

Sustainability Science Unit Plan



Theme: SDG 12 – Responsible Consumption and Production

Stage 1: Big Ideas & Essential Questions

Established Goal(s)/Content Standard(s)

- Analyze the environmental, social, and economic impacts of consumption and production systems.
- Evaluate sustainability challenges using scientific evidence and systems thinking.
- Develop solutions that support sustainable resource management and waste reduction.
- Align learning with UN Sustainable Development Goal 12: Responsible Consumption and Production.

Understanding(s)

Big Ideas

- Human consumption patterns affect environmental sustainability.
- Sustainable production requires balancing economic growth, environmental protection, and social well-being.
- Individual and collective actions can reduce waste and resource depletion.

- Systems thinking helps explain connections between consumption, production, and environmental impacts.

Desired Understandings

Students will understand that:

- Everyday consumer choices have environmental and social consequences.
- Waste generation and resource use are interconnected global issues.
- Sustainable practices can reduce environmental footprints while supporting economic development.
- Data and scientific evidence can inform sustainable decision-making.

Predictable Misunderstandings

- Recycling alone solves waste problems.
- Sustainability is only an environmental issue.
- Individual actions have little impact on global sustainability challenges.
- Economic growth and sustainability cannot coexist.

Essential Questions

- How do our consumption habits affect people and the planet?
- What makes a product sustainable?
- Who is responsible for reducing waste—individuals, businesses, or governments?
- How can science help create more sustainable production systems?
- What trade-offs exist between convenience, cost, and sustainability?

Student Objectives (Learning Outcomes)

Students will be able to:

1. Explain the concepts of sustainable consumption and production.
2. Analyze the life cycle of a consumer product.
3. Interpret data related to waste generation and resource use.
4. Evaluate the sustainability of products and practices.

5. Design and justify a solution to reduce waste in their school or community.
6. Communicate sustainability recommendations using scientific evidence.

Stage 2: Learning Activities

Learning Activities

1. Engagement Activity: Trash Audit

- Students analyze one day's worth of classroom or school waste.
- Categorize waste and identify major sources.

2. Mini-Lecture and Discussion

- Introduction to SDG 12 and the circular economy.
- Discussion of global consumption patterns.

3. Life Cycle Analysis Project

- Students select a common product (water bottle, smartphone, T-shirt, etc.).
- Research extraction, manufacturing, transportation, use, and disposal stages.

4. Data Investigation

- Analyze datasets on waste generation, recycling rates, and resource consumption.
- Create graphs and identify trends.

5. Case Study Analysis

- Examine successful sustainability initiatives from businesses or communities.
- Evaluate strengths and limitations.

6. Sustainability Solution Design Challenge

- Teams identify a waste-related problem in the school/community.

- Develop a realistic intervention or campaign.

7. Peer Review Session

- Students present drafts of their solutions.
- Receive feedback and revise proposals.

8. Reflection Journal

- Students document how their consumption habits influence sustainability.

Stage 3: Performance Tasks / Evidence of Learning

Performance Tasks

Pre-Assessment

- Short survey on student understanding of sustainability and waste issues.
- KWL Chart (Know, Want to Know, Learned).

Formative Assessments

- Exit tickets after lessons.
- Life cycle analysis worksheet.
- Participation in discussions and case study evaluations.
- Reflection journal entries.

Summative Assessments

Performance Task 1: Product Life Cycle Analysis

- Students create an infographic or report explaining environmental impacts across a product's life cycle.

Performance Task 2: Sustainability Action Proposal

- Teams design a solution to reduce waste or improve sustainability in their school/community.
- Present recommendations to classmates or school stakeholders.

Performance Task 3: Reflection Essay

- Students explain how their understanding of sustainable consumption has changed and identify actions they can take moving forward.

Other Evidence for Evaluation

Rubric Criteria

- Accuracy of scientific information
- Application of systems thinking
- Use of evidence and data
- Creativity and feasibility of proposed solution
- Quality of communication and presentation
- Reflection and personal connection

Assessment of Growth

- Comparison of pre- and post-assessment results
- Growth shown in journal reflections
- Improvement through peer feedback and revision
- Self-assessment using rubric criteria

Self-Reflection for Educators

W – Where is the unit going?

Students understand how consumption and production systems affect sustainability and learn to propose evidence-based solutions.

H – Hook and Hold Interest

Real-world waste audits and consumer product investigations connect learning to students' daily lives.

E – Equip All Students

Students receive background knowledge, data analysis practice, and collaborative learning opportunities.

R – Rethink and Revise

Peer review and reflection activities encourage students to revise misconceptions and improve solutions.

