Mars – settling down

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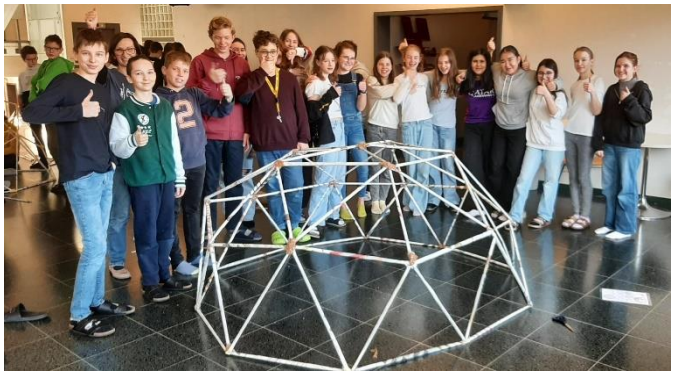
RELATED SUBJECTS	GRADE RECOMMENDATIONS	TOTAL ACTIVITY TIME	LEARNING OBJECTIVES DURING THE LESSON SUBJECT-SPECIFIC COMPETENCIES	LEARNING OBJECTIVES AFTER THE LESSON
English, Physics, Biology, Geography, Mathematics, Art, Social studies	year 7	two months	presenting in English, weightlessness, flying trajectories, solar system, what can grow on Mars, solid structure – earthquakes, volume, surface area calculating/estimating, teamwork	presenting findings, and students' artifacts, evaluating the project

OVERVIEW: TOPIC & PURPOSE

Designing the first settlement on Mars and discussing the related problems: how to get there, what to do/eat during the trip/ how to build the first settlement (geodesic dome)/ weather conditions/ what can grow on Mars/structure of society/ what language will be spoken.



ACTIVITY PREREQUISITES

In Mathematics: area of a triangle, scaled drawing. In Physics: solar system, the orbits, how does a rocket work. In Biology: what is needed for life? water, temperature,...)

STEAM ELEMENTS

ELEMENT 1: context presentation	real problem: Earth overpopulated -> settling down on Mars /space travel, housing, weather conditions / astronaut outfit.
ELEMENT 2: creative design	Designing and building the first houses -> geodesic dome, what can be grown -> experimenting with the soil on Mars, building a rocket.
ELEMENT 3: emotional and social learning	team skills – how to distribute the tasks – roles in the team

STEAM SUBJECT ELEMENTS

STEAM SUBJECTS	SCIENCE	TECHNOLOGY	ENGINEERING	ARTS	MATHEMATICS
SHORT INTRODUCTION TO RELATED SUBJECT ELEMENTS	how does a rocket work? how/when to fly to Mars? what can be grown? what's the weather like? is there water? are there any earthquakes?	designing the settlement, interactive quiz, programming robots, 3D printing - food	a solid structure in extreme conditions: building the model of a geodesic dome	building a geodesic dome model, designing suitable outfits	surface area and volume of bodies where you need scaling or a good estimate, best time/trajectory to fly to Mars

SYLLABUS

LESSONS	SUBJECTS	TOPIC OF THE UNIT	LEARNING OBJECTIVES DURING THE LESSON: SUBJECT SPECIFIC COMPETENCIES	LEARNING OBJECTIVES AFTER THE LESSON: STEAM COMPETENCIES
1	Science, Mathematics	Presenting the problems on the Earth making necessary to leave the Earth, problems to face on Mars	building groups, agreeing on the topic, sharing information by padlet for instance	google search to find relevant information
2-3	Science, Mathematics	Solar System	orbit, rotation time, distances in the solar system	find the best time and position
4	Science, Mathematics	Building a rocket using lemon acid and baking powder	Aim is to make more trials, measure the height reached by the rocket and determine the average	discuss how to find an expected value
5-6	Science, Mathematics, Sport, Crafting, Biology	Designing a parachute for safe landing, to slow down the landing; test some skills an astronaut needs	Experimenting to find out what makes out a good parachute: the size, the form, a solid frame	discuss all the issues toched on during this session
7-9	Mathematics, Crafting, Art, Geography	First buildings must be solid, triangles serve for stability	how to build a house withstanding earthquakes? how big is the surface area? how big is the room?	the skill to estimate the surface area and the volume of solids

10-11	English, Science, Art	Preparing the presentations	Summarizing and organizing information, preparing the presentation	To be able to find the main message and design a suitable presentation
12-14	English, Science, Art	Presentation for the families	Presentation skills, answering questions	Looking back at the presentations and evaluating
15		Evaluating and giving feedback		

INSTRUCTIONAL PLAN BY LESSON (COPY AS MANY TIMES AS NEEDED)

LESSON …1.

