**5th Grade STEM - Engineering Design Process Unit**

**SeaPerch**

**Unit Description:**

Utilizing the SeaPerch curriculum and resources, students will learn about the Engineering Design Process. They will work in small groups to create an underwater remotely operated vehicle (ROV) that will need to complete two tests (obstacle course and the challenge). The obstacle course will require the students to move their ROV through various hoops and rings. The challenge will have other tasks, such as picking up objects and moving them to another location in the pool/tank. This unit will support students’ knowledge of scientific concepts such as density and buoyancy.

**Unit Duration/Timeframe:**

Approx. 34 days of instruction

**Standards Addressed:**

|  |  |
| --- | --- |
| **Standards Addressed** | **Student Friendly “I-Can” Statements** |
| 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost | I can define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. |
| 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem | I can generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. |
| 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved | I can create an engineered model limited by criteria and constraints and designed to achieve the task of solving a complex problem. |
| CCSS.ELA-LITERACY.SL.5.4  Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. | I can present information using a clear voice and speak at an understood pace. |

**Essential Questions (as listed in calendar):**

What is technology?

What is engineering?

What is the Engineering Design Process?

**Investigation Activities/Pacing/Essential Questions: (Activities from SeaPerch.org)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Day 1**  Introductions  Expectations  Intro to STEM Discussion  Sailboat Challenge    - Design Plans    - Begin Building    - Record Problems    - Create Solutions | **Day 2**  Sailboat Activity  - Test Sailboat  - Improve  - Test  - Reflect  **Exit Slip:** Self Assessment | **Day 3**  Pre-Test  **Big Question:** What is technology?  **Big Question:** What is engineering?  Review technology and engineering terms | **Day 4**  Review concepts  Engineering Design Process  Create Poster/notes  Present SeaPerch with video |
| **Day 5**  Read article about underwater ROVs  Discuss impact of ROVs and purpose  Explain Research Project  **Exit Slip:** Pick topic | **Day 6**  ROV research project | **Day 7**  ROV research project | **Day 8**  Research project |
| **Day 9**  Research Project | **Day 10**  Research Project | **Day 11**  Begin Presentations | **Day 12**  Finish Presentations |
| **Day 13**  Flotation Device Challenge | **Day 14**  Flotation Device Challenge | **Day 15**  Review EDP  Gather kits  Safety Explanations  Measure and mark PVC pipes  Cut frame parts  Mark spots for drain holes  **Exit Slip:** Self-Assessment | **Day 16**  Finish marking holes  Drill holes  **Exit Slip:** Self-assessment |
| **Day 17**  Finish drilling  Assemble frame and attach net  **Exit Slip:** Self-Assessment | **Day 18**  Teacher models & explains motors  - Drill hole in   container  - Strip & connect   cable wires  - cover in wax  **Exit Slip:** Self-Assessment  (Soldered by   teacher) | **Day 19**  Complete Motors  - Mount propellers onto shaft  - Mount thruster onto vehicles  **Exit Slip**: Self-Assessment | **Day 20**  Waterproof cables  Mount tether cables  Connect control box  Test motors using control box  **Exit Slip:** Assessment |
| **Day 21**  Explain Daily Reflection WS  Test ROV in water     - Can it move up &      down?     - Can it move side       to side?  **Exit Slip**: Reflection WS | **Day 22**  Continue testing ROVs underwater  **Exit Slip**: Reflection WS | **Day 23**  Improve ROVs for final Test  **Exit Slip:** Daily Reflections | **Day 24**  Finish improving their ROVs for final test  **Exit Slip**: Daily Reflections |
| **Day 25**  Obstacle Course test  **Exit Slip**: Daily Reflection | **Day 26**  Improve ROVs  **Exit Slip:** Daily Reflection | **Day 27**  Explain Challenge  Students try to complete challenge with ROVs  **Exit Slip**: Daily Reflection | **Day 28**  Test ROV in Water for challenges     - Is it able to move        items?     - Is it able to catch       a ball in its net?  **Exit Slip:** Daily Reflections |
| **Day 29**  Improve ROVs  Retest  **Exit Slip:** Daily Reflection | **Day 30**  Test and Improve ROVs for final test  **Exit Slip:** Daily Reflections | **Day 31**  Final underwater Tests   * Obstacle course * Challenge   **Exit Slip**: Daily Reflections | **Day 32**  Engineering Design Process Team Summary  Student Reflections     - About the EDP    - About Your       Thinking |
| **Day 33**  Review EDP and how it was used in building & testing their ROVs | **Day 34**  Post-Assessment |  |  |

**Academic Vocabulary:**

|  |  |
| --- | --- |
| **Tier 2** | **Tier 3** |
| Plan | technology |
| Brainstorm | engineering |
| Team | criteria |
| Research | data |
| Communicate | constraints |
| Critique | Remotely operated vehicle (ROV) |
| Present | Frame |
| Collaborate | Thrusters |
| Test | Motor |
| Explanations | Propellers |
| Models | Troubleshoot |
| Measure |  |

**Instructional Resources, Activities, and Supports:**

* Sailboat Challenge Task sheet, instructions, and Self-Assessment
* Article on underwater ROVs used in the real-world (WMU)
* Seaperch construction manual (copies) <file:///C:/Users/jvujanovic/Downloads/2016%20SeaPerch_ROV_Build_Manual.pdf>
* ROV kits and teacher tool bag

**Pre-Assessment:**

Pre-assessment

Sailboat Challenge Task

**Formative Assessments:**

Teacher observations

Exit Slips (i.e. daily reflections, plan)

Class Discussions

Team Summary

**Summative Assessments:**

ROV tests

Reflections

Summative Assessment

**Lesson Plan Details**

**Day 1:**

**Standard(s)**: NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

**Objective**: I will be able to create a plan for a solution based on a problem and its constraints.

**Materials**: Sailboat Challenge Assignment; bin of water, foil, straws, popsicle sticks, masking tape, rocks (for weight), paper

**Lesson** **Plan**:

* Review STEM classroom expectations
* Explain STEM group roles
* Sailboat Challenge
  + Explain constraint definition
  + Explain constraints of this task
  + Explain task problem: Students must create a sailboat that is able to sail across a tub and hold the greatest amount of stones.
  + Students each think of a solution, and then share their idea to their group.
  + Students listen to one another’s ideas and then choose a solution they believe would be the most successful.
  + Students draw their final plan.
  + Begin building their sailboat using only the allowed materials (aluminum foil, 12 Popsicle sticks OR straws, paper, and tape).
  + As students build their sailboats, they must record any problems that occur and their solutions.

