

STE(A)M IT INTEGRATED LESSON PLAN TEMPLATE

Title

Zoom, Zoom We are going to the Moon with Paxi

Author

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Summary

Who hasn't dreamed of flying to the moon, searching and finding solutions to save the world? Today's students will be the ones who can make things go better in the future. So if we challenge them from a young age to think creatively, work in a team, search for information and find solutions to problems, they will gain confidence and can really achieve great things.

Paxi, the cute ESA mascot, and videos created especially for the youngest ages by the European Space Agency were the inspiration and starting point for our STEAM adventure.

This learning scenario aims to bring children closer to STE(A)M activities, challenge them to think like future scientists, develop their 21st century skills, The 4 C's, creativity, critical thinking, collaboration and communication. those key and transversal skills that will later help them pursue a STEM career, realize their dream and make life better and more beautiful.

During these activities students learn about flight, life on the Moon, forces or aerodynamic design and are challenged to act as engineers, mathematicians, physicists, pilots or astronauts, scientists, build and launch rockets, solve problems, seek information, analyze, compare, test, improve, redesign, listen to opinions and provide solutions and feedback to each other.

After building and launching their own rockets, students creatively use technology and web 2.0 tools and take their first photos in a virtual astronaut suits.

In the end, all students will understand that "Sometimes, for a dream to come true, it is enough to have it." (Urszula Zyburá).

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Subject (s)

Please list in detail the subjects taught in this lesson and briefly explain why specific subjects and teachers were chosen, including the link of the non-STEM subjects and their use in improving the lesson.

I am a Romanian primary school teacher and, according to my national curriculum, I teach STEM and non-STEM subjects. This learning scenario is built on the subjects I teach.



STEM subjects:

1. Mathematics (the students solve addition and subtraction exercises with numbers up to 100, without crossing the order, geometric figures, months of the year, days of the week)
2. Science (the students build and test their own rocket learning about “aerodynamic design”, Space Flight; Moon; Physics: Forces)
3. ICT (the students use NASA SELFIES application with their smartphones to take the first pictures in a virtual spacesuit with gorgeous cosmic images and make a group picture with Pixton; they use web 2.0 tools; they respect online safe rules)

Non-STEM subject:

Arts (the students create 2D and 3D models of rocket, they sing the Zoom, Zoom, Zoom - We're Going To The Moon song and create their own Paxi song)

Real- life questions

How can we get to the Moon?

Why is it important to get to the Moon?

What do we need to live on the Moon?

How does a rocket fly?

How can you build a rocket?

How can we help and save our Planet?

Aims of the lesson

Knowledge application (students are expected to demonstrate sound understanding of how the selected subjects are used and linked between them).

During the activity students will learn to:

- use creatively web 2.0 applications and tools;
- recognize and use 2D/3D shapes in their own projects;
- work in teams to design a common product;
- build and test rockets;
- collect, compare and interpret data;
- follow a personal research plan and draw conclusions;
- present their learning products;
- peer-asses their learning products.



Connection to STEM careers

How the skills developed by this lesson connect to existing and perspective STEM careers. Students are expected to demonstrate (while working in groups or other) how the chosen subjects are linked to STEM careers and list some potential career paths.

STEM careers are increasingly important and present in our lives. The change must start from the little ones who will be able to save the world in the future. Resources are increasingly scarce and scientists and engineers are looking for new exploitation possibilities for economic development. The dream for a better, more beautiful, cleaner world can become a reality starting today.

