How Can We Teach Principles and Practices of Environmental Care?

> *"Education is what remains after one has forgotten everything he learned in school."*[1]

It has been several years since I first compiled a tertiary curriculum for Environmental Science education. Much has happened in the world since then that has influenced the awareness of the environment and our responsibility toward it. Whereas in 1995, the environmental movement was struggling to make its case and the methodology in environmental education focused on highlighting worst-case scenarios, today it has adopted a realistic approach to awareness and remediation.

In the past, environmentalists hoped that the use of scare tactics would induce people to become active in the campaign and recruit new converts to help spread the bad news about anthropological damage to the environment.[2] Currently, environmental education focuses on two perspectives, *earth education* and *environmental education*. Earth education is described as "an approach to environmental education which successfully combines the learning of theoretic knowledge with an education of the senses," whereas environmental education is "education *in* and about, rather than *for* the environment."[3] Today's environmental education realm focuses on the realistic goal of achieving sustainable development by introducing a culture of belonging and sharing for all life on the planet. Christians recognize a parallel biblical principle: service and stewardship, rather than dominion of the earth. Creation is viewed as a work of art, possessing an aesthetic dimension as much as a functional, rationalistic purpose. How to integrate these concepts in formal environmental education is the subject of this article.

Objectives in Environmental Science Education

Outcomes-based approaches look at the projected or desired measurable outcomes following a learning experience and then make adaptations as needed. In environmental education, this

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can be achieved through changing people's perceptions and perspective by encouraging them to feel a sense of dependence upon, and responsibility for, nature. "Education that builds on our affinity for life would lead to a kind of awakening of possibilities and potentials that lie largely dormant and unused in the industrial-utilitarian mind."[4] The home, school, and church should collaborate to instill in children from an early age an appreciation for all life on Earth. As young people progress through the educational system, they should receive developmentally appropriate instruction that promotes and strengthens this viewpoint. What is appropriate for someone studying environmental science at a university would be quite different from what should be included in the curriculum for a secondary or primary school student. And what is meaningful for an inhabitant of a Pacific island would not be the same as for an urban dweller in Mumbai or New York City, for example.

Cultural background influences not only perceptions, but also expectations. For example, the rapid development of the Pacific Island nation of Papua New Guinea has introduced challenges not experienced during the leisurely modernization of countries in the West. Traditional lifestyles in rural areas previously had little impact on the environment, but now, the impact of modernization and technology has made practices based on a subsistence lifestyle, which were sustainable with smaller populations and more abundant natural resources, a matter of concern for environmentalists.

Pressing leaves for later identification for an environmental study in Papua New Guinea.

In designing an appropriate curriculum for a specific group of learners, a number of factors must be incorporated into the objectives. Every level of learning should include a common set of core values; however, these values will need to be adapted and restated to make them relevant to the maturity, background, and goals of the learners, as well as the environmental challenges of the region in which they live.

Core Principles for Environmental Education

Culture is imbued with worldviews and is, to an extent, responsible for them. Christianity allows for the convergence of otherwise disparate worldviews to construct a shared appreciation of nature. "In western societies, ownership signals possession and control, but in other cultures ownership has broader meanings."[5] For the Pentupi of Australia, ownership means shared identity. For the Naskapi Indians of Labrador and the Sami people of northern Norway, it means allegiance ("We belong to the land").[6] Every human activity affects the environment, to a lesser or greater extent. The worth we attach to nature is based upon our background, upbringing, and experience. Thus, the universal values of stewardship over, and dependence upon, nature are best cultivated during a child's early years, and this is where the education of the senses in earth education has its roots.

From a biblical worldview, the value of stewardship over our planet is harmonious with the teachings of Scripture. God has given human beings a mandate to care for creation, which has always required service and stewardship, and in the 21st century, rescuing nature itself. The values that drive our response to nature are determined in large part by our early formal and non-formal education. Embedded within the values of stewardship and dependence can be found the three reasons for conservation, elucidated by Elton in his book *The Ecology of Invasions by Animals and Plants*.[7] These reasons are (1) religious, (2) aesthetic and intellectual, and (3) practical.

In the context of increasing educational awareness and creating links with emotion, Louis Iozzi provides six recommendations for effective environmental education:[8] (1) infuse the instruction with emphasis on the affective domain; (2) use activities that help students understand their own environmental values and illustrate how to improve them; (3) help students develop moral maturity in relation to environmental problem-solving; (4) include outdoor experiences as much as possible; (5) use inquiry methods that involve students in investigating real environmental problems; and (6) design and adapt the curriculum to reach a diverse population—with specific attention to socio-economic status, gender, age, and place of residence.

