

# St. John Stem Club Journal

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# Daily Event Log with team triumphs and struggles

- October 6, 2021

This is the first day of Rube Goldberg's practice. This was the day when we went over the criteria for the team. We took the Myers Briggs test.

- October 13, 2021

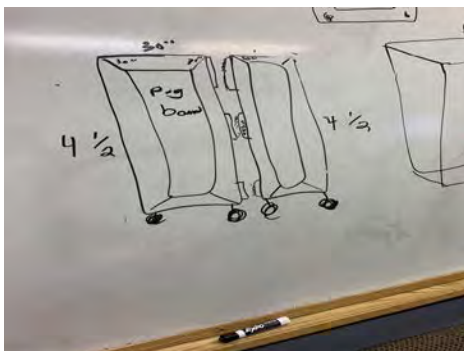
We continued to finish the Myers Briggs tests. We also started doing element ideas through Youtube videos and started getting ideas.

- October 20, 2021

Everyone finished their Myers Briggs tests and we moved on to reading the rubrics and talking about expectations for the team.

- We needed a frame that met the criteria of the competition. So we brainstormed and found out what the perfect frame would be. It would be 4x4x4 and be able to split in two halves so it is easy to move. Then we made a model of it and went from there. We built it, then when we were done building it, we improved it. And now we have the perfect frame for the machine.

## Frame Blueprint & Progress





- **October 27, 2021**

After the first three practices, we started by looking at videos and we started building elements. We started to mingle with different pieces of the machine. We collected drawings from multiple team members on ideas for the machine.

- **November 3, 2021**

Today we decided on team captains. We are doing a 50-50 captain deal between Lela and Joe. Today we also ideas on the end element.

- **November 10, 2021**

Today we had a team meeting which went extremely well. We drew out the end element and had ideas on what to add to it.

- **November 17, 2021**

Today we had multiple people doing different things. Ethan worked on the globe, Wyatt was working on the Archimedes screw, Joe took it to finish

and make sure it works right, Lela worked on the team journal, Aaron was working on programming the Ed3 bot, Jack was shuffling around helping people that needed it, and Joe was looking for lights for the last element.

- December 1st, 2021

We tried working on the end element but didn't make a lot of progress. We did have a lot of ideas but almost no progress building-wise.

- December 6th, 2021

Joe began construction on the final element again, mainly the gearbox switch. It was not a very productive day but Joe got a major part going.

- December 9th, 2021

Jack worked on designing the mailbox element for the start. Lela sent out an email update to parents to find needs around our house. It was a very productive day.

- December 14th, 2021

Jack and Braiden worked on the mailbox idea. Joe worked a hamster wheel idea. Aaron and Ethan looked for ideas. Not the most productive day for a few of them but most of the team members had a great day and progress is coming along.

- January 6th, 2022

Joe worked on the activation system for the end element. Braiden worked on the mailbox element. Aaron worked on the frame around the end element. Jack worked on the Hotwheels element. Ethan and Wyatt are working on the double-pulley element. A productive day overall.

- January 18th, 2022

Braiden and Joe finished the last element and hooked it up to the Archimedes screw, Aaron has been trying to find ideas, Jack looked at ideas but didn't find anything, Ethan worked on his element, and Wyatt did his research.

- **January 27th, 2022**

Aaron and Jack were testing enigneers today. Braiden brainstormed the mailbox element and worked on the Hotwheels track.

- **February 1, 2022**

Aaron and Jack continued working on the mailbox element and flipped the mailbox upside down to see if it would work. Braiden tried to find a more stable base for the Hotwheels element. Wyatt and Ethan also started on a prototype on the Green Track Run or the first element.

- **February 3, 2022**

Braiden worked on improving the last element to make it more stable. The bicycle element was also worked on. Improvements were still made on the Hotwheels element and mailbox element.

- **February 8, 2022**

Worked on the lamp lever element. Continued to improve the Hotwheels element. Found a large piece of cardboard that might work as a base. Ethan and Wyatt continued work on the Green track element. The gear element broke and needed to be repaired. The truck magnet part of the element is no longer working and needs to be fixed. The team is feeling very frustrated.

- **February 15, 2022**

Aaron and Wyatt worked on the Achimedes' Screw element. Braiden cut a larger piece of cardboard out for Hotwheels track. Joe worked on the Rattle Trap Pipe. Braiden and Jack to not spend any more time on the mailbox element and did not include it.

