Chapter 11
Ecological Economics Education

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What Is Economics?

Economics, famously dubbed the dismal science, is broadly concerned with a question that is anything but dull: How does society allocate scarce resources to meet seemingly unlimited wants and needs? Answering this question involves every facet of the economy, including production, distribution, supply chains, markets, consumers, finance, global trade, policy, and governance. But these concepts raise only more questions. How do cultural beliefs shape our notions of needs and wants? Where do all the "things" we need or want actually come from? How do we evaluate the governance, the structures, that determine economic policy? Layer in issues, such as climate change or food security, and economics moves from "dismal" to dynamic and influential.

For sustainability-minded educators, economics is something more. It is one of the "three Es" that is inextricably connected with the other two, the environment and equity. Understanding economics is thus indispensible for K-12 teachers looking to support students in crafting holistic solutions to the challenge of unsustainability.

With countless schools of economic thought, teachers must be able to differentiate approaches that advance sustainability from those that do not. Moreover, teachers must be able to build this understanding in students across grade levels and disciplines. This chapter is intended to support teachers in this daunting task. This chapter introduces the fields of ecological economics and "conventional" economics by comparing their fundamental assumptions and principles using philosophic, historic, and scientific lenses. The final part of this chapter introduces strategies for teaching ecological economics in K-12 classrooms, comparing these approaches to "conventional" approaches.

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Framing the Spectrum of Economic Paradigms

In his influential 1962 work, The Structure of Scientific Revolutions, Thomas Kuhn describes a "paradigm" as an accepted set of models, patterns, beliefs, and assumptions about how the world operates. An economic paradigm is thus a set of beliefs about how the economy operates. This includes beliefs and assumptions about the interactions among businesses, individuals, policies, resources, communities, and other actors in the system. An economic paradigm is also defined by more basic assumptions about human nature and motivations. Is greed a natural impulse? Is personal reward the only—or most important—factor in economic decisions? The varying answers to such questions reflect the broad spectrum of economic theories.

This chapter describes and perhaps simplifies the spectrum of economic paradigms by defining broadly the two (not necessarily extreme) ends: "conventional" and "ecological." Conventional economics refers to the practices and assumptions associated with the dominant global economic system of market-based capitalism (Keen, 2001). This paradigm's distinguishing features include private ownership of wealth and capital, competition in markets to determine production and the allocation of resources, and limited government intervention. While there are many active debates surrounding these issues, they all operate within the conventional paradigm's most fundamental premise that unlimited growth is both desirable and possible. The role of this assumption in shaping the conventional paradigm is explained further later in this chapter.

The other paradigm, "ecological" economics, likewise concerns itself with fundamental questions about resources, allocations, and associated policies. However, unlike its conventional cousin, ecological economics begins with a fundamentally different premise, namely, that all economic activity operates within larger ecological systems. This bedrock principle leads to this paradigm's fundamental question: *How can we create an economic system that enables individuals and communities to thrive, while also sustaining the capacity of the environment to support this?* (Daly & Farley, 2007).

Thus, the two paradigms can be compared and contrasted based on two dimensions:

- The relationship between the environment and the economy
- The fundamental goal of the economy and measurements of success

Definitions

Before going further, readers may benefit from a clarification of the term "environment." As commonly defined, the environment is all living (biotic) and nonliving (abiotic) substances on earth that comprise our surroundings (Miller & Miller, 2002). Biotic substances include plants and animals and are considered "renewable" because they can reproduce. Abiotic materials include minerals, rocks, and water. Because these materials cannot grow back or reproduce, they

are considered nonrenewable. However, all abiotic and biotic materials are recycled within the earth's system through the nutrient cycles (carbon cycle, water cycle, nitrogen cycle, etc.).

