



Mission: ISS – VEGA Teaching Scenario

Topic: To get to know the international space station (ISS) and explore its structure in a virtual reality setting with the VR app

Mission: ISS

Subject(s): Physics / Astronomy / English

Age / Grade: 11+ / grade 5+

Short description of the VR game in this scenario:

- Take a trip into orbit and experience life on board the International Space Station! [In this Emmy-nominated simulation](#), learn how to move and work in zero-gravity using Touch controllers. Dock a space capsule, take a spacewalk, and let real NASA astronauts guide you on the ISS through archival video clips.

Introduction to the scenario

In this exciting lesson, students get to experience the space station in orbit! Traversing zero gravity and operating parts of the station, students can even step outside the station and walk in space. Taking turns, students explore the station and compete as teams in a playful space walk relay race. If there is time, you can share additional videos with the students on the space station.

Learning outcomes:

The students are able to:

- learn about the ISS and NASA
- experience a zero gravity setting
- explore the ISS, both its interior and exterior
- learn about the ISS from video clips featuring archival footage of real NASA astronauts
- dock a space capsule

A selection of learning outcomes from the Finnish Curriculum

- M1 arouse and maintain the student's interest in the environment and the teaching of environmental science and help the student to realize that all subject areas in environmental science are important for him
- M2 guide and encourage the student to set goals for their studies and to work long-term to achieve them and to analyze their knowledge in environmental science
- M3 support the student to develop environmental awareness and to act and influence in their immediate environment and in different contexts to promote sustainable development and to appreciate the importance of sustainable development for themselves and the world
- M4 encourage the student to formulate questions on different subject areas and to use them as a starting point for investigations and other activities
- M5 help the student to plan and carry out small investigations, make observations and measurements in diverse learning environments with the help of different senses and investigation and measurement tools
- M6 help the student to see the connection between cause and effect, draw conclusions based on the results and per center their results and research in different ways
- M13 guide the student to understand, use and create different models with the help of which one can interpret and explain man, the environment and related phenomena
- M15 guide the student to investigate nature , identify organisms and habitats, think ecologically and help the student to understand human structure, life functions and development
- M19 guide the student to understand the areas of health, the importance of healthy habits and the course of life, the individual growth and development in childhood and adolescence and encourage the student to practice and apply their knowledge on health in everyday life

[Formative assessment](#)

Number of students: Duration (estimated time/number of lessons):

- 20 students (4 students/group)
- 2 lessons á 45 min

Prerequisites (necessary materials and online resources):

- Computers with internet connection and Mission: ISS downloaded on a STEAM account
- VR glasses with the application installed on a gaming computer (Valve Index, Oculus Rift or some other VR Goggles connected to STEAM)
- Check that the internet is working
- Information about the topic to mediate to the students (videos, pictures, Educational tools etc.)

Before the program begins (preparatory work for teacher):

- Search and collect information and material about the topic
- get properly acquainted with the app *Mission: ISS* and the demo version on computer
- Prepare and collect all things needed for the scenario
- Learn how basic functions work and how you use the controllers (make a manual for the controllers if the students haven't used them before)
- Divide students into groups of up to four students

The main part of the scenario (amount of lessons):

Part one (one lesson 1 x 45 min)

- The teacher divides the students into small groups (up to 4 per group). Each group needs access to their own computer with Mission: ISS.
 - Quickly introduce the students to the ISS and NASA.
 - This lesson has the students exploring the space station and completing tasks.
1. Where is the ISS? [Take a look at this live stream!](#) Additional source: [the ESA tracker](#).
 2. Go through the theory below ([source](#)) and/or your own notes on the topic with the students.
- **The International Space Station** is the most complex scientific and technological endeavor ever undertaken.
 - Its main construction was completed between 1998 and 2011, although the station continually evolves to include new missions and experiments. It has been continuously occupied since Nov. 2, 2000.
 - The ISS is **not owned by one single nation** and is a “co-operative programme” between Europe, the United States, Russia, Canada and Japan.
 - Crews aboard the ISS are assisted by mission control centers in Houston and Moscow and a payload control center in Huntsville, Ala. Other international mission control centers support the space station from Japan, Canada and Europe.
 - The Space Station flies at an average altitude of 248 miles (400 kilometers) above Earth. **It circles the globe every 90 minutes** at a speed of about 17,500 mph (28,000 km/h). In one day, the station travels about the distance it would take to go from Earth to the moon and back.

3. Student discussion: What do you think can be found on the International Space Station? Which rooms? What kind of technology? Guessing is ok!

Resource: [Map of the ISS](#)

Some examples of specific quarters and technology onboard the station:

- Sleeping quarters
 - Solar arrays and their rotation mounts (the mounts make the arrays face the Sun, providing power for the station)
 - Toilets (in Zvezda and Tranquility)
 - Much, much more: [source 1](#), [source 2](#)
4. VR assignment: **dock the space capsule**. In each group, each student in turn docks the space capsule (this is a specific assignment in the app that must be activated by the student).
 5. VR assignment: **go for a space walk**. Make sure that every student has enough time to space walk in each group!

Part two (one lesson 1 x 45 min)

- Students discuss the challenges of being in a zero-gravity environment.
- Students get to watch the NASA video clips aboard the space station.
- Students take part in a playful relay race while space walking.
- If there is time, students get to see videos on the ISS.

1. Student discussion: The ISS is a **zero-gravity environment**. Based on your VR experience and your prior knowledge, what kind of challenges does zero-gravity impose?

