



Why are we still using 19th century furniture in 21st century learning?

New Desk Design

By XXXXX



PLTW Common Capstone
Mr. Jasinski
12/21/2021

Potential designs? Concepts?

Based on the survey results and what was decided was necessary, we each created two to three concepts of our own. These concepts were then put together in a decision matrix in order to decide which ones would be the most useful.

Our matrix has a baseline for comparison, which is a solution that can do nothing more than the thing we are trying to improve upon. There are weights to the categories are present because we believe that some specifications are more important than others so they have a larger weight than others. the aim is to have a higher score than baseline.

(Desk)																											
The Problem -19th Century Furniture in 21st Century Learning																											
	Concept 1 - Do Nothing Normal Desk			Concept 2 Fold Out Extensions				Concept 3 Flip Up Multi Layer Desk				Concept 4 Locking Back Pack Hooks				Concept 5 Powered Desk				Concept 6 Cup Holder				Concept 7 Easy-Lock Standing desk			
WEIGHT	Rating	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	
Specifications	Rating	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	
Comfort	4	4	16	4	4	4	16.0	4	4	4	16.0	4	5	4	17.3	4	5	18.7	4	4	4	5	17.3	6	5	6	22.7
Space, (desk room)	4	4	16	7	7	7	28.0	6	6	6	24.0	5	5	5	20.0	4	4	3	14.7	5	5	3	17.3	4	3	4	14.7
Complexity (More complex = worse) Costs more	2	4	8	5	6	2	8.7	2	2	2	4.0	3	3	4	6.7	2	3	3	5.3	4	5	5	9.3	3	3	3	6.0
Durability	3	4	12	3	4	3	10.0	3	3	3	9.0	4	4	4	12.0	2	3	3	8.0	4	5	4	13.0	3	3	3	9.0
Environmentally Friendly	1	4	4	3	4	4	3.7	3	4	4	3.7	3	3	4	3.3	2	2	2	2.0	4	5	4	4.3	3	3	4	3.3
Ease of Use (Easier = bigger number)	3	4	12	6	5	3	14.0	3	3	3	9.0	4	3	5	12.0	5	4	5	14.0	4	5	5	14.0	5	5	5	15.0
Adjustability	1	4	4	6	5	5	5.3	5	5	5	5.0	4	4	4	4.0	4	4	4	4.0	4	5	4	4.3	7	7	7	7.0
Back Pack Holder	2	4	8	4	4	4	8.0	4	4	4	8.0	7	7	7	14.0	4	4	4	8.0	4	5	4	8.7	4	5	4	8.7
Storage	2	4	8	7	5	6	12.0	7	6	6	12.7	5	5	6	10.7	4	4	4	8.0	4	5	4	8.7	4	5	5	9.3
TOTAL			88				105.7				91.3				100.0				82.7				97.0				95.7

Scoring Key:
 1 = Terrible In Comparison to Baseline
 2 = Worse In Comparison to Baseline
 3 = A Little Bit Worse in Comparison to Baseline
 4 = Same As Base Line
 5 = A Little Bit Better in Comparison to Baseline
 6 = Better In Comparison to Baseline
 7 = Huge Improvement In Comparison to Baseline

Complexity= more parts/larger cost means lower score. Higher score will mean less parts and lower price

Winning concepts

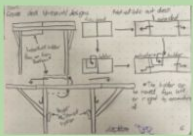

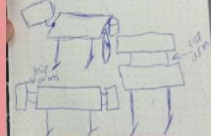
The three concepts below were the highest scoring, so we decided that a good solution would have at least 2 of these good traits. We then used this information to create 2-3 of our own solutions.