These basic principles tell us that humans are a part of the environment and that the environment is everywhere, not just in the rainforest, the arctic, or other "wild" places (that are often without people). Conceptualizing the environment as a place far away and without people is not only scientifically inaccurate, it also reinforces an anthropocentric worldview: the belief that people are separate from and "above" the environment and that it exists primarily for human needs (Bowers, 1999; Kahn, 1997).[1] In contrast, a biocentric view reflects the idea that humans share the environment with other species and that the natural world has value beyond how it serves humans (Kortenkamp & Moore, 2001).

By some interpretations, the familiar phrase "natural resources" reinforces the belief that the environment is merely a source of materials for human use (Kennedy & Thomas, n.d.). Therefore, this chapter offers the phrase "natural materials" to more accurately reflect the idea that the environment supports all life forms, not just humans.

A Comparative Analysis of the Paradigms

The most significant difference between the conventional and ecological paradigms is their respective assumptions about the relationship between the economy and the environment. While the conventional paradigm tends to represent the economy as separate from the environment, the ecological paradigm begins with a fundamentally different assumption: that economic activity occurs within, and depends upon, larger ecological systems. In other words, *the economy is contained within the environment*. This is more than an assumption; it is a basic scientific fact. The following section reviews the basis of this paradigm as drawn from physics and ecology and then evaluates the conventional paradigm in light of these concepts.

The Ecological Paradigm

The first principle underlying the ecological paradigm is that everything needed to support life (human and otherwise) comes from the living or nonliving substances of the environment. For humans, this includes the materials for food, shelter,

[1] Anthropocentric thinking is not necessarily antienvironmental. Anthropocentrism is also reflected in, for example, a desire to "protect" the environment when it is motivated solely by human needs. Note that anthropocentric thinking is not innate in humans; rather, it is culturally determined and tends to increase with age in children living in Western cultural contexts (Kahn, 1997).

transportation, entertainment, and other needs. For example, trees are the basis of paper, lumber, and cardboard. Petroleum (crude oil) is used to make plastics and fabrics (nylon, polyester). Sand is a source of silica, which is the basis of glass and other products.

A second, related principle is that the environment provides critical life-sustaining services for all species. The sun provides food energy. Wetlands purify water. Forests provide habitat and beauty. These "ecosystem services" play a fundamental yet often undervalued role in the economy. For example, the wetlands and waterways that surround agricultural fields absorb fertilizer runoff. Trees absorb carbon emissions from fossil fuel use while also providing oxygen. Microorganisms decompose plant and animal matter, adding to soil fertility. Whereas the conventional paradigm tends to ignore the value of these vital functions, the ecological paradigm attempts to assign a clear value. A landmark study (Costanza et al., 1997) assessed ecosystem services to be worth $33 trillion per year. This was almost double the global output of human-made goods and services, valued then at $18 trillion. While such research invites speculation and debate, it nonetheless moves the value of the environment (intrinsic and otherwise) into economic discussions. Attempting to place a monetary value on ecosystem services can be seen as playing into anthropocentric worldviews that conceptualize the environment in purely market terms. However, ecological economists point to valuation as a method to convey the incalculable value of the environment to people who have yet to see beyond monetary terms. Thus, economic valuation can serve as a tool in communicating, albeit in problematic terms, the importance of the environment, the true value of which is far beyond human limitations of the concept.

A third principle of the ecological paradigm is that natural materials are transformed through the multiple stages of a product's life cycle, including extraction, manufacturing, distribution, consumption, and disposal. For example, manufacturing strawberry jam requires growing berries (with machinery powered by diesel fuel), cooking them (using coal-powered electricity), and transporting the jam. Use and disposal may involve refrigeration or energy for recycling the jar. Moreover, the energy involved in each stage requires its own set of transformations, such as mining, refining, and combustion. All of these stages create outputs in the form of wastes. These outputs go back into the environment in one form or another. The glass jar may end up in a landfill. The carbon emissions from processing the jam will go into the atmosphere. As described in the next two principles, these wastes do not and physically cannot disappear.

