Cap sur l'école inclusive en Europe

Erasmus+

Pedagogical Sheet

MATHEMATICS: Exploration and classification of forms

Section of the module /E

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1. **Context**

Ordinary and specialized classes

2. **Goals**

- Advancing every pupil's skills in mathematics.
- Exploring and classifying shapes
- Introducing and developing the mathematical language to talk about forms
- Learning in a playful way by using the game of the mystery bags to practice and to evaluate the acquisition of mathematical language

This sheet's main theme is to help pupils develop and use a mathematical vocabulary for shapes.

- To do so, you will use open sorting activities to explore shapes knowledge.
- You will develop practical ways to help the pupil in the language discovery or "register" of mathematical terms.
- Practical activities make it easier for children to understand and use mathematical descriptions of basic geometric shapes.

Shape analysis or exploration of geometry with your pupils can be very rewarding. The adoption of a practical strategy and the use of objects in pupils' environment can help to motivate and interest pupils.

In this section, you will use everyday objects to help pupils develop important geometry skills, such as recognition, visualization, description, sorting, appointment, classification, and comparison.

This sheet is a guide to help you as a teacher to work in a fun and visual way with children.

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3. **<u>« Best practice conduct</u>**

- **Team composition:**

Teacher and/or AVS (Auxiliaire de Vie Scolaire, i.e. school life auxiliary), AES (Accompagnant Educatif et Social, i.e. educational and social attendant)

Group of 5 to 6 pupils maximum.

Material: Visible at the end of the presentation.

Duration: To be adapted according to pupils' fatigability

<u>Title of Educational Activities :</u> "Mystery Bag Game"

<u>Step 1:</u> Exploration and classification of forms

To begin, you will need to gather a range of resources that may be useful for this game's activities (see below: Using Mystery Bags). You can collect and keep a box of such objects as a permanent resource. Your pupils may appreciate helping you gather resources and "look for shapes" in everyday life. (Remember to value participating pupils and take the opportunity to talk about the shape of the objects they bring.)

<u>Using mystery bags:</u>

Teachers must plan and adapt this workshop to pupils' level or needs.

The mystery bags or boxes that you (or your pupils) can easily craft (see below) can be used throughout the program to develop your pupils' observations and language skills. In mathematics, it's a good way to help pupils explore the properties of shapes and objects. In science, you can explore the textures of materials. The use of a bag or a mystery box is a great way to motivate pupils because participation in the game, the need to listen carefully and the desire to guess the right answer stimulate and interest them.

Suggestions of objects for activities on forms

You can use different cubes (dice, blocks), rectangular prisms (boxes, wooden blocks) triangular prisms (wooden corners, boxes of fancy chocolates), spheres (balls), pyramids (wooden or plastic), rolls (rolls of toilet paper, pens, pegs), cones (party hats, ice cream cones). You can also include one or two irregularly shaped or semi-irregular objects (stones, shells, leaves) to stimulate discussion. All these objects can be collected locally to establish a link between mathematics and the environment.

Making a mystery bag

For this task, you can use a non-transparent paper bag or you can sew a cloth bag 30 cm by 30 cm, open at one end. The top of the bag must be able to be closed and opened to place the objects and allow the pupil to put his hand to touch the object; however, you must check that no one else can see what is in the bag. You can use a bungee cord or a drawstring to close the top of the bag.

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Game's rules

This game consists of hiding interesting and different objects (that your pupils know) in the bag or the mystery box. You can use regular shaped bowls or pots, tools or even food boxes.

A pupil comes in front of the classgroup and puts his hand in the bag or mystery box to touch an object. He doesn't take it out nor show it to other students.

The pupil thinks very carefully about ways to describe the object without mentioning its name. He uses the sense of touch to list and describe his observations. It must remain very scientific and mathematical. He must take into account the properties of the object. He must think carefully about the shape and size of the object.

Whenever the pupil makes an observation, another pupil in the class has a chance to try to guess the object.

While this is happening, the teacher can take the role of scribe (or secretary) to record observations and inferences on the board or on a large paper sheet. Only the main points are noted.

The game continues until a pupil correctly guesses the object. The object can then be removed from the bag or box and shown to the rest of the class.

It is important to spend some time talking about the accuracy of observations - mathematical language skills, descriptive effectiveness, communication skills and inference quality.

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Step 2: **Helping children sort out everyday objects**

Gather as many objects of different shapes as you can. You need at least two objects per pupil. You can also use photos of shapes in the environment.

- Divide the class into groups of five or six pupils and give each group a selection of objects (see using mystery bags)
- Explain what a "set" is: a collection of items with common characteristics. For example, the class is a "set" of pupils who have a teacher in common - you. This "big set" can be divided into smaller sets. For example, a set of boys and a set of girls. (If you wish, you can physically separate pupils to form these two sets and illustrate your argument.)
- Explain to the groups that you have given them a set of different items. You want them to classify these objects into smaller sets. Ask them the following question: How many different ways are there to sort these objects into sets? The task becomes an "open" task - do not specify the number of sets or criteria.
- Ask them to explain why they sorted the objects this way in each set.
- As pupils work, watch them and listen to their discussions within groups, carefully noting what they say. This will help you identify those with clear ideas and those who are still in the stage of ideas exploration.
- Ask each group to share different ways of sorting objects and to write down the main characteristics on the board.

