STEAM &Sports

Lesson 12 - Green Goals: Designing a Sustainable Sports Stadium

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Green Goals: Designing a Sustainable Sports Stadium

Concept

This lesson guides students in designing a sports stadium with sustainable and eco-friendly solutions. The lesson will encourage creativity, critical thinking, and problem-solving while introducing students to the real-world applications of green engineering in sports infrastructure.

Learning objectives and Outcomes

Upon completion of this lesson, students will:

- Understand the principles of sustainable architecture and engineering.
- Analyze how stadiums can reduce environmental impact through design.
- Explore renewable energy sources and eco-friendly materials.
- Develop collaboration and project-based learning skills through teamwork.

Students will be able to:

- Students will create a blueprint or model of an eco-friendly sports stadium.
- Presentations will explain the sustainable features and energy-saving methods integrated into their designs.
- Students will demonstrate an understanding of green technology and resource efficiency in large-scale construction.

Methodology

The methodology for this lesson follows an inquiry-based, project-driven approach that emphasizes collaboration, creativity, and hands-on learning. Students engage with the topic through real-world examples, fostering curiosity and relevance.
Students are grouped intentionally to ensure gender balance and diversity in each group, allowing a mix of perspectives and experiences.

Educational standards in connection with sports

STEM Integration in Sports Architecture:

1. Use science and engineering principles to design energy-efficient and environmentally responsible sports venues.
2. Apply mathematical concepts such as scaling, measurements, and geometry in creating stadium blueprints.
3. Explore the use of technology (e.g., solar panels, rainwater harvesting) to optimize stadium performance and efficiency.
4. Encourage students to develop innovative solutions for managing crowds, waste, and energy during sports events.

This lesson includes elements of these school subjects

1. Science (Physics and Environmental Science): Renewable energy and sustainability concepts.
2. Mathematics: Measurements, scaling, and geometry.
3. Design and Technology: Blueprint creation and model building.
4. Physical Education: Understanding stadium use in the context of sports events.
5. Art: Visual representation and creative design.

Timeframe

The expected total duration of the lesson is 90 minutes

Students Age

12 – 15
Adaptable for younger students by simplifying the design process and for older students by incorporating more advanced engineering concepts.

Material needed

1. Drawing paper and pencils or design software.
2. Recycled materials for physical models.
3. Internet access for research.
4. Projector for presentations.
5. Rulers, scissors, glue, and markers.

Short description of the content

Students will work in groups to design a sustainable sports stadium. The focus will be on integrating green technologies such as solar panels, rainwater harvesting, and recycled construction materials. They will learn how these elements reduce the environmental impact of large venues. By the end of the lesson, students will present their designs and reflect on the importance of sustainability in modern sports infrastructure.

Sequence of Lesson

1. Engage (10 minutes)
Capture students' interest and introduce the concept of sustainability in stadium design. Show images and videos of famous sustainable stadiums (e.g., Allianz Arena, Mercedes-Benz Stadium).
Ask guiding questions:

- What do you think makes a sports stadium sustainable?
- Why is it important for sports facilities to be environmentally friendly?

Briefly explain the environmental challenges of traditional stadiums (high energy consumption, water use, and material waste). Spark curiosity and set the stage for deeper exploration.

2. Explore (20 minutes)
Allow students to research and gather ideas for their stadium designs. Divide students into small groups. Assign each group one area of focus (e.g., energy sources, materials, water systems).
Things to think about:

- How many people does your stadium need to hold?
- How will you make it look visually appealing, both inside and outside?
- Where will the dressing rooms and players' tunnel go?
- What food and drink outlets will your stadium have?
- How will the fans be kept dry and comfortable when seated?
- How will you make sure they have a good view of the game?
- How can you make sure it is environmentally friendly?

Provide research materials or access to the internet to investigate sustainable design solutions. Encourage notetaking and brainstorming within groups. Equip students with knowledge of green technologies and sustainable design principles.

3. Elaborate (35 minutes)
Groups begin sketching blueprints or creating models of their stadiums.
Encourage students to integrate sustainable elements such as:

- Solar panels, wind turbines, or geothermal heating.
- Recycled materials and natural ventilation systems.
- Water collection and reuse systems.

Walk around the room, providing feedback and guiding questions. Transform ideas into tangible designs that reflect sustainable practices.

4. Evaluate (15 minutes)
Each group presents their stadium design (2-3 minutes per group).
Highlight key sustainable features and explain how they benefit the environment. Allow classmates to ask questions or provide constructive feedback. Encourage critical thinking, communication, and peer evaluation.

Extend (20 minutes)
Expand their understanding of sustainability beyond stadium design and inspire further exploration. Connect the lesson to broader concepts. Facilitate a class discussion on how sustainable stadium design can be applied to other areas.
Ask students:

- How can you implement some of these ideas in your daily life or local community?
- What other industries could benefit from sustainable design?

Assign a short reflective journal entry or sketch of a sustainable project for homework.

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Tips for age group differentation (for older/younger kids than indicated in the lesson)

Younger students (10–12):
1. Simplify the project to designing just one element.
2. Provide templates or partial blueprints to guide their work.
3. Use more images and videos to explain green technologies.

Older students (13-15):
1. Add calculations of energy efficiency or cost estimates.
2. Introduce concepts such as carbon footprint of construction materials.
3. Include real-life case studies and ask for comparison analysis.

To which SDG(s) does the lesson relate most

SDG 11 – Sustainable Cities and Communities
(through eco-friendly infrastructure design).

SDG 13 – Climate Action
(by reducing emissions through green stadiums).

What Inclusivity and Accessibility measures can or should the teacher take for this lesson

1. Use diverse role assignments (e.g., designer, researcher, presenter) to accommodate different strengths.
2. Allow use of both physical materials and digital tools.

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