YARD4ALL

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Guide for Using Mathematical Concepts on School Yard

PROJECT

Yard4All – Using School's yard for ALL child's wellbeing and development

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1. INTRODUCTION

The objective is to use the fact of the existence of a school garden in schools to create hypotheses for formal and non-formal learning, taking into account the existing contexts in each school, with applicability in mathematics and that are enriching and motivating for students.

We involve the math concepts corresponding to each school year in the activities or lessons we present.

These activities are designed for children between 6 and 12 years old.

The objective is to include all students in the processes of applied activities. For this, we use the Peer to Peer Learning method, dividing students into small groups, in all activities, according to the proposed methodology. Ideally, the number of Participants per activity should be distributed as follows: in pairs (2) or small groups (3-4 children/group) - and in case there are children with specific needs, each group will only have one child with this profile.

Each applicator will organize the groups of students, according to the activities to be carried out, in relation to the context of the school where the activity will be applied and taking into account the students in the class. It is up to the applicator (teacher) to use, adapt or create an activity, according to the conditions for carrying out the activity at their disposal and the profile of students in the group for which the activity is intended. Thus, the activities in this guide can be used as they were conceived and applied or they can be modified by the applicator in order to generate motivation and effective student learning.

The duration of the activities will be at least 45 minutes/50 minutes, but it is left to the discretion of each teacher/applicator to design and dimension their activity according to the parameters they wish and the factors they deem fit to consider.

Students should develop skills in the development of activities. Thus, the competences that are essential (and their descriptors) are stated in the development of activities suggested in this guide.

Students should develop skills in the development of the activities.

2. METHODOLOGY

Each school has its own characteristics, time and place, and offers insights into different types of leadership based existing in schools, each with its own benefits provided by the school garden.

All types of leadership share an understanding that school-based and learning gardens offer diverse and cross-functional benefits and that these are best accomplished in partnership and consultation with local leaders, community organizations and parents.

Peer Learning is most effective when learning objectives are clear, and peer engagements are structured to maximise these objectives.
When individual peers are matched appropriately and authorised and empowered to engage effectively, peer learning is also optimised.
Learning is best facilitated when peers do things together, and reflect regularly on what they are learning.

Peer learning refers to "the use of teaching and learning strategies in which students learn with and from each other without the immediate intervention of a teacher (Boud, Cohen, & Sampson, 1999, p. 413). In peer learning the acquisition of knowledge and skills is achieved through active helping and supporting among status equals or matched pupils.

School-based one-to-one support and School-based group support are two examples of peer to peer support models (Coleman et al, 2017).

School-based one-to-one support is a student who helps others, with the supervision of an adult facilitator. Usually addresses issues such as self esteem, confidence, emotional health and well-being at school.

<u>Group size and ability grouping</u>

For students to work together, they must be assigned to groups. To assign students to groups, the teacher must decide how large a group should be, how students are assigned to the group will stay together and what combination will be used during the lesson. There is no ideal size for a Peer Learning group. The typical size of a Peer Learning group ranges from two to four.
Johnson et al. (1994) advise to follow the basic rule of thumb (A rule of thumb is a heuristic guideline that provides simplified advice or some basic rule-set regarding a particular

subject or course of action. It is a general principle that gives practical instructions for accomplishing or approaching a certain task), the smaller the better.

When forming groups there are several factors that need to be considered, such as thefollowing:

a) As the size of the learning group increases, the range of abilities, expertise, skills and the number of minds available for acquiring and processing information increases.

a) The shorter the period of time available the smaller the learning group should be.

b) The smaller the group, the more it is for students to hide and not contribute their share of the work.

c) The larger the group, the more skilful group members must be.

d) With increasing group size, there is a decrease in face-to-face interaction among teammates and a reduced sense of intimacy.

e) The materials available or the specific nature of the task may dictate a group size.

f) The smaller the group, the easier it is to identify any difficulties students have in working together. (Johnson et al. 1994)

The benefits of groups of three or four are numerous. This group size is large enough for the generation of ideas and approaches, but small enough that all members can contribute to solving the problems and the situation of a 'hiding' student is diminished (Johnson et al. 1994). There is no ideal method of assigning students to groups. A groups teamwork skills determines a group's productivity. Johnson et al. (1994) recommend that the teacher assigns the groups. This can be done a number of ways, at random, by ability, either mixing the abilities or groups of the same ability. Whatever suits the task.

3. MATH ACTIVITIES

Potential benefits cover a wide range of topics such as education, health, culture, community, economy and the environment.

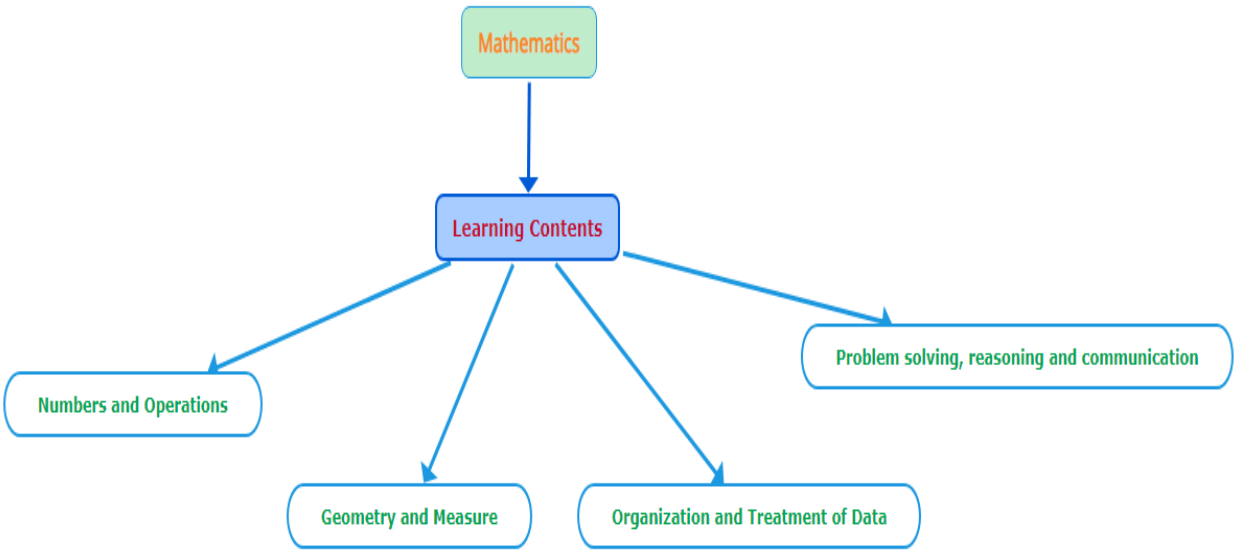
This richness of diversity of the "school garden" tool also allows schools to take advantage of this tool and introduce it in the various school subjects and, if they wish, can use it to make interdisciplinarity between these school subjects.

Even the kindergarten offers a multitude of opportunities to practice basic math activities such as calculations, comparisons, measurements, and varied representations of data (graphs, graphs, etc.). Mathematics becomes practical and relevant when students implement concepts they've learned in the classroom, in a real-life garden setting. Designing and planting a garden requires solving and practicing mathematical problems.

Mathematics involving the school garden uses a hybrid system of learning mathematics, using the Formal method (F) and the Non-Formal method (NF). The Formal Method, when we perform calculations, work with the data and transform the information into knowledge and the Non-Formal Method, when we go to the garden and collect data, we sow, we measure the growth of what we sow at different times, we measure the beds, we draw the vegetable garden, fruit tree, vegetables or some space... Activities involving the school garden represent significant learning, and not just a mechanical process of mathematical calculations.

The teaching of mathematics universally has the following main purposes:
a) To promote the acquisition and development of knowledge and experience in Mathematics and the ability to apply it in mathematical and non-mathematical contexts.
b) Develop positive attitudes towards Mathematics and the ability to recognize and value the cultural and social role of this science.

The learning contents are organized as follows:



Pedagogical practices related to school mathematics, present in most schools, are still more related to the training of algorithms than to a mobilization of cultural mathematical practices that allow students to produce their own meanings of mathematical concepts.
Mathematics activities in the school garden allow students to carry out a practical component that involves and satisfies them, so that knowledge is obtained in relation to the concept introduced in the activity performed.

Skills that activities can develop:
Knowledge of Facts and Procedures

- Use/application of ICT Concepts and Procedures (Excel; Scratch; Word; Geogebra; Information search on the Internet;;
- Understands concepts and applies procedures.

Communication of Ideas and Reasoning

- Use of mathematical language (conventions, notations, terminology and symbology);
- Correction and Clarity.

