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STEAME ACADEMY
TEACHING FACILITATION LEARNING & CREATIVITY PLAN (L&C PLAN) - LEVEL 2
SERVICE TEACHERS: A mission to Mars!

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1. Overview

Title	A mission to Mars!
Driving Question or Topic	*Is the Colonization of Mars a science fiction or an achievable goal? Is it a is it a necessity or an unnecessary luxury?*
Ages, Grades, …	*15 – 18* *9-12 grade level selection*
Duration, Timeline, Activities	*12 learning hours* *12 lessons by 45 minutes* *Number of activities:7*
Curriculum Alignment	
Contributors, Partners	
Abstract - Synopsis	*Students learn about Mars, design a mission to explore the planet, build and test models of spacecraft, helicopter and parachute design and construct building for a base on Mars. Students also engage in scientific exploration about the rocks on Mars and the different kinds of salt. The main goal is to answer driving question using valid and strong arguments and to the construct a base on Mars with all the necessary buildings and equipment needed for survival.*
References, Acknowledgements	

2. STEAME ACADEMY Framework*

Teachers' Cooperation	*Teacher 1: Physics teacher* *Teacher 2: Mathematics teacher* *Teacher 3: Biology teacher* *Teacher 4: Technology teacher* *Teacher 5: Computer science teacher* *Teacher 6: Chemistry teacher* *Teacher 7: Art teacher* *The Teachers agree the action plan (see below), in which the order of the activities is agreed, the assessment tools are discussed, and the final products of the project are listed.*
STEAME in Life (SiL) Organization	*Discussions about the climate crisis are very frequent due to the frequent environmental disasters that occur on our planet. Because of this, the discussion about finding another planet, which will host the human species, is becoming more relevant every day. Students are asked to study various publications about*

Action Plan Formulation	*the climate crisis and the prospect of moving to another planet in the distant future* *STAGE 1: Why we will have to leave Earth and where we can go?* *The Biology teacher has a discussion with the students about the causes that can force humanity to leave the Earth.* *In the Physics class, the selection of Mars as a place that could host humans is discussed.* *In the Art class, the students make a poster with what they have discussed in the Biology and Physics classes.* *In Maths, students learn about number systems and the binary code.* *In Computer Science they learn about graphics software and binary code.* *STAGE 2: How we can leave Earth and how we can land on Mars?* *In the Physics course, students study the principle of conservation of momentum and the resistance of fluids. They also learn about the Tracker video analysis software.* *In the technology class they are involved in building model rockets and parachutes. Each team chooses its own rocket and parachute model.* *In Chemistry class they are dealing with the fuel used in a real rocket.* *STAGE 3: Where we will live in Mars and how we will ensure the materials necessary for life (energy, food, water, oxygen)?* *In Maths they learn about the growth of solids and build models of solids.* *In Chemistry they deal with the ways of extracting oxygen from rocks and from carbon dioxide.* *In Biology they are investigating ways that plants could be grown on Mars with the aim of supplying food and oxygen.* *In Technology they build a model of a photovoltaic park.* *STAGE4: Building the model of a base on Mars* *Each group builds a model in the Technology class.* *In Art and Informatics classes they make a logo for their base.* *STAGE 5: Presentation of the work* *Each team presents in front of the involved teachers the project deliverables (poster, rocket motion analysis video, parachute with encrypted message, base model and its logo) and answer questions.*

[*] *under development the final elements of the framework*

3. Objectives and Methodologies

Learning Goals and Objectives	*Students should be able to* *1. Collect and record data using various methods, such as observation, investigation, measurement/recording.* *2. Formulate arguments to express and support their results or opinions.* *3. Construct concept maps or posters to represent their ideas.* *4. Present their work to the audience and explain and support their arguments.* *5. Make conjectures according to the conditions that prevail each time and follow control procedures to reach valid decisions.* *6. Investigate the motion of a rocket using their own real time data-interpret the related functions using a video analysis software.* *7. Investigate the motion of a parachute using their own real time data-interpret the related functions using a video analysis software.* *8. Investigate factors that affect the motion of a "helicopter" (high, rotation, etc)* *9. Convert a natural number to binary and vice versa* *10. Write a word message using binary (ASCII) code and decode a message in binary code.* *11. Study the rocks on Mars: Determine what elements make up the rocks on Mars, using spectral analysis.*

	12. Students explore the science behind an intriguing planetary feature by creating saline solutions and then observing what happens when the solutions evaporate. *13. Design nets of 3d geometrical models* *14. Construct 3d shapes* *15. Use the engineering design process to design and evaluate their constructions.* *16. Construct a model of a base on Mars with all necessary buildings need for survival, based on research and other data.* *17. Develop critical thinking skills and creativity.*
Learning Outcomes and expected Results	*The students make a poster, construct a rocket, a paper- helicopter and a parachute, make a video amnalysis of the motion of their rocket, write a coded message in binary system, build a 3D model of a base on Mars, design the logo of the base.*
Prior Knowledge and Prerequisites	*Basic knowledge of Stereometry. Position vs time graphs for motions with constant velocity and motions with constant acceleration. Video analysis software.*
Motivation, Methodology, Strategies, Scaffolds	*Project-Based Learning, Investigation (Inquiry-Based Learning), Context-Based Learning, Problem Solving Based Learning, Design Thinking Process, Experimentation, Debate and Argumentation, cooperation and collaboration, team working.*

