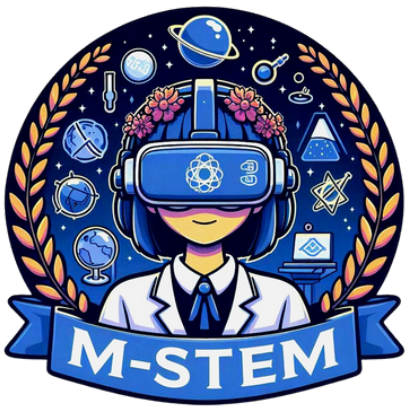

MSTEM

LESSON PLAN: RENEWABLE ENERGIES

METAVERSE-BASED STEM EDUCATION FOR A SUSTAINABLE AND RESILIENT FUTURE

2023-1-FR01-KA220-SCH-000151516

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Purpose of Lesson

The purpose of this lesson is to introduce students to renewable energy sources, their importance, and their role in sustainable development. Students will explore different types of renewable energy, their advantages, and challenges.

Description of Lesson

Students will learn about solar, wind, hydro, geothermal, and biomass energy. The lesson includes discussions, interactive visual demonstrations, and a brief activity in the Metaverse where students can explore a virtual renewable energy facility.

Lesson Teaching Methods

Problem-Solving Approach

- Students will analyze a sustainability challenge (e.g., reducing plastic waste or improving energy efficiency in homes).
- Encourages creative and analytical thinking.

Flipped Classroom

- Students review case studies of sustainable technologies before class.
- Allows more time for hands-on activities and discussions.

Metaverse simulation

- Students will explore a virtual environment showcasing renewable energy infrastructure..

Lesson Objectives

- Identify different types of renewable energy.
- Explain how renewable energy contributes to sustainability.
- Evaluate the benefits and challenges of various renewable energy sources.
- Engage with a virtual renewable energy facility to enhance understanding.

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Lesson plan

- **Introduction (10-15 min):**
  - Engage students with a discussion on their energy consumption habits.
  - Show brief videos on different types of renewable energy.
- **Main Lesson (25-30 min):**
  - Explain how solar, wind, hydro, geothermal, and biomass energy work.
  - Discuss the pros and cons of each source.
  - Explore real-world applications and innovations in renewable energy.
- **Metaverse Activity (15 min):**
  - Students enter a virtual wind farm and explore how wind turbines generate electricity.
  - Discuss observations and reflections on the experience.
- **Conclusion (10 min):**
  - Recap key points.
  - Open discussion: "What renewable energy source would you implement in your community and why?"

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Lesson table

lesson plan	
Engagement Activity: Students brainstorm examples of renewable energy in daily life.	10-15 min
Exploring Renewable Energy: The teacher explains solar, wind, hydro, geothermal, and biomass energy with interactive visuals.	30 min
Virtual Renewable Energy Tour: Students enter a VR simulation of a renewable energy facility to observe solar panels, wind turbines, and hydropower stations in action.	15 min
Discussion & Summary: Recap key concepts and discuss the role of renewable energy in the future.	15 min

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Lesson resources

- Presentation slides on renewable energy sources
- Access to a VR platform for the Metaverse activity

Resources used to create this lesson:

- Intergovernmental Panel on Climate Change (IPCC). (2022). Climate Change Mitigation: Renewable Energy Solutions. Retrieved from https://www.ipcc.ch
- International Renewable Energy Agency (IRENA). (2021). World Energy Transitions Outlook 2021. Abu Dhabi: IRENA. Retrieved from https://www.irena.org
- National Renewable Energy Laboratory (NREL). (2020). Renewable Electricity Futures Study. Golden, CO: NREL. Retrieved from https://www.nrel.gov
- United Nations (UN). (2023). The Sustainable Development Goals Report 2023. Retrieved from https://unstats.un.org/sdgs/
- World Green Building Council. (2022). Advancing Net Zero: Renewable Energy in the Built Environment. Retrieved from https://www.worldgbc.org
- Ellen MacArthur Foundation. (2021). Renewable Energy and Circular Economy. Retrieved from https://www.ellenmacarthurfoundation.org

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Work and homework

Individual work:

- work 1: Compare and contrast two renewable energy sources.
- work 2: Research a local renewable energy project.

Homework:

- Homework 1: Write a short essay on the feasibility of renewable energy in their country.
- homework 2: Create a poster illustrating different renewable energy sources.

Evaluation and indicators

Assessment Methods:

- Class Discussions & Participation: Students will be evaluated based on their engagement and ability to articulate key concepts.
- Metaverse Activity: Teachers will assess students' ability to recognize and describe components of renewable energy or sustainable technology in the virtual environment.
- Work & Homework Assignments: Grading will be based on the depth of research, clarity of explanation, and creativity in presenting solutions.

Success Indicators:

- Students can identify and explain different renewable energy sources or sustainable technologies.
- Students actively participate in discussions and contribute meaningful insights.
- Students demonstrate comprehension through their work and homework assignments.
- Successful completion of the Metaverse activity with correct identification of key elements.

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Evaluation Indicators	
Method	Indicator
Class Participation	Contributions to discussions and activities
Metaverse Activity	Ability to identify key renewable/sustainable features
Homework & Work	Depth of analysis and creativity in solutions

Overview of the lesson

This lesson introduces students to the fundamentals of renewable energy, highlighting its role in sustainable development. Through interactive discussions and visual demonstrations, students will explore various renewable energy sources, such as solar, wind, hydro, geothermal, and biomass energy. The lesson emphasizes the benefits and challenges of these energy sources and includes an immersive Metaverse activity, where students will virtually explore a renewable energy facility. By the end of the lesson, students will gain a deeper understanding of how renewable energy contributes to a greener future and its real-world applications.

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