Reasoning and Problem Solving

- In the development of an investigation/exploration task.

Responsibility and Commitment

- Execution of tasks, participating with a sense of opportunity and persistently.

Collaboration/Cooperation

- Work in a team;
- Adapt their behavior in contexts of cooperation, sharing, collaboration and competition;
- Interact with tolerance, empathy and responsibility;
- Argue, negotiate and accept different points of view.

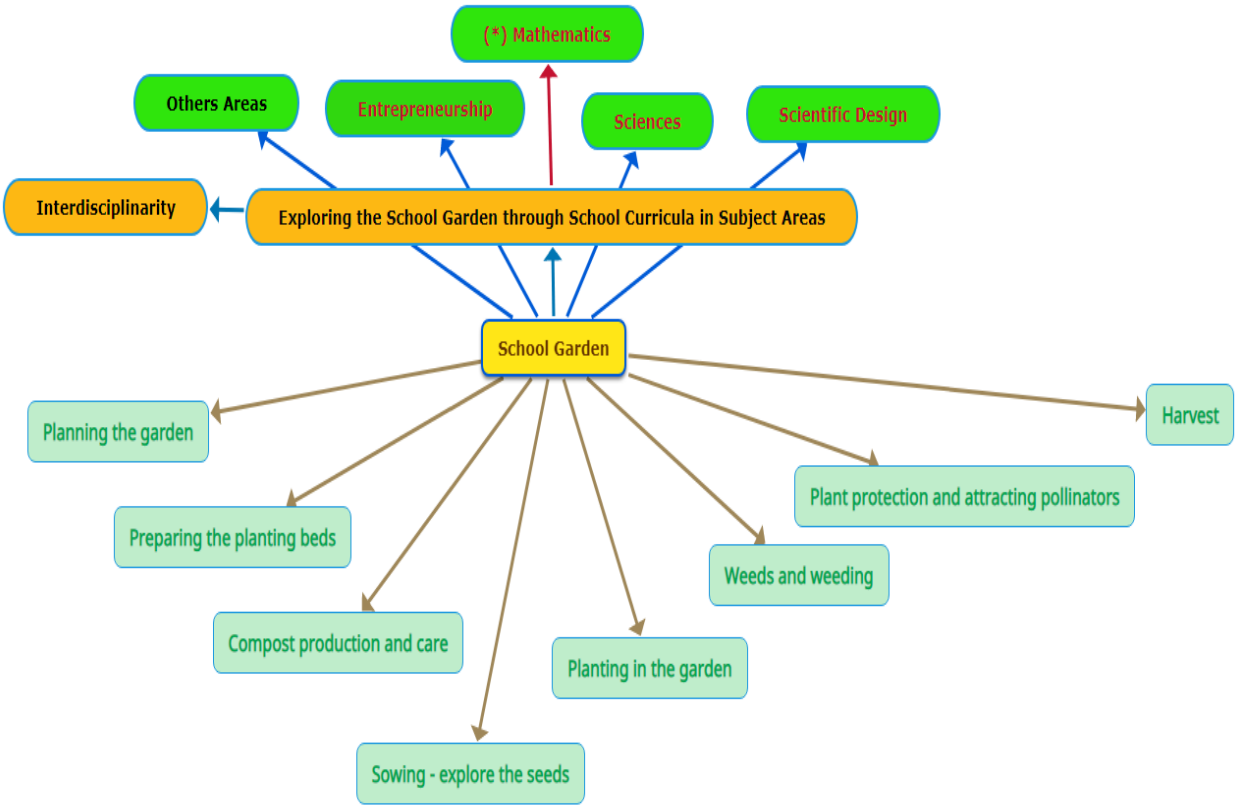
Autonomy

- Ability to request help and support necessary to achieve objectives (individual and group).

Moura (2000, 2002) argues that a teaching activity should involve the student in problem-situations and reflection that generate the need to develop meanings specific to the concept in question.
This same author emphasizes that teaching activity is one that is structured in order to allow subjects to interact, mediated content, negotiating meanings, with the aim of collectively solving a problem-situation. It is a guiding activity because it defines essential elements of the educational action and respects the dynamics of interactions that do not always reach the results expected by the teacher. This establishes the objectives, defines the actions and chooses the auxiliary teaching instruments, however, it does not stop the entire process, precisely because it accepts that the subjects in interaction share meanings that change in face of the object of knowledge under discussion (Moura, 2002).

Concepts play a fundamental role in the understanding of mathematical content, and it is from the concepts that it is possible to establish the interconnections between different concepts, necessary for the satisfactory application of the content.

The practical applications presented by activities carried out in the school garden can help to motivate students, who are often confused by questions and abstract examples from school textbooks. It is therefore important that the activities are not only carried out, throughout the duration, in the classroom or that these activities are carried out in other school spaces, namely in the school garden, where the practical component can constitute an incentive and motivation for the realization of any learning.



The use of the school garden, explored in a pedagogical way, allows transforming the pedagogical approaches used by teachers in their school activities. The potential of exploring the school garden is enormous, transversal to all academic areas, allowing exploration by thematic areas or interdisciplinarity between the areas that are desired. There is therefore ample space for the development of pedagogical approaches involving the school garden.
Mathematics alone can be explored in all phases of use, development and maintenance of school gardens. You can also join any interdisciplinary project, with other disciplinary areas, since you can always plan, investigate and develop activities involving the school garden in all learning content.

Here are some ideas for outdoor classroom math activities using the school garden:

Concept / Activivity	**Process / Operationalization**	**Resources**
	Kindergarten (5/6 years)	
	Students will be expected to compare quantities, 1 to 10, using one-to-one correspondence.	field notebook;

Count the number of vegetables from the garden.	Have them harvest a few different vegetables from the garden. Count how many of each plant they harvested. Compare the amounts of two different vegetables. Describe the results using comparison words/ phrases such as more, fewer, as many as, and the same number as.	pen; computer

Count the number of plants in a row.	Students will be expected to compare quantities, 1 to 10, using one-to-one correspondence. Have them harvest a few different plants from the garden. Count how many of each plant they harvested. Compare the amounts of two different plants. Describe the results using comparison words/ phrases such as more, fewer, as many as, and the same number as.	field notebook; pen; computer

Compare two objects based on a single attribute, such as length	Take some of the vegetables harvested from the garden and compare the mass of two different vegetables and discuss which one is lighter, heavier, or almost the same	field notebook; pen; computer

Compare two objects based on a single attribute, such as mass	Take some of the vegetables harvested from the garden and compare the mass of two different vegetables and discuss which one is lighter, heavier, or almost the same	field notebook; pen; computer

Demonstrate an understanding of repeating patterns.	Visit the garden and look for repeating patterns. Take photos of the patterns or draw visual representations. Discuss the patterns found and create a class book about photos and patterns.	field notebook; pen; computer

Grade 1 (6/7 years)		
Estimate the number of different types of plants and/or vegetable	Students will be expected to say the number sequence, forward and backward between any two given numbers, from 0 to 100. Visit the garden. Estimate the number of different types of plants and/or vegetables (e.g., how many zucchini, tomato, cucumber, and onion plants there are; how many zucchini, cucumbers, and tomatoes are on one plant).	field notebook; pen; computer

Count and record	Visit the garden. Estimate the number of different types of plants and/or vegetables Count and record the number of different types of plants or the number of vegetables on one plant in the garden.	field notebook; pen; computer

Estimate and then count	Visit the garden. Weed one row. Estimate and then count the number of weeds in that row.	field notebook; pen; computer

Count the weeds pulled out	Students pull weeds and keep track of the number of weeds they have pulled.	field notebook; pen; computer

Compare sets containing up to 20 objects	Visit the garden. Estimate the number of different types of plants and/or vegetables Estimate the amount of a particular vegetable using a known quantity.	field notebook; pen; computer

Demonstrate an understanding of repeating patterns (two to four elements)	Visit the garden. Look for repeating patterns in the garden. Create a pattern book either individually or as a whole-class activity.	field notebook; pen; computer

Demonstrate an understanding of measurement as a process of comparing	Using different vegetables harvested from the garden, demonstrate an understanding of measurement as a process of comparing by • identifying attributes that can be compared • ordering objects • making statements of comparison´ Discuss the findings	field notebook; pen; computer

Demonstrate an understanding of measurement as a process of comparing	Using different vegetables harvested from the garden, compare which vegetable in the set is • longest/shortest • heaviest/lightest • largest/smallest Discuss the findings	field notebook; pen; computer