At the Elementary Level

For younger students, the core values of environmental education should include ones with immediate benefits to the

child and nature. Because God's motivations for creation were love and the desire to benefit humanity, the curriculum should highlight the blessings resulting from interactions with the natural world, starting at an early age. Though it is one of the most fundamental and important aspects of early childhood education, educators often erroneously fail to incorporate hands-on experience in nature into the curriculum because they have been seduced by more "sophisticated" artificial learning activities. Children who love nature grow up to be adults who are environmentally aware.

The concept of human beings' ultimate dependence on the natural world can be easily integrated into the values learned by the developing mind. Life exists on this fragile planet only because of a sensitive balance of parameters leading to favorable conditions.

Table 1. A Grid of Environmental Curricular Principles and Suggested Academic Levels for Emphasizing Them

Years	Concepts		
	Ecological	Human	Built Environment
Elementary	Creation response	Interdependence with nature	Responsibility at home and school
Secondary	Connections between global systems	Shared community with the planet	Tensions between development and conservation
Tertiary	Alternative modeling	Bio-cultural conservation	Sociopolitical development

Early childhood education should be regarded as just a prelude to lifelong learning. One basic premise should underlie instruction at all levels: It is our responsibility to preserve the natural world for the next generation. Instilling this sense of responsibility should start at an early age, as teachers compare the consequences of irresponsible behavior toward the environment versus the benefits gained through its nurture. Table 1 suggests appropriate levels for emphasizing various concepts relating to environmental education.

At the Secondary Level

Adolescents are receptive to grandiose visions of the future, even if they do not comprehend the pathways to realizing those visions. The values to cultivate at this level pertain to the universal responsibility of Earth's peoples to ensure a sustainable globe. Instilling the concept that the identity and survival of humanity is integrated (or communal) with all creation should be a primary goal for all educators at the secondary level. The sense of belonging to a bigger reality is often attractive for this age group and can serve as a catalyst for further study[7] and involvement in the environmental movement. Visionaries are born at this age and can do much to inspire their peers.

Environmental awareness must be integrated throughout the curriculum, including the social sciences and humanities. While it seems obvious that disciplines such as history, geography, and political science can readily incorporate environmental themes into their curriculum, other disciplines can also creatively integrate environmental issues into their subject matter. For example, the use of poetry and prose can be used to include creation care in the study of literature. Even economics and business studies can take advantage of the current topics of environmental valuations, national energy budgets, and ecological economics to raise students' consciousness.[9]

At the Tertiary Level

The curriculum of a tertiary-level environmental-science program is designed for people who are already committed to a formal study of the environment, although students from other majors also enroll in some of these classes. Here, in every branch of the subject matter, students should gain specific insights regarding conservation and the sustainability of human activity. Complex issues such as balancing competing values (i.e., maintaining cultural traditions while enhancing living standards) will need to be addressed at this level, when students have developed sufficient maturity to analyze conflicting concepts. How, for example, should the Torres Strait Islanders of northern Australia reconcile their hunting traditions with the needs of a growing and more sophisticated society and a changing environment, as the Dugong (a marine mammal traditionally hunted by the islanders) population stagnates or may even be decreasing?

Because environmental science is a multidisciplinary study, each area has an associated set of principles that must be symbiotically incorporated. However, it is also important to integrate environmental principles into other disciplines at this level. Just as faith is integrated into all subjects for the purpose of reinforcing the importance of implementing Christian principles in all areas of life, so one of the goals of every subject should be to understand the environmental aspects of that dis-

cipline. Humans share the world that God has provided with a host of His other creatures, and thus it is the responsibility of humankind to preserve, as much as possible, their viability. While extinctions have occurred (and continue to occur) as the result of natural events, history clearly reveals human involvement in nearly all recent extinctions (see article by William Hayes and Floyd Hayes on page 23 of this issue).

Curriculum Content

The increasing complexity of the curriculum as students mature corresponds with their physiological and mental development. The choice of appropriate pedagogical methods will therefore also be shaped by the characteristics of the age group for which the material is intended. In the Christian, and in particular, the Adventist worldview, the environment should be seen as our responsibility to maintain and nurture, and thus this fundamental value should be cultivated in every learner, whatever his or her age. For example, with the ever-increasing volume of evidence for human contributions to global warming, it is important that the Adventist worldview reflect society's concern about climate change.