**Assessment**: Sailboat Challenge assignment questions

**Day 2:**

Sailboat Challenge

**Standard(s)**: NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I will be able to conduct a test and make improvements to my design in order to solve the problem.

**Materials**: Sailboat Challenge Assignment; bin of water, foil, straws, popsicle sticks, masking tape, rocks (for weight), paper

**Lesson** **Plan**:

* Continue building and test sailboats from prior class
* After initial test, students will create a new plan and improve their original design in order to hold more rocks (weight)

**Assessment**: Complete reflection on the Sailboat Challenge Lab sheet

**Day 3:**

**Standard(s)**: CCSS L.5.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

**Objective**: I can explain the definition and give examples of technology. I can explain the role of an engineer.

**Materials**: Pre-Test; Definition Posters

**Lesson** **Plan**:

* Students complete the pre-test and can use their Sailboat Challenge as a reference.
* Review that technology is “a tool created to solve a problem or make things easier for people.”
  + Ask students for examples
  + Ensure that students realize that simple objects such as pencils, erasers, and water bottles are also examples of technology.
    - Ask students what problem the object solves or how that object makes things easier for us in order to ensure their understanding.
    - Students discuss in pairs and groups before sharing aloud
* Review that an Engineer is a person that creates something that solves a problem or makes things easier for us. Therefore, an Engineer creates technology.

**Assessment**: None

**Day 4:**

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can describe the stages of the Engineering Design Process.

**Materials**: Markers, paper, SeaPerch video

**Lesson** **Plan**:

* Review the Engineering Design Process stages
* Students create a poster of the Engineering Design Process, including descriptions of what occurs in each stage
* Present a video of the SeaPerch program to preview the unit project

**Assessment**: Posters

**Day 5:**

**Standard(s)**: CCSS RI.5.2 Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

**Objective**: I can explain the importance and effects of an ROV on society.

**Materials**: ROV article; Research topics

**Lesson** **Plan**:

* Read and discuss the article
* Ask students what the ROVs used by WMU are using them for; what is their purpose?
* Explain that ROVs have been created over the years for certain purposes, such as the one described in the article, and that the students will choose an ROV to research and present on.

**Assessment**: Choose a Topic for the research project

**Day 6-10:**

**Standard(s)**: CCSS RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

**Objective**: I can explain the importance and effects of an ROV on society. I can research and create a slideshow presentation.

**Materials**: Chromebooks; Google Classroom Assignment with links; Google Slideshow

**Lesson** **Plan**:

* Students choose their ROV topic
* Students work on researching their ROV, such as the following:
  + Name of the ROV
  + Where it has researched
  + What it has found and provided to society
  + Any issues that have occurred with the ROV

**Assessment**: Slideshow

**Day 11-12:**

**Standard(s)**: CCSS SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

CCSS SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

**Objective**: I can explain the importance and effects of an ROV on society. I can present a slideshow to my peers.

**Materials**: Slideshow Presentations; Rubrics

**Lesson** **Plan**:

* Students present their research Presentations

**Assessment**: Research Presentation Rubric

**Day 13:**

Flotation Device Challenge

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

**Objective**: I can design and create a flotation device that will make an action figure float.

**Materials**: Challenge Lab Sheet; action figures; pool noodles; bubble wrap; foil; paper; straws; popsicle sticks; tape; scissors

**Lesson** **Plan**:

* Explain the task to students
* Review terms Constraints and Success Criteria
* Explain materials that they may use
* Students work in groups to define the problem, define the constraints and success criteria
* Students work in groups to create a plan and then begin building
* Students create and test their flotation devices
* Begin to create a plan to improve the device

**Assessment**: Flotation Device Challenge Sheet

**Day 14:**

Flotation Device Challenge

**Standard(s):** NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can design and create a flotation device that will make an action figure float.

**Materials**: Challenge Lab Sheet; action figures; pool noodles; bubble wrap; foil; paper; straws; popsicle sticks; tape; scissors

**Lesson** **Plan**:

* Test flotation devices
* Create an improvement plan for the flotation device
* Rebuild the flotation device in groups
* Test improved flotation device
* Complete challenge sheet

**Assessment**: Challenge Sheet

**Day 15:**

**Standard(s)**: CCSS SL.5.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.

**Objective**: I can measure and cut PVC pipes.

**Materials**: SeaPerch Kits; Construction Manuals; PVC pipe cutters

**Lesson** **Plan**:

* Explain instructions to measure PVC pipes
* Explain Safety rules for cutting PVC pipes
* Students measure PVC pipes
* Students use Pipe Cutters to cut pipes

**Assessment**: Self-Assessment

**Day 16:**

**Standard(s)**: CCSS SL.5.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.

**Objective**: I can measure and mark drain holes.

**Materials**: SeaPerch kits; Construction Manuals; PVC pipes; drill

**Lesson** **Plan**:

* Explain instructions for measuring and marking drain holes
* Discuss purpose of drain holes in the ROV
* Explain Safety rules for drilling (with teacher guidance)
* Students measure and mark drain holes
* Groups take turns drilling PVC pipes and PVC elbows with teacher guidance

**Assessment**: Self-Assessment

**Day 17:**

**Standard(s)**: CCSS SL.5.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.

**Objective**: I can assemble PVC pipes into an ROV.

**Materials**: SeaPerch kits; Construction Manuals

**Lesson** **Plan**:

* Some groups will finish drilling
* Groups will assemble their PVC pipes into the ROV frame
* Students will use the zip ties to add a net to the bottom of the ROV frame

**Assessment**: Self-Assessment

**Day 18:**

**Standard(s)**: CCSS SL.5.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.

**Objective**: I can create an ROV frame.

**Materials**: SeaPerch Kits

**Lesson** **Plan**:

* Groups place labels on the motors
* Discuss purpose for these labels – to prevent water from entering motors
* Teacher demonstrates drilling holes into the containers
* Teacher demonstrates stripping cable wires
* Teacher demonstrates connecting cable wires and soldering them to the motors

**Assessment**: Self-Assessment

**Day 19:**

**Standard(s)**: CCSS SL.5.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.

**Objective**: I can create an ROV frame.

**Materials**: SeaPerch Kits

**Lesson** **Plan**:

* Teacher demonstrates covering motors in wax
  + Discuss how this helps prevent water from entering motors
* Students mount propellers onto shaft on motors
* Student mounts thrusters onto ROV frame

**Assessment**: Self-Assessment

**Day 20:**

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can create and test an ROV.

**Materials**: SeaPerch kits; control boxes

**Lesson** **Plan**:

* Ensure cables are waterproofed
* Mount tether cables onto ROV frames
* Connect control boxes to tether cables
* Test motors and control boxes

**Assessment**: Exit Slip

**Day 21:**

**Standard(s)**: NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can test an ROV underwater. I can plan improvements to the ROV.

