There's Still Time!

Subject Area(s) Science and Technology

Associated Unit

Associated Lesson

Activity Title There's Still Time!

Image 1

Image file: https://www.flickr.com/photos/charlie23/2013755816

ADA Description: This is a picture of a mother Florida Panther standing next to a pond with her cub. The mother looks like a mountain lion because of the similar big cat features, tan color and short-hair. The mother's dark pupils are fixed on the camera. She is approximately 3 feet in height or close to a meter. Her left side is facing the camera. Her body can be described as 'thin and sunken-in" so that her shoulder blades protrude from the top of her back Her thigh bone of the back left hind leg is visible as well. Her long tail hangs low to the ground and is only visible in sections because it is curled around a fist full of tall brown wheat grass. There are also spots over her left side, a shade darker than the rest of her fur. Her cub's tan color is covered in dark-brown unequally- sized- random spots. The cub stands in a curious alert posture as well with its furry-rimmed ears and somewhat curved tail looks in the direction of the mother panther. The cub height is about ½ the size of his mother and stands about chin length of the mother. .

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Grade Level Media Center Resource (K-5) Plan is for 3-5

Activity Dependency

Time Required 405 minutes. This activity is divided into 9 classes which includes the Motivation: 45 minutes each due to length of class. I suggest at least 60 minutes if possible.

Group Size 18-24

Expendable Cost per Group US $1 x 300 students = $300.00

Summary

What will happen if Florida loses its state animal? I do not want to imagine that, would you? In this activity, students research the endangered Florida Panther in search for the number one cause of death. Students learn and apply the steps of the Engineering Design Process in loop order as they seek a solution to help the Florida Panther from further endangerment. Problem-solving skills, brainstorming ethics, and team building skills are practiced from day one and used throughout this project-based activity. Teams are interacting, discussing, and brainstorming a solution to a Defined Problem after watching motivational videos. Students discover that automobile accidents are the number one cause of death of the Florida Panther. Students use resources such as, books, magazines, and digital resources available to explore information that will prepare them to find the best solution that will help decrease the number of Florida Panther deaths. Students switch to researching for solutions. Once all data is gathered on both the Florida Panther and existing solutions for animals, students begin to create 3D models with objects such as blocks, Legos, straws, cardboard, etc. to explore for an effective design. Once students are satisfied with their models, , students are introduced to additive manufacturing or 3D printing and are given opportunities in class to work with 3D software that engineers use to draw prototypes. Students have options and may use Tinkercad, drafting paper, Thingiverse, and pictures of their Lego or Bock 3D

model. Students will show their creation to their teammates and discuss the positive aspects of each design. Students will synergize by creating one prototype that has the positive aspects of every team member's design. Students will use 3D pens to create their new prototype. As part of each team's presentation, students will create a Google Slide Presentation to present their research and solution that they believe will reduce the number of Florida Panther deaths caused by automobiles. This EDP integrated activity is built around learning of and meets the national science foundation standards. *This engineering curriculum meets the Next Generation Science Standards (NGSS).*

Engineering Connection

Engineers find solutions to problems by following the Engineering Design Process (EDP). Solutions are found through researching, planning, designing, creating, collecting data and iterating the process. There are many types of engineers while some work to help animals and habitats. Engineers ask questions, use their problem-solving skills by conducting experiments numerous times before a successful solution is developed. For an engineer Failure equals opportunities so it's impossible to fail, as failure is a critical part of he EDP and provides opportunity to gain knowledge. This knowledge is the result of the data which communicates what is working and what is not working. It's evident that engineers never say "I give up" because of their empathy and drive to help others. The engineering mindset of delayed gratification demonstrates the rewards of effort, perseverance, and creativity to finally find the best solution. To achieve the best solution, engineers rely on other engineers' successes and collaborate with other engineers. Without this type of interaction, engineers would waste valuable time re-creating solutions that have proved to be unreliable. Many engineers today use 3D printing to create prototypes of their end solution to a problem.

Engineering Category

Engineering Design Process Category #3

Keywords: 3D printing or additive manufacturing, brainstorming, data collection, delayed gratification, design software, engineering, engineering challenge, Engineering Design Loop, engineering mindset, Florida Panther, habitat, indicator, Iterate, measurement, problem-solving, research, solutions, and time constraint.

Educational Standards

State STEM Standards

ISTE Standards 3-5

1-3a Empowered Learner - Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.

3d Knowledge Constructor - Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

4a Innovative Designer - Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

6d Creative Communicator - Students publish or present content that customizes the message and medium for their intended audiences.

ITEEA Standards

3-5: Design Standard 9. Students will develop an understanding of engineering design.

3-5: The Designed World Standard 19. Students will develop an understanding of and be able to select and use manufacturing technologies.

3-5 Standard 8 – Students will develop an understanding of the attributes of design.
In order to realize the attributes of design, students in grades 3-5 (ages 9-11) should learn that

C. The design process is a purposeful method of planning practical solutions to problems. The design process helps convert ideas into products and systems. The process is intuitive and includes such things as creating ideas, putting the ideas on paper, using words and sketches, building models of the design, testing out the design, and evaluating the solution.

D. Requirements for a design include such factors as the desired elements and features of a product or system or the limits that are placed on the design. Technological designs typically have to meet requirements to be successful. These requirements usually relate to the purpose or function of the product or system. Other requirements, such as size and cost, describe the limits of a design.

NGSS Standards

Grade 3

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations. [High]
SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups. [High]
SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted. [Moderate]
SC.3.N.1.4 Recognize the importance of communication among scientists. [Moderate]
SC.3.N.1.5 Recognize that scientists question, discuss, and check each other's evidence and explanations. [Moderate]
SC.3.N.1.6 Infer based on observation. [High]
SC.3.N.1.7Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena. [High]
SC.3.N.3.1Recognize that words in science can have different or more specific meanings than their use in everyday language; for example, energy, cell, heat/cold, and evidence. [Moderate]
SC.3.N.3.2 Recognize that scientists use models to help understand and explain how things work. [Low]
SC.3.N.3.3 Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations. [Moderate]

Grade 4

SC.4.N.1.1 Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations. [High]
SC.4.N.1.2 Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups. [High]
SC.4.N.1.3 Explain that science does not always follow a rigidly defined method ("the scientific method")

but that science does involve the use of observations and empirical evidence. [Moderate]
SC.4.N.1.4 Attempt reasonable answers to scientific questions and cite evidence in support. [High]
SC.4.N.1.5 Compare the methods and results of investigations done by other classmates. [Moderate]
SC.4.N.1.6 Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations. [High]
SC.4.N.1.7 Recognize and explain that scientists base their explanations on evidence. [Moderate]
SC.4.N.1.8 Recognize that science involves creativity in designing experiments. [Moderate]
SC.4.N.2.1Explain that science focuses solely on the natural world. [Moderate]
SC.4.N.3.1 Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model. [Moderate]

Grade 5

SC.5.N.1.1 Links to an external site. Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. [High]
SC.5.N.1.2 Explain the difference between an experiment and other types of scientific investigation. [Moderate]
SC.5.N.1.3 Recognize and explain the need for repeated experimental trials.[Moderate]

SC.5.N.1.5 Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method." [Moderate]
SC.5.N.1.6 Recognize and explain the difference between personal opinion/interpretation and verified observation. [Moderate]
SC.5.N.2.1 Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence. [Moderate]
SC.5.N.2.2 Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others. [Moderate]

CCSS Standards Grades 3-5

MAFS.3-5.MD.1.a Understand how to use a ruler to measure length to the nearest inch.
a. Recognize that the ruler is a tool that can be used to measure the attribute of length.
b. Understand the importance of the zero point and end point and that the length measure is the span between two points.

Media Literacy Standards

AASL Standards:

Grades 3-5
1.1.1 Follow an inquiry-based process in seeking knowledge in curricular subjects and make the real world connection for using this process in own life.
1.1.2 Use prior and background knowledge as context for new learning.
1.1.3 Develop and refine a range of questions to frame search for new understanding.
1.1.6 Read, view, and listen for information presented in any format (e.g., textual, visual, media, digital) in order to make inferences and gather meaning.

FINDS: 3-5 Florida's Library Media Research Model, incorporates research skills that are imbedded in the Florida Standards and provides a framework for the application of these standards through a sequential research process.

- Focus on information need
- Investigate resources to search for answer
- Note and evaluate facts and ideas to answer the question
- Develop information into knowledge for presentation
- Score presentation and search process

K-5 Gifted Standards:

3. By graduation, the student identified as gifted will be able to conduct thoughtful research/exploration in multiple fields.

1) Use a variety of research tools and methodologies.
2) Use and manipulate information sources.
3) Detect bias and reliability in the process of research.
4) Apply ethical standards to research and analyses.

4. By graduation, the student identified as gifted will be able to think creatively and critically to identify and solve real world problems.

1) Identify and investigate a problem and generate supportive arguments from multiple perspectives of a complex issue.
2) Analyze the relevance, reliability, and usefulness of data to draw conclusions and forecast effective problem solutions.
3) Use and evaluate various problem-solving methods to determine effectiveness in solving real-world problems.
5: By graduation, the student identified as gifted will be able to assume leadership and participatory roles in both gifted and heterogeneous group learning situations.

Prerequisite Knowledge

Basic computer skills using a windows environment including, Chrome, Google Browser, Google Email, Google Classroom, Google Earth, Google Slides, Access and knowledge of resources in Edutone (County website resources) includes Brain Pop, Brain Pop Jr., Alachua County Public Library, PBS Learning, Discovery Education, Tumblebooks, My Media Center, Kiddle, Kids Infobits. Students should already be introduced to internet safety, website evaluation skill sets, citing information, and knowledge of Florida Department of Education's FINDS Research Process.

Learning Objectives

After students have completed this activity, students will have demonstrated the Engineering Design Process meeting the following objectives. Students restate the objectives as "I Can work individually and within in a team to …"

- complete a design challenge focusing on and following the EDP loop.
- research information for an defined problem and solution using Media Center resources.
- plan and organize data using a lab notebook.
- present facts and a solution to help the Florida Panther and its habitat using Google Slides.

- create a prototype of a solution using a 3D pen,

Materials List

Team Materials: 4 team members (4 to 6 teams) Some materials are located in the mini-laboratories while most are provided on team tables.

