2024 Engineering Machine Design Contest

Losing Your Marbles Over Reverse Engineering the Human Body Throughout History

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https://docs.google.com/presentation/d/1c4m4L_zGA3EHP8f6W1g85uLzguckKh1QAG7HDjKZXWQ/edit?usp=sharing

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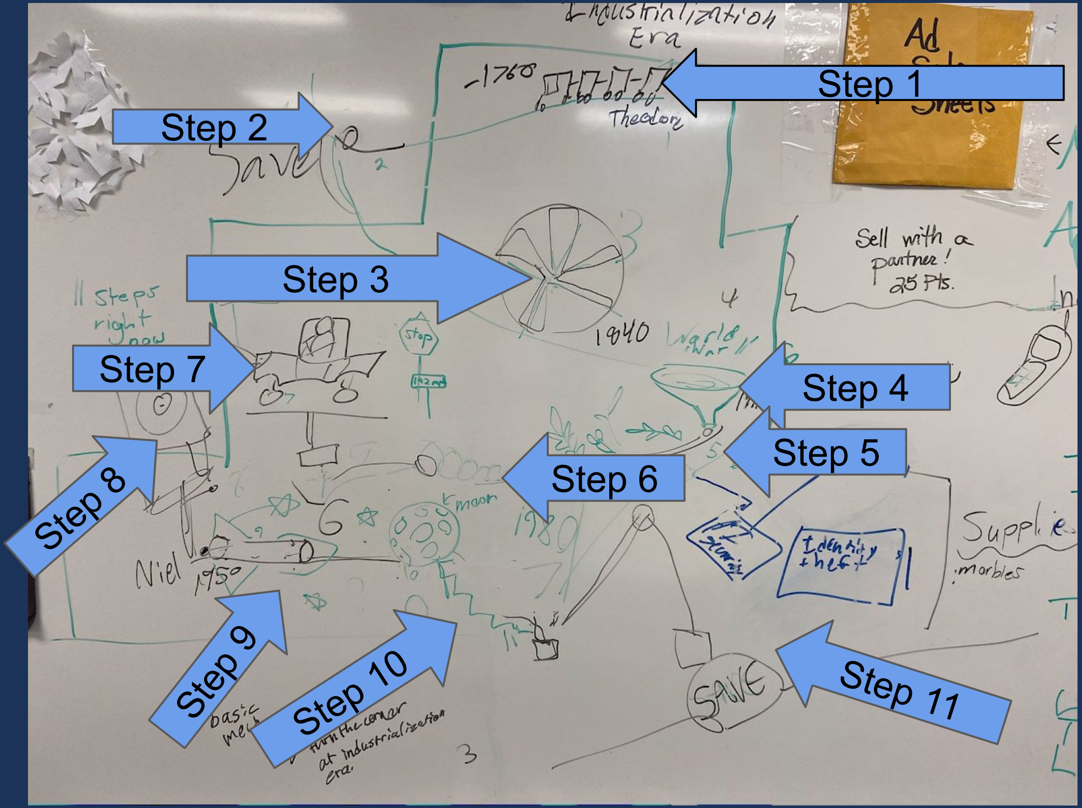
Introduction

Have you ever wondered how the current technology of our world was designed? From trains to artificial intelligence, you'll learn how people in the past as well as the present have used our body to reverse engineer technology. Through our machine, you will be sent back in time to the 1900s, represented in black and white, as trains traveled on tracks sending items just like our brain sends messages using pathways. As our machine progresses through steps, time passes in history and technology is advanced based on reverse engineering the human body. As the exciting journey evolves, you will be back in the present represented in full color, experiencing how scientists have reverse engineered our own brains to create artificial intelligence. After this life-altering experience, you will never see technology under the same lense again!

Planned Machine Design Sketch and Description



This was our beginning plan. As we worked, we changed several of the steps. Our initial plan included:

Step 1 demonstrates the mechanical component of the train rolling forward and pushing the marble.

In Step 2, the marble then goes into the hole cut out and onto the hot wheels track.

Step 3 the marble then rolls down the track and spins a windmill through its mechanical advantage.

In Step 4, the marble is pulled through the funnel by gravity.

In Step 6, it then comes out of the funnel; and through a straight track.

The mechanical component in Step 6 the marble then hits a set of marbles, which makes the marble on the end of the set go forward. This example of Newton's Cradle will push the lever on a remote forward in Step 7.

Step 8 the electrical component of the motor in the car then moves the car forward, pushing the target which sends a marble forward.

In Step 9 the mechanical component of the sign used as a lever to push the marble forward from when the car hit the sign.

Step 10 the marble uses gravity to roll through the moon, down the stairs, and into a bucket.

In Step 11, the marble's weight releases the sign and it slides in front of the other sign.

Overcoming Challenges and Redesigning for Solutions

Design Problem 1: Windmill - Expensive design that did not closely match the theme
Redesign Solution: We solved the problem by using **recycled products** from an old toy to transfer the mechanical advantage of the marble's momentum to spin both windmills that represent lungs.

Design Problem 2: Car Off Ledge - Uncontrolled design created stopping point in steps
Redesign Solution: We made the car roll across a flat surface and tied a string to serve as a stopping guide resulting in a more controlled design which allowed predictable progression of the machine.

Design Problem 3: Mousetrap Trigger - The marble would not set off the mousetrap and keep the marble within the project dimensions.
Redesign Solution: We fixed this problem by sloping the marble ramp onto the mousetrap trigger by revising the wood design to fit the angle impacting force created.

Design Problem 4: Identity Theft Step- Did not closely match the theme
Redesign Solution: We designed a helicopter grand finale that showcased artificial intelligence as the most current reverse engineering of the human body feat to more closely relate to the theme.

Design Problem 5: We learned we didn't have enough time or the resources needed to complete the machine in the TAG room.
Redesign Solution: We solved this problem by working after school and on weekends at woodshop at a local business.

Overcoming Challenges and Redesigning for Solutions, Continued

Design Problem 6: The marble would not roll through the elbow near the rocket.
Redesign Solution: We found that there was a bump inside that stopped the marble. This was fixed by sanding the bump decreasing friction and smoothing rough surfaces.

