Inventor Biography & Automata Module

Mr Arnoczy
Technology, Engineering, and Design
New Century Middle School

Inventor Biography Unit Plan

Standards:
STEL-3G. Explain how knowledge gained from other content areas affects the development of technological objects and systems.
5F. Analyze how an invention or innovation was influenced by its historical context.
5H. Evaluate a technological innovation that arose from a specific society's unique need or want.
6C. Compare various technologies and how they have contributed to human progress.
7Q. Apply the technology and engineering design process.
7R. Refine design solutions to address criteria and constraints.
7V. Improve essential skills necessary to successfully design.

Learning Target
I can analyze why an invention was created from an historical "pain point."
I can use tools, technologies, and materials safely to create an automata of a famous invention.

Academic Vocabulary
Automata, Cam, Follower, Pain Point

Engage

- The instructor will show the class a model of an automata and explain the project to them - In groups of 2, students will design and build an automata based on a chosen inventor or invention.
- Instructor and students will cover the basics of an automata.
- The students and the instructor will go over the Project Brief, Rubric, and the Checklist / Timeline of the project.

Explore / Explain - Individually, then in pairs, students will explore a chosen inventor / invention and the mechanics behind automata.

- Students will choose an inventor from a list and conduct internet research to complete the Inventor Biography Research.
- Students will then spend 3 days building their automata base and exploring simple automata mechanics. They will complete the Mechanics Research. Some students may wish to explore more advanced mechanics, such as side-to-side or the use of levers.
- The Instructor will use interactive discussion to check student understanding of the automata mechanics.

Elaborate - Students will design and build an automata based on a chosen inventor or invention.

- Students will brainstorm ideas for automata scenes that could showcase their chosen inventor or invention.
- Students will create a detailed design for their automata based on their research and brainstorming.
- Students will have 5 days to build their automata.

Evaluate - Using the Rubric, the Instructor will assess the automata. The students will also complete a Reflection to think about challenges they faced building their automata, how they overcame these challenges, and improvements they could make.

Automata Project Brief

(Posted in Canvas for students)

Problem Description: In groups of 2, students will design and build an automata based on a chosen inventor or invention. At the end of the project, students will demonstrate their automata to the class.

Criteria:

- Automata should have at least 2 mechanical movements.
- Automata should display a complete scene depicting the inventor at work or the invention in use.
    - A complete scene will often have both a foreground and a background.
    - The scene should be neatly crafted, be unique, and show creativity in either the scene's content or the use of mechanics.

Materials:

- Cardboard
- Dowels (1/8" or 1/4" will work)
- Straws (make sure the dowels can fit through the straws)
- Other class materials, as requested
- Access to scissors and X-Acto knives
- Access to hot glue guns and glue sticks

Steps:

1. Instructor will show students examples of automata - physical and virtual.
2. Introduce students to how cams work and how they play a very important role in an automata. A cam is a rotating or sliding piece in a mechanical linkage used especially in transforming rotary motion into linear motion.
3. Students will choose a famous inventor/invention and will use internet research to complete the Invention Graphic Organizer.
4. Students will build their basic box.
5. Students will explore several examples of automata techniques and how different kinds of movements can be achieved by modifying the structure of the cams.
6. Once students understand how an automata functions, they will design their own automata by combining multiple movements.
7. Students will build their design and then present it to the class.

Automata Project Rubric

(Posted into Canvas)

Criteria	Excellent (20 pts)	Good (17 pts)	Fair (15 pts)	Poor (12 pts)
Meets Criteria	Model displays a complete scene (often with a foreground and background) of the inventor /invention AND has at least 2 mechanical movements.	Model displays a scene of the inventor / invention but the scene is incomplete AND has at least 2 mechanical movements.	Model displays a scene of the inventor / invention but the scene is incomplete OR the model does not have at least 2 mechanical movements.	Model does not display a complete scene of the inventor / invention AND does not have at least 2 mechanical movements.
Neatness of Build	Excellent craftsmanship with minor construction flaws and good attention to detail.	Good craftsmanship with minor imperfections. Generally neat and well-constructed.	Some noticeable imperfections in craftsmanship. Some areas could be neater.	Poor craftsmanship with numerous flaws and lack of attention to detail.
Creativity	Highly creative and unique approach to the automata's movement and visual presentation.	Creative elements are evident in the automata's movement and design.	Limited creativity; the automata's movement and design are predictable.	Little to no creativity; the automata lacks innovation and imagination.
Automata Movement	Automata operates easily and consistently, with all intended movements and actions well-executed.	Automata operates mostly as intended, with minor occasional issues in movement or actions.	Automata experiences frequent issues in movement or actions but still operates to some extent.	Automata's movement and actions are severely compromised, making it difficult to discern its intended behavior.
Collaboration	Always worked well with partners and was well-behaved	Worked well most of the time w/partners and was mostly well-behaved	Worked well some of the time w/partners and was sometimes well behaved	Never worked well with partners and was not well-behaved

