

Galileo Educator Network

Professional Development Institute

D1.5 – Sorting the Solar System

(1 hour and 15 minutes)

1. Introduction (5 minutes)

- Explain that in this investigation, we will explore and categorize objects in the Solar System, following their chronology of discovery:
 - Students and adults are often curious about why Pluto was demoted to a dwarf planet.
 - In this investigation, you may discover (just as scientists did) that you may need to revise categories for objects, as new objects are discovered.
 - Use the analogy of the platypus.
 - In your 3 envelopes you will find a total of 24 cards of objects in our Solar System.
 - You will sort these cards into groups based ONLY on the images and the data that is provided and logical reasoning.
 - It is not sufficient to put something into a category for the simple reason that you “want it there”, or “know where it belongs”.
 - There may be cards with two sides. You can flip the card over to reveal more information only when the next envelope is distributed.

(5 minutes)

2. Time Period Antiquity to 1799 (20 minutes)

- Distribute the envelope labeled “Antiquity to 1799” and ask participants to sort the objects into groups, and create an index card with a description of each grouping:
 - Lay your groupings down on the table.
 - Use a large post-it note to label/name each grouping and include the following information on the index card: **[slide]**
 - Name for your grouping
 - Description of your grouping
 - Criteria you used to create the categories
 - The card numbers of the objects in your group
 - This will help you later in placing new objects into one of the categories.

- You must be able to explain why each object has been placed under that specific category.
- If one group finishes early, ask them to consider what alternative ways they could have organized the data.

(13 minutes)

- Use the **Numbered Heads** strategy and ask a participant from one of the groups to describe their groupings.
- Use the **Numbered Heads** strategy and ask a participant from one of the other groups to describe how their groupings are different.

(7 minutes)

3. Time Period 1799-1950 (20 minutes)

- Distribute the envelope labeled “1799-1950” and ask participants to sort the new objects into groups, re-sort the existing objects as needed, and update the group names, descriptions, and criteria as needed:
 - If needed, use a new post-it
 - You are free to move objects from one group to another, if needed.

(13 minutes)

- Use the **Numbered Heads** strategy and ask a participant from one of the groups to describe their new groupings and the changes they made.
- Use the **Numbered Heads** strategy and ask a participant from one of the other groups to describe how their groupings are different.

(7 minutes)

4. Time Period 1955 - Now (15 minutes)

- Distribute the envelope labeled “1950-now” and ask participants to sort the new objects into groups, re-sort the existing objects as needed, and update the group names, descriptions, and criteria as needed:
 - If needed, use a new index card
 - You are free to move objects from one group to another, if needed.

(8 minutes)

- Use the **Numbered Heads** strategy and ask a participant from one of the groups to describe their new groupings and the changes they made.
- Use the **Numbered Heads** strategy and ask a participant from one of the other groups to describe how their groupings are different.
- Use the **Numbered Heads** strategy and ask a participant from one of the other groups how the introduction of new data on object 16 influenced their categories, or its categorization.
 - If it has not already been discussed, reveal that object 16 is Pluto.
- Use the **Numbered Heads** strategy and ask a participant from other groups to comment.

(4 minutes)

- Summarize how the object categories were refined over time, citing examples from the different groups.
- Describe what happened to object #16 when we learned more about it and new objects was discovered.
- Distribute **[HO D1.5 – Categories of Solar System Objects]** that includes currently accepted categories for the objects (star, planet, dwarf planet, moon, comet, and asteroid).

(3 minutes)

5. Reflection on the Nature of Science (15 minutes)

- Ask participants to individually answer the following questions in their **Journal**:
[slide]
 - How did your previous knowledge and experiences (related to Solar System objects) interfere or help you as you completed this investigation?
- Ask selected participants to share their answer with the large group and relate answers to objectivity.

(7 minutes)

- Point out how the categories changed during the investigation:
 - This is a good example of how Scientific Knowledge is Open to Revision in Light of New Evidence (NP3).
 - It also demonstrates that Science is a Human Endeavor (NC3), as we balance prior knowledge with the task at hand, along with the emotionally charged debate over what constitutes a planet.

- Ask participants to individually answer the following question in their ***Journal***:
[same slide]
 - How would you reply to a student who said “If science constantly changes, how can we trust it?”
- Ask selected participants to share their answer with the large group.
(8 minutes)