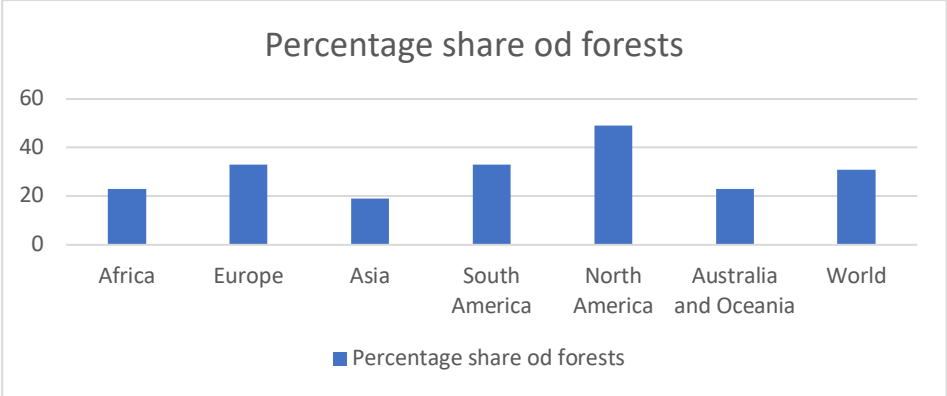
MATHS- LESSON PLAN

Grade:	12-14 years old
Subject:	United in Biodiversity – Habitat Fragmentation
Lesson n°:	**1**
Topic:	**How does the number of natural habitats change? - analysis of charts regarding habitat fragmentation.**
Lessons focus and goals:	**Subject:** Using mathematics to understand habitat fragmentation - reading graphs. **Aims of the lesson:** The aim of the lesson is to familiarize students with the concept of natural habitats and their fragmentation. Using charts and diagrams, students will analyze how natural habitats have changed over the years due to negative factors such as human impact through the construction of roads or highways.
Learning objectives:	**Learning objectives:** You will be able to: ● Read and interpret data presented in a graphics , ● Compare and analyze information in charts, ● Prepare charts or diagrams based on numerical data, You will consolidate your skills in: • Knowing different types of statistical data presentations (diagram, table, pie chart, percentage chart) You will improve your skills in: • communication, • organization, • data chart analysis .

Materials	- worksheets with charts and diagrams for students, - Internet connection - computer - projector or multimedia board to display data,

Structure and activities	**1. Introduction:** (20 minutes) The teacher introduces students to information about natural habitats and habitat fragmentation. A natural habitat is a concept introduced by European Union law as a part of the designation of areas of the Natura 2000 network. It means a land or sea area with specific natural features where there are species of animals and plants that are valuable to the community. Environmental urbanization and economic changes caused by humans mean that population habitats are increasingly fragmented. The phenomenon of dividing habitats into smaller environmental patches is called fragmentation. As a result of human activity, populations of organisms start to live in a new reality. The large populations are divided and isolated by construction of roads and the development of agriculture. Habitat fragmentation causes metapopulations, i.e. local groups or small subpopulations between which individuals of the same species can move. Habitat fragmentation is extremely dangerous for species at risk of extinction. The more fragmented the environment and the smaller the habitat patches, the greater the risk of extinction of a given species. Habitat fragmentation has a major impact on biodiversity disruption. The most important reason for the decline in biodiversity is the constant reduction of the area of natural ecosystems. The biggest problem is deforestation. Forests are the most valuable ecosystems on Earth from the point of view of biodiversity. They are homes for approximately 75% of land species living on our planet. The teacher shows the students Google Earth. Then, together with the students, they analyze how afforestation in the world has changed over the years. Google Earth **2. Exercises** (35 minutes) The teacher shows students videos about deforestation. **https://www.youtube.com/watch?v=Ic-J6hcSKa8** The teacher shows students (on the multimedia board) a diagram showing the percentage of forest resources in relation to land area. Students should answer: what type of chart is:



Africa – 23%
Europe- 33%
Asia- 19%
South America- 33%
North America- 49%
Australia and Oceania- 23%
World- 31%

Students are asked to analyze the diagram and draw conclusions. Students and teachers share their conclusions about a given diagram.

