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## **TEACHING SCENARIO FOR IMPLEMENTATION OF THE INTERDISCIPLINARY PROJECT FOR STUDENTS**

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<b>Project name :</b>	Sustainable development for every time zone
<b>Related Subjects</b>	geography, biology, mathematics
<b>Key words:</b>	local time , time zone , time zones, date limit, ecosystem, endemic, Darwin's theory of evolution, biodiversity , sustainable development

<b>Activity name:</b>	Earth and time
<b>Duration of Activity (min)</b>	45 min

**Detailed description of the activity:**

Project an interactive presentation at the following link or share it with students for students to use on their devices: <https://view.genial.ly/62a0a505c49de700183eeddc/presentation-world-time>  
Ask students what time it is and whether it is the same time in another part of the world. Ask students why this is so and discuss briefly. Announce to students that by participating in this project they will learn to count what time it is in another part of the world or in any country in the world.

Then have the students, each for themselves, test their basic knowledge of calculating time units. Check the students' answers, and then ask them what they think - how people in the past, when they didn't have watches, determined the time. Point out that people have always sought help through nature, so they determined time with the help of the Sun. With the assistance of a picture in the presentation, briefly discuss with the students how people used the Sun to determine time.

Next, continue the lesson by introducing students to the local time that we define as the current time at a place with respect to the position of the Sun. In order for students to understand the concept of local time, continue the discussion with questions pertaining to the presentation - do all the places on the same meridian have the same local time, or does the Earth rotate from east to west or vice versa, and let students think about where noon will be reached first, in Tokyo or New York. This activity will help students connect the concepts of the rotation of the Earth and local time.

Then have the students start calculating again - have the students count in their pairs how many minutes it takes for the Earth to turn  $1^\circ$  and then by  $15^\circ$ .

Help students conclude that if we move east, we add 4 minutes for each degree of longitude, and if we move west, we subtract 4 minutes.

Instruct students to name a city or place that is near where they live. Help them answer the question of what time it is there. The goal is for students to conclude that their selected city has the same hours as their current location, even though the places do not have the same longitude.

Ask students what would happen if every city in the world had its own specific time? For example, if we went to a city only 50 km away from ours to go to the cinema and watch a movie - what should we watch out for? What problems would that create for us when traveling? Guide students during the discussion to conclude that the use of local time in everyday life is not practical.

Indicate to the students that with their own research they will understand how this challenge was solved by universal agreement during the 19th century.



**Adapting activities for students with disabilities**

Make sure that two students with disabilities do not work together while working in pairs. Help students with arithmetic problems.

**Adapted activities for gifted students and those who want to know more**

<b>Activity name:</b>	Time zones
<b>Duration of Activity (min)</b>	35 min

**Detailed description of the activity:**

Share an interactive map with students at <https://www.timeanddate.com/time/map/>  
Introduce students to zonal time, which was introduced in the 19th century, dividing the world into time zones.

Divide the students into pairs and ask them the following questions to which they must find answers and write them down. Instruct them that they can use the map on the link, the Internet and in the textbook. You can also find these questions in Appendix 1 of this teaching scenario.

Explore the time zones:

1. How many time zones (zones) is the Earth divided into?
2. Do all places within the same time zone have exact same specific time ?
3. Investigate what UTC ( Universal Time Coordinated ) is.
4. How is the time of a certain zone determined?
5. What is the time difference between two adjacent zones?
6. Use the interactive map to find out what the date is and what time it is:
  - a) Sydney , Australia
  - b) Moscow, Russia
  - c) Paris, France
  - d) Los Angeles, USA
7. Use the interactive map to find a city located in the country where you live. Make sure the clock in your classroom / watch on your hand / or the device you are using all show the same time.  
Then, find 3 more cities in the world where the time is the same as in your place.  
Finally, list the countries where these cities are located.
8. Name a city you would like to travel to, at least one time zone east of the country where you live. Write down what time it is in that city and compare that time with the time in the place where you live.
9. Name a city you would like to travel to, at least one time zone west of the country where you live. Write down what time it is in that city and compare that time with the time in the place where you live.
10. Choose the correct answer:
  - a) In the time zones east of where I live it is more / less hours.
  - b) In the time zones west of where I live it is more / less hours.
11. Choose the correct answer:
  - a) In a city located 3 time zones east of my zone, it is now 3 hours less / more.
  - b) In a city located 2 time zones west of my zone, it is now 2 hours less / more.

