

**Randolph Township Schools
Randolph Middle School**

Sustainability Curriculum

“We do not inherit the Earth from our ancestors; we borrow it from our children.”

- Native American Proverb

Department of Science, Technology, Engineering and Math
Gabriel Maffei, Supervisor

Curriculum Committee
Robert Chernow
William Zagoren

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Randolph Township Schools
Department of Science, Technology, Engineering and Math
Sustainability

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Randolph Township Schools

Mission Statement

We commit to inspiring and empowering all students in Randolph schools to reach their full potential as unique, responsible and educated members of a global society.

Randolph Township Schools Affirmative Action Statement

Equality and Equity in Curriculum

The Randolph Township School district ensures that the district's curriculum and instruction are aligned to the state's standards. The curriculum provides equity in instruction, educational programs and provides all students the opportunity to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

N.J.A.C. 6A:7-1.7(b): Section 504, Rehabilitation Act of 1973; N.J.S.A. 10:5; Title IX, Education Amendments of 1972

RANDOLPH TOWNSHIP BOARD OF EDUCATION

EDUCATIONAL GOALS

VALUES IN EDUCATION

The statements represent the beliefs and values regarding our educational system. Education is the key to self-actualization, which is realized through achievement and self-respect. We believe our entire system must not only represent these values, but also demonstrate them in all that we do as a school system.

We believe:

- The needs of the child come first.
- Mutual respect and trust are the cornerstones of a learning community.
- The learning community consists of students, educators, parents, administrators, educational support personnel, the community and Board of Education members.
- A successful learning community communicates honestly and openly in a non-threatening environment.
- Members of our learning community have different needs at different times. There is openness to the challenge of meeting those needs in professional and supportive ways.
- Assessment of professionals (i.e., educators, administrators and educational support personnel) is a dynamic process that requires review and revision based on evolving research, practices and experiences.
- Development of desired capabilities comes in stages and is achieved through hard work, reflection and ongoing growth.

Randolph Township Schools
Department of STEM
Sustainability

Introduction

This is a marking period cycle course offered to middle school students interested in studying our past and future impact on our planet earth. Sustainability is the concept of maintaining the present needs of our world and society without compromising the needs of future generations. Course topics include current and time sensitive issues such as carbon footprints, energy resources, climate change, waste disposal, overpopulation, food resources, pollution, and clean water. Solutions to these problems are interdisciplinary and involve not only science and engineering, but also the coordination of economic, legal and social needs and values. Through project based learning, students will be able to evaluate the consequences of our actions on earth, and be better prepared to live as responsible world citizens in the 21st century.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Sustainability

SUGGESTED TIME ALLOTMENT	UNIT NUMBER	CONTENT - UNIT OF STUDY
3 weeks	I	Sustainability Fundamentals
3 weeks	II	Human's Impact on Earth
3 weeks	III	The Future

9 weeks

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Sustainability
UNIT I: Sustainability Fundamentals

<p>STANDARDS / GOALS:</p> <p>MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.</p> <p>MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</p> <p>MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</p> <p>MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.</p> <p>MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.</p> <p>MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.</p>	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
	Your actions and use of resources should not have a negative effect on the environment, economy and society.	<ul style="list-style-type: none"> How can you live a more sustainable life?
	Needs and wants vary among people and are based on societal norms, cultural practices, family values and personal preferences.	<ul style="list-style-type: none"> How can you tell the difference between a need and a want?
	You can minimize your waste and limit your use of natural resources including food, water, and energy to ensure that there will be resources available in the future.	<ul style="list-style-type: none"> How can you reduce your human footprint?
	KNOWLEDGE	SKILLS
<p>Students will know:</p> <p>Sustainability is the concept of maintaining the present needs of our world and society without compromising the needs of future generations.</p> <p>The three components of sustainability include the environment, society, and the economy; improvements in one area should not have a negative impact on the other two.</p> <p>Each person's ecological footprint varies based on their lifestyle and choices in consuming resources.</p>	<p>Students will be able to:</p> <p>Define sustainability and its key components.</p> <p>Define the components of sustainability, describe the range of activities normally undertaken by individuals, businesses, and government; and evaluate the sustainability of these activities based on impacts to the economy, the environment, and society.</p> <p>Determine how each person's actions influence the economy, society, and the environment.</p>	