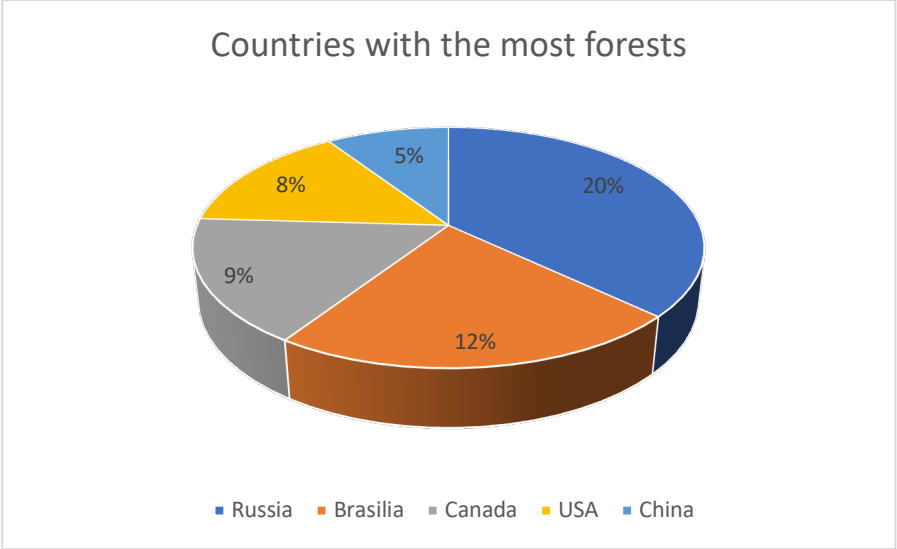
The teacher divides the students into groups and hands out worksheets to the children with questions about the diagram in question.

Questions:
1. Which country has the highest percentage of forests to land area.
2. Which country has the smallest percentage of forests to land area.
3. How many percentage points does the percentage of forests in relation to the land area of Asia differ from that of Africa by?
4. Which countries have the same percentage of forests to land area.
5. Which countries have a higher percentage of forests to land area than the world.

Over the last 10 years, the total area of the world's forests has decreased by approximately 33,609 thousand. ha, i.e. by 0.84%.

The teacher asks students: what are effects of reducing the amount of forest in the world on the biodiversity

The teacher shows the students a pie chart showing the countries with the most forests (as a percentage of the world's total forest area).



The teacher hands out worksheets to the children with questions about the diagram in question.

Questions:
1. Which country has the largest amount of forests?
2. Which country has the least amount of forests?
3. By how many percentage points does Canada have more forests than Russia and by how many more than China?
4. Which countries have more forests than the USA?

3. **Lesson summary** (15 minutes)

The teacher asks the students whether they understood everything during the lesson.
Finally, he asks a question:
What is the role of people in the phenomenon of habitat fragmentation?
Can this phenomenon be reduced?

The teacher explains to students how to stop the phenomenon of habitat fragmentation.
Ecological corridors are areas that connect ecological patches (habitats) created as a result of fragmentation. An ecological corridor may be, for example, a strip of wild greenery left among fields or a footbridge for animals over a highway.
Individuals living in habitats form subpopulations, and corridors enable them to migrate between these habitats. Creating ecological corridors is beneficial for the metapopulation. Thanks to them, it is possible to colonize new environmental patches where subpopulations of a given

	species had previously become extinct. Ecological corridors therefore enable the recolonization and colonization of habitats. Moreover, ecological corridors increase species diversity within given habitats, thus preventing inbreeding of subpopulations (breeding of organisms related to each other).
Inclusion	**Explanation of Lesson Aim and Structure:** This lesson is designed to actively engage students in understanding and combating to familiarize students with the concept of natural habitats and their fragmentation. Using charts and diagrams, students will analyze how natural habitats have changed over the years due to negative factors such as human impact through the construction of roads or highways. **Clear Instructions, Adapted for All Students:** Instructions will be communicated clearly and tailored to meet the needs of all students, ensuring comprehension and engagement. Visual aids, such as videos and images, will support understanding, particularly for visual learners. Instructions will be repeated as necessary, and individualized support will be provided to students who require additional assistance or clarification. **Formation of Inclusive Groups:** To promote collaboration and peer learning, inclusive groups will be formed with consideration for diverse abilities and backgrounds. Mixed-ability groups will encourage cooperation and shared learning experiences, allowing students to support one another. Teachers will ensure that group dynamics are inclusive, fostering an environment where every student feels valued and empowered to contribute. **Monitoring Engagement and Supportive Interventions:** Teachers will monitor student engagement throughout the lesson, ensuring that all students have the opportunity to participate actively. Supportive interventions will be employed if any student appears disengaged or encounters challenges. These interventions may include providing additional guidance, modifying tasks, or encouraging peer collaboration. Teachers will also address any instances of discomfort or exclusion promptly and sensitively, maintaining a supportive and inclusive learning environment.

