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STEAME ACADEMY
TEACHING FACILITATION LEARNING & CREATIVITY PLAN (L&C PLAN) - LEVEL 2
STUDENT TEACHERS: The Future of Energy: Understanding Renewable Resources and Sustainable Solutions

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1. Overview

Title	The Future of Energy: Understanding Renewable Resources and Sustainable Solutions		
Driving Question or Topic	1. What are renewable energy resources, and how do they differ from nonrenewable resources? 2. How can renewable energy technologies like solar, wind, and hydro power contribute to sustainable development? 3. What challenges and opportunities exist in transitioning to a renewable energy future?		
Ages, Grades, …	secondary (15-19)	10th to 12th grade	
Duration, Timeline, Activities	10 learning hours	ten 45 minute class periods	At least 10
Curriculum Alignment	Science, Technology, Engineering, Environmental Studies, and Social Studies		
Contributors, Partners			
Abstract - Synopsis	Students will explore the concept of renewable energy, examining various types of renewable resources and their environmental and economic impact. Through hands-on experiments, case studies, and project-based tasks, students will understand the mechanics behind renewable technologies like solar panels, wind turbines, and hydroelectric systems. They will also evaluate real-world applications and challenges in energy policy, innovation, and sustainability. By the end, students will grasp the importance of renewable energy for a sustainable future and be inspired to think creatively about energy solutions.		
References, Acknowledgements			

2. STEAME ACADEMY Framework*

Teachers' Cooperation	Teacher 1 (Science) and Teacher 2 (Technology/Engineering) will work together to cover both the scientific principles and technological applications of renewable energy systems. - Goal Setting: Teachers establish learning objectives that span environmental science and engineering concepts. - Collaboration Meetings: Teachers meet to coordinate activities such as building simple solar or wind-powered devices.

STEAME in Life (SiL) Organization	- Reflection and Feedback: Teachers assess student progress through both group projects and individual reflections. Arrange a visit to a local renewable energy facility (if feasible) or organize a virtual guest lecture from a renewable energy expert.
Action Plan Formulation	STAGE I. Preparatory Work of the Teacher: a) Research and Planning: - Gather information on different types of renewable energy sources, such as solar, wind, hydro, and geothermal energy. b) Gather Resources: - Prepare materials for hands-on experiments (e.g., small solar panels, wind turbine kits), access to simulation tools, and case studies on energy policies. c) Design Activities: - Develop interactive tasks to build mini renewable energy models and analyze real-world energy case studies. STAGE II. Workshop Activities: 1. Introduction to Renewable Energy - Overview of renewable vs. nonrenewable energy, with examples and multimedia support. 2. Exploration of Each Type of Renewable Energy - Break down into specific modules on solar, wind, hydro, and geothermal energy, examining how each type works and its benefits. 3. Technological Integration - Students work on designing simple models of renewable energy systems, such as solar-powered cars or wind turbines. 4. Real-World Applications and Policy Discussion - Analyze case studies on renewable energy use in different countries and discuss the challenges in scaling up these technologies. STAGE III. Reflection and Wrap-Up: Reflection - Students reflect on the importance of renewable energy in addressing climate change and discuss their experiences building energy models. Future Exploration - Provide resources on emerging technologies in energy storage, smart grids, and green innovation.

[*] *under development the final elements of the framework*

3. Objectives and Methodologies

Learning Goals and Objectives	Learning Goals: 1. Understand the importance of renewable energy for sustainability. 2. Explore the scientific and technological principles behind renewable energy systems. 3. Evaluate the impact of renewable energy on the environment and society. Learning Objectives: 1. Define and Describe Renewable Energy Sources

