



HELLENIC REPUBLIC

Ministry of Education and Religious Affairs

**REGIONAL DIRECTORATE FOR PRIMARY
AND SECONDARY EDUCATION OF ATTICA**



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Υπουργείο Παιδείας & Θρησκευμάτων

ΠΕΡΙΦΕΡΕΙΑΚΗ ΔΙΕΥΘΥΝΣΗ
ΠΡΩΤΟΒΑΘΜΙΑΣ & ΔΕΥΤΕΡΟΒΑΘΜΙΑΣ ΕΚΠΑΙΔΕΥΣΗΣ ΑΤΤΙΚΗΣ



QuaMMELOT INTERNATIONAL CONFERENCE

Erasmus Plus Program – KA2 Strategic Partnership for Education

FINAL EVENT of QuaMMELOT Project for Qualification Minor Migrant E-learning Teacher Training

INCLUSIVE EDUCATION

Educational and learning pathways to support European teachers for the inclusion of students in multicultural secondary school classes

Organized by

University of Florence, 18th September 2020

09:00 – 16:00, Palazzo Vecchio, Salone dei Cinquecento – Piazza della Signoria, Florence

QuaMMELOT



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UNIVERSITÀ
DEGLI STUDI
FIRENZE
SCIFOPSI
DIPARTIMENTO DI
SCIENZE DELLA FORMAZIONE
E PSICOLOGIA



VIFIN



QuaMMELOT (2017-2020): Qualifications for Minor Migrants' Education and Learning Open access – Online Teacher-training 2017-1-IT02-KA201-036610 - Erasmus + 2014-2020

QuaMMELOT INTERNATIONAL CONFERENCE

Strategies for teaching Mathematics for refugee/migrant students

Dr Georgios Kosyvas, Regional Director for Primary and Secondary Education of Attica, Project Manager and Coordinator of the Pedagogical Team of the QuaMMELOT Program in Greece

Why Mathematics in the QuaMMELOT project?

- Mathematics is a difficult subject in lower and upper secondary schools. **It is too abstract, its teaching is little connected with everyday life and students' prior knowledge.** In particular, in math classes with young people from refugee and migrant backgrounds, **the language and the culture of the host country often hinder or complicate the learning process.**
- The Erasmus+ QuaMMELOT project tries to meet these needs. It aims to respond to the need of teaching Mathematics and smoothly integrating **recently arrived refugee and unaccompanied minors in secondary education classes** and into the learning process through successful inclusion practices.



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Questions of my presentation

My attempt focuses on the following questions:

- *How teachers of Secondary Education designed Mathematics lessons for refugee/migrant students, asylum seekers and unaccompanied adolescences?*
- *What methodologies and strategies did they implement, what kind of practices and which materials did they use, while they were confronted with linguistic and cultural heterogeneity?*
- *What are the educational remarks from the didactical applications for the teaching and learning of Mathematics to vulnerable students?*



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How can we teach Mathematics to refugee secondary students?

- Four countries participated in the Erasmus+ QuaMMELOT project: **Denmark, Greece, Italy, Spain.**
- Every partner country applies different schooling models in teaching adolescents from refugee families. Three basic models can be recognized: **integrative model** with students' enrollment into mainstream secondary classes, **parallel model** with separate classes to prepare students' admission into mainstream classes **and semi-integrative model.**
- Under the Erasmus+ QuaMMELOT project, teachers who teach math in mixed multicultural and multilingual classes attended a distance training program and **they reflected on their practices.**



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Distance training course of the QuaMMELoT project

- The training course, consisted of 10 modules, was addressed to in-service secondary teachers from four national partners of the project. Mathematics was the 6th module. The course supported the **professional development** of teaching staff and **particularly of Math teachers**.
- It was a distance training pilot program of 240 hours, which was implemented **through asynchronous activities**. The online training of teachers and the implementation of the program in the schools lessons has been conducted **from September 2019 to February 2020**. The sample of the study consists of teachers from the four partner states' schools at lower and upper secondary education.
- After the experimental implementation of the pilot program, the Digital Platform will remain open to all Secondary Education European teachers.



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Math approaches uploaded in the QuaMMELOT platform

- Indicative scenarios, strategies and methodological instructions for the teaching of Mathematics, **were elaborated by the accountable math teachers** of the Hellenic **Pedagogical Team** and uploaded on the digital platform of the online training course. The Pedagogical Team have undertaken the general guidance, support of the trainees' tasks, **giving feedback** and monitoring their progress.
- Math teachers-trainees from 4 European countries studied the training material and the proposed activities, **they designed experimental math lessons and implemented them in their classrooms.**
- Their work descriptions are uploaded on the QuaMMELOT project digital platform. Some elements of them are given below.



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Exploring Math didactical practices in refugee/migrant students

- Overall, the aim of my study is to examine how teachers design mathematics lessons and whether their experimental implementations practices in Mathematics classrooms fit the needs of the students they teach, developing supportive learning environments.
- I am going to present some didactical applications from different European Mathematics classrooms. Sharing ideas and best practice examples in order to improve the schooling of refugees in the European Union and worldwide is of great importance for the international community.



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Mathematics and culture

- Many math teachers are under the impression that mathematics is a non-cultural subject. **It is clear however that mathematics is not a culture-free discipline.**
- Migrant and refugee students in the same class have various lived experiences, cultural backgrounds and learning styles. This will motivate and enable them to engage in activities that encourage them to understand the cultural traditions of others.
- The multicultural dimension of school mathematics will require increased attention to student's ways **of thinking and reasoning in different settings.**



The educational biography path

- The **educational biography path** of refugee and unaccompanied children is very useful for their inclusion in the European school communities. **My school Autobiography:** *“Me at school, before and now. I tell my school path”*.
- There are children who feel anxious and insecure, have traumatic experiences **and refuse to go to school.**
- Schooling of the refugee minors is a **transition process** experienced by them in multilingual and multicultural school classrooms.
- Diversity in inclusive schools is a **source of learning** and not a problem.



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Previous cognitive background in Math

- New refugee students will have to cope with many changes **associated with moving from one school culture into another** (perhaps from an “unschooled” culture into a school culture).
- Transition is a learning process which teaches students to give **multiple meanings to mathematical knowledge**.
- **Prior personal experiences and math knowledge** in different educational classroom contexts even mathematical practices outside school are a prerequisite for teachers in order to plan effective learning approaches and to develop inclusive practices.

Urdu	• ۱ ۲ ۳ ۴ ۵ ۶ ۷ ۸ ۹
Persian	• ۱ ۲ ۳ ۴ ۵ ۶ ۷ ۸ ۹
Arabic	• ۱ ۲ ۳ ۴ ۵ ۶ ۷ ۸ ۹



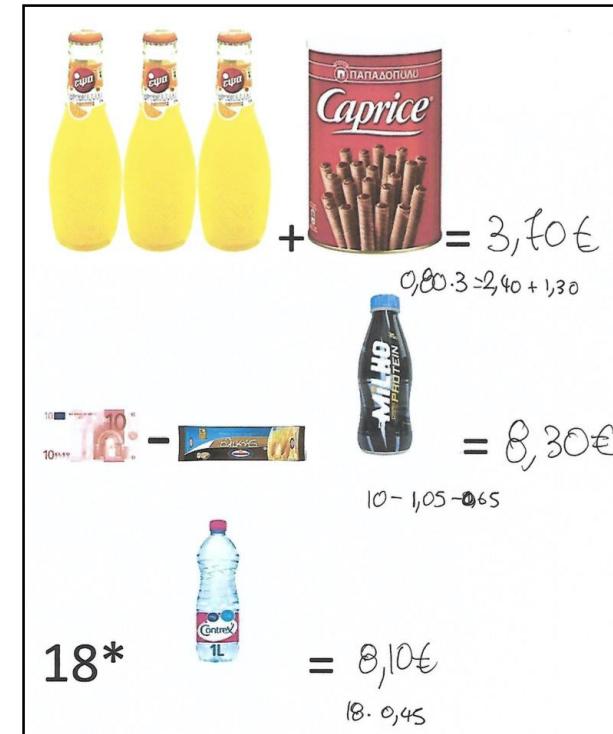
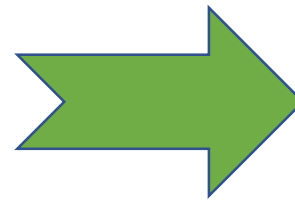
Teaching of Mathematics to refugee students

Teachers are expected :

- to adapt Mathematics teaching to support inclusive education and **respond to the strengths and needs of refugee students.**
- to know when and how to **use teaching differentiated approaches on** numeracy practices and to use everyday mathematics providing adequate materials and resources which enable pupils to have a great progress.
- to help students **overcome mathematical misconceptions** and have a secure understanding to achieve their full potential.



Real life applications and personalization



Students were working on different worksheets with diverse topics on learning to shop from a supermarket by using simple everyday math. After each lesson, **the teacher collected the sheets, corrected them and handed them back during the next lesson.** Providing **personalized lessons** we can meet student verbal, visual or kinesthetic style (Athens).



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Cooperative Learning in Mathematics

- Cooperative Learning is an instructional arrangement that **fosters active student learning of Mathematics** and collaborative skills to small, heterogeneous groups. Refugee students can be given tasks to discuss, practice and solve problems.
- This educational strategy gives students the opportunity **to build knowledge through interaction**, promote oral language and develop social skills, sharing past experiences, as they are asked to build a mathematical vocabulary in their mother tongue and overcome difficulties.



