

Proceedings Citation

Bentley, M.L. (2005). Standards and Field Studies: Pedagogical Issues in Environmental Education in the US (Keynote). *Taiz University Research Journal*, Special Issue: Proceedings of the Third Scientific Conference on the Environment and Natural Resources, Taiz University 3-5 May 2005. Aden, Republic of Yemen: Aden University Printing and Publishing House.

Third Scientific Conference on the Environment and Natural Resources
Taiz University, Republic of Yemen
May 2005

Panel

Environmental Education and Science Education: The Confluence of Roles of both Scientists
and Science Teacher Educators in Conserving the World's Resources

**Standards and Field Studies:
Pedagogical Issues in Environmental Education in the US**

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Abstract

Since the 1980s educational reform in the US has been dominated by the specification of curriculum standards and the accountability movement. While standards-based curriculum may have raised the profile of academics in schools, it has also amplified the domination of direct teaching methods and displaced attention to non-cognitive domains, with a concomitant retreat from experiential education and field studies. Further, standards-based reform represents a flawed, modernist, top-down model model for educational improvement in which teachers are

misconceived as deliverers of instruction (rather than enactors of curriculum) and children are seen as vessels to be filled with particular content rather than as active constructors of meaning. The most important outcomes of EE are not measured via standardized tests and thus environmental education is marginalized in the school curriculum.

The Pros and Cons of Standards-based Curriculum

In the US, environmental education (EE) has not fared well in the current era of state-mandated pK-12 educational standards and accountability. On the plus side, standards-based curriculum is the latest attempt to improve public schooling that began after World War II and the various reform documents do include environment-related content (for example, the water cycle, trophic levels and food chains, ecological succession, and natural resources). However, the work of school-based environmental educators is now prescribed and restricted by curriculum documents that have been legislated in order for states to achieve compliance with the national *Goals 2000* legislation and requirements for standards in the *Elementary and Secondary Education Act* (Council of Chief State School Officers, 1995).

In my view, the implementation of standards-based accountability has been detrimental to EE in terms of less regard to the affective domain and a reduced usage of field studies and experiential learning. In US public schools today anxiety about student test scores influences much classroom practice. In the standards movement the role of the federal government has increased and thus there has been an unhealthy shift of curriculum decision making from the local level to the state and national levels. Standards-based reform appears compatible with “state agendas to provide more effective teacher education and steering of classroom processes” (Popkewitz, 1991, 168). Standards-based reform represents a top-down, modernist curriculum development model and conception of the work of the teacher (Sauvé, 1998). This view of the work of the teacher has been severely criticized, since, among other things, it promotes prescription rather than negotiation and, therefore, ignores the reality that teaching practices are notably embedded in the assumptions and professional motivations of the teacher (Bentley, 1998).

But back to the plus side, education in the US is still a constitutional function of the states and there is considerable variety among the fifty states as to their standards. EE might fall under science, geography or social studies standards, or be represented in all of them and

significant environmental education content is indeed included (National Research Council, 1996; National Council for the Social Studies, 1994; Geography Education Standards Project, 1994). I have illustrated this in the example of the state of Virginia's standards in Figure 1. The Virginia standards primarily speak to the knowledge domain and an annual standardized multiple choice test is the dominant means the state uses to assess students' achievement and hold schools (and teachers) accountable. This test fails to assess major aspects of environmental education, outcomes such as the development of children's attitudes and motivations and their ethical development in relation to the environment. As Dennis and Knapp (1997) note, "Environmental education includes both cognitive and affective dimensions. ... (There is a) strong concern for attitudes and motivation." (p. 8) Further, Price and Hein (1991) suggest that the focus of EE should not be so much in the knowledge domain as they define educationally effective programs as those in which "products (test scores) are not emphasized, inquiry is sparked, open-ended questions are generated, and students actively participate and appear involved." (p. 510)

[INSERT FIGURE 1: Environmental education in Virginia's *Standards of Learning*, Grade 3.]