Decision Matrix (Desk)															
The Problem -19th Century Furniture in 21st Century Learning															
	Concept 1 - Do Nothing Normal Desk			Concept 2 Fold Out Extensions				Concept 4 Locking Back Pack Hooks				Concept 6 Cup Holder			
WEIGHT	Rating	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	
Comfort	4	4	16	4	4	4	16.0	4	5	4	17.3	4	4	5	17.3
Space, (desk room)	4	4	16	7	7	7	28.0	5	5	5	20.0	5	5	3	17.3
Complexity (More complex = worse) Costs more	2	4	8	5	6	2	8.7	3	3	4	6.7	4	5	5	9.3
Durability	3	4	12	3	4	3	10.0	4	4	4	12.0	4	5	4	13.0
Environmentally Friendly	1	4	4	3	4	4	3.7	3	3	4	3.3	4	5	4	4.3
Ease of Use (Easier = bigger number)	3	4	12	6	5	3	14.0	4	3	5	12.0	4	5	5	14.0
Adjustability	1	4	4	6	5	5	5.3	4	4	4	4.0	4	5	4	4.3
Back Pack Holder	2	4	8	4	4	4	8.0	7	7	7	14.0	4	5	4	8.7
Storage	2	4	8	7	5	6	12.0	5	5	6	10.7	4	5	4	8.7
TOTAL			88				105.7				100.0				97.0
Scoring Key: 1 = Terrible In Comparison to Baseline 2 = Worse In Comparison to Baseline 3 = A Little Bit Worse in Comparison to Baseline 4 = Same As Base Line 5 = A Little Bit Better in Comparison to Baseline 6 = Better In Comparison to Baseline 7 = Huge Improvement In Comparison to Baseline															
Complexity=	more parts/larger cost means lower score. Higher score will mean less parts an														

Decision Matrix

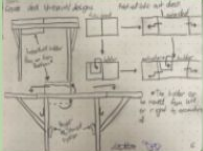
New solutions were put into a new design matrix and assessed using similar specifications and similar weights. The three best ideas are pictured below.

Our matrix has a baseline for comparison, which is a solution that can do nothing more than the thing we are trying to improve upon. There are weights to the categories are present because we believe that some specifications are more important than others so they have a larger weight than others. the aim is to have a higher score than baseline.

Decision Matrix (Desk)																
The Problem -19th Century Furniture in 21st Century Learning																
WEIGHT		Concept 1 - Do Nothing Normal Desk			Concept 4 Ian - fold out desk 180 degree fold				Concept 7 Pedro - Desk desk w/ clamps				Concept 6 Pedro - Desk + arms			
Picture																
Specifications		Rating	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score	
Comfort		4	4	16	6	6	6	24.0	6	6	6	24.0	6	6	6	24.0
Space, (desk room)		4	4	16	7	7	7	28.0	6	6	6	24.0	7	7	7	28.0
Complexity (More complex = worse) Costs more		2	4	8	3	3	3	6.0	3	5	5	8.7	3	4	5	8.0
Durability		3	4	12	3	3	3	9.0	3	4	4	11.0	3	3	3	9.0
Enviornmentally Friendly		1	4	4	4	4	4	4.0	3	4	4	3.7	3	3	4	3.3
Ease of Use (Easier = bigger number)		3	4	12	6	6	6	18.0	5	7	6	18.0	6	7	6	19.0
Adjustability		1	4	4	5	6	5	5.3	7	7	6	6.7	6	7	6	6.3
Back Pack Holder		2	4	8	7	7	4	12.0	4	7	4	10.0	6	7	4	11.3
Storage		2	4	8	5	4	5	9.3	4	4	4	8.0	4	4	5	8.7
Stability		4	4	16	4	3	4	14.7	3	5	3	14.7	2	3	2	9.3
TOTAL				104				130.3				128.7				127.0

Design #1: Fold out 180 degree


The design we chose to roll with. This desk design features two flaps that are half the size of the desk that are placed on top of the desk. Hinges hold the parts in place. When desired, they can be moved 180 degrees outward and held up by supports, creating a larger workspace. These parts can be easily collapsed back into its original state.

