



Case Study 05

Basic data

Title of Research Teaching Unit	Environmental issues – Recycling materials
Unit created by	Istituto Comprensivo “Malaspina” – Massa (IT)
Based on Concept	Environmental concerns
Concept created by	University of Vienna (AT)
Date of teaching	18.01.2024
Number of students in class	22
Number of migrant students	2

1. Unit Description of Research Teaching Unit

Title	Environmental issues – Recycling materials
Age of students/grade	Grade 7
Length of the unit	2 hours
Mathematical topic	Applying Mathematics in real-world problems – it deals with many mathematical skills as reading and interpreting graphs with data, using percentages, working with different units of measurement, using very high numbers where scientific notation is used
Prerequisite knowledge	<ul style="list-style-type: none">Percentages (using proportions in a proper way in order to calculate rate, value, starting value, percentage increase)Knowing the most important graphs where they can represent numerical data (hystogram and bar chart, pie chart, tables)
Materials needed	<ul style="list-style-type: none">StationeryTape measure
Objectives	<ul style="list-style-type: none">Improving text understanding.Applying Mathematics in real-world problems.Strengthening students' ability to collaborate with each other to tackle complex tasks.
Notes on work with migrant students	<ul style="list-style-type: none">Starting with brainstorming about environmental issue and check wheter the matthematical data in the article proposed have been understood by the students or there are technical words which are difficult or even unknown. These words could be written on the blackboard where they can easily be seen during the lesson.Working on reality tasks will be developed in small groups in order to foster students' involvement and social relationships.At the end of the activity, the students will show the results in front of the whole class and will add, if it is profitable, something about their own personal experience.

Lesson plan

Step 1- Brainstorming and choice of the article or another scientific text which deals with an environmental topic chosen by the students

Here there are some links of articles about environment which can be used:

- <https://www.ecodallecitta.it/i-dati-eurostat-sul-riciclo-imballaggi-plastica-eurostat/>

It deals with recent Eurpean data about packaging waste, its type, its distribution.

- <https://quifinanza.it/green/consumo-medio-acqua-quanto-ammonta/508463/>

It deals with the use of water per person and it helps to raise awareness of a more conscious use of this precious resource.

- <https://altreconomia.it/>

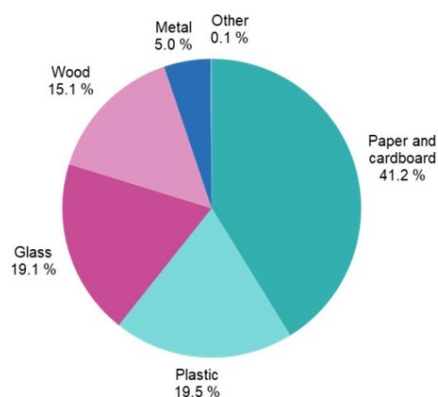
This article focuses on food waste and provides alarming data on the habits of Europeans

Step 2 - Text analysis

Starting from the article chosen, the teacher proposes some questions to which the students try to answer, working in groups.

Example developed on the topic of packaging

Packaging waste generated by packaging material,
EU estimate, 2020
(%)



Source: Eurostat (online data code: env_waspac)

eurostat 

Figura 1: Rifiuti di imballaggio generati dal materiale di imballaggio, UE, 2020
(%)

Fonte: Eurostat (env_waspac)

For example:

- ☐ How many chart types are there in the analyzed text?
- ☐ Why is the pie/circular chart used for the distribution of materials (see above) and why the bar chart for “Packaging waste generated and recycled”?
- ☐ If the total volume of packaging is 79.3 million tonnes, how many million tonnes of paper and card board waste have been produced?
- ☐ If paper and card board waste has increased by 25,2 % since 2009, how big was its production in 2009?
- ☐ The directive on packaging waste sets a target for plastics at 22.5 %. If this target will be reached, how much plastic does each one of us have to recover in a year?
- ☐ Think about your family’s daily habits.... Do you think you can achieve this goal? (Motivate and defend your answer)

Step 3 - Oral presentation to the class

All data taken from the text, which answer the guide questions proposed by the teacher or the questions asked by the students themselves, are organized in a schematic text that will then be proposed to the class with the details of the mathematical formulas used and the step by step reasoning that led to the answers. Each student can add a link, if he/she wants, with good practices of behaviour or considerations on their home country, or some improvement on their habits.