**Materials**: SeaPerch ROVs, large bins filled with water; Chromebooks; Reflection sheets

**Lesson** **Plan**:

* Explain rules and safety of using the ROVs
* Students will practice and test their ROVs in the large bins of water
* Students will use controls to move them up, down, forwards, and backwards
* Students begin thinking of ways to improve their ROVs
* Record observations and plans of improvement on Daily Reflection Sheet

**Assessment**: Daily Reflection Sheet

**Day 22-24:**

**Standard(s)**: NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can test an ROV underwater. I can plan and improve the ROV.

**Materials**: ROVs, large bins of water, materials to create modifications, Daily Reflection Worksheet

**Lesson** **Plan**:

* Continue testing underwater
* Work on creating plans for modifications of ROVs
* Create modifications

**Assessment**: Daily Reflection sheet

**Day 25-26:**

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can test and make modifications to an ROV.

**Materials**: ROVs, Daily Reflection Worksheet; hula hoops; large bins of water

**Lesson** **Plan**:

* Explain Obstacle Course challenge
* Students practice guiding their ROVs through the obstacle course
* Students will decide on and create modifications in order to complete the obstacle course successfully

**Assessment**: Daily Reflection Sheet; Exit Slip (Day 25)

**Day 27-28:**

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can guide an ROV to pick up and move an object underwater.

**Materials**: ROVs; Reflection WS; large bins of water; weighted rings

**Lesson** **Plan**:

* Explain Challenge – Students must use their ROV to pick up the weighted rings from one end of the bin and move it to the other end.
* Students discuss with their groups how to modify their ROVs in order to complete the challenge
* Students create modifications and test them by attempting the challenge

**Assessment**: Daily Reflection worksheet; Exit Slip (Day 27)

**Day 29-30:**

**Standard(s)**: NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can create and modify an ROV in order to complete two challenges successfully.

**Materials**: ROVs, large bins of water; Daily Reflection sheets; hula hoops; weighted rings

**Lesson** **Plan**:

* Students continue testing their ROVs for each challenge
* Students complete modifications for their ROVs

**Assessment**: Daily Reflection worksheet

**Day 31:**

**Standard(s)**: NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can create and modify an ROV in order to complete two challenges successfully.

**Materials**: ROVs, large bins of water; Daily Reflection sheets; hula hoops; weighted rings

**Lesson** **Plan**:

* Groups compete in “Final Challenge Day” where they will compete against one another in each of the two challenges
* Reflect on process

**Assessment**: Daily Reflection worksheet

**Day 32:**

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can describe the Engineering Design Process.

**Materials**: Engineering Design Process Team Summary worksheet; About the Engineering Design Process worksheet; About Your Thinking Worksheet

**Lesson** **Plan**:

* Review the Engineering Design Process
* Complete Team Summary worksheets in groups to identify what they did in each stage of the process to create their ROVs
* Individually complete the “About the Engineering Design Process” and “About Your Thinking” worksheets to reflect on the process

**Assessment**: Reflection worksheets

**Day 33:**

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can describe the Engineering Design Process.

**Materials**: Reflection worksheets; Engineering Design Process posters

**Lesson** **Plan**:

* Review the Engineering Design Process
* Complete worksheets from prior class if not completed
* Review questions students may have

**Assessment**: Study for Post-assessment

**Day 34:**

**Standard(s)**: NGSS 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Objective**: I can describe the Engineering Design Process.

