

# STEMkey

## Module IO8



## Electricity

### Activity 3 - Electrical equipment

This Worksheet document is based on the work within the project “Teaching standard STEM topics with a key competence approach (STEMkey)”. Coordination: Prof. Dr. Katja Maaß, International Centre for STEM Education (ICSE) at the University of Education Freiburg, Germany. Partners: Charles University, Constantine the Philosopher University, Hacettepe University, Institute of Education of the University of Lisbon, Norwegian University of Science and Technology, University of Innsbruck, University of Maribor, University of Nicosia, Faculty of Science of the University of Zagreb, Utrecht University, Vilnius University.

The project STEMkey has received co-funding by the Erasmus+ programme of the European Union under Grant Agreement Number 2020-I-DEO1-KA203.005671. Neither the European Union/European Commission nor the German Academic Exchange Service DAAD are responsible for the content or liable for any losses or damage resulting of the use of these resources.

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### III. Electrical equipment

#### Activity 3. Electrical equipment



Work in pairs



120 min

#### Learning Outcomes

**Knowledge:** Check electrical conductivity of different materials and good electrical, using an electrical circuit.

**Skills:** Plan an investigation to investigate a research question, observe and record the results, critique experimental design and draw conclusions.

**Attitudes:** Foster creativity during the planning, investigation and find solutions/explanations to the research question.

Pre-service and in-service teachers should apply previous knowledge on series and parallel circuits. Describe the function of different components of a circuit and use proper symbolic representation.

#### Session description

To engage pre-service and in-service teachers, the activity starts with a text regarding electrical engineers' career. After that, pre-service and in-service teachers are suggested to work in groups with the goal of investigating a research question: Is there a safe way to electrical engineers' test which materials are adequate without being electrically shocked? Then, they analyse it and plan an activity to solve the problem. They also have to collect data and draw conclusions. All pre-service and in-service teachers, should participate in the discussion of the results, suggesting ongoing paths, pointing research problems and how they can be organized. The final challenge involves three questions. In the first one, they have to search and write the meaning of electrolytes. In second question, they prepare a water-based electrolyte and test its electrical conductivity with the experiment you have planned. Lastly, they explain why the human body is a good conductor of electricity.

#### Interdisciplinary Approach

The activity shows the close relationship between physics, biology, math and technology and show how pre-service and in-service teachers can develop responsibility in their own learning, as well as develop emotional and scientific literacy.

## Activity 3: Electrical equipment



### Worksheet

Read the following text:

Electrical engineers work on electrical equipment. They design equipment such as communication systems, navigation systems, energy production systems, motors, and radar, as well as equipment that is directly related to power generation and distribution. In addition, they develop the equipment, oversee its manufacturing process, and then test it before it is made available to the consumer. Different careers are available for electrical engineers. For example, in communications systems they would develop equipment that transmits digital signals to cell phones. They would also design electrical grids that would help conserve energy. In energy production systems, they would develop sustainable energy technology for harvesting power (Sawah & Clark, 2017, p. 57).



**As mentioned in the text, electrical engineers work on electrical equipment. Is there a safe way to electrical engineers' test which materials are adequate without being electrically shocked?**

1. Predict what are the materials tested by electrical engineers without being electrically shocked.
2. Plan an experiment (materials to use and procedure) that will allow you to test the materials.  
Write your plan (you can use representations).
3. Test the materials and organize the information.
4. Identify two categories of materials tested.
5. Search how the categories identified in the previous question are scientifically designated.
6. Write which tested materials you would use to work on electrical equipment without being electrically shocked and explain why.

Even though the human body is a conductor (because it's made of mostly water that has electrolytes) it's a poor conductor when using a power source like a battery. That's why it's safe to place a finger in the circuit. Do not use a power source like an electric outlet (Sawah & Clark, 2017, p. 56).

7. Search the meaning of electrolytes. Write its meaning.
8. Prepare a water-based electrolyte and test its electrical conductivity with the experiment you have planned.
9. Explain why the human body is a good conductor of electricity.

Reference: Sawah, R., & Clark, A. (2017). *What's your STEM? Activities to discover your child's potential in science, technology, engineering, & math*. Adams Media.

