

# *Lefkara lace and carob sweets in mathematics classes and extracurricular activities in Cyprus*

**Age of students:** 15 to 18 years old

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The pilot project involved two different elements of living heritage that are deeply tied to Cyprus history and the identity of the communities concerned: lacework craftsmanship in Lefkara and the preparation of carob sweets in Anoyira. These elements were integrated in extracurricular activities and later in math classes, helping students to determine the ratio of the volumes of two hemispheres with respect to the ratio of their radii, the slope of a line and the angle between two intersecting lines.

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# Learning objectives

## Mathematics lesson on solid geometry:

- ▶ Understanding the similarities and differences between the solids;
- ▶ Applying empirical methods to determine the relationship between the volume and radius of a sphere.

## Online mathematics lesson on slopes and linear equations:

- ▶ Understanding slopes and calculating the angle between two lines.

# Preparation

## Description of the ICH element and the way it is practised today:

The pilot project involved two different ICH elements: lacework craftsmanship and the preparation of carob sweets. These elements are closely linked to Cyprus' long history and identity and students could thus easily relate to them through family heirlooms or practices.

Lacework from Cyprus is well known among embroidery experts. The most sophisticated designs and patterns are those made by the skilled women of Lefkara, a village south of Nicosia, in Larnaka District. Lefkara embroidery – as it is often called – features a mix of folk motifs and geometric patterns transmitted from generation to generation.

Carob has a special place in the country's economy and culture. The Cypriot people have mastered the cultivation of the trees and the transformation of its pods' flesh into a healthy and nutritious sweetener, which is broadly used as syrup or powder.

## Linkages between the ICH element and the school subject:

Both the lace and the carob products were used as familiar applications of mathematical concepts. The embroidery patterns are perfectly suited to study geometry and symmetry, while truffles are spherical sweets made with carob products that can be moulded into any shape, allowing for demonstrations of geometric solids.

## Involvement of learners in the preparation of the activity:

The pilot student presented the project to his classmates and gathered a group of volunteers. Two groups of learners travelled to the village of Lefkara to learn more about embroidery, or to Anogyra to observe the preparation of a recipe for home-made carob truffles. They interviewed an elected member of the municipality and artisans, including a young female embroiderer, and became more aware of the social and economic impact of these century-old practices, as well as their meaning for the bearers. Students produced videos as an extra-curricular activity in which they managed every step, from equipment preparation to script development, filming and editing. They documented bearers' skills and produced audio-visual materials that included photographs and videos for later use during lessons in the classroom.

## Involvement of bearers and local community in the preparation and/or implementation of the activity:

School teachers were already in contact with active and enthusiastic members of the selected communities. In the village of Lefkara, the local artisans hold excellence in lace-making craftsmanship to be a key part of their identity. As such, they were proud to demonstrate their skills and transmit their knowledge and passion for their products to the students. In Anogyra, famous for its carob products, an experienced woman agreed to pass on her own recipe to turn the traditional syrup and powder into delicious truffles.

# Description of the activity

Small groups of students participated in field trips in which they filmed and produced videos on ICH practices to share with their classmates. These field trips provided pupils with a unique awareness-raising experience, although it should be noted that a significant investment of time and logistical preparation was required. Moreover, the trips had to be rescheduled because of weather conditions. Although embroidered fabrics inherited from earlier generations are common in many households, young people may not be interested in finding out more about the knowledge and tradition behind them. By witnessing the dedication, pride and dexterity of the artisans, **students gained an appreciation for the meaning and value of these products.** Reflecting about the field trip, a participating student concluded *'It is important to know as much as possible about our culture and keep it alive'*.

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In Anogyra, students learnt to prepare carob truffles in a very hands-on manner. They filled two half spheres of different sizes with the paste and weighed them. They managed to demonstrate empirically the mathematical relationship between the volume of the truffle and the cube of the sphere's radius ( $V=4/3 \pi r^3$ ). A group of students produced a video, which they showed to their classmates and explained their empirical findings using mathematical calculations, leading to an exciting peer-to-peer learning experience. Although the

documentation was a one-off activity, the video will remain a useful resource for future lessons.

For the lesson on slopes and angles, the pilot teacher uploaded one of the embroidery photos taken in Lefkara into a free program called GeoGebra, which can be accessed on computers and mobile phones. Students were tasked with finding the linear equation, determining the slopes and calculating the angles between two intersecting lines to verify whether the embroidery pattern was a real square or not. They could then use the software to verify their answers. They could further discuss why the angle was slightly different than the expected 90-degree angle, the elasticity of the fabric being one hypothesis. **This exercise on lines and angles could have been conducted with any drawn shape, but using the famous embroidery spoke to students' pride and sense of belonging as most of them have similar embroidery in their household.** They realized that women have been passing down mathematical principles from mother to daughter, which has brought fame and trading opportunities. Showing the video added a short break to the class as well as a human dimension, especially for the students who had not participated in the field visit. In the words of the teacher, *'Watching a relevant video is a pleasant short break during the class. It is much appreciated by the students, as math is a tough subject.'*

## Learning outcomes

*'Math needs to be enriched with information from the world we live in. This helps students understand how useful it is as a subject.'* Mathematics can be a daunting subject in which students easily panic and get lost. Applied math can help overcome these difficulties by revealing practical applications of theory. **Living heritage offers numerous opportunities to illustrate these complex concepts in a meaningful manner.**

The pilot project took place at a busy time of the year, which created specific challenges for the participating teachers. Developing lessons and activities with living heritage obviously requires some research and preparation time, but is manageable with adequate planning. 'It is not hard to incorporate living heritage in your lessons, as long as you create the relevant material in a way that serves both purposes. *It only takes a few extra*

*minutes preparation to import the Lefkara embroidery photos in GeoGebra.'*

**In many ways, IT is a useful entry point to raise teenagers' interest in local practices. Combining the discovery of a local craft with audio-visual production or the use of mathematical software is one way to draw the interest of the younger generations.**



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