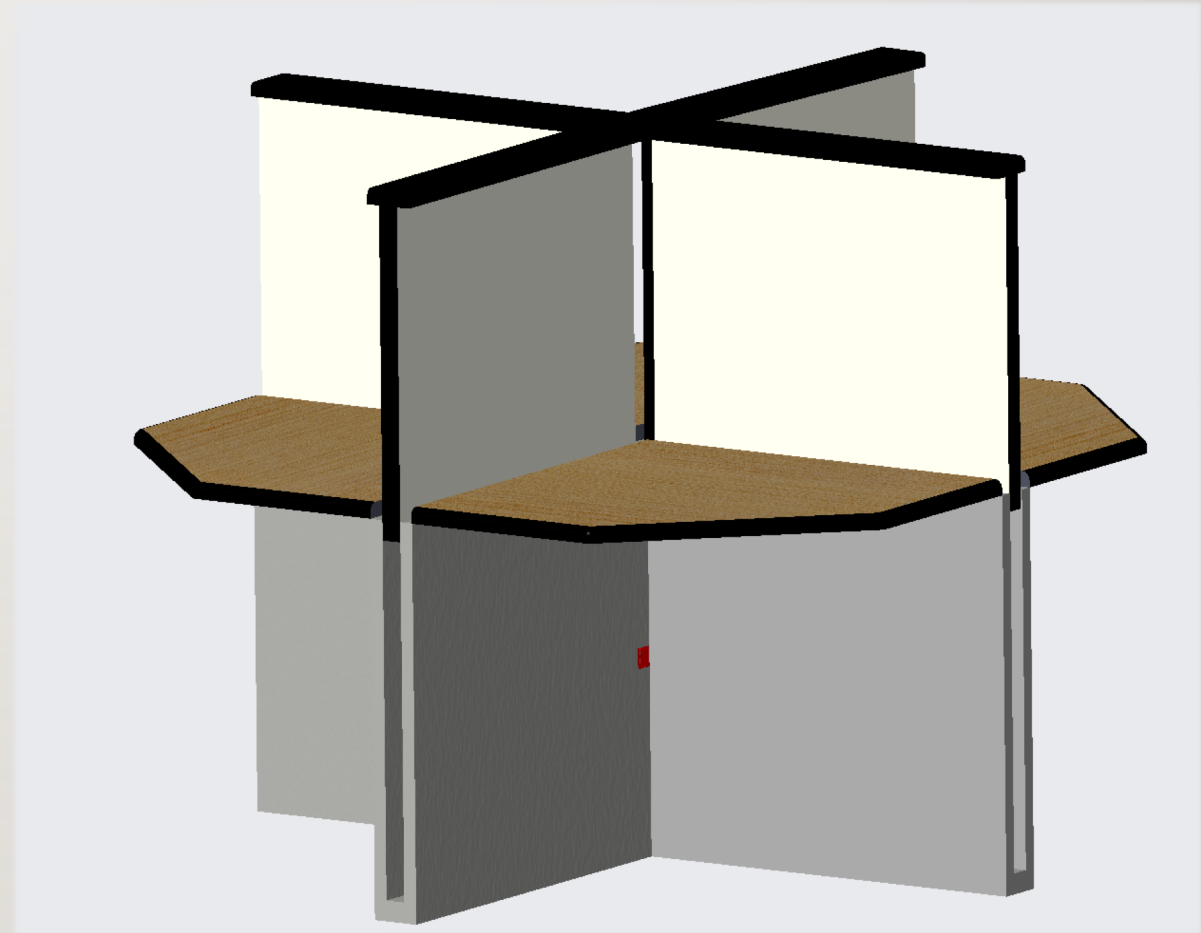
# Current Design



Alec Ellis

# Current Design Iteration

- Short fabric blind to cover each gap in between the dividers
- Legs are connected by 90° locking hinges for ease of table setup
- Whiteboards will lock in the down position and be spring loaded for raising with less effort