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Peer-tutoring in Mathematics

- Peer tutoring is the teaching process between two or more students where one of them acts as a tutor for their classmates. **Peer tutoring interactions** provided **migrant and refugee students with** opportunities to practice math skills, reason and solve problems.
- Through tutoring, children tutors helped their classmates by using their **own explanation about mathematical concepts and procedures in their mother tongue** and giving everyday examples that make learning easier.



Multimodal Approaches in Mathematics

- **Mathematical ideas are abstract mental constructs.** Teachers, as trainees of the QuaMMELoT project, planned and carried out a variety of activities to encourage their migrant and refugee students to understand Mathematics in a foreign language.
- To help students improve their achievement level, these abstract ideas had to be represented in a concrete way using **multiple representations**, taking the place of the abstract, mental concepts, and embodying the main properties of the concepts.



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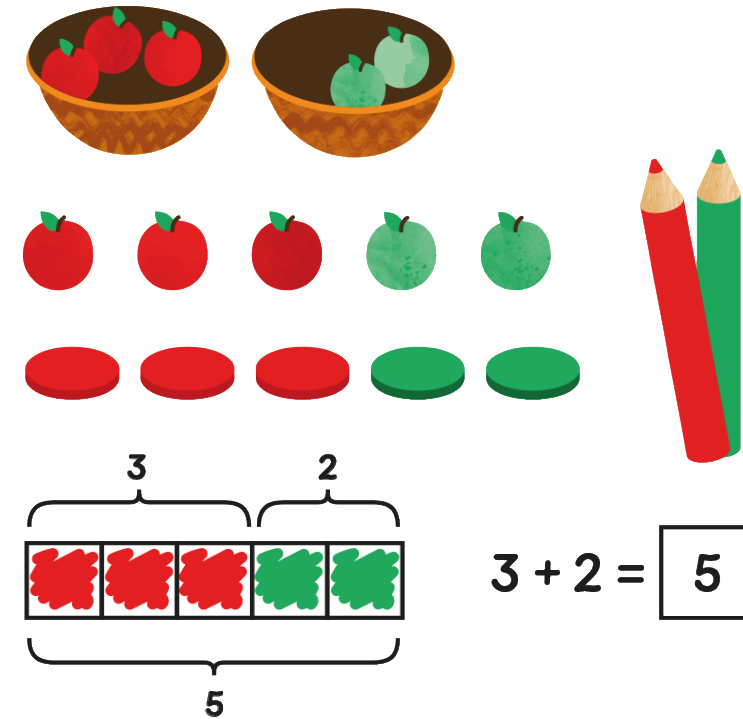


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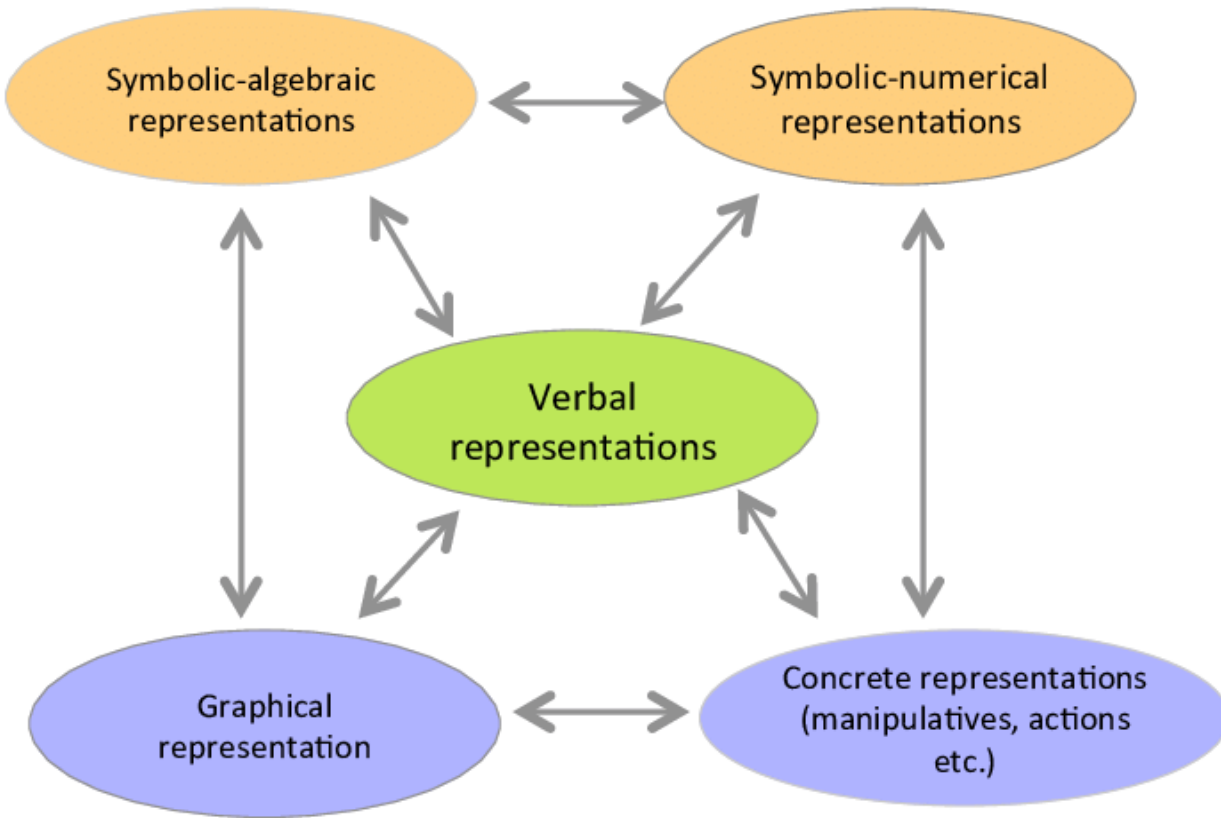


Multimodal Approaches in Mathematics

- **Some multiple representations** are the following: graphs, diagrams and figures, tables and grids, words, gestures, software code, physical and virtual manipulatives, sounds, symbols and mathematical formulas.
- Teachers designed enriched activities and **used different modes of instruction**. They showed pictures and videos, they conducted games and group activities and provided hands-on tools that can reinforce learning mathematics encouraging students to build models, paint pictures or act out scenes that explain ideas.



Using multiple representations in Mathematics



Transitions between different representations
(Prediger, Clarkson, & Bose, 2016).

- In Mathematics there are **five commonly used modes of representation**, namely numbers, words, symbols, diagrams and real things.
- The use of multimodal approaches is an attempt to translate these modes of representation into a systematic and practical technique for teaching Mathematics. This technique **will stress connections among different modes of representation**, thus deepening understanding.



An example of multimodal approach in Mathematics

Consider $48 \div 12$. The five modes are illustrated by the results of the following actions:

Verbal representations: read this aloud (*word*) and create a story or a word problem that can be solved using the division operation (*story*).

Numerical representations: Compute its value with or without using calculator (*number*).

Graphical representations: Draw a design to illustrate the operation (*diagram*).

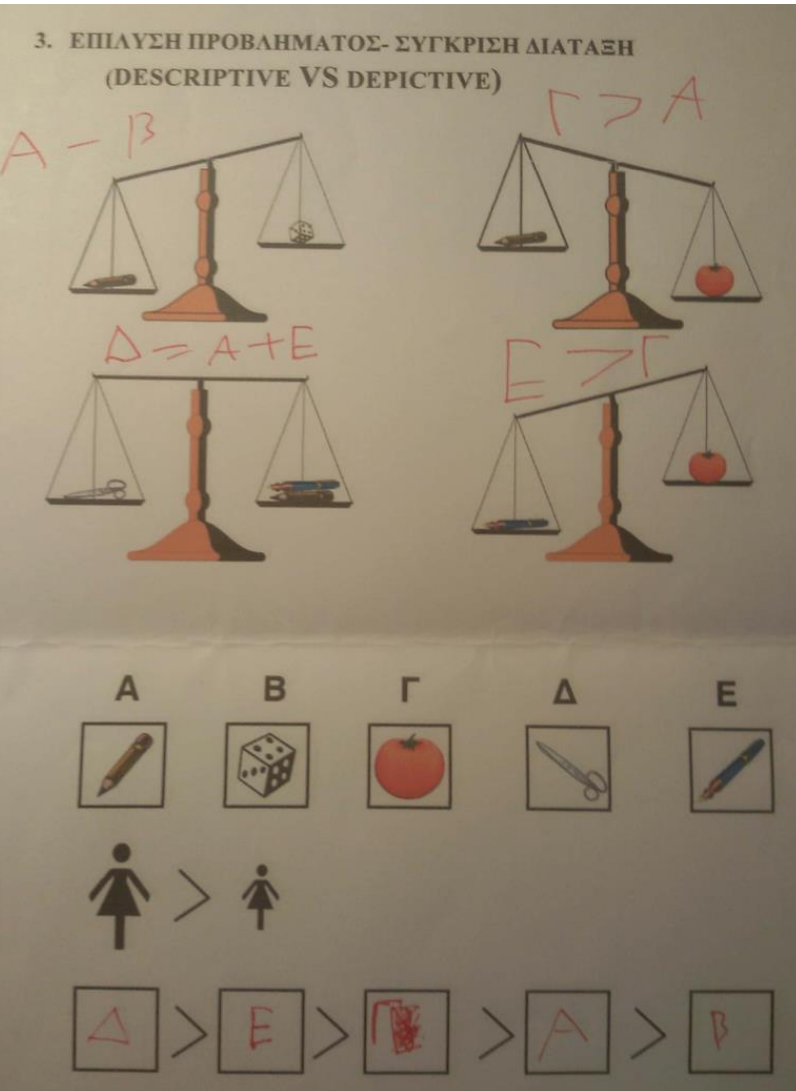
Concrete representations: Demonstrate the operation using real objects (*things, actions*).

