

# Data Literacy Learning Activity - Biosphere



## Comparison of Tree Height Measurements

# Evaluation of Tree Height Measurement Data

**Topic:** Comparison of tree height measurement results using clinometer and GLOBE Observer app

**Age of students:** 12-15

**Skills developed:** the ability to compare two data sets, analyze and interpret the differences and recognize and identify potential sources of measurement error in these data sets

**Prerequisites:** Basic knowledge of tree height measurement using GLOBE Observer App and clinometer

**Big idea:** Knowing the height of trees, gives us valuable information about the characteristics of the ecosystem in which they grow.

Critical thinking and evaluation of measured data are essential for obtaining good results from height measurements as well as other scientific investigations.

	CLINOMETER	NASA GLOBE OBSERVER	PACE
LITA	4,07m	5,00m	2,36m
VRBA	8,18m	58m	1,08
VISNJA	6,6m	6,46m	0,14m
MIKVA	4,0m	3,82m	0,18m
LIPAL	6,03m	4,65m	1,38m
GOLSTAD	2,66m	2,85m	0,19m

# Content of the activity

**Slide 4:** Introduction

**Slide 5-6:** Description of the methods used for the measurements

**Slide 7:** Work assignment for students

**Slide 8:** Data to be used for the activity

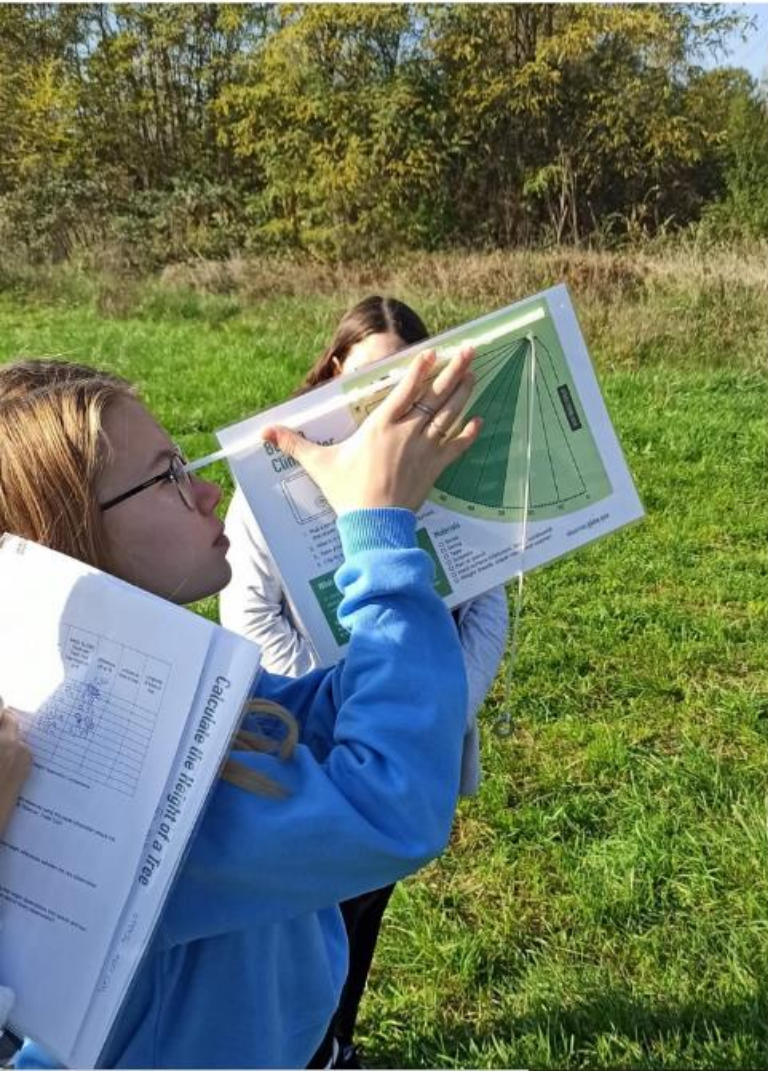
**Slide 10:** Answers to the questions for students

# Introduction

- The activity is based on results of Elementary school Rugvica, Croatia.
- Students measured height of nine trees
- They used two methods of measuring a tree height – clinometer and GLOBE Observer app
- Students compared results and tried to find out, which measurement method is more precise



# DETERMINING THE HEIGHT OF TREES USING THE CLINOMETER



**1.** We move back far enough so the tree-top can be comfortably viewed through the crosshair of the clinometer, and read the percent scale