Grade 2 (7/8 years)		
Compare and order objects	Students will be expected to compare and order objects by length, height, distance around, and	field notebook; pen; computer

	mass using non-standard units and make statements of comparison	

Estimate, measure, and record	Estimate, measure, and record the measurements of different vegetables and parts of the plants (e.g., vines, stems, leaves) using non-standard units.	field notebook; pen; computer

Compare and order the measures	Compare and order the measures of two different vegetables / plant parts and explain how and why you chose to put them in that order.	field notebook; pen; computer

Estimate and measure	Estimate and measure the length and width of the garden, the width of rows and paths, and the height of the various plants using non-standard units such as a rake, a trowel, the student's hand or finger, the student's step …	field notebook; pen; computer

Compare Measure or other caracteristic ...	Arrange vegetables according to specific parameters: for example, by color, by type, by size. Write in your notebook all the comparisons made.	field notebook; pen; ruler

Perimeter and area	Calculate the perimeter and area, strengthening the ability to determine the length of objects by measuring (the "beds" in the school's vegetable garden); developing the capacity to explore / investigate and find solutions to various problematic situations of a mathematical nature (perimeters of "beds"); strengthening the ability to use appropriately the terms used to measure the size of objects.	sheets of paper, pen, tape measure

Measure, record and solve problems	Measure objects with the help of standard measurements: meter, centimeter; record on paper the measures found; use the data obtained to solve mathematical problems;	sheets of paper, pen, tape measure

Grade 3 (8/9 years)		
Demonstrate a understanding of measuring mass	Use a balance scale to measure and record the mass (in grams or kilograms) of different vegetables harvested from the garden. Compare two similar vegetables with different masses and explain your results.	Balance; field notebook; pen; computer

Collect first-hand data and organize	Collect first-hand data and organize it using tally marks, line plots, charts, and lists to answer questions.	field notebook; pen; computer

Record information and create graphs	Record information and create graphs about the different types and quantities of vegetables harvested. Use data to determine if students should plant more, fewer, or the same amount of vegetables the next year.	field notebook; pen; computer

Measure and Design	Map the school garden using length, width, and height measurements; Group discussion on the components of the school garden. Register the components, Scientific Design can be used; Collection of data on the components of the Garden, measures of the garden, bed, composting site, trees, water point, access to the Garden space, geographical orientation;	graph paper, sheets of paper, pen/pencil, tape measure/rule, square, colored pencils

Measure mass, types of measures	Propose situations in which children try to fill and empty different utensils, trying to find out the mass of each vase in each group of students; Check if the children know some conventional mass measurements, discuss with them the various types of measures; Solve problems	weight balance; sheets of paper, pen, small pots with soil

Perimeter, area and solve problems	Measure the length and width of the garden beds; Measure the height of the sown vegetables; Solve problems	balance; field notebook; pen; ruler

Diameter, radius, areas and solve problems	Determining the Perimeter of the Circumference (top of a pots of soil); Determine the length of the diameter; Calculate the radius value; Solve problems	sheets of paper, pen, tape measure, pots with soil

Statistical Treatment and create graphs	Collect School Garden data (vegetable height, bed length, bed width, garden dimensions); organize the data; Put the data in an Excel sheet to make graphs.	sheets of paper, pen; Excel

Measure the growth - height	Measure the height of the vegetables; Compare with previous data from the collection of data on the height of vegetables.	sheets of paper, pen;

Geometric figures	Geometric figures found in the school ecosystem;	sheets of paper, pen; school space;

Grade 4 (9/10 years)		
Identify and model fractions and mixed numbers	Plan a pizza garden. List the vegetables to be grown for a pizza (e.g., onions, tomatoes, peppers, eggplants, garlic, basil, oregano). Each student can choose the vegetables to be grown. Divide a circle into fractions, with each section representing one type of vegetable.	Compass; protractor; Ruler or square; field notebook; pen; computer
Map the school garden using length, width, and height measurements	Draw in a map, use a scale that will be manageable in size but large enough to highlight the features of the site. Convert measurements from English to metric, and vice versa.	measuring tape; Ruler or square; field notebook; pen; computer
Create pictographs using the vegetables to illustrate the number of plants in the garden.	Collect data about the number of plants in the garden. Count how many of plants are in the garden. Use the data collected and create pictographs using the vegetables to illustrate the number of plants in the garden.	field notebook; pen; computer
Create pictographs using technological support such as Excel, Geogebra, scratch, ...	Collect data about the number of plants in the garden. Count how many of plants are in the garden. Based on the counts made, create pictographs also using technological support such as Excel, Geogebra, scratch, ... Provide students with a simple and straightforward manual.	field notebook; pen; computer; Excel, Geogebra, Scratch Page
Create pictographs using structured scientific design.	Collect data about the number of plants in the garden. Count how many of plants are in the garden. Based on the counts made, create pictographs using structured scientific design.	field notebook; pen;
Estimate the amount	Estimate the amount of soil for pots or other objects needed to fill plant pots of various sizes. Fill pots or other objects with soil and record their capacity.	field notebook; pen; computer; Excel

Collecting data and create a line graph	Collecting weather/ temperature data for science activity, have students create a line graph to interpret data.	field notebook; pen; computer; Excel;
Create plans, do measurements, estimate	Create garden plans using scientific design. In these plans, use seed catalogs to determine or choose which vegetables to plant. And for example, given the measurements of the garden or the rows, determine how many seeds are needed. Or, supposing that one wanted to sow an exaggerated number of seeds, calculate what the measurements of the garden or the lines should be.	field notebook; pen; computer; ruler
Create plans, do measurements, estimate	Create a garden plan(s) using computer planning software such as Scratch.	field notebook; pen; Scratch
Calculate the perimeter and area	Calculate the perimeter and area of beds, raising beds, garden, garden benches, ...	field notebook; pen; computer;
Calculate the diameter, radius and area	Calculate the diameter, radius and area of the garden pond, other circular things or even circular constructions made by students in the garden...	field notebook; pen; computer; Excel
Measure and sketch	Measure and sketch 5 plants in the garden.	field notebook; pen;
Count, regist and perform	Count the number of ingredients by type, which are in the compost, regist and perform the statistical treatment.	field notebook; pen; computer; Excel, Geogebra
Make a map, choice the scale	Make a map of the school grounds showing buildings, paths, roads, taps, water tanks, play areas, gardens, etc. Also include any problem areas such as steep slopes, soil erosion, litter dumping, dripping taps, and paths that people not following ...	field notebook; pen; computer; Excel

Discuss the map of the school	Discuss the map of the school and decide on the best place to locate the garden or other places to add to the main school garden, fruit trees and any other demonstration areas. Mark these on the map.	field notebook; pen; computer; Excel

Demonstrate areas	Recognize and demonstrate that objects of various shapes in the school garden may have approximately equal areas or the same area.	field notebook; pen; computer;

Recognize and demonstrate that objects of the same area can have different parameters.	Plan a pizza garden, list the vegetables to be grown for a pizza (e.g., onions, tomatoes, peppers, eggplants, garlic, basil, oregano). Determine how much of each vegetable is needed. Use a seed catalogue to determine the área needed to grow the desired quantity. Using graph paper, plan a garden of the required area in the shape of a square, rectangle, triangle, etc. Measure the perimeter of each.	field notebook; pen; computer; Excel; Geogebra

Measure the growth rates and make predictions	Measure the growth rates of plants and display results on different types of graphs. Make predictions regarding future growth. Use standard and nonstandard units of measurement.	field notebook; pen; computer; Excel; Geogebra

Determine the rate of growth	Host a bean race. Plant a number of beans at the base of a trellis and track their growth on a chart. Determine the rate of growth and award the fastest plant a red ribbon.	field notebook; pen; computer; Excel;

predict dates	Using information from seed catalogs, predict dates of germination and maturity.	field notebook; pen; computer; Excel;

Plan backward and determine dates	Plan backward from a desired harvest date to determine when each crop should be planted.	field notebook; pen; computer; Excel;

Measure, calculate areas and make a map	Measure your garden parameters and calculate the area. Use graph paper to make a map to scale of your garden.	field notebook; pen; computer; Excel;

