

Environmental Literacy **Scope and Sequence**

PROVIDING A SYSTEMS APPROACH TO ENVIRONMENTAL EDUCATION IN MINNESOTA



Introduction

Why should we want to be environmentally literate?

Throughout every day, all of us in all our roles are making decisions that affect the environment we depend on. A county commissioner has to decide whether to grant a building permit. A business person chooses which supplies to buy or what kind of vehicle fleet to build. A homeowner ponders whether to install central air conditioning. A family mulls over whether to move to the edge of town and create a long commute or live downtown where both employed people can walk to work. A voter is in a quandary about whether to give her support to a candidate who has strong, well-articulated opinions on environmental issues, but is less interested or concerned about good education.

Each of these decisions, when taken by millions of people, will and do create major changes in environmental systems. Each of these decisions is also intertwined with myriad personal and social considerations that might override what little each knows about the environmental impacts they are creating. Yet in the long run, we know that just these kinds of decisions are changing both the physical and social world and each of our own little pieces of it. Would we change our decisions if we had full knowledge of how what we do affects our own futures? Maybe—and maybe not; but without that knowledge, we are shortchanging ourselves by unwittingly creating changes we might not have chosen, had we known.

If we are environmentally literate about our own choices, we travel with eyes wide open into our futures. We are far better prepared for any unwelcome consequences that we endure because we valued the trade-off more, and we are better prepared to live within the physical and social boundaries we know are there.

If this is something we want, why are we not more environmentally literate right now?

Often it takes a long time to build knowledge. The environmental education (EE) community has been struggling with defining what we need to know and be able to do for some time, both as individuals living our lives and as educators working with students of all ages. Often our subject matter has been too narrow, focused only on material that is really primarily science. Since environmental education is not a discipline, whether it is taught at all often depends on the teacher's or organization's interest. We have made no concentrated efforts to carry the education through in a connected way from lower to upper grades, so understanding is piecemeal at best. Moreover, we haven't done a good job of defining

Minnesota Statute §115A.073 outlines the state's environmental education goals and plan as follows: "Pupils and citizens should be able to apply informed decision-making processes to maintain a sustainable lifestyle.

In order to do so, citizens should:

1. understand ecological systems;
2. understand the cause and effect relationship between human attitudes and behavior and the environment;
3. be able to evaluate alternative responses to environmental issues before deciding on alternative courses of action; and
4. understand the effects of multiple uses of the environment."

exactly what core of knowledge is absolutely necessary in order to make those informed decisions for which we are striving. That results in very fuzzy ideas of what is really important to know. This lack of clarification has resulted in many environmental educators focusing on nature study, ecology, or environmental issues.

So what do we need to do to build environmental literacy?

We need to tackle the problems:

- by identifying what we need to know and what we need to be able to do to make informed environmental decisions—*the scope*
- by creating a step-by-step guide from prekindergarten through adult ages to achieve the scope—*the sequence*
- by finding a way to measure whether the guide works

We hope the *Environmental Literacy Scope and Sequence* is a step in that direction. It defines what students should know and be able to do to be environmentally literate. It is a guide for building a curriculum from prekindergarten to adult levels that should enable the learner who has mastered it to make informed environmental decisions. It can be used for curriculum development and adaptation by educators in schools, environmental learning centers, higher education institutions, agencies, and nonprofit organizations. Furthermore, the Scope and Sequence gives us a way to measure how well students are doing in achieving environmental literacy.

Defining the core knowledge

Environmental educators are finally coming to some consensus about what people need to know and be able to do. The National Environmental Education Advisory Council of the U.S. EPA (Environmental Protection Agency) defines environmental education as:

The interdisciplinary process of developing a citizenry that is knowledgeable about the total environment in its natural and built aspects and has the capacity and commitment to insure environmental quality by engaging in inquiry, problem solving, decision-making and action.

