



New Earth

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Background information for teachers

New Earth

Overview of this lesson pack:

Name of the activity	Discovering the New Earth
Topics introduced	planet, exoplanet, solar system, star, luminosity, transit, graph, plotting, coordinate system
Curriculum Connection	<p>GREECE:</p> <p>Maths: Organizing data and information (4th grade) Collecting, organizing and representation of data (5th grade) Making bar charts (6th grade) Mean value (5th, 6th, 7th grade) Rounding decimal numbers (5th, 6th grade) Graphs, mean value, median (7th, 8th grade) Functions and graphs (9th grade)</p> <p>Geography: Earth as an celestial body (shape, geographical coordinates, rotation axis, rotation around the sun, solar system) (6th grade) planet Earth (7th grade)</p> <p>Science: Light (transmission, reflection, refraction, analysis and synthesis) (5th, 6th, 9th grade)</p>
Reference Demonstrator	Discovering Alien Worlds
Age of students	10-14 years old
Duration	2-3 didactical hours

Overview of this lesson pack:

Type of activity	Experimental activity with real data analysis (Salsa J)
Description of activity	<p>Teacher activities:</p> <p>Before the activity</p> <ul style="list-style-type: none"> <input type="checkbox"/> Install software (Java and salsa J) to all computers that students will work on, <input type="checkbox"/> Transfer the data sheet to all computers <input type="checkbox"/> Prepare the introductory activity for the exoplanets, some hypothetical questions to arise conversation among students, <input type="checkbox"/> Work on the data collection and analysis at list once to be sure that are ok. <p>During the activity</p> <ul style="list-style-type: none"> <input type="checkbox"/> Introduce topic <input type="checkbox"/> Arise conversation with questions <input type="checkbox"/> Guide students through software <input type="checkbox"/> Divide students in to groups <input type="checkbox"/> Supervise students during team work <input type="checkbox"/> Compare teams' results <input type="checkbox"/> Conclusions <p>Student activities:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Discuss the term exoplanets <input type="checkbox"/> Work in teams with salsa J and draw the required graph <input type="checkbox"/> Compare graphs <input type="checkbox"/> Discuss and draw conclusions
Equipment requirements	<p>Computers with Excel, Java and Salsa J</p> <p>Alternative option</p> <p>Printed data from Excel, printed pictures (ideally may be laminated to sanitize easily) graph paper</p>

Remarks and advices for the application of the discovering alien worlds demonstrator:

Dear colleagues,

Here we are giving you some remarks and advices
that they could be useful for the application of this
demonstrator in your classroom.

- For the first introductory part, we propose to begin with the possibility of the existence of life on some of the discovering planets so as to attract the kid's interest and to motivate their curiosity. So, it is suggested to avoid to be consumed with technical details that may make the kids be bored from the beginning. Besides, at the next steps of the demonstrator kids will have the opportunity to learn and apply many theoretical details related to the subject.

- As it became clear from our experience during the application of the demonstrator, there were arisen many difficulties when the kids tried to install SalsaJ to their PC especially if they were supposed to do it by themselves at their home. For this, we propose to give them extensive instructions for the installation and the possible difficulties that may be occurred. For example you can guide them what exactly version of SalsaJ is better to use accordingly with their operating system or what else you think will make the installation easier for them. You can also encourage students to ask you when they have difficulties with the installation.

- Don't consider as a fact that kids can do the photometry by only reading the instructions from the demonstrator. It is much better to show them by watching you doing this live.
- Don't suppose that it is easy for your students to insert the data that they have count to the excel sheet even though it is almost ready and it seems very easy. It has been observed that in this age, kids are not feeling familiar with complicated applications like excel, so maybe it will be useful to help them with this.

Good Luck

Presentation for students

Part 1

We all have wondered if there is life at another place of the universe except from the earth isn't it? It's true and it is a very old question which it was born from the motivating force of life, curiosity, which is actually the reason for the basic science. This question maybe is the reason also for the fact that the quest of new exoplanets has become so popular and today is considered as one of the greatest challenges of Astronomy provoking great interest and in public opinion as well. And this is happening because we hope deeper inside that on a planet of them with common features with ours, there could exist some kind of life.

But what is exoplanet?

Exoplanet is a planet which does not belong to our solar system so that it isn't rotating around our star, the sun.

Why exoplanets were discovered so late?

The reason is that they are not observable with telescopes due to their huge distances from the earth. As a matter of fact the closer of them refrain many light years from us. The detectable variations are only the spectroscopic, the photometric and the astrometric ones. These variations happen because their motion around their parent star affects the emitted radiation and/or the position of these stars. Nowadays, there are the proper instruments with the required accuracy for the detection of these variations.

When was noted the first discovery of an exoplanet?

In 1992 were discovered the first exoplanets orbiting around the pulsar PSR 1257+12 from the radio astronomers Aleksander Wolszczan and Dale Frail. In 1995 was discovered the first exoplanet orbiting around a common star like our sun (51 Pegasi) from Michel Mayor and Didier Queloz and as a result for that great discovery they won the Nobel Prize in 2019.

Which are the main ways of the detection of the exoplanets?

- With measurement of the variation of the radial velocity of the parent star. A planet orbiting around a star exerts on it a gravitational force which causes a small extra movement. This movement becomes perceptible to us as a result of the approaching or the distancing of the star something that is getting detectable with the Doppler effect.

Which are the main ways of the detection of the exoplanets?

- With measurement of the decrease of the luminosity of the star when the planet transits in front of it. This method is called “Transit photometry” and is the method that we are going to study and apply to this demonstrator.
- With the detection of the diversion of the light as it passes close to the planet, as indicates the General Relativity Theory.

Which of the exoplanets is possible to host life?

To be an exoplanet a candidate for hosting life on its surface, it is necessary to be satisfied some requirements about the temperature and the existence and the composition of atmosphere. For a kind of life just like ours you can think the conditions we are seeking to be similar with them that exist on the earth. So it was defined a zone around the parent that is called “The habitable zone” where the conditions are supposed to be proper for the creation and the evolution of some kind of life.

**Watch the following small video of
“ National Geographic” about
exoplanets and then begin to hunt
them.**

Good luck!!!!!!

[Exoplanets 101 | National Geographic - YouTube](#)