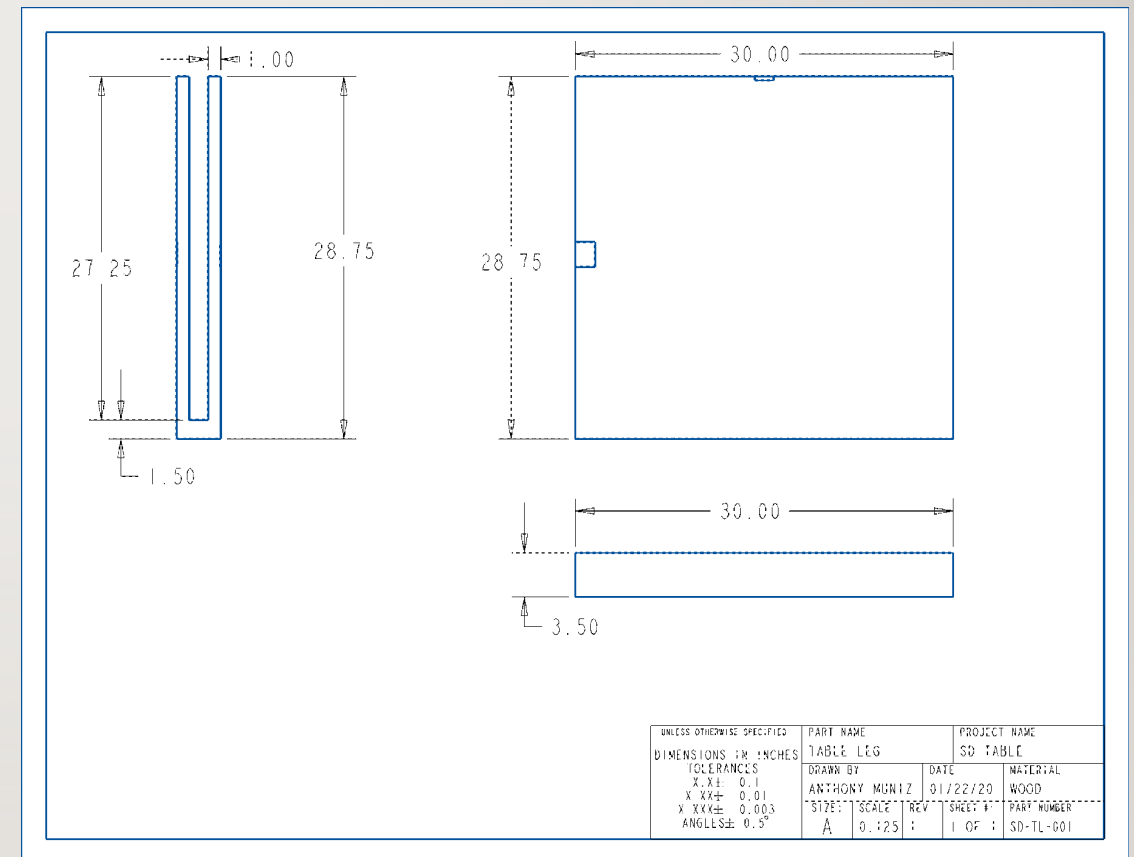
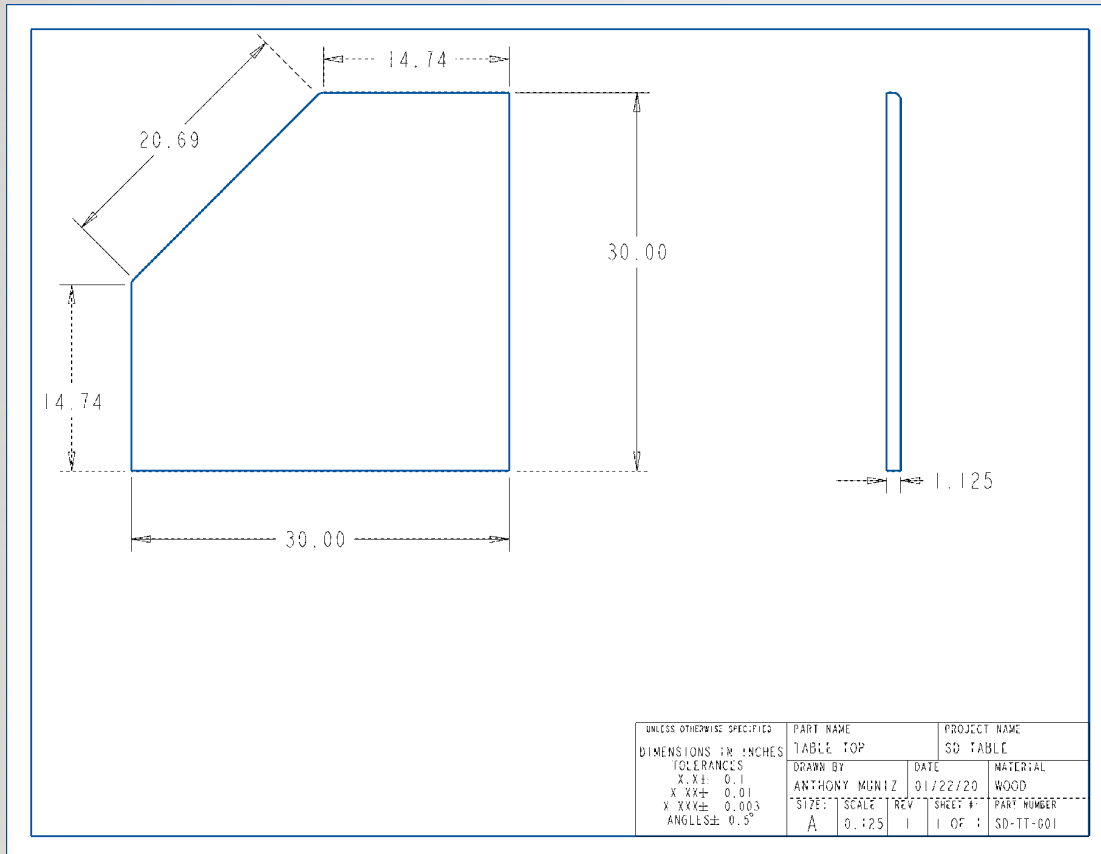