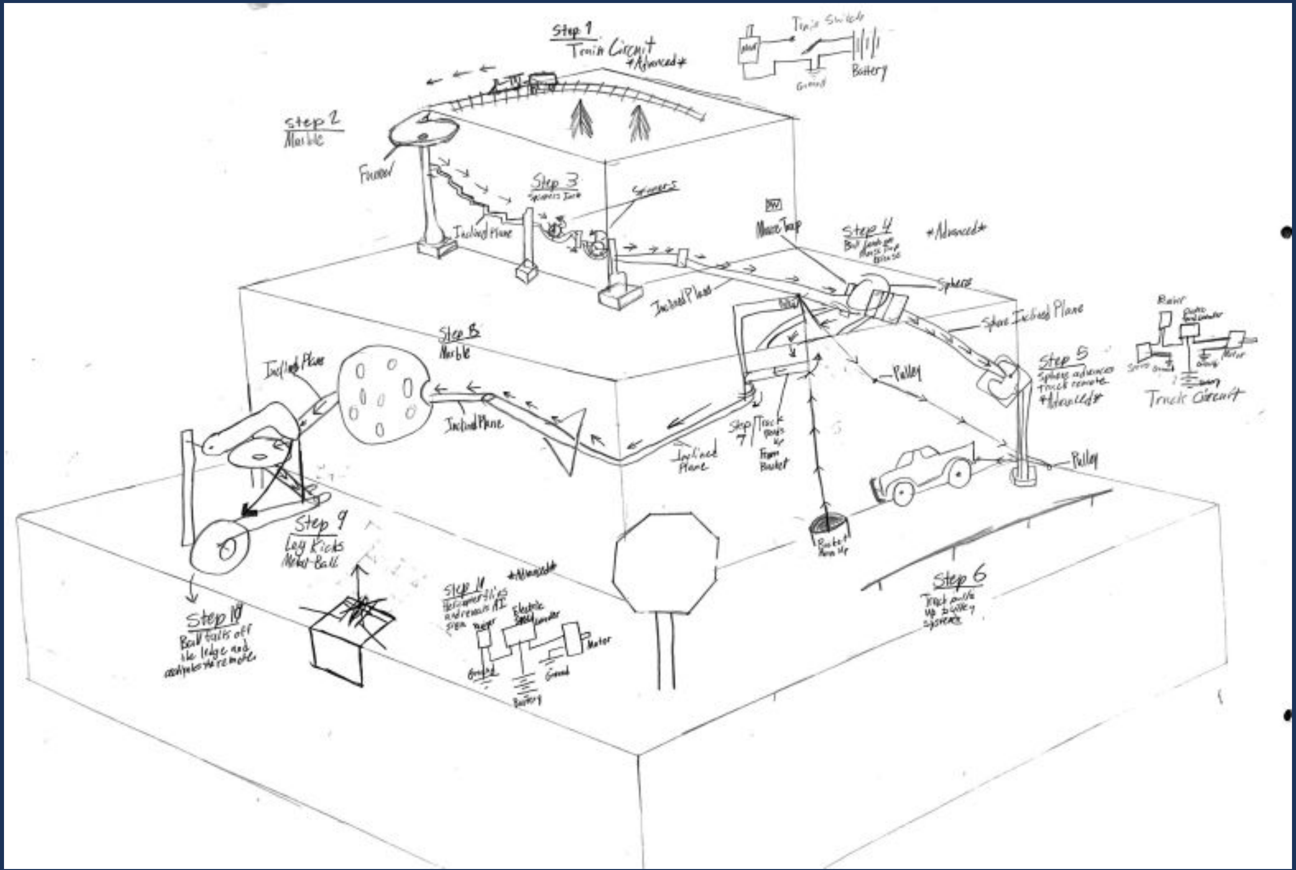
Design Problem 7: The wooden ball would not stay on the grey slope.
Redesign Solution: We installed a wooden barrier to keep the wooden ball from flying off the slope from the strong mousetrap spring. A grove was installed on the slope to keep the ball to rolling towards the remote. We also discovered that a quick slope and groove needed to be sanded at the end to keep the ball in place so the remote stayed in the forward position.

Design Problem 8: The marble did not weigh enough to operate the helicopter remote.
Redesign Solution: We found a metal ball that weighed enough, but we still needed something strong enough to push it over the edge. We started with a lever system that we thought would have a mechanical advantage to move the ball over the edge. We found the lever system to be inconsistent and the marble still did not weigh enough to move what we wanted. We needed more leverage so we came up with a heavy leg. We supported the leg with a sensitive support that weight of the marble could easily move.

Design Problem 9: The helicopter did not have enough lift to pull up the sign.
Redesign Solution: We found that the frame for the sign weighed more than the what the helicopter would lift. This problem was resolved by reducing the frame weight by cutting 3/4 of the thickness.

Design Problem 10: The helicopter did not stay within dimensions.
Redesign Solution: We used light string to secure the helicopter during take off and limit its maximum altitude.

Final Machine Design and Description



Step 1: Electro-chemical energy drives the train's wheels propelling it forward. As the train drives forward it pushes the marble into the funnel.

Step 2: The inclined plane and the earth's gravitational pull moves the ball towards the marble run.

Step 3: The gravitational pull on the marble pulls it down the incline plane and keeps it in motion to the spinners.

Step 4: The kinetic energy is transferred to the spinners making them turn as the marble passes through. The weight of the marble on the mousetrap releases the potential energy of the loaded spring.

Step 5: The mousetrap lever hits the wooden sphere transferring the kinetic energy to the sphere. The slope of the wooden path allows the sphere to roll and push the truck's forward control.

Step 6: The mechanical energy transfer from the bucket to the hot wheels track forces it to bend, and funnel the marble into the hole.

Step 7: The inclined plane creates gravitational pull on the marble moving it through the rocket and the moon.

Step 8: The mechanical energy transferred from the momentum of the marble knocks out the leg's support. Releasing the leg's potential energy to kick the metal ball.

Step 9: The mechanical energy from the leg is transferred from the foot and to the ball and rolls of the edge to activate the helicopter remote.

Step 10: The energy stored in the helicopter battery is activated by the remote energy to make the helicopter spin its blades and creates the lift to pull the AI sign up.