Chart temperatures	Chart temperatures of the air and soil in your garden in Fahrenheit and centigrade.	field notebook; pen; Excel;
Determine the weight and volume	Determine the weight and volume of soil mix when wet and dry. Determine the volume of soil in a rectangular window box.	field notebook; pen; computer; Excel;
Investigate prices, determine the value of the harvest	Investigate vegetable prices in a supermarket. Verify the amount of produce harvested in the school garden and use the market prices to determine the value of the harvest.	field notebook; pen; computer; Excel;
Count and calculate the germination rate.	Count the number of seeds planted and the number of seeds that sprout and calculate the germination rate.	field notebook; pen; computer; Excel;
Measure the height and determine the mean, median, and mode.	Measure the height of a group of plants and determine the mean, median, and mode.	field notebook; pen; computer; Excel; Geogebra
Predict and measure	Predict how many seeds will germinate (sprout), how long it will take to sprout, measure the growth each day …	field notebook; pen; computer; Excel;
Compare and identify	Compare the dimensions of the beds (larger/smaller, higher/lower) and identify geometric figures.	field notebook; pen; computer;
Observe, regist and do the statistical treatment	During harvesting, observe and regist the size, shape, quantity and types of leaves, stems and roots. Do the statistical treatment (frequency tables/ graphics/ ...).	field notebook; pen; computer; Excel;
Count, regist do the statistical treatment	During sowing/harvesting, count and regist the seeds, plants or fruits. Do the statistical treatment.	field notebook; pen; computer; Excel;
Determine the weight	Determine the weight of some plants or fruits picked.	field notebook; balance; Excel;

Compare bugs and populations of bugs	Using the Insect Parts Chart, compare the total number of bugs to the total number of wings, legs and antennae. They can also compare different populations of bugs in the garden.	field notebook; pen; computer; Excel;

Grade 5 (10/11 years)		
Create and interpret line graphs	Implement garden weather station (Temperature, Wind Speed, Wind Direction, Precipitation, Humidity, Solar Radiation, Atmospheric Pressure and Visibility). Create line graphs to interpret the data collected in the garden's weather station.	field notebook; pen; Excel; Geogebra
Fractions and drawings	Calculate how many onions (for example) there are in the whole group of vegetables - represent the quantities as drawings and as fractions.	field notebook; pen;
Fractions, decimals and percentages	Calculate how many onions (for example) there are in the whole group of vegetables - represent all fractions in decimals, percentages, and decimal fractions.	field notebook;
Math problems, fractions, percentages, addition and subtraction of fractions	Create math problems that involve fractions, percentages, different numerical representations and that are in accordance with the theme (vegetables/plants). Invest in mathematical thinking and problem-solving skills, including addition and subtraction of fractions.	field notebook; pen;
Draw (scientific, technical or free design), measures, perimeter	Choose two vegetables and draw them in the field notebook. Measure both vegetables with a ruler, recording all measurements in the notebook. Calculate the perimeter and surface of both vegetables, according to the measurements.	field notebook; pen; Excel; Geogebra; ruler
Perimeter and area	Determine the perimeter and area of beds with different geometric shapes.	field notebook; pen; Excel; ruler
Geometric shapes	Create hypotheses of beds with different geometric shapes to be built inside the schoolyard.	field notebook; pen; Excel; Geogebra

Measure, average	Measuring and record the height of a plant and calculate the average using the growth rate formula	field notebook; pen; Excel; ruler

	Consolidate and deepen contents of the grade 4.	

	Grade 6 (11/12 years)	
Solve measurement problems	Continue to solve measurement problems involving length, capacity, area, volume, mass and time	field notebook; pen; computer; Excel; Geogebra

create garden plans	Have students create garden plans. Using seed catalogues, determine which vegetables to plant. Decide how much of each vegetable is wanted and then the length of the row and the number of seeds required. How much space does each require? Draw several plans to accommodate the vegetables, using different shapes for the garden plot.	field notebook; pen; computer; Excel; Geogebra

Determine the amounts needed	Using the results from the soil tests, determine the amount of nutrients needed to augment the soil in gardens of different sizes.	field notebook; pen; computer; Excel; Geogebra

Perimeters and Areas	Choose two vegetables and draw them in the field notebook. Measure both vegetables with a ruler, recording all measurements in the notebook. Calculate the perimeter and surface of both vegetables, according to the measurements.	field notebook; pen; Excel; Geogebra

Perimeters and Areas	Determine the perimeter and area of beds with different geometric shapes. Create hypotheses of beds with different geometric shapes to be built inside the schoolyard.	field notebook; pen; Excel; Geogebra

Volume Measure Estimates	Make plausible estimates of measuring the volume of structures present in the schoolyard, comparing them with known geometric solids. Compare the estimates with the remaining pairs/groups.	field notebook; pen; Excel; Geogebra

Geometric Solids	Yard Bingo with geometric elements present in the schoolyard.	field notebook; pen;

Geometric Solids	Riddles: creation of riddles, involving the characteristics of geometric solids. Example: Build riddles about geometric solids and play with your teammates.	field notebook; pen;

Geometric Solids	Research on natural elements of the schoolyard. Example: Search (on the internet) some caracteristics of each plant and try to relate them of sustainability.	field notebook; pen; internet

Measures Conversion	Using the schoolyard, students in pairs, will complete five challenges involving the conversion of measurement units. (Peddy Paper)	field notebook; pen;

Patterns/Sequences	Construction of sequences with the leaves found in the schoolyard – work in pairs.	field notebook; pen;

Scales	Using satellite images of the schoolyard, discover the actual size of specific elements within it, using the scale provided and the simple rule of three. Verify the result, whenever possible, comparing it with reality.	field notebook; pen; internet

Measure, scales	Measuring the outdoor temperature using different scales	field notebook; pen;

4. ANNEXES (Example of activities carried out)

These activities can be adapted to other levels than those identified here.

Grade 2 (7/8 years)

Activity 2

Calculate the perimeter and area

Purpose of the activity:

- strengthening the ability to determine the length of objects by measuring (the "beds" in the school's vegetable garden);
- developing the capacity to explore / investigate and find solutions to various problematic situations of a mathematical nature (perimeters of "beds");
- strengthening the ability to use appropriately the terms used to measure the size of objects.

Carrying out the activity

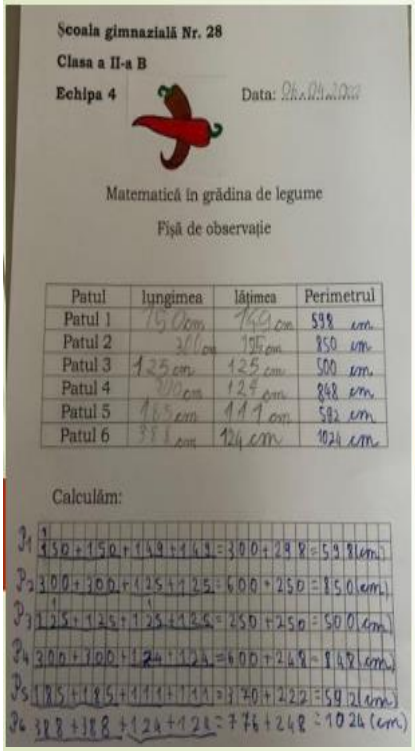
- The class staff (27 students) is organized in 5 teams, of 5/6 students.
- Each team receives an observation sheet to write down the data.
- The "beds" (6) are numbered

Estimate, measure, and record !

Operational objectives:

- to measure objects with the help of standard measurements: meter, centimeter;
- to record on paper the measures found;
- use the data obtained to solve mathematical problems;

We calculate the perimeters!



Remarks:

- **the students participated with great enthusiasm in the activity;**
- **they worked very seriously;**
- **there were students who have grandparents in the country side and are familiar with the activities in the vegetable garden;**
- **the results obtained by the 5 teams are very close, the differences between the perimeters obtained being between 6 and 30 cm; there are 3 exceptions (out of 30) with much smaller perimeters than the others (60 - 400 cm), proving 3 pairs of students who did not take accurate measurements.**

Patul/Team	E 1	E 2	E 3	E 4	E 5
P 1	538 cm	610 cm	610 cm	598 cm	622 cm
P 2	844 cm	846 cm	852 cm	850 cm	844 cm
P 3	746 cm	754 cm	736 cm	500 cm	748 cm
P 4	850 cm	854 cm	844 cm	848 cm	848 cm
P 5	590 cm	588 cm	590 cm	592 cm	588 cm
P 6	1048 cm	1024 cm	1054 cm	1024 cm	650 cm

Conclusions

The school garden offers the students the opportunity to learn many skills that are useful in life, but which often cannot be developed through the school curriculum and the usual teaching methods.

