

Essential Elements of Sustainability Education

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Learning Outcomes

NOTE: Much of the environmental literacy framework presented here is from *Excellence in Environmental Education: Guidelines for Learning (K-12)* (NAAEE 2010 – first published in 1999 and most recently revised in 2010) [<http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf>]. Other documents in the *Guidelines for Excellence* series are referenced when appropriate.

The *Guidelines for Learning (K-12)* are organized into four strands and further delineated by guidelines and performance indicators. They are also benchmarked at grades four, eight and twelve. For the purposes of outlining the framework, benchmarks for high school graduation (18 year olds) are used here.

Enduring Understandings/Big Ideas:

Essential Underpinnings of the Environmental Literacy Framework:

Systems – Systems help make sense of a large and complex world. A system is made up of parts. Each part can be understood separately. The whole, however, is understood only by understanding the relationships and interactions among the parts. Systems can be nested within other systems.

Interdependence. Human well-being is inextricably bound with environmental quality. Humans are part of the natural order. We and the systems we create – our societies, political systems, economies, regions, cultures, technologies – impact the total environment. Since we are a part of nature rather than outside it, we are challenged to recognize the ramifications of our interdependence.

The importance of where one lives: Beginning close to home, learners forge connections with, explore, and understand their immediate surroundings. The sensitivity, knowledge, and skills needed for this local connection provides a base for moving out into larger systems, broader issues, and an expanding understanding of causes, connections, and consequences.

Roots in the real world: Learners develop knowledge and skills through direct experience with the environment, environmental issues, and society. Investigation, analysis, and problem solving are essential activities and are most effective when relevant to the real world.

The importance of civic engagement and action taking: Working individually or in groups, an informed, skilled, motivated and active citizenry is critical to improving the well-being of individuals, societies, and the global environment now and in the future.

Lifelong learning: Critical and creative thinking, decision making, and communication, as well as collaborative learning are emphasized. These skills are essential for active and meaningful learning, both in school and over a lifetime.

Content Knowledge :

Strand 2: Knowledge of Environmental Processes and Systems

Environmental literacy is contingent upon a deep understanding of the environmental processes and systems that are typically included in the Earth system sciences and the ecological sciences. Importantly, environmental literacy is also dependent on an equally deep understanding of human systems, including political, economic, social, and cultural systems and their relationships and interactions with Earth's physical and living systems. Understanding the ramifications of the interdependence of these systems is essential.

Strand 2.1: The Earth as a Physical System

- a.) **Process that shape the Earth** - Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth.
- b.) **Changes in matter** - Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena.
- c.) **Energy** - Learners apply their knowledge of energy and matter to understand phenomena in the world around them.

Strand 2.2: The Living Environment

- a.) **Organisms, populations, and communities** - Learners understand basic population dynamics and the importance of diversity in living systems.
- b.) **Heredity and evolution** - Learners understand the basic ideas and genetic mechanisms behind biological evolution.
- c.) **Systems and connections** - Learners understand the living environment to be comprised of interrelated, dynamic systems.
- d.) **Flow of matter and energy** - Learners are able to account for environmental characteristics based on their knowledge of how matter and energy interact in living systems.

Strand 2.3: Humans and Their Societies

- a.) **Individuals and groups** - Learners understand the influence of individual and group actions on the environment, and how groups can work to promote and balance interests.
- b.) **Culture** - Learners understand cultural perspectives and dynamics and apply their understanding in context.
- c.) **Political and economic systems** - Learners understand how different political and economic systems account for, manage, and affect natural resources and environmental quality.
- d.) **Global connections** - Learners are able to analyze global, social, cultural, political, economic, and environmental linkages.
- E.) **Change and conflict** - Learners understand the functioning of public processes for promoting and managing change and conflict, and can analyze their effects on the environment.

Strand 2.4: Environment and Society

- a.) **Human/environment interactions** - Learners understand that humans are able to alter the physical environment to meet their needs and that there are limits to the ability of the environment to absorb impacts or meet human needs.
- b.) **Places** - Learners understand "place" as humans endowing a particular part of the Earth with meaning through their interactions with that environment.

- c.) **Resources** - Learners understand that the importance and use of resources change over time and vary under different economic and technological systems.
- d.) **Technology** - Learners are able to examine the social and environmental impacts of various technologies and technological systems.
- e.) **Environmental issues** - Learners are familiar with a range of environmental issues at scales that range from local to national to global. They understand that these scales and issues are often linked.