There are some general guidelines for instilling these values at all levels of maturity. Students learn through interaction and experience. Wherever possible, activities should (1) involve data collection, (2) promote analysis, and (3) require formulation of conclusions, particularly for the more advanced student. Topics covered in the curriculum can allow for more open-ended outcomes when students are given careful direction. Ideally, students should arrive at the same destination through personal discovery, which is likely to be far more convincing than the conventional lecture-oriented knowledge transfer.[10]

Understanding current environmental issues involves both cognitive and affective responses that mature with age. It is vital that students be exposed to all facets of environmental issues including the political, economic, social, and scientific aspects, so that this can inform their views and the actions they take through their lifetimes. Once humans understand where and why life occurs and how to stop destroying it, a mindfulness about everything spreads.

A sample of relevant topics for enhancing the environmental education experience for students at different education levels is provided in Table 2.

Table 2. Sample Curricular Topics for K-16 Levels[11]

Area	Primary	Secondary	Tertiary
Biology	Life cycles of plants and animals	Symbiosis Biodiversity	Zoology Botany
Ecology	Water Weather Ecosystems	Natural cycles Water, Carbon, Nitrogen, etc.	Ecological principles Webs
Energy	Sun, wind, and water	Alternative sources	Competitive alternative energy - projects
Resources	Materials Natural and man-made recycling	Pollution Deforestation Global warming	Waste analysis and reduction strategies Environmental chemistry
Community	Tree planting Waste collection	Local studies Water quality	Research projects Air quality
Social	Social and cultural needs Agriculture and food	Land issues Agriculture vs. land or energy	Political and cultural analysis Logging vs. ecotourism
Built Environment	Types of buildings Town planning	Building design Waste disposal systems	Environmental impact assessment
Sustainability	Conservation and society	Resource optimization	Ecology and sustainability Human-altered natural environment

At the Elementary Level

Although the specifics of the curriculum will vary, the essential principles remain the same: personal discovery through data collection and confirmation of existing information. The processes learned in the early years are repeated at subsequent levels in greater depth and breadth.

Examples of data collection for primary school-age children could include the following:

- weather measurements;
- home- and school-based activities, such as recycling, that help children become aware of the human impact on natural resources and the environment while further developing measurement skills;
- additional measurement opportunities, such as tree diameters or stream velocities using homemade boats. These can be especially useful in developing countries outside of urban centers; and
- observing or measuring various characteristics/features in plants and animals such as length, size, mass, color, quantity, etc.

Careful reporting of observations/measurements, analysis of data, and recognizing trends are important skills that can be developed through the elementary years in ways that are appropriate to students' cognitive growth.

The universality of global environmental issues crosses political borders and areas of study, and should be considered in any curriculum, whether environmentally oriented or otherwise.

At the Secondary Level

Teenagers' minds are beginning to assimilate differing points of view and make critical analyses of information and data. More sophisticated data-collection techniques can be incorporated into the curriculum at the secondary level, and students can be asked to analyze competing arguments supporting the data by considering the outcomes and consequences of each. Literature reviews will form an increasingly important part of any study.

The secondary school environmental curricula should enable students to understand the "bigger picture." Global warming, for example, can be studied from a variety of political perspectives, ranging from the climate skeptic on the one hand to the environmental scientist on the other. At this stage, the introduction of controversial issues may encourage students to undertake further study that will enable them to make informed decisions about ambiguous data. Secondary students should be taught to draw information from multiple sources in order to accurately interpret historical data and predict future trends. Teenagers today are more in tune with current events than ever before, due in part to the Internet and social media, and environmental issues are currently hot topics on the Internet, blogs, and social media sites. Students need to be taught how to evaluate the credibility of online sources—a peer-reviewed journal article by a renowned scientist should be given more weight than an opinion piece written by a pundit working for a television network or an "infomercial" funded by a corporation that has a financial stake in public decision making on the issue.[12]

At the Tertiary Level

Although Environmental Science is fully developed as a free-standing field of study at the tertiary level, even there, issues relating to the environment must be incorporated into all study disciplines. Most human activities impact the environment, so all university departments should include aspects of conservation in their coursework and embrace the values of conservation and recycling. The universality of global environmental issues crosses political borders and areas of study, and should be considered in any curriculum, whether environmentally oriented or otherwise.