The laws of thermodynamics are physics principles as fundamental and immutable as gravity. The first law, the conservation of energy, states that energy is never created or destroyed but rather is transformed from one form to another. For example, consider the process in which energy is transformed to power a vehicle. The potential chemical energy in gasoline transforms into kinetic mechanical energy (movement) through the process of combustion. However, the gasoline is not "gone"; the energy has been converted to movement, with heat loss and outputs such as carbon dioxide.

Can we "recapture" these outputs to move the vehicle again? The second law, entropy, tells us no. Entropy is a measure of how *available* an energy source is to

perform useful "work" (such as moving the vehicle). With each step of transformation (such as combustion), energy becomes less able to do work; heat and other outputs become more diffused. For example, after gasoline is burned, the emissions are not able to fuel the vehicle because the energy has dispersed. Gasoline is thus low entropy (high availability to work), while the outputs of combustion are high entropy (low availability).

The Conventional Paradigm

The scientific foundations of ecological economics are largely absent from the conventional paradigm. Nothing more clearly demonstrates this than a look at its basic model. Macroeconomics is the "big picture" view of the overall economy, as opposed to the microeconomics' focus on individual firms. Conventional macroeconomics is represented in virtually every economics textbook by the classic "circular flow model." This diagram shows the flows of money among households, businesses, and government. Understanding these relationships is certainly important. But where in this model is the environment? It is seemingly nonexistent except for a nod to "land" as a factor of production (along with labor and capital). Unlike the ecological paradigm in which the environment is the containing system, the conventional paradigm regards the environment as a mere input, with all its complexity stripped away by the simplistic label "land." The conventional model largely separates the economy from the environment.

From a sustainability perspective, the conventional model is problematic on scientific and cultural levels. First, it ignores the fundamental biophysical reality that the environment is not just a "factor" of production but is the *basis* of it. This misrepresentation stems from a cultural issue. The belief that people and their activities (i.e., the economy) are separate from the environment reflects the anthropocentric notion that the environment is merely a source of materials for human use.

The Economic Goal: A World of More, Better, or Both?

With the basic assumptions of each paradigm laid out, we next turn to the ways each approach answers another fundamental question: What is the economy for? We begin with the ecological paradigm.

Ecological Economics: Toward a Better Household

Etymology is a good vantage point for understanding the ecological paradigm. The word "economics" comes from the Greek "oikonomia," which means "household management." Inasmuch as ecological economics is rooted in the concept of

interdependence, this paradigm's definition of "household" thus includes the natural and human systems that sustain life. These shared and inherited gifts, such as water, air, language, and culture, are known as the *commons* (Friends of the Commons, 2008).

In the ecological paradigm, the well-being of individuals and communities (including the environment) is connected and dependent upon a healthy commons. In this view, the goal of the economy is to distribute goods and services in ways that sustain the long-term well-being of the household and all it implies (Daly & Cobb, 1989). A "successful" economy is defined by *qualitative* improvements in the well-being of the entire household. For humans, this means better health, stronger families and communities, and more security and happiness. Also, because these outcomes occur within larger ecological systems, "success" includes—and ultimately depends—on a healthy environment. In short, the purpose of the economy in an ecological paradigm is to make things *better*: supporting improvement in the overall quality of life in ways that sustain the systems that contribute to it.

Conventional Economics: A Focus on Growth

In contrast to the ecological economics goal of preserving a healthy commons, the conventional paradigm focuses on these core questions (National Council for the Social Studies [NCSS], 2010):

- What is to be produced?
- How is production to be organized?
- How are goods and services to be distributed and to whom?
- What is the most effective allocation of the factors of production?

The focus on production and distribution evident in these questions hints at larger assumptions underlying the conventional paradigm, i.e., unlimited growth is the overriding economic goal.

