**Lesson Number 2: Space Junk Research**

**Problem statement:** Students will continue building off ideas, concepts, and discussions from Unit Lesson 1 by researching additional information about space junk. Primary focus will be spent on identifying why space junk is a problem.

**Learning objectives:** Students will research the space junk problem and answer questions on a graphic organizer.

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

CCSS:

ELA:

CCSS.ELA-LITERACY.SL.5.2

Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

[CCSS.ELA-LITERACY.RI.5.3](http://www.corestandards.org/ELA-Literacy/RI/5/3/)

Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

[CCSS.ELA-LITERACY.RI.5.7](http://www.corestandards.org/ELA-Literacy/RI/5/7/)

Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

[CCSS.ELA-LITERACY.RI.5.9](http://www.corestandards.org/ELA-Literacy/RI/5/9/)

Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

CTE:

1.3: Investigate and Think Critically:Research, manage and evaluate information and solve problems using digital tools and resources.

**Soft skills:**

* Information, Media and Technology skills
  + Information literacy
  + Technology literacy
* Data Analysis
* Identifying credible sources

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

Students will be required to compose formal reports throughout their time in middle school and high school, in which conducting research is a critical component required for reports. In this unit lesson, students will navigate the internet in order to collect various information that delves into the main topic of these unit lessons: space junk. Students must will gain skills in identifying credible websites that provide useful resources as well as identifying websites that are not credible.

**Connections to career and educational pathways:**

This unit lesson provides a glimpse into a career that is in the research sector. Various careers in academia provide roles involving researching information, extracting the relevant data and drawing key takeaways that may support (or counter) a particular thesis. Refer to the Career Connections for real life examples of people that are in this field.

We also recommend creating a careers poster in this unit, for this lesson you could add “Researcher” to the list.

Students will earn the “researcher” badge in this lesson by reflecting on their researching skills today.

**Materials:**

* Access to video (via YouTube) discussing space junk
* Space Cadet Academy Guidebook
* Chromebook/computer
* Summary Table
* Space Junk Research worksheet

**Lesson preparation:** Teacher will want to check the links on the research worksheet and fix or replace any links that are expired or no longer link to the answer to the question asked. Printed copies of the research articles for those needing paper versions may also be useful.

**Time required:**

1 hour approximately

**Grouping of students for instruction:** Students will work independently during the research portion of this lesson. The last 10 minutes of this unit lesson will be designated for group discussion of research findings. Students will work with one partner during this portion of the unit lesson.

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

In this second lesson students are researching and exploring the space junk problem.

**Understanding the Problem**

|  |  |
| --- | --- |
| **Teacher** | **Student** |
| “Ok class today we are going to learn more about space junk. This video model shows the accumulation of space junk from the first time humans went to space.”  video clip: [Space Debris 1957-2016](https://www.youtube.com/watch?v=O64KM4GuRPk)  (2-4 mins) | Watch video and rewatch video if needed. |
| “We are going to be using a summary table to keep track of our learning in this unit, let’s quickly review what we did last time.”  For “Game Maker” Go through observations, learning and connections, having a brief discussion on each while documenting them on a document camera.  (5 mins) | Students share observations, learning, and connections from the Game Maker lesson. |
| “Today, you will be working independently researching space junk. I will pass out a worksheet with 8 questions. Each person on your team will be responsible for answering 2 of these questions.  Quickly as a team divide up which questions you will answer.  Before you get your computer (or article) you need to answer all the questions on the left to the best of your ability. If you don’t know the answer, don’t worry because by the end of today you will!”  (8-10 mins) | [Research Badge Worksheet](https://docs.google.com/document/d/1Q8ewrIhipCRhwlD_WmF-2DYcjaXsHElb9YUkEgyzufM/edit)  Allow students about 10 minutes to answer the what you think you already know questions, have students write answers to their own questions at a minimum. |
| “If you have at least answered the “What do you think” left side for the 2 questions you planned to answer, you should now go ahead and get started on reading the research articles for those questions.”  (20-25 mins) | Allocate approximately 25 minutes for the students to perform independent research; Ensure students are filling out worksheet to document their research understanding. |
| “Now that you have spent time conducting independent research on space junk, it is now time to share some of your most interesting findings with your table group.”  (5-10 mins) | Student groups will discuss their individual research findings with each other. Students are expected to document what they have learned from each other. |
| “To wrap up this class, I’d like volunteers to share some of their interesting findings from either their own research or from hearing a new fact from their table group.”  (5 mins) | Volunteers will share interesting facts that they learned. |
| “To earn your space cadet researcher badge  Please answer the following questions: (Teacher can ask all or some of these questions depending on student understanding based on formative assessments)   1. What questions do you now have about space junk? 2. Describe some of the odd types of space junk. 3. What was the most interesting fact about space junk that your learned today?   Congratulations, you have earned your “Researcher” badge today!”  (5 mins) | Student will record their thinking in writing on the “Researcher” page in the guidebook. |

**Accommodations:**

Modification on question answering: if time is limited each group could answer one question and share out.

Highly Capable: Adjust reflection statements in the guidebook dependent upon student ability. Students can read more articles and answer more questions if time permits.

**Extensions:** Students could read additional research articles independently. As homework, students could search for the most current information on the space junk problem via News Atlas, NASA, or other online resources, and report back to the class with further resources and understanding.

**Assessment:**

Formative Assessment in the Lessons: The completed research questions worksheet, and the “Space Cadet Academy Guidebook” reflection questions.

**References/Resources:**

**For Class:**

* [Space Debris 1957-2016](https://www.youtube.com/watch?v=O64KM4GuRPk)
* <http://easyscienceforkids.com/all-about-space-junk/>
* <https://www.natgeokids.com/nz/discover/science/space/space-junk-strange-things-in-space/#!/register>
* <http://www.bbc.com/news/world-us-canada-39521406>
* <https://www.popsci.com/technology/article/2010-07/cluttered-space>
* <https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-a-satellite-58.html>
* <https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-orbit-58.html>
* <http://www.esa.int/esaKIDSen/SEMESIXJD1E_Liftoff_0.html>
* <http://news.mit.edu/2017/space-junk-shards-teflon-0619>
* <https://www.nasa.gov/mission_pages/station/news/orbital_debris.html>

**For Guidebook**

* <http://apps.agi.com/satelliteviewer/>
* <https://www.sciencenewsforstudents.org>
* <https://spaceplace.nasa.gov/>
* <https://newatlas.com>
* [https://www.dogonews.com](https://www.dogonews.com/)