Introduction to Sustainability Concepts
Course Outline

COURSE SUPPLEMENT (FOR EDUCATORS):
This course provides K-12 educators with an introduction to sustainability topics and teaching methods. The course is appropriate for newcomers as well as those who have familiarity, but wish a greater breadth and depth of understanding. Participants discuss the state of the planet and its people, explore the triple bottom line of sustainability, and examine various pedagogical approaches to teaching about sustainability. The course culminates with participants applying what they learned to their own teaching, curriculum, and school communities.

COURSE DESCRIPTION (GENERAL AUDIENCE):
This course is designed to equip students and adults with a strong foundational knowledge of sustainability, the science and technology of promoting sustainability, and the balance between environmental, social, and economic concerns. The materials provide participants with a thorough introduction to sustainability topics such as ecosystems, energy and water challenges, life-cycle analysis, new technology, and climate change science. The course incorporates hands-on activities, online modules, nationwide discussion forums, and dynamic instruction methods.

Unit 1: Introduction to Sustainability: Its Purposes, Challenges and Requirements

Essential Question: What is sustainability and why is it important?

The Big Idea: Whether we are concerned with a simple object such as a cup of coffee, an activity such as going on vacation, or a large system such as government, assessing and creating sustainability is usually aiming for a moving rather than a stationary target; it is often grey, rather than black or white. Sustainability is both personal and global. The triple bottom line of sustainability is a powerful tool because it forces us to consider multiple options and make nuanced choices that depend largely on our own situation in life.

Topics Covered:
- Defining Sustainability and its Main Challenges of Natural Resource Depletion, Climate Change, and Population Explosion
- “Green” vs. “Sustainable”
- The Triple Bottom Line – As a Context for Business, Learning, and Living
- The Myths and Misconceptions about Sustainability
- Sustainable Development – Exploring the Development Objective
- Sustainable Development’s Triple Crisis – Poverty, Water, and Food
- Intergenerational Responsibility and the Sustainability Movement

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Unit 2: The Global Ecosystem: Part I

Essential Question: How are the Earth’s systems connected and why is it important to understand the concept of interdependency?

The Big Idea: The science of ecology emphasizes the interdependencies between parts of an ecosystem, and between systems. An understanding of Earth systems and their life supporting functions provides an important context for viewing sustainability as an integrating concept.

Topics Covered:
- The Natural Environment and a Sustainable Planet – Biocentrism
- Earth as an Evolving, Changing System
- Geological Time and Human Time
- Ecosystems Large and Small
- The Relationship Between Forests, Waterways, and Atmosphere
- Ecological Interdependence – Sustainability as an Integrating Concept
- Systems Approach Thinking – STEM Application

Unit 3: The Global Ecosystem: Part II

Essential Question: Why is biodiversity an important feature of healthy, vibrant ecosystems?

The Big Idea: Ecosystems depend on life-supporting cycles that naturally drive plant and animal production and diversity. This unit continues where Unit 2 left off by exploring the biocentric viewpoint of sustainability as an inherent tendency of ecosystems.

Topics Covered:
- Where Does Life Exist? Defining the Earth’s Biosphere
- Life-supporting Cycles – Water (Hydrological), Energy (Carbon), and Food (Nitrogen)
- Photosynthesis and the greenhouse effect
- Oceans as the Base of the Food Chain
- Biodiversity as Nature’s Risk Management Tool
- Trends in Biodiversity Reduction and Ecosystem Damage

Unit 4: Human’s Ecological Footprint: Part I

Essential Question: How has human impact on ecosystems changed over time through the early stages of civilization development to today’s industrialized and growing societies?

The Big Idea: The essential needs of humans to sustain life are food, shelter and water. In fact, the history of human impact on ecosystems can be readily described in terms of the evolution of technologies and methods used to acquire those three resources. Humans have always had potentially serious impacts on local ecosystems, however the large-scale global impacts observed today are a relatively recent phenomenon; and those impacts now pose fundamental challenges to the sustainability of human societies.
Topics Covered:
- The Impacts of Population Growth on Global Ecosystems
- Emergence of Modern Humans
- The Industrial Revolution
- Today’s Human Ecological Footprint
- Greenhouse Gasses and Their Sources
- Global Warming vs. Climate Change

Unit 5: Human’s Ecological Footprint: Part II

Essential Question: What are the primary ways in which impact measurements are useful tools and what are the long-term effects of human ecological footprints?