Standards-based curriculum is founded on a flawed assumption, the age-old curriculum fallacy of *universalism*. This is the view that some content can be identified that is of fundamental and universal significance regardless of context or the characteristics of the students. Universalism is the fallacy of believing there is a "best" curriculum (Doll, 1996). Thus the US National Science Education Standards proclaim that its prescribed content is to be learned by every student regardless of age, gender, race or ethnic background, disabilities, interests, motivation, or aspirations (NRC, 1996, 2).

Epistemologically, standards-based curriculum is thoroughly modernist, but postmodern philosophers have argued persuasively against the metaphysical idea of a universal human nature and have advocated a deeper appreciation of human individuality. David Elkind (1997) points out that "What has come to the fore in postmodern times is the awareness of the importance of difference." (p. 242)

Further, externally imposed standards actually may create impediments to other educational purposes, such as the development of student autonomy and independent thinking.

Focusing on recalling information in order to score well on standardized tests distracts students from the intellectual substance of the content and transforms “their efforts to learn into efforts to please.” As Linda Lantieri (1995) argues:

The problem is not with standards as such; it is with standards imposed entirely from without - impersonal standards that turn students into objects and disrupt connections between teachers and students and between students and their work. (Effective) teachers... have high expectations of their students, but the expectations are constructed in collaboration with the students, and they are translated into “informational” rather than “controlling” feedback. Controlling feedback is “outcome oriented,” while informational feedback “is focused on the ongoing activity.” (p. 392)

As Lantieri points out, the problem is not with having standards *per se*, as standards certainly did exist before the current reform movement. Who would not want teachers to have appropriate academic standards, expectations of achievement recognized alike by student, teacher, and parents? However standards are properly established at the *local* level because every child is unique, having his or her own history, personality, learning style, intellectual gifts and talents, interests, and aspirations. Thus achievement standards are best negotiated between the classroom community and its teacher, who is the only agent of the school in a position to know each individual student.

Environmental Education and Field Studies under the Standards Régime

Environmental education has been defined as including education *in* the environment. Field site experiences, or simply *field trips*, can be broadly defined as "any journey taken under the auspices of the school for educational purposes" (Sorrentino & Bell, 1970, 233). Dr. Melear's paper in this Panel argues that science education for the most part has abandoned the practices of natural history education and experiential learning. Biotechnology and other new topics have squeezed out this valuable content while preparation for high-stakes tests has squeezed out offering students opportunities for meaningful experiences in and of nature. Yet it is just such experiences of nature that, "...can nourish a lasting attachment to the earth, and in turn, nurture self-esteem" - and caring, humility, tolerance for other creatures, and much more

(Nabhan & Trimble, 1994). Standards-based curriculum combined with high-stakes tests for accountability have limited the curriculum, resulted in more use of direct instruction, and less use of field trips and outdoor studies (Blair & Archer, 2001; Woods, 2001, Amrein & Berliner, 2002). During the school day, the demands of meeting academic standards increasingly usurps outdoor time. Many schools have abolished recess above the primary grades (Rivkin, 2000). Schools now require teachers to justify field studies exclusively in terms of addressing state standards (George Hunter, personal communication, February, 1998).

A crucial point is that the potential outcomes of field studies include much more than just the knowledge gains of the students. Elliot Eisner (1995) views the standards movement as a distraction from the deeper issues of education: "It distracts us from paying attention to the importance of building a culture of schooling that is genuinely intellectual in character, that values questions and ideas at least as much as getting right answers." (p. 764) Wolins, Jensen and Ulzheimer (1992) found that third graders' most powerful memories of visits to museums were related to affective or emotional content of the experiences and that these memories were often both unique to the child and not the intended goals of the museum educator or the teacher. Raizen and Michelson (1994, 48) claim that, "Viewing the world beyond the school as part of students' learning community is critical for effective science teaching." Such a view is critical for effective teaching in other school subjects as well. Moreover, joining others on a journey to a new place (or a familiar place in a new context) is inherently stimulating, if not exciting, for students. John Dewey (1915, 1938) argued that incorporating field trips in the curriculum makes educative experiences come alive and promotes a sense of community.

