



SPACE 
awareness

PLANET EARTH

LET'S DESIGN A SPACE SUIT

DIDACTIC COURSE FOR PRIMARY LEVEL

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Information about the course

Brief description: In the following activity children will design a spacesuit – a special set of clothes wearable out of space, suitable for space conditions, which provides safety conditions for astronauts' activity.

Students will face different questions about which properties the suit will need, in order to find the best design. This activity is part of the school project *The Space Explorers*, inspired by the 6-7 year old children from the Discovery Kids Primary School, Ramnicu Valcea, in Romania.

Curriculum topic:
Planet Earth. Integrated Science, Language and Art

Category:
Our fragile planet

Keywords:
planet, astronaut, planet Earth, space shuttle, space rocket, space station (ISS), spacewalk, spacesuit, space dust, satellite, the Moon, atmosphere, oxygen, water, extreme temperatures

Age range:
6-10

Education level:
Primary

Language:
English

Students' prior knowledge:
Space, the Earth

Didactical hours:
2

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Educational Objectives:

Types of Knowledge	Cognitive Objectives	Affective Objectives	Psychomotor Objectives
Factual	<p>to remember</p> <p>Describe the space around planet Earth.</p> <p>Consider some of the parameters of the space beyond the Earth's atmosphere: darkness, low temperatures, Sun radiation, space dust, lack of air/atmosphere.</p>	<p>to pay attention</p> <p>Watch video files and/or images presenting planet Earth viewed from space, the space shuttle flight and the International Space Station.</p>	<p>to imitate and try out</p> <p>Imitate and try out the moves of the astronauts in outer space</p>
Conceptual	<p>to understand</p> <p>Describe why and how these conditions affect human beings/affect human life/activity.</p>	<p>to respond and participate</p> <p>Children respond to the teacher's questions and participate.</p>	<p>to perform confidently following instructions</p> <p>Perform confidently following instructions while expressing their own ideas, feelings, thoughts.</p>
Procedural	<p>to apply</p> <p>Understanding why humans need to adapt to these conditions and using their previous knowledge they need to solve the most important problems.</p>	<p>to recognise values</p> <p>Recognise the importance of life in space, identify the potential risks and try to find solutions to these aspects.</p> <p>Understand the importance of the good education, hard work/training.</p> <p>Understand the values and the importance of the team work.</p>	<p>to perform independently, skilfully, and precisely</p> <p>Perform independently, skilfully, and precisely in designing the spacesuit</p>
Meta-cognitive	<p>to think critically and creatively</p> <p>Thinking critically and creatively, they design a spacesuit suitable for human life/activity in space. Children draw conclusions, present and describe their creations.</p> <p>Compare their own design with the real spacesuit.</p> <p>Reconsider their ideas and improve the spacesuit performances after sharing ideas and presentations of their creations with their peers.</p>	<p>to form and follow a system of values</p> <p>Watch video files/images presenting astronauts working out of ISS or space shuttles and wearing spacesuits.</p> <p>Recognise, name and understand some of the astronauts' feelings, emotions, concerns, character features.</p> <p>Practise effective team work</p> <p>Choose/design a logo/badge for their team and spacesuit.</p>	<p>to adapt and perform creatively</p> <p>Children present and describe their creations showing confidence, using body language and the proper vocabulary / keywords.</p> <p>Identify weak / strong aspects of their creations or of their peers' designs.</p>



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Samantha Cristoforetti, first Italian woman on space, attired in a spacesuit (Author: NASA/Robert Markowitz, Public Domain)



ORIENTATION

To start with this lesson, we invite students to do a spacewalk.

“Do you want to see our beautiful blue planet from outer space? Let’s take a spacewalk.”

Show the students images of planet Earth viewed from space, space shuttle flights and images from International Space Station (ISS) from YouTube:

<https://www.youtube.com/watch?v=yyUeRLO7H2Y>

Images of Planet Earth from space (length: 3:08 minutes). Shorten it if needed.

<https://www.youtube.com/watch?v=OnoNITE-CLc>

Space shuttle launch video from NASA (length: 3:52 minutes)

<https://www.youtube.com/watch?v=mve7hRaoH8U>

Images of a shuttle and the Space Station taken from space. Show only 1st minute.

Based on children’s previous activities and knowledge about our planet, underline the most important parameters:

- The sky is dark
- Direct exposure to the Sun’s radiation
- Extreme temperatures
- The lack of air/atmosphere/air pressure
- The lack of water
- The presence of other objects (dust, meteorites, satellites, space garbage) in the nearby space

Encourage the children to describe these extreme conditions and identify some of the consequences. Reinforce the specific vocabulary using the keywords as much as possible. Try to be creative and include in this part open questions, funny examples, little jokes:

“Would you like to see the Earth from outer space? Would you like to take a spacewalk? Are you going alone or with somebody else? What object would you take with you? Can you take your pet with you? What means of transportation can we use? Why we can’t travel by car, or by train? What is a space shuttle or a space rocket? What is a spacewalk? Could we use our daily clothes for a spacewalk? Why/Why not? Do we need a special suit for space explorations?”

EXTRA GUIDELINES

Use of ICT tools and other resources

Take pictures of the children working in different stages of the activity. Make sure you have the parents' authorisation to take pictures of the students. Take pictures of the final designs. Make a short PowerPoint presentation for the parents.

Use of a projector or Interactive Whiteboard to show the videos.

CONCEPTUALISATION

Take one by one all the parameters connected to the problem. Start a discussion saying:

"Do we need a spacesuit for a spacewalk? What does a spacesuit look like? How does it work?"

Encourage your students to identify and describe why and how each parameter could affect human life. When we take a long walk we keep a bottle of water in our bag and the air is all around us. In the outer space there is no air and no water.