1. Lab notebooks
2. pencils
3. erasers
4. colored pencils

1 per team or 1 per mini-laboratory: whatever you have available.

5. 3D Doodler Create 3D Printing Pen Set with extra filament.
6. Books and magazines about the Florida Panther,:
    - Florida Panther by Barbara A. Somervill
    - The Endangered Florida Panther by Margaret Goff Clark.
    - Panther: Shadow of the Swamp by Jonathan London; illustrated by Paul Morin.
    - 3D printing : science, technology, engineering / by Steven Otfinoski

8. anchor charts:
    - Brainstorming Tips (a set of cards for each team)
    - Engineering process poster (for classroom)
    - Works Cited anchor chart maps Google classroom resources: (one for each student)
    - Who, What, When, Where Anchor Chart (I created cards and hung up for student take away)

Digital Access to: Google Classroom, School Email, and Edutone: School Board Single Sign On Websites which includes, Alachua County Public Library, Brainpop, Brainpop, Jr., Discovery Education, Gale, Kiddle, Kids Infobits, My Media Center, PBS Learning Media, Tumble Books and World Book.

1. Blocks
2. Legos

Links in Google Classroom: *add them as you want to introduce them to be used as resources.

3. Thingiverse
4. https://interestingengineering.com/10-beautiful-wildlife-crossings-around-world
5. Florida map showing topography
   https://www.bing.com/images/search?view=detailV2&ccid=zRm%2F3DB7&id=037C5E880BC16F389330565C3EFF6CA64CF8C516&thid=OIP.tE01J5akGRdt6gLQ5Yq-4QHaHa&mediaurl=https%3A%2F%2Fwww.worldatlas.com%2Fwebimage%2Fcountrys%2Fnamerica%2Fusstates%2Flgcolor%2Fflcolor.gif&exph=643&expw=643&q=Printable+Map+of+Florida&simid=608045265591864824&selectedindex=45&ajaxhist=0
6. Florida map showing legend:
   http://www.free-largeimages.com/wp-content/uploads/2014/11/Florida_map.gif

7. Blank Florida Map Students will use the following blank map to demonstrate their understanding of where the Florida Habitats are: https://i.pinimg.com/originals/c8/2d/19/c82d19e09c883b17b69ddfdeafe7fa8c.jpg
8. Florida map showing Big Cypress Reserve area: Post in area https://moon.com/wp-content/uploads/2013/07/06_01_Everglades.jpghttps://www.conservancy.org/our-work/policy/florida-panther http://wfit.org/post/signs-panthers-trail

- Game Board with vocabulary "Help the Florida Panther Cross the Road" (optional-early finishers) http://www.makinglearningfun.com/t.asp?b=m&t=http://www.makinglearningfun.com/Activities/Chickens/RosiesWalk/RosiesWalkFun/RosiesWalk-Fun-board-4.gif
- Florida maps: Florida map showing all of the counties: http://www.kidswellflorida.org/wp-content/uploads/2012/10/FloridaMap2.png
- Florida map showing all of the major highways: https://www.bing.com/images/search?view=detailV2&ccid=bUFW2wk3&id=3676045FC2C17D0B02FC0E5AB0851D581B1239A6&thid=OIP.bUFW2wk3cjuPZGixeQwFpQHaHB&mediaurl=http%3a%2f%2ffreeprintablemaps.w3ec.com%2fwp-content%2fuploads%2f2009%2f02%2ffloridaroadmapxxxpy7.gif&exph=711&expw=750&q=Printable+Map+of+Florida&simid=608035159555903380&selectedIndex=18&ajaxhist=0
- Florida map showing Lake Okeechobee and the Everglades: http://i.pinimg.com/736x/cf/f4/59/cff4594e3637ab9466e6db96e823063e.jpg
- Florida map showing everything all together: 3-5 https://www.bing.com/images/search?view=detailV2&ccid=F7lO6gRA&id=DFE97D244909CFEC783C8AC91D532E6EEC2C2E1A&thid=OIP.YyDRfVipkhyR-SOxevkXsQHaFm&mediaurl=https%3A%2F%2Fwww.tripinfo.com%2Fmaps%2FFL.gif&exph=871&expw=1152&q=Printable+Map+of+Florida&simid=608024568172249908&selectedindex=43&ajaxhist=0
- **Tinkercad https://www.tinkercad.com/#/**

Teacher Daily Materials:

1. Chart paper
2. Marker
3. Projector
4. Lady Bug
5. The Design Process anchor chart
6. Random Sticks to call on students
7. Computer

Introduction:

Motivation and Day 1

Teacher Materials:

1. https://thinklikeanengineerproject.com/the-engineering-design-process/

video about teach engineering design process loop: (1:46).

2. *Video: Discovery Education Jeff Corwin video, called, "Florida Panther"(2.13)*
3. *Video: PBS Learning, "The Kratts Search for a Florida Panther"(26 minutes - divide into 2 classes)*

Day 2

Teacher Materials:

1. Google Earth and/or Google Maps
2. Video, *"Exploring the Everglades, and*
3. *"What is an Engineer?*
4. Brainstorming anchor charts and team discussing prompts: Provide each team with the following laminated cards:

Day 3

1. Video: *Exploring the environment*

Day 4

1. Video: Teach Engineering's "Shapes of Strength"
2. 3D manipulatives:
    a. Lincoln Logs
    b. Legos
    c. Blocks

3. *Digital Resources:*
    Tinkercad.com
    Thingiverse.com

Day 5 Rulers

Day 6

1. *Imationation Lab:* 3D Pens
2. *Digital Resource*: Google Classroom Video: Kids Learn 3D Printing (1:53)

Day 7

1. *Exploration Lab:* Prototype materials: straws, tape, ribbon, cardboard,
2. *Imagination Lab:*

Day 8

1. Presentations
2. Post-Test
3. Display Team Badges

Introduction / Motivation

Essential Question: In what ways can the Engineering Design Loop help the Florida Panther?
Students Learning Goal is to find answers to questions using informational videos and log them in their laboratory notebooks.

Whole Group:

The setting: Greet students wearing Personal Protective Equipment (PPE) such as a lab coat, exam gloves and eye-protective goggles . Have tables set up as mini-laboratories with microscopes, magnifying glasses and other materials you may find that scientists and engineers use, Engineering Anchor Charts and pictures of the Florida Panther.

Explanation of an Engineering Laboratory:

1. Before students enter the media center, instruct them to walk in at a level 0 (no talking), so students can use all of their senses to observe the classroom.
2. After students are seated at their team tables. Seek answers to questions, writing the answers and drawing the answers on chart paper as students answer: 1. What kind of observations did you make? 2. What kind of setting are we in? I use random calling sticks or a spin the wheel to call on students after they whispered (level 1) possible answers to teammates. Many students will make the connection to a 'laboratory' after their observations and seeing the answers of the questions.
3. Explain that the library's theme of our Media Center this year is *"Foster Steers for Engineers!"* as a peppy slogan for this project. Explain that the slogan summarizes our culminating activity over the next 8 classes:
4. **Activity Timeframe:** Explain that this is a process and will not happen in just one class. It is planned for 8 more classes for the 45 minutes class period which is time constraint.
5. When students walk through the library door, they are an engineer, part of a research team and are ready to identify a need to solve using the Engineering Design Process. We will focus on what is called the Engineering Design Process Loop. There will be an Engineering Design Challenge where students is to create a prototype of an object that will help the Florida Panther, our state animal, from going extinct.
6. To focus in meeting this challenge, we have turned the media center into mini-engineering laboratories, aka stations or centers.
7. Show and briefly introduce the Engineering Design Process anchor chart. For now, we will just focus on the first step. https://thinklikeanengineerproject.com/the-engineering-design-process/
8. Refer to the Bullseye Knowledge Growth Chart that helps students gather data for their background knowledge before and at the end of each class: For example, the subject today is *The Engineering Design Process:* 0- I never heard of it 1-I have heard of it 2-I have heard of it and have done it once or twice so I may need help, 3-I know enough about the subject that I can figure it out. 4-I know this subject well enough that I can teach it.. Have students find their number so they can compare their number at the end of the activity to measure their growth. The goal would be to reach the bullseye which is a 4. Students can log this into their Lab Notebooks.
9. Once students check their knowledge about the Engineering Process, provide students with a pre-test. (10 questions).
10. Continue to go over the Engineering process poster, pointing out the first step: Show video about teach the engineering design process loop: (1:46).
    a. What is an engineer? Give students time to collaborate and come up with the correct answer to this question, providing traits to identify what an engineer does, how they look, etc., Show: The first step of the Engineering Design Process (EDP) (point out on anchor chart) and explain that these are the steps we will follow to design something.. To do this engineers have to **ASK questions that are specific to the issue:** What is the problem? **What are your constraints?**
    b. Due to our time constraints, I created a design challenge that includes the steps of the engineering design process. This is what engineers use to solve real-world problems. I chose a problem that is a global responsibility in the state of Florida. Instruct students to start thinking like an engineer and remember key events, they will log them in their lab notebook. Briefly discuss the notebook connecting it to engineers.

Explain Structure

11. In the engineering challenge, students work in teams and together will help each other gather information students need to accomplish the challenge. Sometimes students may be working with the same team, but sometimes students will need to split up (Jigsaw) and spread out among the mini-laboratories so a team meeting at the end of class is necessary to share information, Have students create a K-W-L chart in their lab notebooks about the Florida Panther and complete the K and W sections.
    a. Explain that engineers ask questions such as: Who, What, Where, When, How and Why (show anchor chart and individual laminated labels). Complete the What together.
    b. Have students write down questions under the W of their K-W-L chart using the words above.
    c. Explain that the videos will be showing will be used for research.Show video which takes us into the Florida Panther habitat. The video is from Discovery Education and Jeff Corwin virtually takes us into the Everglades where we learn more about the Florida Panther. (2:16)
    d. Engineers look for information and write down and/or draw everything in one organized location, the lab notebook. Have students log what they learned in the L section of their chart which will be their lab notebooks, do the same after the Kratts Video.
    e. The Kratts Search For the Florida Panther (26 minutes total, view first 10 minutes. Tell students that our goal today is to learn more about the Florida Panther so that we can come up with a plan to help them.

