

Math MiniMOOC: Measure for Measure

Prepared by Giulia Cordone and Valeria Greco, Palermoscienza Association, Italy

Summary

Measure for measure, is a real-life activity and its focus is the knowledge of relation between us and buildings around us, and how it is possible to understand their size using our body at first guess. For this activity it is chosen an important architectural structure, Palermo Cathedral, like a laboratory where it is possible to test different points of view, to measure its size using different measure unit to calculate, for example, its volume and to include it in urban space in which it is.

This activity will help students to understand how to apply curriculum learning in real life.

This activity is developed on two parallel tracks introducing two different method virtual and real-life to measure a building. We chose an important architectural structure, Palermo Cathedral, as a laboratory where it is possible to test different points of view, to measure its size using different measure unit to calculate, for example, its volume and to include it in urban space in which it is.

One is real, **Man is a measure (mètron) of all things¹**, is a real-life activity and its focus of this activity is the knowledge of relation between us and buildings around us, and how we can understand their size using our body at first guess.

The other is virtual, **38°N 15°E... where are we?** and its focus is the knowledge of informatic tools, like Google Earth Pro to measure size and height of buildings.

The same activity can develop with different buildings like, for example, their school

We aspect students develop some skill like:

Citizenship skills

critical and innovative thinking, collaboration, communication, technology literacy, respect for diversity and multiculturalism, learning autonomy, initiative and entrepreneurship, openness to lifelong learning, respect and development of professional values and ethics, active and effective insertion in the community/school community and/or professional school environment, nurturing an educational environment centered on values and democratic relationships

Interdisciplinary skills

Methodological

being able to make interconnections between art and science

Being able to observe surrounding environment

Become increasingly curious about the world around them and feel empowered to change it for the better

Linguistic and communicative area

Read and interpret texts and instructions

¹ Man is a measure of all things, of those which are for what they are, and of those what are not for what they are not (Protagora, fr.1, in Platone, *Teeteto*, 152a)

Being able to explain process and development of own project

Scientific, technological, engineering, art and mathematic area

Learning how to use school knowledge in reality and in informal context

Identifying the data of the phenomena observed for the construction of a model

Applying STEAM learning to solve real-world problems through hands-on learning activities and creative design.

Using of materials and tools to experiment, explore and collect data

Man is a measure (mètron) of all things

Engage: We want to measure something and we don't have a meter (30 minutes).

Objective for students: to understand that their steps are a possible solution of problem.

What happens: Involvement of students in discussion to understand how to resolve the problem. The role of teacher is that of "facilitator" (help with some tips without to give instructions to follow, like "can we use ourselves? Can we use something that has a relationship with length? What do you think about this?")

Methodology: Students work in group

Where: Activity outdoor

Explore: the measure of Cathedral sides (30 minutes)

Objective for students: to measure Cathedral sides to calculate perimeter and its area.

What happens: After chosen the unit of measurement, one of students set a walking rhythm and begin to walk along the sides of the building counting (after the student set rhythm, everyone continues on its own). At the end every student will have record steps numbers of each side.

Methodology: individual job

Where: Activity outdoor

Explain: Units of measure and spreadsheet (120 minutes)

Objective:

- to understand the importance of having a shared and unique unit of measure and why the rhythm of steps is the right choose
- learning to use spreadsheet and to describe in right way activities

What happens:

- **Step 1:** involvement of students in discussion to understand how to resolve the problem to have an unique unit of measure and why it is important. Sharing what they did before.
- **Step 2:** involvement of students in discussion on why they used the rhythm of their steps to measure building sides and if they know other rhythms

- Step 3: to introduce the concept of homogeneous quantities
- Step 4: to introduce spreadsheet and their use
- Step 5: to introduce statistical quantities (mean, median, mode)

Methodology: Students work in group and individually

Where: Activity at school and outdoor

Explain: measure of perimeter Cathedral and correct description of activities

Objective: learning to use spreadsheet and to describe in right way activities

What happens:

- Step 1: to convert steps in meter
- Step 2: to share the same on-line spreadsheet **and to insert** data in it and to describe activity
- Step 3: calculate media and compare with real measure of sides of Cathedral

Methodology: Students work in group and individually

Where: Activity at school and at home

Extend: We want to measure height of a building and we could not use a meter.

Objective: to measure the height of one of bell towers of Cathedral

What happens:

- Step 1: Involvement of students in the choose of right tool
- Step 2: building of a quadrant
- Step 3: measuring of bell tower

Methodology: Students work individually

Where: Activity at school and outdoor

38°N 15°E... where are we?

Engage: We want to measure something using Google Earth (30 minutes)

Objective for students: helping students to improve their use of technology in informed and aware way.

What happens:

- Step 1: download Google Earth Pro app.
- Step 2: involvement students to test it and try to make some measurements of distances and heights of buildings using the ruler function (the app is very intuitive).

Methodology: Students work in group or individually

Where: Activity at school

Explore: space and measure (60 minutes)

Objective for students: to locate the building choose (in this case it is Palermo Cathedral) and measure its sides.

What happens:

- Step 1: Students use Google street view to locate the building, take a photo of the location so they have the contest in which the building is. They should take two photos, 3D photo and 2D one to look for the difference between them.
- Step 2: writing differences

Methodology: Students work in group

Where: Activity at school

Explain: how Google Earth works (60 min)

Objective: to understand difference between 2D and 3D photos and what it is possible measuring with Google Earth

What happens:

- Step 1: involvement of students in discussion what they have learned using Google Earth
- Step 2: comparison between 2D and 3D photo and explanation of difference between them. Teachers introduce first information about 2D and 3D photo, showing that the difference between them is their base unit (pixels for 2D and Polygons for 3D).

Methodology: Students work in group and individually

Where: Activity at school

Evaluate: correct description of activities (60 min)

Objective: learning to describe correctly activities

What happens:

- Step 1: creating a multimedia presentation
- Step 2: to share with classmate

Methodology: Students work in group

Where: Activity at school

Extend: We want to measure height of a building with Google Earth tool.

Objective: to measure the height of one of bell towers of Cathedral using App tool and a ruler

What happens:

- Step 1: to challenge students to measure elements of Cathedral that are at different heights, using Google earth tool and after a ruler on screen
- Step 2: involvement them in discussion in speculating why they are obtained different results
- Step 3: explain potentiality and limits of App.

Methodology: Students work individually

Era's muse



Co-funded by the
Erasmus+ Programme
of the European Union

Where: Activity at school