The centrality of the idea of economic growth in the conventional paradigm can be traced back to 1712, when Thomas Newcomen invented the coal-powered steam engine (McKibben, 2007). Up until that point, the scale of economic activity was limited by the availability of energy through the "muscle power" of people and animals or the mechanical energy delivered through, for example, windmills or water wheels. The introduction of fossil fuels and engines enabled people to dramatically expand access to energy and with it production. The next three centuries brought about dramatic and unprecedented expansion in the production of food, clothing, housing, transportation, and other needs, accompanied by rapid global population growth.

However, growth was more than a phenomenon; it was a belief system. Growth drove the expansion of colonial economies in the eighteenth century and the US ideology of "Manifest Destiny" in the nineteenth century. In the twentieth century, growth became associated with "development" and the process of industrialization.

For example, in his 1949 inaugural address, President Harry Truman proclaimed that "we must embark on a bold new program for making the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas" (Truman, 1949). In this speech, Truman coupled growth, at least in theory, with a humanitarian aim: "The old imperialism—exploitation for foreign profit—has no place in our plans. What we envisage is a program of development based on the concepts of democratic fair dealing."

Growth was further embraced by leaders across the political spectrum, from John F. Kennedy to Ronald Reagan to Nikita Khrushcehev, who proclaimed that "Growth of industrial and agricultural production is the battering ram with which we shall smash the capitalistic system" (McKibben, 2007, p. 8). In this way, the conventional paradigm's emphasis on "more" became the means to a "better" life. In many ways, it was.

Of course, history also is quite clear on the downside of this growth, including the degradation of people and the environment subjugated to serve it. Slavery, child labor, and deforestation were all methods to drive growth, contributing to the social inequalities and environmental problems still with us today (World Commission on Environment and Development, 1987).

So why did these realities not temper the fervor for growth and force society to redefine it? The answer lies in how the conventional paradigm measures success.

The GDP: Measuring Success in the Conventional Paradigm

The conventional paradigm's most prominent measurement tool is the gross domestic product (GDP). The GDP is "the total market value of the output of goods and services produced by labor and property located in [a given country]" (Bureau of Economic Analysis [BEA], 2007). The GDP includes consumer and government spending, investment, and the value of exports, minus the value of imports. Historically, the GDP has grown at an average of 2.5–3% per year but with substantial fluctuations during recessions and boom periods (BEA).

Because the GDP is indexed to the market value of goods and services, it grows each time money is spent. This is a problem from the ecological perspective because market value is only one dimension of the overall worth of something. For example, clear cutting a forest registers as "growth" in the GDP based on the value of the timber, but the value of lost ecosystem services (habitat, erosion control, carbon sequestration, etc.) is ignored. Likewise, the GPD views divorce as "positive" given the legal fees and other dollars spent on counseling or establishing a new household. The potential social or health costs associated with divorce are ignored. Thanks to this selective accounting, policymakers cheer growth while simultaneously ignoring the erosion of the environmental and social capital on which the economy ultimately depends.

The fundamental assumption behind the GDP is that unlimited growth is both *desirable* and *possible*. In terms of desirability, growth is seen as the main way to

increase benefits, called "utility" by economists. At some level, this holds true. People have needs, and, after providing for basics such as food, shelter, and clothing, additional production and spending (growth) may focus on entertainment, travel, or additional comforts. For people without basic needs such as food, getting "more" material goods may well mean a "better" life.

The second part of the belief that unlimited growth is possible derives from a worldview that neither sees nor understands environmental limitations. This worldview stems from the conventional assumption already discussed: that the environment is separate from the economy. A growing number of business leaders and economists are recognizing this is not the case. As Herman Daly, former World Bank economist and revered "grandfather" of ecological economics notes, "the evolution of the human economy has passed from an era in which manmade capital was the limiting factor in economic development to an era in which remaining natural capital has become the limiting factor" (Goodland, Daly, & Serafy, 1992, p. 23). In other words, whereas economic activity was once limited by the availability of energy or industrial infrastructure, today, declining ecological conditions will be (and in some ways already are) a decisive factor driving the future of the economy.