**Materials**: Post-Assessment

**Lesson** **Plan**:

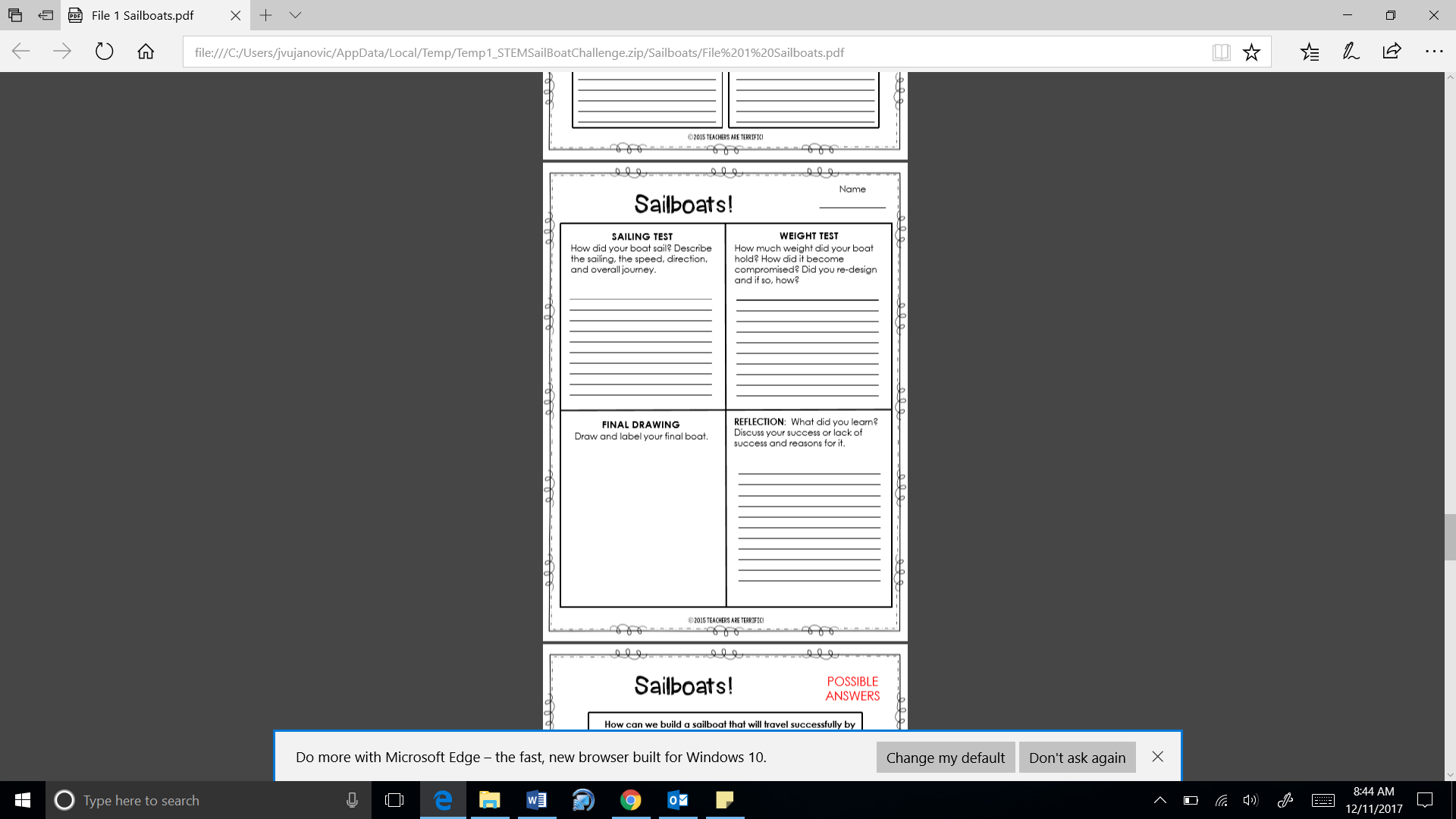
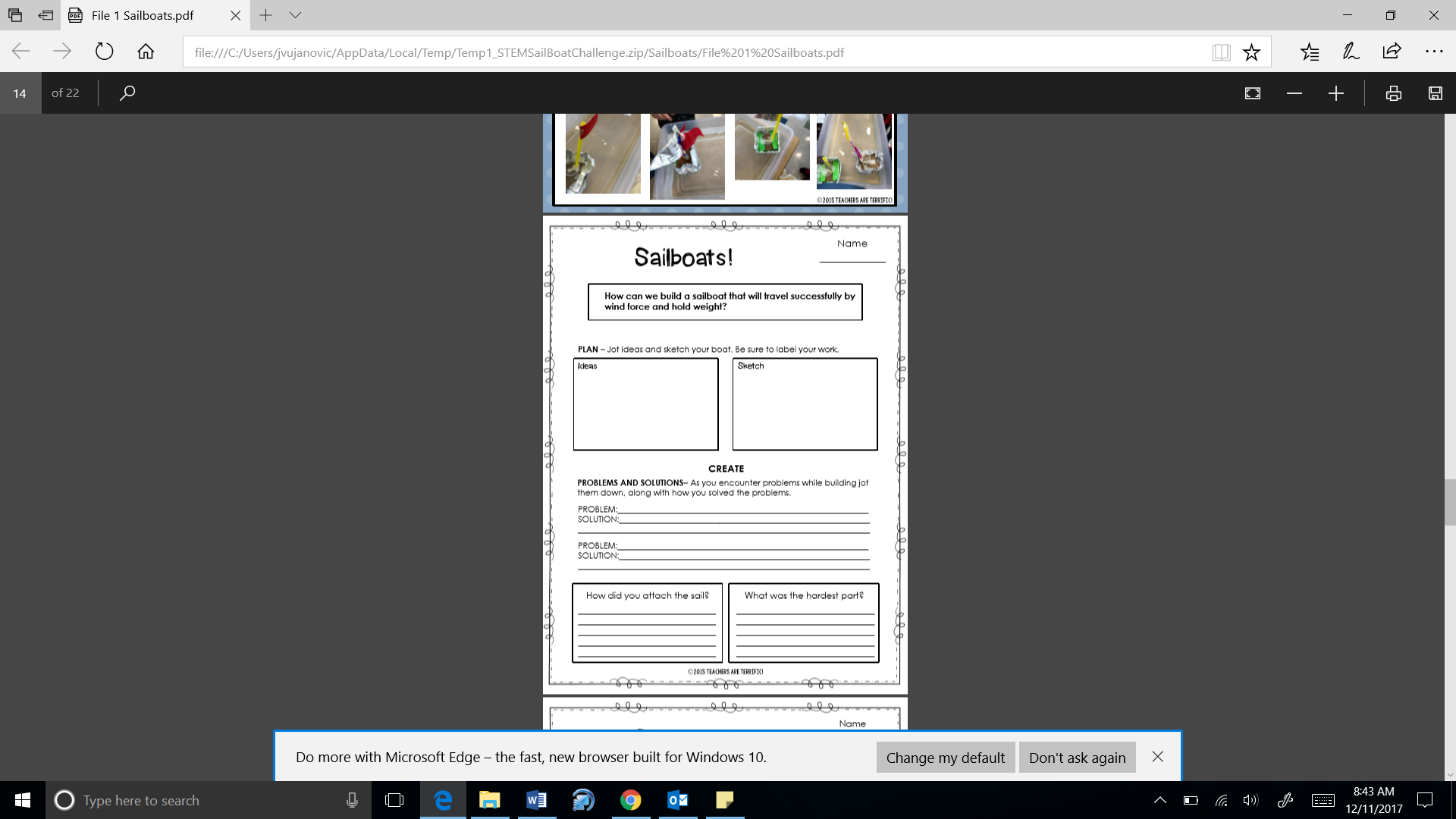
