Learning Design for: Are we alone in the Universe?

Context

Topic: Exoplanets

Total learning time: 12 hours

Designed learning time: 12 hours

Size of class: 10

Description: Your research task in noncredit Physics course is to provide an answer to the one of the most frequent questions related to the Universe: "Are we alone in the Universe?"

For five weeks you will work in 2 groups where each group will consist of 5 students. It is planned that you work in groups for 2 hours per week. In the last week, each group will present the result of its activities.

Mode of delivery: Blended

Aims

The aim of the project “Are we alone in the Universe?” is to find out how the actual current science got ahead while seeking the answer to that particular question. Is there in the Universe some other “Earth” similar to our planet which circle around its “Sun”?

While working as a unit/group, students will explore the techniques for searching the exoplanets, collect the most recent data from the official NASA webpage and analyse the TESS satellite data.

Outcomes

Find out/discover (Knowledge): Find out/discover (Knowledge): Students will define what the exoplanets are, list the techniques for searching the exoplanets and define the meaning of the habitable zone.

Comprehension: Students will explain the features and the principles of each of 5 techniques for searching for exoplanets.

Analysis: Students will analyse data on results of searching for exoplanets.

Application: Students will apply the obtained knowledge by working on the data collected by TESS satellite.

Evaluation: Students will evaluate the results of other students’ activities.

Teaching-Learning activities

For the introduction, explore the facts about the Sun and compare the Sun to the other stars. Find out what the exoplanets are, what is the habitable zone and when did the search for exoplanets start.

Read Watch Listen 2 hours 5 students Tutor is not available Online

Watch the video and write down 10 most interesting facts about the Sun.

Is Sun the special star in the Universe? Compare Sun to the other stars. Explore and research the Herzshprung-Russell diagram.

How many suns are there in the Universe? Do planets circle around these suns?

What is an exoplanet? When did the search for the exoplanets start? Which exoplanets do scientists find interesting?
Watch the edcuational video on the habitable zone.

Answers to many questions during this research are available at NASA website: Exoplanet Exploration

Linked resources

Top 10 Amazing facts about the Sun

Herzshprung-Russell diagram

What is a habitable zone?

NASA website on exploring the exoplanets

Investigate the techniques scientists use for searching for exoplanets.

Investigate *2 hours* *5 students* *Tutor is not available* *Online*

Each member of the group should explore one technique and present its features and principles to the other members of the group (by video, description...).

Linked resources

5 ways to Find a planet

Data on discovered exoplanets

Collaborate *2 hours* *5 students* *Tutor is available* *F2F*

Collaborate within the group and analyse the efficiency of each exoplanet-searching technique.

Show the results by choosing the relevant charts and graphs from the NASA website.

Explore and show the results of the Kepler satellite while discovering exoplanets.

Explore and show the results of the TESS satellite while discovering exoplanets.

Use NASA website so the results are up-to-date.

Linked resources

NASA exoplanet archive

Using the TESS satellite data

Practice *2 hours* *5 students* *Tutor is available* *F2F*

Register at Planet Hunters TESS website and discover the new exoplanet by analysing the TESS satellite data.
Become a volunteer!

Read the Planet Hunters TESS Tutorial first

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Linked resources

zooniverse projects

Planet Hunter TESS

How to become a TESS volunteer.

Space Careers: Astrobiologist

Read Watch Listen *1 hour* *5 students* *Tutor is available* *F2F*

Do you want to search for exoplanets and life in space?
Find out what is an astrobiologist.
Investigate if there are any scientists in the Republic of Croatia who search for exoplanets.

Linked resources

Who is an astrobiologist?

Interview with Karen Olsson-Francis

Interview with Zita Martins

Presentation of the results

Produce *2 hours* *5 students* *Tutor is available* *F2F*

Each group prepares the PPT presentation and presents the results of its activities and research.

Discussion

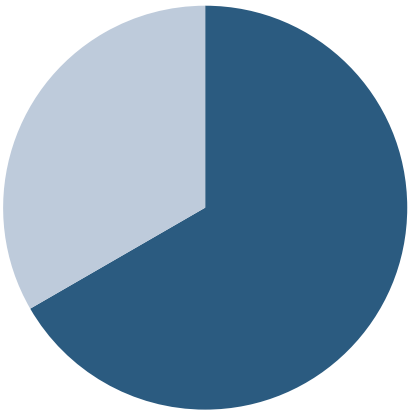
Discuss *1 hour* *10 students* *Tutor is available* *F2F*

Students analyse the results of the other group, discuss and compare their own results to the results of the other group.

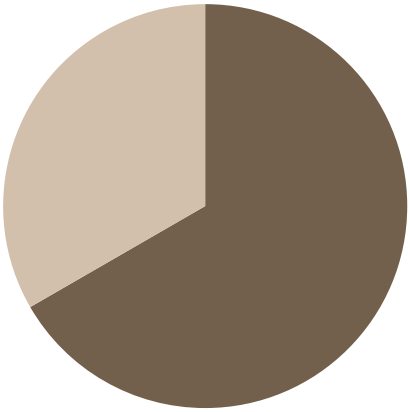
Representations of the learning experience

Learning through	Minutes	%
Acquisition (Read, Watch, Listen)	180	25
Investigation	120	17
Discussion	60	8
Practice	120	17
Collaboration	120	17
Production	120	17

	Minutes	%
Whole class	60	8
Group	660	92
Individual	0	0



	Minutes	%
Face to face	480	67
Online	240	33



	Minutes	%
Teacher present	480	67
Teacher not present	240	33