At the same time, growth is not necessarily an anathema to the ecological paradigm. As designers William McDonough and Michael Braungart (2002) point out, a lot depends on what is growing. Is there growth in local food economies and with it, growth in social capital and health? Or is there growth in "junk food" sales with external (and often unaccounted for) health costs?

Nonetheless, many ecological economists advocate a "steady state" approach that scales economic activity to the ability of the environment to provide the materials and absorb the associated wastes (Daly, 1980). Ecological economists base their argument on clear evidence about the current state of "overshoot" and unsustainability that characterizes human impact on the environment (Wackernagel et al., 2002).

Growth becomes "uneconomic" when the environmental and social costs of growth outweigh the marginal benefits (Daly & Farley, 2007). Finding this balancing point is a compelling economic challenge.

Alternatives to the GDP: Tools for the Ecological Paradigm

While GDP effectively measures growth, it fails to account for other measures of well-being: the overall quality of family, community, health, ecosystems, and other members of the "household." Therefore, economists have developed alternative indicators based on the understanding that environment, economics, and social well-being are inextricably related.

The two most prominent indicators that reflect an ecological economic perspective are the Index of Sustainable Economic Welfare (ISEW) (Daly & Cobb, 1989) and the Genuine Progress Indicator (GPI) (Talberth, Cobb, & Slattery,

2007). While these methodologies differ somewhat from each other, they share the basic approach. Like GDP, the ISEW and GPI include expenditures. However, unlike GDP, the ISEW and GPI add in the value of non-monetized benefits and subtract the costs of negative environmental and social impacts. Additions include benefits to society that come from nonmarket activities such as volunteer time, housework, parenting, and services from roads or other public infrastructure. Subtractions include the impacts of negative activities like pollution, the costs of accidents, and costs associated with environmental degradation and depletion. To varying degrees, these indicators also consider the social costs of inequality (Talberth et al.).

Calls for an alternative to the GDP have moved into conventional economic discussions. For example, in November 2007, the European Commission, European Parliament, Club of Rome, the Organization for Economic Co-operation and Development, and the World Wildlife Fund hosted "Beyond GDP," a conference focused on "clarifying which indices are most appropriate to measure progress, and how these can best be integrated into the decision-making process and taken up by public debate" (Beyond GPD, 2011). One outcome of that conference is that the European Commission released "GDP and beyond: Measuring progress in a changing world," a 2009 document which outlines a roadmap to improve indicators of progress.

Economics Education Standards in K-12 in Canada and the USA

Curriculum standards can serve as a basis for state or provincial guidelines and thus can drive economics instruction at the local school level. In Canada, curriculum standards are set at the provincial level, and economics-related topics can be found in some provincial social studies curriculum frameworks (e.g., Alberta and Ontario). However, there is not a set of nationally recognized economics education standards in Canada.

In the USA, two national organizations have developed economics education standards, the National Council for the Social Studies (NCSS) and the Council on Economic Education (CEE). The National Council for the Social Studies (NCSS) is a national association that serves as the umbrella organization for elementary, secondary, and college teachers of courses associated with the social studies (i.e., history, civics, geography, economics, political science, sociology, psychology, anthropology, and law-related education). The NCSS standards, *National Curriculum Standards for Social Studies* (2010), are organized into ten themes ranging from culture to governance to global perspectives. Economics is captured in theme seven, "Production, Distribution, and Consumption."

CEE, a private nonprofit organization, provides the second set of economics standards. The CEE's mission is "to instill in young people the fourth "R"—a real-world understanding of economics and personal finance" (Council on Economic

Education [CEE], 2012). Because the CEE standards focus solely on economics, they provide a more detailed set of outcomes than the NCSS standards.[2]

Strategies for Teaching Ecological Economics

The various Canadian provincial as well as the NCSS and CEE economics standards largely reflect the conventional economic paradigm (Maier & Nelson, 2007) and thus create a challenge for educators seeking to form an ecological perspective. However, educators can employ the standards by leveraging the similarities and differences between the two economic paradigms, thus engaging students in a comparative analysis of the two perspectives.

