Walking on Water

EDSGN 100, Section 8
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Fig. 1. Device

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Summary/conclusion

Our team was assigned the task of designing a walk-on-water device for college students.

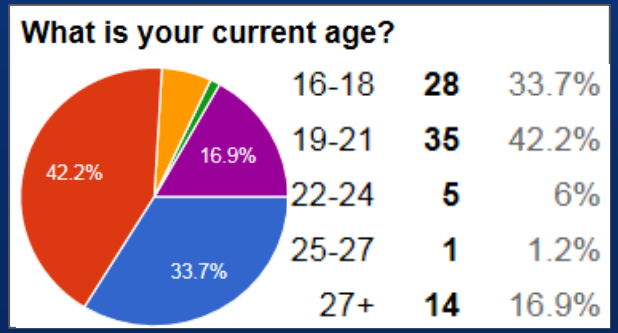
Mission Statement:

To operate a business geared towards college students to provide them with an effective method of traveling across the length of a pool by means of walking. This device should be suitable for the 100-200 lbs. weight range, and allow for additional cargo capacity.

Stakeholders:

- ICM^2
- Dr. Colledge
- Potential Customers
- Natatorium
- Solidworks (Dassault Systemes)
- Learning Factory
- Material Suppliers
- Media Coverage
- Penn State University
- Waste Management
- Production Facilities

The survey we created helped influence the features of our device.



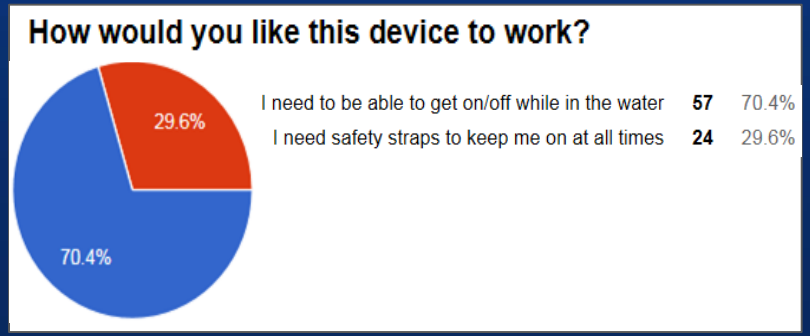
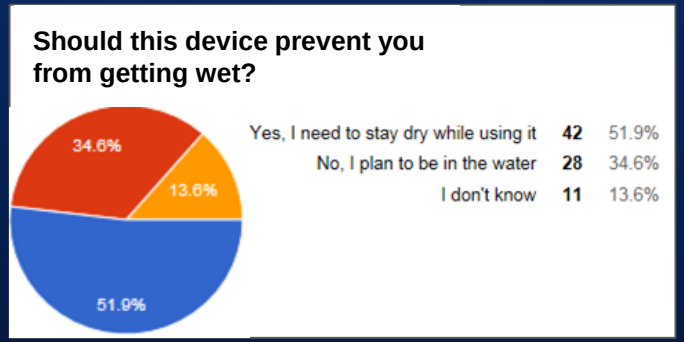


Fig. 2. Needs Assessment Data



The device specifications meet the requirements and constraints of stakeholders.

Speed	0.5 mph
Cost	$100-$500
Cargo Mass	≤ 40 lbs
Occupant Mass	136.0-172.2 lbs
Ease of Assembly	Less than 5 mins
Appearance	Safe and appealing
Energy	Human power only
Conditions	32-120 °F, still/slowly moving water