Step 11: The energy stored in the helicopter battery is activated by the remote energy to make the helicopter spin its blades and creates the lift to pull the AI sign up.

Key- Blue=Electrical, Green=Chemical Red=Mechanical

Advanced Components:

Step 1: Chemical-Train battery, Electrical-Train Motor, Mechanical-Train Wheels and Axles
- Electro-chemical energy drives the train's wheels propelling the train forward.

Step 2: Mechanical-Marble Slope
-The funnel design creates a mechanical energy transfer with an inclined plane and the earth's gravitational pull moving the ball

Step 3: Mechanical-Marble Momentum
-The kinetic energy is transferred to the spinners making rotational kinetic energy to make them turn as the marble passes through.

Step 4: Mechanical-Spring
-The mechanical energy in the spring moves the mousetrap lever.

Step 5: Chemical-Truck Remote and Truck Battery, Electrical-Truck Motor, Servos, Mechanical-Wooden Ball
-The chemical energy stored in the Truck's battery is released by the Electric Speed Controller after the Receiver gets an electric message from the controller. The Electric Speed Controller then sends electric energy to make the motor turn and accelerate forward while the Servo keeps the truck linear. The weight of the wooden ball keeps the forward control for the truck remote in the forward position.

Step 6: Mechanical-Truck, String and Pulley
-As the truck accelerates forward the mechanical energy is transferred to the string. The string is pulled through the pulley system to lift the bucket from the well.

Step 7: Mechanical-Marble Slope
-The mechanical energy transfer from the bucket to the hot wheels track forces it to bend, and funnel the marble into the hole.

Step 8: Mechanical-Marble Momentum
-The slope has gravitational potential energy and is transferred to kinetic energy to move the marble through the rocket and the moon increasing its speed.

Step 9: Chemical-Helicopter Remote Battery, Mechanical-Metal Ball
-Rotational mechanical energy transfers the kinetic energy from the wooden leg to the metal ball.

Step 10: Mechanical-Metal Ball, Controller
-The metal ball weighs enough to pull the remote's throttle lever forward to activate the remote.

Step 11: Chemical-Helicopter Battery, Electrical-Helicopter Motor, Mechanical-Helicopter Rotors
-The chemical energy stored in the helicopter battery is released by the Electric Speed Controller after the Receiver gets the electric message from the controller.

Applied STEM Processes

4 or more STEM Processes with clear details provided

Creating this machine, we **asked** (defined the problem) how we could build a machine that demonstrated the reverse engineering of the human body. **Imagined** (brainstormed solutions) through researching. Then **planned** creating initial design sketches. We **experimented** running the machines and multiple times in various ways as we problem solved. Then we **improved** our machine creating a final design.

Electrical Component

- Train Motor, RC Car Motor, and Helicopter Motor.

Mechanical Component

- RC Car String, Prosthetic Leg, Mouse Trap.

Chemical Component

- Train Battery, RC Car batteries, and Helicopter Batteries.

Applied STEM Processes Continued

How we used the design process:

1. Creating this machine, we **asked** (defined the problem) how we could build a machine that demonstrated the reverse engineering of the human body.

We began defining the problem through research. We downloaded the handbook and watched videos of reverse engineering and the human body. We also researched the timeline of technology. We often researched different example machines examples and studied the rubric to see what the regulations were for our machine.

2. **Imagined** (brainstormed solutions) through researching.

We often met together in the TAG room to plan and determine our steps. We made sure to be very specific of our steps and made sure they fit the theme as well as if they were reliable and if they really work. We further researched timelines of different breakthroughs in engineering and the human body to determine and design steps, since we chose to show how we reverse engineered the human body throughout time for our machine name.

3. Then **planned** creating initial design sketches.

Once we had determined all of our steps we sketched our ideas down and made sure they all fit onto our plywood machine board as well. We also determined if the gravity would keep the momentum of the marble, and so we determined the direction of the motion. Once we had build the plywood machine board at the wood shop, we sketched onto the white paint where the step would take place and be built.

4. We **experimented** running the machines and multiple times in various ways as we problem solved.

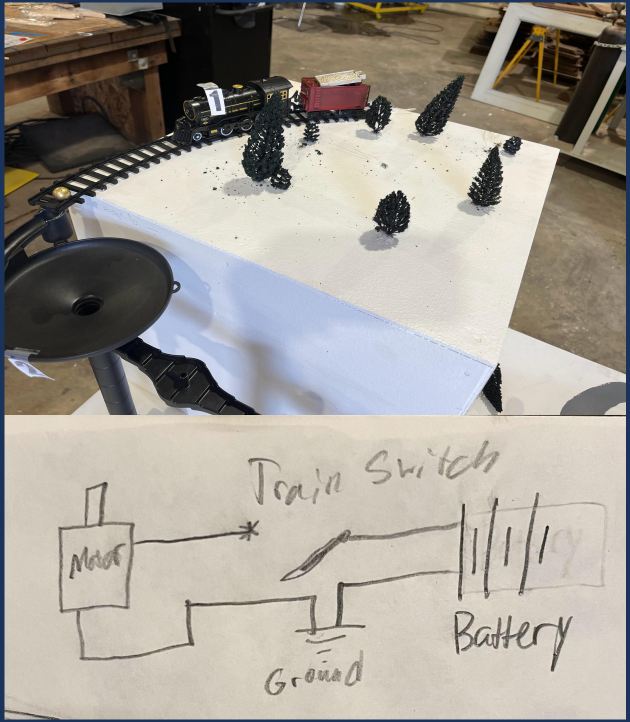
At the machine shop we assembled the basic components of the machine. Once we had built the machine we designed the specifications of its function we began test runs. We identified problems such as windmill design, car inconsistencies, and helicopter failures. We applied science to solve each problem that was identified by evaluating material for increased flexibility, adjusting slope to change momentum, and adjusting weight to create lift.

5. Then we **improved** our machine creating a final design.

As we solved problems, we revised and improved our design. It resemeblem the original design, however, it became more detailed and realistic based on scientific application. The final design answered and solved the initial question of how we could build a machine that demonstrated the reverse engineering of the human body.