In addition, some state and national standards documents promulgate goals that are incompatible and possibly counterproductive to the goals of EE, for example, goals related to students' "workplace readiness" and "economic productivity." In the US National Science Education Standards, for instance, one of the overall goals for science education is to, "increase their [students'] economic productivity through the use of the knowledge, understanding, and skills of the scientifically literate person in their careers" (NRC, 1996, p. 13). Identifying the purpose of the curriculum with economic productivity is a confusing message at best, as many of our most pressing environmental problems relate directly to the consumption of resources fostered by a growth-dependent economic system. The goal to increase productivity also conveys an interpretation of the purpose of education that renders it more like a training

focused on the student's performance instead of on the “multiplication of potentialities”, as expressed by von Foerster (1992). In other words, standards-based curriculum emphasizes conformity and ignores the importance of both context and diversity in teaching strategies and methods. Standards-based reform results in narrowing the decision-making processes within teachers’ work (Popkewitz, 1991). If assessment is tied to the standards more “teaching to the test” may be the unfortunate result, whereas the purpose of education should emphasize diversity, creativity, social responsibility, empowerment to think and, more particularly, to act (DeBoer, 1991, p. 240).

In the various national standards some portion of EE goals and content are addressed, especially in the standards for science, social studies, and geography education. There is considerable content overlap within the standards documents, particularly at the elementary level. The North American Association for Environmental Education (NAAEE) has also produced a curriculum framework of its own, called the “Environmental Education Learner Guidelines” (Legro, Bybee, & Simmons, 1997), which are summarized below and mapped in Figure 2. Commendably, the NAAEE learner guidelines present a simple framework and do not specify the minutiae to be taught. Inquiry skills are emphasized, as is the case in both the national science and social studies standards. The NAAEE posits that, “Learners rely on these abilities (inquiry skills) to understand the environment and to investigate environmental problems and issues using a variety of techniques.” (Legro, Bybee, & Simmons, 1997, p. 12)

Synopsis: NAAEE Framework for Environmental Literacy

1. Knowledge of environmental processes and systems - understanding the Earth as a physical system, the living environment (e.g. diversity, interdependence of organisms, flow of matter and energy through living systems), and humans and their societies.
2. Inquiry skills - depends on learners willingness and ability to ask questions about the world, speculate and hypothesize, seek information, and develop answers to their questions. Requires familiarity with basic modes of inquiry, skills for gathering and organizing information, and ability to interpret and synthesize information and develop explanations.

3. Skills for decision and action - being able to draw conclusions, develop solutions, make decisions, and participate in resolving environmental issues; being able to consider implication of alternative course of action and arrive at own conclusions. Ultimately students need to understand the ideals, principles, and practices of citizenship in a democracy.

4. Personal responsibility - citizens are motivated and empowered to act on conclusions about what should be done to ensure environmental quality. (Legro, Bybee, & Simmons, 1997)

[INSERT FIGURE 2: Concept map of NAAEE Learner Guidelines]

Because of the standard for personal responsibility and empowerment, the NAAEE Learner Guidelines can also be commended for being consistent with John Dewey's view that "responsible social democratic action is the goal of all education." (Dennis and Knapp, 1997, p. 8)

The map in Figure 2 of the NAAEE Learner Guidelines might be compared to Figure 1 of the Grade 3 EE-related content prescribed for the science curriculum in the state of Virginia's *Standards of Learning* (Board of Education, 1995). The latter includes mainly the knowledge aspect of the former, i.e. ecological processes and systems. However, elsewhere in Virginia's science standards, one of the 8 curriculum goals is that students should be able to,

Make informed decisions regarding contemporary issues taking into account the following:

- public policy and legislation
- economic costs/benefits
- validation from scientific data and the use of scientific reasoning and logic
- respect for living things
- personal responsibility (and)
- history of scientific discovery." (Board of Education, 1995).