Vocabulary / Definitions Florida Panther

Word	Definition
endangered	a species that is declining in population size and is near extinction
extinction	the complete disappearance of a species from Earth
mitigation	the return an ecosystem to the way it was prior to a disturbance; the act of making a situation less severe, hostile, or harsh.
predator	a living organism that relies on another living organism as a food source; *e.g.* a panther is a predator that relies on deer as a food source.
prey	a living organism on which another living organism relies as a food source; *e.g.* a deer is prey for a panther.

Vocabulary / Definitions Engineering Design Process

Word	Definition
brainstorming	a group problem-solving technique that involves the spontaneous contribution of ideas from all members of the group
constraint	something that imposes a limit or restriction or that prevents something from occurring
empathy	when you're able to understand and care about how someone else is feeling
iterate	the act of repeating; a repetition
solution	an action or process of solving a problem

Procedure
Background

1. Before the Activity

7. Ensure that the media center or classroom is equipped with fully functional mini laboratories (consists of a table and science board) with pencils, paper, rulers, timer, anchor charts and other necessary items needed at particular stages of the EDP.
8. Plan for a primary and intermediate to work together for the first and last 2 steps of the Engineering Design Loop. (3-5 will present their Google Slides to K-2 grades).
9. Ensure Teams are already in Cooperative Learning teams and know their leader positions within the team. Leaders are: Team Timekeeper/Manager Leader, Team Materials Manager Leader, , Team Recorder Leader, and Team Publicist Leader.
10. Plan for visitors for students to interview for research purposes.

2. With the Students

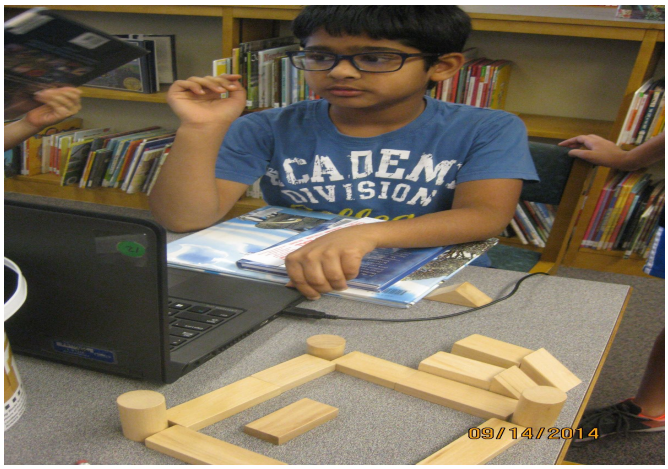
1. 

Figure 1

Image file:

ADA Description: student creating a model of a solution using 3D blocks

Source/Rights: © Leslie Williams. All rights reserved.

Caption: Collaborating during a Design Challenge

Daily Routines: The first few classes, teacher will model for class.

1. **PASSING OUT MATERIALS:** Have the *Materials Manager Leader* of each group distribute the materials to each member and explain that this will be completed upon arrival of each class and adds 1 minute to Beginning of Class Team Meetings.
2. **BEGINNING OF CLASS Team MEETING (BOC)** The *Team Presenter Leader* will use
    a. the Team Journal to review what was accomplished last class within teams,
    b. VOCABULARY: Discussed and Materials Manager Leader will look up words on dictionary.com for sounding, meaning and spelling.
    c. have students take out their K-W-L chart from their lab notebooks and write what they would like to know more about today on a freshly dated page.
    d. Have students make goals for the day on what they want to accomplish. The time constraint for this daily meeting is 5 minutes.
    e. **END OF CLASS Team MEETING (EOC):** At the beginning of the End of Class meeting, have the *Team Presenter Leader*
    f. share the results of the BOC meeting and ask team members to
    g. write in their individual lab notebooks, what was accomplished
    h. and what team members would like to see accomplished at next class. Use the Engineering Design Process. The time constraint for this meeting is 5 minutes.

3. **TEAM JOURNAL:** Have the *Team Journalist Leader* summarize the success of the team's progress in the "Team Journal." Just a few sentences:
4. **TIMER:** Have the *Time Keeper Leader* of each team use a timer set for 5 minutes for each meeting. It's okay if teams finish earlier. This position will also sets and monitors time for class activities. Class activities are approximately 30 minutes.
5. **BRAINSTORMING** -Remind students to use brainstorming techniques from the anchor cards provided in the materials bin. (Go over if necessary)
6. **Panther Badges** students can earn for every resource that they use and cite. The *Team Materials Manager* will stamp each team's Badge Sheet as needed by checking resource and cite information.

Day 1: Identify the need:
Student Learning Goal: Students will gather information about the Florida Panther using Step 1 of the Engineering Design Process.

Whole Group

1. Show the remainder of the Kratts Video, "*In Search of A Florida Panther"* having students continuing to record important new information in their Lab notebooks. (16 minutes)
2. After the video, tell students that now that we have watched a couple of *credible* sources about the dangers that the endangered Florida Panther faces everyday, (*Cite the works for students, reminding them how this is done and have them log the video information on the worksheet provided in their materials bin for the day in their notebooks).*
3. After class discussion about the video, ask students, what they believe is the #1 problem facing the existence of the endangered Florida Panther. Florida Panthers are hit by automobiles as people continue to build within the Florida Panther's habitat which could cause our state animal to become extinct.
   Mini-Laboratories:
4. *Digital Resources Lab*: Two team members search for information using digital resources such as websites about The Florida Panther that are placed in their Google Classroom,
5. *Reading Lab:* The other two team members will read and log information found in books, magazines and exploring with encyclopedias and other reference resources. Book: *"Panther: Shadow of the Swamp"* by Jonathan London; illustrated by Paul Morin" and "Felina's New Home:, A True Story about a Florida Panther." Magazines: Numerous editions of "Big Cats" magazine.
6. Both teams document their research in their lab notebooks remembering to document their resources on the Works Cited Worksheet.

Day 2 Research the Problem: Imagine and Brainstorm solutions and choose the best idea.
Students Learning Goal is to gather as much useful information from informational books and/or videos and write in their lab notebooks. Remind students to stay focused on the main ideas and look for articles and stories about Florida Panther and habitat that provide answers to who, what, where, why, or how questions.

1. Go over the next design element: **Students will Imagine like engineers:**
   a. Explain that engineers can't do it all alone, they need help from people in their team or other professionals. They have meetings and brainstorm ideas to help them find the best

solution. They work with a team that all want the same goal just like you are doing in your BOC and EOC meetings.

b. Brainstorming strategies are all a part of research. Have students use their brainstorming cards during team discussions. Have students come up with questions of information they need to know about the Florida Panther before they can help the Florida Panther. Have students write in their notebook. To get started, answer the "W" questions first. Divide up the cards: Who, What, When, Where, Why and How and have teams answer the questions based on learned knowledge. Example: Remind students that they can't answer these questions fully yet until they have completed their research. Some questions students can answer after looking over their Laboratory Notebooks.

Mini-Laboratories:

Reading Lab: Two students from each team will be responsible to read books from the list: Book *Panther: Shadow of the Swamp and other Big Cat books and magazines found in the Media Center. Felina's New Home, Works Cited Worksheet is provided with examples of different types of mediums.*

Digital Resources Lab: Two other team members will be working on the laptop researching through the approved websites. Students will pick and choose which resources they want to use. Students will use resources found in Edutone and Google Classroom.

a. Offer Tips, such as, as you find them:
   - *For example,* if using Kids InfoBits, complete a search for, "The Florida Panther" or the "Florida Panther Habitat." http://go.galegroup.com/ps/i.do?p=ITKE&u=alachuasb&id=GALE|A193509098&v=2.1&it=r&sid=ITKE&asid=8f008597
   - *As as example, use the "*District digital resources and go to https://www.flelibrary.com/ The Florida Electronic Library, complete a search for, "The Florida Panther." Show results.
   - Demonstrate using the below websites and go over the work cited guide sheet.
   - Students will find many different materials located in the Google Classroom to research the Florida Panther Habitat in addition to solutions.
   - Remind students to use https://www.kiddle.co/ search engine instead of Google.

5. **Take away**: Assign each team to answer one question giving each team one category: What, Who, When, Where, Why and How. Students will place the sticky notes on the wall underneath each heading as they walk out the door.

Day 3: **Develop possible solutions:**

Student Learning Goal is to find solutions that other engineers have found for similar issues that could help the Florida Panther's habitat to become more safe for Florida Panthers.

Step 3 of the Engineering Design Process

1. Refer to the Engineering Design Anchor Chart and Explain that now students know the defined problem, and are familiar of the causes of the defined problem, such as highways building they need to switch their research focus to developing a possible solution.
2. Explain that engineers goal is to generate possible solutions to questions. Engineers always researches to see what other engineers have designed to solve similar problems to see if they can use and tweak to fit their needs or improve upon other engineers' designs.

3. Bring up Google Earth and Google Maps to show students approximately where the Florida Panther Habitat is located.
4. Explain that in their Google classroom, students will have a link to the 10 most beautiful animal crossings in the world as an example. https://interestingengineering.com/10-beautiful-wildlife-crossings-around-world. http://go.galegroup.com/ps/i.do?p=ITKE&u=alachuasb&id=GALE|IRKVIV065370787&v=2.1&it=r&sid=ITKE&asid=0a01ebc1

Mini-Laboratories:
Digital Resources:

1. Students will look over the maps that I assigned to each team member in Google classroom.
2. They all have different information and each team member will write on the big map where everything is and discuss it with their team.
3. Students **map out** the Florida Panther's habitat on a map as well as **identify** other types of animals and plants, soil, water, etc., that make up the habitat.
4. Students need to **identify the highways or roads** in the Florida habitat that is the number one cause of death of the Florida Panther today. Prior to moving on, students must understand basic facts about the habitat.
5. Students will cite work before switching to a new website.

   Digital Resources Lab 2:

6. Students will research specific websites listed in the Google Classroom for information.
   a. Exploring the Environment: The Everglades http://www.cotf.edu/ete/modules/everglades/FEpanther.html
   b. http://dos.myflorida.com/florida-facts/florida-state-symbols/state-animal/

Take Away: Students will highlight one type of important information on a large classroom map, such as, highway locations, The Everglades, Big Cypress Swamp, and other important information that is in the Florida Panther's habitat.