Check the answers to the questions, then re-project the presentation on the link

<https://view.genial.ly/62a0a505c49de700183eeddc/presentation-world-time>

Point out that each time zone covers an area of 15 ° longitude. Ask students what they think, why time zones do not fully follow the provision of meridians. As an aid, show students the area of South America (Argentina)



and Europe and help them with inferences. Then discuss with students how many time zones each major country has (USA, Canada, Russia, Australia, and the exception - China).

**Adapting activities for students with disabilities**

Make sure that two students with disabilities do not work together while working in pairs. If students need help with understanding one of the tasks, explain it to them.

**Adapted activities for gifted students and those who want to know more**

<b>Activity name:</b>	Time travel
<b>Duration of Activity (min)</b>	10 min
<b>Detailed description of the activity:</b>	
<p>Again, instruct students to look at the map at <a href="https://www.timeanddate.com/time/map/">https://www.timeanddate.com/time/map/</a> and write down what day it is and what the current time it is at these locations:</p> <ul style="list-style-type: none"> <li>a) one of the cities in the easternmost part of Russia</li> <li>b) one of the cities in Alaska</li> </ul> <p>Then, with the help of a globe or Google Earth tool that you will project on a screen (<a href="https://earth.google.com/web/">https://earth.google.com/web/</a>), one student should show the easternmost part of Russia and Alaska. Ask the whole class a question - how is it possible that such a difference in time is possible if these two spaces are close enough?</p> <p>Get students interested in this topic by saying that time zones practically lead to time travel. Namely, since there are 12 time zones east of the prime meridian and 12 west of the prime meridian, as opposed to the zero meridian, at about 180 ° longitude the date boundary phenomenon occurs. Ask students:</p> <ul style="list-style-type: none"> <li>a) What happens to the current time when we cross the date line from west to east?</li> <li>b) What happens to the current time when we cross the date line from east to west?</li> </ul> <p>Announce to students that they will continue to deal with another phenomenon - the Galapagos Islands .</p>	
<b>Adapting activities for students with disabilities</b>	
<b>Adapted activities for gifted students and those who want to know more</b>	

<b>Activity name:</b>	Galapagos - from isolation to biodiversity
<b>Duration of Activity (min)</b>	45 min
<b>Detailed description of the activity:</b>	
<p>Announce to students that they will get to know a very special archipelago - the Galapagos . Ask students to use the digital map ( <a href="https://www.google.com/maps">https://www.google.com/maps</a> ) to find the Galapagos Islands . Then, divide the students into groups so that there are a minimum of 4 students in each group. After dividing into groups, encourage students to share roles with each other. In each group, part of the students (half of the group) will be researchers and the other part of the students (the other half) will be designers. To make it easier for students to choose roles, explain to them the following:</p> <ul style="list-style-type: none"> <li>- researchers - unravel the secrets of the Galapagos Islands by searching for answers to using the Internet or a textbook</li> </ul>	



- designers - show the findings of researchers in the most creative way with the help of Adobe Spark - <https://express.adobe.com/sp/>

Researchers will discover the secrets of the Galapagos Islands by answering a series of the following questions. Designers must creatively present every secret that researchers discover (ie the answer to every question). You can also find the questions in Appendix 2 of this teaching scenario.

1. In which ocean is the Galapagos Islands located ?
2. Which country does the archipelago belong to?
3. What is the current date in the Galapagos and what time is it there currently?
4. The archipelago is far from the rest of the continent - how did the archipelago come to be?
5. On which hemispheres of the Earth is the archipelago located?
6. Given the geographical location of the archipelago, describe the climate of the archipelago.
7. Use a map to determine approximately how many kilometers the archipelago is from the nearest continent.
8. Explain whether you think the archipelago is isolated from the rest of the world.
9. Explain what endemics are. Given the location of the Galapagos Islands , do you expect there to be a lot of endemics in the islands?
10. Show the following animals from the Galapagos Islands and point out one of the most interesting features of each species:
  - a) a special kind of turtle
  - b) birds of diverse beaks
  - c) a cormorant that does not fly
  - d) a Galapagos lizard
  - e) a Galapagos iguana
11. Explore what an ecosystem is, and then explain the ecosystem in your own words.
12. Is the Galapagos Islands highly biodiverse ?
13. Explore who Charles Darwin was: Thanks to his travels and research into the Galapagos , this researcher set up Darwin's theory of evolution. Explain that theory and present it.

Spend the last 7-10 minutes of the activity checking how the students answered the questions. Have each group give a short presentation. The discussion that will develop should lead students to conclude that they have explored the Galapagos in order to discover the connection between geographical isolation and biodiversity .