	Students will be able to identify various types of renewable energy, such as solar, wind, hydro, and geothermal, and explain how each source works. 2. Analyze the Environmental and Economic Benefits of Renewable Energy Students will explore the positive impacts of renewable energy on the environment, including reduced carbon emissions, and evaluate its potential economic benefits. 3. Investigate and Compare Renewable and Nonrenewable Energy Sources Students will investigate the differences between renewable and nonrenewable energy, comparing factors like availability, environmental impact, and sustainability. 4. Understand and Demonstrate Basic Principles of Renewable Energy Technologies Students will participate in hands-on activities to model basic renewable energy technologies, such as solar panels and wind turbines, and understand the mechanics behind energy conversion and storage. 5. Evaluate Real-World Applications and Policy Challenges of Renewable Energy Students will assess case studies on renewable energy use globally, discussing the challenges and opportunities in scaling up renewable energy solutions in different contexts. 6. Reflect on the Role of Renewable Energy in Sustainable Development Students will engage in discussions about the importance of renewable energy in achieving sustainability goals and propose ways to promote renewable energy in their communities. 7. Develop and Present a Proposal for a Sustainable Energy Solution Students will work collaboratively to create a proposal for a small-scale renewable energy solution, demonstrating their understanding of energy systems, sustainability, and potential impact.
Learning Outcomes and expected Results	Learning Outcomes: 1. Students will demonstrate an understanding of different renewable energy sources, including solar, wind, hydro, and geothermal energy. 2. Students will be able to analyze the environmental and economic benefits of renewable energy, including reduced emissions and sustainable resource use. 3. Students will compare renewable and nonrenewable energy sources, evaluating their impact on the environment and their potential for long-term use. 4. Students will demonstrate basic knowledge of renewable energy technologies by building models, such as a solar panel or wind turbine, and explaining how they generate energy. 5. Students will critically assess real-world case studies, identifying challenges and potential policy solutions for implementing renewable energy on a larger scale. 6. Students will reflect on the significance of renewable energy for sustainable development and propose practical ways to support renewable energy adoption in their communities. 7. Students will collaborate to create and present a proposal for a sustainable energy solution, demonstrating an understanding of both technical and social aspects of renewable energy. Expected Results:

	1. Increased appreciation for the role of renewable energy in reducing environmental impact and supporting sustainability. 2. Improved critical thinking and analytical skills demonstrated through the assessment of renewable energy benefits, challenges, and economic impacts. 3. Enhanced understanding of the differences between renewable and nonrenewable energy sources, fostering a deeper awareness of sustainability. 4. Development of practical skills in model-building and basic energy technology concepts, contributing to students' hands-on learning experiences. 5. Strengthened collaboration and communication skills through group projects and discussions on sustainable energy solutions. 6. Greater motivation and interest in exploring further topics and potential careers in renewable energy, environmental science, and sustainable technology. 7. Increased awareness of global and local policy considerations related to energy sustainability, promoting informed and active citizenship in environmental issues.
Prior Knowledge and Prerequisites	Prior Knowledge and Prerequisites: 1. Basic Understanding of Energy Concepts: Students should have foundational knowledge of energy, including the difference between potential and kinetic energy, and an understanding of how energy is used in everyday life. 2. Familiarity with Environmental Science: Students should have an awareness of environmental issues such as pollution, climate change, and resource depletion, which will help them understand the importance of renewable energy. 3. Basic Math and Physics Skills: Students should have skills in basic math operations and a basic understanding of physics concepts such as force, motion, and energy conversion, which will support their exploration of energy technologies. 4. Digital Literacy: Students should be comfortable using digital tools and resources, including online research, data visualization, and basic simulations, which will be used in exploring renewable energy technologies and models. 5. Interest in Environmental and Sustainability Topics: Students should have a curiosity about environmental issues and an interest in exploring how science and technology can address sustainability challenges. 6. Openness to Collaborative Learning: Students should be willing to engage in group work, participate in discussions, and share ideas, as this lesson involves collaborative activities and project-based learning. 7. Critical Thinking Skills: Students should possess the ability to analyze information, make connections between concepts, and engage in discussions about the benefits and challenges of renewable energy.
Motivation, Methodology, Strategies, Scaffolds	1. Project-Based Inquiry: Begin with an overarching question on how renewable energy can help address climate change and resource scarcity. This approach sparks curiosity and motivates students to explore real-world applications of renewable energy. 2. Collaborative Learning: Organize group activities where students investigate various renewable energy sources, such as solar, wind, and hydro power. Encourage them to share their findings, discuss challenges, and brainstorm sustainable solutions, fostering teamwork and communication. 3. Hands-On Activities: Incorporate hands-on tasks where students build simple models of renewable energy devices, like a solar panel or wind turbine. These activities offer tangible learning experiences, reinforcing scientific concepts and principles of energy conversion. 4. Technology Integration: Use simulations and digital tools to explore energy data, analyze the efficiency of renewable technologies, and visualize the impact of renewable vs. nonrenewable energy use. Technology aids comprehension and allows students to experiment with complex systems.

	5. Authentic Assessments: Design assessments that require students to apply their learning to real-world scenarios. For instance, students could develop a proposal for a renewable energy project in their community, demonstrating their understanding of sustainability principles and the practicalities of energy solutions. 6. Reflection and Feedback: Include regular opportunities for students to reflect on their learning journey and receive feedback. Encourage students to document their progress, discuss their experiences, and critically evaluate the potential of renewable energy solutions. 7. Scaffolded Support: Provide structured guidance by breaking down complex topics, offering visual aids, and providing resources for exploring different energy types. Offer step-by-step support for hands-on projects and allow time for questions and exploration to ensure understanding.