1. Engineer (building flying machines)
2. Mathematician (calculations, problem solving)
3. Physicist (study of forces, aerodynamic design)
4. Flying machine pilot (testing flying machines)
5. Data analyst (collecting data and drawing conclusions)

Age of students

8-9 years old

Time

Preparation time:

30' to prepare each lesson

Teaching time:

- **Brainstorming and discussion: 45'**
- **STEM Subject 1: Mathematics – 45'**
- **non-STEM subject 1: Arts – 45'**
- **non-STEM subject 2: Arts – 45'**
- **STEM Subject 2: Science – 45'**
- **STEM Subject 3: Technology – 45'**

Teaching resources (material & online tools)

Materials:

- plastic soda bottle
- Thin cardboard
- Duct tape
- Scissors
- Vinegar
- Paper towel
- Baking soda
- Cork

Online tools:

G Suite for Education (The lesson can be implemented during online school, via Google Meet and Google Classroom.)

Mentimeter, Padlet, ThinkLink, Nasa Selfies, Pixton



<https://clasamea.eu/calculam-pana-la-100/>

YouTube videos:

Zoom, Zoom, Zoom-We're Going To The Moon <https://www.youtube.com/watch?v=us05bPh5dAs>

Paxi explores the Moon! <https://www.youtube.com/watch?v=PxqltnER8E4>

How to Make a Baking Soda and Vinegar Rocket <https://www.youtube.com/watch?v=pquyfOH4iuI>

WORLD SPACE WEEK 2018 Rocket Launch - Part 1 <https://www.youtube.com/watch?v=KK8fTxOd-Q>

Zoom Zoom We are Going to The Moon with PAXI <https://www.youtube.com/watch?v=TE1mOUdHric>

21st century skills

How the lesson plan corresponds to 21st century skills. To find out more: <http://www.p21.org/our-work/p21-framework>

This lesson plan will enhance among the students the following skills, defined as 21st century skills:

This lesson plan will improve among students the following skills, defined as 21st century skills:

Creativity: Students will use available materials developing their creative thinking skills to create original products, improve products and find solutions to problems

Critical Thinking:

students will analyze the created products, identify possible errors and find their own solutions to improve the prototype

Communication:

Students will participate in a constructive dialogue, bring arguments and counterarguments and listen to each other's suggestions and opinions.

Collaboration:

Students will work in teams, collaborate and interact to make products, learn from each other, respect the opinions of peers, provide constructive feedback and feedforward to each other

Information and Digital Literacy: Students will study tutorials about flight and life on the Moon, use apps on their own phones, and create original and creative products.

Problem Solving: Students will identify the problems, failure or success of each rocket launch by learning about aerodynamic design or forces, providing possible solutions

Lesson Plan

The implementation of integrated STEM teaching and learning is facilitated by the use of specific pedagogical approaches (PBL, IBL, etc). In order to facilitate the research done by the teachers and the design of activities by teachers, a selection of such approaches is presented in Annex 1. Maintaining Annex 1 in the Learning Scenario and citing where necessary is mandatory.

How can we get to the Moon?

Why is it important to get to the Moon?

What do we need to live on the Moon?



How does a rocket fly?

How can you build a rocket?

How can we help and save our Planet?

Name of activity	Procedure	Time
1st Lesson		
Brainstorming and discussion	<p>Zoom, Zoom We are going to the Moon</p> <p>Students learn through a fun song about every man's dream, to reach the moon, and discuss the possibility of achieving this dream.</p> <p>https://www.youtube.com/watch?v=us05bPh5dAs</p> <p>The students meet Paxi, a ESA mascot, watch the video created by the European Space Agency</p> <p>https://www.youtube.com/watch?v=PxqltnER8E4</p> <p>The students fill in their answers to some learning questions, on Menti.com, before and after watching the video.</p> <ol style="list-style-type: none"> 1. Before watching the video How can we get to the Moon? 2. After watching the video What did you learn from Paxi explores the Moon video? Why is it important to get to the Moon? What do we need to live on the Moon? 	45'
Discussion and preparation for the next lesson	<p>First driving question:</p> <p>How can we help and save our Planet?</p> <p>Students discuss about the humans' dream to fly to the Moon, to live there, to discover and exploit new resources to help and save the world.</p> <p>Secondary driving questions:</p> <p>How does a rocket fly? How can you build a rocket?</p> <p>Students fill in the first cells of a KWL rubric about Flying to the Moon and rocket design.</p> <p>Students discuss about STEM careers that help them to achieve their dream, grouping into teams based on multiple intelligences to better develop their skills.</p> <p>During the lessons:</p> <ul style="list-style-type: none"> -they will understand why the humans need to fly and live on the 	