2. Interview Analysis

The teacher teaches also Sciences. The length of her teaching experience is 14 years and the length of her mathematics teaching practice is 10 years.

The training for teaching in multicultural classrooms in her initial teacher training was some theoretical lessons about inclusion and students' involvement.

In her in-service teacher training she never received any training for teaching in multicultural classrooms.

She has taught mathematics to migrant students] before, because in recent years she always had 1 or 2 foreign students in her classrooms.

The most frequent problem she has always encountered is that migrant students have poor or partial schooling. Consequently, even if they are clever, they don't have prerequisite knowledge to attend the lessons properly. In addition, students are not so often interested in Maths or scientific subjects, also due to a "low" familiar context, and they don't study so much at home.

The main advantage of having migrant students in the classroom is that you can be in touch with different situations and habits, which is a constant stimulus to knowledge and respect. Another positive aspect is that you have to find alternative ways for working in class (which should be more practical or should concern a different communication code) and these ones are often useful also for other students.

When she has migrant students in her classroom, the main change in her teaching strategies is working in groups and peer tutoring. In addition, her lessons become a little bit more practical and laboratorial.

3. Improvement Suggestions

Some parts of the lesson plan were replaced by different activities/materials:

a) Original:

- Students' choice of a web article about environment
- Questions (as a starting point to apply Maths) are asked by students

Replaced by:

- The teacher proposes some articles about environment, which deal with issues that have been discussed during Science lessons;
- Most of the questions (as a starting point to apply Maths) are asked by the teacher.

Reason:

- Mainly due to lack of time and the need of creating a sort of link among the discussed topics.

b) Original:

- Schoolbook

Replaced by:

- The charts and the starting data from which students had to obtain information were in the articles

c) Original:

- Creation of posters

Replaced by:

- Oral presentation

4. Classroom observation

At the beginning, the charts in the text were copied on the notebook by each student to have a better reasoning about scale ratio and datas' order of magnitude.

The activities with the mathematical formulas and the answers for each question are developed in small groups (4/5 students each) to foster all students' involvement and a constant dialogue among them.

The obtained data are analyzed according to students' personal experience to let them think about their role in responsible consumption.

At the end, each group spoke about the reasoning developed to answer the questions and their personal final observations.

The work was organized in homogeneous groups (4-5 students each). The whole class involved.

Cross-links were made with the discipline "Citizenship": the linking topic is the responsible use in terms of resources and/or the actions everyone can take in everyday life to help environment.

Students fairly participated in the lesson, especially in the first half of the activity and they cooperated in finding the solutions.

The working climate was positive, but the teacher had to intervene in order to involve all students.

Compared to other teaching units, there were differences in attitude between students and students, because they cooperated more.

From a motivational point of view (attitude / interest / commitment), working in groups to solve real problems was suitable for all students, because peer tutoring helped the students in troubles. However, probably there could have been more interest if the activity had been concluded with a concrete action.

From a cognitive point of view (increase in the level of learning), students enhanced the use of the formulas and their reasoning about problems, but some students found it difficult to answer questions about specific words in the articles because they did not know them.

No evaluation tests were administered.

The proposed teaching unit made it possible to carry out an effective recovery effort for students in difficulty, because group working led the students to overcome some difficulties in Maths, but also in text comprehension.

The teaching unit made it possible to carry out an effective stimulus action for the brightest students: they were proud about sharing their ideas, being the spokesperson in their own group and in the final presentation of the work.

The main methodological choice and inclusion strategy used for pupils with a migratory background was to provide them with formularies with the translation of the words used in Geometry.