Kyle Innis



# Current Design Iteration

- Tabletops will be locked into place



- Table folds to roughly 30"x30"x20" and is equipped with 8 total caster wheels for transport

Kyle Innis

# Prototype

- To observe the main features of the table, a scaled down prototype was created
- Displays the dividers and separate tables for each section
- Incorporates the collapse feature of the table



Kyle Innis



# Full-size Model

- Constructed from plywood and is heavy
- Demonstrates a quarter of the actual table (2 legs, 1 tabletop)
- Used to determine:
  - A locking mechanism to hold up the tabletops
  - Best way to stop the legs from swiveling open past 90°



Kyle Innis

# Next Steps

## Full-size Model

➤ Models will aid in determining function of:

- Mechanism for raising the whiteboards
- Hinges with a  $90^\circ$  stop for legs
- Correct size of  $360^\circ$  rotation caster wheels
- Support pins for tabletops once open



➤ Once determined, we can edit our bill of materials and submit and order for the necessary parts

Kyle Innis



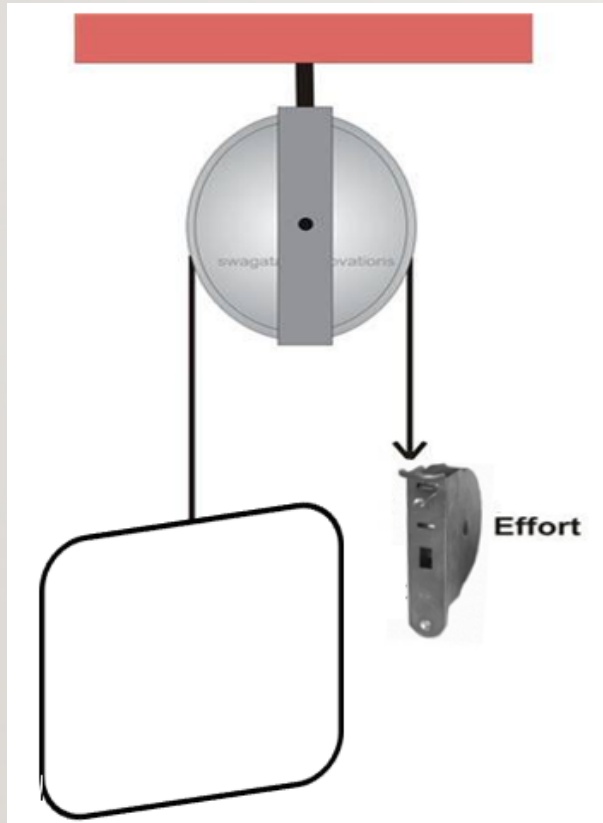
# Tabletop & Whiteboards

- The tabletops need a mechanism to support them once lifted
  - Arm swivel mechanism to hold up the tabletop
- The whiteboards need to be able to slide up and down independent to each other
  - Constant force spring
  - Pulley system