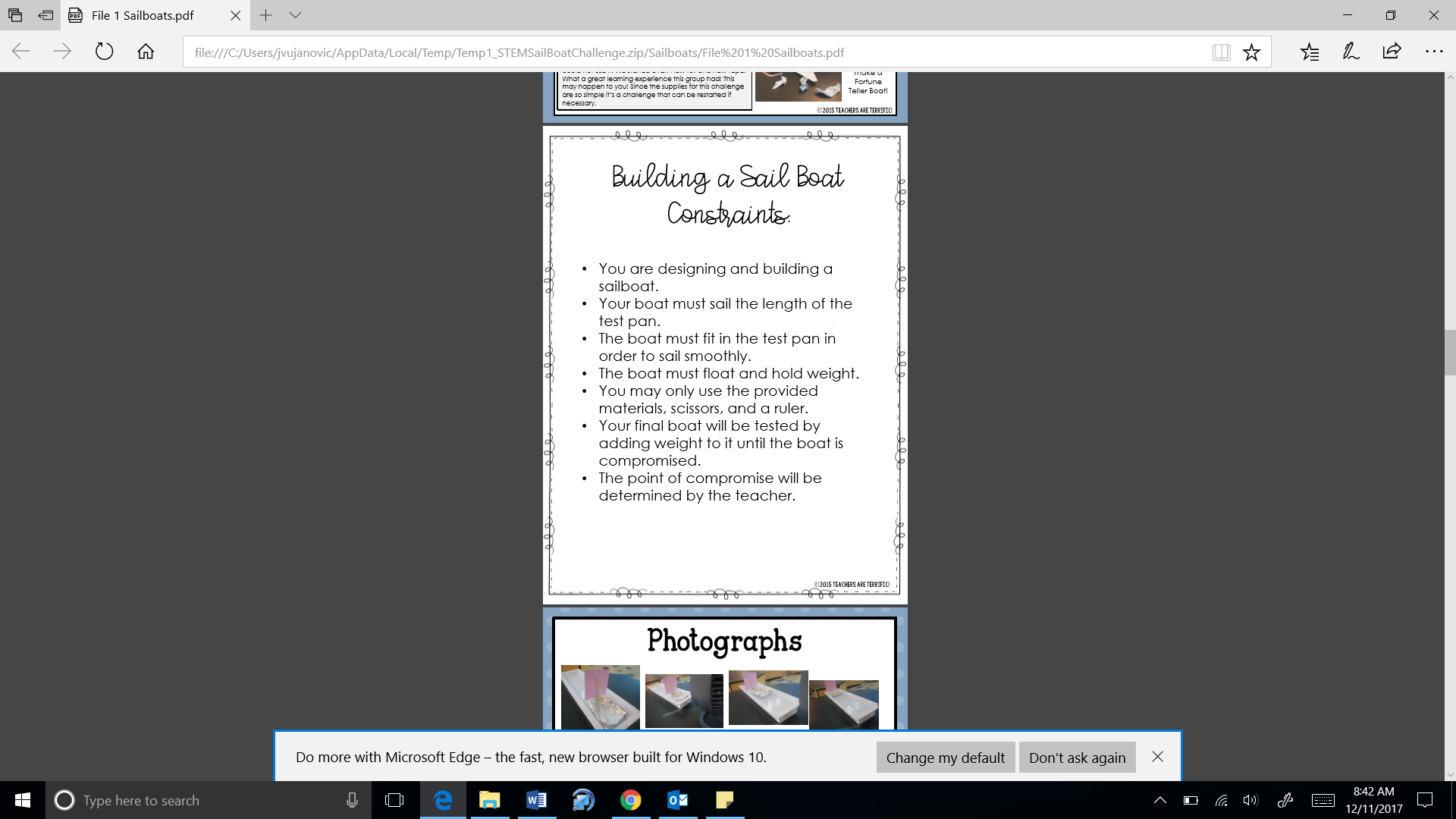
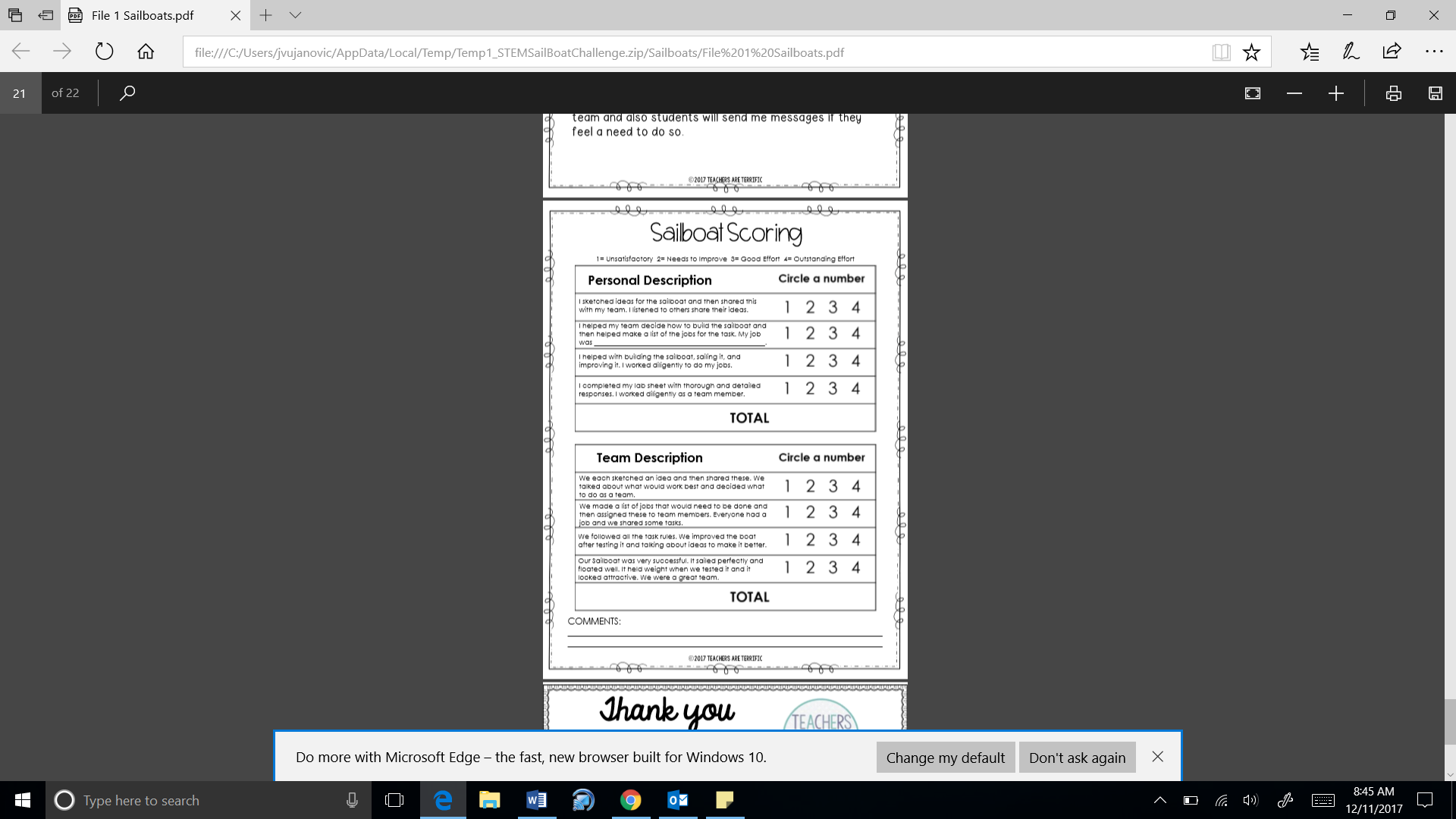
* Students complete the Post-Assessment