Name of activity	Procedure	Time
	Moon -they will design, build and test their own rocket; -they will launch and test their products -they will take selfies on virtual spacesuit and create their own avatar using technology	
2nd Lesson		
STEM Subject 1	Mathematics	45'
STEM Subject 1 Assignment in class	2D rocket math requirements https://clasamea.eu/calculam-pana-la-100/ Students will work in teams to solve math calculations and order the months of the year and days of the week. Step 1: - cutting out the figures Step 2: - solving mathematical calculations Step 3: -sorting figures (months, days) Step 4: -ordering the figures Step 5: - peer review	
Learning products	<i>If you wish to share more materials that complement the text, please include them in the Annexes section and refer to them in this section as well.</i> Exhibition with the products made	
3rd Lesson		
Non-STEM Subject 1	Arts	45'
Non-STEM Subject 1 Assignment in class	2D rocket design Students will work in teams to create the rocket by assembling and gluing the shapes obtained in the previous lesson Step 1: -assembling the rocket (from the figures with the months of the year and completing it with the figures with the days of the week) Step 2: - sticking the figures on the cardboard to build the rocket Step 3: -decoration and personalization of works	



Name of activity	Procedure	Time
	<p>Students work in teams to collaborate and design their own rocket</p> <p>Step 4:</p> <ul style="list-style-type: none"> - presentation of the products <p>The students present their learning products An interactive exhibition will be organized.</p> <p>Step 5:</p> <ul style="list-style-type: none"> - peer review <p>The students present and peer evaluate their learning products using a rubric. The most creative models will be appreciated.</p>	
Learning products	ThinkLink joint presentation will be used to organize the `2D Rocket museum	
4th Lesson		
Non-STEM Subject 2	Arts	45'
Non-STEM Subject 2 Assignment in class	<p>3D rocket aerodynamic design</p> <p>Students are asked to bring a plastic soda bottle, thin cardboard, scissors, vinegar, paper towel, baking soda, cork, https://www.youtube.com/watch?v=pquyfOH4iul</p> <p>Step 1</p> <p>The students watch a tutorial on building 3D plastic bottle rocket which fly with vinegar and baking soda.</p> <p>Step 2</p> <p>The students analyze the working steps and principles that contribute to a successful launch (aerodynamic design, forces that act to make the rocket fly)</p> <p>Step 3</p> <p>Students work in teams to collaborate and design their own 3D models of plastic bottle rocket with aerodynamic design which should be able to fly.</p> <p>Step 4:</p> <ul style="list-style-type: none"> - peer review <p>The students present and peer evaluate their learning products using a rubric. The most creative models will be appreciated.</p>	
Learning products	<i>If you wish to share more materials that complement the text, please include them in the Annexes section and refer to them in this section as well.</i>	



Name of activity	Procedure	Time
	`3D Rocket museum` A Padlet – exhibition with the 3D models designed by students with plastic bottle rocket will be organized	
5th Lesson		
STEM Subject 2	Science	45'
STEM Subject 2 Assignment in the schoolyard	Zoom, Zoom We are going to the Moon with Paxi-rocket launching Step 1: The students test and launch their learning products in the schoolyard. Step 2: They analyze and write in a <i>learning diary</i> ; -the aerodynamic design of the model; -the distance of the flight; -personal reflections: what went right/wrong and why; what to do to make the model fly better. Step 3: The students work in groups to find solutions to the problems. They use the information collected to improve their own models. Step 4 The students present their projects and peer evaluate each other using rubrics.	
Learning products	<i>If you wish to share more materials that complement the text, please include them in the Annexes section and refer to them in this section as well.</i> Video on YouTube https://www.youtube.com/watch?v=KK8fTxOd_-Q https://www.youtube.com/watch?v=TE1mOUdHric Learning diary (The learning diary can be kept on a notebook or online, on a Jamboard).	
6th Lesson		
STEM Subject 3	Technology	45'
STEM Subject 3 Assignment in class	Nasa Selfies and Pixton Applications Students will group up and use their own phones to take selfies and create their own avatar.	