Skill Sets:

Strand 1: Questioning, Analysis and Interpretation Skills

Environmental literacy depends on a willingness and ability to ask questions about the surrounding world, speculate and hypothesize, seek and evaluate information, and develop answers to questions. Learners must be familiar with inquiry, master fundamental skills for gathering and organizing information, and interpret and synthesize information to develop and communicate explanations.

- a.) **Questioning** - Learners are able to develop, modify, clarify, and explain questions that guide environmental investigations of various types. They understand factors that influence the questions they pose.
- b.) **Designing investigations** - Learners know how to design investigations to answer particular questions about the environment. They are able to develop approaches for investigating unfamiliar types of problems and phenomena.
- c.) **Collecting information** - Learners are able to locate and collect reliable information for environmental investigations of many types. They know how to use sophisticated technology to collect information, including computer programs that access, gather, store, and display data.
- d.) **Evaluating accuracy and reliability** - Learners can apply basic logic and reasoning skills to evaluate completeness and reliability in a variety of information sources.
- e.) **Organizing information** - Learners are able to organize and display information in ways appropriate to different types of environmental investigations and purposes.
- f.) **Working with models and simulations** - Learners are able to create, use, and evaluate models to understand environmental phenomena.
- g.) **Drawing conclusions and developing explanations** - Learners are able to use evidence and logic in developing proposed explanations that address their initial questions and hypotheses.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Environmental literacy is not limited to conceptual knowledge. The environmentally literate individual is able to identify, investigate, and formulate potential solutions to environmental issues.

Environmentally literate individuals have the skills needed to determine what if any action is warranted and to make reasoned decisions about their own involvement.

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- a.) **Identifying and investigating issues** - Learners apply their research and analytical skills to investigate environmental issues ranging from local issues to those that are regional or global in scope.
- b.) **Sorting out the consequences of issues** - Learners are able to evaluate the consequences of specific environmental changes, conditions, and issues for human and ecological systems.

c.) **Identifying and evaluating alternative solutions and courses of action** - Learners are able to identify and propose action strategies that are likely to be effective in particular situations and for particular purposes.

d.) **Working with flexibility, creativity, and openness** - While environmental issues investigations can bring to the surface deeply held views; learners are able to engage each other in peer review conducted in the spirit of open inquiry.

Strand 3.2: Decision-making and Citizenship Skills

a.) **Forming and evaluating personal views** - Learners are able to communicate, evaluate, and justify their own views on environmental issues and alternative ways to address them.

b.) **Evaluating the need for citizen action** - Learners are able to decide whether action is needed in particular situations and whether they should be involved.

c.) **Planning and taking action** - Learners know how to plan for action based on their research and analysis of an environmental issue. If appropriate, they take actions that are within the scope of their rights and consistent with their abilities and responsibilities as citizens.

d.) **Evaluating the results of actions** - Learners are able to evaluate the effects of their own actions and actions taken by other individuals and groups, including possible intended and unintended consequences of actions.

Attitudes:

The framework does not promote, advocate, or specify a particular set of attitudes. Instead, the framework asks learners to develop an understanding of the nature and importance of values, beliefs, personal perspectives, and motivations. Learners are regularly expected to be able to evaluate their own personal beliefs and values, and the beliefs and values of others. They are also expected to develop a realistic self-confidence in their effectiveness as citizens and understand the importance of exercising the rights and responsibilities of citizenship. Each of these represents a concept and skills based consideration of attitudes. For example, the following guidelines relate to the importance of attitudes:

2.3.a.) **Individuals and groups** - Learners understand the influence of individual and group actions on the environment, and how groups can work to promote and balance interests.

2.3.b.) **Culture** - Learners understand cultural perspectives and dynamics and apply their understanding in context.

3.1.d.) **Working with flexibility, creativity, and openness** - While environmental issues investigations can bring to the surface deeply held views, learners are able to engage each other in peer review conducted in the spirit of open inquiry.

3.2.a.) **Forming and evaluating personal views** - Learners are able to communicate, evaluate, and justify their own views on environmental issues and alternative ways to address them.

4.a.) **Understanding societal values and principles** - Learners know how to analyze the influence of shared and conflicting societal values.

4.b.) **Recognizing citizens' rights and responsibilities** - Learners understand the importance of exercising the rights and responsibilities of citizenship.

4.c.) **Recognizing efficacy** - Learners possess a realistic self-confidence in their effectiveness as citizens.

4.d.) **Accepting personal responsibility** - Learners understand that their actions can have broad consequences and accept responsibility for recognizing those effects and changing their actions when necessary.

