|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| ACTIVITY PLAN | | | | |
| ACTIVITY PLAN | | | | |
|  | | | | |

|  |  |  |
| --- | --- | --- |
| **Theme** | **Subtopic** | **Activity Title** |
| 2. STEAM Integration in Environmental Education | 2.1. Science in Environmental Studies | Fairy hand |

|  |
| --- |
| Introduction part (or activity overview) |
|  |

|  |  |
| --- | --- |
|  | |
| **Introduction part (or activity overview)** | This experiment is aimed at creating fire bubbles using water, detergent and flammable gas. By mixing the ingredients and their interaction, flammable balloons are formed that release energy in the form of heat and light. When gas burns, it creates a controlled flame. Students combine these elements to prove the chemical reaction. Fire bubbles effectively demonstrate how combustion can generate pollutants. The experiment produced a strong flame and effectively illustrated the biochemical aspects of combustion-induced pollution. |
| **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. |

|  |
| --- |
| Materials Needed |
|  |

|  |  |
| --- | --- |
|  | |
| **Materials Needed** | Glass container with water, liquid soap, flammable gas, lighter. |

|  |
| --- |
|  |
|  |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **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:** **Preparation for an experiment**  **Theoretical part (Duration: 15 minutes): Discussion of the combustion process and the products of the combustion process**   * Discussing air pollutants, finding ways to purify the air by reducing all pollutants, including the combustion process. * Students research on the internet about the combustion process and all the negative consequences of the combustion products, depending on the combustion reactants.   **Task (Duration: 90 minutes):**  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 experiment.  Step 3: Giving suggestions how to reduce air pollutants.  **Activity 2: Demonstration of an experiment**  **Theoretical part (Duration: 20 minutes):** Watching and discussing a video of a fairy hand, description of the experiment and method of performance.  Duration: Approx. 1 minute  https://www.youtube.com/watch?v=bRm4POS7Rv4  Pro­cess­es de­scrip­tion: Some liquid soap is poured into a glass container with water. The solution is stirred. A flammable gas is passed through the solution. After dipping a hand in the solution, the experimenter collects some foam in the palm of the same hand and ignites it. The foam burns without burning the experimenter’s hand!  **Task 1 (Duration: 60 minutes): Demonstration of an experiment**  Step 1: Prepare the mixture, combine water, flammable gas and soap. The soap helps create bubbles that will be placed on the demonstrator's hands.  Step 2: Ignite the mixture, causing the flammable gas to burn, which creates a controlled flame in the container.  Step 3: Cover the hands of the demonstrator with soap bubbles containing water from the mixture.  Step 4: Demonstrate the Leidenfrost effect: With soap bubbles covering your hands, insert them into the container with the burning gas mixture. As the soap bubbles come into contact with the hot gas, the water in the bubbles evaporates, creating a protective layer of steam around the person's hands.  The vapor layer insulates the person's hands from direct contact with the burning gas, preventing them from burning.  Step 5: Watch the soap bubbles break up around the person's hands as they dip them into the container, demonstrating the protective effect of the Leidenfrost effect.  **Task 2 (Duration: 30 minutes):** Final Work. Reflection. Students answer questions about endothermic and exothermic reactions, discuss the reason why the flame from this experiment does not cause burns, draw a poster on this topic.  Reactions that absorb heat are called “endothermic reactions,” while reactions that release heat are referred to as “exothermic reactions.” For example, combustion is an exothermic process, which is why we feel heat emanating from fire. Meanwhile, water evaporating or ice melting are examples of endothermic processes. This experiment involves both types of reactions – when the flammable gas in the foam burns, a large amount of heat is released, which is immediately spent on evaporating the water covering the hand. As a result, the fire does not burn the hand! |  |
| **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, drawing poster, description of the process, skills in presenting about Science in Environmental Studies. 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** | **Eco** - improvement of air quality by reducing air pollutants.  **S**cience – demonstration of the combustion process.  **T**echnology – creative use of information technology.  **E**ngineering – developing a model for improving the quality of the air.  **A**rt – develop skills in the art of visualization, drawing poster.  **M**ath – mathematical calculations when making a solution. |  |
| **References** | * https://www.youtube.com/watch?v=bRm4POS7Rv4 |  |
| **Notes** | In order to control air pollution, it is necessary to take measures to reduce the emission of polluting gases and particles. This implies legal and technological measures such as the establishment of national and international legal provisions to reduce emissions. A monitoring system is also important to assess air quality and detect important changes. The main permanently monitored air pollutants are frequent, such as CO2, O3 and pollen in the air. Physical contamination - one of the most serious health risks associated with air pollution is the presence of particulate matter in suspension. The most dangerous are those with a diameter of less than 10 μm (0.01 mm), these particles can penetrate deep into the alveoli of the lungs and often consist of hydrocarbons and toxic metals. Particulate matter (PM) - These material particles are also emitted into the environment by combustion processes, such as aerosol applications and various erosive industrial processes. Internal combustion engines (especially diesel) and solid fuel combustion (especially coal) are two of the most important sources of particulate matter.  It is also necessary to reduce dependence on fossil fuels and increase the use of clean energy (hydroelectric, solar, wind, geothermal). It is essential to raise public awareness about the causes, consequences and preventive measures against air pollution. |  |
|  |  |  |

Visually effective experiment “ Fairy hand “



|  |
| --- |
| performance of the experiment by our students |

**Activity 2 Self-Assessment Table**

|  |  |  |
| --- | --- | --- |
| Evaluation criteria | Points | Comments |
| Proper handling of laboratory equipment and reagents | \_\_/5 |  |
| Effectiveness of planning  Poving the set hypothesis | \_\_/5 |  |
| Writing combustion process equation and making poster | \_\_/5 |  |
| Ability to act according to the plan  Description of burning process and products of burning | \_\_/5 |  |
| Creativity Collaboration Effort  Skills in presenting about Environmental Studies | \_\_/5 |  |
| What worked |  | |
| What needs to be improved |  | |