Go over brainstorming rules (Anchor Chart)

- Positive comments only (Use cards to guide)
- All ideas will be recorded regardless if everyone agrees.
- Stay focused on the topic.
- Only one conversation at a time (may use talking stick if necessary).
- Build on the ideas of others.

Day 4: Build a Prototype: Use Imagination

Students Learning Goal is to use 3D objects to create possible solutions.

Step 4 of the Engineering Design Process

Whole Group:

Introduce key words: 3D printing and 3D design software such as Tinkercad. Refer to the Engineering Design Process anchor chart and explain that now they have an idea of what solution they feel will work, it's time to create a prototype.(1:35) Show the Teach Engineering video"*Shapes of Strength*" . Explain

that it is about how the shape of certain structures are stronger than others. Explain that engineers have to understand the function of their design and if it will be effective.

Imagination Labs consist of different materials to construct models.

1. Lego Lab
2. Lincoln Log Lab

Digital Resources Lab: Sign up and use Tinkercad to create 3D object. Students who do want to draw can look through Tinkercad's gallery for already made objects. Students can also use Thingiverse.

- Students will plan their design using blocks, Legos, play doh and other connecting devices you have on hand from your Makerspace such as straws, rubber bands, clips, cardboard, string, tape, etc.

Take Away: Students will draw their completed plan design and necessary information in their lab notebook.

Day 5: Construct a prototype: Create
Student Learning Goal: Students will come together as teams and construct a prototype of the team's best solution.
Step 5 of the Engineering Design Process

Once each team member has constructed a model or prototype:

1. teams will come together and use one positive factor from each team member's design. Once this is completed, students synergize to create one new solution. Teams will design and create a prototype of a solution to help the Florida Panther.
2. Students will work in teams using a tape measurement or ruler to measure out the size of the prototype to a specific size of 3"x3" unless teams used Tinkercad or draw to scale using graph paper, create their prototype.

Day 6: Test and evaluate prototype: Improve: Make Better if needed! There are no mess-ups!
Student Learning Goal: To Create a team prototype using 3D pens.
Step 6 of the Engineering Design Process

Whole Group

1. Tell students they are near the end of the Design Process, oh wait, it never ends.
2. Explain that this is the step that means engineers will Iterate steps or they have the best solution. Each group will get one pen so students will need to work as a team to plan which part each of the students will build.
3. Show something that was printed by a 3D printer.

Mini-Laboratories:
Digital Resources: Look in Google Classroom to view the video from CNN:
KIDS LEARN 3D DESIGN AND PRINTING https://www.youtube.com/watch?v=nHgY947uCbU. (1:53)
Exploration Lab: Explain to students that engineers have to use precise measurements when using rulers or design software.

1. Students need to use a ruler and ensure that their prototype is within 3" for the height, length and width. What measurement makes the object 3D - width is involved. Take the time to show students how to properly measure length and width and height of a 3D object. Have students practice measuring the measurements of 3 blocks using a ruler.
2. For students who need more assistance, have them watch the video "*Introduction to Standard Measurement for Kids: Measuring Length in Inches with a Ruler"* https://www.youtube.com/watch?v=VzW2sdCe228 in the Google Classroom.
3. Some students who use Tinkercad will not have to measure. The design program will do this for you.
4. For those using Graph Paper, use a ruler to find out how many squares equals to 1".

Imagination Lab:

5. Once measured out prototype, students will get to print the teams best solution prototype using a 3D Pen using a ruler to ensure the size fits the requirements.

Day 7: Communicate the Design
Step 7 of the Engineering Design Process
Student Learning Goal: Students will present their Google Slides Presentations.

Mini-Laboratories:
Digital Resources Lab:
Students may use half of the class to putting the finishing touches on their Google Slides presentation.
Imagination Lab: Other team members may complete the prototype.
Exploration Lab: For those who are finished: Can create a Florida Panther: Habitat game for primary grades.
Whole Group:

a. Begin the Team presentations, allowing approximately 7 minutes per team (there are 4 to 5 teams).

Day 8: Iterate:Redesign or continue making presentations.
Student Learning Goal: Students will present their Google Slides and prototype.
Step 8 of the Engineering Design Process

Whole Group:

1. Provide Post Engineering Test,
2. Display Panther Badge Sheets.

Attachments
Pre and Post Test: Engineering Test
Panther Resource Badge Sheet
Cover of Laboratory Notebook Sheet

Safety Issues
3D pens (heat) - use Laytex Free, vinyl exam gloves and goggles; however, I had no problems!

Troubleshooting Tips
All of the following need to be discussed and/or demonstrated prior to beginning the project:

- What to do when finished or need teacher's assistant for each lab

- Students need to be signed up for the Google Classroom prior to activity
- Have a plan to ensure all books used as resources are returned.

Investigating Questions

Florida Panther:

- Where does the Florida Panther live and why do they live there?
- What are some ways plants and animals meet their needs so that they can survive and grow?
- How are parents and their children similar and different?
- Are we continuing to build highways in the Florida Panther habitat?

Assessment

1. **Pre-Activity Assessment**

Teacher Created Engineering Pre-Test

Activity Embedded Assessment

Teams will create a Google Slide when introducing their models of their solution.

2. **Post-Activity Assessment**

Students will be given the same pre-test given at the beginning of the lesson.

Activity Extensions

Students who complete the labs, will have opportunities to explore and incorporate other scientific skills into their prototype. For example: circuits

Activity Scaling

All students have the opportunity to work comfortably at their own pace as they choose different activities with the same objective within the given time constraint.

Additional Multimedia Support

- Students will share their Google slides presentation with me via Google Classroom for feedback to let them know they're on the right track. Have students sign up for presentation dates and by order #. We allotted 2 days of presentations.

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Other

Redirect URL

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Classroom Testing Information

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Science Buddies. Project List.

https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-problem-statement?class=eMpOSoW-qEAJnqSbv2YS9CTP59D8AlzuqpKS0IgKcxFTaRijCR-F_w#checklist

https://www.education.com/download/worksheet/85475/longitude-latitude-florida.pdf

Habitat Protection For The Florida Panther © 2018 The Conservation Fund. All Rights Reserved.https://www.conservationfund.org/projects/habitat-protection-for-the-florida-pantherj 8/3/2018

https://defenders.org/save-florida-panther research.