Decision Matrix (Desk)								
The Problem -19th Century Furniture in 21st Century Learning		WEIGHT	Concept 1 - Do Nothing Normal Desk	Concept 4 lan - fold out desk 180 degree fold				
Picture								
Specifications			Rating	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score
Comfort		4	4	16	6	6	6	24.0
Space, (desk room)		4	4	16	7	7	7	28.0
Complexity (More complex = worse) Costs more		2	4	8	3	3	3	6.0
Durability		3	4	12	3	3	3	9.0
Environmentally Friendly		1	4	4	4	4	4	4.0
Ease of Use (Easier = bigger number)		3	4	12	6	6	6	18.0
Adjustability		1	4	4	5	6	5	5.3
Back Pack Holder		2	4	8	7	7	4	12.0
Storage		2	4	8	5	4	5	9.3
Stability		4	4	16	4	3	4	14.7
TOTAL				104				130.3



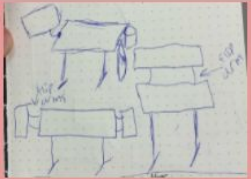
Design #2: Desk w/ Clamps

The second place design. We are going to take elements from this design and integrate them into the main later. We are going to add the movable arm piece. This will give more freedom of where to put items that are needed if the person does not want to fully extend the desk, or if additional space is needed even after the desk is extended.

Decision Matrix (Desk)						
The Problem	Concept 1 - Do Nothing Normal Desk		Concept 7 Pedro - Desk desk w/ clamps			
WEIGHT						
Picture						
Specifications	Rating	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score
Comfort	4	16	6	6	6	24.0
Space, (desk room)	4	16	6	6	6	24.0
Complexity (More complex = worse) Costs more	2	8	3	5	5	8.7
Durability	3	12	3	4	4	11.0
Environmentally Friendly	1	4	3	4	4	3.7
Ease of Use (Easier = bigger number)	3	12	5	7	6	18.0
Adjustability	1	4	7	7	6	6.7
Back Pack Holder	2	8	4	7	4	10.0
Storage	2	8	4	4	4	8.0
Stability	4	16	3	5	3	14.7
TOTAL		104				128.7

Design #3: Desk + Arms

The third place design. This design bears similarities to the first design, however it is not as sturdy due to the type of mechanism used to hold up the arms. We plan to use these more flexible arms for the addon that was previously mentioned in second place.

Decision Matrix (Desk)						
The Problem -19th Century Furniture in 21st Century Learning						
WEIGHT	Concept 1 - Do Nothing Normal Desk		Concept 6 Pedro - Desk + arms			
Picture						
Specifications	Rating	Weighted Score	Rating Ian	Rating Pedro	Rating Carter	Weighted Score
Comfort	4	16	6	6	6	24.0
Space, (desk room)	4	16	7	7	7	28.0
Complexity (More complex = worse) Costs more	2	8	3	4	5	8.0
Durability	3	12	3	3	3	9.0
Environmentally Friendly	1	4	3	3	4	3.3
Ease of Use (Easier = bigger number)	3	12	6	7	6	19.0
Adjustability	1	4	6	7	6	6.3
Back Pack Holder	2	8	6	7	4	11.3
Storage	2	8	4	4	5	8.7
Stability	4	16	2	3	2	9.3
TOTAL		104				127.0

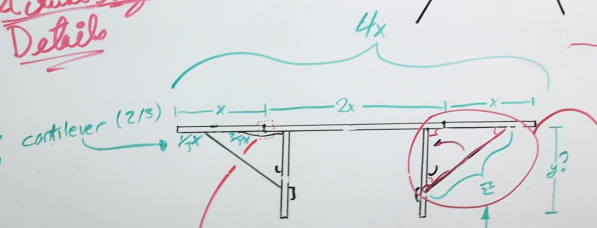
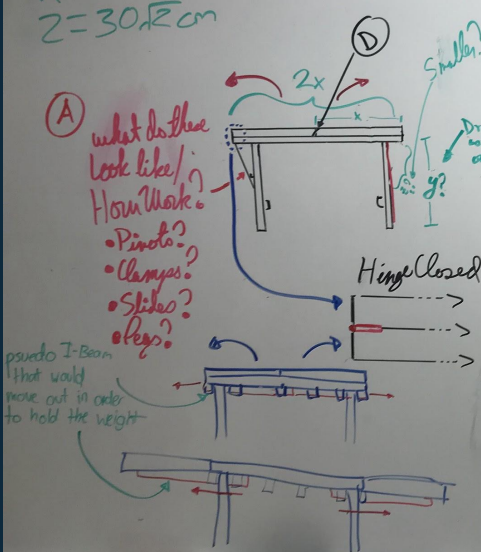