Name of activity	Procedure	Time
	Step 1: The students take the first pictures in a virtual spacesuit with gorgeous cosmic images. Step 2: They make they avatar on Pixton to take the group picture The students present their projects and peer evaluate each other using rubrics.	
Learning products	<i>If you wish to share more materials that complement the text, please include them in the Annexes section and refer to them in this section as well.</i> Padlet with the selfies, the avatars and their impressions at the end of the activity.	

Assessment

Initial, formative and final assessment will be organized during the learning activities and the information gathered during the process will track the students' evolution and will help teachers to give feedback and to organize future learning activities.

Initial assessment

The students fill in on Mentimeter their answers for some of the driving questions. The students fill in the first cells of a KWL rubric about Rockets Design and Flying to the Moon

Formative evaluation

The students are asked to keep a learning diary (aerodynamic designs, learning products, personal reflections). The teachers will read the learning diaries to see if the students are on their right path in their learning process.

Final assessment

The students will peer evaluate their learning products (2D/3D designs of rocket) using evaluation rubrics.

Students fill in the last cell of a KWL rubric about rockets design and Flying to the Moon.

Student feedback

The students will use their learning diaries to give feed forward and feedback during the lessons. Teachers will follow students' diaries to track their evolution.

Teacher feedback

The teachers are expected to provide feedback on how the lessons were received and implemented.

The lesson was a real success, well received by the students because it was a new challenge, it opened new horizons, gave them wings to fulfill their dreams, gave them confidence in their own strength, helped them present more well created products and achieve beautiful results working in a team. Students learned from each other, from their mistakes, gave each other feedback, encouraged each other, developed 21st century skills, were creative, made original products and learned about STEM careers , about forces, aerodynamic design and used technology creatively.



Annexes

A thorough and complete list of all the materials used will be asked from all teachers. Those materials will be cited as Annexes and they can be further cited in the learning scenario.

KWL rubric

Rockets Design and Flying to the Moon

Know	Want to know	Learned

Peer assessment rubric

Learning products

Team/students name(s): _____

You will evaluate:	3 Excellent	2 Good	1 Improvements required	Points
Model parts	The model includes all the required parts.	The model includes most of the required parts.	The model doesn't include all the required parts.	
Model execution	The model is excellent designed/built.	The model is good design/built.	The model needs some improvements.	
Creativity	The model is unique.	The model has some unique parts.	I saw the model in other presentations.	
Presentation	The presentation is logic and clear. All the students were actively involved	The presentation is logic and clear, but only a few students from the team presented the work.	The presentation isn't so clear and logic.	



Evaluation rubric to be used by teacher

STUDENT'S NAME: _____						
Skills	Expected outcome	Excellent	Good	Satisfactory	Fair	Poor
Technology Literacy	The student recognizes and uses 2D/3D shapes and web 2.0 tools in his own project.					
Information Literacy	The student collects data, identifies the problems in their models					
Social Skills	The student respects the opinions of others, gives feedback and makes peer assess of learning products.					
Initiative	The student builds and tests their own rockets.					
Leadership	The student guides and motivates the members of the group.					
Collaborating	The student works in team to design a common product.					
Productivity	The student completes the assigned tasks and presents his learning products.					
Creative Thinking	The student responds creatively to a challenge following a personal research plan and draws conclusions.					