I agree with

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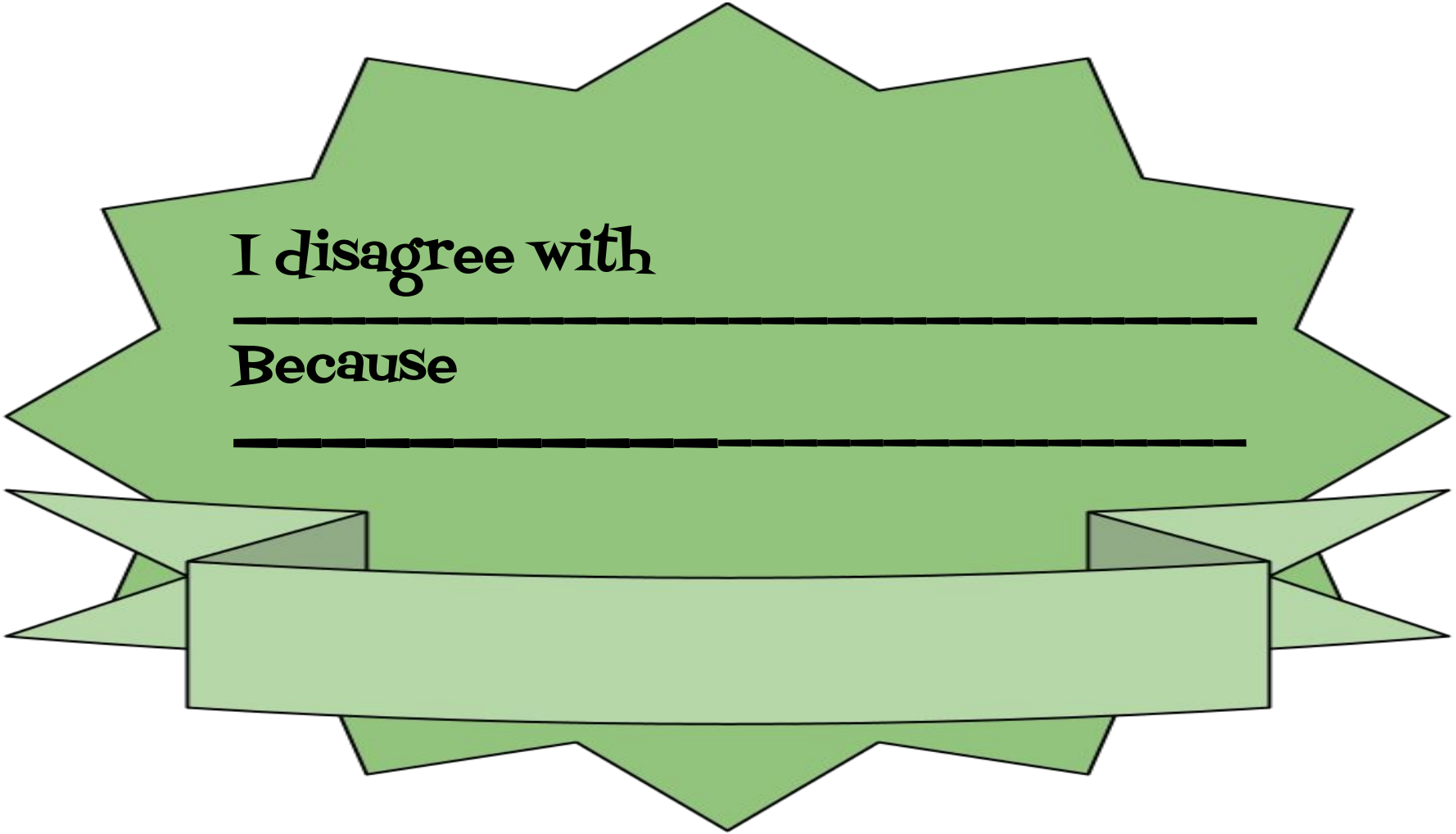
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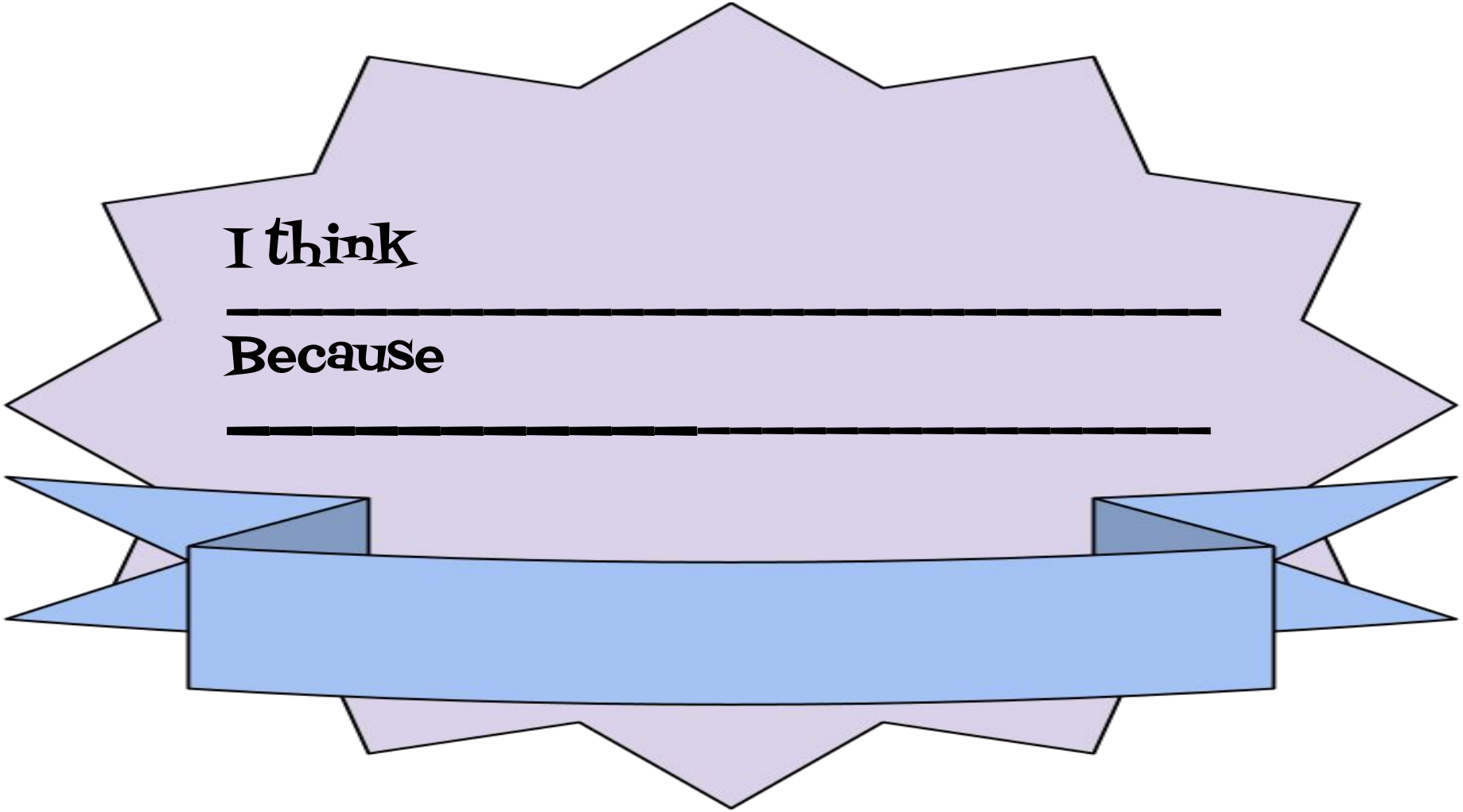
Because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