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| ACTIVITY PLAN | | | | |
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| **Theme** | **Subtopic** | **Activity Title** |
| STEAM Integration in Environmental Education | Technology for Environmental Solutions | Making solar ovens |

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| Introduction part (or activity overview) |
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| **Introduction part (or activity overview)** | During these activities, students will practically construct solar cookers where solar energy will be used for sustainable food preparation. Collaborating in designing and experimenting, they will delve into renewable energy and its practical application. By testing and refining their prototypes, students will develop problem-solving skills and creative thinking abilities. This project aims to inspire students to seek innovative solutions for environmental sustainability while encouraging a deeper understanding of the potential of solar energy. |
| **SETTING** | Classroom.  Sunny place outside |

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| Materials Needed |
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| **Materials Needed** | - Cardboard box / two boxes that can fit into each other / pizza box / cardboard pieces  - Aluminum foil / used packaging with foil  - Transparent plastic film / glass sheet  - Black construction paper / spray-on black paint  - Insulating materials (newspaper, polystyrene)  - Scissors  - Measuring tape / ruler  - Pencil  - Thermometer / temperature sensor  - Glue, adhesive tape |

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| **Learning Outcomes** | * - Expand knowledge about solar energy utilization * - Deepen fundamental engineering and design skills in creating solar cookers. * - Enhance problem-solving and critical thinking skills by addressing issues, adjusting designs, and optimizing the performance of solar cookers. * - Improve knowledge related to heat transfer, insulation, and solar energy reflection. * - Enhance teamwork and communication skills. * - Promote environmental awareness and sustainability, emphasizing the use of renewable energy sources. |  |
| **Activity Contents** | Activity1: Making solar ovens.  Theoretical part (Duration: 15 minutes): Remembering that solar energy obtained from sunlight is a clean and renewable energy source that helps address environmental issues and reduces dependence on fossil fuels. Students know that solar energy can be used to generate electricity in solar panels, but few have heard of solar ovens. These devices use solar heat to prepare food, eliminating the need for traditional cooking methods that rely on non-renewable energy sources such as gas or electricity. Solar ovens capture solar energy through reflective surfaces and convert it into thermal energy, making them an eco-friendly alternative that adheres to sustainability principles. Such ovens are an excellent alternative to burning wood when camping or vacationing where there are no other energy sources.  Videos:  <https://www.youtube.com/watch?v=dAUF5fp35Ys>  Overview: This video shows how does a Sun Cook solar oven work.  Duration: Approx.1.5 minutes  <https://www.youtube.com/watch?v=Ofn7jqPDTeY>  Overview: This video shows how a stove powered by the sun is making a big difference in impoverished countries.  Duration: Approx.3.10 minutes  <https://www.youtube.com/watch?v=DhhXGF8hE20>  Overview: This video explains how to make and use a solar cooker.  Duration: Approx.6.5 minutes  Task 1: Design Stage (30 minutes): Divide the students into groups (4-6 students each) and ask them to brainstorm and draw their solar cooker design. Encourage creativity while ensuring that their designs are practical and feasible, considering factors such as size, shape, insulation, and reflectivity. Students should decide what tools and materials they will need for building the cooker. The construction should take place the next day, as students need time to gather materials unless provided by the teacher.  Task 2: Construction (45 minutes): Students build their solar cookers based on their designs.  Task 3: Testing and Cooking Demonstration (60 minutes): This task is conducted outdoors on a sunny day. Each group must place their solar cooker in direct sunlight. Insert a thermometer into the cooker and regularly measure the temperature. Once the solar cookers reach the appropriate temperature, begin cooking a small dish (e.g., s'mores, hot dogs, vegetables).  Task 4: Presentation of Work (30 minutes): Students present their created and tested solar cookers. They should evaluate the structure, explain how they work, assess their efficiency, identify what worked well, and suggest improvements. Students discuss their learning experience, challenges faced, and new insights gained about solar energy and sustainable living. |  |
| **Assessments** | The final result is assessed according to the grading table No. 1. |  |
| **Key Competences** | Cognitive competence  Creativity competence  Communication competence  Digital competence  Citizenship competence |  |
| **Connections with Eco STEAM** | Eco – Implementation of eco-friendly practices using renewable solar energy.  Science – Physics knowledge: heat transfer, thermal conductivity, and properties of light.  Technology – Solar ovens are a simple yet effective technology that harnesses solar light to generate heat for cooking.  Engineering – Applies engineering principles: problem-solving, design of structures, material selection, testing.  Art – The design and decoration of solar ovens allow for artistic expression.  Math – Performs mathematical calculations in designing solar ovens, measuring, and cutting materials. |  |
| **References** | <https://www.youtube.com/watch?v=yJIQCDnVNrE> How to Build a Solar Oven?  <https://www.youtube.com/watch?v=DaiGiRqCTQw&t=459s> How to Build a Solar Cooker?  <https://www.youtube.com/watch?v=nUX9nEIOSrU> Solar Cooking and Food Physics with Carla Ramsdell, Physics and Astronomy, CAS Zoomer Fall 2020  <https://www.youtube.com/watch?v=t97JyTMEOd0> How to Make a Solar Oven? |  |
| **Notes** |  |  |
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Evaluation Table No. 1

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| Assessment Criteria | Points | Comments |
| Design and Construction | \_\_/5 | Is the design of the solar oven well thought out and structurally reliable?  Are suitable materials used for insulation and reflection?  Are safety aspects such as stability and heat insulation taken into account in the design process? |
| Functionality | \_\_/5 | Does the solar oven effectively harness sunlight to generate enough heat?  Is the baking chamber adequately insulated to retain heat?  Does the solar oven operate consistently and reliably during testing? |
| Innovation and Creativity | \_\_/5 | Does the solar oven demonstrate originality and creativity in its design and construction?  Are there unique features or adaptations that enhance functionality or aesthetics? |
| Collaboration and Communication | \_\_/5 | Did group members effectively collaborate throughout the project?  Are roles and responsibilities clearly defined and allocated to team members?  Is there evidence of clear communication and idea-sharing within the group? |
| Presentation of Work | \_\_/5 | Was the work presented smoothly?  Did they evaluate the structure of their solar ovens, explain their operation, efficiency, identify what worked well, and what could be improved?  Did they articulate their learning experience, challenges faced, and new insights into solar energy and sustainable living? |