4. Preparation and Means

Preparation, Space Setting, *Troubleshooting Tips*	*The stages of the work are presented to the students, and they encouraged to ask teachers, if any questions appear.*
Resources, Tools, Material, Attachments, Equipment	*For each activity teachers will provide the necessary materials, tools, equipment as shown through the activities.*
Health and Safety	*Teachers take care about the students' safety, especially in Technology class.*

5. Implementation

Instructional Activities, Procedures, Reflections	***Activity 1. Why should we leave Earth and why should we choose Mars?*** Students work first individually and then in groups to list the reasons why humanity would need to leave Earth and the reasons why Mars would be a possible destination. Students then make a poster to showcase their ideas. ***Activity 2: The motion of a rocket balloon*** Students are working in groups to build a model balloon rocket, videotape its motion after launch, and analyse it with video analysis software. They write a short paragraph on how a real rocket moves and on what physics principles the motion of a rocket is based. ***Activity 3: Constructing a parachute to land on Mars*** Students build a model parachute, drop it from a height of a few meters, record its movement and analyze it with video analysis software. They discuss in their group what kinds of motion the parachute performs as it falls, and how those kinds of motion would differ if the parachute were to fall on Mars. ***Activity 4: Writing a message in binary code***

	Students study the binary code of writing a number and convert numbers from decimal to binary and vice versa. They choose a message to write using the binary code. The message will appear in graphic form on the base model they will build. ***Activity 5: Building a base on Mars*** Students in plenary discuss the building infrastructure they think is necessary for human life on Mars. Students in their groups study the nets of solids and make cardboard solids using the nets. They build the model of the base on Mars using their constructions. They ***Activity 6: The production of oxygen*** The students study about the rocks that exist on Mars and investigate whether it is possible to produce oxygen from them. Ways to enrich the Martian atmosphere with oxygen are suggested. **Activity 7: Designing the logo of the base.** Students use a designing software to create a logo for their base.
Assessment - Evaluation	*Teachers agree about the assessment rubrics to measure the student's ability to perform what was described in the objectives. Each teacher assess students performance in the tasks related toy her/his lesson and together assess the final product of the project – the presentation by the students of the deliverables of the project.*
Presentation - Reporting - Sharing	*Except the presentation for their teachers, students can present their results in a school science conference. The models can be placed in a prominent area in the school so that all students in the school can see them*
Extensions - Other Information	

Resources for the development of the STEAME ACADEMY Learning and Creativity Plan Template
In the case of learning through project-based activity

STEAME ACADEMY Prototype/Guide for Learning & Creativity Approach
Action Plan Formulation

Major steps in the STEAME learning approach:

STAGE I: Preparation by one or more teachers

1. Formulating initial thoughts on the thematic sectors/areas to be covered
2. Engaging the world of the wider environment / work / business / parents / society / environment/ ethics
3. Target Age Group of Students - Associating with the Official Curriculum - Setting Goals and Objectives
4. Organization of the tasks of the parties involved - Designation of Coordinator - Workplaces etc.

STAGE II: Action Plan Formulation (Steps 1-18)

Preparation (by teachers)

1. Relation to the Real World – Reflection
2. Incentive – Motivation
3. Formulation of a problem (possibly in stages or phases) resulting from the above

Development (by students) – Guidance & Evaluation (in 9-11, by teachers)

4. Background Creation - Search / Gather Information
5. Simplify the issue - Configure the problem with a limited number of requirements
6. Case Making - Designing - identifying materials for building / development / creation
7. Construction - Workflow - Implementation of projects
8. Observation-Experimentation - Initial Conclusions
9. Documentation - Searching Thematic Areas (AI fields) related to the subject under study – Explanation based on Existing Theories and / or Empirical Results
10. Gathering of results / information based on points 7, 8, 9
11. First group presentation by students

Configuration & Results (by students) – Guidance & Evaluation (by teachers)

12. Configure STEAME models to describe / represent / illustrate the results
13. Studying the results in 9 and drawing conclusions, using 12
14. Applications in Everyday Life - Suggestions for Developing 9 (Entrepreneurship - SIL Days)

Review (by teachers)

15. Review the problem and review it under more demanding conditions

Project Completion (by students) – Guidance & Evaluation (by teachers)

16. Repeat steps 5 through 11 with additional or new requirements as formulated in 15
17. Investigation - Case Studies - Expansion - New Theories - Testing New Conclusions

18. Presentation of Conclusions - Communication Tactics.

STAGE III: STEAME ACADEMY Actions and Cooperation in Creative Projects for school students

Title of Project: _____
Brief Description/Outline of Organizational Arrangements / Responsibilities for Action

STAGE	**Activities/Steps** Teacher 1(T1) Cooperation with T2 and student guidance	**Activities /Steps** **By Students** Age Group: ____	**Activities /Steps** Teacher 2 (T2) Cooperation with T1 and student guidance
A	Preparation of steps 1,2,3		Cooperation in step 3
B	Guidance in step 9	4,5,6,7,8,9,10	Support guidance in step 9
C	Creative Evaluation	11	Creative Evaluation
D	Guidance	12	Guidance
E	Guidance	13 (9+12)	Guidance
F	Organization (SIL) STEAME in Life	14 Meeting with Business representatives	Organization (SIL) STEAME in Life
G	Preparation of step 15		Cooperation in step 15
H	Guidance	16 (repetition 5-11)	Support Guidance
I	Guidance	17	Support Guidance
K	Creative Evaluation	18	Creative Evaluation