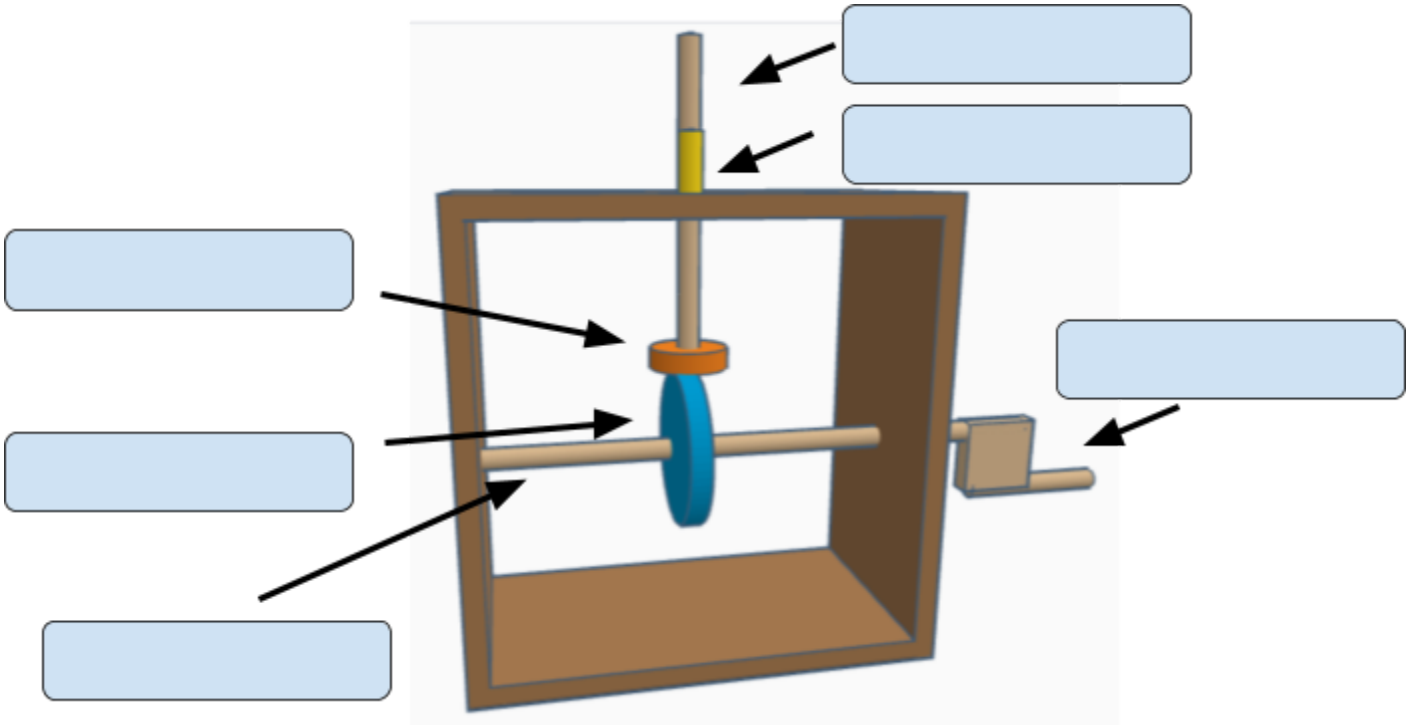
Automata Project Checklist:

- ☐ Day 1 - Automata Edpuzzle - Learn about the basics of automata and how you will build one
- ☐ Day 2 to 3 - Inventor Biography - Using internet research or other sources, complete the Inventor Biography Research
- ☐ Day 4 - Build your Automata Base
- ☐ Day 5 to 6 - Complete Automata Mechanics Research
- ☐ Day 7 - Brainstorming - Based on your research and the mechanics activity, brainstorm ideas for your automata. Your brainstorming should be done in your Engineering Design Notebook.
- ☐ Day 7 - Design - Choose your favorite idea and make a design of your automata. It should include a labeled diagram of your automata and should show the following:
  - ☐ The invention and scene you are depicting
  - ☐ At least 2 separate movements and the cams you are using to make these movements
  - ☐ Foreground and background scenery
- ☐ Day 8 to 11 - Build your Automata - You'll have 4 days to build your scene. If you would like custom cams, you should email your stls to the instructor quickly so that they can be printed.