4. Preparation and Means

Preparation, Space Setting, Troubleshooting Tips	Preparation: - Gather materials for hands-on activities, such as small solar panels, wind turbine kits, batteries, and basic circuitry supplies for building simple renewable energy models. - Prepare instructional resources, including videos, articles, and simulations on renewable energy topics. - Set up access to digital tools and simulations, ensuring students can explore energy data and experiment with virtual renewable energy models. Space Setting: - Arrange the classroom to allow for group work, with tables set up for collaborative activities and hands-on model-building. - Set aside a designated area for computer-based activities, where students can access online resources and energy simulations. - If possible, arrange for outdoor space to test renewable energy models like solar panels or wind-powered devices, enhancing the experiential aspect of the lesson. Troubleshooting Tips: - Test all digital tools, simulators, and renewable energy kits ahead of time to ensure functionality and compatibility. - Provide troubleshooting guides for common issues with the equipment or software, such as handling battery connections, troubleshooting solar cells, and using online simulations. - Prepare alternative activities in case of technical issues or insufficient sunlight for outdoor activities, such as videos or recorded experiments to demonstrate the energy models in action.
Resources, Tools, Material, Attachments, Equipment	1. Educational Resources - Instructional videos on renewable energy concepts (e.g., solar, wind, hydro, geothermal). - Articles and case studies on real-world applications of renewable energy and sustainability practices. - Infographics and visual aids explaining energy conversion, sustainability, and environmental impact. 2. Digital Tools and Simulations - Online simulators for renewable energy technologies (e.g., PV Watts for solar energy calculations).

	- Energy data visualization tools (e.g., US Energy Information Administration, International Renewable Energy Agency). - Access to virtual labs or interactive simulations for experimenting with energy efficiency and renewable systems. 3. Hands-On Kits and Materials - Small solar panels, wind turbine kits, and basic hydropower models. - Batteries, LED lights, and basic wiring supplies for building and testing energy circuits. - Measuring tools like multimeters to record voltage and current from renewable energy models. 4. Equipment for Classroom and Outdoor Use - Laptops or tablets for accessing digital resources and simulations. - Projector or screen for presentations and viewing educational videos. - Outdoor space (if available) for testing solar and wind models, with tables and power supplies. 5. Attachments and Reference Material - Step-by-step guides or instruction sheets for assembling renewable energy models. - Assessment rubrics and worksheets for documenting observations and findings. - Reference materials on global renewable energy data and current sustainability practices.
Health and Safety	

5. Implementation

Instructional Activities, Procedures, Reflections	1. Instructional Activities and Procedures - Introduction to Renewable Energy: Start with an overview of renewable and nonrenewable energy sources, using videos and visuals to explain the basics of solar, wind, hydro, and geothermal energy. - Hands-On Model Building: In small groups, students build simple renewable energy models (e.g., a small solar panel circuit or a wind turbine). Guide them through measuring energy output and observing factors that affect efficiency. - Data Analysis and Comparison: Using energy data visualizations, students analyze the environmental impact of renewable vs. nonrenewable sources, comparing metrics like emissions and sustainability. - Real-World Applications: Explore case studies on renewable energy applications in different sectors, such as transportation, industry, and urban planning. Facilitate discussions on the challenges and benefits of renewable energy adoption. 2. Engagement and Reflection - Group Discussions and Reflection Journals: After each activity, prompt students to discuss their observations and document reflections on what they learned. Encourage them to think about how renewable energy can be applied in their own communities. - Peer Review and Feedback: During group presentations, students provide feedback to peers on their renewable energy models or proposals. This activity encourages constructive feedback and collaborative learning. - Final Project Reflection: Students complete a final reflection on their project, considering what they've learned about sustainable energy and the role they can play in promoting sustainability.