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (20 minutes)	Presenting students with problems that may make mankind leave the Earth, settling down on Mars as a possible solution	PowerPoint	To make students aware of problems and that we need to find solutions
LEARNING ACTIVITIES (20 minutes)	Students decide on groups, topics and form how they want to work	padlet: to share thoughts and give each other an overview of what the groups are working on	To practice team skills, first quick research to decide on a topic
WRAP-UP & EVALUATION (10minutes)	Getting an overview of all topics the class selected	padlet	Comparing the topics to find out if all important topics are covered

LESSON …2-3.

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (10 minutes)	Introducing the topic, gathering info from the students	internet	activating knowledge and raising interest
LEARNING ACTIVITIES (80 minutes)	orbits, how to fly	model of solar system, internet	find the best constellation, when is it worth flying
WRAP-UP & EVALUATION (10 minutes)	summing up		consolidate

LESSON 4….

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (10 minutes)	Explaining: How does a rocket work? What happens if you add lemon acid and baking powder? and water?	plastic bottle, cork, lemon acid, baking powder, water	learning about the chemical reaction between baking powder, lemon acid if you add water →how does a rocket work
LEARNING ACTIVITIES (35 minutes)	making the experiment a couple of times to see how high the rocket can fly, determining the average to find the expected value if you start a rocket	plastic bottle, cork, lemon acid, baking powder, water	measuring the height reached by the rocket (use an app on handy or estimate using the school building as reference
WRAP-UP & EVALUATION (5 minutes)	discuss how well the experiment went, how you could get the rocket higher		consolidate

LESSON …5-6. sleepover at school

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (5 minutes)	explaining the program		
LEARNING ACTIVITIES (6 hours)	astronaut training with many stations: reaction time: one student lets a stick fall, the other one has to catch it balancing eating in weightlessness building a parachute building a tower to experience how it is to work in a space suit watching the movie: The Martian	 stick a pillow filled with air carrots on a thread hanging plastic bag, paper, scissors, thread, glue building blocks and clumsy big gloves film	get to know about the difficulties an astronaut must face, team skills weather conditions, growing potatoes
WRAP-UP & EVALUATION (5 minutes)	summing up, asking about the general view		

LESSON ...7-9.

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (10 minutes)	learning about the earthquakes in South-America and geodesic dome as a possible solution because of the very stable structure	youtube video	triangles serve for stability, where to find them in architectures

LEARNING ACTIVITIES (x minutes)	material demand estimating and calculating building a geodesic dome	 newspaper, sticky tape, scissors	practicing how to estimate sg you cannot calculate accurately team skills
WRAP-UP & EVALUATION (x minutes)	photos, praise		if you manage sg well, you deserve an appraisal

LESSON ...10-11.

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (5 minutes)	explaining how to proceed		
LEARNING ACTIVITIES (90 minutes)	preparing the presentations, posters in English and practicing the presentations	big sheet of paper, pencils, internet, PowerPoint	presentation skills, summing up, focusing,
WRAP-UP & EVALUATION (5 minutes)	giving students feedback		

LESSON 12-14....

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (30 minutes)	to get ready for the presentation, each group prepares its own station	pin wall, pins	how to set the scene?
LEARNING ACTIVITIES (120 minutes)	presenting, discussing, answering questions of the guests	what each group needs	presentation skills
WRAP-UP & EVALUATION (30 minutes)	tidying up		you need to tidy up

LESSON 15.

TIME PLAN	TEACHING & LEARNING ACTIVITIES	MATERIALS	LEARNING OBJECTIVES
INTRODUCTION (5 minutes)	introducing the issue now we will evaluate the whole project		learning how to evaluate
LEARNING ACTIVITIES (40)	discussing what went well, what we could do better the next time	questionnaire	how to give feedback, constructive criticism
WRAP-UP & EVALUATION (5 minutes)	praise	something nice for the students	good job deserves to be praised

EVALUATION PLAN BY LESSON

LESSON	EVALUATION CRITERIA	EVALUATION METHOD
1	E.g. Does the student understand / know ... ?	E.g. Making concept map
2	E.g. Did the student make ... ?	E.g. Observation, comparing products
3	E.g. Is the student able to present ... ?	E.g. Observation, peer-review of presentation materials
4	E.g. Is the student able to implement ... ?	E.g. Creating a project for recontextualizing and adapting the idea
5	E.g. Did the students cooperate ...?	E.g. Observation, self-evaluation of groups / students.

NOTES

Optional

ACTIVITY SHEETS TO BE LINKED

Optional

EVALUATION MATERIALS TO BE LINKED

Optional

REFERENCES / SUPPORTING MATERIALS TO BE LINKED

Optional - Additional information for teachers to refer to.