"Respect for living things" and "personal responsibility" do indeed overlap the NAAEE Guidelines but the items specified in this goal are not evident in that part of the document

where the science content is detailed. Further, the attainment of this goal is certainly not being measured by the multiple choice tests the state uses exclusively for curriculum accountability.

The Wider Perspective: Education *In, About, and For* the Environment

Earlier I stated that EE has been defined as including education *in* the environment. EE also includes education *about* and *for* the environment. In regard to the “about” aspect, what content should be in the curriculum? For the most part, in my view, that should be a local decision based upon many considerations. However, I can agree with Lantieri (1995) in that, “To care about one’s thinking and to think about what one cares about... are goals worth aiming for. These are things that ‘all students should be able to do.’” (p. 392) In addition, certain process skills as identified in the NAAEE Guidelines may be generally desirable for all students to attain. These fall under the aspect of “Skills for Decision and Action”, or inquiry.

Inquiry in EE represents investigations that often emerge naturally from the interests and motivations of students and teachers to understand and relate to their local environment. In terms of investigations of authentic questions children frequently are able to go well beyond the typical expectations of the standards documents. As Schack (1993) points out:

Elementary students can do descriptive, historical, experimental, correlational, and developmental research. When students are researching their own questions, they are more likely to use data gathering techniques of primary research, such as observation, surveys, interviews, and document analysis. Authentic research teaches students that their questions and interests matter, that they have to skills and abilities to pursue those interests in a meaningful way, and also that their work has value in the outside world (Schack, 1993).

Investigations of authentic questions, including field-based studies, should be infused across the curriculum, but particularly in the social studies and science programs. As John Elder (1996) notes, “The sciences are fundamental to environmental education.” (p. 3) Elder argues that school-based environmental education should be focused mainly on the *local* environment, which is one more reason for local rather than state standards.

Despite a generous representation of EE content in many of the state standards, the unfortunate result of standards-based reform with its concomitant high stakes testing and de-emphasis on field studies is an overall weakening of environmental education in US public schools. This situation has arisen at a time when many measures of global environmental health seem to be rapidly deteriorating. There is, for example, the growing hole in the protective ozone layer with increased ultraviolet light at the surface that has been linked to the worldwide decline of amphibians. We have the depletion of major oceanic fish stocks, a global loss of wetlands and widespread deforestation, especially of the tropical forests. There is the loss of biodiversity and the widespread dieback of the coral reefs. Further, there is the accelerating depletion of fossil fuels and other limited natural resources, and we face the specter of global climate change.

Nobody knows how much the complex buffering systems within the global ecosystem can be pushed. In an issue of *Sierra* magazine several years ago humanity's impact on the planet was depicted via the metaphor of a footprint. Placed over a footprint image were these facts:

- Between one-third and one-half of the land surface of Earth has been transformed or degraded by human action.
- The carbon dioxide concentration in the atmosphere has increased by nearly 30 percent since the beginning of the Industrial Revolution.
- Earth's forested areas have shrunk by about one-third since the rise of agriculture-based civilization.
- Roughly one percent of the world's water is fresh and available for human use; more than half of that is already in use by humanity.
- About one-quarter of the bird species on Earth have been driven to extinction.
- The world's population is expected to grow from 5.9 billion today to between 8 and 10 billion by the year 2050.¹ (*Sierra*, 1998, p. 21)

These trends have continued and such signs forebode ill for our species. In the 1960s and 70s, the goal of environmentalism was to save the living world around us. The consensus then was

¹ *Sierra* cited the United Nation's Population Division and, Peter M. Vitousek, et al., "Human domination of earth's ecosystems" from the July 25, 1997 issue of *Science*.

that students should learn there are limits to growth in three areas - population, technology, and appetite (i.e., greed). This consensus was based on an underlying awareness, “that the progressive, secular materialist philosophy on which modern life rests, indeed on which Western civilization has rested for the past three hundred years, is deeply flawed and ultimately destructive to ourselves and the whole fabric of life on the planet.” (Worster, 1995, p. 417) Unfortunately, that message is too often part of the *null curriculum* in most schools, and this situation is not likely to change during the reign of standards-based curriculum.

