An Engineering Project
Sand Timer Device

Problem

My problem is that I have trouble waking up in the morning. For example, it is very difficult to wake up when you are warm and the lights are turned off while you are sleeping in bed. So, I am going to attempt to make a device that automatically turns on my lights after a period of time. This device could also be used for turning on a heated blanket or heating pad.

Research

I researched websites on how to make mechanical timers, heating pads, and sand timers. The mechanical timer could turn on my light automatically, which is very useful. The heating pad would be able to keep me warm when I wake up. And finally, the sand timer gave me an idea on how to make my project which would have bottles balancing on my light switch. While sand is coming out of the bottle, it puts pressure on the light switch and turns it on in a specific time.

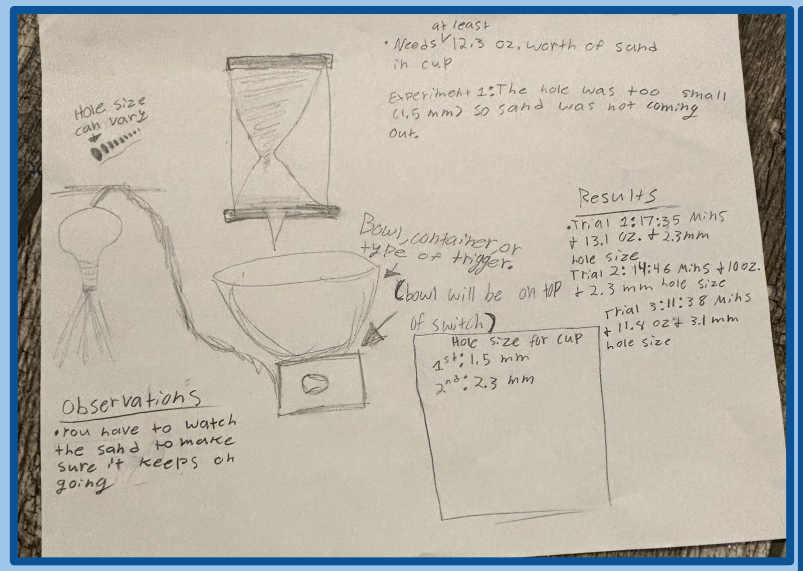
Requirements and Criteria

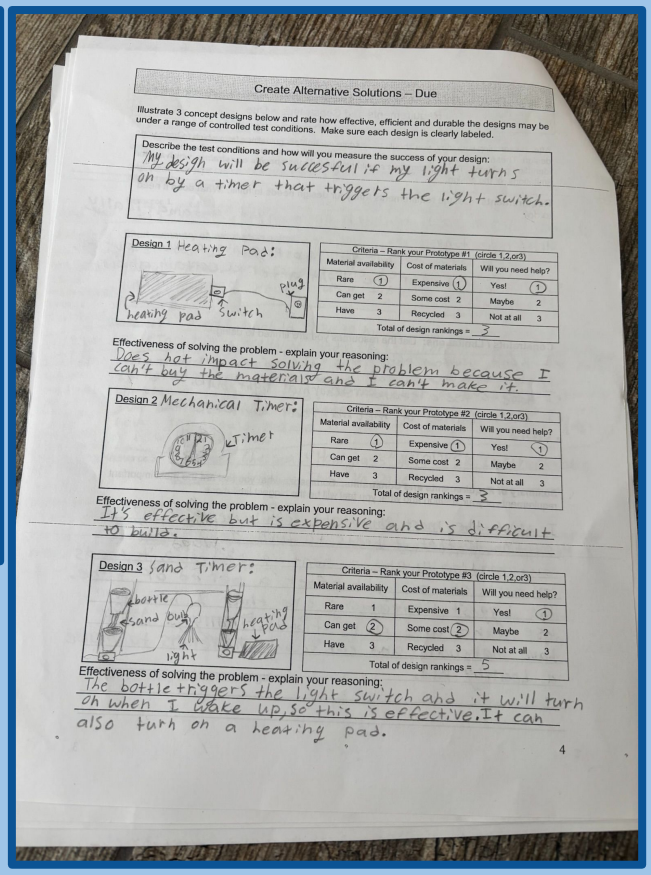
- My design should turn my lights on automatically and/or a heating pad.
- My design needs to have a light wire/cord that plugs into the wall.
- The device should trigger the switch after a period of time.
- Should cost less than twenty dollars.
- Size has to have a limit of 48 inches by 30 inches.

Constraints/Limitations

- I don’t have enough resources to make a heating pad.
- I have to use a standard/normal light bulb.
- Materials are very rare to buy and challenging to use for a mechanical timer.
- I can only use sand for the sand timer.