For example, students may develop:

- **social skills such as communication;**
- **practice the basics of mathematics, such as counting, comparing, sets, counting or measuring;**
- **ability to work in a team;**
- **sense of community;**
- **appreciation of others and their opinions, etc.**

Grade 3 (8/9 years)

Activity 4

Theme: Geometric figures found in nature

OPERATIONAL OBJECTIVES:

- to recognize the geometric figures in the given drawing,
- to describe the geometric figures learned from pictures and riddles,
- to associate the geometric figure with the object of the same shape,
- to specify the similarities and differences between geometric figures: square - rectangle;

TEACHING STRATEGIES:

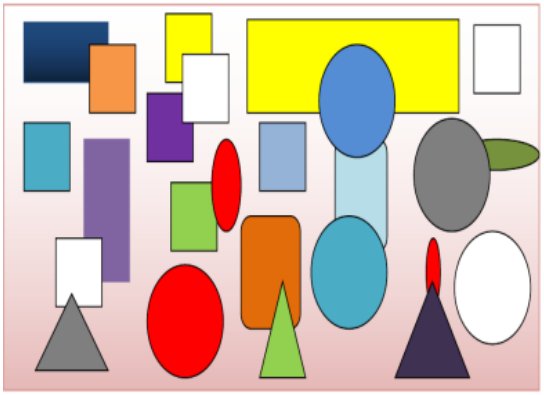
- Methods and procedures: conversation, presentation, explanation, observation, exercise, problem solving, teaching game.
- Teaching tools: PPT images, worksheets, stools, textbooks, markers, puzzles, envelopes, bag with chips;
- Forms of organization: front, individual, team, pairs.

Forms of evaluation: systematic observation, oral evaluation, self-evaluation.

Resources: a) thunderstorms: 50 min
b) human: 27 students
c) digital: Wordwall.

Conducting the lesson

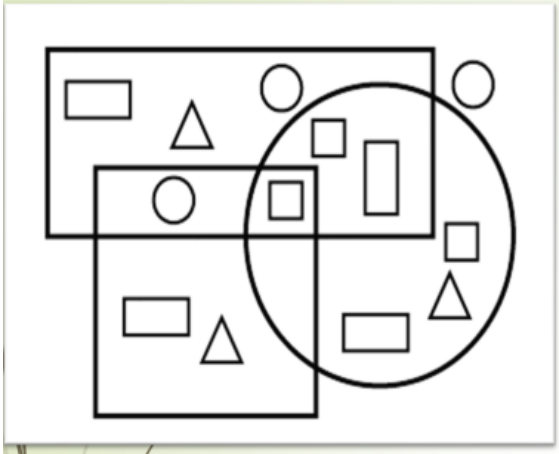
Worksheet - What I know !



At the beginning of the activity we updated the students' knowledge about geometric figures using cardboard geometric figure models.
Each figure is divided into smaller ones on which questions are written.
The group of students was divided into three teams.
Each team bears the name of a studied geometric figure (triangle team, square team, rectangle team) and solves different tasks.

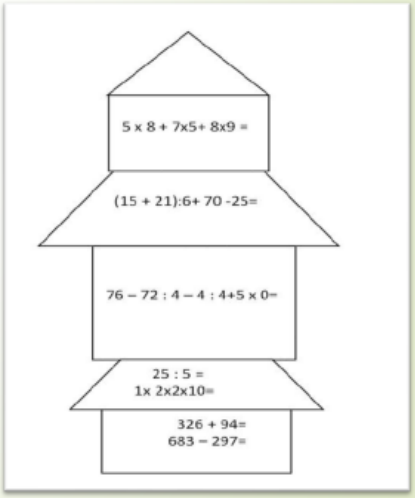
Count the geometric figures:

Circles	Square	Triangles .....
White figures	Rectangles	Red figures .....



Observe the image then write the number of geometric figures from:

a) **inside the circle …… .**
b) **b) inside the square ……**
c) **c) inside the rectangle …… .**
d) **d) inside the three geometric figures .....**
e) **e) outside geometric figures ..**



Teamwork

Sleek Rocket Solve the following calculations correctly starting from the base of the rocket. Color the geometric figures you have learned

- **The Fibonacci string is a series of numbers that follow such a simple mathematical pattern that even a first grader can understand it.**
- **Here's how it works**
- **Watch the series below:1, 1, 2, 3, 5, 8, 13, 21, 34, 55**
- **To form the pattern, start by writing the number 1 consecutively twice. Add up to get 2. Then add the last two digits: 1 + 2 = 3.**
- **Continue to add the last two numbers in the series to find the next number.**
- **They form the famous Fibonacci sequence - a group of numbers that mysteriously appear everywhere in nature: in the number of flower petals, in the structure of fruits and vegetables, in the captivating shape of spirals in nature and even in the proportions of the human body.**

Count the petals of the sunflower and you will most likely find:

a) **21**
b) **34**
c) **55**

Let's take a look at how Fibonacci numbers appear in nature!

- **One of the easiest ways to explore Fibonacci numbers is to count the flower petals. Most often you will find 5, 8, 13, 21 or 34 petals.**
- **Sunflower is especially interesting because it expresses Fibonacci numbers in many ways.**

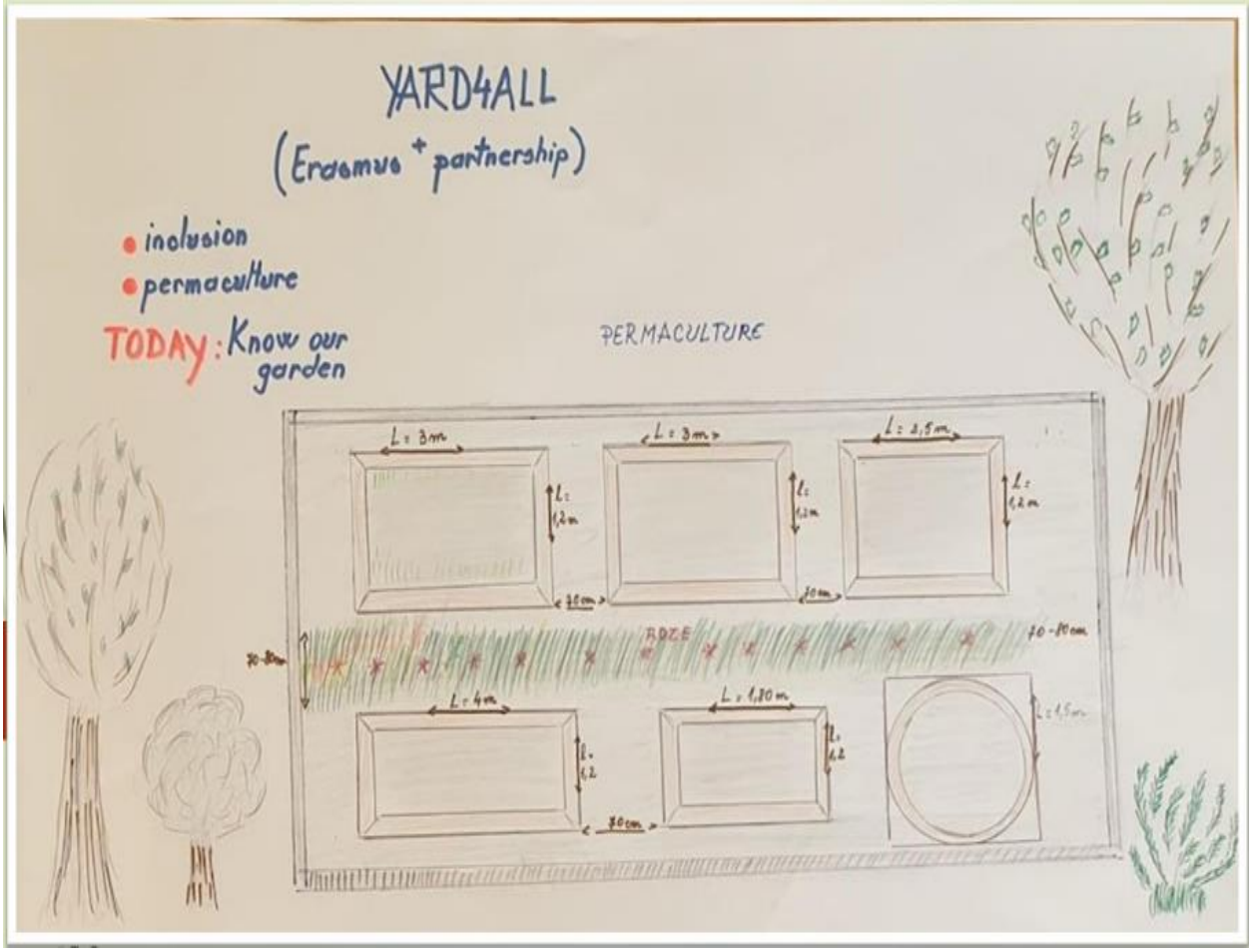
Grade 4 (10/11 years)

ACTIVITY 1- Know our garden

Purpose of the activity: **Map the school garden using length, width, and height measurements**

- **Group discussion about the components of the school garden. Register the components.**
- **Collected data on the components of the garden, measurements, flowerbed, composting site, trees, water point, access to the garden space, geographical orientation.**
- **Wrote down the information on observation sheets.**

- **Students worked in groups, drew sketches of the garden.**
- **Each group presented the sketch of the garden and explained to their colleagues the process developed in class and how the**


YARD4ALL
(Erasmus + partnership)
• inclusion
• permaculture
TODAY: Know our garden
PERMACULTURE
L = 3m
L = 3m
L = 2,5m
L = 4m
L = 1,20m
BOZE

Grade 5 (10/11 years)

Activity 6

Consolidate and deepen contents of the grade 4.