Environmental educators, indeed, all educators, should be contemplating the educational needs of citizens in the emerging postmodern, post-industrial world. Leonard Waks (1995) has called attention to four dimensions of social changes since the Vietnam War:

- an awareness of the impact of production (its effect on the environment),
- new technologies of communication and information processing,
- the rise of international corporations and the decline of nations,
- the emergence of a global security system.

Add to these changes the increase in global population, which has doubled since the peak of the Vietnam conflict, and the conclusion has to be that the *nature of citizenship* itself has changed. According to Arne Sessions (1995), “...humanity’s ultimate ecological priority should be the protection of biodiversity, wild ecosystems, and wild evolutionary processes.” (p. 412)

Recognizing the priority of EE as part of the curriculum is only part of the solution. One of the biggest obstacles educators may face in the classroom is a mindset, or misconception, identified by Daniel Quinn (1996) as “the Great Forgetting,” an overarching world view or paradigm that, “blinds us to the fact that we are a biological species in a community of biological species and are not exempt or exemptible from the forces that shape all life on this planet.” (p. 307) The educational implication of Quinn’s hypothesis, as I interpret it, is that a paleontological and archaeological perspective should infuse the school curriculum. Inclusion of this perspective is compatible with field-based studies. Education can help children construct more sophisticated, broader understandings of our species’ genetic and pre-historical context.² Such an historical perspective can be integrated when teaching ecological concepts and principles.

² Man: A Course of Study (MACOS), an NSF funded curriculum project of the 1970s was a course that helped kids perceive such a long view.

An example of exceptional practice

In the US, unlike in Britain, private schools are exempt from state curriculum standards and high stakes tests. In education the greatest public good is not always served by the public schools. Community School (<http://www.communityschool.net>) is a not-for-profit, non-sectarian private school that has been educating children in the Roanoke Valley of Virginia since 1971. Community School (CS) currently serves a diverse population of 150 students from pre-K through middle school. The affiliated Community High School (<http://www.communityhigh.net>) began in 2001 and will ultimately serve 60 students in grades 9-12. Forty percent of CS students receive financial aid. A number of features characterize Community School's nontraditional educational program. A learner-centered curriculum is enacted in non-graded, multi-aged classes with a low pupil to teacher ratio. The curriculum is interdisciplinary and includes a strong visual arts program as well as drama, movement, and music. Experiential environmental education and community service also form a vital part of the curriculum. Fridays each week of the school year are typically devoted to field studies and students are given several choices of trips and activities. In the Fall overnight and week-long camping opportunities are offered, with longer stays for the older students. In the Spring middle school students may opt to study environments in more distant places, such as the Florida Everglades National Park and sites in other countries.³ Community High School (CHS) represents a new and unique niche in education: the museum school. This concept has emerged only recently with only about twenty examples in the US and those representing a variety of designs. Community High School is charting new territory, particularly in developing the practice of collaborations between a formal school and multiple informal educational agencies and real-world learning sites. CS and CHS are examples of schools where environmental education is infused in an integrated curriculum and where field studies are a regular part of students' learning.

Conclusion

³ My own daughter visited tropical forests in Bolivia as part of a student exchange with a Bolivian middle school.

Standards-based curriculum may eventually fade away, as has “management-by-objectives” (MBO) and other educational fads, but for now, environmental educators must be pragmatic and make the best of a bad situation. US environmental educators are advised to study their state standards to identify the environmental education content therein, as I have done above for the Virginia standards. Comparing standards in the science and social studies programs, for example, can be used to justify much curriculum integration, one of the strengths of environmental education. The standards reign will probably mean that environmental educators will have to fight harder for field based studies and affective education, but, of course, that is something we have always had to do. Environmental educators are urged to “hang in there.” With the state of the world in environmental decline, our work is more vital than ever.