Prototype Designs





Create Alternative Solutions – Due

Illustrate 3 concept designs below and rate how effective, efficient and durable the designs may be under a range of controlled test conditions. Make sure each design is clearly labeled.

Describe the test conditions and how will you measure the success of your design:
My design will be successful if my light turns on by a timer that triggers the light switch.

Design 1 Heating Pad:

Criteria – Rank your Prototype #1 (circle 1,2,or3)					
Material availability		Cost of materials		Will you need help?	
Rare	(1)	Expensive	(1)	Yes!	(1)
Can get	2	Some cost	2	Maybe	2
Have	3	Recycled	3	Not at all	3
Total of design rankings = 3					

Effectiveness of solving the problem - explain your reasoning:
Does not impact solving the problem because I can't buy the materials and I can't make it.

Design 2 Mechanical Timer:

Criteria – Rank your Prototype #2 (circle 1,2,or3)					
Material availability		Cost of materials		Will you need help?	
Rare	(1)	Expensive	(1)	Yes!	(1)
Can get	2	Some cost	2	Maybe	2
Have	3	Recycled	3	Not at all	3
Total of design rankings = 3					

Effectiveness of solving the problem - explain your reasoning:
It's effective but is expensive and is difficult to build.

Design 3 Sand Timer:

Criteria – Rank your Prototype #3 (circle 1,2,or3)					
Material availability		Cost of materials		Will you need help?	
Rare	1	Expensive	1	Yes!	(1)
Can get	(2)	Some cost	(2)	Maybe	2
Have	3	Recycled	3	Not at all	3
Total of design rankings = 5					

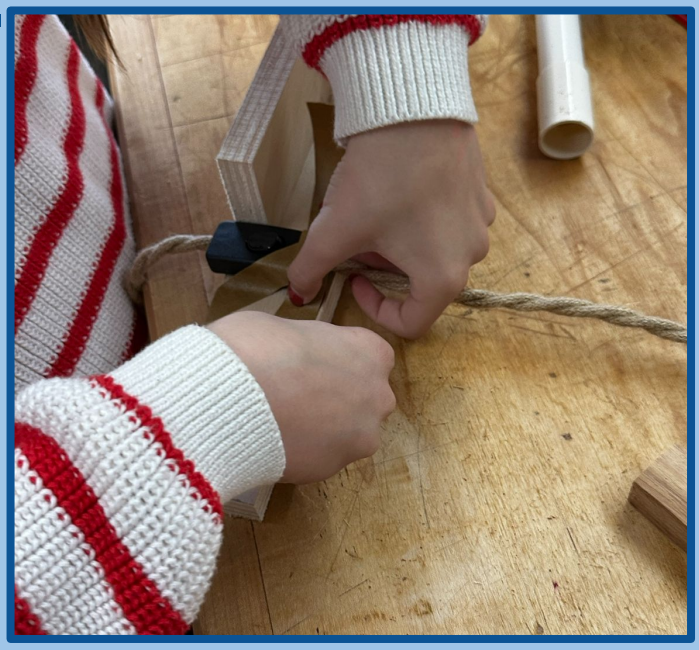
Effectiveness of solving the problem - explain your reasoning:
The bottle triggers the light switch and it will turn on when I wake up, so this is effective. It can also turn on a heating pad.