**2.** Measure the distance to the tree from where the reading was taken, with a tape measure

# DETERMINING THE HEIGHT OF TREES USING THE APPLICATION (GLOBE OBSERVER)

Using the free GLOBE Observer mobile app we take observations of tree heights



# Work assignment for students

## Task

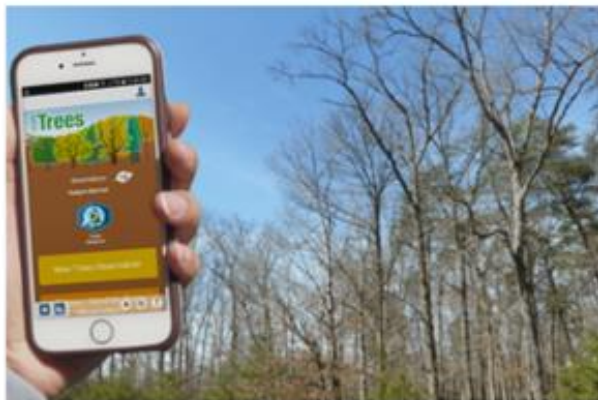
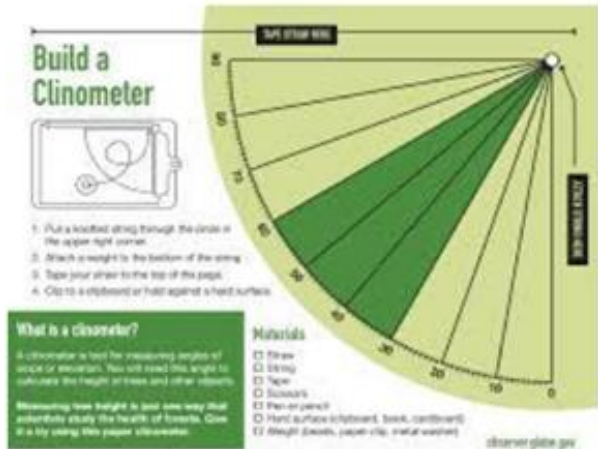
Compare the two datasets (data measured using clinometer and data measured by GLOBE Observer) and answer the questions below.

## Steps/ questions

1. Find out which tree had the biggest/smallest difference between the measurement results
2. Is it possible to say that we measure greater height using one method than the other?
3. Can you tell for which trees the measurement was the most accurate?
4. Which of the trees was most likely measured with a significant error ? What can be the source of the error?
5. Looking at the data, can you make a conclusion, which measurement method is more precise?

# Comparison of data

Tree	Clinometer (m)	GLOBE Observer (m)	Difference (m)
1. White poplar 1 ( <i>Populus alba</i> )	8,74	7,72	1,02
2. White poplar 2 ( <i>Populus alba</i> )	8,00	6,52	1,48
3. Bare tree	8,66	8,85	0,19
4. Lime tree 3 ( <i>Tilia cordata</i> )	4,64	5,00	0,36
5. Willow ( <i>Salix babylonica</i> )	8,18	6,38	1,8
6. Cherry ( <i>Prunus cerasus</i> )	6,60	6,46	0,14
7. Lime tree 2 ( <i>Tilia Cordata</i> )	6,03	4,65	1,38
8. Fig tree ( <i>Ficus carica</i> )	4,00	3,82	0,18
9. Grey willow ( <i>Salix cinerea</i> )	16,42	11,95	4,47





For answers to the questions go to the next  
slide 😊

# Answers

1. Find out which tree had the biggest/smallest difference between the measurement results

The biggest difference: tree No 9

The smallest difference: tree No 6

2. Is it possible to say that we measure greater height using one method than the other?

No, for some trees the height was bigger when measured by clinometer for other when measured by GLOBE Observer

3. Can you tell for which trees the measurement was the most accurate?

At the first sight, we can see that four trees have small difference between the two measurements (tree No. 3, 4, 6, 8)

However we should always relate the difference to the total height of the tree. (for example for tree No. 3 it would be  $0,19/8,85 = 0,02147 \times 100 = 2,15 \%$ )

4. Which of the trees was most likely measured with a significant error ? What can be the source of the error?

Tree No 9 - The error source can be: more students use the same phone and do not adjust the height or length of pace in the app; not seeing the tree top properly; error in measuring the distance to the tree etc.

5. Looking at the data, can you make a conclusion, which measurement method is more precise?

No, it is not possible. We would need more measurement results for each tree done by each method.



The data literacy learning activity was prepared by GLOBE Program Europe and Eurasia Region Coordination Office, inspired by a real classroom activity coming from a GLOBE school.

Thanks to the teacher Zrinka Klarin, from Elementary School Sime Budinica, Zadar, Croatia for the inspiring idea, photos and materials.



Implemented by: The UCAR logo, featuring a blue starburst symbol followed by the letters "UCAR" in a bold, sans-serif font.