<p>MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</p> <p>MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</p> <p>MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.</p> <p>MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<p>A system is a group of interconnected parts that work together; a change in one part affects the other parts and the whole system.</p> <p>Needs are things that are required for survival and a want is something we would like to have but is not required for life.</p> <p>American advertising influences consumer choices and purchasing power.</p> <p>KEY TERMS: sustainability, system, need, want, natural resource, human footprint, environment, economy, society.</p>	<p>Determine how changes to one earth system have consequences on the other systems.</p> <p>Identify and understand the requirements for life. Recognize that different people have different wants.</p> <p>Recognize the connection between advertising and consumption choices.</p>
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ASSESSMENT EVIDENCE: *Students will show their learning by the following, but not limited to:*

- Reflection including asking questions
- Collaborative discussion
- Recording observations
- Explanatory writing
- Analyzing and interpreting data
- Research of primary and secondary resources
- Engaging in argument and debate from evidence

KEY LEARNING EVENTS AND INSTRUCTION:

- Activity – *Systems Are Dynamic* - Each student is one part of a larger system (class). Students move in relation to other students' movements to demonstrate how a system is made up of parts.
- Activity – *Turtles in the Air* - Each student is one part of a larger system (class). Students toss an object following a set of rules. The parts must work together or the system fails.
- Activity – *Needs and Wants* – Students rank 30 items and emotions in order of importance.
- Activity – *Venn diagram* - Three components of sustainability.
- Activity – *Are You Buying This?* - Students evaluate how advertising influences consumption by creating and presenting their own advertisement.
- Activity – *What Makes You Happy?* - Students evaluate quality of life issues.
- Activity – *What's Your Cup of Tea?* - Students evaluate what determines their consumption choices.
- Reading – *Sustainability* (Facing the Future)
- Reading – *Human Footprint* (Facing the Future)
- Video – *Human Footprint* (National Geographic)
- Activity – *Current Events* – Relate to curriculum topics. Evaluate connections to environment, economy, and society. Create awareness, analyze impacts, and propose solutions.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Sustainability
Unit I: Sustainability Fundamentals

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
3 Weeks	Sustainability Fundamentals	<p style="text-align: center;"><u>Suggested Supplies</u> Computer with Internet Access</p> <p style="text-align: center;"><u>Suggested Resources</u> FacingtheFuture.org Storyofstuff.org Newsela.com NJ Model Curriculum Resources Sustainability Document Folder</p>

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Sustainability
UNIT II: Human’s Impact on Earth

<p>STANDARDS / GOALS:</p> <p>MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.</p> <p>MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</p> <p>MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</p> <p>MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.</p> <p>MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.</p> <p>MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.</p>	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
	Overuse of existing resources and careless industrial practices have caused pollution of air, groundwater and surface water and soil.	<ul style="list-style-type: none"> How does human activity impact earth?
	Burning of fossil fuels for energy releases excess carbon dioxide (CO ₂) to the atmosphere which absorbs heat and contributes to climate change.	<ul style="list-style-type: none"> What is climate change?
	In many societies, economic “progress” is measured by the amount of manufacturing production and public consumption. The five steps in the "materials economy" (aka product life cycle) are extraction, production, distribution, consumption, and disposal.	<ul style="list-style-type: none"> What is the product life cycle?
	If societies continue to consume resources at the current rate, we must develop new technologies and renewable energy resources to maintain our standard of living.	<ul style="list-style-type: none"> Can humans continue to consume resources at the current rate?
	KNOWLEDGE	SKILLS
<p>Students will know:</p> <p>Burning fossil fuels for energy creates the greenhouse gas CO₂, which is known to absorb heat and may contribute to climate change.</p>	<p>Students will be able to:</p> <p>Develop and practice lifestyle modifications to reduce carbon footprints.</p>	