E – Evaluate Their Work

Multiple assessments provide ongoing feedback and measure understanding.

T – Tailored Learning

Students choose products and sustainability challenges that interest them.

O – Organized to Maximize Engagement

Activities progress from observation and investigation to analysis, solution design, and action.

SDG 13: Climate Action



Stage 1: Big Ideas & Essential Questions

Established Goal(s)/Content Standard(s)

- Analyze human impacts on Earth's systems.
- Evaluate scientific evidence related to climate change.
- Develop and communicate solutions to sustainability challenges.
- Connect local actions to global sustainability goals.

Understanding(s)

Big Ideas

- Human activities influence climate systems.
- Climate change affects environmental, economic, and social systems.
- Individuals and communities can take meaningful actions to reduce climate impacts.

Desired Understandings

Students will understand that:

- Climate change is a complex sustainability challenge requiring scientific and social solutions.
- Local actions contribute to global sustainability efforts.

- Evidence-based decision-making is essential for addressing environmental problems.

Predictable Misunderstandings

- Climate change only affects future generations.
- Individual actions do not matter.
- Climate change is solely an environmental issue rather than a social and economic issue as well.

Essential Questions

- How does climate change affect our community and the world?
- What actions can individuals, schools, and communities take to address climate change?
- How can science help us make sustainable decisions?

Student Objectives (Learning Outcomes)

Students will be able to:

1. Describe the purpose of SDG 13: Climate Action.
2. Analyze evidence related to climate change impacts.
3. Identify sustainable actions that reduce greenhouse gas emissions.
4. Develop and communicate a realistic climate action proposal.

Stage 2: Learning Activities

Day 1 (45–60 minutes)

Hook (10 minutes)

- Show images of extreme weather events, droughts, flooding, or wildfires.
- Ask students: "How might these events affect our lives?"

Mini-Lesson (10 minutes)

- Introduce SDG 13 and key climate change concepts.

- Explain connections among emissions, climate impacts, and sustainability.

Small Group Investigation (20 minutes)

- Students analyze short articles, graphs, or infographics about climate impacts.
- Groups identify:
 - The problem
 - Evidence presented
 - Possible solutions

Exit Ticket (5 minutes)

- What is one climate challenge facing society?
- What is one action that could help address it?

Day 2 (45–60 minutes)

Review (5 minutes)

Climate Action Challenge (30 minutes)

- Student groups design a climate action proposal for their school.
Examples:
- Reduce single-use plastics
- Increase recycling
- Promote biking/walking
- Reduce energy use
- Create a school garden

Students must explain:

- The sustainability issue
- Their proposed solution
- Expected benefits
- Potential challenges

Presentations (10–15 minutes)

- Groups present 2–3 minute pitches.

Reflection (5 minutes)

- Students write one action they can personally take to support climate action.

Stage 3: Performance Tasks / Evidence of Learning**Performance Tasks****Pre-Assessment**

- Quick poll: What do you know about climate change and sustainability?

Formative Assessments

- Group discussion participation
- Investigation worksheet
- Exit ticket responses

Summative Assessment

- Climate Action Proposal Presentation

Students will be evaluated on:

- Understanding of the sustainability issue
- Use of evidence
- Feasibility of solution
- Collaboration
- Communication skills

Other Evidence for Evaluation**Rubric (4-point scale)**

- Understanding of SDG 13
- Application of scientific evidence

- Creativity of solution
- Quality of presentation

Student Growth

- Comparison of pre-assessment and reflection responses
- Ability to apply sustainability concepts to a real-world problem

Self-Reflection for Educators

W – Students understand the purpose of SDG 13 and apply learning to a local issue.

H – Real-world climate examples capture interest.

E – Students receive background knowledge and structured support.

R – Group discussions encourage reconsideration of ideas.

E – Multiple assessments provide evidence of understanding.

T – Students choose solutions relevant to their interests.

O – Activities progress from understanding a problem to proposing solutions.

Stage 2: Learning Activities

Unit Launch: Understanding Climate Change and Sustainability

Activity 1: Climate Change Gallery Walk

Students rotate through stations containing photographs, graphs, maps, news headlines, and personal stories related to climate impacts.

Students discuss:

- What patterns do you notice?
- Who is affected?
- What questions do these sources raise?

Purpose: Activate prior knowledge and generate curiosity.