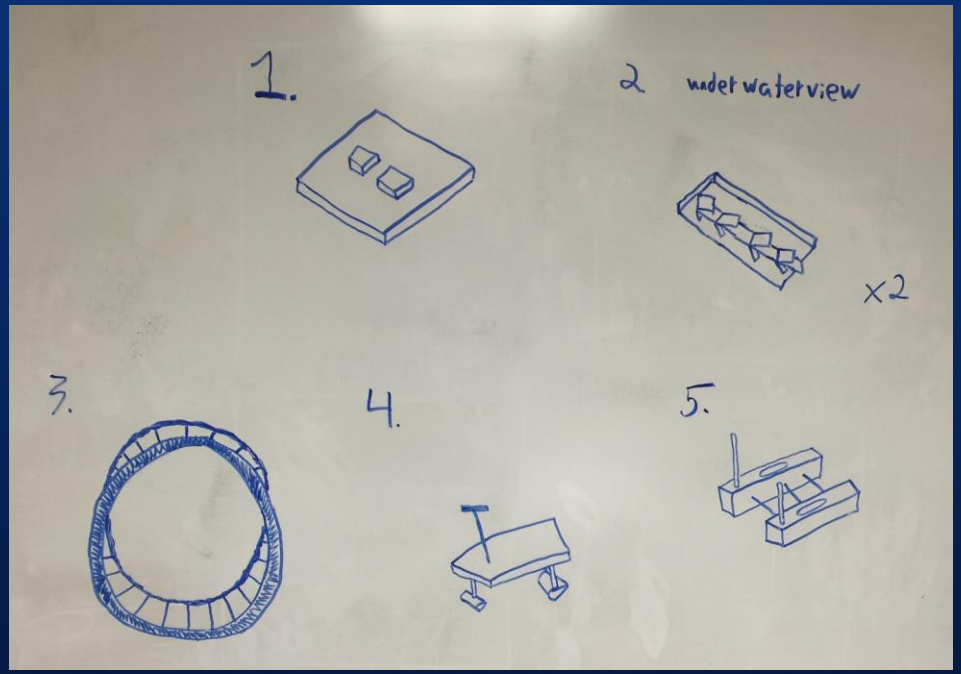
Table 1. Device Specs

Features
Adjustable strap for any shoe size
Able to get on and off in the water
Guaranteed to stay dry under normal conditions
Capable of multiple uses
Optional poles
100% recyclable
Cushioned handles and stability tether
Not Coast Guard approved

Table 2. Device Features

Our team came up with five possible designs to fit the product constraints.

Fig. 3. Design Idea Sketches



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We evaluated five potential ideas to pursue as our prototype.

