**Lesson Number 9: Analyzer**

**Problem statement:** Following previous unit lessons in constructing and improving the space junk models, students will reflect over what they have completed over the previous weeks. More specifically, students will self assess and analyze their product design, as well as reflect on their overall experience in the engineering process.

**Learning objectives:** Students will reflect on the their overall experience in the engineering process using a collaboration rubric and completing the reflect and analyze questions at the end of their engineering journal.

**Lesson standards (NGSS, CCSS, CTE):**

CCSS.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

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.B

Follow agreed-upon rules for discussions and carry out assigned roles.

**Soft skills:**

* *Collaboration*
* *Reflection*

**Locally and/or personally relevant for students:**

Hopefully students will be able to identify that they have gone through multiple iterations of the engineering design phases and that they will now have ample time to spend on a final reflection of the overall takeaways made from the previous unit lessons. This will be relevant to students in that personal reflection on the goods and bads may be something they can take away and apply ro future group assignments

**Connections to career and educational pathways:**

This unit lesson plan completes the space junk unit by asking students to go through a process that engineers typically go through regarding project reflection, which includes identifying possible improvements that could be incorporated to their designs. Students need to understand the importance of this part of the engineering design process and that it is an iterative step. Hopefully students will be able to utilize all key takeaways in this project and apply it to future academic project endeavors.

**Materials:**

* Summary Table from all previous lessons
* Space Cadet Guidebook from all previous lessons
* Presentation Feedback Forms from lesson 8
* Student Collaboration Rubric
* Student Collaboration Rubric with Overview Instructions
* Additional Debrief Circle option for Teachers
* NASA website for extension activities

**Lesson preparation:**

Print a student collaboration rubric for each individual student or supply an electronic version.

**Time required:** 45 - 75 minutes

**Grouping of students for instruction:**

Students will be with their work groups for the review process so it is important to provide a quiet place for students to complete the collaboration rubric on their own away from their groups.

**What is the instruction? Consider the PBL Procedure that is being addressed here:** The instruction in this lesson is about an honest reflection and grade for the project. It is important here to stress to students that the reflection process is ongoing from school to career and that process never stops.

**Understanding the Problem**

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| **Teacher** | **Student** |
| “Today we will be wrapping up our Space Junk Unit! It’s been fun engaging in this topics with you, and I’m interested to hear your reflections on this challenge.  We will start as we often have in this unit by quickly thinking about what we observed, learned, and made connections to in our “Presenter Badge” lesson.”  (5 mins) | Students will complete their summary table page on the previous lesson: Presenter. |
| “OK students, as you have probably seen in some of your research an engineer always asks questions about the engineering design process to improve the next piece be it another redesign or what they learned that can be brought to the next project.  Meet back with your group to reflect on your team’s final design. Look over your teams Presentation Feedback Forms, and have an open discussion about what worked both on your design as well as how well your team collaborated on this project. Please work quietly with your team to answer the Reflect and Analyze questions on page 8 of your engineering journal.  (5-15 mins) | Students will get together with their team and discuss their final design. They should have an open conversation using the group consensus protocols to end this project with a positive reflection process learning from the things that worked and the things that needed to change.  Hopefully students will understand that this reflection process is a positive learning experience so as they get together with their groups the conversations will be constructive in nature.  Students will need to each write in their own reflect and analyze question responses. |
| “OK Engineers, another important part of our project is to think about how the process went for you personally. As a part of our grading for this unit I am going to ask that individually you complete a rubric where you will be thinking about how your actions in this unit helped move the project forward for you group.”  (5-10 mins) | Students find a quiet place to complete the collaboration rubric. |
| “To wrap up this unit, we completed our design challenge, and now we have 2 more final pieces to complete: our summary tables, and guidebook response questions. These, along with your feedback forms, and other evidence of your learning from the unit, will be used in scoring your final Unit grade.  First we will complete our summary tables together. Please help me fill out the “Analyzer” row. What did you observe today? What did our learning involve? What connections to the space junk problem did you make?”  (5 mins) | Students will complete the last column of their summary table, the “Analyzer” section. |
| “Now we will spend just a few quick moments to reflect on our analysis work in our engineering notebooks, and respond to 1-2 of the following questions in our guidebooks to earn our “Analyzer” badges. Please respond to one of the following questions for your exit ticket today:”   1. Of all the careers you have learned about over this unit about Space Junk, what was the most interesting and why? 2. Overall how was your experience in learning about space junk? 3. On a scale of 1-10 (1 low, 10 high) how well do you think you worked together with your teammates? Describe your work with your teammates. 4. If you could change one thing about the whole experience, what would you change?   (5 mins) | Students will answer the reflective guidebook questions to demonstrate learning for their Analyst badge. |

**Accommodations:** If small group reflection is difficult for your class another option is called a Debrief Circle. This video explains what it looks like.

**Extensions:** The NASA website offers opportunities for students and educators to continue studying education around space.

**Assessment:**

Formative Assessment in the Lessons: In this lesson all student work that was more formatitive during the unit will be submitted and evaluated for a summative review. In this lesson, teacher observations of student participation and engagement in whole class, and team discussion will be noted.

Summative Assessment for the Unit: As a summation of this unit students will reflect on their work using their engineering notebooks, a collaboration rubric, their final summary table entry, and their guidebook reflection questions.

**References/Resources:**

Collaboration Rubric from https://newtechnetwork.org/

An additional potential analysis option for the class: Debrief Circle Video from https://www.teachingchannel.org/videos/students-reflect-on-learning-exl

**For Guidebook**

* <http://www.agi.com/home>
* ***Youtube:*** Crash Course Kids: The Engineering Process