Symbolic-algebraic representations: Extend this operation to algebra (*symbol*).

These five modes assess the quality of mathematical understanding. The inability of refugee students to **fluently link the different representations together** is a sign of weak understanding.



Inequalities by using scales



In the first scale, the pencil is heavier than the dice. In the second scale the tomato is heavier than the pencil, in the third scale the pencil and the pen are equal to the scissors and in the last scale the pen is heavier than the tomato. Firstly, they had to depict the inequality for each scale. That is:

$$A > B \quad \Gamma > A \quad A + E = \Delta. \quad E > \Gamma$$

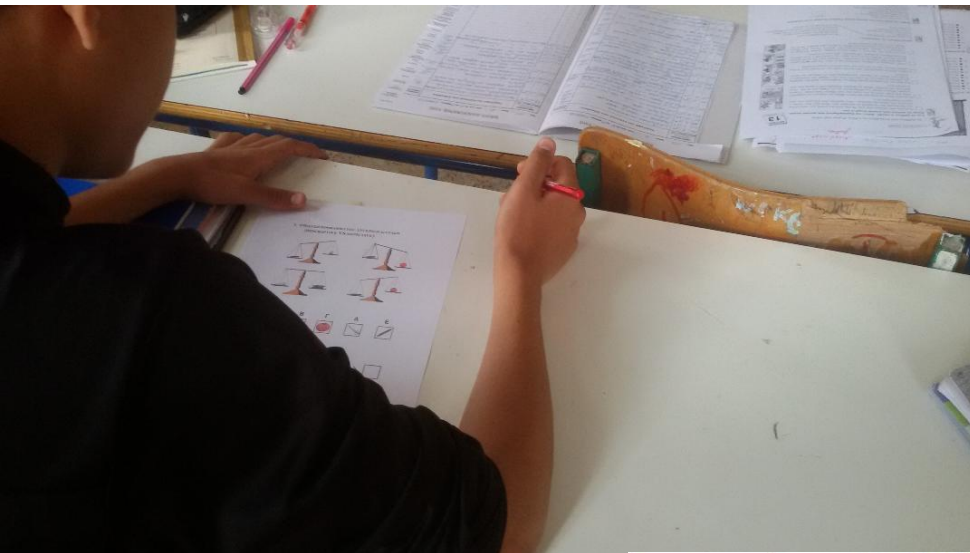
Afterwards they had to put the inequalities in order starting from the heavier one: $\Delta > E > \Gamma > A > B$

(Teacher report).

Inequalities by using scales



All students succeeded in the task. They felt self confident, they got involved and that was the first step of our aim to make them love Math and not consider it just a difficult subject they will never succeed in (Teacher report).



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Representations of the Roman Numerals

Coloca cada pieza del puzzle en su lugar correcto, en su equivalencia con los números romanos.



23	1456	1232	2347
901	1561	129	789
356	156	651	681
2311	3000	3156	145
512	431	341	411

NUMEROS ROMANOS

DCLXXXI	MMCCCXI	CCCXLI	CLVI
DXII	CDXI	CCCLVI	MMCCCXLVII
MMMCLVI	MDLXI	DCLI	XXIII
CMI	CDXXXI	MCCXXXII	MMM
CXLV	MCDLVI	DCCLXXXIX	CXXIX

Tree lessons (Secondary school in Spain)



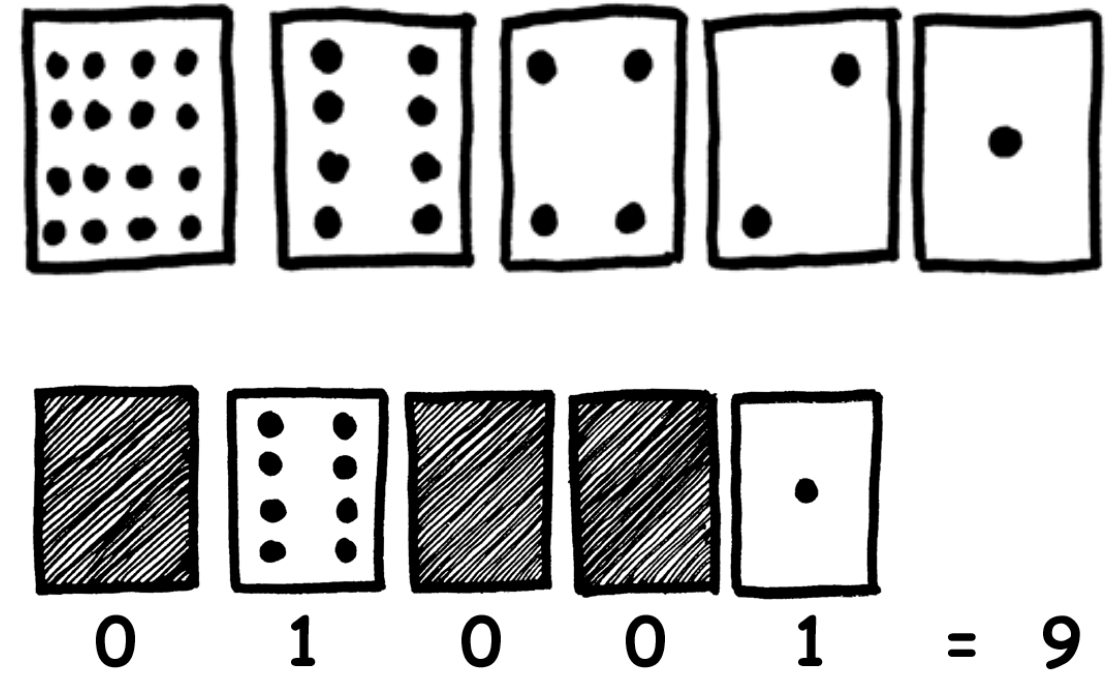
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Representations of the binary system



Two lessons on binary arithmetic system (Intercultural high school of Athens).



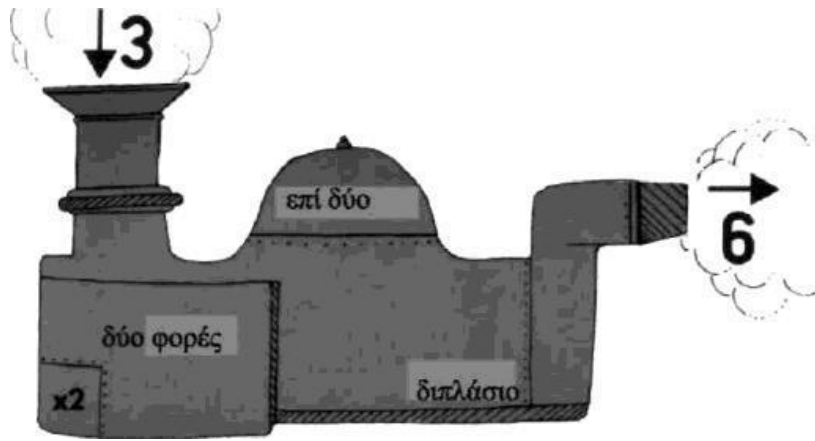
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Functions and multiple representations



You have an imaginary machine in front of which we can enter values of one variable and output other values according to a rule. For example, the image engine doubles every number we enter.

Q1: What will we get when we enter 4?

Q.2: If the result is 20, what number entered the machine?