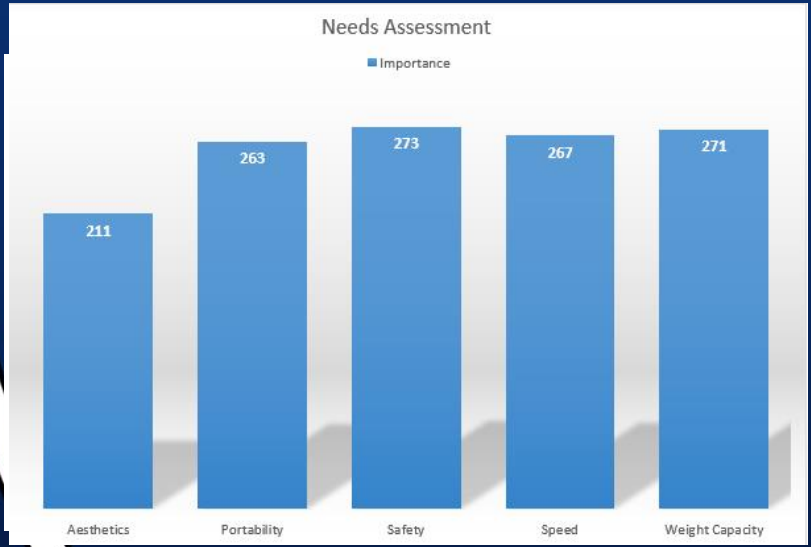

Fig 34 Needs Assessment

Table 3 Needs Assessment Categories

		Concept Scoring Sheet									
		Idea 1		Idea 2		Idea 3		idea 4		Idea 5	
Selection Criteria	Percent	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Cost	15%	1.00	15.00	2.00	30.00	1.00	15.00	1.00	15.00	3.00	45.00
Speed	20.50%	1.00	20.50	2.00	41.00	3.00	61.50	3.00	61.50	2.00	41.00
Weight Transported	23%	3.00	69.00	2.00	46.00	3.00	69.00	2.00	46.00	2.00	46.00
Successful	5%	2.00	10.00	3.00	15.00	3.00	15.00	2.00	10.00	3.00	15.00
Practical/fun	7.50%	1.00	7.50	2.00	15.00	3.00	22.50	3.00	22.50	2.00	15.00
Safety	10.50%	2.00	21.00	2.00	21.00	3.00	31.50	2.00	21.00	3.00	31.50
Portability	10.25%	3.00	30.75	2.00	20.50	1.00	10.25	2.00	20.50	2.00	20.50
Aesthetics	8.25%	2.00	16.50	3.00	24.75	3.00	24.75	3.00	24.75	2.00	16.50
Totals			190.25		213.25		249.50		221.25		230.50
Rank			5.00		4.00		1.00		3.00		2.00
Continue?			No		No		Yes		Yes		Yes

Table 4 Concept Assessment Matrix

We identified these key aspects to be essential to the success of our design.

Subsystems

Propulsion
Stability
Buoyancy
Structure
Sustainability
Marketability

Fig. 5. Production of Device

Accurate calculations proved the design functional under the given constraints.

Mass of Device (lbs)	11
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Volu (m^3	
Dens (kg/r	

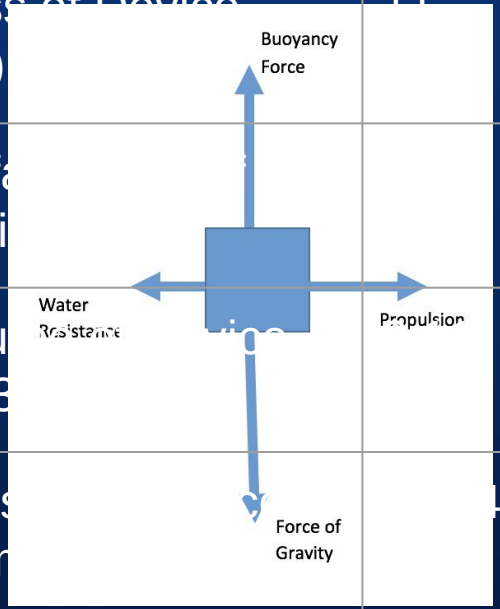

Fig. 6. Free Body Diagram

Maximum C Mass (lbs)	224
Dimensions	4 ft 2 in x 1 ft 6 in x 10 in
Average Total Weight (N)	783.82
Buoyancy Force (N)	1,048.6

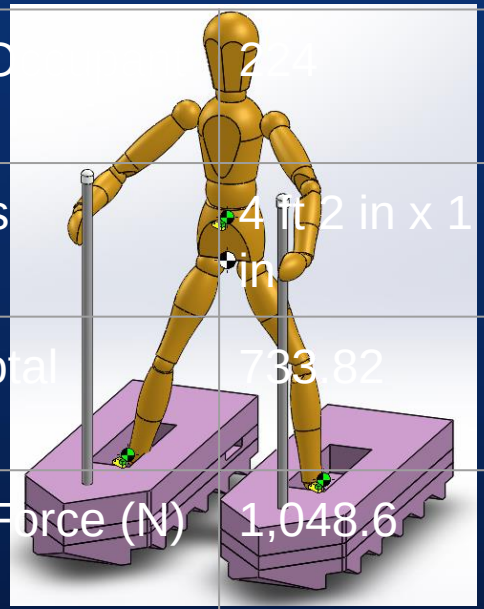

Fig. 7. Center of Mass

Table 5. Calculations

We worked with CAD to effectively design and assist in construction of our prototype.