The purpose of the lesson

Consolidate and systematize the rules regarding the order of performing mathematical operations.

OPERATIONAL OBJECTIVES:

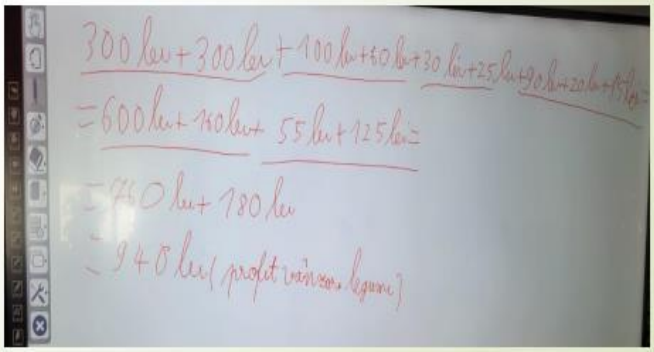
- **to operate with the terminology specific to the operations of addition, subtraction, multiplication and division;**
- **to perform correctly orally and in writing, operations of addition, subtraction, multiplication and division, respecting the order of operations and the use of parentheses;**
- **to solve problems by applying the steps corresponding to the problematization.**

TEACHING STRATEGIES:

Methods and procedures: conversation, explanation, observation of the exercise, bunch method, individual activity;

Teaching aids: textbook, notebooks, whiteboard, tablets, phone, laptop, internet (Wi-fi), Google Meet, YouTube;

PRODUS	NUMĂR BUCĂȚI	PREȚ PE BUCATĂ	PREȚ TOTAL
microgreen - upi	15	20	300
[illegible] ardei+roșii	20	15	300
salată	20	5	100
ceapă verde	20	3	60
[illegible]	20	[illegible]	20
ardei iute	25	1	25
ridichi	20	3	60
[illegible]	10	2	20
mărar	3	5	15



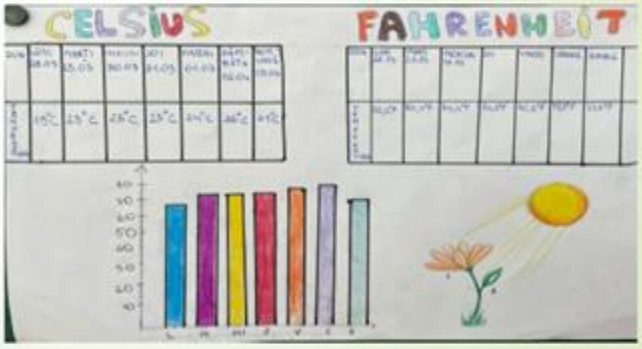
Grade 6 (11/12 years)

Activity 7

Measuring the outdoor temperature using different scales

Measuring the outdoor temperature is important for harvest planning. Taking into account the fact that the temperature influences the vegetables' growth, the purpose of this activity was to note the values between the 28th of March and the 3rd of April, to transform them in different scales and to present them in a diagram.

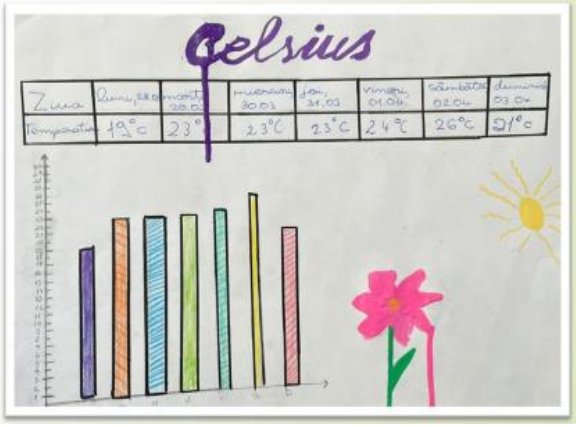
Therefore, the 6th grade students of 28th Middle School, coordonated by their physics teacher, were divided in 3 groups, one for each temperature scale (Celsius, Kelvin and Fahrenheit).



Firstly, each group searched the temperatures in the Celsius scale and wrote them in a table. The first group's job was a little bit easier, considering that they only had to make the diagram.

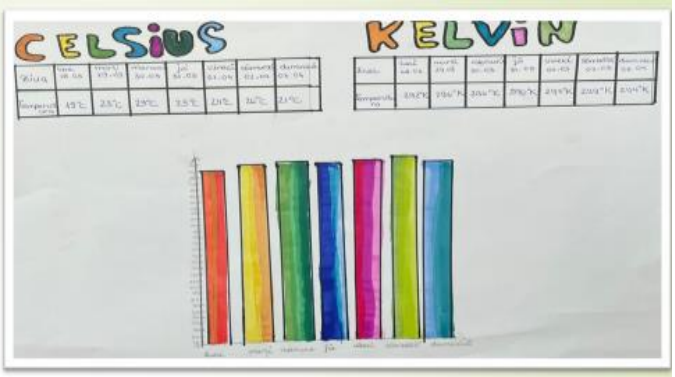
The second group's job was to transform the temperatures from Celsius to Kelvin using the formula that they learnt in the physics class and to make the diagram based on the new values.

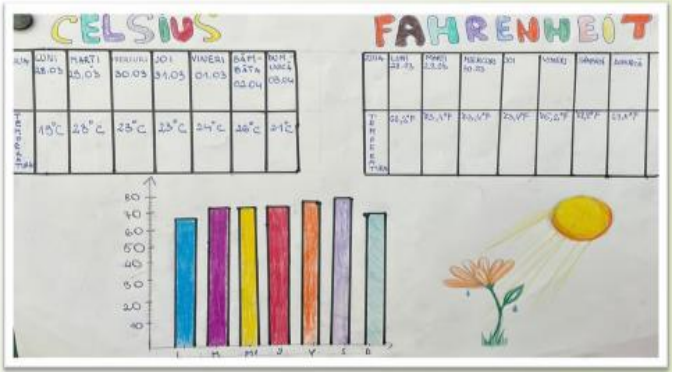
The third group's task was to transform temperatures from Celsius to Fahrenheit using the specific equation and to put them together in a colorful diagram.



The main focus of this activity was the inclusion of the students that encounter difficulties understanding physics. The fact that they were divided in mixed groups helped them and each student had their own task to complete.

They helped each other and felt confident when the projects were finished. Furthermore, the bond between them as colleagues has been strenghtened considering that, by the end of the activity, everyone learnt something new.