#### Adapting activities for students with disabilities

#### Adapted activities for gifted students and those who want to know more

<b>Activity name:</b>	What did we learn?
<b>Duration of Activity (min)</b>	7 min
<b>Detailed description of activities:</b>	
Share the digital worksheet with students at the following link: <a href="https://app.wizer.me/learn/RTNS78">https://app.wizer.me/learn/RTNS78</a> Let the students solve the leaflets on their own. You can evaluate student responses for the assignment by granting numerical or descriptive grades to students.	



**Adapting activities for students with disabilities**

If necessary, help students navigate the Wizer.me tool to successfully complete assignments.

**Adapted activities for gifted students and those who want to know more**

<b>Activity name :</b>	My first business experience
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<b>Duration of Activity (min)</b>	38 min
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**Detailed description of the activity:**

Start a short discussion with the students. For starters, tell students that we can learn a lot about the environment from the Galapagos Islands . Namely, only 4 of the 13 large islands are inhabited. Also, point out that 97% of the area of the islands are actually national parks where no one lives and settlements are not allowed to be built in those areas. As the population increases and many people immigrate to the islands, the population grows. Ask students - what happens to those settlements?

Furthermore, point out that a lot of the inhabitants of the islands are engaged in tourism. Many tourists come to the archipelago eager to explore the interesting nature of the island, but also to relax on the beautiful beaches. This, along with the growth of the local population, has a great impact on the environment.

Announce the task for students - each student will create their own business plan. Namely, students need to:

- devise a tourism-related business to live in the Galapagos
- devise how they will earn, while:
  - a) providing tourists with services / products that tourists need / want
  - b) making sure that their businesses do not have a bad impact on the environment.

Project a mind map to students at the following link: <https://coggle.it/diagram/YqHptTctkO-aYrAK/t/moj-posao-na-galapagosu/321c6bb420167b51346598cf1ad68ec3f986768954a33e3500aa8d40cc738c75>  
students use a smart map in Coggle to present their business by complementing the 3 basic branches of a smart map. The tool can be accessed via the link: <https://coggle.it/>

Take the last 8 minutes of the activity to present the ideas of students who will want to present their business. Use the presentations to help students conclude that the Galapagos business example is actually useful elsewhere in the world because thinking like this ensures sustainable development - development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs.

**Adapting activities for students with disabilities**

**Adapted activities for gifted students and those who want to know more**



## Annex 1

Explore time zones:

1. How many time zones (zones) is the Earth divided into?
2. Do all places within the same time zone have the same specific time zone ?
3. Investigate what UTC ( Universal Time Coordinated ) is.
4. How is the time of a certain zone determined?
5. What is the time difference between two adjacent zones?
6. Use an interactive map to find out what the exact date is and what time it is in:
  - a) Sydney , Australia
  - b) Moscow, Russia
  - c) Paris, France
  - d) Los Angeles, USA
7. Use the interactive map to find a city located in the country where you live. Make sure the clock in your classroom / watch on your hand / on the device you are using all show the exact same time.  
Then, find 3 more cities in the world where the time is the same as at your place.  
Finally, write in which countries these cities are located.
8. Name a city you would like to travel to, at least one time zone east of the country where you live. Write down what time it is in that city and compare that time with the time in the place where you live.
9. Name a city you would like to travel to, at least one time zone west of the country where you live. Write down what time it is in that city and compare that time with the time in the place where you live.
10. Choose the correct answer:
  - a) In the time zones east of where I live it is more / less hours.
  - b) In the time zones west of where I live it is more / less hours.
11. Choose the correct answer:
  - a) In a city located 3 time zones east of my zone, it is now 3 hours less / more.
  - b) In a city located 2 time zones west of my zone, it is now 2 hours less / more.



## Annex 2

1. In which ocean is the Galapagos Islands located ?
2. Which country does the archipelago belong to?
3. What is the current date in the Galapagos and what time is it there?
4. The archipelago is far from the rest of the continent - how did the archipelago come to be?
5. On which hemispheres of the Earth is the archipelago located?
6. Given the geographical location of the archipelago, describe the climate of the archipelago.
7. With the assistance of a map, determine approximately how many kilometers the archipelago is located from the nearest continent.
8. Explain whether you think the archipelago is isolated from the rest of the world.
9. Explain what endemics are. Given the location of the Galapagos Islands , do you expect there to be a lot of endemics in the islands?
10. Show the following animals from the Galapagos Islands and point out one of the most interesting features of each species:
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  - c) a cormorant that does not fly
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