

Lesson Plan

Assessment
Cross-curricular

Feedback, peer assess, rubric
Health, P.E., Technology

<p>Big Ideas</p> <ul style="list-style-type: none"> Celestial objects in the solar system and universe have specific properties that can be investigated and understood. Technologies developed for space exploration have practical applications on Earth. <p>Learning Goals</p> <ul style="list-style-type: none"> Ways to keep astronauts alive and healthy The important components of a space station 	<p>Specific Expectations</p> <p>D1.1 research the challenges associated with space exploration, and explain the purpose of materials and technologies that were developed to address these challenges and how these materials and technologies are now used in other fields of endeavor</p> <p>D2.1 use appropriate terminology related to space exploration</p> <p>D2.3 use a research process to compile and analyse information on the characteristics of various objects in the universe</p> <p>D2.4 investigate a technological challenge related to the exploration of celestial objects that arises from the objects’ specific properties, and identify the solution that has been devised</p> <p>D3.3 identify the factors that make Earth well suited for the existence of life</p>
<p>Materials</p> <p>Superb Space Stations Plan (from lesson 3 with feedback)</p> <p>Superb Space Stations- Summative Assessment</p>	<p>Safety Notes</p> <p>No safety concerns</p> <p>This could take 2 X 75 minute class periods.</p>

Description

This is **lesson four** in a series of four lessons where students will be creatively introduced to a problem (How can we keep astronauts alive on a distant planet or moon), will self-direct the specific nature of their learning (choose a planet or moon), will research background details (planet research), and then develop solutions to the specific nature of their problem. This lesson will be organized around a Problem-Based Learning (PBL) Framework.

Introduction

- This lesson will likely take 2 X 75 min periods
 - The teacher will return the one copy of Superb Space Stations Plan (from the previous lesson) with descriptive feedback added to each group. Group members should be given time to read and discuss the descriptive feedback and must show evidence to making changes to their plan to take this feedback into account.
-

Action

- Once groups can show the teacher that they have taken the feedback into account and made appropriate changes to their space station plan they should be provided with a whiteboard, chart paper, space on a room chalkboard, or drawing palate on a computer.
 - Groups will cooperatively convert their space station plan from lesson 3 into a 2-dimensional top-view diagram of their space station.
- As students work in their sketches the teacher should move throughout the classroom to ask probing questions about design choices.
 - Ex. "I notice that your bathroom and your water purifier are on different sides of the station. Why might that be a problem?" OR "I don't see any way that you're producing electricity for your space station. How do you plan to do that?"

GALLERY WALK:

- After sketching their space station fully, they will engage in a gallery walk for casual peer assessment.
- Half of the group members will stay with their sketch while half will rotate around the room, group to group.
- At each stop, the group member(s) remaining will describe their planet or moon and their station design decisions.
- Once a full rotation has happened, group members will switch places and the full rotation will start again.
 - The intent of this Gallery Walk is twofold. It allows students to see other innovative solutions while also giving them time to verbally practice discussing their work for their interview assessment.

BUILD STATIONS (OPTIONAL):

- Teachers may choose to have students construct their space stations as 3-D models using cardboard, boxboard, or other available materials.
 - While this can be time consuming (1 period or more) it may provide students more time to reflect on and improve their problem solving.
 - It can also allow them to model sections of their space station that can't be done in 2-D.
- Groups will be interviewed by their teacher and scored on a rubric based on how well they can answer questions about their space station drawing or model.
 - Although groups may be interviewed together, students will be asked and must answer questions individually without help from their peers, making this an individual assessment.

- This means that all students will be accountable for knowing about the design decisions of their space station and students should be encouraged to coach one another to effectively answer questions.
- The questions asked in the interview by the teacher will be based directly on the categories listed on the Superb Space Stations Plan.
 - An example of the a question based on the "breathable air" category with leveled responses is:
 - Question: “How do you make sure that there is always clean air for your astronauts to breathe?”
 - Answer LVL 4: “Well, we know that when people breath they turn oxygen in the air into carbon dioxide. That means that if we don’t do something about it there will soon be too much carbon dioxide and the astronauts will suffocate. We decided to install an oxygenator to convert carbon dioxide into breathable oxygen and we put it in the room with the heating and cooling so it’s easy to move the air out from that spot.”
 - Answer LVL 3: “We decided to put in an oxygenator to convert carbon dioxide to oxygen. We put it here in the centre because that way the air can move around easily.”
 - Answer LVL 2: “We put in a device to make sure that they can breathe the air.”
 - Answer LVL 1: “Well... The space station is big so they just breathe the air and there is lots of it. If they run out they make more.”
- Further questions, directly related to the Superb Space Stations Plan categories, could be:
 - How will you provide food for your astronauts?
 - How will you make sure there is enough water?
 - What do you do with your waste?
 - How do you make sure air stays in your station?
 - What plans do you have to deal with health emergencies?
 - How do you communicate with earth?
 - How do you create electricity? What do you use that electricity for?
 - Etc.

Consolidation/Extension

- Based on the initial module hook, the teacher may choose to have a 'winner' chosen from the different space station proposals.
- Students could be given the opportunity for an anonymous vote (as members of the Canadian Space Agency) to choose which plan will be the one to go forward.