Step 3: **Introducing and developping mathematical language to talk about forms**

After introducing the concept of sorting objects and asking pupils to describe features in "everyday" language, it is time to develop a more mathematical way of describing some of the characteristics of objects.

In all areas of activity, people develop special words and terms to describe what they do. The special language of mathematics is sometimes called the mathematical register. It will take time to introduce the language of forms to pupils; you will need to incorporate this activity into your lessons over time. When your pupils have understood the concepts behind the names, the time will come to introduce them to mathematical words. In addition to using these words in practice, you can also ask your pupils to start creating a "mathematical dictionary" to help them memorize the meaning of these terms. **Resource 1: A mathematical dictionary** gives six examples of the types of words that pupils can use to describe the forms they work with.

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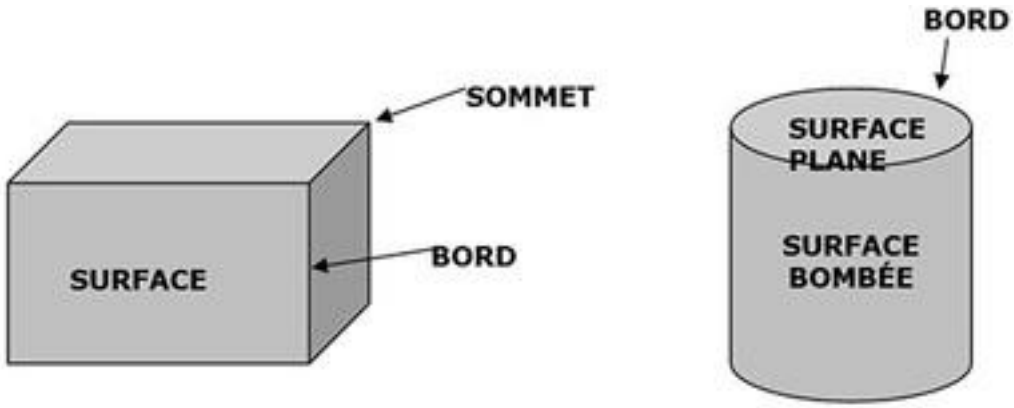
Resource 1 : A mathematical dictionary

A resource teachers should plan and adapt to pupils' level or needs

There are many on the market. Stella Baruk's Dictionary of Elementary Mathematics is of good quality.

Here are some words about geometry:



- **Curved surface (*Surface bombée*)**
- **Edge (*Bord*)**
- **Surface**
- **Flat surface (*Surface plane*)**
- **Vertex (*Sommet*)**

Pupils can record their own definitions of each word and check with peers or you if they are not sure that their definition is correct.

Step 4: Describing geometrical objects

- Using a selection of collected objects, group the pupils around you and show them some of the objects.
- Show them one object with a flat surface, then another with a curved surface.
- Ask pupils to choose other objects with flat surfaces or curved surfaces.
- Have pupils get back to their group and give each group a selection of items.
- Their task is to place each object in one of these four sets:
    - All flat surfaces;
    - All curved surfaces;
    - Flat and curved surfaces;
    - Others.
- You can develop this activity by introducing two other terms: « vertex » and « edge » and by using these terms to sort objects
- Make a table of their results that will be displayed in the classroom.

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<u>Step 5:</u> Using the game of mystery bags to practice and evaluate the acquisition of mathematical langage

One way to assess whether your pupils have learned to understand and how to use the description language of forms is the use of "mystery bags". A pupil must carefully describe an object hidden in a bag. The pupil must use the special words he has learned; other pupils should try to guess what is the object described. Pupils should visualize the shape in the bag and correctly use the simple geometric terms they learned to "win" the mystery bag game. It is important to organize this activity so that all pupils are involved. Indeed, if done well, more pupils will learn better.

<u>FINAL STEP:</u> Using the mystery bag to think about forms

First of all, prepare your mystery bag or mystery box. You need a bag or box where you put an object and in which a student can put his hand to touch the object, without seeing it.

You can use one mystery bag for the whole class or, if your class is large, several bags to allow several groups to work at the same time. This allows more students to participate.

Then start the game.

- A pupil must touch the object in the bag (or box) and, without taking it out, describe it very carefully to others. The pupil must not name the object.
- He has to say things like "all its surfaces are flat, it has so many angles, it has so many flat surfaces" and so on.
- The description continues until a pupil thinks he or she has guessed the object.
- If the answer is correct, the object is taken out of the bag and the pupil who correctly guessed is the one who touches the next object (give only one chance to each pupil).
- Encourage your pupils to use the vocabulary learned in previous activities to describe the objects. Ask them to add them to their mathematical dictionaries.

4. <u>Activity evaluation</u>

This activity requires a quiet environment and a limited number of pupils to reduce anything that can help distract the child. This activity can be easily diversified and does not require a very high cost in its design. These activities have the advantage of addressing enumeration with children with different cognitive profiles.

5. <u>Limitations</u>

<u>Mystery bag game:</u>

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- During the activity, check that all pupils are attentive and allow only one pupil at a time to speak so that all can reflect on what each person is saying.

- Choose mystery objects according to the child's abilities

- The size of the group is limited

- Carefully choose objects to obtain variations of shapes

Each teacher must take care to limit situations of failure for the child because he can quickly become discouraged.

6. Prospects

Possibility of diversifying the objects by integrating other physical properties and working on the 5 five senses.

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