- **February 17, 2022**

Joe finished the Rattle Trap element. Braiden finished repairing the prototype of the Hotwheels element. Aaron and Wyatt successfully finished the Achimedes' Screw and attached it to some Hotwheels tracks.

- **February 22, 2022**

Braiden and Joe finished the first element. Braiden and Jack attached the Hotwheels element to the first element. Joe started on the hamster wheel element. Ethan and Wyatt worked on fixing the counterbalance on the bicycle wheel element. Joe restrung the gear element.

- **February 24, 2022**

Joe finished the hamster wheel element and attached it to the Hotwheels element. Jack, Braiden, and Joe attached the rickety tube element to the hamster wheel element. The team then worked on getting the first elements to work consistently. Having major problems. Jack and Braiden then redesigned the Hotwheels element to work better adding weights.

- **March 1, 2022**

Wyatt and Ethan worked on getting the bicycle element to transfer energy successfully to the Trever lever. Worked on the Trever lever successfully transferring to the Archimedes' Screw. Archimedes Screw broke and Wyatt and Joe problem-solved and figured out the battery had burst and had needed to be fixed.

- **March 3, 2022**

The first element broke and needed to be redesigned. The hamster wheel element broke and needed to be fixed. The lever element wasn't triggering correctly and needed to be redesigned. The gear element broke again and needed to be reworked. It was redesigned with a heavier weight so that the gears would be triggered easier.

- **March 8, 2022**

Braiden and Jack drilled a hole for the new weight. They put a hole so that the weight wouldn't fall off so easily. They also drilled down the bicycle element so it was secured to the machine. Braiden and Aaron redesigned the first element again, this time using PVC tubing. The team then set up and tested the machine five times in a row. Each time the

machine failed at different points. The team then worked on trying to solve each of the failures so everything would trigger. The team then started to secure elements so they would be more consistent.

- March 10, 2022

Lela and Joe worked on untangling the lights from being tangled. We evaluated each element on consistency. The first element was about 80%. The team retaped and reattached the element to get it to work more constantly. The second element worked 5 out of 5 times on that day making it a consistent element. The hamster wheel worked at 60%. The main issue was it not being set up the correct way. You had to set it up with the doorstep to get it to work. The fourth element worked only once and needed to be redesigned. The element was rebuilt. The gear element was working at 40%. The weight wasn't triggering correctly. If the gear wasn't put back in the same spot it wouldn't work. This made it a very hard element to run. The bicycle wheel worked 100% of the time. The Trever lever worked 100% of the time as well. The Archimedes' screw worked 100% of the time and the marble works worked 100% of the time. The last element worked 100% of the time.

- **SPRING BREAK WEEK! The team did not meet!**

- March 21, 2022

The team worked on the display boards and practiced the presentation. Joe and Lela continued to work on untangling the lights. The first four elements needed to be taped down and fixed

- March 22, 2022

The team stayed extra late to work on the machine. We went through two more runs however but many elements needed to be redone and fixed again. We also finished stringing the lights on the globe which turned out to be a great success.

- March 23, 2022

**Set up the machine and went through it several times. The Rattle Trap Tunnel kept failing and needed to be redone. Practiced presentation.**

- **March 30, April 6, 11, 13 & 20**

**The Rattle Trap kept failing so the team struggled to fix it so we made a new element, the rail gun. The team also reworked the theme.**

## **Materials and Costs**

- **Costs:**

**\$7.99 lights from Amazon**

**1 by 1s and pegboard \$20 (some of this was already in stock)**

- **Recycled:**

- 1. PVC Pipe was recycled in the first element**
- 2. The cardboard and metal washers in the second element**
- 3. The hamster wheel in the third element**
- 4. The cup, corrugated tube, and wood in the fourth element**
- 5. The string, cardboard, wood, and plastic covid barrier in the fifth element**
- 6. The covid barrier, plastic cup, bicycle wheel, and wood in the sixth element**
- 7. The cup in the seventh element**
- 8. The eighth through the tenth element is a covid barrier**
- 9. The tenth element is using the globe for recycled as well**

## **Recycled or Reused materials are 92%**

- **Repurposed and reused items that were already on hand**

- 1. The green track in the first element**
- 2. The Hotwheels track and cars in the second element**
- 3. Ruler in the third element**
- 4. The k'nex in the fourth element**



5. Knex, wooden ball, truck, and metal ball in the fifth element
6. Knex, green track, Techno Gears, marble works, Hotwheels, and Legos are sixth to the end element.