Step 1:
Reverse Engineering The Brain's Communication System

<u>1900s trains traveling on a track delivering items represent reverse engineering the brain's messages sent through the nervous system.</u>
Turning on the switch completes the train's electrical circuit between the battery and motor. Electro-chemical energy drives the train's wheels propelling it forward. As the train drives forward it pushes the marble into the funnel.



Creating the track to show communication pathways.

Step 2:
Reverse Engineering The Nervous System

<u>The nervous system carries the signal to the lungs.</u>
The funnel design creates a mechanical energy transfer with an inclined plane and the earth's gravitational pull moving the ball towards the marble run.

Using a funnel to show the nervous system.

Step 3:
Reverse Engineering Breathing

<u>1910 windmills reverse engineered the signal which initiates the lungs to start breathing and moving air.</u>
The gravitational pull on the marble pulls it down the incline plane and keeps it in motion to the spinners. The kinetic energy is transferred to the spinners making rotational kinetic energy to make them turn as the marble passes through.

Creating wheels to make breathing

Step 4:
Reverse Engineering Instant Reactions

<u>1920’s wooden roller coasters reverse engineered signals reaching muscles to create instant reactions.</u>

The weight of the marble on the mousetrap releases the potential energy of the loaded spring. The mechanical energy in the spring moves the mousetrap lever.

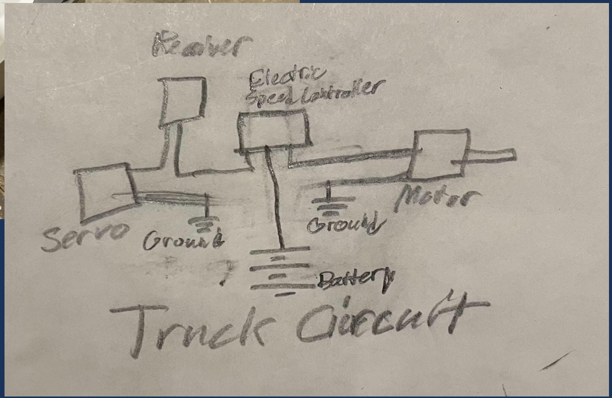
Designing the mouse trap to show instant reactions.

Step 5:
Reverse Engineering Our Body to Execute Simple Tasks

<u>1920's wooden roller coasters reverse engineered signals reaching muscles to create instant reactions.</u>

The mousetrap lever hits the wooden sphere transferring the mechanical energy to the ball. The slope of the wooden path allows the sphere to roll and push the truck's forward control.

The chemical energy stored in the Truck's battery is released by the Electric Speed Controller after the Receiver gets an electric message from the controller. The Electric Speed Controller then sends electric energy to make the motor turn and accelerate forward while the Servo keeps the truck linear.

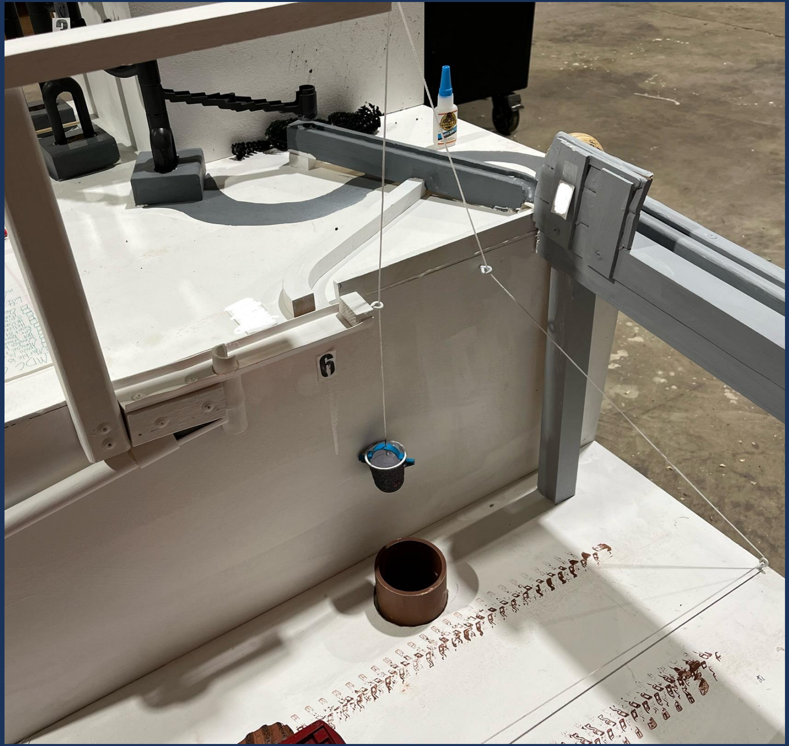


Engineering the car to show simple tasks.

Step 6: Reverse Engineering Nerves Activating Bones.

<u>1930's buckets coming out of wells represent nerves in the body creating instant bone movements.</u>

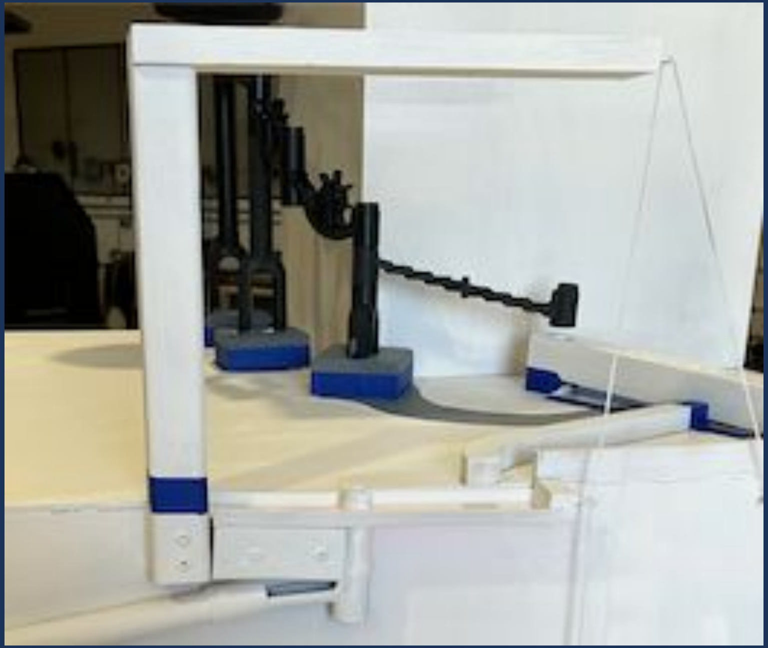
As the truck accelerates forward the mechanical energy is transferred to the string. The string is pulled through the pulley system to lift the bucket from the well.