This section provides a broad framework for teaching with this strategy, using the NCSS and CEE standards as a point of departure. The section is organized into two subsections to parallel the main topics in the chapter: the relationship between the environment and the economy, and economic goals and measurements. Each subsection outlines fundamental learning outcomes and teaching strategies and highlights connections to (or differences from) the economics standards. Extended narratives of teaching activities on life cycles, the ecological footprint, culture, globalization, and economics for young children can be found in Santone (2001, 2009, 2010).

Teaching the Relationship Between the Economy and the Environment

This section begins by outlining fundamental learning outcomes related to the economy and the environment. Outcomes are organized as core concepts, guiding questions, and enduring understandings (big ideas). These teaching suggestions are designed to support these outcomes.

Core Concepts

- Needs, wants, the commons, interdependence.

Guiding Questions

- What do we need for a fulfilling life?
- What supports our well-being?

[2] Readers interested in a more exhaustive analysis of the standards might consult Maier and Nelson (2007).

Big Ideas: Students Should Understand that

- All people share certain needs for a fulfilling life; wants vary.
- The commons are natural and human-made gifts that sustain life and make well-being possible.
- The living and nonliving elements in the environment are the ultimate source of all materials we use to meet our needs.[3]

Teaching Suggestions

- To teach needs and wants, students can respond to the question, "What do we need to be happy and healthy?" or "What do we need for a fulfilling life?" After brainstorming responses, students can sort and prioritize needs vs. wants. Students can then examine what shapes their beliefs about needs and wants, exploring the influence of family, peers, media, or religion. Discussion can then focus on how these beliefs might vary across time, place, or culture.
- To teach interdependence, students can identify or map the elements and relationships that sustain their well-being, including families, communities, and the natural world. This activity not only supports thinking in systems, it also introduces the concepts of price and value, i.e., that while not all needs have a price (love, friendship), they have great value. This understanding is essential for students to see themselves as social beings—friends, neighbors, and family members—and not just "consumers."
- To teach the commons, take a community tour to identify examples of shared natural and human-made elements and how they contribute to well-being (e.g., trees produce oxygen and habitat; roads and infrastructure enable transportation and commerce). (More advanced learners could examine the governance and economic structures that affect access to these resources.)
- To teach local economies, create a community food systems map to identify the interdependence of human and natural elements that provide food: farms, rivers, stores, processing facilities, etc.

More advanced lessons could focus on comparing beliefs about human-environment relationships as represented in different faith traditions, literary genres, art movements, and other forms of cultural expression. As students gain an understanding that the economy is embedded in the environment, they can critically examine the assumptions in the phrase "natural resources" and compare it with "natural materials."

Links to Standards

These fundamental concepts about needs and wants link to NCSS standards and support NCSS Theme 7, "Production, Distribution, and Consumption," which

[3] The other part of this idea—that the environment also serves as the final "sink" into which all wastes go—is more advanced and would come after students understand that all materials come from the environment.

notes "People have wants that often exceed the limited resources available to them. The unequal distribution of resources necessitates systems of exchange, including trade, to improve the well-being of the economy, while the role of government in economic policy-making varies over time and from place to place" (NCSS, 2010). These basic concepts are also reflected in CEE Standard 1, Scarcity: "Productive resources are limited. Therefore, people cannot have all the goods and services they want; as a result, they must choose some things and give up others" (CEE, 2010).

Teaching needs and wants is a cornerstone for teaching economics from any perspective. However, both sets of standards gloss over the idea of "needs" in favor of "wants," implying that needs are already met (Maier & Nelson, 2007) or that wants are insatiable (Daly & Cobb, 1989). Moreover, while the concept of well-being is mentioned in the NCSS standard, it is the economy that is the cause for concern, not the ecological and social systems that support it. The wording of the standard thus reflects a disconnect between the economy and the environment—a core assumption of the conventional paradigm.