Further Brainstorming From Design Matrix

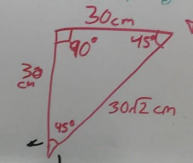
Design Documentation in Depth

*Figure out Lengths
 $X = 30\text{cm}$
 $Z = 30\sqrt{2}\text{cm}$

*Need to Figure out Actual Sizes + Attachments Details



Some Math Thing
 Right Triangle
 $(ax)^2 + (by)^2 = z^2$
 and base Percent of x or y depending



Hinge and Lid
 PROBLEM SUPPORTS HAVE TO BE STRONG OR THERE IS HIGH TORQUE ON HINGE
 (Might rip it off) Break Hinge

NEED TO FIGURE OUT

- ① SIZE OF DESK
 ↳ LENGTH, WIDTH, HEIGHT
- ② FOLD OUT SUPPORTS
 ↳ HOW THEY WORK, SEE A (OVER THERE)
 ↳ SIZE (WILL BE FIGURED OUT ONCE WE DECIDE X AND Y AND WHERE THEY CONNECT/SUPPORT) SEE B
- ③ HINGES
 ↳ STRENGTH? → SEE C
 ↳ INFLAYED → LAYS FLAT
- ④ CLAMP → PLATFORM
 ↳ HOW SUPPORTED
 ↳ WEIGHT MAX?
 ↳ MATERIAL?
 ↳ MOVEABLE YET SUPPORTIVE?

5 days left

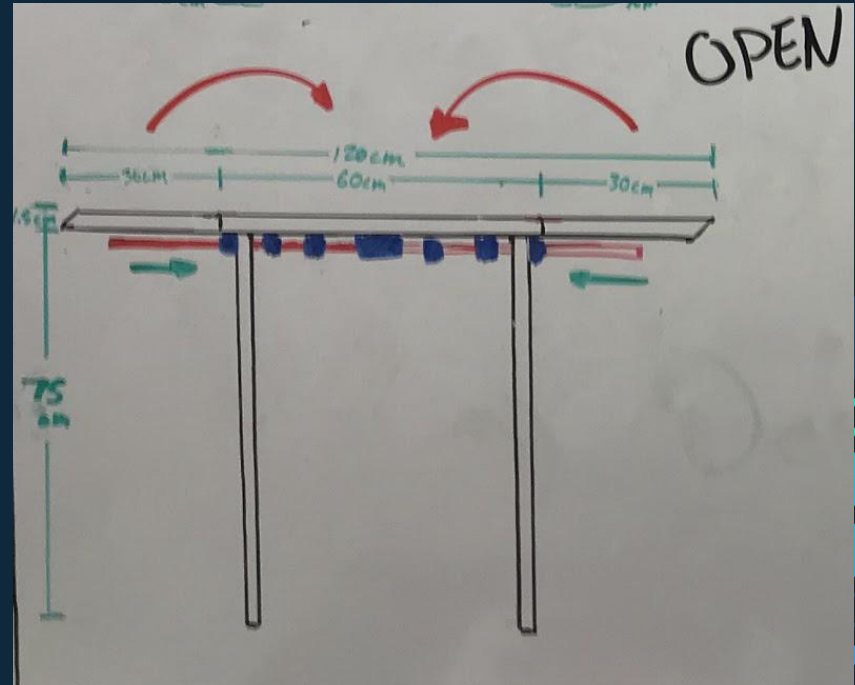
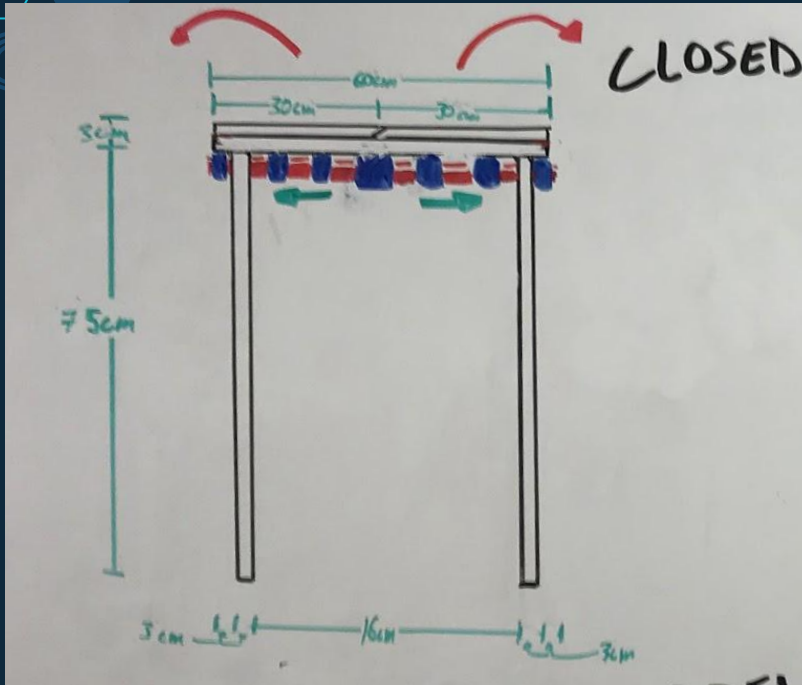
- ⑤ HEIGHT/LEG ADJUST ABILITY, ↳ HOW? **STRONG?**
 ↳ PEGS, HOLES
 ↳ PADDLE BOARD THING
- ⑥ BACKPACK HOOK
 ↳ STRONG
 ↳ DESK BALANCE?
 ↳ MATERIAL
 ↳ FOLDS IN?
- ⑦ CLAMP TO HOLD TING EXTENSIONS DOWN? at D
- ⑧ HEAVY?