- **Mechanical Components**
  - Gear element
  - Bike element
- **Electrical Components**
  - Three electrical components with 4 total batteries. Two double As, One rechargeable 6 volt, and one 3 volt disk battery.

## **Our theme is C.A.R.P.**

- Thousands of years ago, the sun exploded. The catastrophe left the entire earth enveloped in darkness. On the surface of the cold, dark planet, scientists worked feverishly. To keep the world out of darkness, various machines were being built to spread light and guide the people out of the dark. Once the machines were built, they were launched into orbit in order to fill the sky and make it bright and warm like summertime. All that is needed now is to turn them on.

## **Elements**

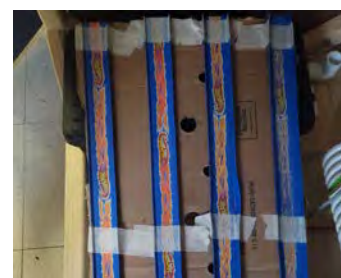
- **Element #1 Green Track Run**

### **Simple Machines Used**

- **Ramp**

### **Number of Energy Transfers**

- **One**
  - **Element #2 Down Town Traffic**



### **Simple Machines Used**

- Ramp
- Wheel and Axel

### **Number of Energy Transfers**

- Two

### **Element #3 The Wheel of Fortune Simple Machines Used**

- Wheel and Axel
- Lever

### **Number of Energy Transfers**

- One



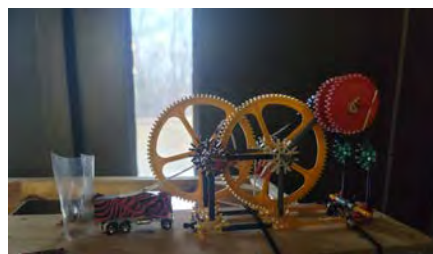
### **Element #4 Rattle Trap Pipe**

### **Simple Machines Used**

- Lever
- Ramp
- Axel

### **Number of Energy Transfers**

- Two



- **Element #5 Pulley and Clock Work**

**Simple Machines Used**

- **Wheel and Axel with gears**
- **Pulley**

**Number of Energy Transfers**

- **Two**

- **Element #6 Rock in a Hard Place**

**Simple Machines Used**

- **Wheel and Axel**
- **Ramp**



**Number of Energy Transfers**

- **Two**

- **Element #7 Around the World in 2.5674639 Seconds**

**Simple Machines Used**

- **Wheel and Axel**
- **Inclined Plane**

**Number of Energy Transfers**

- **Two**



- **Element #8 Trever Lever**

**Simple Machines Used**

- **Lever**

**Number of Energy Transfers**



- One

### ● Element #9 Archimedes' Screw

#### Simple Machines Used

- Screw
- Wheel and Axle with gear
- Inclined Plane

#### Number of Energy Transfers

- None



### ● Element #10 Da Power Source

#### Simple Machines Used

- Gear and Axle

#### Number of Energy Transfers

- One



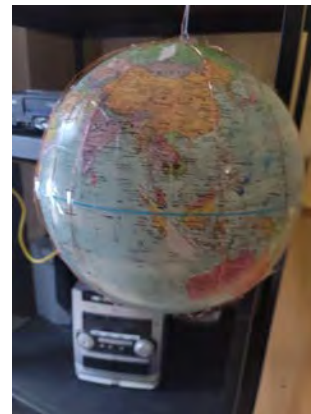
### ● Element #11: Light up the World

#### Simple Machines Used

- No simple machines

#### Number of Energy Transfers

- One



# Team Roles

- **Captains: Joe, Lela**
- **Design Engineers: Joe, Braiden, Ethan, Wyatt**
- **Test Engineers: Everyone**
- **Record Keeper: Lela**
- **Researchers: Everyone**
- **Discussion Leader: Lela**
- **Programmer: Braiden**
- **Organizer: Lela**
- **Presentation Creator: Lela**
- **Story Author: Joe**
- **Frame Builder: Braiden**