Behaviors and Actions:

Environmentally responsible behavior is seen as involvement in intentional and habitual behaviors, individually or as a member of a group, that work towards solving current problems or preventing new ones. As with attitudes, specific behaviors or actions are not prescribed. Instead, the framework details the *skills* (Strand 3) and *dispositions* (Strand 4) necessary for making sound, informed decisions related to civic engagement, including decisions about what, if any, behaviors/actions are to be taken.

Strand 3.2: Decision-making and Citizenship Skills

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- b.) **Evaluating the need for citizen action** - Learners are able to decide whether action is needed in particular situations and whether they should be involved.
- c.) **Planning and taking action** - Learners know how to plan for action based on their research and analysis of an environmental issue. If appropriate, they take actions that are within the scope of their rights and consistent with their abilities and responsibilities as citizens.
- d.) **Evaluating the results of actions** - Learners are able to evaluate the effects of their own actions and actions taken by other individuals and groups, including possible intended and unintended consequences of actions.

Strand 4: Personal and Civic Responsibility

Individual dispositions are critical to environmental literacy. Environmentally literate individuals accept the premise that true civic engagement depends on the recognition of rights and responsibilities. They are willing and able to act on their own conclusions about what should be done to ensure environmental quality. As they develop and apply concept-based learning and skills for inquiry, analysis, and action, they understand that what they do as individuals and in groups makes a difference and they are willing to take responsibility for the effects of their actions.

- a.) **Understanding societal values and principles** - Learners know how to analyze the influence of shared and conflicting societal values.
- b.) **Recognizing citizens' rights and responsibilities** - Learners understand the importance of exercising the rights and responsibilities of citizenship.
- c.) **Recognizing efficacy** - Learners possess a realistic self-confidence in their effectiveness as citizens.
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The Classroom or Educational Setting

Curriculum, Instruction and Assessment Practices Aligned With Learning Outcomes:

The learner is an active participant. If learning is to become a natural, valued part of life, instruction should be guided by the learner's interests and treated as a process of building knowledge and skills. Using the *Guidelines for Learning (K-12)* framework and knowledge of individual learners, educators can make instruction relevant to specific learners at particular developmental levels.

Instruction provides opportunities for learners to enhance their capacity for independent thinking and effective, responsible action. Engaging in individual and group work helps learners develop these capacities independently and in collaborative situations that anticipate the ways in which problem solving happens in the community, on the job, and in the family. A strong emphasis on developing communications skills means that learners will be able to both demonstrate and apply their knowledge.

Because environmental issues can prompt deep feelings and strong opinions, educators must take a balanced approach to instruction. Educators incorporate differing perspectives and points of view even-handedly and respectfully, and present information fairly and accurately.

Environmental literacy depends on a personal commitment to apply skills and knowledge to help ensure environmental quality and quality of life. For most learners, personal commitment begins with an awareness of what immediately surrounds them. Instructors foster learners' innate curiosity and enthusiasm, providing them with early and continuing opportunities to explore their environment. Experiencing and observing the local environment helps learners build a strong foundation of skills and knowledge for reaching out further into the world and deeper into the conceptual understands that environmental literacy demands. Direct experience in the environment also helps foster the awareness and appreciation that motivate learners to further questioning, better understanding, and appropriate concern and action. Taking students out of the classroom and into the community is an important instructional strategy for engaging students in direct discovery of the world around them.

The framework, *Excellence in Environmental Education: Guidelines for Learning (K-12)*, articulates learner concepts, skills and dispositions. How the framework is linked to the development of curriculum, instruction, and assessment is described in a companion document: *Guidelines for the Preparation and Professional Development of Environmental Educators* (NAAEE 2010). This set of guidelines, organized into six themes, speaks to educators' competencies, what they are doing to prepare curriculum, deliver instruction, and assess learner outcomes.

Theme Four: Planning and Implementing Environmental Education

Educators combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction. They provide the interdisciplinary, hands-on, investigative learning opportunities that are central to environmental literacy.

4.1 Knowledge of learners - Educators know how to tailor instructional approaches to meet the needs of, yet challenge, different learners. They apply theories of cognitive and moral or social development in creating an environmental instructional plan for a particular age, class or group. They understand theories such as multiple intelligences and learning styles and organize instruction to accommodate different approaches to learning. They recognize and acknowledge the validity of varying cultural perspectives present in groups of learners and tailor instructional approaches to respond to these perspectives and use them as an educational resource.