First Minimalistic Design

- Minimal Design → areas we hope to improve
- Just enough of a solution to solve the problem
- Simplest solution to solve the problem (No Bells and Whistles)

DESK DIMENSIONS

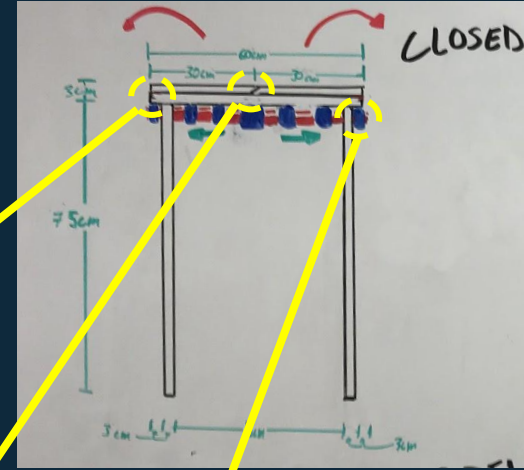
- Desk Closed:
 - Height 78 cm, Width 60 cm, Length 46 cm
- Extensions:
 - Width 30 cm, Length 46 cm, Thickness 1.5 cm



First Minimalistic Design Continued

Design Features

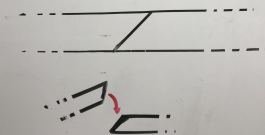
- Hinges
 - Inlaid into extensions on corners, multiple on each side
- Extension Supports
 - 2cm x 2cm x 60cm piece of wood
 - Brackets fit wood support
 - 3d printed or metal
- Overlapping Extensions
 - Diagonal 45 degrees
 - prevent gap