Potential answers (go through together)

- Movement is difficult
- All bodily needs are difficult (eating, sleeping, drinking, bathroom)
- Liquids are notoriously difficult to handle in zero G
- Loss of bone density and muscle mass (only during extended stays)
- Sensitive electrical and mechanical equipment can easily be damaged

2. Student question: What kind of challenges does space present in addition to zero gravity?

Potential answers:

- Lack of night & day cycle (loss of circadian rhythm)
- Lack of most daily activities and hobbies
- Radiation
- Time away from friends and family
- Lack of sexual activity

3. VR assignment: **watch the NASA astronaut videos**. As long as students get to hear and see the videos even when not wearing the VR headsets, watching each video once per group is probably enough. Have the students change who has the VR set after each video.

4. VR assignment: **space walk relay race**.

- In this playful race between student groups, students race across the space station's exterior, from one end to another.
- Each time a student reaches one end of the space station, another member of their group gets the VR set.
- A team wins once all of its members have raced across the space station's exterior at least once (if teams have a different number of members, some team members will have to race more than once for the race to be fair.)
- This is a race without stakes and no prizes, and also teaches the students how rushing through a zero-gravity environment can be quite dangerous.

5. Bonus: If there is time, you can watch these educational videos with the students.

- [Canadian Space Agency: Sleeping in Space](#) (3 min)
- [NASA: The ISS: A Laboratory in Space](#) (3 min)
- [AskNASA: What is the ISS?](#) (5 min)
- [NASA: The International Space Station: Together is the Future](#) (9 min)
- [CBS Sunday Morning: Web extra: International Space Station tour](#) (30 min)

6. DEBRIEFING - questions for each student individually

- Who owns the ISS? A: No particular nation, instead it is a collaborative effort between Europe, the United States, Russia, Canada and Japan.
- What powers the ISS? A: An extensive array of solar panels that continuously face the Sun.
- What challenges does a zero-gravity environment pose? A: Movement is difficult, all bodily needs are difficult (eating, sleeping, drinking, bathroom), liquids are notoriously difficult to handle in zero G, loss of bone density and muscle mass (only during extended stays), sensitive electrical and mechanical equipment can easily be damaged

Summative assessment:

Grades 5-10	5	6	7	8	9	10
Activity and engagement	The student has had challenges to get the task finished. The student hasn't shown signs of engagement neither at school nor at home.	The student has only occasionally shown interest in the work and has had difficulty finding motivation.	The student has mostly shown interest in the work both at home and at school.	The student has shown interest and commitment to the work both at home and at school.	The student has shown great interest and commitment both in lessons and at home.	The student has shown great interest, responsibility and commitment both in lessons and at home.
The overall picture of the work when completed.	The student misses several parts of his work and several points are not checked in the list.	The student lacks several parts of the checklist in his work.	The student lacks certain parts of the checklist, but it is largely complete.	The student has done all the parts on the checklist.	The student has done all the parts on the checklist and you can see that the student has made an effort to include all the parts.	The student has done every single part on the checklist and it can be seen that the student has processed the content.
Images and captions	The student lacks pictures.	The student has few pictures and no captions.	The student has pictures but no captions.	The student has pictures with accompanying text.	The student has several pictures and descriptive captions.	The student has versatile pictures and descriptive and explanatory text.

<p>Showing responsibility for the completion of the work. Cooperation and peer response</p>	<p>The student had difficulty cooperating with his group and did not listen to his classmates. The student did not give a peer response and did not take into account what the group gave in response.</p>	<p>The student had some difficulties in cooperating with his group and listening to his classmates. The student gave peer feedback without following the instructions. The student did not take into account the response given by the group.</p>	<p>The student mostly cooperated well with his group. The student received and gave feedback from his group almost always according to the instructions. The response was mostly constructive.</p>	<p>The student showed responsibility and mostly a good ability for cooperation. The student received and gave feedback from his group. The response was constructive.</p>	<p>The student showed evidence of good responsibility and a good ability for cooperation. The student gave a versatile response and took the response he / she received from his / her group into account.</p>	<p>The student showed evidence of excellent responsibility and an excellent ability for cooperation. The student made an effort to formulate himself in a constructive and valuable way for the task in order to help his group further in his work. The student received a response from his group and took it into account in his own work.</p>
<p>Skills</p>	<p>The student shows obvious shortcomings in the understanding of the subject.</p>	<p>The student shows some shortcomings in the understanding of the subject.</p>	<p>The student shows evidence of a certain understanding and some learned knowledge of the subject. .</p>	<p>The student shows evidence of a good understanding and has assimilated the most important content in the subject.</p>	<p>The student shows an excellent understanding and has assimilated the most important content in the subject but lacks some knowledge.</p>	<p>The student shows evidence of an excellent understanding and fully masters the content.</p>

Language learning/English	The student has big difficulties in learning the English words.	The student struggles with and has some challenges with the English words.	The student knows the most important concepts and words in English.	The student shows evidence of understanding most parts In English.	The student has a good understanding and has learned most of the concepts and knows all the words in English.	The student masters all concepts and words in English.
The VR part and the app use	The student presents obvious difficulties in understanding how Mission: ISS app works. Shows a lack of interest and is careless in the use of equipment needed.	The student presents some difficulties in understanding how the Mission: ISS app works. Trying to follow the instructions, but can not keep the interest up all the time. The student is sometimes careless in the use of equipment needed.	The student understands the main features of how Mission: ISS works. Mostly follows the instructions, but sometimes lacks perseverance. Is usually careful with the equipment.	The student shows a good understanding of how Mission: ISS app works. The student always follows the teacher's instructions and is careful with equipment.	The student shows an excellent understanding of how Mission: ISS app works. Always follows the teacher's instructions and is very careful with the equipment.	The student masters the use of Mission: ISS app. Always follows the teacher's instructions and helps their classmates. Always careful with technology.