

## LESSON PLAN

### Title

# ARCTIC ISSUES:

## STUDYING PAST ENVIRONMENTS

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### Subject

Geography, Biology

### Topic

- \* polar regions
- \* climate change
- \* scientific research
- \* Paleoclimatology

### Aim of the lesson

Student will:

- \* understand the concept of gathering data based on climate proxies
- \* interpret research results (foramniifera)
- \* recognize different methods used in paleoclimatology
- \* describe specific ecosystems (peatlands) and their role in studying past environments
- \* name possible causes of changes in ancient climate

### Trends <http://www.allourideas.org/trendiez/results>

- \* STEM learning
- \* GAME-based learning and gamification
- \* Virtual learning assistant
- \* Project-based learning



## Age of students

- \* 13-16 (basic material)
- \* 17-19 (basic + advanced material)



## Time

- \* Preparation time: up to 60' (preparation of experiment, preliminary attempt to fill in the worksheet – depending on chosen version of Ipan)
- \* Lesson duration: 45 minutes (alternatively: 60 minutes, depending on duration of lesson unit)
- \* Homework: 45 minutes
- \* Follow-up lesson: 45 minutes (not obligatory; alternatively, in case of 90 minutes session (science club or 2 units combined – all activities during 1 session)



## Teaching materials and tools

Online:

Polarpedia.eu	<a href="#">LITTLE ICE AGE</a>	<a href="#">MEDIEVAL WARM PERIOD</a>	<a href="#">ICE AGES</a>	<a href="#">INTERGLACIATIONS</a>
Other resources:	<a href="#">PALEOCLIMATOLOGY</a>	<a href="#">FORAMNIFERA</a>	<a href="#">TREE RINGS</a>	<a href="#">ISOTOPES</a>
	<a href="#">PEATLAND</a>		<a href="#">CLIMATE PROXY</a>	

Educaplay (use LINK or QR CODE)

[https://www.educaplay.com/learning-resources/6068285-studying\\_past\\_environments.html](https://www.educaplay.com/learning-resources/6068285-studying_past_environments.html)



Kahoot.it: **QUIZ** (7 questions, 20 seconds for an answer, individual or team mode) –smartphones/tablets/computers required (use LINK OR QR CODE)

<https://create.kahoot.it/share/studying-past-environments/cddfa5f5-9467-46d1-9ee1-2b2c311b5967>



Offline:

<b>FOR THE EXPERIMENT</b>	Sand, garden soil	Red, white, yellow, green paper sheets
Tall jar/transparent vase	gravel	Tray for sampling; 5 trays/large lunch boxes to mix soil, sand and gravel

For details see: **EXPERIMENT SCENARIO**



**21<sup>st</sup> century skills** <http://www.p21.org/our-work/p21-framework>

- \* Critical thinking and problem solving
- \* Global awareness
- \* Environmental literacy



## Activities

### VERSION 1

	Name of activity	Procedure	Time	Resources
BEFORE THE LESSON <b>A</b>	<b>1</b> BEFORE THE LESSON – PREPARATION ACTIVITY for 2-4 volunteers	2 groups of 2-4 volunteers prepare an experiment according to scenario (at school or at home) –2 experiments – sediment columns prepared in total; both groups	60'	Materials for the experiment; research online regarding plants names in the scenario and “plan” the whole set for DETECTIVES team who will study the site.



DURING THE LESSON <b>B</b>		perform part 1 of the experiment (Team: CREATORS)		
	<b>2</b> BEFORE THE LESSON- PREPARATION ACTIVITY for 10 students	6 students prepare short (3') oral presentations regarding 5 following topics (based FUN FACTS from MATERIALS FOR TEACHERS and other resources) – 2 students per topic: <b>The Challenger Mission</b>  <b>Death of a Bishop written in ice cores</b> <b>Pack rats time capsules</b>	15'	Materials for teachers  Additional resources (research by students)
	<b>1</b> Preliminary questions	Students write their answers to 3 short questions and verify their answers during the lesson  How is past climate studied? Has climate changed in the past? Why? How far back can we go in learning about past temperatures and precipitation?	1' (3')	
	<b>2</b> Introduction	Presentation (by teacher using ready .ppt or video recording with expert)	15'	
	<b>3</b> Short presentations by students	3 students (drawn out of 6) – each topic (FUN FACT) presented once	10' (15')	
	<b>4</b> Working with resources:	Students are divided into 10 groups (1-3 students per group), each group obtains a topic to work on and a set of materials:  <b>What are peatlands, how are they formed, why are they important?</b>  <b>How is information about climate recorded in different proxies? POLLEN, FORAMNIFERA, TREE RINGS, CORAL REEFS – how do we read those records?</b>  <b>What are possible causes of climate change in pre-industrial era?</b>  <b>Historical climate change – what happened during Little ice lge?</b>  <b>Historical Climate Change – what happened during Medieval Warm Period?</b>	9' (15')	Materials for teachers ; each group receives a relevant part  Animations