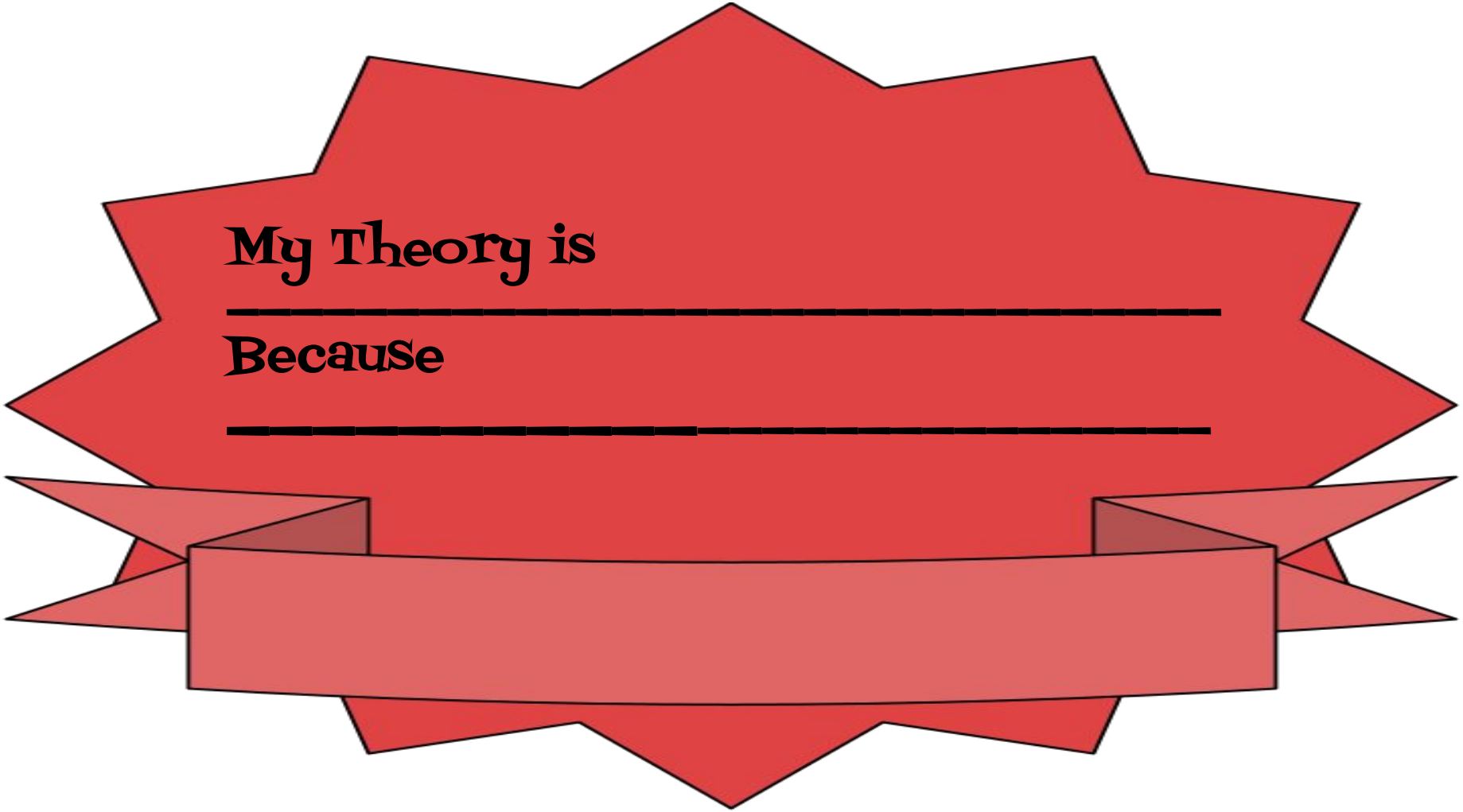
Because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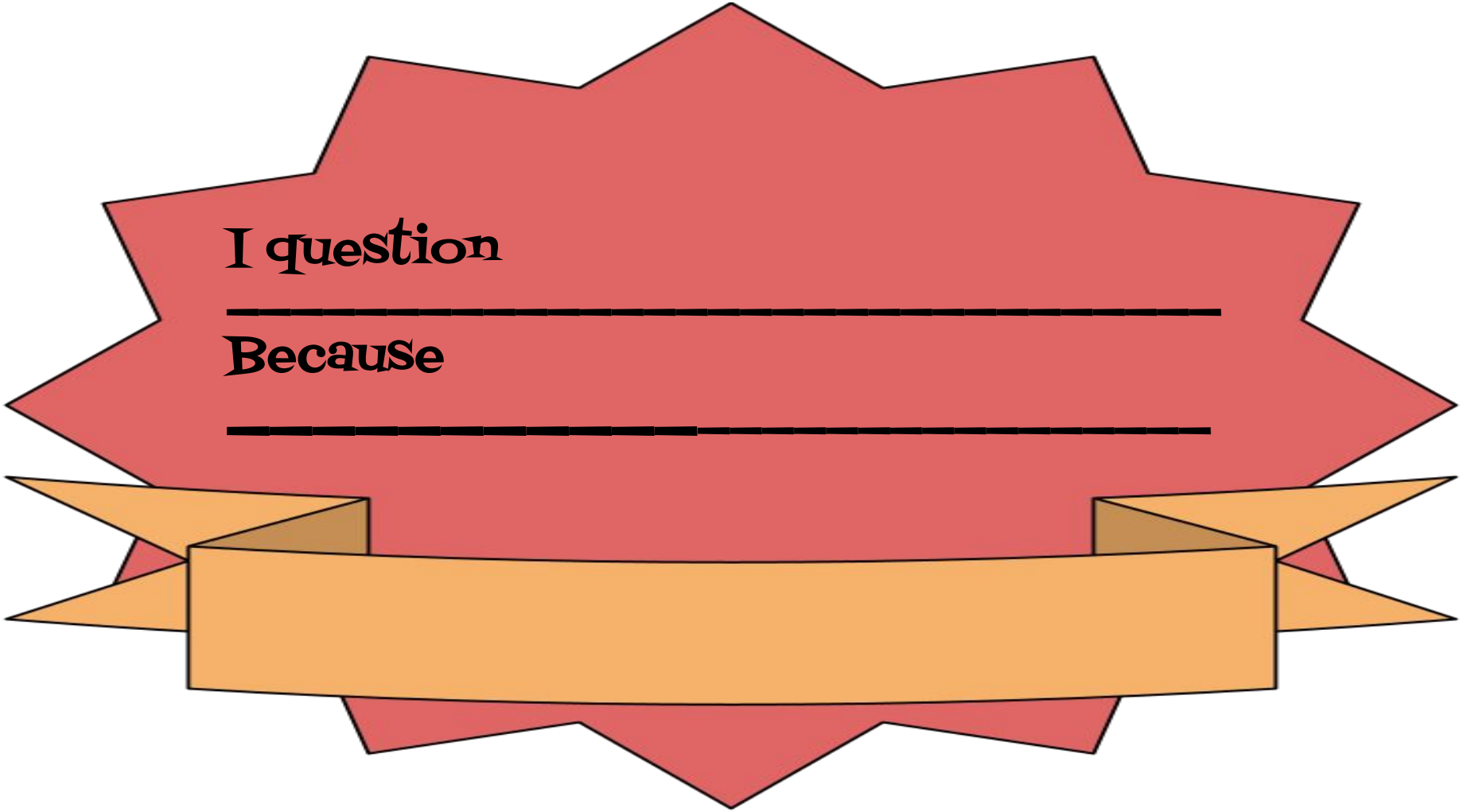
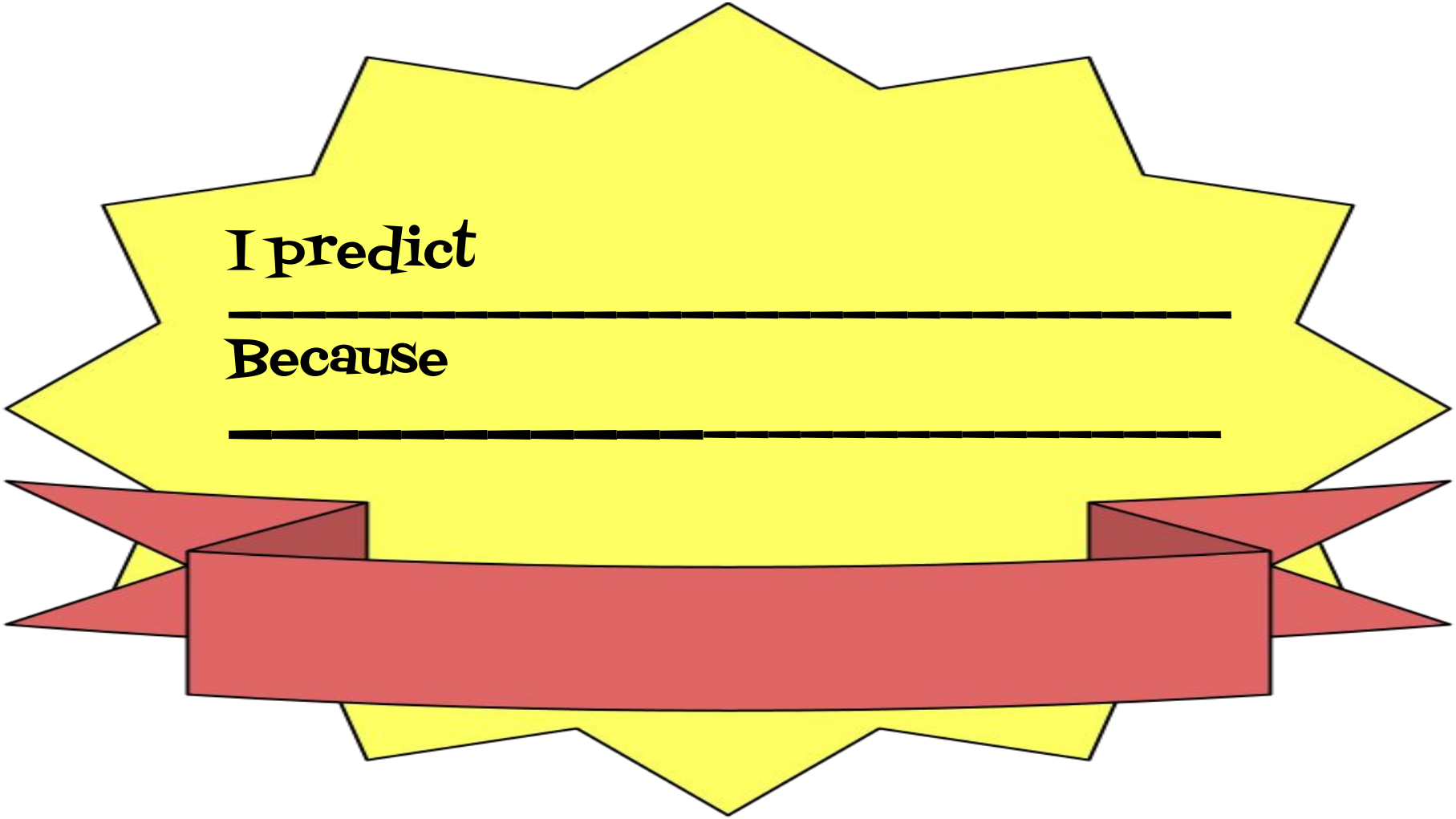
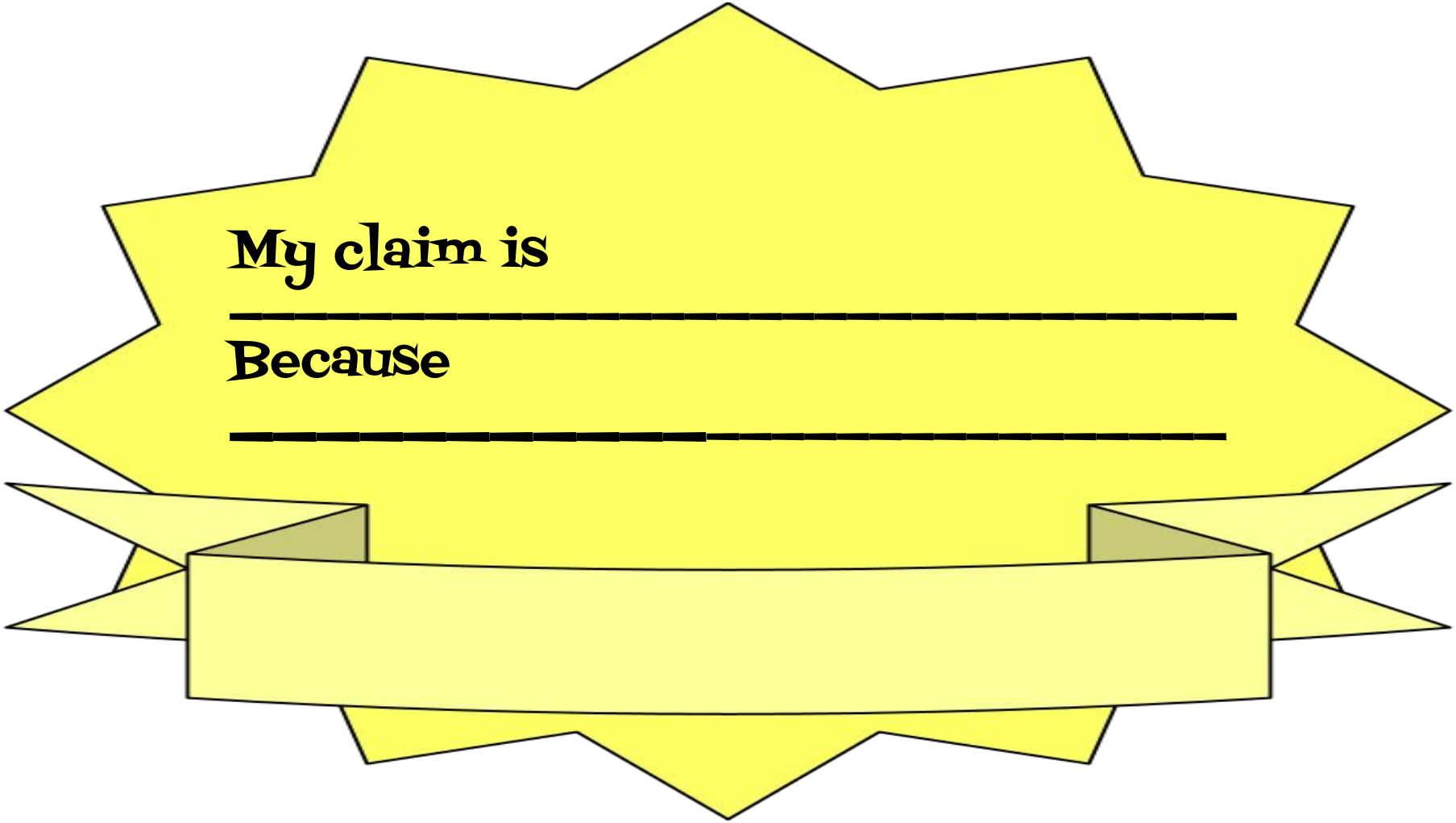
Because