Q.3: Fill in the table to show how the machine changes some numbers (Teacher planning-Junior High School, Athens).

x	3	4	8			15	20
y	6			10	24		



Flexible transitions between multiple representations in Mathematics

- **Connections and transitions** among different mathematical representations is an important activity for developing students' conceptual understanding.
- In mathematics communications between classroom participants are used three language registers: **the everyday register, school register and technical register.**
- The boundaries between them are not hard and rigid, but permeable and at times quite fluid.
- Transitions between registers can be within the same language or **between languages of multilingual students.**



Exploring the square root concept

Χρημα Βγ

ΔΙΑΤΑΞΗ	ΕΠΙΦΑΝΕΙΑ	ΤΕΤΡΑΓΩΝΟ	ΤΕΤΡΑΓΩΝΙΚΟ ΡΙΖΑ
1x1		$1^2 = 1$	$\sqrt{1} = 1$
2x2		$2^2 = 4$	$\sqrt{4} = 2$
3x3		$3^2 = 9$	$\sqrt{9} = 3$
4x4		$4^2 = 16$	$\sqrt{16} = 4$
5x5		$5^2 = 25$	$\sqrt{25} = 5$
6x6		$6^2 = 36$	$\sqrt{36} = 6$
7x7		$7^2 = 49$	$\sqrt{49} = 7$
8x8		$8^2 = 64$	$\sqrt{64} = 8$
9x9		$9^2 = 81$	$\sqrt{81} = 9$
10x10		$10^2 = 100$	$\sqrt{100} = 10$



Junior High School, Athens

Χρημα Βγ

ΔΙΑΤΑΞΗ	ΕΠΙΦΑΝΕΙΑ	ΤΕΤΡΑΓΩΝΟ	ΤΕΤΡΑΓΩΝΙΚΟ ΡΙΖΑ
1x1		$1^2 = 1$	$\sqrt{1} = 1$
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Culture of interdisciplinary cooperation in schools

- QuaMMELOT project contributing to the development of inclusive practices and obliging teachers to carry out 8 tasks offered them opportunities to collaborate to teach other subjects and **plan interdisciplinary approaches**.
- **Interdisciplinarity** means involving or blending two or more academic, scientific or artistic disciplines.
- Teachers teams are encouraged to be "teaching and learning designers», who seek to establish an **active learning environment** where all students are empowered to learn.
- Teachers **collaborate with their colleagues from different disciplines** to enhance students' understanding and improve their performance by teaching shared topics and exposing students to multiple perspectives: Mathematics, Language, Arts, Physics etc.



An example: electoral system and class council

Ποσοστά εκλογών πενταμελούς

Δικαιώμα ψηφίου 25 ψηφισαν! 18

Ποσοστά συμμετοχής

$$\frac{18}{25} \cdot 100 = 72\%$$

ΑΠΤΑΡ = $\frac{12}{18} \cdot 100 = 66,7\%$

ΣΑΚΑΡ = $\frac{4}{18} \cdot 100 = 61,1\%$

ΙΟΥΛΙΑ = $\frac{10}{18} \cdot 100 = 55\%$

ΒΛΑΝΤ = $\frac{9}{18} \cdot 100 = 50\%$

ΜΑΧΝΤΙ = $\frac{8}{18} \cdot 100 = 44,4$

*They organized whole class discussions about electoral systems and representative democracy. Students are requested to **calculate the percentages of the class council.** (excerpt from teacher's report - 2nd Intercultural Junior High School of Ellinikon, Greece).*



Worksheet with a real word problem: average calculation

ΦΥΛΛΟ ΕΡΓΑΣΙΑΣ

Εύρεση και ρόλος του Μέσου Όρου και Τέρας
 Νικόλ Κασέφ

1) Μέτρηση κυκλικής περιφέρειας αλουμινένιου κουτιού. Τυλίξτε ένα πλαστό ακριβώς 10 φορές γύρω από ένα αλουμινένιο κουτί. Καταγράψτε την τιμή σε εκατοστά:

Όνομα	Τιμή
Σάμι - Αλί	215
Νικόλ - Μαρίαν - Ανί	198
Σάμπα - Άννα - Βασίλ	194
Λίλι - Μαρίαν	216
Ηλίας - Λορέντσο	214
Μέρι - Ρόζα - Λυαράν	210
	110
Σύνολο	

2) Αυτή που είναι περίπου στη μέση, αυτή που είναι "ανάμεσα"

3) Ο μέσος όρος είναι η πιο ακριβής εκτίμηση του "ανάμεσα". Τα λάθη στη μέτρηση είναι τυχαία πιο πάνω ή πιο κάτω με το μέσο όρο το πάνω με το κάτω ακυρώνονται

1037,5

2) Ποιά τιμή είναι η καλύτερη; Γιατί;

3) Βρες το άθροισμα των τιμών και διαιρέσε με το πλήθος τους. Αυτό που θα βρεις είναι ο Άθροισμα: $\frac{1037}{10}$ μέσος όρος.

$$\begin{array}{r} \text{Μέσος όρος } 1037 \overline{) 5} \\ \underline{-10} \\ 37 \\ \underline{-35} \\ 2 \end{array}$$

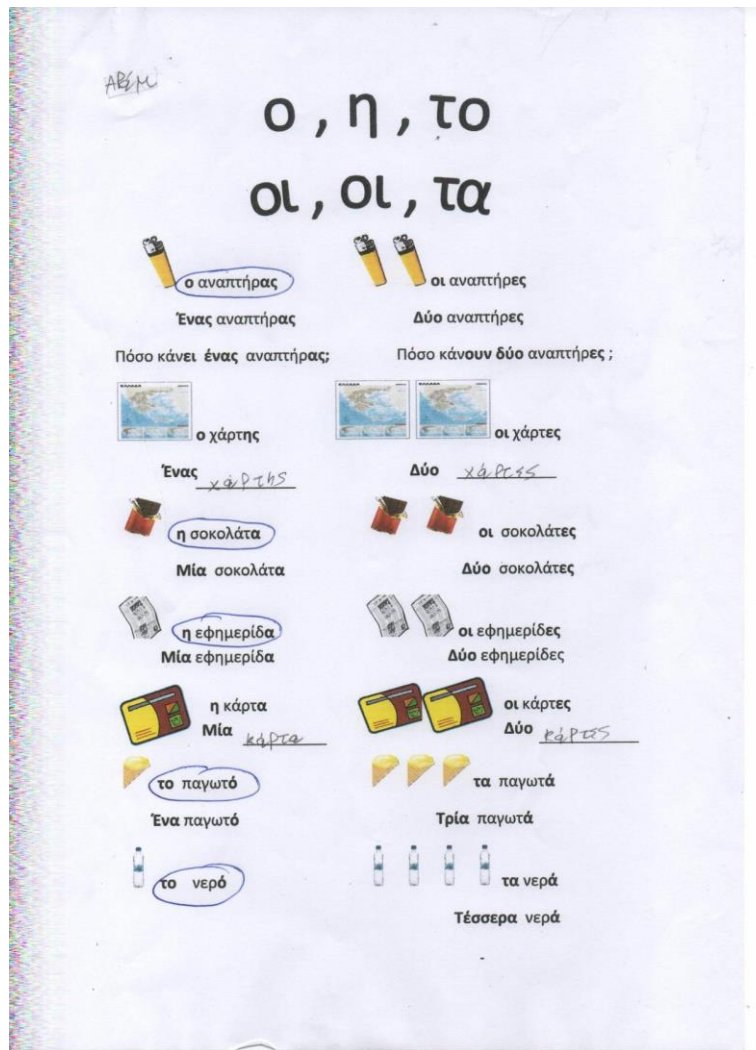
4) Γιατί ο μέσος όρος είναι η "καλύτερη τιμή";

5) Διαιρέσε με το 10 για να βρεις την καλύτερη τιμή και τέρας περιφέρειας του κουτιού.
 $207,5 : 10 = 20,75$ εκατοστά

Interdisciplinary approach in Mathematics gives immigrant and refugee students not only great power to solve real world problems, but also helps them to understand how the universe operates, facilitating their **effective inclusion in school community** (2nd Intercultural Junior High School of Ellinikon, Greece).



Content and Language Integrated Learning (CLIL)




- CLIL method refers to teaching subjects such as Mathematics, **through the medium of a foreign language.**
- Teachers **design activities with respecting migrant and refugee student's mother tongue and culture,** using simple words and activating their prior learning experience.
- They help them express their ideas and compare the host country language mathematical **terminology with their mother tongue.**







Content and Language Integrated Learning (CLIL)



Sadika



Η σειρά σου

i. 
 Πόσο κάνει μία σοκολάτα


ii. 
 Πόσο κάνει ένα νερό









iii. 3  , 2  και 
 Πόσο κάνουν Τρία παγωτά, δύο αναπτήρες και μια εθνική



iv. 2  και 
 Πόσο κάνουν Δύο χαρτες ένας αναπτήρας



v. 5  και 
 Πόσο κάνουν πεντε πορτοκαλάκια και 5 κάρτα



Το περίπτερο στη γωνία
"The kiosk at the corner"






	1€		1,5€
	4€		3€
	0,5€		2€
	5€		0,8€



i.  +  = 1,5€


ii. 3  + 2  = 5,5€

iii.  + 3  = 14€

iv.  =  + 1,4€

v. 5 2€ = 

vi.  -  = 2€

vii.  = 20 λεπτά

- In this case, CLIL methodology promotes a **close collaboration of Greek and Mathematics teachers** helping students develop mathematical vocabulary.
- This method **increases students' motivation** to learn foreign languages and improves intercultural competence by fostering inclusion.

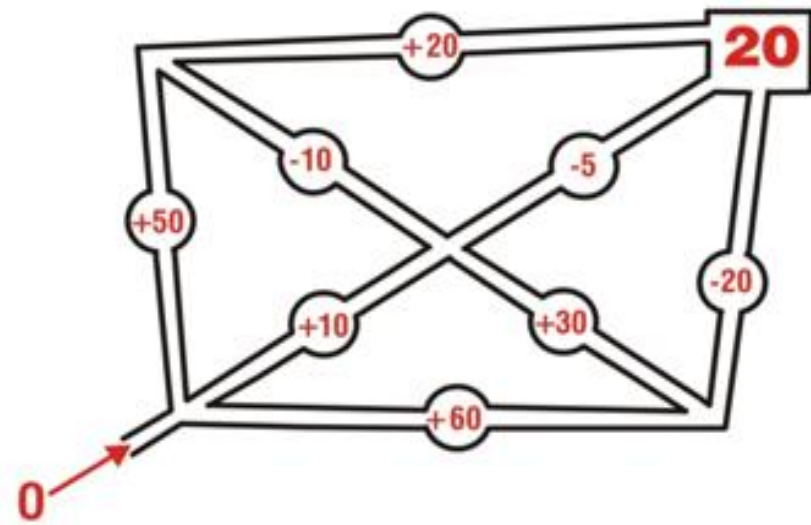


Open-ended problems (problem-setting technique)

- Open-ended problem is a problem that **has many correct answers and several ways to the correct answers.**
- Refugee students can deal with challenging problems that offer them opportunities for sharing ideas, **exploring different methods or multiple solution strategies**, justifying arguments and collaborating.
- There are rich experiences for students to have the **pleasure of discovery** and to receive the approval from their classmates.