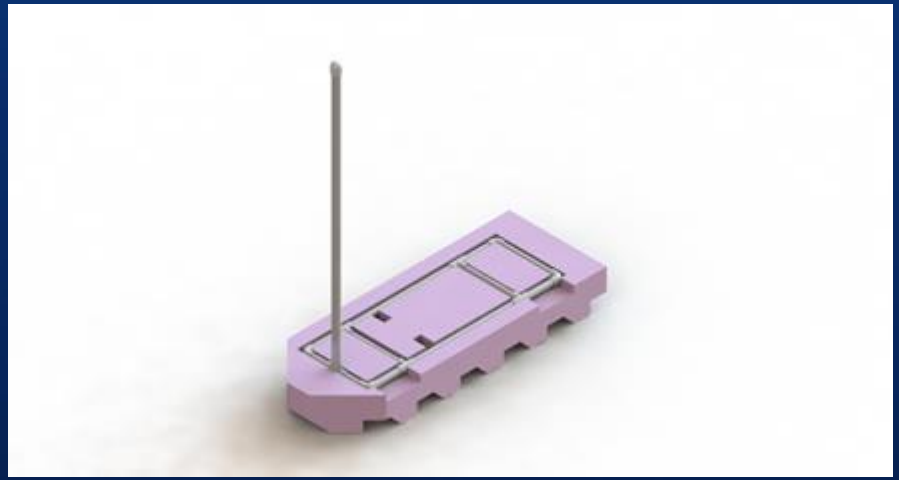

Fig. 8. Interior

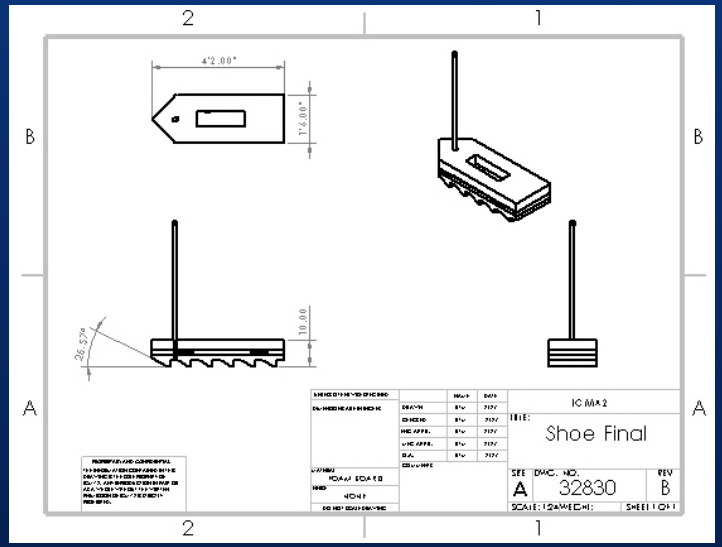

Fig. 9. Multiview

Only the best materials were used for the design with minimized cost.

Material	Quantity	Cost per Unit ($)	Total ($)
Foam Insulation Board (4'X8'X2")	2	$32.00	$64.00
3/4"X10' PVC Pipe	2	$2.69	$5.38
1"X10' PVC Pipe	1	$1.96	$1.96
3/4" 90 Degree PVC Elbow	8	$0.48	$3.84
3/4" Threaded 90 Degree PVC Tee	2	$0.88	$1.76
3/4" PVC Tee	8	$0.48	$3.84
1"X3/4" Male Adapter	2	$0.98	$1.96
1" PVC Cap	2	$0.68	$1.36
PVC Cement	1	$4.94	$4.94
Foam Board Adhesive	3	$3.58	$10.74
Nylon Straps (2PK)	1	$7.97	$7.97
Nylon Cord	1	$2.98	$2.98
Paint Roller Handles (2PK)	1	$4.97	$4.97
Duct Tape	1	$3.98	$3.98
		Total	$119.68

Table 6. Cost of Materials

Testing our prototype determined what changes needed to be made to improve our design.