Assessment - Evaluation	1. Formative Assessment - Conduct regular checks for understanding through class discussions, quizzes, and group reflections, focusing on key concepts like energy conversion and sustainability. - Provide immediate feedback during hands-on activities to address misconceptions and guide learning, especially as students build and test renewable energy models. - Use exit tickets or quick polls to assess students' grasp of renewable energy concepts at the end of each session. 2. Summative Assessment - Final Project Presentation: Students design and present a renewable energy solution, explaining its benefits, potential challenges, and environmental impact. Assess their understanding of energy principles and practical application. - Written Report or Proposal: Students create a written report or proposal outlining their renewable energy model or solution, including details on functionality, environmental impact, and feasibility. - Reflection Essay: Students submit a reflective essay discussing what they learned about renewable energy, its importance for sustainability, and how they can apply this knowledge in real life. 3. Peer and Self-Assessment - During project presentations, students provide constructive feedback to peers, encouraging critical thinking and collaborative improvement. - Students complete a self-assessment, reflecting on their participation, the challenges they faced, and how their understanding of renewable energy evolved throughout the project.
Presentation - Reporting - Sharing	1. Project Presentation: Students deliver a presentation on their renewable energy solution, using visuals to explain their model's design, functionality, and environmental benefits. They can share their slides or visual aids with the class for a collaborative learning experience. 2. Written Report or Digital Portfolio: Students compile a written report or digital portfolio that includes their project proposal, research findings, data analysis, and reflections. This document can be shared electronically with classmates or uploaded to a shared platform for review. 3. Virtual Exhibition or Poster Session: If possible, host a virtual or in-class poster session where students display and discuss their projects. Each group can present their model and findings to peers, teachers, or invited guests, fostering a real-world sharing experience. 4. Online Sharing and Community Engagement: Use a class website, blog, or shared online platform (e.g., Google Classroom) where students can publish their projects, proposals, and reflections. This allows for broader sharing with the school community and provides a lasting resource for future learning. 5. Peer Review and Feedback Session: Organize a feedback session where students exchange constructive feedback on each other's projects. This encourages collaboration, enhances presentation skills, and deepens their understanding of renewable energy applications.
Extensions - Other Information	

STEAME ACADEMY Prototype/Guide for Learning & Creativity Approach
Action Plan Formulation

Major steps in the STEAME learning approach:

STAGE I: Preparation by one or more teachers

1. Formulating initial thoughts on the thematic sectors or areas to be covered
2. Engaging with the wider environment, including work, business, parents, society, ethics, and environmental factors
3. Determining the target age group of students, aligning with the official curriculum, and setting clear goals and objectives
4. Organizing tasks and responsibilities, including the designation of a coordinator and establishing workspace.

STAGE II: Action Plan Formulation (Steps 1-18)

Preparation (by teachers)

1. Relation to the Real World – Reflection
2. Incentive – Motivation
3. Formulation of a problem (possibly in stages or phases) resulting from the above

Development (by students) – Guidance & Evaluation (in 9-11, by teachers)

4. Background Creation - Search / Gather Information
5. Simplify the issue - Configure the problem with a limited number of requirements
6. Case Making - Designing - identifying materials for building / development / creation
7. Construction - Workflow - Implementation of projects
8. Observation-Experimentation - Initial Conclusions
9. Documentation - Searching Thematic Areas (AI fields) related to the subject under study – Explanation based on Existing Theories and / or Empirical Results
10. Gathering of results / information based on points 7, 8, 9
11. First group presentation by students

Configuration & Results (by students) – Guidance & Evaluation (by teachers)

12. Configure STEAME models to describe / represent / illustrate the results
13. Studying the results in 9 and drawing conclusions, using 12
14. Applications in Everyday Life - Suggestions for Developing 9 (Entrepreneurship - SIL Days)

Review (by teachers)

15. Review the problem and review it under more demanding conditions

Project Completion (by students) – Guidance & Evaluation (by teachers)

16. Repeat steps 5 through 11 with additional or new requirements as formulated in 15
17. Investigation - Case Studies - Expansion - New Theories - Testing New Conclusions
18. Presentation of Conclusions - Communication Tactics.

STAGE III: STEAME ACADEMY Actions and Cooperation in Creative Projects for school students

Title of Project: _____
Brief Description/Outline of Organizational Arrangements / Responsibilities for Action

STAGE	**Activities/Steps** Teacher 1(T1) Cooperation with T2 and student guidance	**Activities /Steps** **By Students** Age Group: ____	**Activities /Steps** Teacher 2 (T2) Cooperation with T1 and student guidance
A	Preparation of steps 1,2,3		Cooperation in step 3
B	Guidance in step 9	4,5,6,7,8,9,10	Support guidance in step 9
C	Creative Evaluation	11	Creative Evaluation
D	Guidance	12	Guidance
E	Guidance	13 (9+12)	Guidance
F	Organization (SIL) STEAME in Life	14 Meeting with Business representatives	Organization (SIL) STEAME in Life
G	Preparation of step 15		Cooperation in step 15
H	Guidance	16 (repetition 5-11)	Support Guidance
I	Guidance	17	Support Guidance
K	Creative Evaluation	18	Creative Evaluation