4

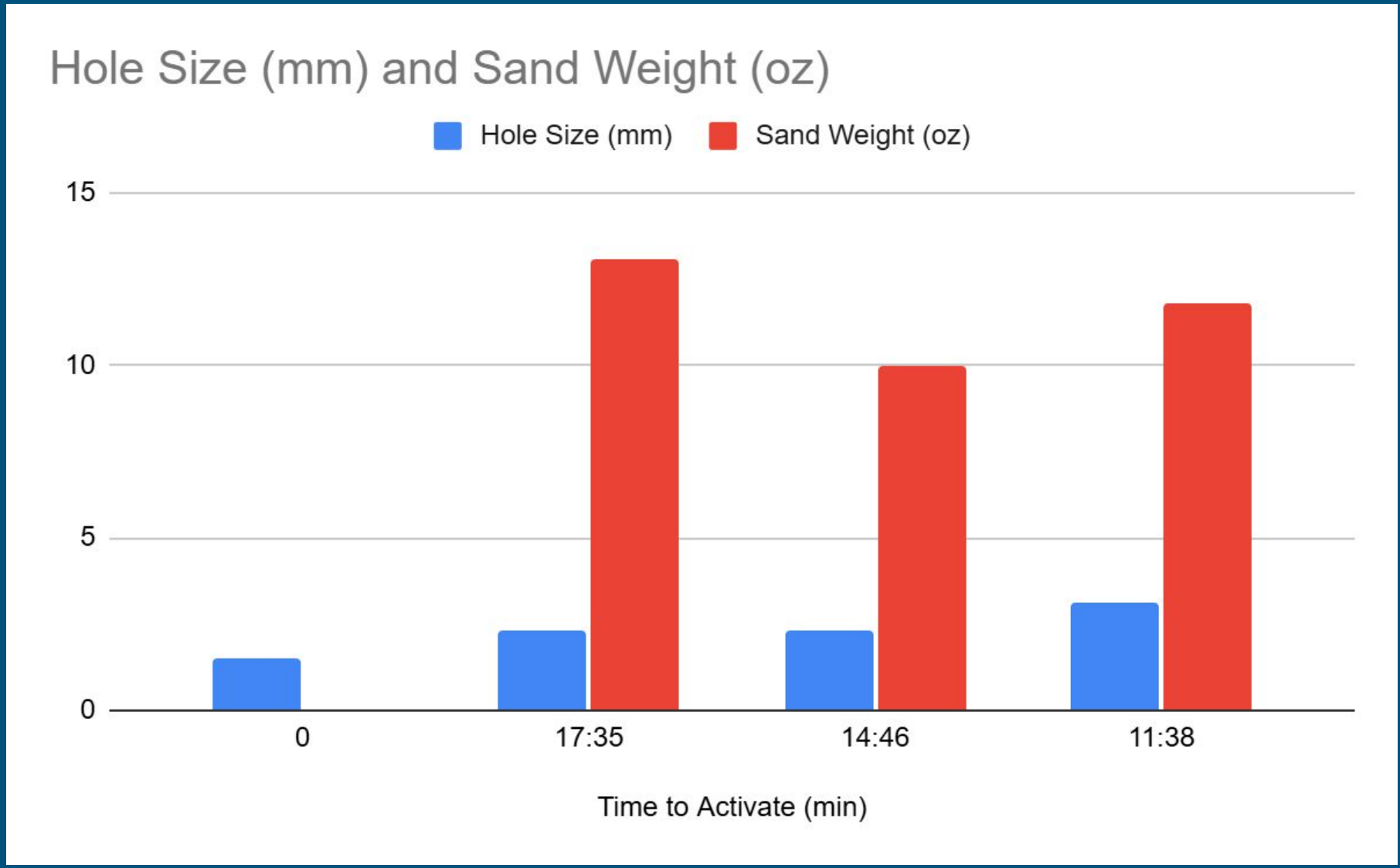
Materials

- 16 ounces of pink sand
- 3-5 plastic cups
- Duct Tape
- 1-2 plastic and white cut in half pipes
- 4 screws
- Screw driver
- Saw
- Wood blocks
- Light bulb and a cord attached to each other

Procedures



Testing and Data



Reflection and Redesign

During the first test, sand was not coming through the hole so I decided to make a bigger hole for test number two. For test three, clumps of sand were blocking the hole, making it difficult for sand to come through the hole. To fix that, I put less sand in the cup for test four.

Results

The results of my testing were great. For instance, sand was coming through one cup to another. This led to my lights turning on because of how much weight was in the bottom cup that triggered the light switch. I figured out that you don't need a lot of sand in one cup just only about 13-16 ounces. Also I would say that the 2.3 millimeters hole size worked the best for my design.

Proposal

A problem I frequently have is waking up easily in the morning. I can't wake up in the morning because it's so cozy, dark, and warm in my room. So to fix this, I am going to make a sand timer that automatically turns my light on. This device could also work on heating pads, too!

Here are some requirements and limitations I have for my design. For example, my light needs to turn on automatically after a period of time. Next, I have to use sand for the timer. And thirdly, I don't have materials to build a heating pad nor a mechanical timer.

For my first prototype, I sawed pieces of wood and drilled holes through them. Then I put screws in the holes and screwed a lever arm to another hole. After that, I taped the light switch to the wood and attached cups to the lever arm and pipe(s). Fourthly, I taped the lever arm to the wood and connected the objects together. I also drilled a hole through the cup for sand. And finally, since the hole was too small, I drilled a bigger hole and added more tape to be secure.

Proposal Continued

I think the final prototype is the best solution because it can turn my light on automatically. Also, it works on heating pads. It has a lever arm, 3-5 plastic cups, pink sand, wood blocks, screws, pipes, and duct tape.

In conclusion, this could help others by not being late to an important occasion, work, or school. I love my design and I think it's unique because it has colorful cups and pink sand. Also, this is unique because I got to learn how to use a wood machine (saw) and most of the tools I used were from home. This is why I think this design is a great solution for my problem!

Bibliography

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