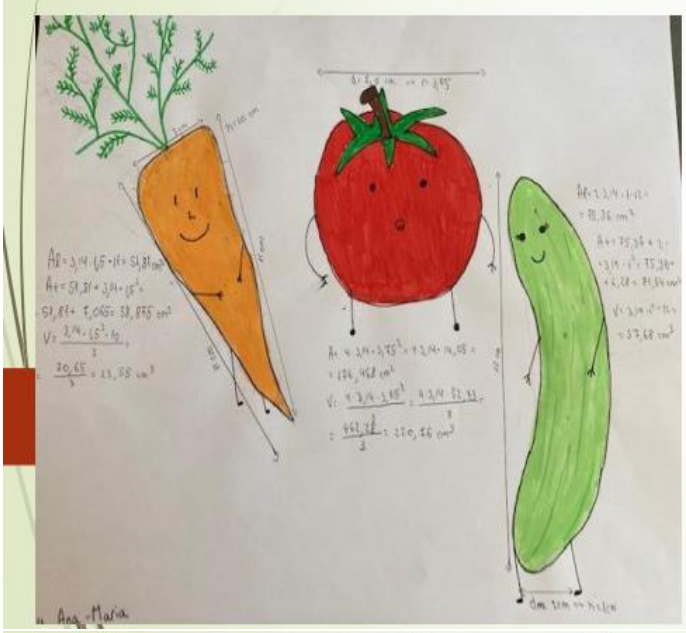


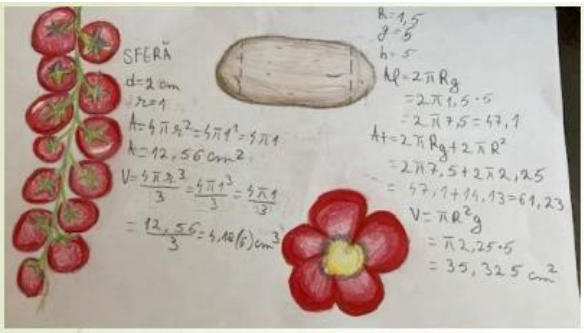
Interdisplinarity

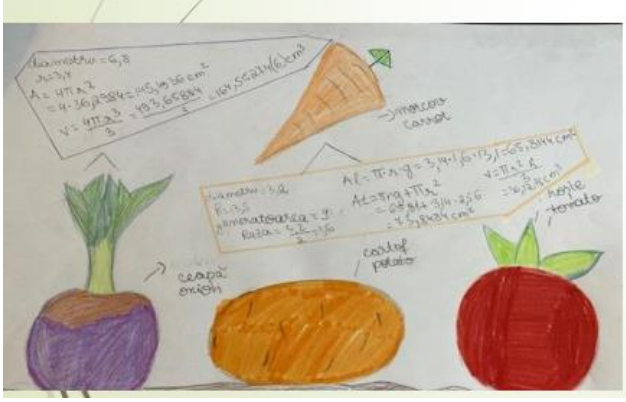
When siences teacher work together!

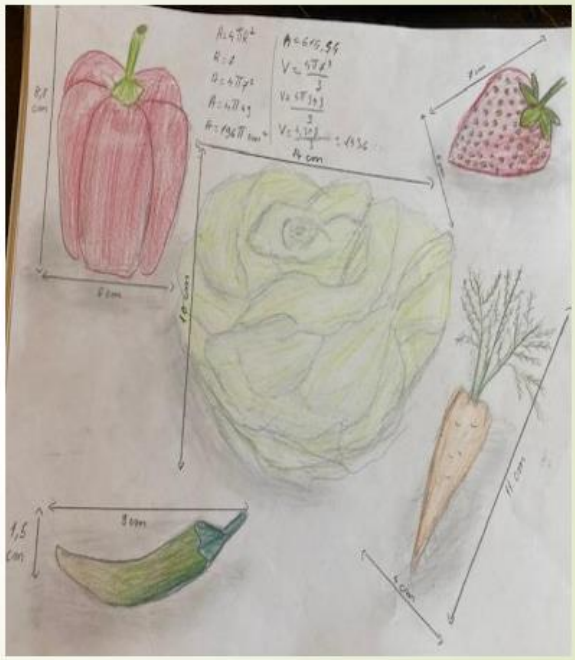
Activity 11

The biology teacher helped the stutends to draw the designs of the vegetables and the mathematics teacher helped the students to calculate.

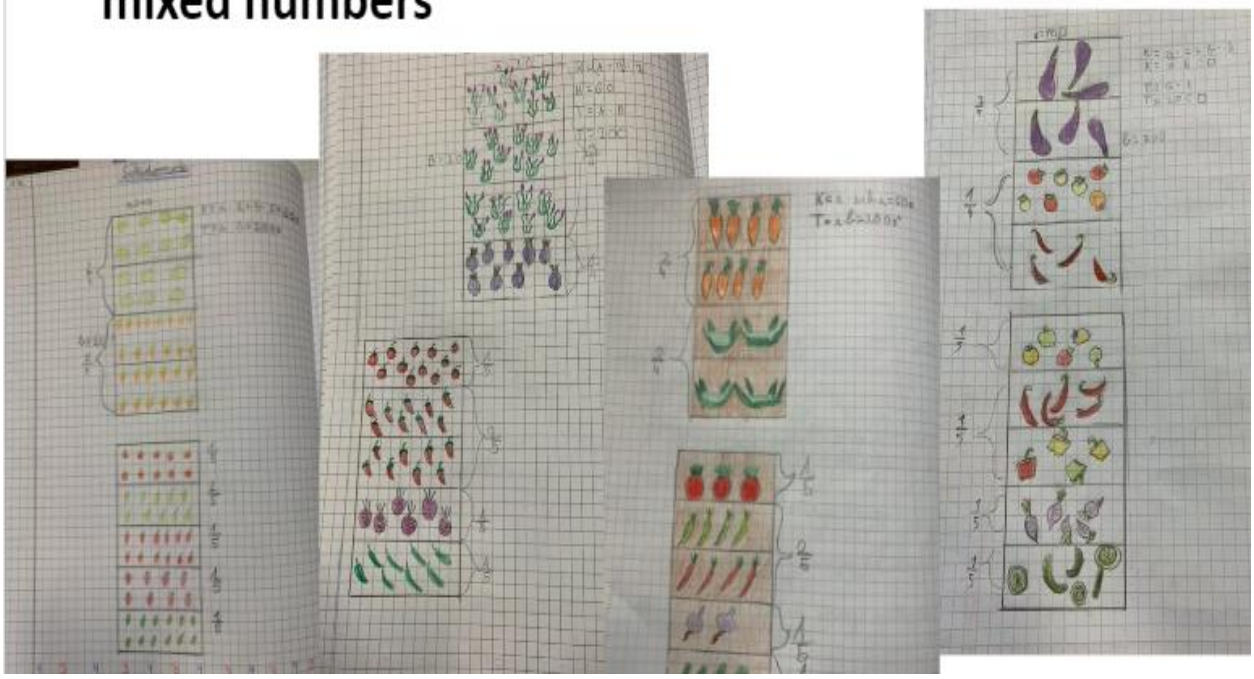




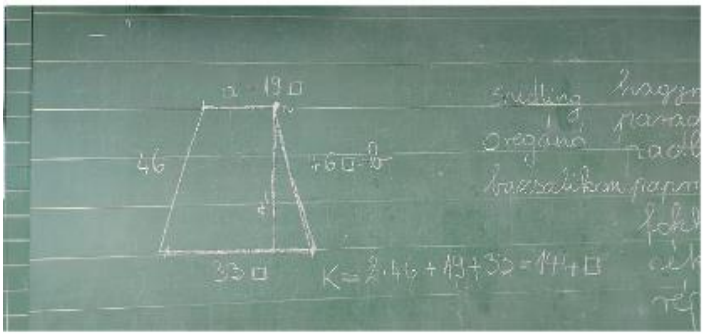




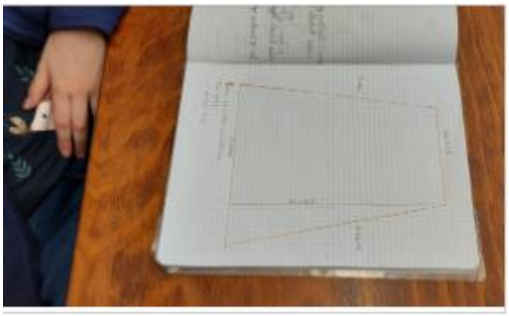
Activity 1: Identify and model fractions and mixed numbers



Activity 2: Mapping the school garden using length, width, and height measurements.

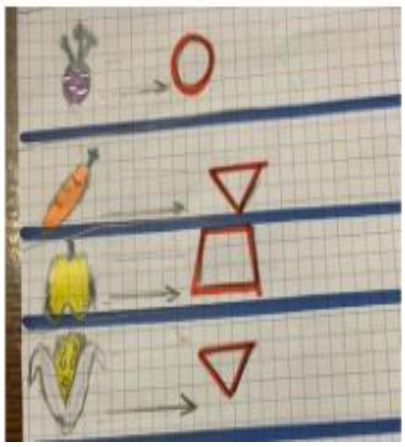


Activity 3: Calculating the perimeter and area.