HINGE



OVERLAPPING EXTENSIONS

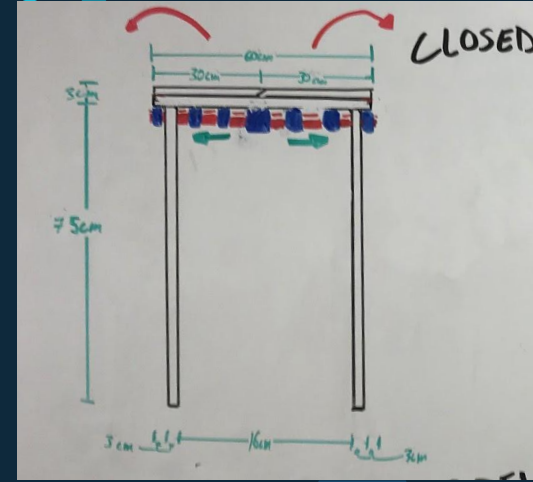


EXTENSION SUPPORTS



*For First Prototype

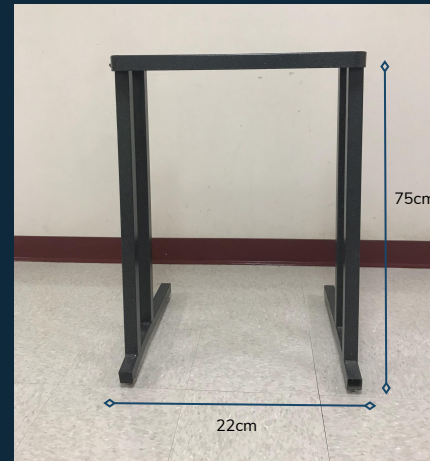
- Top desk will be designed like shown in the design diagrams
- The bottom of the desk will be created in later prototypes. For the first one we will repurpose the bottom of an existing desk that has the same dimensions as our design.



Top

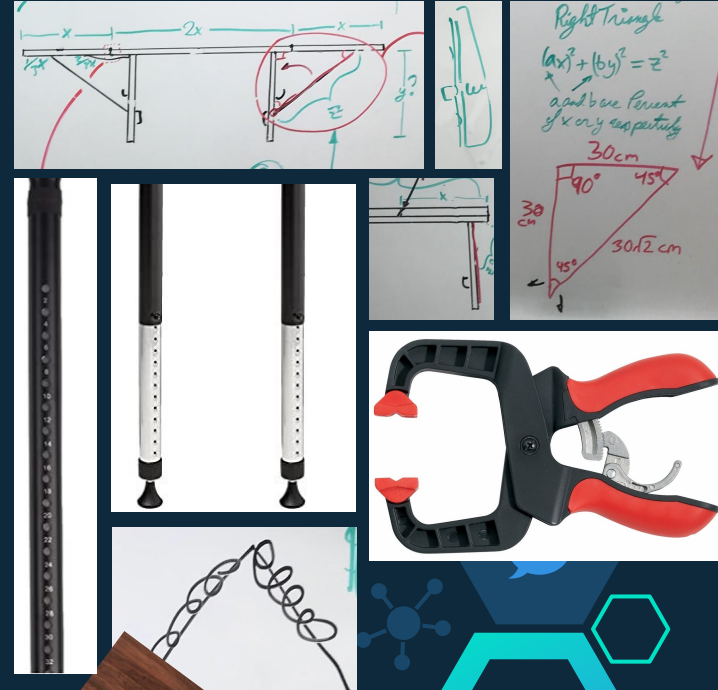


Side



**Things we hope to add

- ◇ Alternative Support Methods
- ◇ Leg extensions
- ◇ Different Leg Designs
- ◇ Backpack Holder
- ◇ Middle Clamp
- ◇ Clamp attachment
 - Arm suspension, degree of movement





Roadmap

1 Order relevant parts for the prototype
Wood, adjustable metal legs, and hinges

3 Establish pros and cons with the built model.
Weight out what to add/take away

5 Document the final design and re-design according to the prototype

2 Build a cardboard model as a baseline for the prototype (based off of [Minimalistic Design](#))

4 Build and test the new prototyped desk based off of the feedback and pros and cons of the previous prototype

6 Create final design and present to the relevant stakeholders