# Rube Goldberg Checklist

1. **Make sure safety is on when running**
2. **Make sure the truck isn't wedged under gear**
3. **Make sure stick is aligned with metal marble**
4. **Make sure the doorstep is on the knex thing**
5. **Make sure the car for the downtown traffic is set upright.**
6. **Make sure Archimedes' Screw is on**
7. **Make sure EV3 is on and in the program**
8. **Make sure marbles are on the truck magnet**
9. **The metal ball stopper must be pushed back**
10. **Make sure we have at least ten marbles on hand!!!**

# Team Reflection:

**We learned about perseverance through this machine because of how hard it has been to complete. We learned how to cooperate with the people on our team even when they have different perspectives. Most importantly we learned how to stay focused, stay positive and have fun!!**

# **Personal Reflections:**

**Joe:**

**I was surprised when my team nominated me as the team captain because I'm on the spectrum. Being a captain allowed me to improve my leadership skills.**

**Lela:**

**I learned to trust in my team even when the machine isn't cooperating. I also learned how to be a better captain by encouraging others.**

**Jack:**

**I have discovered how to design elements with the Engineering Design Process which made it easier to problem solve. For example, when an element didn't work like the gears, we went back and tried different solutions.**

**Braiden:**

**I realized that working with a team is essential for a Rube Goldberg machine to be successful. Working as a team this year helped me understand that everyone has different skills to add and without certain skills, the machine wouldn't be able to function correctly.**

**Aaron:**

**I discovered that I'm excellent as a testing engineer. I needed to work on improving on how to be a better design engineer so I worked with Joe who has a strength in design.**

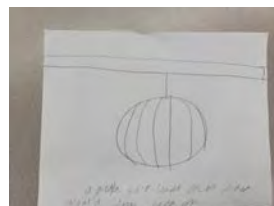
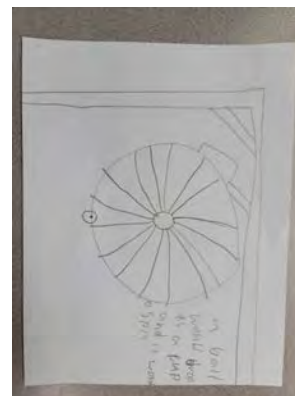
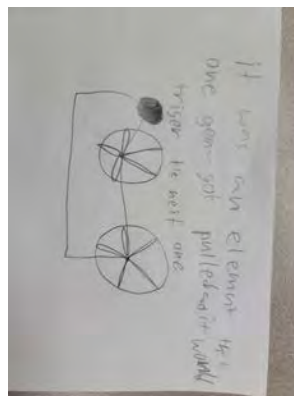
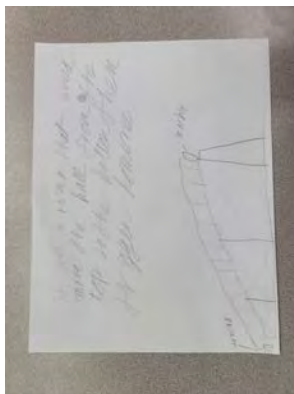
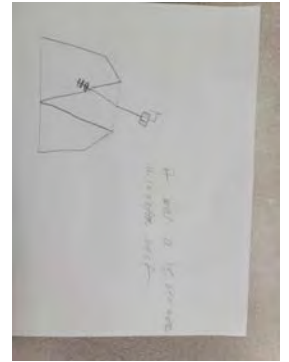
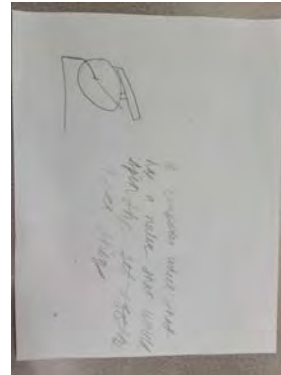
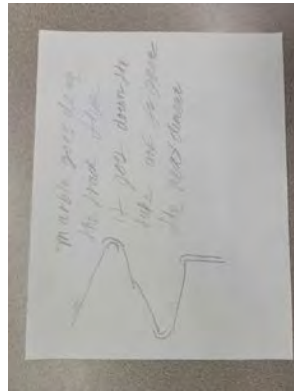
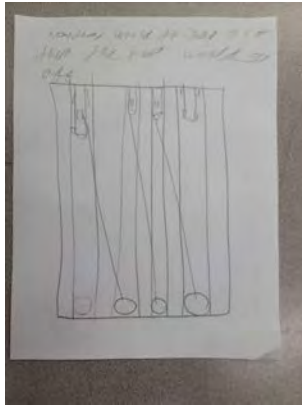
**Wyatt:**