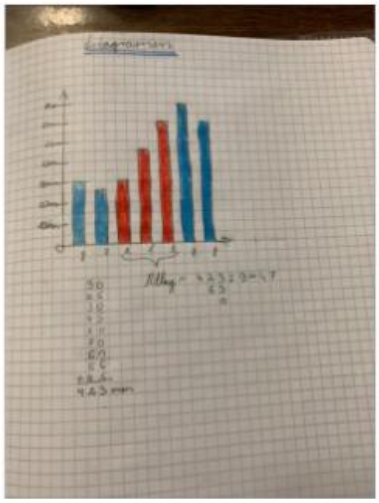


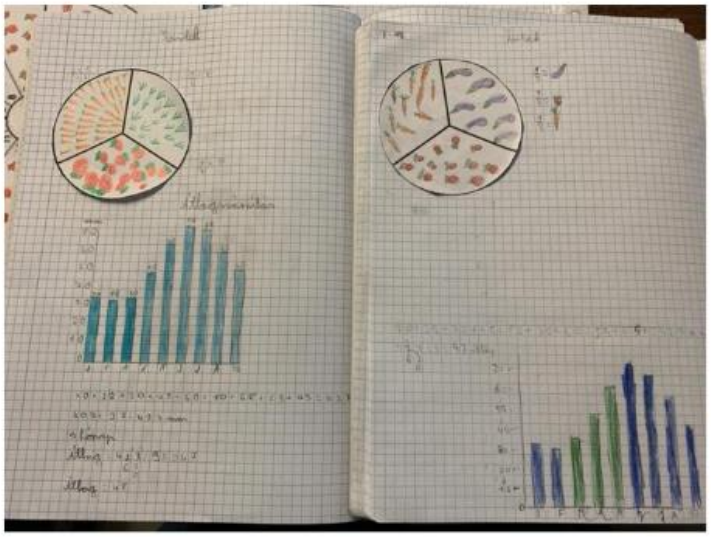
Activity 4: Identifying different geometrical shapes in the school garden

Activity 5: Identifying different geometrical shapes among vegetables



Activity 6: Collecting data and create a line graph





Activity 7: Creating plans, doing measurements, estimating.

Activity 8: Determine the rate of growth. Host a wheat race.

Activity 9: predict dates Using information from seed catalogs, predict dates of germination and maturity.

	A	B	C	D
1	növény	csírázás ideje	vetés	várható csírázás
2	paradicsom	6-14 nap	2022. 03 02.	2022. 03. 08-16.
3	paprika	8-12 nap	2022. 03 02.	2022. 03.10-14.
4	borsó	6-36 nap	2022. 03 02.	2022. 03. 08- 04. 08.
5	uborka	3-6 nap	2022. 03 02.	2022. 03. 05-08.
6	fokhagyma	10-14 nap	2022. 03 02.	2022. 03.12-16.
7	retek	3-12 nap	2022. 03 02.	2022.03.05.-14.
8	cékla	5-16 nap	2022. 03 02.	2022.03.07.-18.
9	saláta	2-14 nap	2022. 03 02.	2022.03.04.-16.
10	sárgarépa	6-18 nap	2022. 03 02.	2022.03.08.-20.
11	bab	6-18 nap	2022. 03 02.	2022.03.08.-20.
12	bazsalikom	5 nap	2022. 03 02.	2032.03.07
13	padlizsán	5-10 nap	2022. 03 02.	2022.03.07.-12.

Activity 10: Determine the weight and volume

Activity 11: Investigate prices, determine the value of the harvest

	A	B	C	D	E	F
1	növény	a termés bolti ára	tervezett mennyiség	bevétel		
2	paradicsom	1350 Ft/kg	6 kg	8 100 Ft		
3	paprika	1200 Ft/kg	5 kg	6 000 Ft		
4	borsó	600 Ft/kg	2 kg	1 200 Ft		
5	uborka	1000 Ft/kg	3 kg	3 000 Ft		
6	fokhagyma	1250 Ft/kg	2,5kg	3 125 Ft		
7	retek	300 Ft/csomó (5 db)	8 csomó	2 400 Ft		
8	cékla	300 Ft/kg	4 kg	1 200 Ft		
9	saláta	350 Ft/fej	12 fej	4 200 Ft		
10	sárgarépa	450 Ft/kg	3 kg	1 350 Ft		
11	bab	400 Ft/kg	4 kg	1 600 Ft		
12	padlizsán	1250 Ft/kg	3 kg	3 750 Ft		
13	fehérrépa	1100 Ft/kg	3 kg	3 300 Ft		
14	spenót	900 Ft/kg	2 kg	1 800 Ft		
15	vöröshagyma	450 Ft/kg	4 kg	1 800 Ft		
16	zeller	300 Ft/darab	8 darab	2 400 Ft		
17				45 225 Ft		
18						

3. MEAN, MEDIAN AND MODE OF FLOWERING AND PODS OF OUR FAVA BEAN PLANTATION

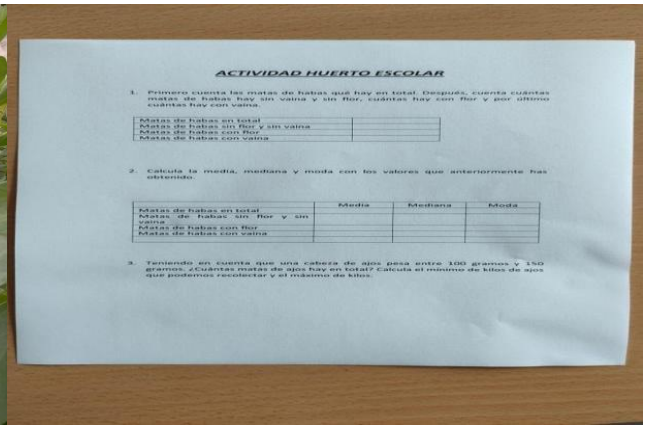
ACTIVITY:

2 theoretical sessions: The teachers, in two theoretical sessions, have explained to the students the concepts of mean, median and mode. Now they will have to put them into practice according to the number of broad bean plants in our vegetable garden, developing mathematical and social and citizenship competence.

Practical session: Students count the number of broad bean plants in the garden, developing and putting into practice mathematical competence.

Practical session and obtaining the results: Students do the calculations to obtain the mean, median and mode of our broad bean production, putting mathematical competence into practice.

PHOTO OF THE BROAD BEAN PLANTATION:



ACTIVIDAD HUERTO ESCOLAR

1. Primero cuenta las matas de habas qué hay en total. Después, cuenta cuántas matas de habas hay sin vaina y sin flor, cuántas hay con flor y por último cuántas hay con vaina.

Matas de habas en total	
Matas de habas sin flor y sin vaina	
Matas de habas con flor	
Matas de habas con vaina	

2. Calcula la media, mediana y moda con los valores que anteriormente has obtenido.

	Media	Mediana	Moda
Matas de habas en total			
Matas de habas sin flor y sin vaina			
Matas de habas con flor			
Matas de habas con vaina			

3. Teniendo en cuenta que una cabeza de ajos pesa entre 100 gramos y 150 gramos. ¿Cuántas matas de ajos hay en total? Calcula el mínimo de kilos de ajos que podemos recolectar y el máximo de kilos.

5. ONLINE RESOURCES

- Doran, J.W., Stamatiadis, S.I. & Haberern, J. 2002. Soil health as an indicator of sustainable management. *Agriculture, Ecosystems & Environment*, 88(2): 107–110. https://doi.org/10.1016/S0167-8809(01)00250-X
- Growing with Nature, https://www.growingwithnature.org/observe-your-garden/
- Leveraging Nutrition Outcomes in Schools, https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/57228/IDL-57228.pdf?sequence=2&isAllowed=y
- Metric Conversions, https://www.metric-conversions.org/pt/tabela-de-conversao-metrica.htm
- Model nutrition gardens, http://www.fao.org/home/en/
- MOURA, Manoel Oriosvaldo de. O educador matemático na coletividade de formação: uma experiência com a escola pública. 2000. Tese (Livre Docência) – São Paulo, SP, Faculdade de Educação, USP, 2000.
- Organic Garden, https://www.gardenorganic.org.uk/
- Project Learning Tree, http://www.plt.org
- Schools – the beginning of the end of malnutrition, http://www.fao.org/zhc/%20detail-%20events/en/c/462548/
- School Gardens significantly increase science achievement scores. - Klemmer, C. D., T. M. Waliczek, and J. M. Zajicek. 2005. Growing minds: The effect of a school gardening program on the science achievement of elementary students. HortTechnology15(3):448-452.
- Soil Calculator, https://www.gardeners.com/how-to/soil-calculator/7558.html
- http://peersforprogress.org/learn-about-peer-support/what-is-peer-support/
- https://ecohuertosescolares.eu/guiasrecu
- https://www.metoffice.gov.uk/weather/learn-about/how-forecasts-are-made/observations/weather-stations
- https://www.metoffice.gov.uk/weather/forecast/eyckrb1nv#?date=2021-09-13
- https://www.earthnetworks.com/resources/weather-facts/automated-weather-stations/#for-schools

Project Partners:

YARD4ALL