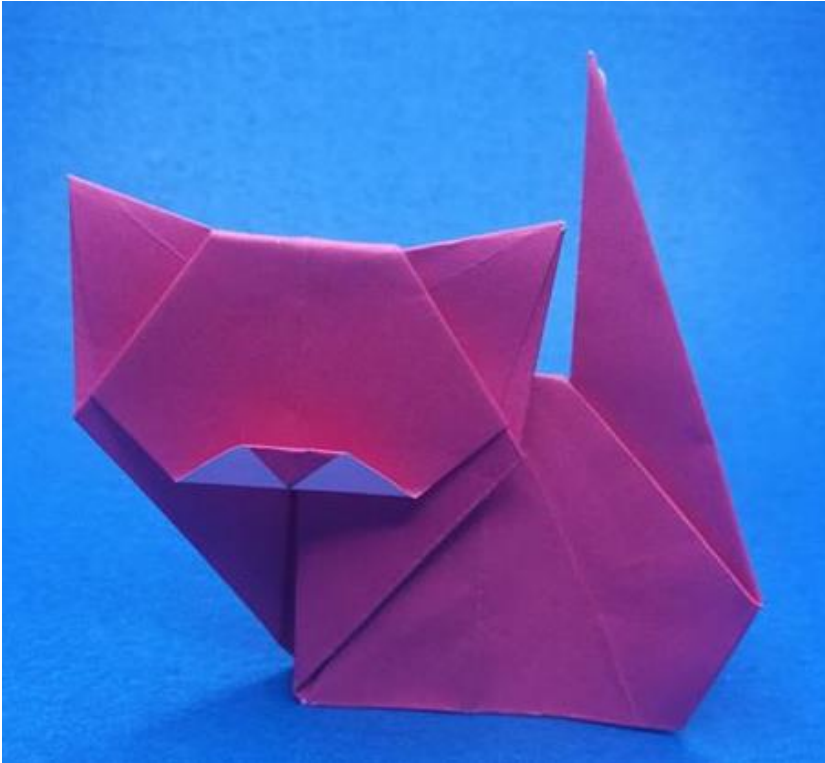
An example of open problem



- There is a kind of labyrinth. This calculation game starts with zero (0) and at the exit, there is a positive number (20).
- Following the labyrinth, where there are “pathways», and “stations” of numbers, students must try to **find the correct itineraries to arrive at the exit of the labyrinth.**
- In the class there **was established a creative climate** by doing the necessary additions or subtractions to find the two solutions.



Hands-on activities (making origami)



Visual approaches were implemented as tasks consisted of **problems without words** to engage students with doing Mathematics without the burden of language (Italy).



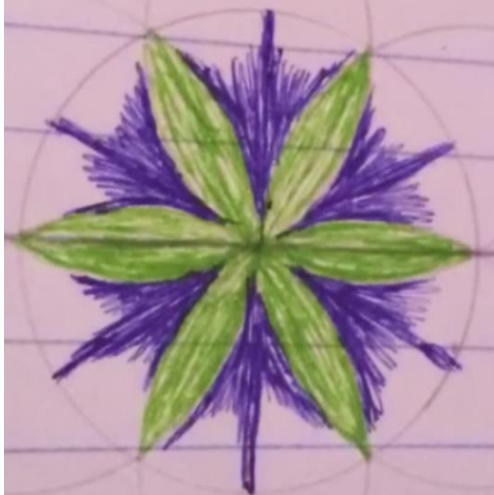
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Practical activities and Handicrafts



Students are suggested to construct geometric shapes by using cardboard or other materials. The activities of geometric constructions and painting mobilized students to express themselves in a creative way and helped them to **familiarize with mathematics vocabulary in a pleasant way** (square, circle, line, etc.). They were realized in the Intercultural Lyceum of Helleniko, Athens.



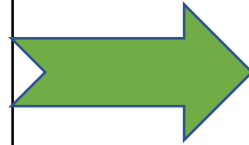
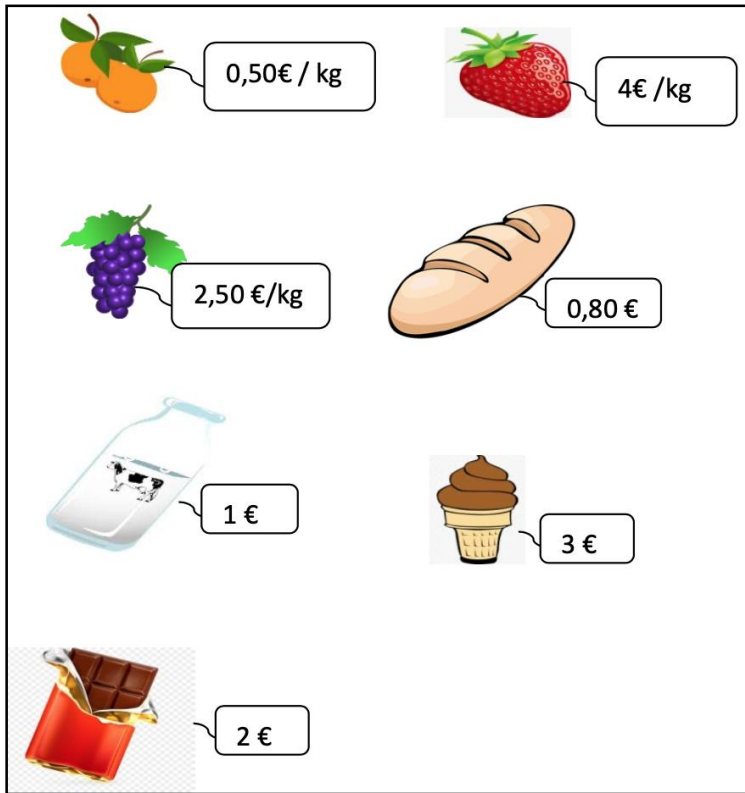
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Wordless problems : "A Walk To The Supermarket"