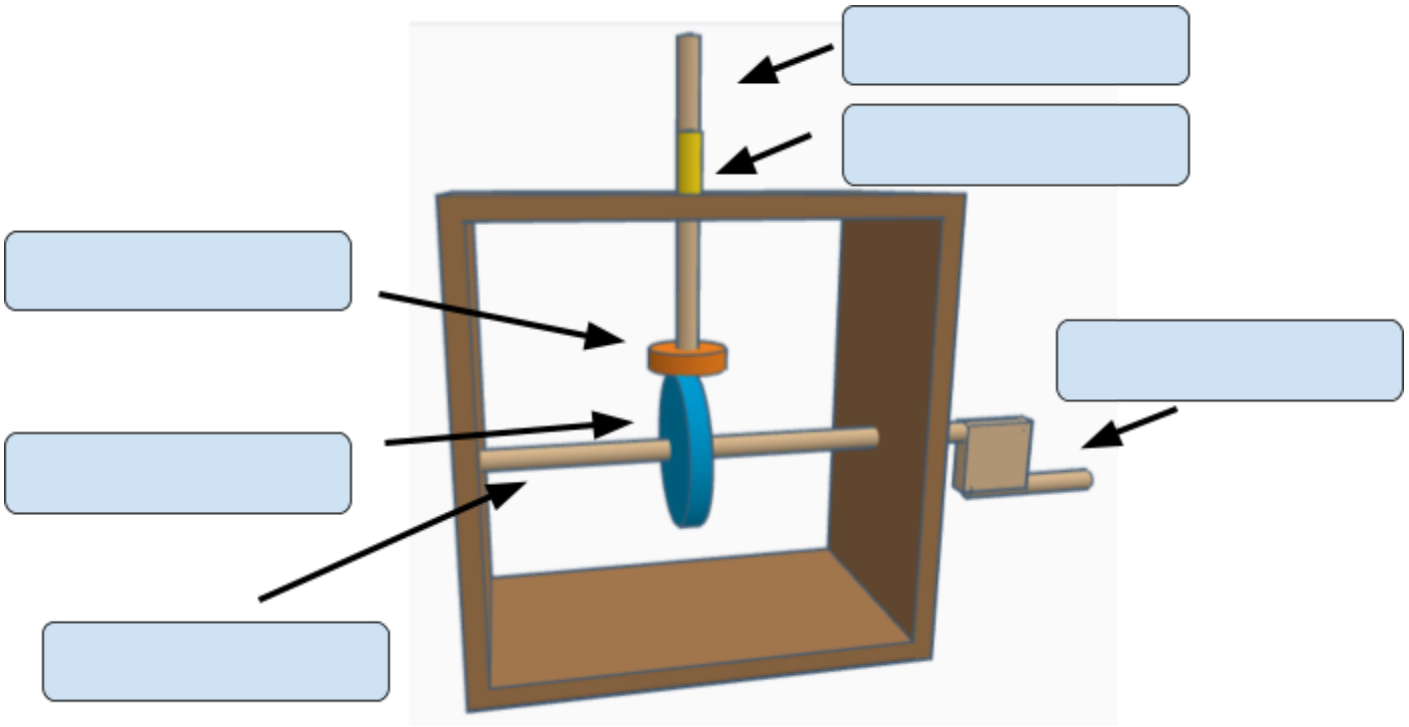
Automata Project Checklist:

- ☐ Day 1 - Automata Edpuzzle - Learn about the basics of automata and how you will build one
- ☐ Day 2 to 3 - Inventor Biography - Using internet research or other sources, complete the Inventor Biography Research
- ☐ Day 4 - Build your Automata Base
- ☐ Day 5 to 6 - Complete Automata Mechanics Research
- ☐ Day 7 - Brainstorming - Based on your research and the mechanics activity, brainstorm ideas for your automata. Your brainstorming should be done in your Engineering Design Notebook.
- ☐ Day 7 - Design - Choose your favorite idea and make a design of your automata. It should include a labeled diagram of your automata and should show the following:
  - ☐ The invention and scene you are depicting
  - ☐ At least 2 separate movements and the cams you are using to make these movements
  - ☐ Foreground and background scenery
- ☐ Day 8 to 11 - Build your Automata - You'll have 4 days to build your scene. If you would like custom cams, you should email your stls to the instructor quickly so that they can be printed.

Automata Guided Notes:



Automata Guided Notes:



Inventor Biography Research

(Posted into Canvas)
Instructions:

<u>This is an individual assignment. Once you have chosen your inventor, each of you will answer the questions separately.</u>

With your partner, choose one of the following Inventors below to research. You will be using this inventor / invention as the subject of your automata.