Scientific Foundations

Activity 2: Climate Science Investigation

Students examine evidence supporting climate change:

- Global temperature records
- Atmospheric CO₂ data
- Sea level rise data
- Extreme weather trends

Students create evidence-based claims using the CER framework:

- Claim
- Evidence
- Reasoning

Systems Thinking

Activity 3: Climate Systems Mapping

Students create systems maps showing relationships among:

- Fossil fuels
- Transportation
- Energy production
- Consumption
- Greenhouse gas emissions
- Climate impacts

Students identify feedback loops and unintended consequences.

Purpose: Develop systems thinking skills central to sustainability science.

Local Sustainability Audit

Activity 4: School Climate Impact Assessment

Student teams investigate a sustainability issue within the school.

Possible topics:

- Energy consumption
- Transportation habits
- Cafeteria food waste
- Single-use plastics
- Water use

Students collect data through:

- Observations
- Surveys
- Utility records (if available)
- Interviews with stakeholders

Stakeholder Analysis

Activity 5: Who Has a Voice?

Students identify stakeholders connected to climate action.

Examples:

- Students
- Teachers
- School administration
- Local government
- Businesses
- Community members

Students examine:

- Interests

- Concerns
- Potential conflicts
- Opportunities for collaboration

Research and Case Studies

Activity 6: Climate Solution Research

Student groups investigate one climate solution such as:

- Renewable energy
- Electric transportation
- Carbon sequestration
- Urban forestry
- Sustainable agriculture
- Green building design

Groups evaluate:

- Benefits
- Limitations
- Costs
- Environmental impacts
- Social implications

Engineering and Design Challenge

Activity 7: Designing for Sustainability

Using the engineering design process, students create a proposal addressing a climate challenge.

Project options:

- School solar initiative

- Waste reduction campaign
- Sustainable transportation plan
- Energy efficiency improvements
- Native plant restoration project

Students:

- Define the problem
- Research solutions
- Develop prototypes or models
- Test feasibility
- Revise designs

Civic Engagement Component

Activity 8: Community Action Project

Students implement a small-scale action.

Examples:

- Awareness campaign
- Tree planting event
- Recycling education program
- Energy conservation challenge
- Community presentation

Students document outcomes and challenges.

Reflection and Synthesis

Activity 9: Sustainability Portfolio

Students maintain a portfolio containing:

- Data analyses

- Reflection journals
- Research notes
- Project drafts
- Peer feedback
- Final products

Students conclude by reflecting on how their understanding of sustainability evolved.

Stage 3: Performance Tasks / Evidence of Learning

Pre-Assessment

Climate Literacy Survey

Measures:

- Prior knowledge
- Attitudes toward climate action
- Understanding of sustainability concepts

Concept Map

Students create an initial concept map illustrating their understanding of climate change.

Formative Assessments

- Exit tickets
- Think-pair-share discussions
- CER writing assignments
- Systems maps
- Data analysis worksheets
- Peer review sessions
- Journal reflections

- Progress checkpoints
- Teacher conferences

Summative Performance Tasks

Task 1: Climate Impact Investigation Report

Students analyze a climate-related issue using scientific evidence.

Requirements:

- Background information
- Data analysis
- Stakeholder analysis
- Sustainability implications
- Recommendations

Demonstrates:

- Scientific reasoning
- Research skills
- Evidence-based argumentation

Task 2: Sustainability Action Project

Student teams design and implement a solution addressing a local sustainability challenge.

Deliverables:

- Written proposal
- Data collection plan
- Action implementation
- Reflection on outcomes

Demonstrates:

- Problem-solving
- Collaboration
- Application of sustainability principles

Task 3: Public Presentation

Students present findings to an authentic audience such as:

- Classmates
- School administration
- Community members
- Environmental organizations

Presentation includes:

- Problem statement
- Evidence
- Proposed solution
- Expected impacts
- Reflection on limitations

Demonstrates:

- Communication skills
- Scientific literacy
- Civic engagement

Other Evidence for Evaluation

Rubric Criteria

Scientific Understanding (25%)

- Accurate use of climate science concepts

- Appropriate interpretation of evidence

Systems Thinking (20%)

- Recognition of interconnected environmental, social, and economic factors

Research and Analysis (20%)

- Quality and reliability of sources
- Effective use of data

Solution Design (20%)

- Creativity
- Feasibility
- Sustainability impact

Communication (15%)

- Organization
- Presentation quality
- Professionalism

Student Growth Assessment

Growth will be measured through:

- Pre- and post-unit concept maps
- Climate literacy survey comparison
- Reflection journals
- Portfolio development
- Self-assessment
- Peer assessment
- Teacher observations

Students will demonstrate growth by showing increased ability to:

- Analyze sustainability issues
- Apply systems thinking
- Use scientific evidence
- Design actionable solutions
- Communicate sustainability recommendations effectively