a) 2 + =

b) 3 + 3 - 3 =

c) = + _____

d) 5 + _____ =

e) 5 · _____ =

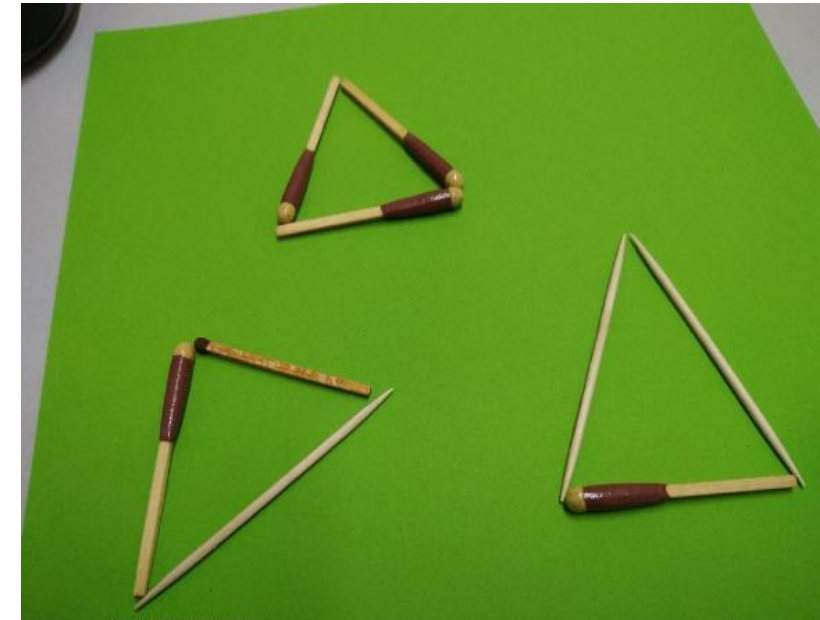
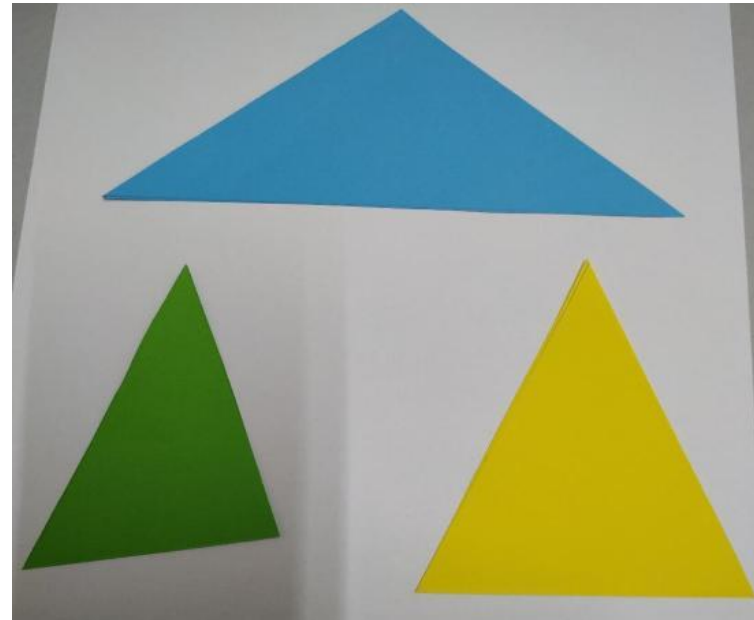
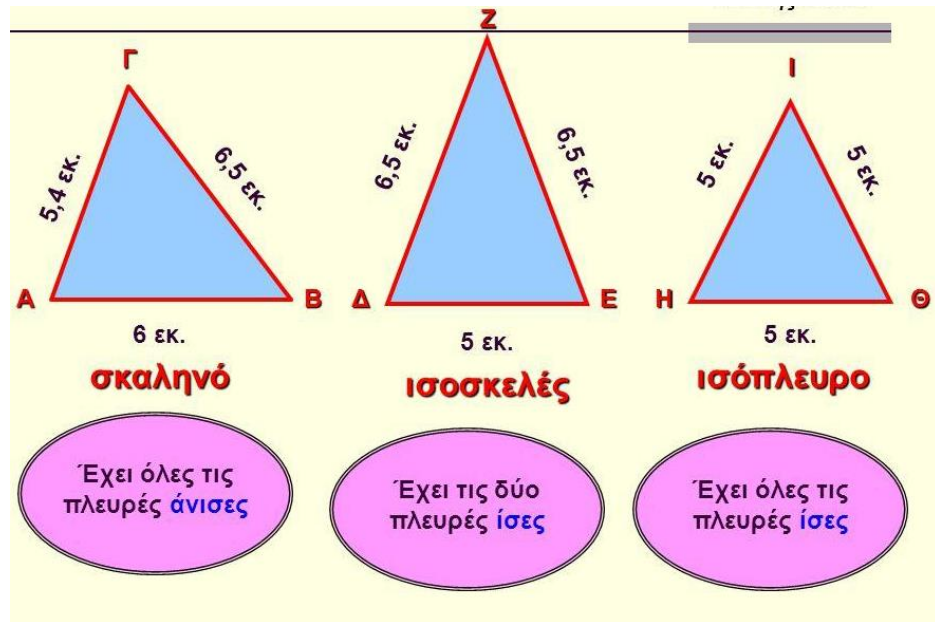
f) 500gr =

g) =

- "A Walk To The Supermarket" is planned for the assessment of all the newly arrived - including immigrant and refugee - students at the 1st grade of secondary education.
- **Without the use of any word** only images we ask the student to perform simple calculations and overcome possible language barriers. **Usually oral teacher explanations are necessary.**



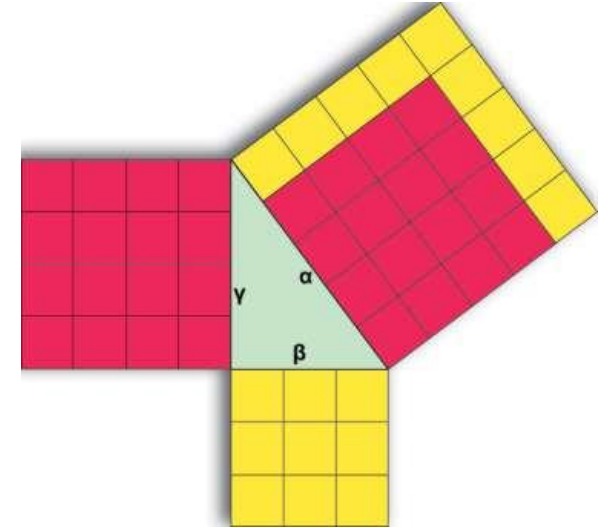
Geometric constructions



- Students use **toothpicks and then cardboard**.
- They **measure sides with the ruler to classify triangles**.



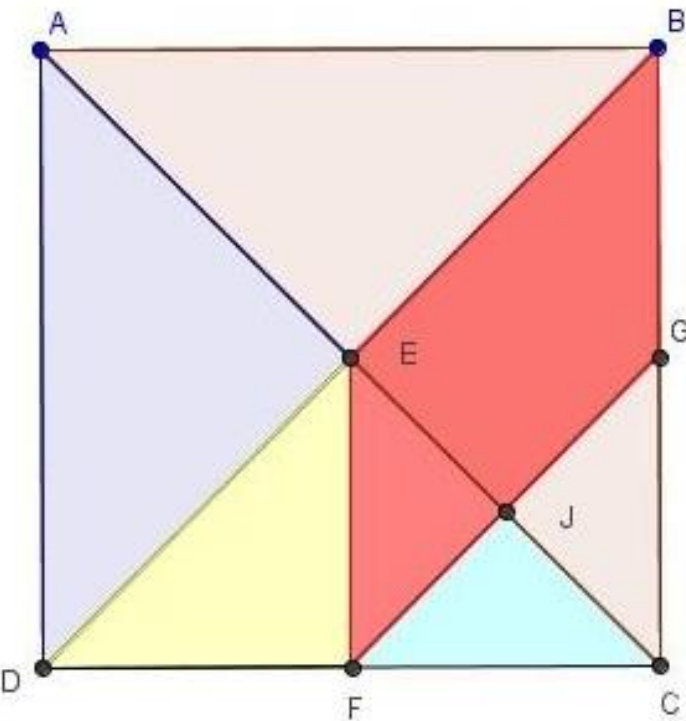
Pythagorean Theorem: visual proofs and applications



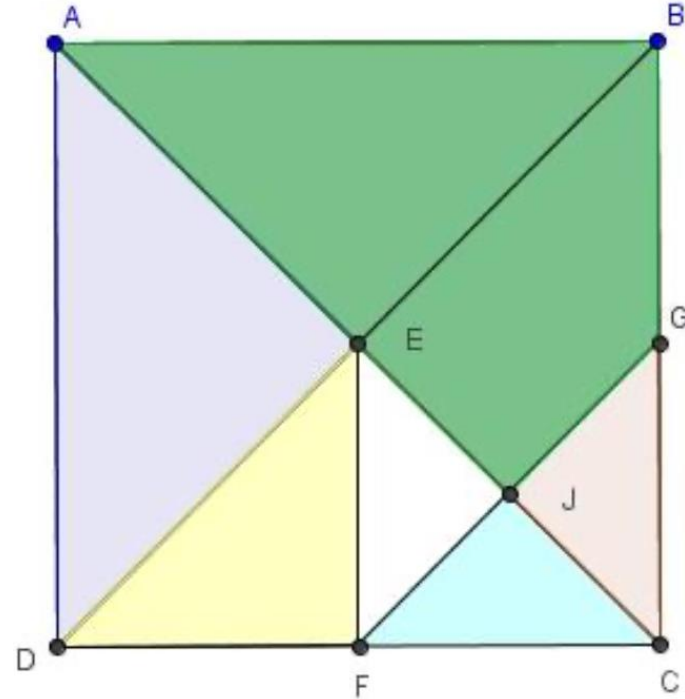
- Teachers encourage students to discover the Pythagorean Theorem and **find proofs without words.**
- Students will be able to explore and formulate the Pythagorean Theorem and its inverse **and use them to calculate lengths.**
- They should understand that a triangle with sides 3cm, 4cm and 5cm **is right.**



Areas: problems without using formulas



$$\begin{aligned} (ABC) &= \frac{1}{2} & (BGFE) &= - \\ (ADE) &= \frac{1}{4} & & \\ (DEF) &= \frac{1}{8} & & \\ (ABD) &= - & & \\ (BCE) &= - & & \\ (CEF) &= - & & \\ (CJF) &= - & & \end{aligned}$$



$$\begin{aligned} (ABC) &= \frac{1}{2} & (BGFE) &= - \\ (ADE) &= \frac{1}{4} & (AEFD) &= - \\ (DEF) &= \frac{1}{8} & (ABGJ) &= - \\ (ABD) &= - & & \\ (BCE) &= - & & \\ (CEF) &= - & & \\ (CJF) &= - & & \end{aligned}$$

This is a method for calculating areas of plane shapes, without using the area formulas.



