

The Solar System - How to make models of the planets? Practical work and observations at the Astronomical Observatory "Yuri Gagarin" in Stara Zagora involving the parent community

What	How	Why
<ul style="list-style-type: none"> • Learning goals: The main goal of the project “Solar system” is to create model projects of the Earth and the solar system in order to gain new knowledge and develop new skills. • What skills and experiences do children develop through this (and similar) projects? • What is the form of the Earth? How does the Earth spin and why do day and night change? 	<ul style="list-style-type: none"> • By creating projects and using “out of the box” methods • By using materials (not used in class in a daily basis) • With the help of the teachers and parents community • By using video content and digital learning in order 	<ul style="list-style-type: none"> • To generate an impact and understanding for important questions about our planet and the world around us <ul style="list-style-type: none"> • Space is a subject that engages children and encourages them to ask questions about the world around them. Through learning about our Solar System, children can apply and build on concepts they have already learned and develop understanding about the vast world beyond the planet <ul style="list-style-type: none"> • It is important to study about Earth because it is the one place in the entire Solar System where humans can live (our home).

What	How	Why
<p>How does the solar system function and which planets are part of it? What do they know about the sun and how is the sun different from the planets?</p> <ul style="list-style-type: none"> • What do our students know about the planets, their order and which planets are the closest to our Earth? • To learn interesting facts about the Earth and the planets? • Developing 21st century skills such as: scientific skills; personal development; team work; IT skills; communication skills • Developing interdisciplinary skills: mathematics; IT technology and entrepreneurship; Arts and Crafts; 		

1. Project description

School subjects involved: Mathematics, Nature Studies, English, Technology and Entrepreneurship, Art, Crafts;

Learners' profile: The theme of this project is suitable for students aged 8-12. The topics are implemented in the curriculum. The practical topics are related to learning outside the classroom, observations and meetings with astronomers and scientists from the Astronomical Observatory in Stara Zagora.

Duration: 6 lessons - 40 minutes each (at school); 2 practical activities-60 min. each; 2 practical lessons- 40 min. each (at school- preparation for making models)

Cross-curricular teaching:

Mathematics-Solve practical problems about the movement of the Earth. Observe sunrise and sunset from the same place and record the time in seconds at the beginning and end of the week; Calculate the length of day and night, etc.

IT technology and English - students look for information on the Internet and make presentations in classes with interesting facts about this topic. Parents and teachers help them.

Technology and Entrepreneurship, Art and Crafts- Students make models, posters of the planets and the solar system from different materials. The important task was to use recycled materials and used ones.

2. Teaching lesson: (description of one of the lessons)

Title of lesson: What is the solar system? What do you know about the planets?

Duration- 40 minutes

Activity type: observation and discussion, presentation, reading, writing

Class organization: individual and group work

Teacher's role: The teacher guides the learning activity by helping the students to reach the new knowledge on their own. The teacher gives a presentation on the topic and uses an E-lesson for students to have a clearer idea for the order of the planets. Some of our teachers used the method "Flipped classroom", too.

Activities: Students observe a presentation of the solar system and through discussion they get to know the planets and their names. What do they learn: Which are the closest planets to the Sun? Which planet orbits the Sun for the longest time and which for the shortest time? What do Jupiter, Saturn, Uranus and Neptune look like? They read information and do exercises in their writing books "The great adventure". They do crosswords with the names of the planets (group work).

3. Outdoor learning: Practical activities at the observatory in Stara Zagora.

Duration: 60 min each (2 activities)

Activity1: Meeting and talk with professor Nadya Kiskinova and the students. Prof. Kiskinova presented them an interesting educational film and facts about planets, the solar system, the life of the planets and how to protect our planet, because it is our only home.

Activity 2: Introduction to the museum and the history of astronautics. Presenting interesting photos from the past. Observation with a telescope. Calculating and checking the weight of the students on the Moon and on the planets Mars and Earth. Introduction of the astronomical apparatus.

4. Practical lessons- 40 min. each -2 lessons (at school)

School subjects – Technologies and Entrepreneurship; Art and Crafts;

The teacher discusses with the students the projects of the planets that they will make. He/She talks the group through the different ideas, suggested by the students. The group talks about the work materials and the teacher recommends to use recycled materials and to search information and photos for similar projects, materials, paints for coloring the models on the Internet.

Many children work on the projects at home due to the size of the project. The parents support their work.

Students present projects in the classes and arrange an exhibitions at school (with the help of the teachers).

5. A guide to help teachers who works on the project:

Grade/age	Books (text books, another kind of books) Who uses them?	Students activities: Questions, mind maps, pictures... look for information...	Methodology: Traditional Flipped classroom, project based learning, game based learning, others	Some tasks which students love doing
3 rd - 4 th grade-9-10-10-11 years old;	students book, work book, star maps, atlases, globes, moon maps;	students search for information on the internet and in encyclopedias.	the teacher introduces the lesson; he/she uses the e-lessons, presentations and other additional school materials; she/he engages the students for the lesson and the theme and encourages them to gain new knowledge through discussion and debates by themselves; some teachers use Flipped classroom	students enjoy searching for information, pictures and videos online; they like prepare presentations and introduce the new lesson to other students. They like drawing pictures of the planets, painting maps, making mock-ups, making posters, writing quizzes , crosswords with new concepts.

What?/ Name	Materials/kit	Step 1	Step 2	Step 3
making projects (mock-ups) of the Solar System and; posters of the Bulgarian astronauts.	drawing a pattern on a sheet of paper and consulting the teacher	drawing a pattern on a sheet of paper and consulting the teacher.	making the base of the model from boxes, sterophor, paper and colouring; making the models of the planets by preferred materials and colouring them	drawing a pattern on a sheet of paper and consulting with a teacher

6. A short test for students:

Students	Have you enjoyed the task?	Have you work on your own or in a team?	Have you left your desk cleaned?	What have you learned?
3 rd -4 th grade	Yes	they work on their own or their parents help them; some students work in a team	Yes	the names of the planets of the solar system and their arrangements; tolerance, cooperations, support, discussion of the ideas, pleasure at work, have fun;

Created by: Antoniya Andreeva, Gergana Stratieva, Sevdalina Jeliaskova