I question
Because


I predict
Because


My claim is
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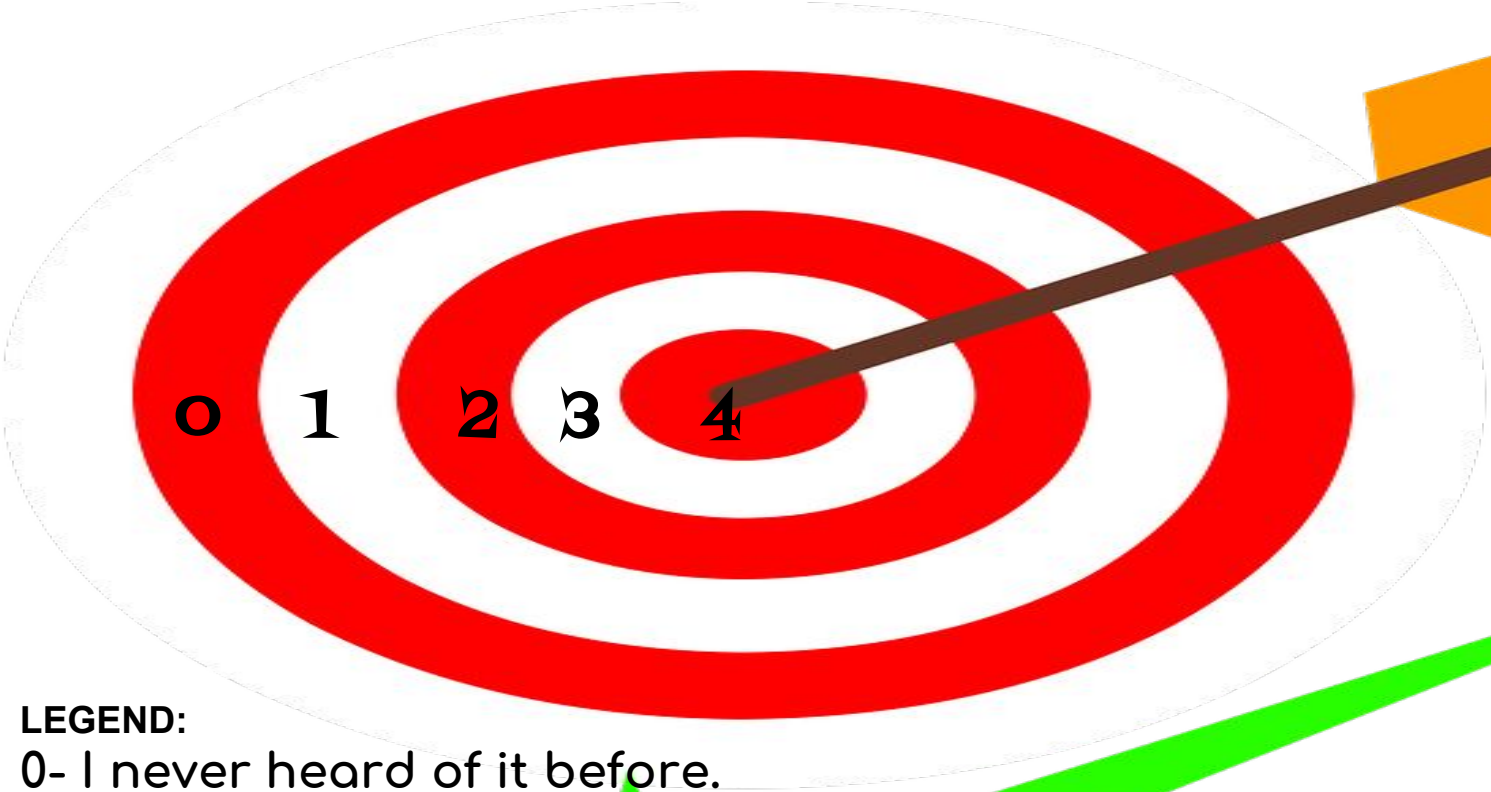

LEGEND:

0- I never heard of it before.
1- I have heard about it, but do not know much about it.
2- I have heard and used it before, but need help.
3- I have used it and need little help. I can figure it out.
4- I can teach it!

Name: _____ Date: _____

Engineering Design Process (EDP)Test

1. **In engineering, the design process begins when**
   a. data about an existing product is displayed
   b. new products are needed
   c. an engineer recognizes the need for a solution to a problem
2. **What is the first step of the Design process?**
   a. Define the Need
   b. Research the Problem
   c. Create Possible Solutions
3. **Which sentence is an example of time constraint?**
   a. Students will be able to work on project at their own pace.
   b. Students must keep an eye out on time so everything gets completed.
   c. There is ample amount of time for engineers.
4. **During a brainstorming session we want to focus *more* on:**
   a. What one team member has to say
   b. Allow the smartest team member to come up with a solution.
   c. All students will contribute during brainstorming sessions.
5. **Which step of the EDP does the creating stage happen?**
   a. Constructing a Prototype
   b. Researching a solution
   c. Creating a great team
6. **In the Engineering process, students create a model and then synergize with team members to create a prototype. Which sentence is correct?**
   a. A prototype is used to test different aspects of a product before the design is finished.
   b. A model is used to test different aspects of a product after the design is finished.
   c. A prototype is different because it needs to demonstrate the function of the design.
7. **The engineering design process is iterative. This allows engineers to…**
   a. Continue to research
   b. Find the best solution.
   c. Repeat instructions
8. **Empathy means:**
   a. How we talk to each other
   b. We feel bad for someone who has lost something
   c. We have the need to help others who are in need.
9. **The Engineering Design Process is followed when**
   a. Engineers need information
   b. Engineers are working
   c. Engineers need to solve a solution
10. **Engineers cannot mess up, they only have one chance to get it right.**
    a. True
    b. False

Name: _____ **Date:** _____

For Question #10: Support your answer:

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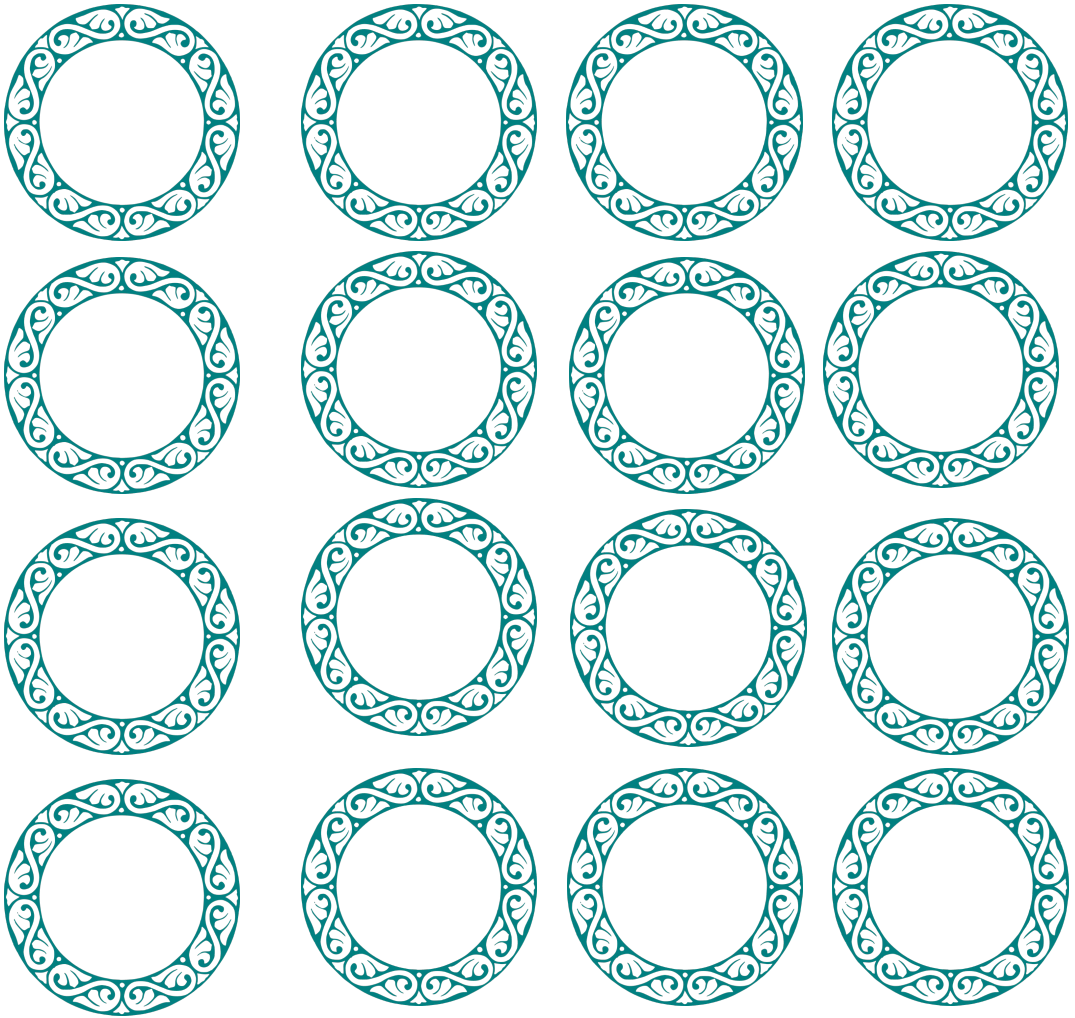
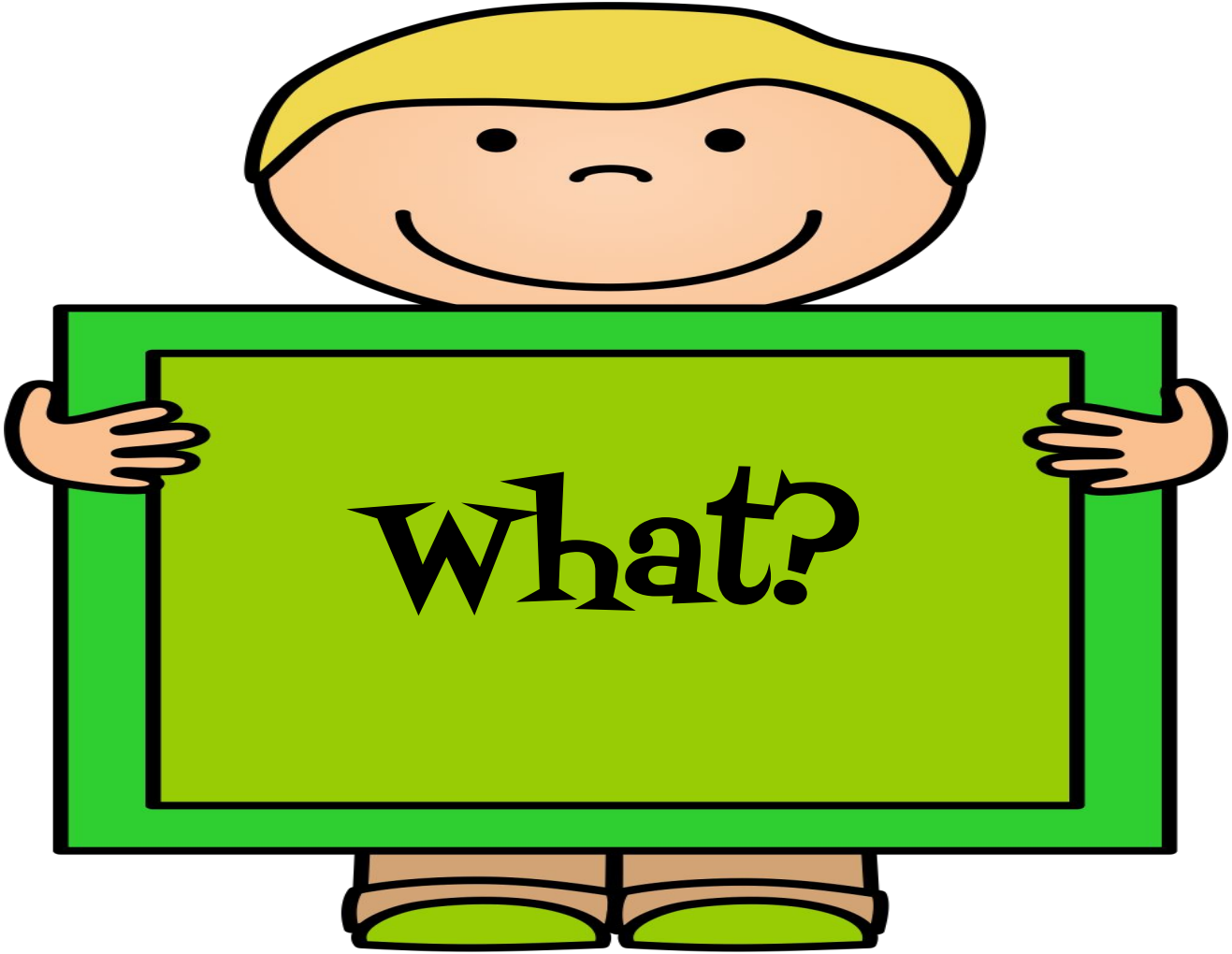