Teaching these standards from an ecological perspective enables a more nuanced analysis of the relationship between the economy and natural systems. For example, introducing the concepts of the commons and ecosystem services offers a deeper perspective on the "Related Concepts" for CEE Standard 1, including Producers [*sic*], Production, Productive Resources, Services, and Factors of Production. Whereas the conventional paradigm would define "producers" as firms, the ecological paradigm would broaden this to include, for example, the plants and sunlight that produce food and other dimensions of the commons that contribute to well-being. When this distinction is identified, students can then differentiate between monetized (paid) and non-monetized goods and services. For example, firms produce goods and services for a fee yet rely on free ecosystem services such as the regeneration of natural materials.

This type of analysis helps students uncover the broader connections between human and natural systems—the core biophysical reality highlighted by the ecological paradigm. Students can apply this understanding to critically assess if and how it is reflected in the conventional paradigm and the presentation of key CEE concepts such as markets, price, and the role of money.

Teaching Economic Goals and Measurements of Success

A second entry point for teaching ecological economics is by focusing on the fundamental goals of the economy and critically assessing how it measures "success." Here, the learning outcomes highlight differences between the ecological and conventional paradigms.

Concepts

- More, better, quality, quantity, growth, development, indicators, GDP, GPI.

Guiding Questions

- What is the difference between quantity and quality?
- How are these outcomes measured? Give examples relevant to education, the economy, community change, etc.
- What is the relationship between quantity and quality in these examples? Is one dependent on the other?

Big Ideas: Students Should Understand that

- Growth is quantitative; development is qualitative.
- Infinite growth is not only biophysically impossible but does not always contribute to well-being.

Teaching Suggestions

- To teach "more vs. better," provides students with a Venn diagram to compare and contrast things in their life that they want more of and aspects of their life that they want to improve. Are there any overlaps? When is more (friends, clothes, popularity) better? When is improvement in these areas related to other factors?
- To introduce the concept of indicators, use examples from everyday life such as grades or sports rankings. Students can then develop indicators in categories such as the economy, public health, or education. Students can use primary sources (census, etc.) to create a community "report card," providing an opportunity to develop, research, analyze, and display meaningful data.

Links to Standards

An examination of economic goals and measurements is a perfect way to meet CEE Standard 15, Growth: "Investment in factories, machinery, new technology, and in the health, education, and training of people can raise future standards of living" (CEE, 2010). Here, "can" is the operative word, inviting fundamental economic questions: When does growth raise standards of living—and what is included in that? Does "standard of living" mean only material goods or does it also include health, security, and other dimensions of well-being? At what point do the costs of growth outweigh the benefits? This line of inquiry supports essential critical thinking skills.

More advanced students can also apply this analysis to identify if and when growth becomes "uneconomic" (i.e., when the costs outweigh the benefits) (Daly & Farley, 2007). This provides an excellent context for meeting CEE Standard 16, Role of Government: "There is an economic role for government in a market economy whenever the benefits of a government policy outweigh its costs" (CEE, 2010). While the standard specifically applies the cost-benefit analysis to government, students can apply the same reasoning to evaluating the impacts of growth. This lens can provide a more thorough understanding of the roles and influences of multiple economic factors, including consumers, firms, and governments.

Conclusion

Economics is an essential but complex element of sustainability that requires teachers to be able to critically evaluate economic beliefs, approaches, and policies. Ecological economics is a paradigm that supports the broader beliefs about sustainability, including interdependence and the well-being of human and natural systems.

Ecological economics offers a lens for students to explore such vital and timely issues as consumption, population, and development. Ecological economics provides an opportunity for students to grapple with issues through a transdisciplinary perspective just as they will need to do as citizens and workers (Daly & Farley, 2007). Because it is grounded in broader scientific principles that highlight the environmental and social impacts of economic activity, ecological economics supports the analysis and problem-solving skills needed to solve interconnected global problems.

What could be less dismal than that?

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