Step 7:
Reverse Engineering The Flexibility of Our Bones

1940’s highways are reverse engineered from strong bones that are flexible to take on blunt force so they won’t fracture.

The mechanical energy transfer from the bucket to the hot wheels track forces it to bend, and funnel the marble into the hole.



Designing the flexibility process.

Step 8:
Reverse Engineering The Lightness of Our Bones

<u>1950's the space race begins reverse engineering how our bones are strong but light to move shuttles designed with titanium throughout space.</u>

The slope has gravitational potential energy and is transferred to kinetic energy to move the marble through the rocket and the moon increasing its speed.

Creating the Space Area to represent being able to bring things to the moon.

Step 9:
Reverse Engineering Our Limbs

<u>1970's, prosthetics reverse engineered human appendages like legs.</u>

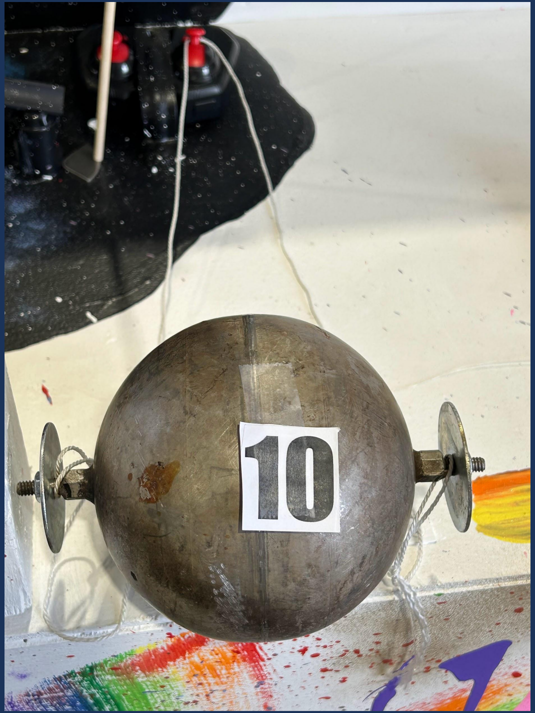
The momentum of the marble knocks out the leg's support. Releasing the leg's potential energy to kick the metal ball over the edge. The rotational mechanical energy transfers the kinetic energy from the wooden leg to the metal ball.

Designing our own prosthetic.

Step 10:
Reverse Engineering Our Brain

<u>1990's, the brain is reverse engineered to create AI.</u>

The rotational mechanical energy from the leg is transferred through the foot to the ball and gives the ball momentum to roll forward and off the ledge. The metal ball weighs enough to pull the remote's throttle lever forward to activate the remote.

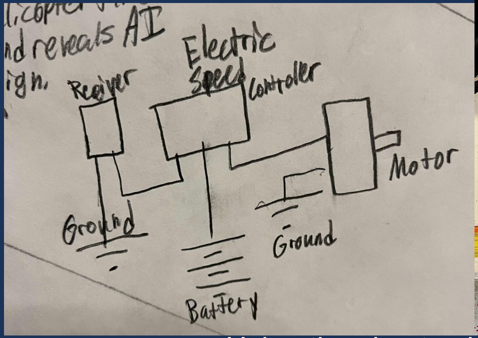


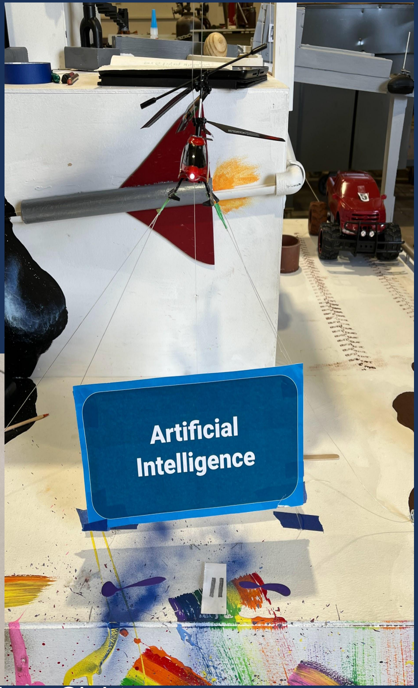
Creating the helicopter to make the artificial intelligence.

Step 11:
Reverse Engineering Sight

<u>Currently, AI is being advanced to be more intuitive, making it difficult to differentiate between human and machine.</u>

The chemical energy stored in the helicopter battery is released by the Electric Speed Controller after the Receiver gets the electric message from the controller. The Electric Speed Controller then sends electric energy to make the motor rotate the helicopter rotors and creates the lift to pull the AI sign up.





Using the sign to show Sight.

Final Machine Video:

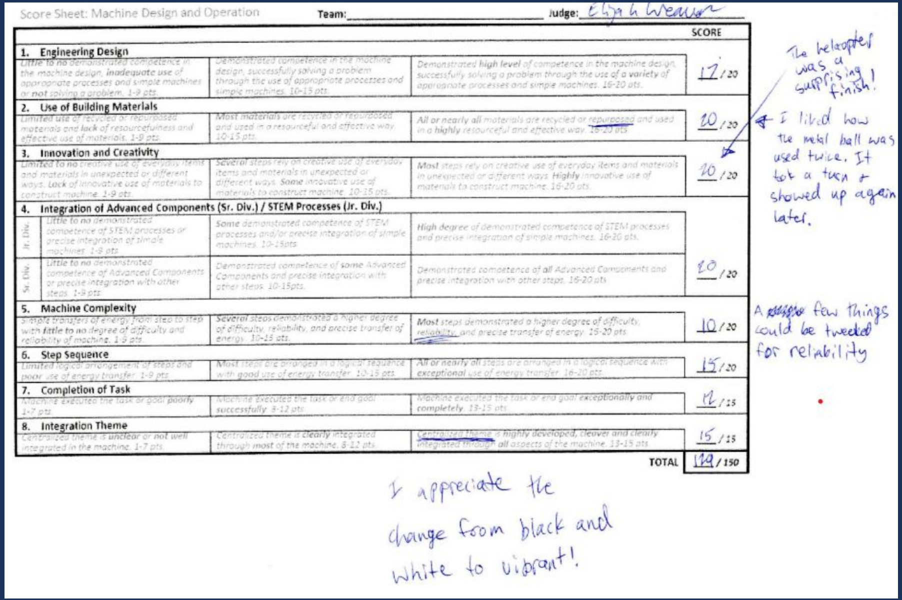
Materials List and Costs

Total Cost of Machine: $40

Percent of Recycled Materials: 68%

Recycled Materials	Purchased Materials (Cost)
Wood	Mouse Trap ($4)
String	Mini Solo Cup ($3)
Train Set	Wood Javelin ($1)
Recycled Screws	Paint ($18)
Marble Set	Tape ($2)
Marble	PC Piping ($10)
Wood ball	Paper Towel Roll ($2)
RC Car	
Stop Sign	
Styrofoam Frame	
Clay Moon	
Wood Foot	
Metal Scap	
Metal Ball	
Drone	

Practice Assessment with Northwestern College Method for Teaching Elementary Science Preservice Teachers



Score Sheet: Machine Design and Operation **Team:** ____________ **Judge:** Elijah Weaver

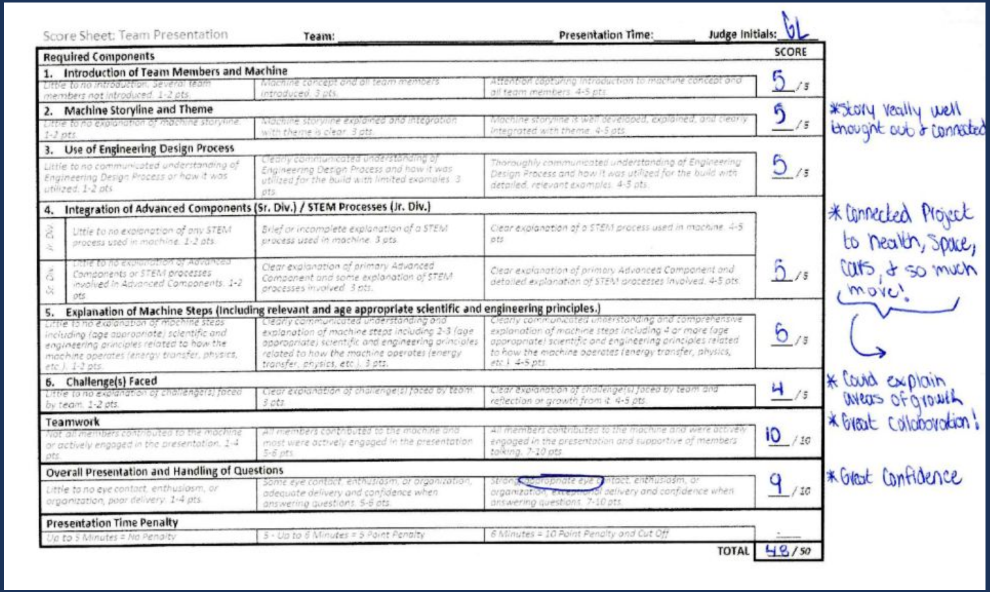
			SCORE
1. Engineering Design			
Little to no demonstrated competence in the machine design, inadequate use of appropriate processes and simple machines or not solving a problem. 1-9 pts.	Demonstrated competence in the machine design, successfully solving a problem through the use of appropriate processes and simple machines. 10-15 pts.	Demonstrated high level of competence in the machine design, successfully solving a problem through the use of a variety of appropriate processes and simple machines. 16-20 pts.	17 / 20
2. Use of Building Materials			
Limited use of recycled or repurposed materials and lack of resourcefulness and effective use of materials. 1-9 pts.	Most materials are recycled or repurposed and used in a resourceful and effective way. 10-15 pts.	All or nearly all materials are recycled or repurposed and used in a highly resourceful and effective way. 16-20 pts	20 / 20
3. Innovation and Creativity			
Limited to no creative use of everyday items and materials in unexpected or different ways. Lack of innovative use of materials to construct machine. 1-9 pts.	Several steps rely on creative use of everyday items and materials in unexpected or different ways. Some innovative use of materials to construct machine. 10-15 pts.	Most steps rely on creative use of everyday items and materials in unexpected or different ways. Highly innovative use of materials to construct machine. 16-20 pts.	20 / 20
4. Integration of Advanced Components (Sr. Div.) / STEM Processes (Jr. Div.)			
Jr. Div.: Little to no demonstrated competence of STEM processes or precise integration of simple machines. 1-9 pts.	Some demonstrated competence of STEM processes and/or precise integration of simple machines. 10-15pts.	High degree of demonstrated competence of STEM processes and precise integration of simple machines. 16-20 pts.	
Sr. Div.: Little to no demonstrated competence of Advanced Components or precise integration with other steps. 1-9 pts.	Demonstrated competence of some Advanced Components and precise integration with other steps. 10-15pts.	Demonstrated competence of all Advanced Components and precise integration with other steps. 16-20 pts.	20 / 20
5. Machine Complexity			
Simple transfers of energy from step to step with little to no degree of difficulty and reliability of machine. 1-9 pts.	Several steps demonstrated a higher degree of difficulty, reliability, and precise transfer of energy. 10-15 pts.	Most steps demonstrated a higher degree of difficulty, reliability, and precise transfer of energy. 16-20 pts.	10 / 20
6. Step Sequence			
Limited logical arrangement of steps and poor use of energy transfer. 1-9 pts.	Most steps are arranged in a logical sequence with good use of energy transfer. 10-15 pts.	All or nearly all steps are arranged in a logical sequence with exceptional use of energy transfer. 16-20 pts.	15 / 20
7. Completion of Task			
Machine executed the task or goal poorly 1-7 pts.	Machine executed the task or end goal successfully. 8-12 pts.	Machine executed the task or end goal exceptionally and completely. 13-15 pts.	12 / 15
8. Integration Theme			
Centralized theme is unclear or not well integrated in the machine. 1-7 pts.	Centralized theme is clearly integrated through most of the machine. 8-12 pts.	Centralized theme is highly developed, cleaver and clearly integrated through all aspects of the machine. 13-15 pts.	15 / 15
		TOTAL	129 / 150

The helicopter was a surprising finish!