The Big Idea: Ecological Footprint is a concept for measuring and comparing human demand on nature with the biosphere’s ability to regenerate resources. This unit continues where the previous unit ended and explores the usefulness of such measurements as well as their potential problems.

Topics Covered:
- The Ecological Footprint of Energy
- The Ecological Footprint of Agriculture
- The Ecological Footprint of Industry
- Toxins and Their Impact on Ecosystem, Animal, and Human Health
- The Ecological Footprint of Poverty –Destructive Agriculture, Deforestation, and Water Pollution
- The Ecological Footprint of the Built Environment
- Long-term Ecological Effects – Resource Depletion, Degradation, and Climate Change

Unit 6: Sustainable Development: The Social Challenges

Essential Question: How does society and governance contribute to sustainability and what are the essential elements of quality of life for people?

The Big Idea: Society and Governance play an important role in achieving local and global sustainability initiatives. Inequities in income, education, and access to healthcare and resources are primary challenges in developing countries; while obesity, unheeded consumption, and resistance to cultural change bring a different suit of challenges to more industrialized countries.

Topics Covered:
- Global Inequities in All Dimensions of Sustainability
- The Ecological Footprint of Poverty –Destructive Agriculture, Deforestation, and Water pollution
- Health and Sustainability
- Sustainable Consumption Levels
- Sustainability, Society and Social Change

Unit 7: The Economics of Sustainability: Part I
**Essential Question:** How are traditional economic systems evolving to encourage sustainability on global, regional and local scales?

**The Big Idea:** The global economy reflects three trends having important implications for efforts to move toward sustainability. First is the increasing economic inequality across nations and regions. Inequality is partly explained by the second trend: spectacularly rapid economic growth in some countries, especially in Asia. This rapid growth is an important reason for the third trend, which is an increasing rate of natural resource depletion and greenhouse gas emissions globally. There are few if any natural market incentives to change these trends; in fact the incentives are strongly favoring these trends. That leaves government as the source of restricting these trends, but in most countries government policies have been of limited effectiveness and in many instances actually served to reinforce these trends.

**Topics Covered:**
- Global Trends in Consumption/Resource Utilization
- Global Economic Inequality
- Basic Economics Concepts for Assessing Sustainability – Market Failures, Externalities, and Market Incentives
- Economic Disincentives for Sustainability
- Sustainable Development Requirements in Both Developing and Developed Countries

**Unit 8: The Economics of Sustainability: Part II**

**Essential Question:** What are the roles of governments in addressing sustainability market failures?

**The Big Idea:** Because economic markets have failed to address the issues of sustainability, it is governments that must take action. First, economic inequality must be reduced. Second, patterns of consumption must be changed. Third, economic behaviors that are particularly damaging must be more effectively regulated. Governments have generally resorted to very coercive regulations to compel behavior, and this naturally generates political as well economic opposition. The alternative is to use regulations and other policies to create market incentives for the behaviors desired, and there are many opportunities for such incentive programs. In the end, wealthier countries and populations must be incentivized to consume less, while the means for poorer populations to consume more must be provided. Incentives must also be provided to develop sustainable energy and food production systems.

**Topics Covered:**
- The Roles of Government
- Sustainability Policy and Regulation
- Explosive Growth of Environmental Regulations in the U.S. and Europe – Intentions and Effectiveness
- Government Subsidies and Sustainability Failures – Energy, Agriculture, Housing, and Water
- Measures for Coping with Market Failures
- Tragedy of the Commons
- Government Protection of Public Goods
- Creation of “Missing Markets” – Cap and Trade, Ecosystem Services, and Public Goods
- Case Study: Chesapeake Bay Watershed
Unit 9: New Technology and Innovative Sustainability Approaches

Essential Question: What new technologies are being developed to address sustainability issues and why is important that consumers embrace demand for them?

The Big Idea: There is a wide variety of new and innovative sustainable technologies entering the market. Unfortunately, no single technology is a “silver bullet” that will solve the problems of sustainability, but taken together these innovations can help make significant improvements. It will take the positive actions of all people, employing a wide range of innovations over an extended period to achieve sustainable societies. The opportunities are available; now we must exploit them.

Topics Covered:
- Renewable Energy Options
- A New Agriculture
- Transportation Innovations
- Biomimicry
- Green Building Technology – The Technology Evolution brought forth by LEED and Other Green Building Rating Systems

UNIT 10: Toward a Sustainable Future

Essential Question: What important cultural and fundamental shifts must continue happening in businesses, governments, media, and societies in order to fully promote and implement sustainability?

