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| ACTIVITY PLAN | | | | |
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| **Theme** | **Subtopic** | **Activity Title** |
| Global and Local Perspectives in Environmental Education | Local Environmental Challenges and Solutions | A small oxygen factory of aquatic plants |

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| Introduction part (or activity overview) |
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| **Introduction part (or activity overview)** | Students, with an in­ter­est­ing and en­ter­tain­ing ex­per­i­ment that lies on the bor­der­line of two sciences – chem­istry and bi­ol­o­gy, eas­i­ly produce pure oxygen through the process of photosynthesis by aquatic plants, a small oxygen generator. |
| **SETTING** | А chemical cabinet with appropriate equipment for conducting bio - chemical processes or a classroom with the necessary equipment and materials  Еducational context: teamwork and learning. |

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| Materials Needed |
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| **Materials Needed** | So­lu­tion of bak­ing soda (5 g/L), wa­ter plant (in our case it is wa­ter­weed), beaker, fun­nel, test tube, match or splin­ter, lamp, phones, computer. |

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| **Learning Outcomes** | - Encourage local environmental challenges and solutions.  - Reinforce the awareness that everyone can contribute to environmental sustainability.  - Develop teamwork and environmental conservation skills.  - Enhance research skills for global and local perspectives in environmental education. |  |
| **Activity Contents** | **Activity 1:** **The meaning and role of oxygen and clean air for healthy living**  **Theoretical part (Duration: 15 minutes):** Discussion on improving air quality by planting trees, numerous plants and green areas. Students research the process of photosynthesis online, discover the meaning of oxygen released during the process of photosynthesis.  **Task (Duration: 60 minutes): Preparation for demonstration**  Step 1: Working in groups. Еach group to prepare laboratory equipment and reagents for experimentation.  Step 2: Have each group state a hypothesis and expected results of the photosynthesis experiment.  Step 3: Giving suggestions on how to make oxygen at home with a help of pants.  **Activity 2: Photosynthesis and significance for the environment**  **Theoretical part (Duration: 20 minutes):** Watching and discussing a video of a small oxygen factory – plants, description of the experiment and method of performance.  Duration: Approx 1min 13sec  https://www.youtube.com/watch?v=Uiuct-2yAxA  Pro­cess­es de­scrip­tion : Pho­to­syn­the­sis is a com­plex chem­i­cal process in which light en­er­gy trans­forms into the en­er­gy of chem­i­cal bonds, or more sim­ply it is a process in which car­bon diox­ide and wa­ter trans­form into or­gan­ic sub­stances and oxy­gen un­der the im­pact of light: СО₂ + Н₂О → Or­gan­ic sub­stances + О₂  **Task 1 (Duration: 60 minutes): Demonstration of an experiment**  Step 1:Take an aquatic plant, place the wa­ter plant in the beaker, cov­er it with a fun­nel and fill the beaker with the salt so­lu­tion.  Step 2: Submerge it in a solution of baking soda which serve as a source of carbon dioxide  Step 3: Place a test tube filled with a water into the funnel.  ( After 15 minutes under a bright light the plant will be covered with oxygen bubbles, they   accumulate in the test tube, displacing the water )  Step 4 :Turn on a bright light and wait for around two to three hours. Af­ter the test tube fills com­plete­ly, care­ful­ly re­move it from the fun­nel and hold a smol­der­ing splin­ter or match up to it. Watch the splin­ter burn.  When exposed to light, photosynthesis takes place in the plant. During the process, carbon dioxide and water turn into organic compounds and oxygen. Two hours later the gas will fill the hole test tube.  Step 4: Prove the presence of oxygen  It is easy to prove the pres­ence of oxy­gen – just low­er a smol­der­ing splin­ter or match into the test tube and it will im­me­di­ate­ly flare up, as oxy­gen is a gas that sup­ports com­bus­tion. Why the so­lu­tion of bak­ing soda is re­quired: as the car­bon diox­ide in the air dis­solves poor­ly in wa­ter, to in­crease its con­cen­tra­tion we can use car­bon­ates or bi­car­bon­ates, which by their na­ture are salts of car­bon­ic acid (CO₂・H₂O).  **Task 2 (Duration: 30 minutes):** Final Work. Reflection. Students write equations for the photosynthesis process, draw the photosynthesis graph and make a poster.  The overall reaction in which carbohydrates—represented by the general formula (CH2O)n—are formed during plant photosynthesis can be indicated by the following equation:  light  CO2 + H2O --------→ ( CH2O )6 + O2 + H2O  green plants |  |
| **Assessments** | The reflection will be evaluated through the self-evaluation method.  The evaluation segments are contained in the evaluation table, which includes: Proper handling of laboratory equipment and reagents, equations for the photosynthesis process, graph and poster, description of the process of photosynthesis and producing an oxygen, skills in presenting about Local Environmental Challenges and Solutions.  All students in the class can be included in the evaluation. |  |
| **Key Competences** | * Cognitive competence * Creativity competence * Communication competence * Social, emotional and healthy living competences * Digital competence |  |
| **Connections with Eco STEAM** | **E**co - improvement of air quality with the production of oxygen for a healthy environment.  **S**cience – obtaining oxygen through the process of photosynthesis.  **T**echnology – creative use of information technology.  **E**ngineering – developing a model for improving the quality of oxygen in the place of residence.  **A**rt – develop skills in the art of visualization, drawing photosynthesis cycle.  **M**ath – mathematical calculations when making a solution of bak­ing soda (5 g/L). |  |
| **References** | * <https://www.britannica.com/science/photosynthesis> * https://www.youtube.com/watch?v=Uiuct-2yAxA |  |
| **Notes** | It would be impossible to overestimate the importance of photosynthesis in the maintenance of life on [Earth](https://www.britannica.com/place/Earth). If photosynthesis ceased, there would soon be little food or other organic matter on Earth. Most organisms would disappear, and in time Earth’s [atmosphere](https://www.britannica.com/science/atmosphere) would become nearly devoid of gaseous oxygen. The only organisms able to exist under such conditions would be the chemosynthetic [bacteria](https://www.britannica.com/science/bacteria), which can utilize the chemical energy of certain inorganic compounds and thus are not dependent on the conversion of light energy. |  |
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**Activity 2 Self-Assessment Table**

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| Evaluation criteria | Points | Comments |
| Proper handling of laboratory equipment and reagents | \_\_/5 |  |
| Effectiveness of planning  Poving the set hypothesis | \_\_/5 |  |
| Writing equations for the photosynthesis process, graph and poster | \_\_/5 |  |
| Ability to act according to the plan  Description of the process of photosynthesis and producing an oxygen | \_\_/5 |  |
| Creativity Collaboration Effort  Skills in presenting about Local Environmental Challenges and Solutions | \_\_/5 |  |
| What worked |  | |
| What needs to be improved |  | |