Kyle Innis

# Tabletop & Whiteboards



- **Constant-force** springs are constructed as a rolled ribbon of spring steel such that the spring is relaxed when it is fully rolled up
- A pulley system will be used in junction with this to create a mechanism that exposes and hides the whiteboards.

Kyle Innis



# Power Integration

- The power will be supplied to the table via a standard 110V outlet connection
- 1 outlet and 2 USB per table section
- The wires will be routed down through the center of the table



Kyle Innis

# Testing

- Test strength of tabletops in their raised position
- Safety and ease of use will also be tested
- The whiteboards will be tested to see if they can slide up or down
- The tests will be validated based on our targets and metrics



Kyle Innis

# References

- 1) Barber, C. (Ed.). (2017). *Gensler Research Catalogue* (Vol. 2). Novato: ORO Editions
- 2) Free Image on Pixabay - Checklist, To Do, Activities, Boxes. (n.d.). Retrieved November 3, 2019, from <https://pixabay.com/illustrations/checklist-to-do-activities-boxes-1316848/>
- 3) <https://www.wikihow.com/Build-a-Picnic-Table>
- 4) Reynolds, S. (2013, October 24). What's the Future of 3D Printing? *Victoria and Albert Museum*
- 5) <https://formis.se/product/fallbart-bord-folding-leg/>



**EML4551-2**

*"We are what we repeatedly  
do. Excellence, then, is not an  
act, but a habit."*

*~Aristotle*

Alec Ellis, Rieley O'Brien, Kyle Innis, Lauren Smith, Anthony Muniz

Department of Mechanical Engineering



FAMU-FSU  
Engineering



# Bill of Materials

Item	\$/Unit	Quantity	Price	Weight/Unit (lbs)	Total Weight (lbs)	Dimensions	Item Description	Line Completion %
Aluminum Square Tube	\$26.65	4	\$106.60	4.1	16.4	6' long 1-1/4"	Aluminum will be used for the base the table	45.00
Machine Screws	\$0.03	100	\$3.04	0.56	56	#8-32 7/8"	Screws will be used to attach the parts of the table	45.00
Whiteboard	\$54.45	4	\$217.80	14.1	56.4	47.2" x 35.4" x 1"	Whiteboards are used for additional drawing space	45.00
Rubber Wheels	\$7.19	5	\$35.95	0.16	0.8	2-7/8"	Wheels are used to move the table to other places	45.00
Piano Hinges	\$5.50	6	\$33.00	0.12	0.72	14" x 1.8" x 0.2"	Piano hinges to fold the tabletop and the legs of the table	45.00
Power outlet with USB-A	\$18.31	4	\$73.24	0.3	1.2	4" x 1.7" x 1.7"	Power outlet for users to plug in computers and other electronic device	45.00
Bolts	\$0.09	100	\$9.00	0.002	0.2	5" x 3" x 0.7"	Bolts are for the srews that will be used to attach the table	45.00
MakerBot PLA Filament, Ocean Blue	\$47.00	1	\$47.00	8.81	8.81	1.75 mm diam.	PLA will be used for the center column of the table and as a mesh barrier	45.00
Laminated Particle Board (1-1/8")	\$35.00	4	\$140.00	92	368	5'x 8' x 1-1/8"	Laminated particle board used for the table top of table	45.00
Butt Hinge	\$0.83	8	\$6.64	0.1	0.8	2" x 3"	Butt hinges to fold the tabletop and the legs of the table	45.00
Washers	\$0.04	100	\$4.00	0.0007	0.07	4" x 3" x 0.3"	Washers to support the screws for the table	45.00

➤ Total cost is \$676.27

Kyle Innis