Assessments:

#1 -

	Initiating	Developing	Excelling
Description of performance	Introducing the definitions and basic concepts of Mathematics (Statistics, Data), Biodiversity, Biodiversity Loss and Habitat Fragmentation.	Explaining how Habitat Fragmentation is one of the greatest biodiversity loss issues worldwide and how Mathematics is a tool to counter it through data analysis and statistics that support the creation of habitat and biodiversity recovery strategies.	Great understanding of Habitat Fragmentation as a biodiversity loss issue and Mathematics as a tool to protect wild fauna and flora from it.
Sample student response	"The causes of habitat fragmentation are primarily: human landscape such as roads, highways, buildings, energy structures, fences resulting from deforestation. The main consequence of habitat fragmentation is the disruption of the balance of species dynamics."	"The most important cause of the decline in biodiversity is the constant reduction of the area of natural ecosystems."	" One method to connect fragmented habitats are ecological corridors, i.e. areas that connect habitats created as a result of fragmentation. An ecological corridor may be, for example, a strip of wild greenery left among fields or a footbridge for animals over a highway."

#2 -

	Initiating	Developing	Excelling

Description of performance	Little or no knowledge on the connection between Habitat Fragmentation, Mathematics and Biodiversity.	Capacity to explain the damages caused by Habitat Fragmentation to biodiversity and the role of Mathematics in avoiding them in simple terms.	Ability to explain the role of every citizen in advocating against human activities that cause Habitat Fragmentation.
Sample student response	"Habitat fragmentation is important for species at risk of extinction. The more fragmented the environment and the smaller the habitat patches, the greater the risk of extinction of a given species."	"Habitat fragmentation causes metapopulations, i.e. local groups or small subpopulations between which individuals of the same species can move."	"As a result of human activity, populations of organisms (have not previously formed metapopulations) start to live in a new reality. the The large populations are divided and isolated by construction of roads and the development of agriculture'.

Supporting Documentation/Resources:

1. **Materials:** https://www.visualcapitalist.com/which-countries-have-the-largest-forests/
2. **Videos:**
   a. National Geographic Explorer: National Geographic Explorer often covers topics related to wildlife conservation and trafficking. The program offers informative documentaries and series that can shed light on the issue of wildlife trafficking in an engaging manner suitable for middle school students.**https://www.youtube.com/watch?v=Ic-J6hcSKa8**

Quantitative Assessment Rubric:

Criteria	Initiating	Developing	Excelling
Description of Performance			
Immersive Learning Reflection			
- Emotions and challenges expressed	1-3 points	4-6 points	7-10 points
- Connection to ethical considerations	1-3 points	4-6 points	7-10 points
Creative Expression and Advocacy			
- Project plan depth and creativity	1-3 points	4-6 points	7-10 points
- Strategy for impact outlined	1-3 points	4-6 points	7-10 points
- Consideration of broader community impact	1-3 points	4-6 points	7-10 points

Total Points Calculation:

- Total points for each criterion can be calculated by summing up the points awarded in each category.

Sample Student Response:

- Qualitative descriptors alongside quantitative assessments provide additional context and insight into the student's performance.
- For example, a response in the "Developing" category may be accompanied by qualitative feedback like "Demonstrates improvement in expressing emotions and challenges experienced during the simulation. However, further development is needed to deeply connect these experiences to ethical considerations."

Assessment Table: Inclusion and Diversity - Climate Change

Criteria	Check
Information offered in multiple formats	
- Variety of learning materials provided	
- Text, visual, auditory resources	
Inclusive methodologies like peer-to-peer learning	
- Opportunities for collaborative activities	
- Group discussions, peer teaching	
Use of ICT tools	
- Integration of technology in learning activities	
- Use of online platforms, interactive tools	
Overall Inclusion and Diversity	
- Integration of diverse perspectives	
- Opportunities for student engagement	
- Promotion of equitable participation	

Explanation of Criteria:

- **Information offered in multiple formats:**
  - Assess whether the lesson plan provides learning materials in various formats

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such as text, visuals, and auditory resources to cater to diverse learning styles.

- **Inclusive methodologies like peer-to-peer learning:**
  - Evaluate if the lesson plan incorporates inclusive methodologies like peer-to-peer learning, group discussions, and collaborative activities to encourage interaction and engagement among students.

- **Use of ICT tools:**
  - Determine if the lesson plan utilizes ICT tools such as online platforms and interactive resources to enhance learning experiences and accessibility.

- **Overall Inclusion and Diversity:**
  - Summarize the overall assessment of inclusion and diversity in the lesson plan, considering the integration of diverse perspectives, opportunities for student engagement, and promotion of equitable participation.