A GreenPrint for Minnesota: State Plan for Environmental Education, (GreenPrint), defines the mission of environmental education to:

Develop a population that has the knowledge, skills, attitudes, motivation and commitment to work individually and collectively toward sustaining a healthy environment..¹

¹ *A GreenPrint for Minnesota: State Plan for Environmental Education*. Minnesota Environmental Education Advisory Board. St. Paul. 1993, revised edition 2000.

The problems we have created in the world today will not be solved by the same level of thinking that created them.

—Albert Einstein

These two definitions agree fairly well. Each includes the concept that there is a core of knowledge that is important to master in order to become environmentally literate. Though this consensus is spreading, until a few years ago no one had really come to grips with identifying what that core knowledge consisted of.

So what is this core knowledge?

One of the major agreements among environmental educators is that science may be the basis on which the core knowledge is built, but it is *more* than science. If that is true, then what is the environmental educator's perspective that is different from but builds on and adds to the knowledge gained by studying science and social science?

In the 1990s, several thoughtful groups of people spent a great deal of effort on this question. These included representatives of 10 Minnesota universities involved in the Environmental Education Teacher Preparation Project; representatives of 12 state departments of education in the Pew Charitable Trust's State Education and Environment Roundtable; and several committees working to define the Minnesota Environmental Systems graduation standard.

These three groups independently came to this definition:

The Earth is a set of interacting natural and social systems. An environmentally literate person must understand the relationship of the parts of a system and the interdependence of human and environmental systems.² The content of environmental education is the exploration of the relationships between social and natural systems.³

This is the *scope* for environmental literacy, the vision of what students should have achieved at the end of their entire learning experience.

What is new about this core knowledge definition?

There are two important new elements in this definition: 1) the idea of the importance of learning how systems work, and 2) the recognition that the study of the interaction between natural and social systems is crucial to understanding what is happening in the world.

² North American Association for Environmental Education (NAAEE). *Guidelines for Excellence in Environmental Education*. (Draft.)

³ Lieberman, Gerald A. and Linda L. Hoody. 1997. *Putting the Pieces Together: Improving Student Learning with the Environment as an Integrating Context*. State Education and Environment Roundtable. Pew Charitable Trusts. Lieberman, Gerald A. and Linda L. Hoody. 1998. *Closing the Achievement Gap. Using the Environment as an Integrating Context for Learning*. State Education and Environment Roundtable. Pew Charitable Trusts. Science Wizards, Poway, CA.

Why systems?

Traditional environmental education accepted as a basic concept that everything was connected. This was the underlying idea behind most environmental education efforts. However, we never really examined that whole idea in terms of what it meant, exactly, and how it should be taught clearly and understandably. The concept of system allows us to explore what that interconnectedness is and how it works.

A system is a collection of interrelated parts consisting of objects, materials, phenomena, processes, ideas, principles, rules, organizations or people that interact to form a distinguishable whole. It consists of parts that work together in ways that cannot be understood only by studying the parts alone. Systems are characterized by what arises from the interactions of the parts; and these interactions are often as much a part of the study as the parts themselves.⁴

Using this systems school of thought, the Minnesota Scope and Sequence Development Team created the *Environmental Literacy Scope and Sequence*. The team was made up of experienced practicing environmental education professionals and representatives of preK through adult education, state agencies, higher education, and environmental learning centers. Because the Scope and Sequence is based on both state and national standards, it enables environmental education deliverers to build, adapt or integrate curriculum and assessments that are most appropriate for their particular grade level or audience. The *Environmental Literacy Scope and Sequence* is designed to help create opportunities for mainstreaming environmental education in a way that has not been possible before.

System is an idea that helps us think about parts and wholes. It draws attention to the interactions of the parts of something with one another and the relation of the parts to the whole. The idea also emphasizes effects—what influences the behavior of something and what, in turn, that thing accomplished.

—AAAS

⁴ American Association for the Advancement of Science. 1993. *Benchmarks for Science Literacy*. Oxford University Press. New York.