**Assessment**: Post-Assessment

**Materials and Assessments**

**Day1-2: Sailboat Challenge**

(from TPT user “Teachers are Terrific” titled “STEM Sail Boat Challenge”)

**Day 3: Pre-Test**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5th Grade STEM Pre-Test**

1. What is technology?

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2. What is an engineer?  
  
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3. What was the main problem/goal of your challenge?

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4. What were the constraints of the challenge?

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5. What is a problem that you and your team came across while completing your task? What did   
   you do to improve and solve this problem?

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6. What is the engineering process? Describe the stages and include examples from your   
   challenge.

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7. How have technological developments impacted devices, processes, and systems for the   
   way we live?

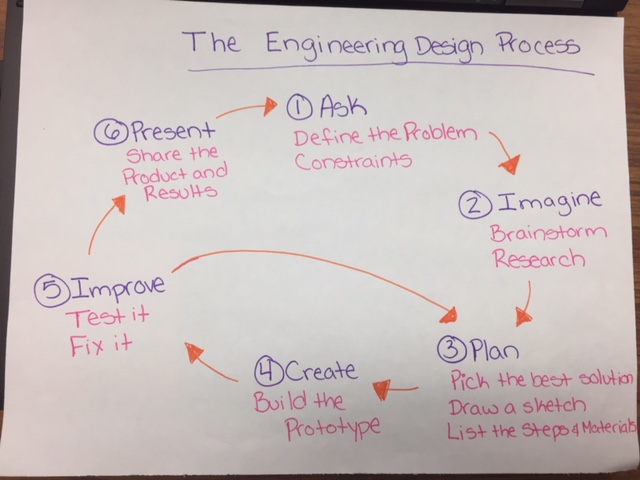
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**Day 4: Engineering Design Process Poster**

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**Day 5: WMU Article**

Attached as PDF documents. Each page is a separate PDF

**Day 6-10: Research Links**

NOAA Submersibles Link: <http://oceanexplorer.noaa.gov/technology/subs/subs.html>

NOAA Expeditions Link: <http://oceanexplorer.noaa.gov/okeanos/explorations/explorations.html>

Nautilus Exploration Program Link: <http://www.oceanexplorationtrust.org/nautilus-exploration-program>

Nautilus Expedition Link: <https://nautiluslive.org/expedition/2016>

Robert Ballard Link: <https://www.britannica.com/biography/Robert-Ballard-American-oceanographer>

RMS Titanic Found by Robert Ballard Link: <http://www.titanicandco.com/discovery.html>

PBIS Lost Liners Under the Sea Link: <http://www.pbs.org/lostliners/under.html>

USS Indianapolis Discovery Links:

<https://news.usni.org/2017/08/19/uss-indianapolis-wreckage-found>

<https://www.nytimes.com/2017/08/20/world/asia/uss-indianapolis-paul-allen.html>

<http://www.cnn.com/2017/08/19/us/uss-indianapolis-wreckage-found/index.html>

<http://www.latimes.com/nation/la-na-uss-indianapolis-20170819-htmlstory.html>

Mars Rover Links:

<https://mars.nasa.gov/mer/home/>

<https://mars.nasa.gov/programmissions/missions/present/2003/>

<https://www.space.com/37722-mars-rover-curiosity-five-years-anniversary.html>

<https://www.space.com/16385-curiosity-rover-mars-science-laboratory.html>

<https://www.space.com/18289-opportunity-rover.html>

<https://www.space.com/36544-opportunity-mars-rover-departs-cape-tribulation.html>

<https://www.space.com/18766-spirit-rover.html>

Apollo Lunar Rover Links:

<https://nssdc.gsfc.nasa.gov/planetary/lunar/apollo_lrv.html>

<https://www.nasa.gov/multimedia/imagegallery/image_feature_2020.html>

<http://www.armaghplanet.com/blog/nasas-lunar-rover-everything-you-need-to-know.html>

<https://www.space.com/12482-moon-car-lunar-rover-apollo-15-legacy.html>

**Day 11-12: ROV Presentation Rubric**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ROV Presentation Rubric**

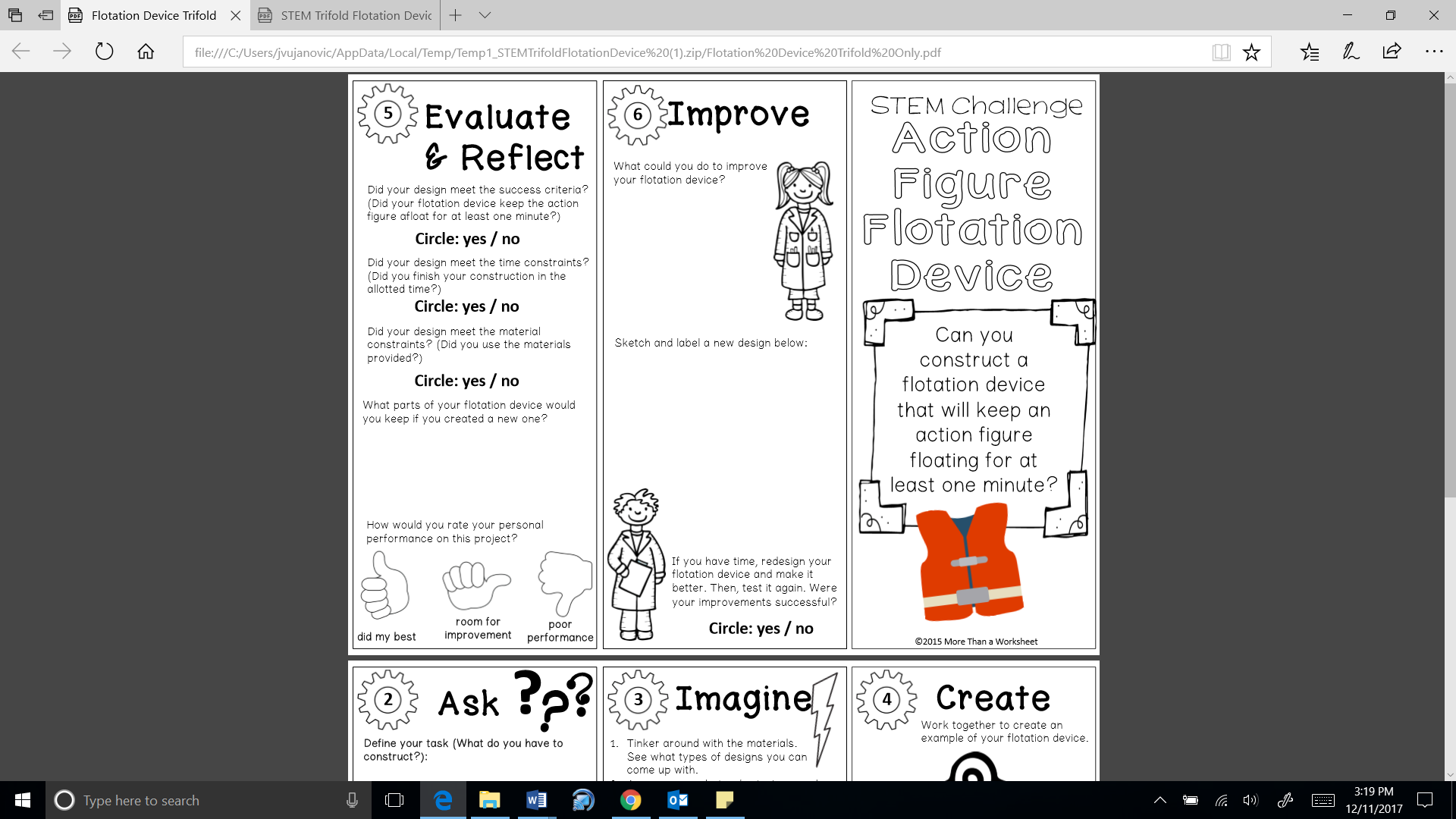
**Topic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