- Sharper bow
- Sharper treads
- Duck tape

https://youtu.be/SY7TDual86k

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Grounded on our prototype, our final product was deemed successful.

1. Functionality
2. Weight capacity
3. Speed
4. Cost
5. Practicality/Fun

https://youtu.be/CHrJNIdwi28

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Our project was managed in a professional and efficient way.

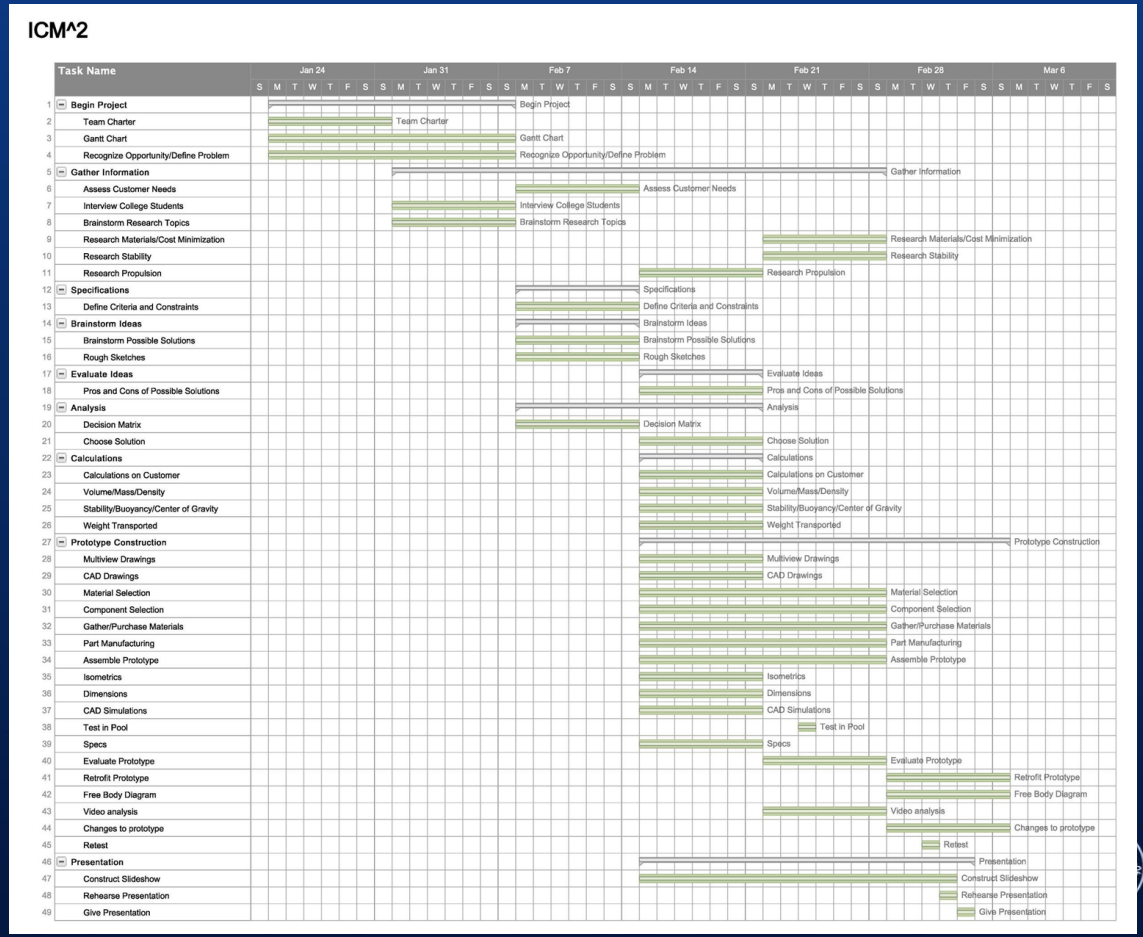

Table 7. Gantt Chart

References

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Starn Tool and Manufacturing Company (Feb, 2016). *Engineering Consultation*.

Questions

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