I liked how the metal ball was used twice. It took a turn & showed up again later.

A few things could be tweeked for reliability

I appreciate the change from black and white to vibrant!



Score Sheet: Team Presentation **Team:** ____________ **Presentation Time:** ______ **Judge Initials:** GL

Required Components			SCORE
1. Introduction of Team Members and Machine			
Little to no introduction. Several team members not introduced. 1-2 pts.	Machine concept and all team members introduced. 3 pts.	Attention capturing introduction to machine concept and all team members. 4-5 pts.	5 / 5
2. Machine Storyline and Theme			
Little to no explanation of machine storyline. 1-2 pts.	Machine storyline explained and integration with theme is clear. 3 pts.	Machine storyline is well developed, explained, and clearly integrated with theme. 4-5 pts.	5 / 5
3. Use of Engineering Design Process			
Little to no communicated understanding of Engineering Design Process or how it was utilized. 1-2 pts	Clearly communicated understanding of Engineering Design Process and how it was utilized for the build with limited examples. 3 pts	Thoroughly communicated understanding of Engineering Design Process and how it was utilized for the build with detailed, relevant examples. 4-5 pts.	5 / 5
4. Integration of Advanced Components (Sr. Div.) / STEM Processes (Jr. Div.)			
Jr. Div.: Little to no explanation of any STEM process used in machine. 1-2 pts.	Brief or incomplete explanation of a STEM process used in machine. 3 pts.	Clear explanation of a STEM process used in machine. 4-5 pts	
Sr. Div.: Little to no explanation of Advanced Components or STEM processes involved in Advanced Components. 1-2 pts	Clear explanation of primary Advanced Component and some explanation of STEM processes involved. 3 pts.	Clear explanation of primary Advanced Component and detailed explanation of STEM processes involved. 4-5 pts.	5 / 5
5. Explanation of Machine Steps (Including relevant and age appropriate scientific and engineering principles.)			
Little to no explanation of machine steps including (age appropriate) scientific and engineering principles related to how the machine operates (energy transfer, physics, etc.). 1-2 pts.	Clearly communicated understanding and explanation of machine steps including 2-3 (age appropriate) scientific and engineering principles related to how the machine operates (energy transfer, physics, etc.). 3 pts.	Clearly communicated understanding and comprehensive explanation of machine steps including 4 or more (age appropriate) scientific and engineering principles related to how the machine operates (energy transfer, physics, etc.). 4-5 pts.	5 / 5
6. Challenge(s) Faced			
Little to no explanation of challenge(s) faced by team. 1-2 pts.	Clear explanation of challenge(s) faced by team. 3 pts.	Clear explanation of challenge(s) faced by team and reflection or growth from it. 4-5 pts.	4 / 5
Teamwork			
Not all members contributed to the machine or actively engaged in the presentation. 1-4 pts.	All members contributed to the machine and most were actively engaged in the presentation. 5-6 pts.	All members contributed to the machine and were actively engaged in the presentation and supportive of members talking. 7-10 pts.	10 / 10
Overall Presentation and Handling of Questions			
Little to no eye contact, enthusiasm, or organization, poor delivery. 1-4 pts.	Some eye contact, enthusiasm, or organization, adequate delivery and confidence when answering questions. 5-6 pts.	Strong appropriate eye contact, enthusiasm, or organization, exceptional delivery and confidence when answering questions. 7-10 pts.	9 / 10
Presentation Time Penalty			
Up to 5 Minutes = No Penalty	5 - Up to 6 Minutes = 5 Point Penalty	6 Minutes = 10 Point Penalty and Cut Off	-
		TOTAL	48 / 50

*Story really well thought out & connected

*Connected Project to health, Space, cars, & so much more!

*Could explain areas of growth

*Great Collaboration!

*Great Confidence

Team Journal Timeline: January

Jan. 23, 2024- first meeting

This was our first time meeting for the project. We went over rules and learned about this year's theme. Examples of brainstorms: Robotics, water, communication tech, water and robotics together, food tech and processing, layers of the ocean
Looks of machine, how the machine works, materials needed, shape of the machine, how steps happen.
Possible ideas?

- Hand shaking
- Water
- Three layers
- Lever
- Propeller
- Leads to robotics

Jan. 25-

We shared more ideas, and we are thinking about the materials needed for the machine. Plus how the steps will work? different objects we could use in the machine? Thinking about a new idea (gumball machine).

Jan. 29-

We talked about final designs and the practicality of our ideas. We settled on an idea:
A timeline of how robotics have improved and changed over the decades.

Jan. 30-

We started making the design and sketching out our chain reaction. We looked at some reference photos and made a price for our machine.

Jan. 31-

We're debating about a final idea for our machine. We want a theme that still falls under the category of the contest. But we also want a machine that looks nice and has a flow to it.

Team Journal Timeline: February

Feb. 1-
We finally finaled our chain reaction which was a relief! We decided to not meet up for a few days so we could start to work on building the base of the machine.

Feb. 9-
Lainey made the base of the machine and painted it white (as a base coat).
Teygan is gathering supplies we need (he's trying to not spend too much money and recycle stuff he already owns.

Feb. 12-
We met at the woodshop for the first time to start building the chain reaction. We still need a little bit more supplies but we're almost there!

Feb. 14-
We gathered all the supplies! Today we started to paint a few of the objects and map out where we're placing them on the base. Also the base is very big, so we decided to make both halves removable from each other so we can more easily transport it.

Feb. 15-
We did more work on the project. We finished the first step.

Feb. 16-
Today we did lots of spray painting and Lainey made a clay moon. But we're starting to question if the ball launching part will work? We will keep testing.

Feb. 17-
The ball launching doesn't work. We are currently designing a different reaction for that step. our ideas are a mouse trap, or slingshot.

Feb. 19-
After trial and error we settled on using a mouse trap. We haven't gotten it to work just yet but we think after work on the pieces for a bit it'll come together. The other parts are going well but we are all nervous about the deadlines coming up.