The Big Idea: The ultimate objective of efforts to promote sustainability is the creation of a green economy, one that imposes the least possible environmental damage and consumes no more resources than nature can replenish. There are three primary actors in creating this green economy: the consumer who determines whether green products are demanded; businesses that design and produce those goods; and the media, especially social media, which provides the essential information link between all actors. Businesses are increasingly discovering that promoting sustainability is good for business, and consumers are beginning to understand that responsible behavior is good for their community and their family. The media will play an ever more important role in educating the public, in keeping businesses honest about their performance, and in linking consumers and producers in an ongoing dialogue about sustainability best practices.

Topics Covered:
- Designing a Sustainable Economy
- The Role of the Consumer
- The Role of Business
- The Role of the Traditional and Social Media
- The Road Ahead – Sustainability as a Mindset
Unit 11: Sustainability Education: Students, Teachers, and Schools
(EDUCATOR VERSION ONLY)

Essential Question: What does sustainability education look like across the nation?

The Big Idea: In the same way that there is no “silver bullet” for the sustainability challenges that humanity faces, and no one-size-fits-all approach to sustainability education. Sustainability literacy will not look the same for any two teachers and sustainability initiatives will vary between schools. Teachers all have unique interests, skills sets, and job requirements. However, the role of education is paramount to creating a sustainable future. We need to guide, help, and learn from one another in order to create a fair and kind society, a healthy and equitable green economy, and to protect and utilize our planet's resources with care. There are fantastic resources available to us, including a vast network of governmental and non-governmental organizations supplying information, curriculum, expertise, sustainable schools programs, award and grant programs for green schools, and national standards for sustainability education. As literacy in sustainability increases, teachers and students develop their ability to adapt and grow in the new green economy. The capacity to adapt and integrate helps both people and governments create solutions and prosper as we address the issues facing this and future generations.

- Teacher as Learner
- Sustainability Education: Fostering a Generation of Integrated Learning
- Systems Thinking
- National Education Programs in Sustainability
- National Sustainability Education Standards as Integrating Context for Learning

Unit 12: Sustainability Education Standards and Frameworks
(EDUCATOR VERSION ONLY)

Essential Question: How can sustainability education standards guide our work?

The Big Idea: Sustainability and sustainability education can be advanced by standards and frameworks that are already available. Each takes a slightly different approach to sustainability concepts and skills based on addressing what students should know and be able to do. For example, the new national science framework explicitly promotes systems thinking, technology, and engineering for sustainability, environmental stewardship, and an appreciation for limits in nature. National and state standards and frameworks are increasingly addressing sustainability, often through a strategy of integrating sustainability concepts into core content areas.

Topics Covered:
- National Sustainability Education Standards
- K-12 Science Framework
- National Social Studies Standards
- Ed Steps Global Competence Matrix
- Oxfam Global Citizenship Framework
Unit 13: Sustainability as an Integrating Context for Learning
(EDUCATOR VERSION ONLY)

Essential Question: How and where in your curriculum can you teach about sustainability?

The Big Idea: Teachers and students will get more out of sustainability curriculum if it can be framed in a well-structured and integrated unit that takes advantage of sustainability standards. Curriculum should be designed and delivered with best teaching practices that engage the learner’s existing knowledge, provide rich new information and concepts. The point of this exercise is to give course participants an experience in framing a curriculum unit, with the possibility of later development complete lessons and assessments.

Topics Covered:
- Pedagogy: The Learning Cycle
- Connecting Core Content Topics and Sustainability Education Standards
- Developing a Sustainability Education Unit

UNIT 14: School-wide Sustainability Initiatives
(EDUCATOR VERSION ONLY)

Essential Question: How can sustainability foster school improvement by contributing to a school culture of respect, student engagement, and achievement?

The Big Idea: Sustainability education thrives when it engages students and administrators from the onset, employs best teaching practices, and favors collaboration and innovation. Good partnerships are essential. Most important is the creativity of the teacher in designing activities that enthusiastically engage students.

Topics Covered:
- Developing a School-wide sustainability initiative
- Integrated sustainability curriculum
- Green Campus initiatives
- Environmental and physical health
- School climate and citizenship
- Place-based learning and service learning
- Professional development
- Creating a sustainability education plan