**Lesson 9: Title:** The Final Product

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| **Lesson** | **Title & Short Description:** | **Learning Outcome:** |
| **#9 -** | The students will be going back to the original scenario problem and they will make recommendations to the CFO of Pacific Airlines, Malcolm Eagle. | The students will write a summary of their findings based on the organizational system that they created. They will write an email or letter to CFO of Pacific Airlines, Malcolm Eagle. |

**Problem statement: *How can we improve our production process so that we have less debris (foreign object debris or FOD) left on the SPACE during the build stage and can deliver a clean, safe SPACE? What turns an object into a FOD?***

**Learning objectives:** I can write a summary of my findings based on the organizational system that my team created. I can write an email or letter to CFO of Pacific Airlines, Malcolm Eagle with recommendations for his airline company.

**Standards:** Next Generation Science Standards (NGSS), Common Core Standards (CCSS)

**NGSS:**

**5-PS1-3:** Make observations and measurements to identify materials based on their properties.

**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.

**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

**3-5-ETS1-3:**

Plan and carry out fair tests in which variables our controlled and failure points are considered to identify aspects of a model or prototype that can be improved

**CCSS**

CCSS.Math.5.NBT.B.7

Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

[ELA-LITERACY.SL.5.1](http://www.corestandards.org/ELA-Literacy/SL/5/1/)

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.

[CCSS.ELA-LITERACY.SL.5.1.A](http://www.corestandards.org/ELA-Literacy/SL/5/1/a/)

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.5.1.A](http://www.corestandards.org/ELA-Literacy/SL/5/1/a/)

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.5.1.C](http://www.corestandards.org/ELA-Literacy/SL/5/1/c/)

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

[CCSS.ELA-LITERACY.SL.5.1.C](http://www.corestandards.org/ELA-Literacy/SL/5/1/c/)

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

**Soft Skills:**

Listening, Critical Thinking, Collaboration, Communication (written and oral), Creativity & Innovation

**Materials:**

* FOD - Lesson 9 Powerpoint slides
* Completed Student Planning Sheet Packets
* Completed Lesson 8\_Organizational System Rubrics
* Electronic device to type up report

**Lesson preparation:** Teachers should review PPT for Lesson 9 and make any necessary adjustments for their class. Teachers will need to distribute the edited PPT to each team.

**Time required:** 1- 2 hours to fill-out Powerpoint template and 1 hour to have teams present slides

**Grouping of students for instruction:** Each team will create their presentation using the Lesson 9 Powerpoint slides template.

**What is the instruction? Consider the PBL procedure that is being addressed here:**

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| **Teacher** | **Student** |
| 1. The teacher will ask the students to get out their completed “Student Planning Sheets’ packet and completed Lesson 8 - Organizational System Rubrics from the last lesson. She will review the Engineering Design task criteria for a ‘successful’ product with the students. | 1. Students will get out their completed Student Planning Sheet. packet and completed Lesson 8 - Organizational System Rubrics from the last lesson. They will ask clarifying questions. |
| 1. The teacher will show the first 4 slides of the FOD - Lesson 9 Powerpoint which review the original scenario and task. She will ask the students if they have any questions. | 1. Students will listen to the teachers presentation and take any notes as needed.They will ask clarifying questions. |
| 1. The teacher will show slides 5-9 of the FOD - Lesson 9 Powerpoint to the students that explain the task that they will be doing today. She will explain the report that they will be writing to the CFO (Malcolm Eagle) of Pacific Airlines. Students will use this PPT template for writing their report. | 1. Students will listen to the teacher's presentation of the last set of slides. They will ask clarifying questions. They will get together with their teams to start writing out their report. (Students at this point can assign roles in their group for who will be typing in the PPT, who will be uploading any pictures or data from their planning sheets or rubrics, etc.) |
| 1. The teacher will monitor the groups as they fill-out theri slides 5-9 of the FOD - Lesson 9 Powerpoint. She will help with technical issues and the format of the report/letter/email. Teacher should not tell the students what to write but guide them to a professionally written response that would be grade-level appropriate. | 1. Students will work together in a cooperative manner to complete slides 5-9 of the FOD - Lesson 9 Powerpoint. They will add slides as needed and ask clarifying questions to the teacher. |
| 1. The teacher will give the groups a five minute warning before the groups need to present their PPT findings. She will ask the groups to decide who will present which slides. Every team member should present at least one slide. | 1. Students will finish up their PPT and decide who will present each slide. |
| 1. The teacher will reconvene the class to present their ‘findings’, i.e. PPTs. She can choose groups randomly to present or take volunteers to go first. She should remind students to be a supportive audience for their classmates. | 1. Students will be a supportive audience for their classmates. They will be quiet listeners and give positive feedback at the end of each presentation. |
| 1. The teacher will close out the unit with any other clarifying questions. She will praise the students for all of their hard work. Optional: Teacher can tie in the real-world applications and have a longer discussion about other jobs that mechanical and aerospace engineers do in our area and around the world. | 7. Students will celebrate and reflect on group work effort. They will ask clarifying questions. |

**Accommodation:**

Students with special needs or accommodations (IEPs or 504s) can have some extra one-on-one time with the teacher(s) to help clarify the project's criteria and constraints and provide additional support as needed. Students can also use a computer to help create their design versus doing their design by hand on paper. Finally, a student might be given sentence starters or examples of other similar design solutions as a starting point for designing their system.

Implement best practice for students with significant special needs like always using anchor charts that stay for visual, audio systems that broadcast sound over the whole room, space for movement like using different spaces for group work so students can move around.

**Extensions:**  Use multimedia options for presentation (e.g. embed video), student performances, modeling, user feedback, experts guests feedback, experts guests panel, etc.

**Assessment:**

* Formative based on teamwork rubric - (Lesson 7 - Excelling as Engineers!)

**Presentation Checklist/Rubric**

Your presentation should have the following and you will be evaluated on a scale of 1-5 on each component:

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| 1. A slide(s) that shows my goals? |  |
| 1. A slide(s) that shows my model/process? |  |
| 1. A slide (s) that shows the initial data collected? |  |
| 1. A slide(s) that shows the evaluation, improvement, and final results? |  |

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| 1. Use visual components like images and diagrams. |  |
| 1. Use bullet points for your presentation; not paragraphs. |  |
| 1. Demonstrate effort through proper spelling, clear writing, and an attractive presentation. |  |
| 1. Your presentation should take between 5-10 minutes. |  |
| 1. Everyone contributes. |  |

**References/Resources:**