Feb. 20-
We didn't do much today. All we did was work on the mousetrap. But Lainey is concerned about the fact that it only works about 75% of the time. Saleah couldn't show up again so it was just Lainey and Teygan.

Feb. 23-
We kept working on the same parts as before. Lainey spray painted some fake trees black and Teygan painted a toy car (The car looks a bit incomplete though... Lainey might go in and paint it again even though it was so difficult to get the cover removed)

Feb. 28-
Lainey and Saleah have been very busy working on a theater performance and Teygan has been busy with NHD (National History Day) no one has been able to work on it. Teygan was the only one who came in today to work on it. He cut some more pieces and constructed a bridge area. He also constructed the end scene with the helicopter.

Team Journal Timeline: March

March 2-

Lainey was the only one who worked on it today (her and Saleah are finally done with their performance). She worked on painting the other details to bring it together.

March 5-

Lainey did a little bit of painting again.

March 9-

We started finalizing the steps and have finished some steps. Teygan and Lainey started working on the journal.

March 13-

We brought the project into our school. There are still a few things that need to be fixed but we have the main parts done.

March 15-

Today the Northwestern College Method for Teaching Elementary Science preservice teachers came to the Akron Westfield School to judge the machine and the introduction using the contest assessment forms. They gave us valuable information and topics to practice on.

March 18-

Revised the team machine, journal, and made improvements preparing for submission.

March 20-

Final Edits, recorded steps, and labeled steps, preparing for submission.

March 28-

We learned of judging results, reviewed score sheets, and began planning our trip to Minnesota.

Team Journal Timeline: April

April. 2-

Moved the machine back to the wood shop and made a plan of attack for improvements based on score sheets.

April. 4-

We worked on machine step improvements and taking better pictures.

April 6-

We worked on journal revisions and additions.

April 7-

We worked on the machine and took a video of the run.

April 8-

We worked on journal final edits.

Team Reflection

https://docs.google.com/document/d/1SXuJhMrlypAfyClGfG_CJ32boKA0ZITEbY9JtmWIG94/edit?usp=sharing

Team Reflection

We addressed several challenges during this project. The first challenge was that the windmill was too resistant and would not turn. We realized this problem when we were constructing the step because the hub had small grooves on it, which would create resistance.The second problem was that the car had too much power and went off the ledge. Our third problem was that the helicopter did not have enough lift energy to pull up the Artificial Intelligence sign. An overall challenge we faced was not having enough time or resources available to work on the project in school.

We were able to enjoy many successes within this project. Our first success was that some of the initial design steps were always reliable, such as Step 7 and Step 8. Overcoming our challenges became one of our successes as we were able to identify and solve problems..We learned that through experimenting, we were able to fix problems, like the helicopter and car, and make the steps that were less reliable, like the windmill and car, become an expected reaction. Our third success was that through this project, we were able to learn new scientific concepts such as AI through reverse engineering the human body. We also found success in partnering with a local shop that offered many tools and recycled resources for machine construction and revision of our design.

We learned about energy transfers throughout the steps, and how we can use strings, like we did in step six, or we can use kinetic energy force, like we did in step nine, to keep the ball rolling. We also learned about components, and how they can complete a designed task. We learned about electric radio waves, transistors and receivers, pulleys, inclined planes, and levers. We learned about the STEM process, and how important it is when it comes to designing a project like this. We learned how to fix engineering problems, like when the helicopter could not lift the sign. We learned that if we studied the problem, we could find out what was making it go wrong, and fix it. Another important thing we learned was teamwork. We all had specific talents and hobbies that we enjoyed using to make the project. Saelah likes to read, so she excelled in writing and presenting. Lainey likes art, so she made the machine look good in every step and put meaning into color. Teygan likes engineering, so spent time in machine design. All our talents and hobbies combined made it fun and exciting with making this project.

Annotated Bibliography

Energy transfers and transformations. (n.d.). Education | National Geographic Society. https://education.nationalgeographic.org/resource/energy-transfers-and-transformations/

This source is about Energy Transfer: Energy Transfer National Geographic. It helped us understand different energy transfers and how they operate. We this to solve the problem of how we could connect different steps.

"Engineering Machine Design Contest." *Minnesota State Engineering Center of Excellence*, 9 Jan. 2024, engineering.mnsu.edu/engineering-machine-design-contest/. Accessed 2 Apr. 2024.

This source is about the Engineering Machine Design Contest from Minnesota State. We referenced the EMDC handbook for rules and regulations. We also studied the teme, watched videos, and reviewed samples.

Engineering: Simple machines - Lesson. (2023, March 1). TeachEngineering.org. https://www.teachengineering.org/lessons/view/cub_simple_lesson01

We used this website, Simple Machine Presentations and Reference Sheets: Teach Engineering, as a reference as to how we could create our steps, design our report, and construct our presentation. We went back to this source many times throughout the building of the project.

"Examining Simple Machines." *Who We Are | Tennessee STEM Innovation Network*, www.tsin.org/examining-simple-machines. Accessed 2 Apr. 2024.

This website is from the Tennessee STEM Innovation Network, and it taught us about simple machines. We applied it to how we could get the big wooden ball to get the small wooden ball to go to the next step through a series of pulleys.

Reverse engineering the brain. (2017, May 16). YouTube. https://youtu.be/0f1-Yfq8XN0?feature=shared

This source is about Reverse Engineering the Brain from the National Academy of Engineering. We used this video to study how the brain works. We applied it to create the tenth step and culminate our display of the advancements of technology reverse engineering the human body with AI.

Simple machines. (n.d.). Department of Education. https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/simpmachines.aspx

This is a website about Simple Machines: Victoria State Government Department of Education. We used this to help us understand levers, such as when the wooden foot hits the metal ball to get the helicopter to lift the sign. We applied it to when the marble goes through the windmills and down to the mouse trap.

What are mechanical springs and their types. (2021, November 24). Engineering Product Design. https://engineeringproductdesign.com/knowledge-base/springs/

This source is about Springs Mechanical Component: Engineering Product Design. We used this website to help us understand how springs work and their potential energy. We applied it to the problem with the power of the mousetrap spring.