4.2 Knowledge of instructional methodologies - Educators are familiar with and can employ a range of instructional methods that are particularly suited to environmental education. For example, some essential approaches to environmental education instruction include:

- Hands-on observation and discovery in the environment

- Inquiry
- Cooperative learning
- Community-based action research and problem solving
- Investigating environmental issues
- Service learning
- Simulations and models
- Case studies
- Problem-based learning
- Project-based learning
- Student-led investigations

4.3 Planning for instruction - Educators are able to plan age-appropriate environmental education instruction and programs that meet specific instructional goals.

4.4 Knowledge of environmental education materials and resources - Educators are aware of a range of materials and resources for their environmental efforts and understand how to access, evaluate, and use these resources. They demonstrate ways in which the community can be a resource for instruction, identifying local businesses, service organizations, government agencies, nonprofit organizations, and others that may participate in and support programs.

4.5 Technologies that assist learning - Educators are familiar with a range of technologies available to assist student learning. They use a variety of tools for environmental observation, measurement, and monitoring.

4.6 Settings for instruction - Educators understand the importance of a safe and conducive learning environment both indoors and outside. They identify, create, and use diverse settings for environmental education, appropriate to different subject matter and available resources. These may include the school yard, laboratory, field settings, community settings, museums, zoos, demonstration sites, and other places. They plan and implement instruction that first links content to learners' immediate surroundings and experience, then expands learners' horizons as appropriate to larger environmental issues and contexts.

4.7 Curriculum planning - Educators are familiar with ways of including environmental education in the curriculum (e.g., infusion, integration, theme-based, standards-based).

Theme Six: Assessment and Evaluation

Educators possess the knowledge, abilities, and commitment to make assessment and evaluation integral to instruction and programs. Professional preparation should provide educators with tools for assessing learner progress and evaluating the effectiveness of their own programs.

6.1 Learner outcomes – Educators understand the importance of tying assessment to learning. They state expected learner outcomes and engage learners in setting their own expectations for achievement.

6.2 Assessment that is part of instruction – Educators are familiar with ways of incorporating assessment into environmental education. They make objectives and other expectations clear to learners at the outset of instruction, implement performance-based assessments, develop formative and summative assessments, identify techniques for encouraging learners to assess their own and others' work, and use assessments to improve learning experiences.

6.3 Improving instruction – Educators know how to use their instructional experiences and assessments to improve future instruction.

6.4 Evaluating programs – Educators understand the importance of evaluating environmental education programs and are familiar with basic evaluation approaches.

Characteristics of Authentic Engagement:

Some of the *Essential Underpinnings of the Environmental literacy Framework*, outlined above under Enduring Understandings/Big Ideas, begin to describe some of the key characteristics necessary for authentic engagement:

The importance of where one lives: Beginning close to home, learners forge connections with, explore, and understand their immediate surroundings. The sensitivity, knowledge, and skills needed for this local connection provides a base for moving out into larger systems, broader issues, and an expanding understanding of causes, connections, and consequences.

Roots in the real world: Learners develop knowledge and skills through direct experience with the environment, environmental issues, and society. Investigation, analysis, and problem solving are essential activities and are most effective when relevant to the real world.

The importance of civic engagement and action taking: Working individually or in groups, an informed, skilled, motivated and active citizenry is critical to improving the well-being of individuals, societies, and the global environment now and in the future.

Lifelong learning: Critical and creative thinking, decision making, and communication, as well as collaborative learning are emphasized. These skills are essential for active and meaningful learning, both in school and over a lifetime.

In addition, *Guidelines for the Preparation and Professional Development of Environmental Educators* (NAAEE 2010) further speaks to what educators are doing to establish a learning context for authentic engagement.

Theme Five: Fostering Learning

Environmental educators must enable learners to engage in open inquiry and investigation, especially when considering environmental issues that are controversial and require learners to seriously reflect on their own and others' perspectives. The following describes some of what the educator must do in order to set the stage for authentic engagement.

5.1 A climate for learning about and exploring the environment - Educators understand how to create a climate in which learners are intellectually stimulated and motivated to learn about the environment (e.g., relating the idea of lifelong learning to instructional practices that engage learners in taking responsibility for their own learning and expectations for achievement).

5.2 An inclusive and collaborative learning environment - Educators know how to maximize learning by fostering openness and collaboration among learners (e.g., encourage flexibility, creativity, and openness, implement management techniques that foster independent and productive group work, include diverse cultures, races, genders, social groups, ages, and perspectives with respect, equity, and an acknowledgment of the value of such diversity, use diverse backgrounds and perspectives as instructional resources).