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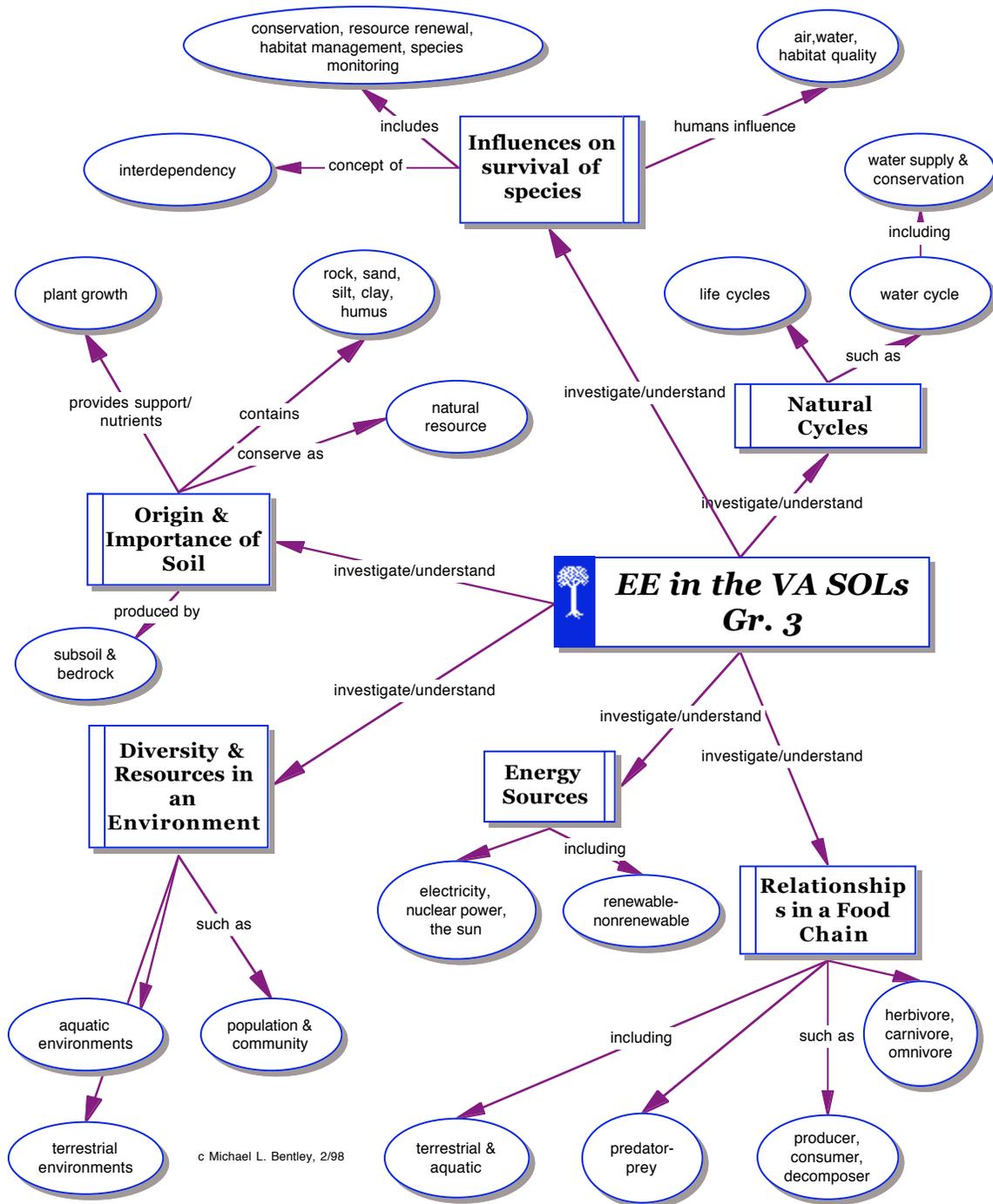


FIGURE 1: Environmental education content in Virginia's *Standards of Learning* (1995) for Grade 3