"Can we live without air or water? No. We need water to drink. Also, we need a source of air/oxygen to breathe. What can we do to solve the problem during our spacewalk?"

Next, we introduce the problem of the Sun's radiation, explaining that on Earth we are protected by the atmosphere, but there is none in outer space. Also, exposure to the Sun could overheat our body.

"Is it wise to sunbathe up there? How do we usually protect ourselves from Sun radiation here, on Earth? Sunglasses, light-coloured clothes, sun cream, caps or hats.... What can we do there, in space?"

In space the temperature is very low. So, our body must deal with extreme temperatures.

"It is very cold... What kind of clothes should we wear in this case?"

Explain to students that an astronaut must work in space. He/she needs to move his/her feet, arms and hands easily. His/her job needs to be done as quickly as possible. An astronaut can't spend too many hours out of the space station or space shuttle. So, uncomfortable clothes are not the best choice.

“Which one is more suitable: a one-piece suit (like a ski outfit) or one made of more parts?”

Space dust means many, tiny particles. Tiny particles don't hurt too much but even a very small particle, at a high speed, can damage the spacesuit. Explain this to your students.

“How about the fabrics? Thin, thick, soft or durable textiles? How about colours? Remember, the astronauts have to work in dark space. Shall we wear pink? Or dark blue?”

During our spacewalk we need to communicate with others. But in outer space there is no sound.

“How can we communicate in space? What do we need for that?”

After some guesses, you can explain they need a communication device. Then, you raise the question of how can they eliminate waste –urine and faeces –while in space.

“How can we go to the bathroom if there is no bathroom? What can we use instead?”

For extra-vehicular activity, astronauts use a diaper called a Maximum Absorbency Garment.

Gathering and organising concepts and information is a difficult task for children so young. Help them to create a map. Project in the classroom the next table:

The spacesuit must:
Be comfortable , not too heavy. Easy to put on/take off
Provide us with water to drink
Provide us with air to breathe
Protect us from getting too hot or too cold
Protect us from space dust
Protect us and especially our eyes from bright sunlight
Allow us to communicate with other astronauts or with Space Center team
Allow us to “use the toilet ” in space.

Taking into consideration the children's age you can edit the map to include more suggestive images than words. Make sure that these concepts are clear to all the children. Encourage them all to express their ideas, thoughts, point of views, questions.

For the older children you can introduce parameters like gravity, in fact the absence of it. The astronauts float in space. They can easily float away, too far from the space shuttle or station.

"We need to add some security devices to keep them close enough to their space home. What can we do about that?"

Also, the main purpose of the spacewalks or EVA as they are called is work. During their space missions the astronauts always need to fix or repair something. Any craftsman has a tool box or a tool belt. The astronauts have a tool belt, too. It is called MMWS (modular mini work station).

"How can you keep the screwdriver from floating away?"



EXTRA GUIDELINES

Use of ICT tools and other resources

To localise the action better, you can use this image of the ISS while putting questions to students:

<https://pixabay.com/en/international-space-station-iss-548331/>

INVESTIGATION

In this part of the activity the children work in pairs. The children can be assigned randomly or they can freely choose their partner. The teacher will pay attention to the children's preferences. No child should be left aside or feel isolated. Encourage children with high levels of achievement to help their peers during this activity. It is not a contest; it is just an opportunity to let their imagination go beyond the Earth's atmosphere.

Spread large sheets of white paper on the classroom floor and provide children with plenty of coloured pencils, crayons, fibre pens. Ask them to design their own spacesuit according to the parameters discovered. They can use their own body as a pattern. Encourage them to use their imagination and draw their own amazing design.

Give them enough time to finish their drawings and to add all the items they want to add. Remind them to design a badge (logo and/or a symbol) for their team and suit.

EXTRA GUIDELINES

Materials and using ICT as an alternative:

Materials to use in classroom:

- white paper
- coloured pencils, crayons, fibre pens.

If using tablets, you can use drawing apps such as Autodesk SketchBook, available for [Android](#) and [IOS](#).

CONCLUSION

Display their work on the walls of the classroom. Each team presents their own design underlining their creative solutions for the spacesuit tasks. Encourage and guide all the students to draw their conclusions. Guide them and help them to check if their design responds to all the tasks from the map. Encourage hesitant students to speak their minds and don't allow interruptions.

DISCUSSION

Encourage children to compare their team's design with other teams' concepts. Based on what they see in other designs do they consider any changes in their original work? Encourage them to discuss the best solution for a specific task even if it is not their own. For example: what colour is more appropriate for a space suit? White or dark blue? What colour stands out best in the darkness of space? The astronaut must be visible for his/her team. He/she doesn't need to camouflage him/herself! So, the spacesuit is white.

Show the students video files and images with astronauts living and working in space, in the interior of the ISS or space shuttle:

<http://www.spacekids.co.uk/spacesuits/>

<http://www.sciencekids.co.nz/videos/astronauts/spacesuits.html>

What do spacesuits look like in those images/videos? Do they look like those in their designs? Point out some similarities and some differences. Give them some information and details about real spacesuits and how they respond to astronauts' needs.

EXTRA GUIDELINES

Materials and handcraft:

Teachers can find more information about the spacesuit here:

<http://www.encyclopedia.com/topic/Spacesuit.aspx>

The picture of Samantha Cristoforetti attired in an Extravehicular Mobility Unit (EMU) spacesuit can be found here to show to your students:

<http://www.flickr.com/photos/nasa2explore/12778323243/>

This image can be used to show students the important role of women in science.

The classroom can participate in handcraft to make a spacesuit with plastic bottles:



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