<p>MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</p> <p>MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</p> <p>MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.</p> <p>MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<p>The following renewable energy alternatives do not consume earth's finite resources: solar, wind, geothermal, tidal and biofuel.</p> <p>Plastic is manmade from petroleum products and does not readily decompose, harms animals, and takes up space in landfills.</p> <p>Food packaging creates additional solid waste and may cause environmental harm to animals.</p> <p>Every person can minimize the amount of waste generated by recycling.</p> <p>Garbage ends up in landfills which takes up space, attract pests, can cause soil and groundwater pollution, and mar the landscape; incineration causes air pollution and bad odors.</p> <p>Biodegradable products and packaging will naturally decompose in the environment which reduces landfill volume and eliminates the need for incineration which causes harmful greenhouse gases.</p> <p>Current agricultural practices contribute to soil erosion, utilize abundant pesticides and herbicides, require scarce water resources, and may not be healthy for our diets.</p>	<p>Analyze various renewable energy resources and assess advantages and disadvantages of each.</p> <p>Identify and explain environmental problems caused by plastic packaging.</p> <p>Design, plan, and construct a model of environmentally-friendly food packaging.</p> <p>Identify and list everyday consumable products in the house that we throw away in the garbage.</p> <p>Formulate and implement home practices to reduce the amount of garbage generated and increase the volume of recycled material.</p> <p>Maintain an inventory of foods that individuals eat over a one week period.</p>
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	<p>Locally produced foods taste fresher, require less packaging, utilize less energy to get to the market, and create jobs for local farmers and fisherman.</p> <p>Many types of seafood are disappearing due to over-fishing.</p> <p>Environmental remediation is often a slow, expensive, and not entirely successful process.</p> <p>KEY TERMS: renewable and non-renewable resources, fossil fuel, carbon footprint, biodegradation, product life cycle, extraction, production, distribution, consumption, disposal.</p>	<p>Determine where different foods originate and make appropriate food choices accordingly.</p> <p>Understand human's connection to the marine environment for food resources.</p> <p>Evaluate human activities that contribute to environmental harm and how humans try to remediate the problem.</p>
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KEY LEARNING EVENTS AND INSTRUCTION:

- Activity – *Is It Sustainable?* – Students evaluate whether or not certain activities are sustainable.
- Activity – *What's In Your Food?* – Students research the source and ingredients in their foods.
- Activity – *How Do You Make a Hamburger?* – Students research the ingredients in a hamburger, then evaluate the sources, processes and impacts of making it.
- Activity – *Watch Where You Step* – Students discover impacts from everyday activities.
- Activity – *What's In It? How Is It Made?* – Students research the contents of common items.
- Activity – *Tragedy of the Commons* – Students evaluate the consequences of depleting a common resource (water, air, fish).
- Reading – *Human Footprint* (Facing the Future)
- Video – *Human Footprint* (National Geographic)
- Video – *Story of Stuff* – Product life cycle.
- Video – *Majestic Plastic Bag* – Mockumentary life cycle.
- Video – *Ted Talk: Plastic Straw* – Effort to ban the use of plastic straws.
- Reading – *World Without Fish*, Mark Kurlansky – Narrative and consequences of over-fishing.
- Activity – *Current Events* – Relate to curriculum topics. Evaluate connections to environment, economy, and society. Create awareness, analyze impacts, and propose solutions.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Sustainability
Unit II: Human's Impact on Earth

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
3 Weeks	Human's Impact on Earth	<p style="text-align: center;"><u>Suggested Supplies</u> Computers with internet access</p> <p style="text-align: center;"><u>Suggested Resources</u> FacingtheFuture.org Storyofstuff.org Newsela.com NJ Model Curriculum Resources Sustainability Document Folder</p>