- Mary Anderson - Inventor of the windshield wiper.
- Patricia Bath - Pioneered the field of laser cataract surgery.
- Alexander Graham Bell - Invented the telephone.
- Karl Benz - Built the first practical gasoline-powered automobile.
- Otis Boykin - Patented an improved electrical resistor used in radios and computers.
- Marie Van Brittan Brown - Invented the home security system with closed-circuit television (CCTV).
- George Washington Carver - Developed over 300 uses for peanuts, including peanut butter.
- Josephine Cochran -Inventor of the first commercially successful automatic dishwasher.
- Mark Dean - Co-invented the first IBM personal computer and the color PC monitor.
- Thomas Edison - Invented the electric light bulb.
- Alexander Fleming - Discovered penicillin, the first widely used antibiotic.
- Benjamin Franklin - Invented the lightning rod.
- Robert Fulton - Developed the first commercially successful steamboat, the Clermont.
- Temple Grandin - Known for her innovations in the design of humane livestock handling facilities.
- Johannes Gutenberg - Invented the printing press.
- Edward Jenner - Pioneered the smallpox vaccine.
- Lonnie G. Johnson - Invented the Super Soaker water gun.
- Stephanie Kwolek - Discovered and developed Kevlar.
- Hedy Lamarr - Known for co-inventing an early form of frequency hopping, which laid the groundwork for modern wireless communication technologies.
- Guglielmo Marconi - Invented the radio.
- Elijah McCoy - Invented an automatic lubrication system for steam engines, known as the "Real McCoy."
- Garrett Morgan - Invented the traffic signal and a smoke hood (early gas mask).
- Samuel Morse - Invented the Morse code and co-developed the telegraph.
- Louis Pasteur - Developed pasteurization and made significant contributions to the field of microbiology.
- James Watt - Improved the steam engine.
- James West - Co-invented the electret microphone used in telecommunication devices.
- Eli Whitney - Invented the cotton gin.
- Wright Brothers (Orville and Wilbur Wright) - Invented and built the first successful powered aircraft.

Questions:

1. What is your inventor's name?
2. When was your inventor born?
3. Where was your inventor born?
4. What was your inventor's early life like?
5. When did your inventor create his / her invention?
6. What was being used before your inventor created his / her invention?
7. What did your inventor see as a "pain point"?
8. What did the invention do differently that removed this "pain point"?
9. Name one previous technology that the inventor used to create his / her invention.
10. What was the impact of the invention on society?
11. How has the invention changed since it was invented?

Mechanics Research Activity

Name:_____ 1st / 2nd Encore

Cam	Describe the motion of the vertical rod	How can this motion be used in your automata?
Round (off-center)		
Eccentric (use 2)		
Egg		
Snail		
Elliptical		

Mechanics Research Activity

Name:_____ 1st / 2nd Encore

Cam	Describe the motion of the vertical rod	How can this motion be used in your automata?
Round (off-center)		
Eccentric (use 2)		
Egg		
Snail		
Elliptical		

Mechanics Research Activity

Name:__Teacher Notes_____ 1st / 2nd Encore

Cam	Describe the motion of the vertical rod	How can this motion be used in your automata?
Round (off-center)	When placed slightly off-center, will turn the vertical rod in one direction.	
Eccentric (use 2)	Used in pairs offset in opposite sides, causes the vertical rod to turn in one direction, and then in the other direction.	
Egg	Keeps the vertical rod low for most of the turn of the crank and then lift it briefly before slowly bringing it down again.	
Snail	Raises the vertical rod slowly, then drops it sharply.	
Elliptical	Raises and lower the vertical rod twice for each rotation of the crank.	

Mechanics Research Activity

Name:_____ 1st / 2nd Encore

Cam	Describe the motion of the vertical rod	How can this motion be used in your automata?
Round (off-center)		
Eccentric (use 2)		
Egg		
Snail		
Elliptical		

Inventor Automata Design Rubric

Names:_____ 1st Encore / 2nd Encore

Areas for Improvement	Criteria	Evidence for Meeting Standard
	Design represents the chosen inventor / invention.	
	Design is neat and labeled.	
	Design is unique and shows creativity.	
	Design shows at least 2 mechanical movements, how they operate, and how the cams will work.	
	Design shows foreground and background for the scene.	

Final Design Score: _____

Inventor Automata Design Rubric

Names:_____ 1st Encore / 2nd Encore

Areas for Improvement	Criteria	Evidence for Meeting Standard
	Design represents the chosen inventor / invention.	
	Design is neat and labeled.	
	Design is unique and shows creativity.	
	Design shows at least 2 mechanical movements, how they operate, and how the cams will work.	
	Design shows foreground and background for the scene.	

Final Design Score: _____

Automata Project Reflection Questions

(Posted into Canvas)

1. In your own words, explain who your inventor is.

2. In your own words, explain what the invention is and why it was important.

3. In your own words, explain what your scene is and how your automata works.

4. What was your biggest challenge in completing your automata?

5. How did you overcome this challenge?

6. If you could improve one thing about your automata, what would it be?