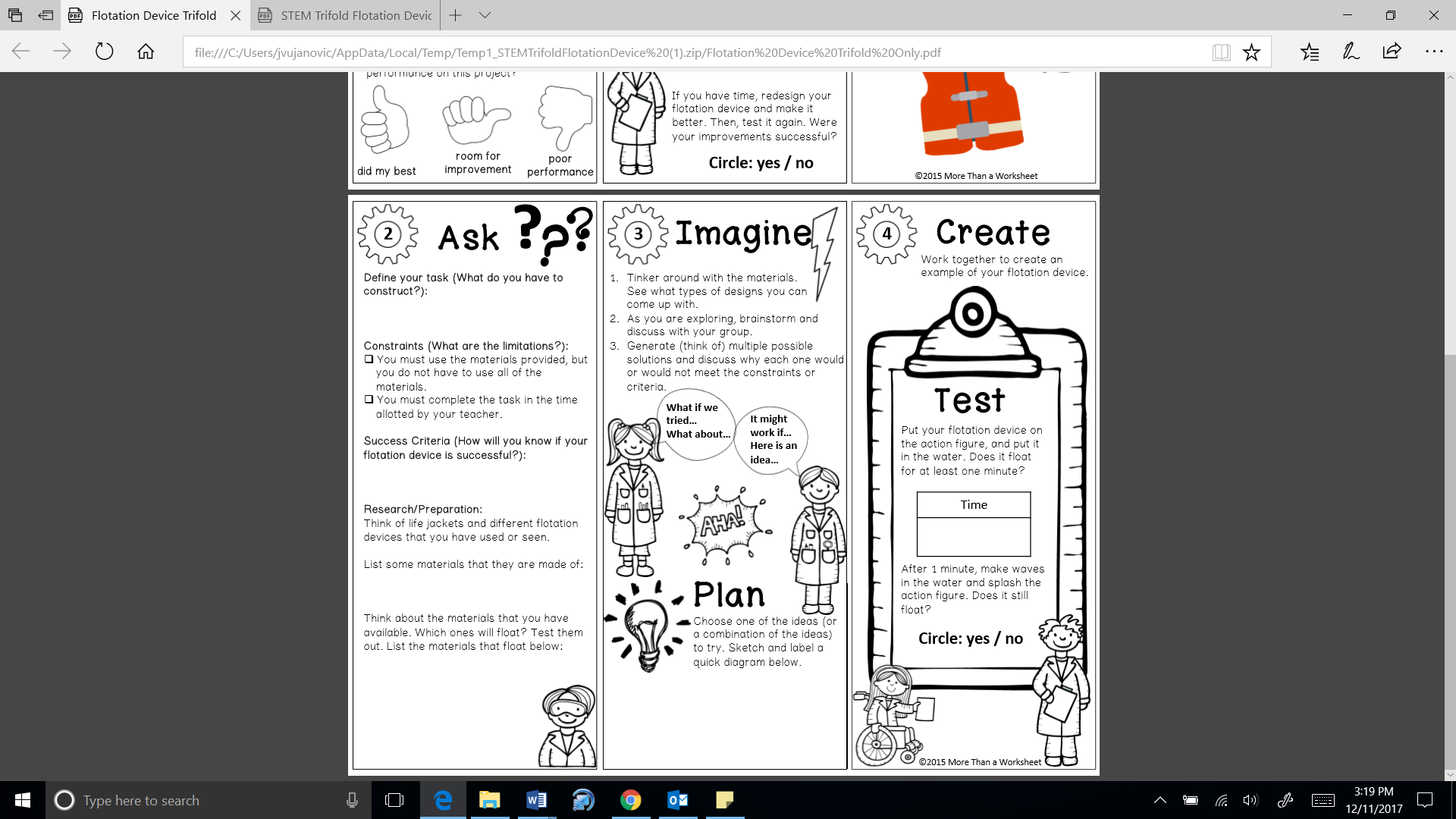
|  |  |  |  |
| --- | --- | --- | --- |
|  | **Emerging** | **Approaching** | **Proficient** |
| **Topic** | The topic is simply stated. | The topic is stated with a few facts (2-3). | The topic is stated and explained thoroughly (4+ facts). |
| **Impact** | There is no impact provided. | The impact of the ROV is stated briefly. | The impact of the ROV is stated and explained thoroughly. |
| **Additional Facts** | No additional facts are given. | A few additional facts are provided. | 4+ additional facts are provided to assist in our understanding of the topic. |
| **Sources** | There are no sources provided. |  | All sources are provided. |
| **Presentation** | The slideshow does not provide images and/or does not catch one’s attention. | The presentation includes some images to support the text and is eye-catching to the audience. | The presentation is very creative, eye-catching, and includes a multitude of images to support the audience’s understanding. |
| **Speaking** | The student provides little to no eye contact with the audience and is difficult to hear. | The student provides some eye contact and at times is difficult to hear. | The student speaks very clearly and provides eye contact with the audience throughout. |

**Final Grade:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Day 13-14: Flotation Device Challenge**

(from TPT “More Than a Worksheet” titled “STEM Trifold: Flotation Device”)





**Day 15-24: SeaPerch Frame build**

The following link is to the SeaPerch Construction Manual

<http://www.seaperch.org/online_training_videos>

**Day 15-19: Self-Assessment**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Self-Reflection**

**Directions**: Reflect on your performance today as you worked on assembling the SeaPerch submersible frame. Put a check mark to reflect where you best feel you performed today.

|  |  |  |  |
| --- | --- | --- | --- |
| **Description** | **Proficient (3)** | **Approaching (2)** | **Emerging (1)** |
| 1. I participated in   the task today. |  |  |  |
| 2. I listened to and   followed the   directions given. |  |  |  |
| 3. I listened to my   team members’   ideas fully. |  |  |  |
| 4. I asked   questions if I did  not understand. |  |  |  |
| 5. I gave ideas to   my group in an   appropriate and   kind way.. |  |  |  |
| 6. I explained my   ideas and   thoughts clearly. |  |  |  |

**Comments: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Day 20, 25, and 27: Exit Slip**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Exit Slip**

**Directions**: Answer the following questions based on our SeaPerch Challenge.

1. What is the main goal of this challenge?

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2. What are the constraints of this challenge?