5.3 Flexible and responsive instruction - Educators know how to augment proper planning with the flexibility that allows them to take advantage of new instructional opportunities.

Schools/Institutions

Favorable Conditions—Organizational Policies and Practices:

Communities

Characteristics of Institution-Community Partnerships:

Although the characteristics of community partnerships are not detailed, the importance of partnerships is addressed, in part, in another document in the Guidelines for Excellence series: *Nonformal Environmental Education Programs: Guidelines for Excellence* (NAAEE 2009). The guidelines outline a program development model. Some of the important steps, including needs assessment and identification of organizational needs and capacities, are essential to building any partnership.

Key Characteristic #1: Needs Assessment

Programs are designed to address identified environmental, educational, and community needs and to produce responsive, responsible benefits that address those identified needs.

1.2 Inventory of existing programs and materials - The environmental education program builds on existing resources and complements existing programs. Community and organizational strengths and resources have been inventoried to see if present resources can be adapted or adopted to fill the need, and identify gaps that might hinder the successful development of the program.

1.3 Audience Needs - The environmental education program reflects a careful analysis and consideration of the target audience(s). The cultural perspectives, needs, and interests of the target audience have been identified, understood, accommodated, and addressed in program development and activities.

Key Characteristic #2: Organizational Needs and Capacities

Programs support and complement their parent organizations' mission, purpose, and goals.

2.1 Consistent with organizational priorities - The environmental education program is consistent with, and supportive of, parent organization priorities and objectives.

2.2 Organization's need for the program identified - The environmental education program fills an identified need within existing activities of the sponsoring organization.

2.3 Organization's existing resources inventoried - The sponsoring organization has the means and will to support the program.

Key Characteristic #3: Program Scope and Structure

Programs should be designed with well-articulated goals and objectives that state how the program will contribute to the development of environmental literacy.

3.4 Partnerships and collaboration - The environmental education program maximizes effectiveness and efficiency by working in partnership with groups of similar interest or with shared goals.

- Potential partners and collaborators have been identified.
- The relationship of the program to desired long-term cooperative activities between and among partners is clearly articulated and understood.
- Partners have been involved in the process of developing the program.
- Roles of partners and collaborators are clearly established and are linked to the expertise, resources, and skills each partner brings.
- Duration of commitment to the program is clearly articulated among partners.
- The relationships among program goals and the goals of partners' programs and collaborators' interests are clear.
- A program development team represents partner and collaborator interests.

Environmental Literacy Framework

Although the environmental literacy frameworks articulated in *Excellence in Environmental Education: Guidelines for Learning (K-12)* (first published in 1999 and most recently revised in 2010) and later in the *Framework for Assessing Environmental Literacy* (Hollweg, K. S., Taylor, J. R., Bybee, R. W., Marcinkowski, T. J., McBeth, W. C., & Zoido, P. 2011) draw from a wide range of research and writing, including the Brundtland Commission (Brundtland 1987), the United National Conference on Environment and Development in Rio (UNCED 1992), the International Conference on Environment and Society in Thessaloniki (UNESCO 1998) and the World Summit on Sustainable Development in Johannesburg (United Nations 2002), they are rooted in the Belgrade Charter (1976) and the goals and objectives outlined in the 1977 Tbilisi Declaration (<http://resources.spaces3.com/a30712b7-da01-43c2-9ff0-b66e85b8c428.pdf>).

Tbilisi Goals:

- To foster clear awareness of and concern about economic, social, political, and ecological interdependence in urban and rural area;
- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;
- To create new patterns of behavior of individuals, groups, and society as a whole towards the environment.

Tbilisi Objectives:

Awareness: to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.

Knowledge: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.

Attitudes: to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.

