

STEAME: Guidelines for Developing and Implementing STEAME Schools

The implementation of a Learning and Creativity Plan, entitled “Colonizing Mars: Science fiction or an achievable goal? Necessity or an unnecessary luxury?”

Identity of the project

“Colonizing Mars” is an interdisciplinary project developed within the STEAME Erasmus + project activities. Forty (40) students, aged 14-17, participated in this project during a summer Space and STEAME summer camp. The Space and STEAME summer camp took place in Paphos, Cyprus, July 13-14, 2021, hosted by the Paphos Innovation Institute.

Description of the project

The ‘Colonizing Mars’ project involves a set of hands-on compelling STEAME activities, that are designed to engage all students in learning and implementing key disciplinary content with an engaging Mars context. The activities focus on curriculum mathematical and science concepts that are combined with aspects of NASA science and engineering, related to the colonization of Mars and the supporting of humans living there. This includes Mars transit technology and Mars environmental research and life support. In general, the ‘Colonizing Mars’ project activities allow students to design, test, analyze and manage a space mission, following all steps from initial concept activation to the construction of a base on Mars. Also, it provides opportunities for the development of problem-solving skills and critical thinking skills, which are needed for the designing, and organizing a space mission, as well as for investigating related information in order to build a model of a space base.

Three main activities were included in "Colonizing Mars" project, in which students worked in groups to complete various tasks. In the first activity, entitled "Why on Mars?", students were asked to think about the possible reasons for leaving Earth in the long run and why Mars could be an option for resettlement. Furthermore, students were asked to look for information about life on Earth and the possibility of colonizing Mars, in order to reflect on their ideas and to create a poster, presenting the statement "In case we have to leave Earth, we will choose Mars, because...".

The second major activity, which focused on planning a mission to Mars, involved three different tasks: (a) “The journey from Earth to Mars”, (b) “Landing to Mars: An Eggstronaut Parachute Challenge”, and (c) “Landing to Mars: Sending a message on a parachute”. In the first task, students had to design and construct a rocket that would travel to Mars, launch the rocket and video record its movement. In addition, students had to analyze the rocket motion, using the “Tracker” software and to describe the rocket’s movement. In the second task students were to construct a parachute for safe landing of the eggstronaut, release the eggstronaut parachute and video record its motion. Using the “Tracker” software, students had to study and describe the parachute motion. In the final task of this activity students had to create their own message on a parachute using the same code that NASA’s Jet Propulsion Laboratory (JPL) designers used for the parachute that helped Perseverance land safely.

The third major activity focused on the construction of a space base on Mars. Two main tasks were included, the “Exploration of Mars” and “The designing of a base on Mars”. Specifically, students were asked to explore the geography and geology of Mars, the atmosphere, the climate, etc., through various websites or videos, in order to gather information about the construction of their three-dimensional base model on Mars. In their group discussion, students mentioned some essential buildings and other infrastructure that the inhabitants of Mars would need, which have to be included in their construction. These were a hospital, a flight control tower, corridors connecting the buildings, oxygen storage, supermarket, accommodation, fuel tanks, water tanks, rocket launch base, etc. Furthermore, students designed a flag and an emblem for their Mars’ base.

For the completion of the project activities, students worked for a total of 10 hours in a period of two days, 5 hours per day. At the end of the second day, students presented and described their construction to the audience. They, also, expressed their feelings and views about the project, using an online questionnaire.

Students’ opinion about the project

According to the facilitators’ observations and students’ answers on the questionnaire, while working on the project students felt happy, excited and focused. Sometimes they felt tired and stressed, because they had to deal with a lot of information in a limited of time. They mentioned that the project was “interesting” and “enjoying”, and it enabled team bonding. It was also “fun” and gave them “an opportunity to be creative”. It was “awesome”, especially the part about building the base.

Project activities helped in gaining a lot of information about Mars and space in general, e.g. what is needed to live on Mars, pros and cons of leaving earth/colonizing Mars, the atmosphere and geology on Mars, sources of energy, infrastructure, transport, communications systems, food sources etc. In addition, students reported that they have learned to work on a scale, to make models of buildings using paper or foam board and to construct a model of a town.

Their favorite part of the project was building the Mars base, the construction of the rocket and the parachute, and the Tracker Physics program for tracking the motion of an object in a video. Furthermore, students liked most the making of an emblem and the using of the binary code for writing a message as well as the decoding of a message written in a binary code. According to their opinion, “all the parts of the project were absolutely interactive, contagious and really interesting, making the whole experience really unique!”. However, due to the limited time, they did not like the fact that they had to hurry to finish.

More time and the inclusion of more sophisticated activities that require advanced critical thinking, mathematics, physical and digital technology, are some of the students’ suggestions for improving the project.

Furthermore, students recommended the usage of interactive applications, such as Mentimeter and Kahoot, for a better understanding and practice. In addition, the project could include more challenges that are competitive, e.g. which rocket would go higher and then draw plausible conclusions about the characteristics of each flight (e.g. forces-gravity, resistance of air, etc...).

For the presentation of the base on Mars, an application or even a game could be used that would be more attractive (e.g., colonization of Mars - from the Play Store).

Finally, “Travelling into a black hole”, “Theory of relativity” and “Gravitational waves”, were some challenging topics the students mentioned for future investigations.