Carefully designed experiments can build on data gathered by previous researchers. At this stage, students will have sufficient background and maturity to examine political associations with environmental issues and to advance potential solutions. Teachers should ensure that students keep abreast of how these factors influence and are impacted by their various disciplines. Integrating environmental issues in all courses of study is not only possible, but will also help ensure that the graduates of our colleges and universities are fully informed about the overarching issues in the global environmental crisis.

Conclusion

This article has offered some strategies and suggestions for

teaching the principles of environmental awareness at various educational levels. The teacher's worldview will have a significant impact on the character of the instruction as well as its content. As individuals, human beings seem to be insignificant in the "big picture" of the universe, yet each one of us has an invaluable part to play in caring for the natural world. Just as our planet, apparently inconsequential in the cosmos, was chosen as a special place for humankind and where the Savior was incarnated to save each human being, so each individual has a God-directed responsibility to the ecosystem of which he or she is a part. This should be the underlying ethos of Adventist education.

For Further Reading

Beder, S. *Environmental Principles and Policies* (Sydney: UNSW Press, 2006).

Barrow, C. J. *Environmental Management for Sustainable Development,* 2nd ed. (London: Routledge, 2006).

Campolo, Tony. *How to Rescue the Earth Without Worshiping Nature* (Nashville, Tenn.: Thomas Nelson Publishers, 1992).

Gough, A. *Education and the Environment* (Melbourne: ACER, 1997).

Hanna, S. S., C. Folke, and K. Maler, *Rights to Nature* (Washington, D.C.: Island Press, 1996).

Orr, D. W. *Earth in Mind: On Education, Environment, and the Human Prospect* (Washington, D.C.: Island Press, 2004).

Internet Resources

Education World

http://www.educationworld.com/science/hs/9_12_earth_enviro.shtml

Geoscience Content Developer, Karin Kirk Science Education Resource Center - Carleton College

http://serc.carleton.edu/NAGTWorkshops/affective/environment.html

North American Association for Environmental Education (NAAEE)

http://www.naaee.net

Sustainability Curriculum Framework: Environment, Water Heritage and the Arts, Australian Government

http://www.environment.gov.au/education/publications/pubs/curriculum-framework.pdf

Wisconsin Environmental Science Teacher Network

http://www.uwsp.edu/cnr/wcee/EnvSci/online.htm

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For more information about the book, see http://www.adventus21.com.

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NOTES AND REFERENCES

1. Albert Einstein. From an address at Albany, New York, October 15, 1936.
2. A. Gough, *Education and the Environment* (Melbourne: ACER, 1997), p. 59.
3. Ibid., p. 100.
4. D. W. Orr, *Earth in Mind: On Education, Environment, and the Human Prospect* (Washington, D.C.: Island Press, 2004), p. 213.
5. S. S. Hanna, C. Folke, and K. Maler, *Rights to Nature* (Washington, D.C.: Island Press, 1996), p. 36.
6. Ibid.
7. Charles Elton, *The Ecology of Invasions by Animals and Plants* (Chicago: University of Chicago Press, 2000).
8. Louis A. Iozzi, "What Research Says to the Educator, Part Two: Environmental Education and the Affective Domain," *The Journal of Environmental Education* 20:4 (1989):6-13.
9. The term "ecological economics" refers to an emerging, trans-disciplinary field of study and research, which seeks to understand and address the evolving relationships of human economies and their impacts on natural ecosystems over time. *The Journal of Ecological Economics* (http://www.journals.elsevier.com/ecological-economics/) is "concerned with extending and integrating the study and management of 'nature's household' (ecology) and 'humankind's household' (economics)." See also Stephen Dunbar, "What Is the Value of an Ecosystem?" *Entrusted: Christians and Environmental Care,* Stephen Dunbar, L. James Gibson, and Humberto M. Rasi, eds. (Adventus, 2013), Chapter 14, pages 149-160.
10. Diane M. Schweizer and Gregory J. Kelly, "An Investigation of Student Engagement in a Global Warming Debate," *Journal of Geoscience Education* 53:1 (2005):75-84.
11. Many teaching resources are available for all levels of education at various Websites including Teacher Vision (http://www.teachervision.fen.com/environmental-education/humans-and-environment/67405.html) and the U.S. Global Change Research Information Office: http://www.gcrio.org/links/links5-5.htm.
12. For helpful tips on teaching students to use the Internet, refer to Lauren Matacio and Bruce Closser's article in the April/May 2008 issue of the *Journal*: "Guiding Students Through the World Wide Web," 70:4 (April/May 2008): http://circle. adventist.org//files/jae/en/jae200870044804.pdf.