Environmental Literacy Scope and Sequence

According to the environmental education goals and plan outlined by the Minnesota Legislature (Minn. Stat. §115A.073), “pupils and citizens should be able to apply informed decision-making processes to maintain a sustainable lifestyle. In order to do so, citizens should:

1. understand ecological systems;
2. understand the cause and effect relationship between human attitudes and behavior and the environment;
3. be able to evaluate alternative responses to environmental issues before deciding on alternative courses of action; and
4. understand the effects of multiple uses of the environment.”

Surveys in the 1990s indicate that while teachers are improving their knowledge of environmental education content and methodology and their confidence in using these, they are still far from feeling comfortable integrating environmental education into the curriculum. The problem, however, was that there was no standards-based model of environmental literacy that described and ordered the sequence of knowledge and skills people must acquire to be environmentally literate. The *Environmental Literacy Scope and Sequence* can serve as an approach to focus the efforts of teachers and deliverers of environmental education to unify their many independent efforts.

The Scope and Sequence makes it possible for all its deliverers, no matter how diverse, to maximize their ability to contribute to student achievement in environmental education. In addition, a curriculum based on the Scope and Sequence is able to:

- Build on what the grade level or audience has learned before.
- Contribute to what that audience will learn later.
- Enable teachers and other environmental education deliverers to create coordinated programs that allow students to have a seamless learning experience as they:
 - Move up the grade levels.
 - Participate in out-of-classroom programs conducted in the community or at day visit and residential sites.
 - Apply more precise assessments.
 - Progress through an articulated series of developmentally appropriate concepts and skills that lead, measurably, to their becoming environmentally literate and enabled citizens.

Scope: *The vision of what the students should have achieved at the end of their entire school experience.*

Sequence: *A series of age-appropriate achievements that students succeed at during their school experience in order to master the Scope.*

The *Environmental Literacy Scope and Sequence* consists of:

1. Environmental Literacy Benchmarks

The Benchmarks help define the scope of knowledge students need to understand in order to become environmentally literate. These benchmarks are sequenced so that new knowledge is constructed on prior knowledge. Successful environmental education programs will build upon these benchmarks, utilizing the social and natural systems identified in their communities.

2. Key Systems Concepts and Supporting Concepts

Key Systems Concepts and Supporting Concepts of natural and social systems. The five Key Systems concepts, which assist in understanding the application of each Benchmark to environmental lessons are to be used as a guide to formulate questions about the social and natural systems being examined. The Supporting Concepts provide further detail and clarification for the Key Systems Concepts.

Key Systems Concepts

- *parts and objects*
- *interactions and relationships*
- *subsystems*
- *inputs and outputs*
- *change over time*

These two pieces together provide the framework for developing successful environmental education in working towards environmentally literate individuals and societies.

Environmental Literacy Benchmarks

The Environmental Literacy Benchmarks define the scope of knowledge students should understand, at the end of each level, in order to become environmentally literate. These Benchmarks are sequenced so that new knowledge is constructed on prior knowledge. Successful EE programs will build upon these Benchmarks, using them to organize instruction and learning experiences for preK to adult audiences.

Grades preK - 2

- Social systems and natural systems are made of parts.
- Social systems and natural systems may not continue to function if some of their parts are missing.
- When the parts of social systems and natural systems are put together, they can do things they couldn't do by themselves.

Grades 3 - 5

- In social and natural systems that consist of many parts, the parts usually influence one another.
- Social and natural systems may not function as well if parts are missing, damaged, mismatched or misconnected.

Grades 6 - 8

- Social and natural systems can include processes as well as things.
- The output from a social or natural system can become the input to other parts of social and natural systems.
- Social and natural systems are connected to each other and to other larger or smaller systems.

Grades 9 - 12 (adult)

- The interaction of social and natural systems can create properties that are different from either individual system.
- Interaction between social and natural systems is defined by their boundaries, relation to other systems, and expected inputs and outputs.
- Feedback of output from some parts of a managed social or natural system can be used to bring it closer to desired results.
- It is not always possible to predict accurately the result of changing some part or connection between social and natural systems