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Sustainability
UNIT III: The Future

STANDARDS / GOALS:	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
<p>MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.</p>	<p>Each individual’s commitment and contribution to sustainability makes a difference. The greater the participation, the greater the positive impact.</p>	<ul style="list-style-type: none"> • How can one person make a difference in sustaining our earth?
<p>MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</p>	<p>You can modify your wants and values in order to change your habits and practices by using more renewable natural and energy resources and creating less waste.</p>	<ul style="list-style-type: none"> • How will you reduce your carbon footprint?
<p>MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</p>	<p>Government may get involved when it feels that certain measures will benefit society as a whole.</p>	<ul style="list-style-type: none"> • When is it acceptable for government to require sustainable practices?
<p>MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.</p>	<p>KNOWLEDGE</p>	<p>SKILLS</p>
<p>MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.</p> <p>MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.</p>	<p>Students will know: Individuals and society can change their practices to promote conservation and create a more sustainable planet.</p>	<p>Students will be able to: Evaluate their own lifestyles and implement change to protect natural resources.</p> <p>Make appropriate personal choices to reduce energy and water use.</p>

<p>MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</p> <p>MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</p> <p>MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.</p> <p>MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<p>A school is a specific society made up of individuals, who can improve their sustainable practices.</p> <p>Conservation regulations must consider political, legal, and economic tradeoffs.</p> <p>Less than 1% of the water on earth is available as fresh water for man's use.</p> <p>The United States has 5% of the world's population but uses 20% of the world's energy and creates 20% of the world's waste.</p> <p>KEY TERMS: carbon footprint, ecological footprint, lifestyle, tradeoff</p>	<p>Assess the components of their school's Ecological Footprint.</p> <p>Determine the degree to which the school's practices are sustainable.</p> <p>Make recommendations for improving the overall sustainability of the school.</p> <p>Students will be able to evaluate different criteria and be aware that tradeoffs are necessary in many decisions.</p> <p>Evaluate scientific and non-scientific data and news to understand current events and world conditions.</p>
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- Reflection including asking questions
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KEY LEARNING EVENTS AND INSTRUCTION:

- Activity – *Deep Space 3000* – Students conceptually design and draw a sustainable spaceship for future populations.
- Activity – *Every Drop Counts* – Students evaluate water resources and uses.
- Activity – *Sustainable Advertisements and Labels* – Students find ads and labels promoting sustainability.
- Project – *Harmless Holder* – Students apply the engineering design method for a new substitute for the plastic 6-pack ring holder.
- Project – *Carbon Calculator* – Students measure and calculate their personal energy consumption (to be developed).
- Activity – *Current Events* – Relate to curriculum topics. Evaluate connections to environment, economy, and society. Create awareness, analyze impacts, and propose solutions.
- Video – *Land Philharmonic* – Students in a poor community in Guatemala create musical instruments from landfill waste and learn to play.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Sustainability
Unit III: The Future

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
3 Weeks	The Future	<p style="text-align: center;"><u>Suggested Supplies</u> Computers with internet access</p> <p style="text-align: center;"><u>Suggested Resources</u> FacingtheFuture.org Storyofstuff.org Newsela.com NJ Model Curriculum Resources Sustainability Document Folder Carbon Calculator</p>

APPENDIX

RESOURCES:

Suggested Web Address:

<http://www.facingthefuture.org/>

<http://pbskids.org/designsquad/parentseducators/resources/index.html?category=green>

<http://www.nature.org/greenliving/carboncalculator/index.htm>

<http://www.soils.org/lessons/>

<http://www.youtube.com/watch?v=GLgh9h2ePYw> The Majestic Plastic Bag – A Mockumentary

http://eeweek.org/greening_stem

<http://sepuplhs.org/high/sands/index.html>

<http://storyofstuff.org>

Software Names:

Microsoft Office Suite