1. Books (2)
2. World Book Online (Edutone)
3. Kiddle (Different Websites)
4. BrainPop and/or BrainPop Jr.
5. Discovery Education
6. Kids Infobits and/or Gale
7. TumbleBooks and/or MackinVIA
8. TinkerCad and/or Blocks/Lincoln Logs
9. My Media Center
10. Alachua County Public Library
11. Websites from Google Classroom
12. Magazines (2)
13. Google Slides Presentation

1 = Purple	11 = Purple
2 = Green	12 = Green
3 = Yellow	13 = Yellow
4 = Red	14 = Red
5 = Orange	15 = Orange
6 = Blue	16 = Blue


Who?


What?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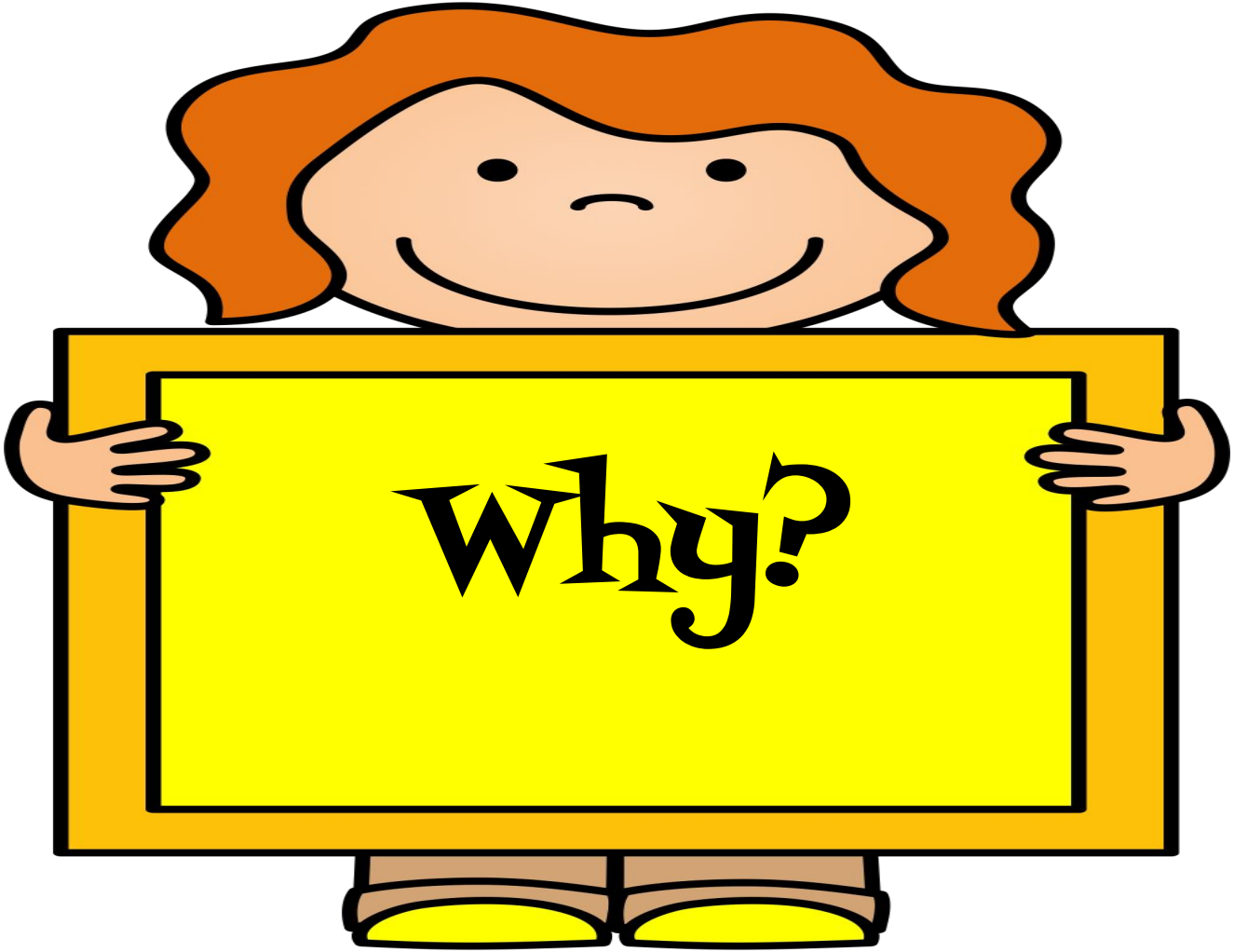
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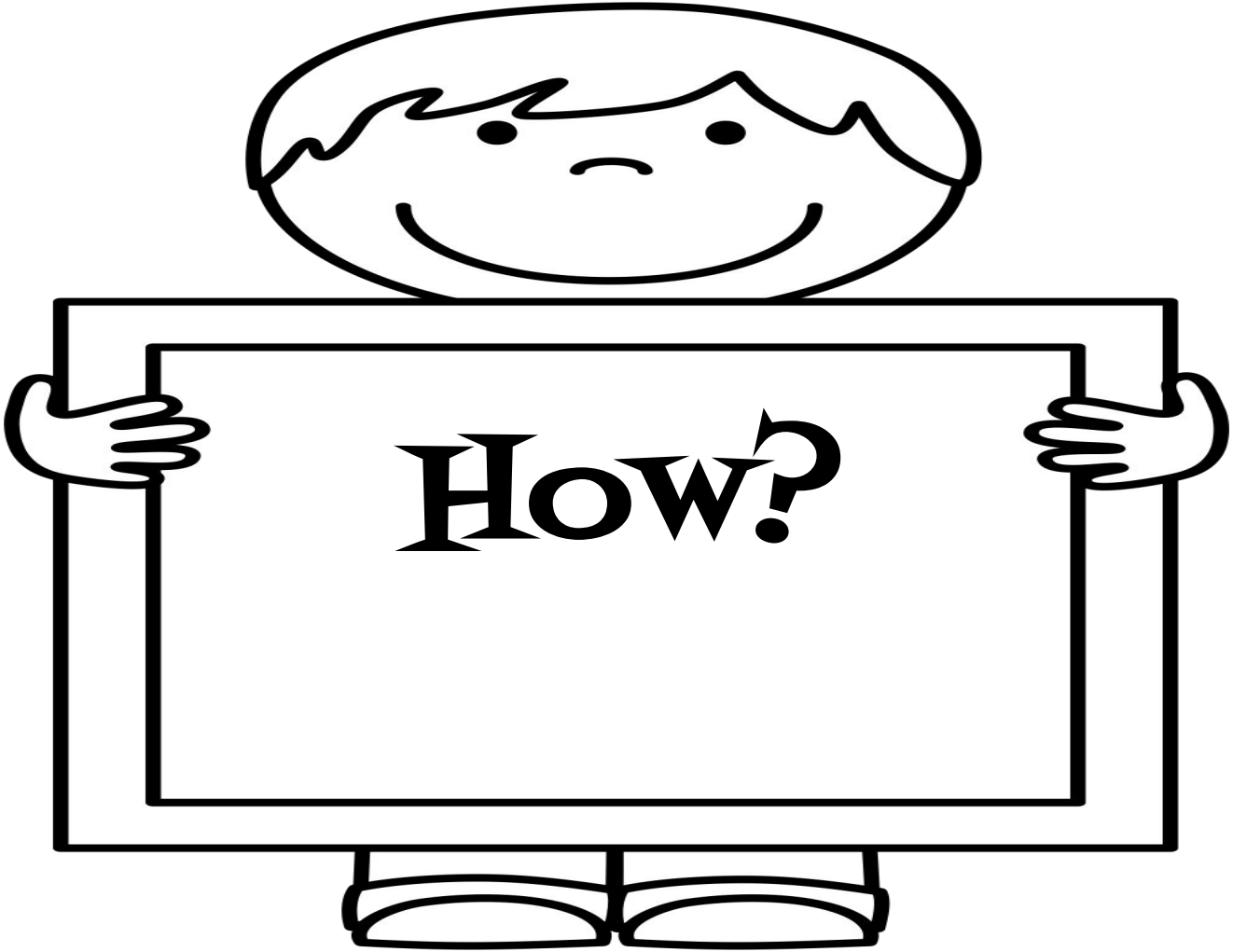
How?