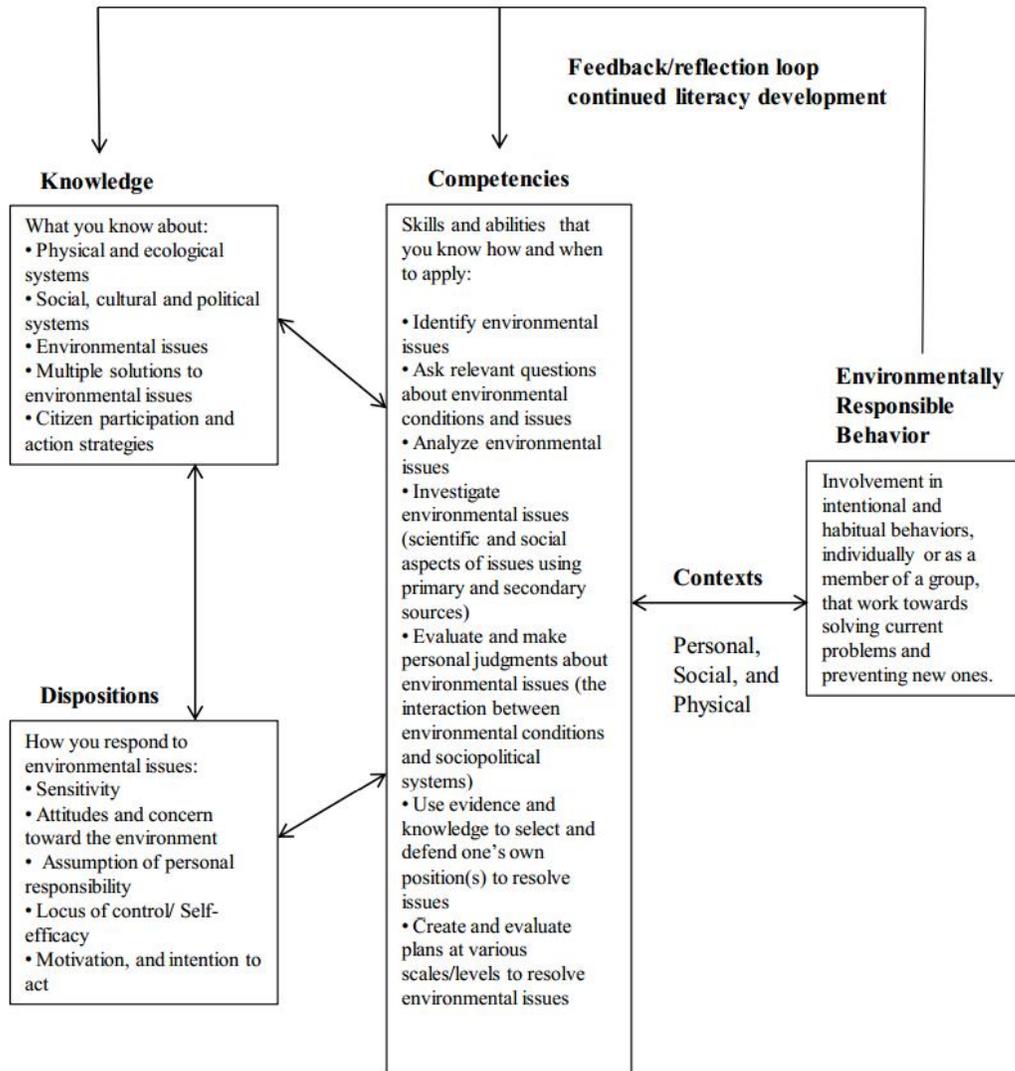
Skills: to help social groups and individuals acquire the skills for identifying and solving environmental problems.

Participation: to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

From its earliest days, environmental literacy has:

- Defined the environment broadly to include natural ecosystems as well as human created systems (e.g., transportation, agriculture, cities);
- Encompassed knowledge about economic, social, political, cultural, natural, and physical systems and how each of these systems is interrelated;
- Depended upon the development of a rich set of citizen engagement dispositions and decision-making skills;
- Focused on the engagement and empowerment of *all* individuals, groups and societies;
- Been committed to illuminating the relationship between a quality environment and quality of life; and
- Focused on empowering individuals and groups to move from awareness to action where action resolves current problems and prevents new ones.

It is essential to understand that environmental literacy is a complex process that is not linear and does not end with a simple set of activities. The interrelated nature of the environmental literacy components are illustrated in the following graphic from the *Framework for Assessing Environmental Literacy*:



Some Context - How Were the Guidelines Developed?

From the very beginning, there was a strong desire to ensure that each publication in the *Guidelines for Excellence* series were research based and reflected a widely shared understanding of environmental education practice. They were developed through a broad process of critique and consensus where at least four drafts were offered for public review and comment. Review comments were used not only to test and revise the basic framework for the individual set of guidelines, but also to develop every detail of the final document from overall structure to examples, and glossary terms to references. Throughout the process, thousands of individuals and organizations participated. Although comments were received from individuals from over 30 countries, the vast majority of comments were from North America.

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