**This is my second year on a Rube Goldberg team. I rediscovered the joy a team feels when the machine finally works after months of work!**

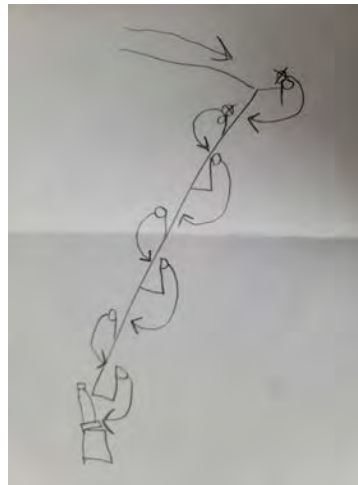
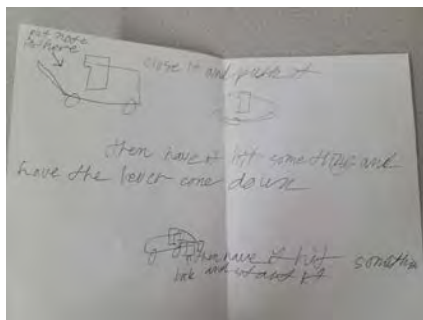
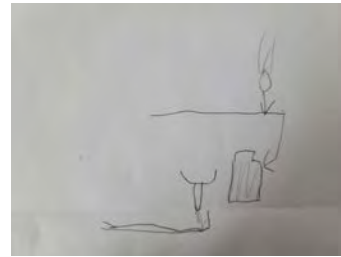
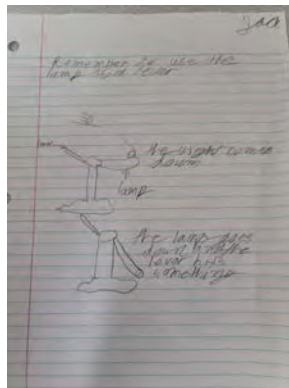
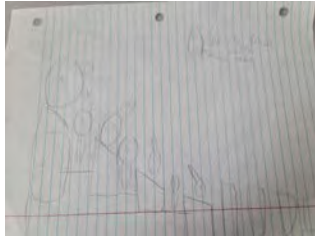
**Ethan:**

**This year, I learned about the Engineering Design Process and designed elements successfully. It was really challenging, but I learned teamwork makes the dream work!**

# Drawings and designs for the machine



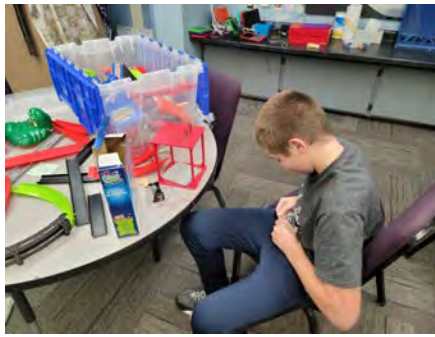




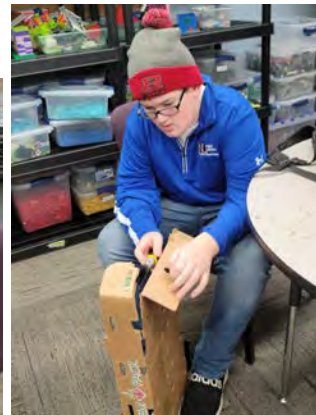


# Team Photos



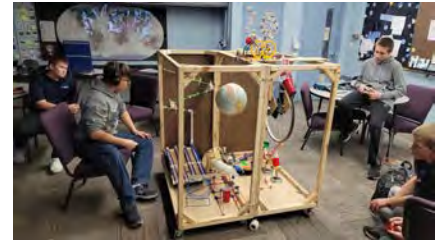














Link to a video of the machine working!

<https://photos.app.goo.gl/zfngYnHNyHB4kM8e6>