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3. What is the success criteria?

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**Day 21-31: Daily Reflection Sheet**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_       Class \_\_\_\_\_\_\_\_\_\_\_

**Daily Reflection Sheet**

**Challenge Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- |
| **Date** | **What new obstacle or snag did you find today?** | **Were you able to solve the snag/obstacle today? How?** | **If not, what is your plan to fix the obstacle/snag tomorrow?** |
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|  |  |  |  |
| **Date** | **What new obstacle or snag did you find today?** | **Were you able to solve the snag/obstacle today? How?** | **If not, what is your plan to fix the obstacle/snag tomorrow?** |
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**Day 32-33: Reflection/Review Worksheets**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_       Class \_\_\_\_\_\_\_

**About the Engineering Design Process**

|  |  |
| --- | --- |
| **What did you try that didn’t work out? How many times did something like this happen?** | **What did you do when things didn’t work out like you expected?** |
|  |  |
| **How could you bring technology into your final prototype?** | **If given enough time, what would your next step look like?** |
|  |  |

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_     Class \_\_\_\_\_\_\_\_\_\_

**About Your Thinking**

1. What were some of the struggles you and your team went through during the project?

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2. What was surprising to you about the engineering design process?

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3. What do you think you have learned from this process you didn’t know before?

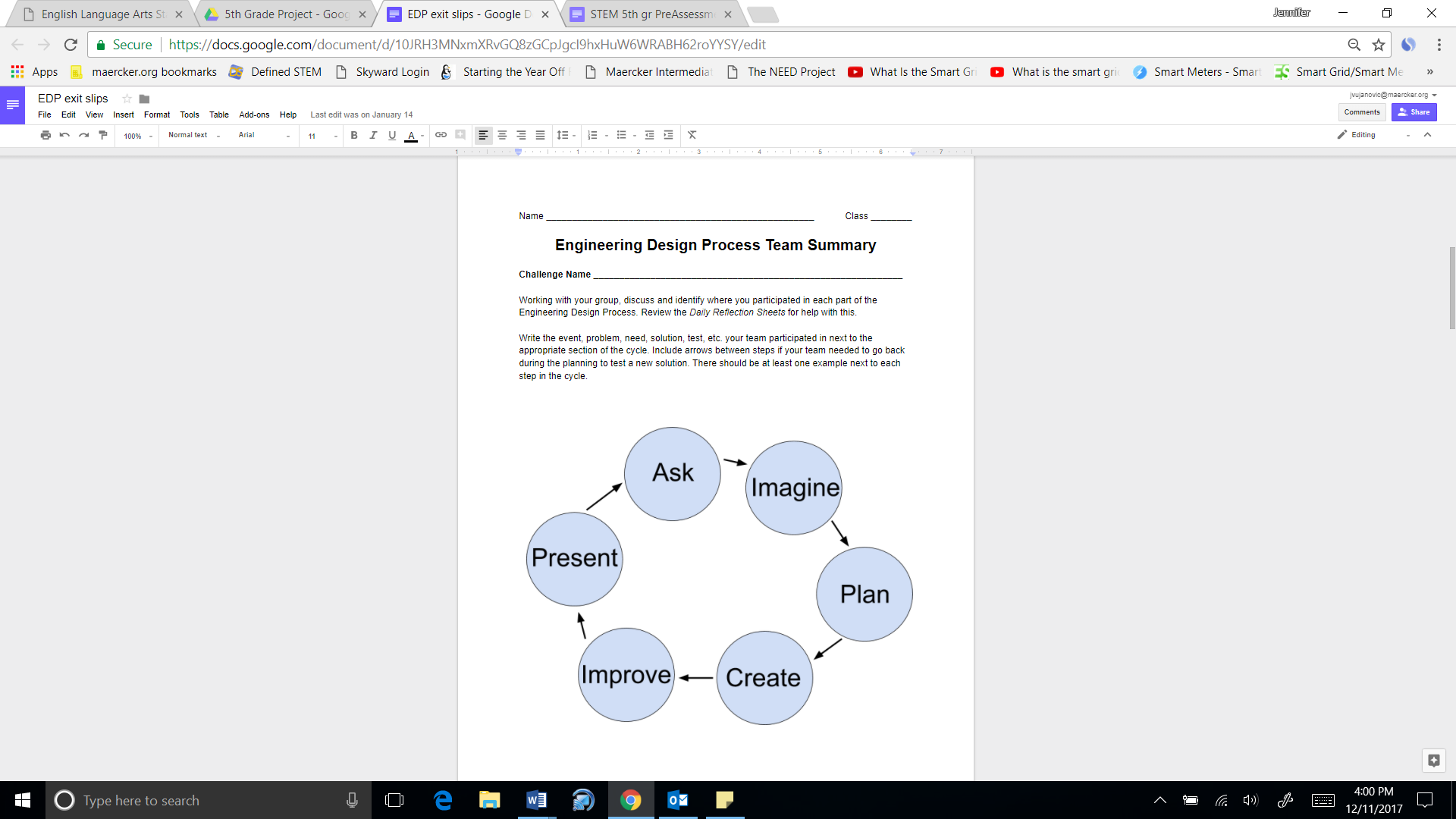
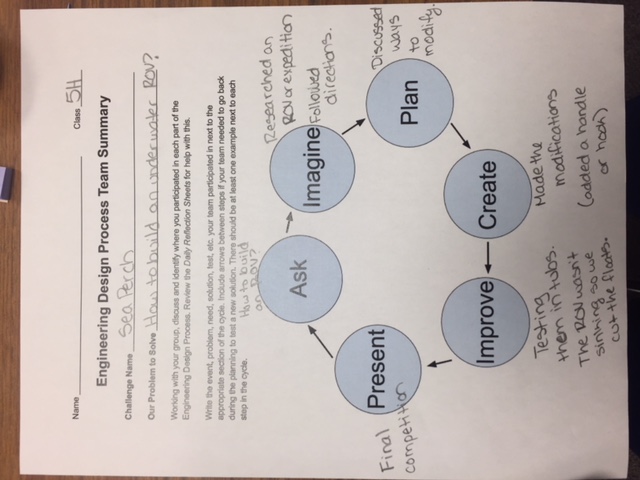
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**Day 34: Post-Test**

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**5th Grade STEM Post-Test**

1. What was the main problem/goal of your challenge?

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2. What were the constraints of the challenge?

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3. What is a problem that you and your team came across while completing your task? What did   
   you do to improve and solve this problem?

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4. What is the engineering process? Describe the stages and include examples from your   
   challenge.

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5. How have technological developments impacted devices, processes, and systems for the   
   way we live?

   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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