



**Dofinansowane przez
Unię Europejską**

Erasmus+ project "Developing selected competences of key students in lessons and in school extracurricular activities"

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SCENARIO OF A DEMONSTRATION LESSON CARRIED OUT AS PART OF THE ERASMUS+ PROJECT

STAGE OF CLASSES FOR GRADE VII OF PRIMARY SCHOOL

HOST: Małgorzata Ambrosiewicz

TOPIC – Application of double-sided lever and straight machines in mathematics. Can an ant swing with an elephant?

1. LEARNING OBJECTIVES - GENERAL REQUIREMENTS (according to the Core curriculum)

- Recognizing and marking simple machines, with particular emphasis on double-sided leverage.
- Understanding the principles of leverage and using them in practice.
- Shaping teamwork skills, inferences and solving technical problems.

2. TEACHING CONTENT - SPECIFIC REQUIREMENTS (according to the Core curriculum)

- What is double-sided leverage and what applications does it have in everyday life.
- Equilibrium conditions of the double-sided lever.
- Examples of simple machines and their functioning based on experience.

3. OBJECTIVES FORMULATED IN THE LANGUAGE OF THE STUDENT

- I can explain how a double-sided lever works.
- I can check if it is possible to adjust the balance of the lever with the help of an elastic band and a paper clip.

- I skillfully perform calculations related to masses and distances from the fulcrum.
- I work in a team, sharing tasks and drawing conclusions.

4. NACOBESU

- Why is leverage an important simple machine?
- In what situations in everyday life can we use leverage?
- What do we need to know to build a lever that can support the weight?

5. METHODS, TECHNIQUES AND FORMS OF WORK

- Problem method (testing whether an ant can swing with an elephant).
- Experience (rubber band and paper clip balance test).
- Work in groups of 2 people.
- Discussion and conclusions in the classroom.
- Working with worksheets.

6. KEY COMPETENCES VALUED DURING LESSONS

1. Communication in the mother tongue – discussion, explanation and presentation of results.
2. Mathematical competences and basic scientific and technical competences – calculations, recognition of equilibrium conditions.
3. IT competence – use of multimedia materials (e.g. illustrations, films).
4. Learning ability – independent experimentation, drawing conclusions.
5. Social and civic competences – teamwork, sharing tasks.
6. Initiative and entrepreneurship – creative problem solving.
7. Cultural awareness and expression – recognizing the importance of simple machines in everyday life.

7. ADAPTATION TO STUDENTS WITH SPECIAL EDUCATIONAL NEEDS (SPE)

- Dividing the class into groups of 2 people, adapting the tasks to the students' abilities.
- Use of handling materials (rubber bands, paper clips).
- Supporting the teacher in performing experiments and calculations.
- Simplified worksheets with step-by-step instructions.

LESSON PLAN:

1. Introduction (10 min.)

- The teacher presents the question: "Can an ant swing with an elephant?"
- Shows an illustration of an ant and an elephant, referring to simple machines.
- A short conversation about what leverage is.

2. Research part – experience (15 min)

- The students in pairs check if the balance of the elastic band and the paper clip can be adjusted to simulate the mass of an ant and an elephant.
- A question for students: "What must happen for leverage to be in balance?"
- The teacher instructs to write down the condition of equilibrium:

$$masa_1 \cdot odległość_1 = masa_2 \cdot odległość_2$$

3. Calculations and conclusions (15 min)

- Students perform calculation tasks on worksheets, e.g.:
 - If the ant weighs 0.2 g and is 10 cm from the fulcrum, then how much does the ant on the opposite side need to weigh for the lever to be in balance?
- The teacher discusses examples, showing how to solve tasks.

4. Summary and discussion (10 min)

- The students share their conclusions: can an ant swing with an elephant?
- The teacher explains that yes, provided that the appropriate distances and masses are used.
- Discussion of the use of leverage in everyday life.

5. Homework / Individual Work

Describe how it can be used at home or at school.

Worksheet 1:

Leverage Balance Test

Position the ruler with the elastic band and paper clip so that it is balanced. Save the result of the observation.

Worksheet 2:

Ant and elephant on a swing

Draw a swing and mark where the ant should sit and where the elephant should sit so they can swing.

Worksheet 3:

Compute Task

The ant weighs 0.2 g, it is 10 cm from the fulcrum.

How much does an ant on the opposite side have to weigh if it is 20 cm from the fulcrum for the lever to be in balance?

Hint:

$$\text{mass1} \times \text{distance1} = \text{mass2} \times \text{distance2}$$

$$0.2 \text{ g} \times 10 \text{ cm} = x \text{ g} \times 20 \text{ cm}$$

$$x = (0.2 \text{ g} \times 10 \text{ cm}) / 20 \text{ cm} = 0.1 \text{ g}$$

Worksheet 4:

Additional task

An elephant weighs 100 times more than an ant. How far from the center of the swing must an ant sit if the elephant sits at a distance of 1m?

SUMMARY:

The lesson aims to teach students the basics of operation and application of bilateral leverage in mathematics through experience, calculations and discussion, as well as to develop key competences, in particular mathematical, scientific and technical and social competences.

TEACHER'S OPINION OF THE METHODOLOGIST:

The lesson scenario I analyzed deserves a high rating for several reasons. The script has a clearly defined goal and a topic that is consistent with the core curriculum.

It contains a variety of forms and didactic methods, such as: group work, experience, research work, which can increase student engagement and facilitate the acquisition of knowledge.

The way the problem is introduced enriches the lesson and helps students to better understand the topic being discussed. Students independently look for a solution to a problem and share their knowledge with others.

The scenario includes a summary phase (evaluation), which will allow the teacher to assess how well the students have absorbed the material. Willing students can summarize and expand their knowledge by completing an additional worksheet at home.

In conclusion, the math lesson scenario is well thought out, engaging, and varied, which will contribute to effective learning and develop interest in math and science among students.

Bożena Cudowska

APPROVAL BY THE SCHOOL PRINCIPAL

The script received a positive assessment - I approve it for implementation.