C	5 Discussion	How are past environments studied + Mind map creation <a href="https://www.lucidchart.com">https://www.lucidchart.com</a> or black/whiteboard or flipchart	10' (2')	With help from mind map included in syllabus
	1 Homework for students	Worksheet for students	45'	Worksheet ; it is recommended that teachers give student some time to solve the tasks on their own and then send them solutions
HOMEWORK	2 Experiment part 2	2 groups of 2-4 volunteers perform part 2 of the experiment an experiment according to scenario (at school or at home) – take samples from 2 sediment columns prepared; each team fills in table with data (Team: DETECTIVES)	60'	Materials for the experiment; research online regarding plants names in the scenario and “plan” the whole set for DETECTIVES team who will study the site.
D FOLLOW-UP LESSON	1 HOMEWORK CHECK-OUT - WORKSHEET	Discussing problematic issues	10'	
	2 HOMEWORK CHECK-OUT - EXPERIMENTS	Comparing results of DETECTIVES teams with CREATORS teams; were findings correct? If there are discrepancies between what CREATORS designed and DETECTIVES discovered, what might be the causes? Is it more difficult or easier for real studies on real sites?	20'	Experiment materials, tables, information of preferred conditions for plants gathered by CREATORS teams
	3 KAHOOT QUIZ	Checking students' knowledge from previous classes	5'	Ready to use Kahoot quiz, mobile devices or computers
	4 5 drawn groups present results in short	<p>What are peatlands, how are they formed, why are they important?</p> <p>How is information about climate recorded in different proxies? POLLEN, FORAMNIFERA, FREE RINGS, CORAL REEFS – how do we read those records?</p> <p><b>What are possible causes of climate change in pre-industrial era?</b></p> <p><b>Historical climate change – what happened during Little ice lge?</b></p> <p><b>Historical Climate Change – what happened during Medieval Warm Period?</b></p> <p>(based on previous analysis, 2 minutes each)</p>	10'	

## VERSION 2

	Name of activity	Procedure	Time	Resources
BEFORE THE LESSON <b>A</b>	<b>1</b> PREPARATORY ACTIVITY FOR ALL STUDENTS	Students watch video recording with presentation by glaciologist, 2 animations and try to fill in the worksheet on their own	60'	Video recording, animations, Worksheet for students
	<b>2</b> PREPARATION ACTIVITY for 10 students	6 students prepare short (3') oral presentations regarding 3 following topics (FUN FACTS about glaciers)-2 students per topic: <b>The Challenger Mission</b>  <b>Death of a Bishop written in ice cores</b>  <b>Pack rats time capsules</b>	25'	Materials for teachers  Additional resources (research by students)
	<b>2</b> Experiment – preparation of sediment columns	Teachers prepared a sediment column with “pollen”	45 '	
DURING THE LESSON <b>B</b>	<b>1</b> Checking level of knowledge	EDUCAPLAY CROSSWORD activity solved together, with necessary clarifications	5'	
	<b>2</b> Working with resources	Half of students divided into 5 groups (1-3 students per group) each group obtains a topic to work on and a set of materials:  <b>What are peatlands, how are they formed, why are they important?</b>  <b>How is information about climate recorded in different proxies?</b> <b>POLLEN, FORAMNIFERA, TREE RINGS, CORAL REEFS – how do we read those records?</b>	15' (15')	Materials for teachers, selected sections  Animations

		<p><b>What are possible causes of climate change in pre-industrial era?</b></p> <p><b>Historical climate change – what happened during Little ice lge?</b></p> <p><b>Historical Climate Change – what happened during Medieval Warm Period?</b></p>		
	<p><b>3</b></p> <p>Experiment</p>	<p>Parallel to Step No 2, half of the group divided into 2 smaller groups perform the experiment: 1 group takes samples from sediment column prepared by teachers second group write down the results</p>	15' (15')	<p>Sediment column prepared by teacher before the lesson; sheets filled in by students – see Experiment Scenario</p>
	<p><b>4</b></p> <p>Short presentations by students</p>	<p>5 students (drawn out of 10)-each topic (FUN FACT) presented once</p>	10' (15')	
	<p><b>5</b></p> <p>Working with worksheets</p>	<p>Students divided into 3-5 people teams fill in the gaps in preliminarily solved worksheet tasks, assisted by teacher; they receive sheets with answers, if necessary</p>	15' (20')	<p>Worksheet for students</p>
<p><b>HOMEWORK</b></p> <p><b>C</b></p>	<p><b>1</b></p> <p>Homework for students</p>	<p>Preparing a mind map regarding paleoclimatology</p> <p>Drawing a graph based on experiment results</p> <p>Searching for climate conditions preferred by plants in experiment</p>	<p>At home – 35'</p> <p>15'</p>	
<p><b>FOLLOW-UP LESSON</b></p> <p><b>D</b></p>	<p><b>1</b></p> <p>HOMEWORK CHECK-OUT</p>	<p>Discussing mind map, creating one common result</p>	10'	<p>With help of exemplary MIND MAP provided in SYLLABUS, if needed</p>
	<p><b>2</b></p> <p>KAHOOT QUIZ</p>	<p>Checking students' knowledge from previous classes</p>	5'	<p>Ready to use kahoot quiz, mobile devices or computers</p>

	<b>3</b> Experiment results	Observation of experiments results – discussing presumed climate conditions in analysed periods	10'	Based on graphs prepared as homework and research regarding climate conditions preferred by plants, pollen of which was found
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## Assessment

Describe here the assessment method of the lesson, if any. For example, if you plan on assessing your students with a quiz, include here questions and answer options with colour-coding the correct answers.

##### AFTER IMPLEMENTATION #####

## Student feedback

3 jars are prepared, one marked: **INTERESTING**, the second – **UNDERSTANDABLE**, the third one – **CHALLENGING**.

In the box next to the jar there are post-it cards in 3 colours:

**RED**- for HIGH

**YELLOW** for AVERAGE

**BLUE** – for LOW

As they leave they choose 3 cards and put one into each jar, depending on how they assess the lesson.