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Practical activities and Handicrafts (learn by playing)



Practical activities and Handicrafts had a positive impact on students' interest in learning. Students composed geometric shapes or built constructions, using instructional materials (wooden models). The aim of this activity was to develop a **better mathematical intuition.**



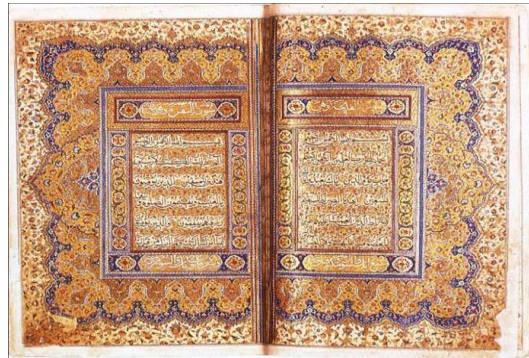
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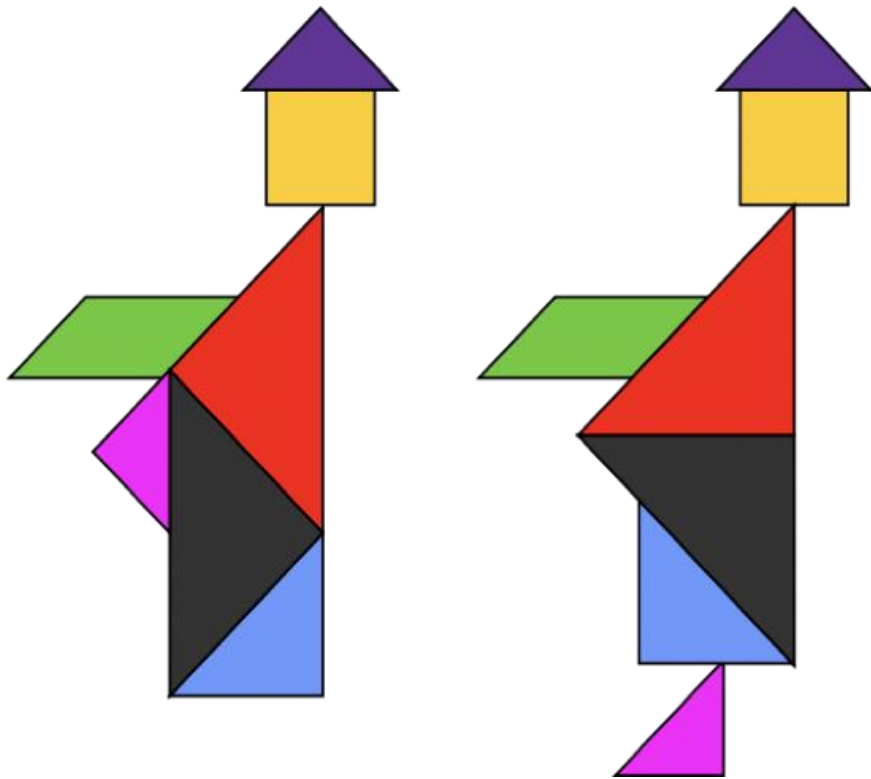
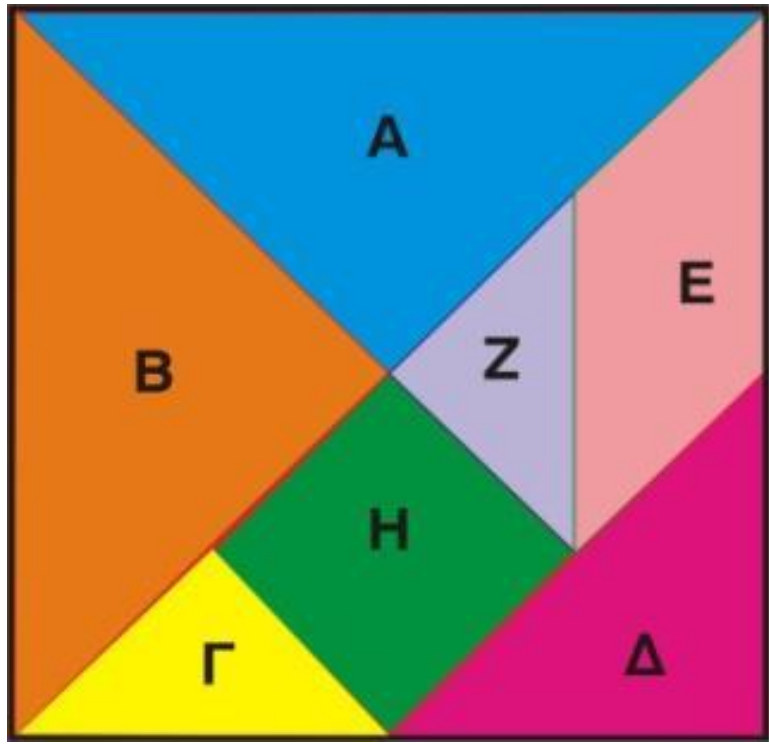
Geometric art for respecting cultural diversity



- This teaching scenario is a collaboration between the **Math and the Art teacher**. The majority of pupils were Muslims and they had a special interest in the Islamic art geometrical shapes (Intercultural lower secondary school of Athens).
- Mathematical concepts based on cultural components allow students to reflect on and appreciate not only their own culture **but also the culture and traditions of others**.
- There was a focus on interactions in the mathematics multicultural classroom, **since cultural diversity is linked to opportunities, barriers and conflicts during the transition process**.



Fostering creativity by using tangram



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Experiential Learning

Experiential Learning was provided by enriched activities of **History and Culture, Games, Dance and Experiments**. Teachers used figures or photographs, so that all students in a mixed class were able to understand the problem, suggest solutions and **overcome the barrier of learning in a foreign language**.



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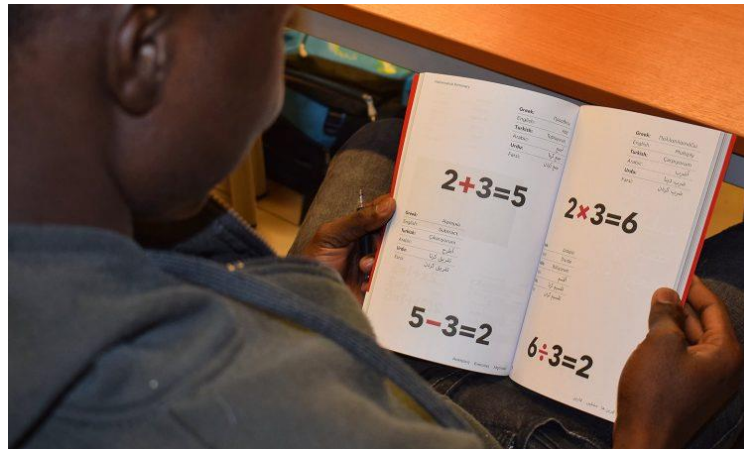


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Mathematics dictionary

قاموس رياضيات
Μαθηματικό Λεξικό
اصطلاحات رياضي
Mathematical Dictionary
رياضي کی لغت
Matematik Sözlüğü



The Mathematical Dictionary **was created by SolidarityNow** as part of the project “*Comprehensive Service Provision for the Integration and Well-Being of Refugee Children and Families*”, supported by UNICEF with funding from the European Union Civil Protection and Humanitarian Aid Operations (DG-ECHO), and in **collaboration with METAdrasi**.



Source: <https://metadrasi.org/en/campaigns/mathematical-dictionary/>



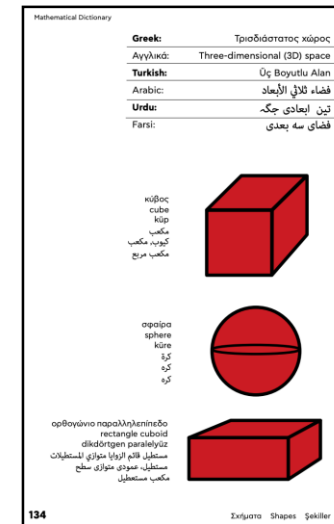
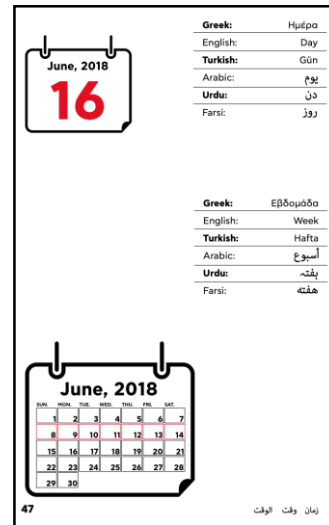
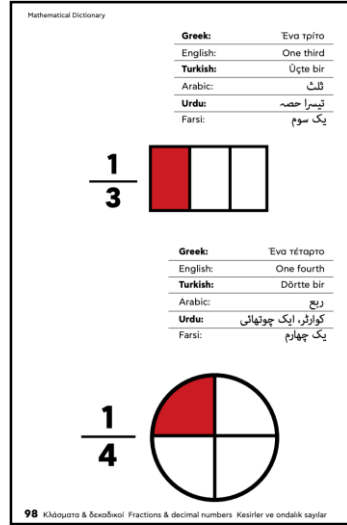
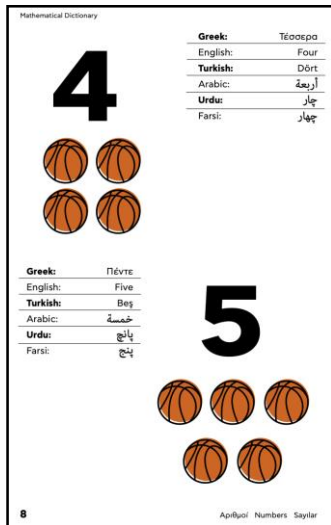
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Mathematics dictionary : a tool for students and teachers



- The Mathematical Dictionary contains **general mathematical terminology and specialized vocabulary of Algebra and Geometry** and it is the starting point for assimilation of the world of Mathematics, as well as for the application of knowledge in practice through exercises.
- It does not merely cite the translation or definition of mathematical terms from Greek into Turkish, Farsi, Urdu and English, but, at the same time, also tries to include **all possible cases in which a math term may appear in a school environment.**



Mathematical Bodies: a tool for teaching Math

PiCaM

Project in Citizenship
and Mathematics

Mathematical Bodies



Sarah Ainslie

- These final materials were produced by the PiCaM partners **from United Kingdom, Germany, Portugal, Romania, Greece- in 2019** after testing in partner countries. They are curriculum resources, **designed with 10-12-year old students** and their teachers, to develop critical global learning through the teaching and learning of mathematics.
- Resources include suggested mathematical and global learning intentions and can be used individually. This activity is designed to build a learning group where everybody matters and everyone has an equal role to play. **It offers an embodied experience of multiples and factors, common multiples, primes and co-primes.**

Source: http://www.citizenship-and-mathematics.eu/index.php?article_id=39&clang=3



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Refugees in Math? Data Gathering and Analysis

What is the difference
between a **refugee**
and a **migrant**?