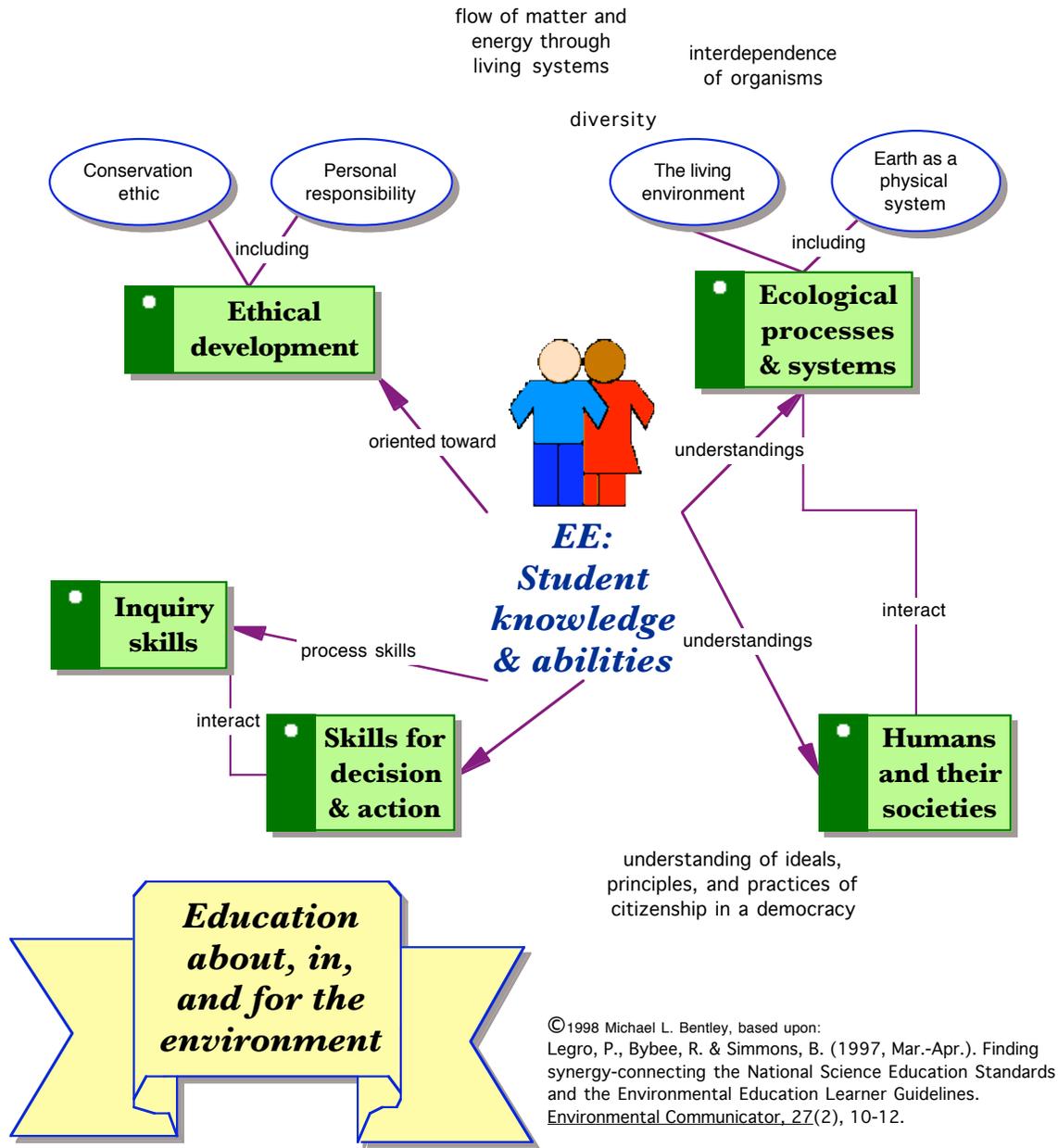


FIGURE 2: Concept map of NAAEE Learner Guidelines