Source: <https://www.startthechange.eu/download/FINAL-Refugee-Activity.pdf?lang=en>

- The project 'Start the change' gives teachers tools to actively involve their students in global issues and address contemporary world challenges, such as migration and development issues, starting with their practical experiences. **This tool refers to how statistics analysis courses can provide young people with awareness of own prejudices and biases related to global justice and equity and commitment to overcoming these.** The activities are designed for teachers to help students identify with refugees.
- Active and participatory Global Citizenship Methodologies are used to give students the chance **to develop Skills, Values and Attitudes for Empathy, the sense of belonging to a common human community,** with appreciation of human interconnectedness and interdependency at local and global levels, but valuing of own and others' individuality.



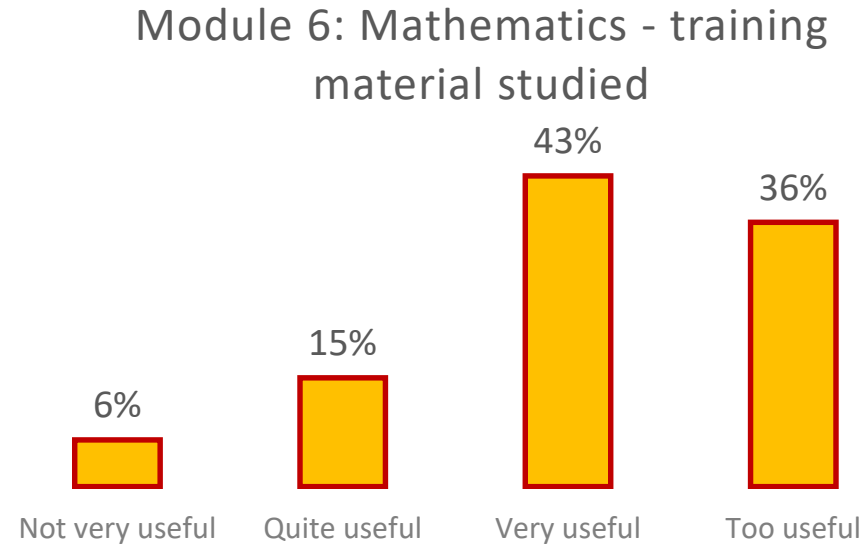
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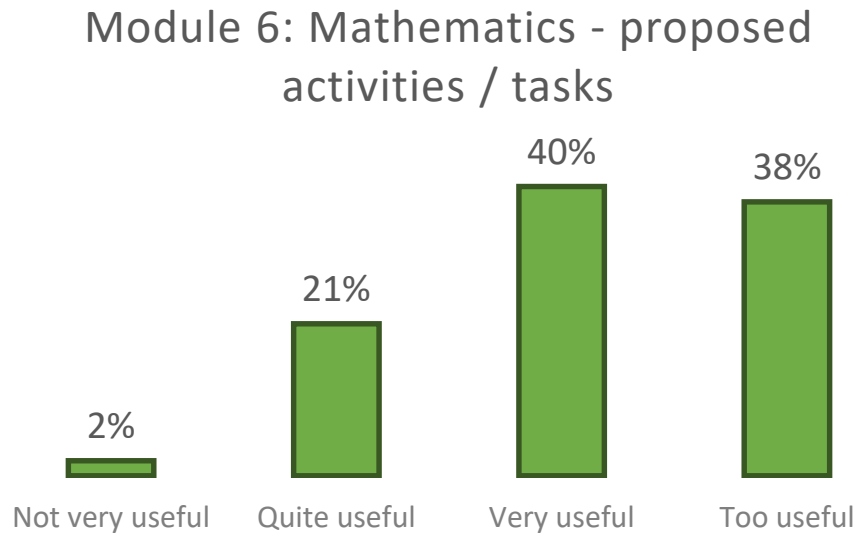
How would you evaluate the training material you studied for the Module 6 (Mathematics)?



Mathematics was chosen by 47 of the 84 teacher-trainees. According to the trainees, the training material of Mathematics is very / extremely useful at 44%, and the percentage after removing the 'not chosen' is **79%**.



How would you evaluate the proposed activities / tasks for the Module 6 (Mathematics)?

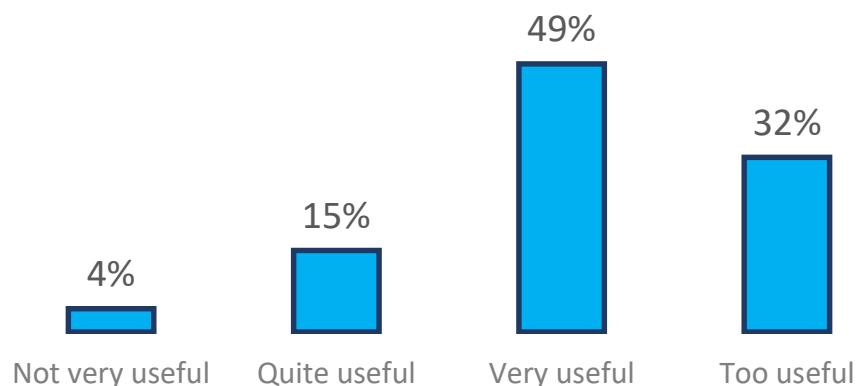


According to the trainees, the proposed tasks for the Module of Mathematics is very useful/extremely useful, at 43%, and the percentage after removing the 'not chosen' is **78%**.



How would you evaluate the feedback of your work for the Module 6 (Mathematics)?

Module 6: Mathematics - feedback of your work



According to the trainees, the feedback of their work for the Module of Mathematics is very useful/extremely useful at 45%, and the percentage after removing the 'not chosen' is **81%**.



The QuaMMELOT Program and the inclusion of refugee and migrant students

- Erasmus + QuaMMELOT project contributed to vulnerable students create a **smooth continuity between the two cultures**, their home and the host country, and foster inclusive pedagogical approaches for **active integration in the school community**.
- **Holistic approaches of the content** implemented to overcome cultural and language restrictions of refugee and migrant students.



Strategies of secondary Math teachers

The greatest achievement was the **change of teachers' attitude and practices.**

We will mention again some **methodologies and strategies** of teachers-trainees :

- Interdisciplinary culture of cooperation at school.
- Cooperative Learning and Peer-tutoring in Mathematics.
- Multimodal, multiple representations approaches, CLIL methodology.
- Visual proofs, open-ended problems, wordless problems.
- Experiential learning, handicrafts, practical activities, hands-on activities.

Teachers effectively coped with the heterogeneity of learning groups, created appropriate teaching materials that met the needs of refugee students and implemented **differentiated and individualized Math lessons.**



The contribution of the QuaMMELOT project in Secondary Mathematics Education

- There is no official curriculum for Secondary Mathematics Education emphasizing on refugee students, **few adequate teaching materials and instructional recourses have been developed** and the training needs are enormous.
- Distance learning course motivated the active participation of Math secondary teachers in an online community within an interconnected digital platform that enabled them to **design inclusive teaching classroom scenarios, reflect on them and consider changes in their lessons.**
- Module 6 of the QuaMMELOT project helped Math teachers to design their lessons and implement planning **in mixed multicultural and multilingual classes** providing all students with adequate mathematics instruction.



Some concluding educational remarks on the teaching of Mathematics to vulnerable students

- Math teachers of the four European countries **designed and implemented their mathematics lessons very differently** trying to adapt their planning to the needs of their heterogeneous classes, taking into consideration the different ways of teaching mathematics in the refugee students' country of origin. **The teachers' educational background determined their attitude** in which they carried out their teaching.
- The use of the **students' native language in the lesson** had positive effects on students' motivation and self-confidence.
- **Cultural differences influenced the learning and teaching of Mathematics.** Instead of relying on memorized algorithms, students had the opportunity to learn Mathematics in a meaningful and relevant context.



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Warm thanks

I would like to thank:

- the teacher-trainees for allowing me to use in this presentation their teaching activities from instructional interventions in mathematic classrooms, that are uploaded in the QuaMMELoT digital platform.
- the members of the Greek Pedagogical Team for discussing and sharing their experience in meetings and informal discussions.



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Thank you for your attention!

Thanks

Ευχαριστώ

Grazie

תודה

Gracias



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