EVALUATING THE UNIVERSITY OF GEORGIA'S ENVIRONMENTAL LITERACY REQUIREMENT

by

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(Under the Direction of Peter G. Hartel)

ABSTRACT

The University of Georgia is one of the few state universities in the United States that requires that every undergraduate student fulfill an environmental literacy requirement (ELR). In Fall 2005 and Spring 2006 semesters, we assessed a total of 7,268 students currently taking an ELR course and the 86 faculty teaching these courses, on their awareness, support, and satisfaction for the requirement. Although a majority of faculty (87 percent) was aware of the ELR, a majority of students (68 percent) were not. Both a majority of faculty (89 percent) and students (84 percent) supported the idea of an ELR. The ELR increased student knowledge (76 percent) and concern (65 percent) about environmental issues and changed some students' behavior (26 percent). Although there was widespread support and satisfaction with the requirement, creating an ELR coordinator position, publicizing the ELR, and evaluating the ELR periodically should improve the requirement.

INDEX WORDS: college, curriculum, environmental education, environmental evaluation, higher education

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DEDICATION

I would like to dedicate this thesis to Dr. Peter G. Hartel for inspiring me to become involved in researching and evaluating UGA's Environmental Literacy Requirement. He has been my mentor throughout both my undergraduate and graduate career and has demonstrated the power that determination, discipline, and passion can have in accomplishing difficult feats that otherwise would have been pushed aside.

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CHAPTER I

INTRODUCTION

Since the 1960s there has been considerable interest in informing the general public about the human impact on the earth's ecosystems and potentially unwise use of natural resources. This interest has translated into federal and state regulations as well as national and international conferences and declarations that encouraged universities to increase their environmental stewardship and environmental education and literacy. Environmental education and environmental literacy are related but not the same, environmental literacy is the intended outcome of the process of environmental education, which, more or less, includes one acquiring awareness and knowledge of environmental issues and problems, and the skills to identify and solve them, and above all, exhibiting environmentally responsible behavior (Elder, 2003).

Although these regulations, conferences, and declarations have had a positive impact on resource preservation and biodiversity conservation, the public's overall knowledge and understanding of the environment remains low (Elder, 2003). It seems that many of these attempts rarely cause societal action and behavioral change, and instead state the environmental issues and challenges and set environmental quality standards and broad objectives rather than focusing on public understanding of the underlying interconnected causes of environmental problems. Basically these attempts treat the symptoms rather than the causes.

Educating the public about environmental issues and solutions needs a different approach. One approach may be to focus at the university level, not only because this is where the research concentration is the greatest and the development of solutions the most promising,

but also because universities and society are intimately linked: society influences universities in their values and practices, and, in turn, universities influence society. Many university graduates will be society's future leaders and decision-makers. Although it is important that universities serve as role models for society as a whole, acting as laboratories where "green" strategies and ideas can be tested before being applied to society, they should also ensure that they are producing environmentally literate students. However, surveys show that overall, universities and colleges do not produce environmentally literate students (National Wildlife Federation, 2001).

As part of the process of improving a university's environmental literacy, it would be useful to universities if there was a national standard that included both an essential framework for developing an effective academic curriculum infused with environmental issues and a baseline to determine specific student learning outcomes, thereby clarifying what all students must know in order to be considered environmentally literate. This standard, in turn, could facilitate universities in developing and improving environmental literacy program guidelines and courses as well as producing a mechanism for measurement and comparison of progress and achievement across the country. However, there are no national or international standards for environmental literacy. Instead, universities create their own definitions and standards of environmental literacy and have differing approaches in achieving them and measuring their outcomes. These approaches range from universities feeling that their students are environmentally literate by requiring them to take a science course to requiring students to sign a pledge that advocates responsible environmental behavior to implementing interdisciplinary environmental programs.

The University of Georgia

The University of Georgia is one of the few state universities in the United States that requires that every undergraduate student complete an environmental literacy requirement (ELR). The ELR was implemented in the form of courses that fulfill two criteria (ELR criteria); these criteria encompass UGA's definition of what a student must be able to critically evaluate and comprehend to be considered environmentally literate. The criteria are an understanding of:

1. Basic scientific principles which govern natural systems, and
2. the consequences of human activity on local, regional, and global natural systems (University of Georgia Curriculum Committee, 1998, p. 1).

Students must take one out of a list of 86 courses to satisfy the ELR. On the positive side, UGA stands out for having such a requirement, while on the negative side, it has increasingly neglected this requirement since its inception in 1989. This neglect has been due to a variety of reasons, such as an inadequate budget for a program coordinator, new faculty positions, courses, teaching materials, faculty training and workshops, and differing agendas among departments (competition over increased student enrollment), limited assessment of the ELR courses and criteria, lack of oversight, dissatisfaction with the ambiguous nature of the two criteria, and uncertainty about the effectiveness of the ELR in producing environmentally literate student.

In order to move towards the objective of improving UGA's ELR, my thesis focuses on reviewing and assessing the efficacy of the components which make up the ELR, including the two criteria, the courses that address these criteria, and the students and faculty who take and teach these courses and their knowledge of, satisfaction with, and support for the ELR.

CHAPTER II

LITERATURE REVIEW

Public consciousness of environmental degradation and its impacts came to the forefront with the 1962 publication of Rachel Carson's landmark book, Silent Spring (Jordan, 1995). Catalyzing the environmental movement of the 1960s and 1970s, Silent Spring clarified the notion that as population increases so does the demand for goods and services, which, in turn, increases production and depletes resources. In effect, the natural resource base is unable to fulfill our demands and the world's mounting environmental problems have begun to affect the health and lives of all creatures (Carson, 1962). Silent Spring was also the inspiring force behind federal legislation to ban certain harmful pesticides, as well as encouraging scientists to devise less harmful agricultural methods (Jordan, 1995). In addition, the Earth Day celebration of April 22, 1970 and the subsequent energy crisis of the 1970s reaffirmed public concern about resource depletion and promulgated the importance of having an environmentally educated public. From the public's increased concern came a series of federal and state regulations such as the Wilderness Act of 1964, the National Environmental Policy Act of 1969, the Clean Air Act of 1965, 1970, and 1977, the National Environmental Education Act of 1970 and 1990, the Federal Water Pollution Control Act of 1972, and the Endangered Species Act of 1973 (Jordan, 1995; National Environmental Education Advisory Council [NEEAC], 1996). In addition, the Environmental Protection Agency (EPA) was created in 1972, charged with setting major air and water quality standards and enforcing environmental legislation (Jordan, 1995).

Environmental Literacy: an Outcome of Environmental Education

The field of environmental education evolved in the early 1970s as a fusion of conservation education, nature study, and outdoor education, but it was not until the 1980s that the social and human dimensions of environmental issues were addressed with the emergence of sustainability education (Elder, 2003). Acknowledging the assumption that education is the primary tool capable of treating the underlying causes of our environmental problems rather than the symptoms alone, various organizations and institutions organized conferences and workshops that have contributed to the field of environmental education by formulating general guidelines and objectives. The most commonly accepted goal worldwide was developed at the 1975 UNESCO (United Nations Educational, Scientific, and Cultural Organization)/United Nations Environment Programme (UNEP) workshop held in Belgrade, Yugoslavia:

> [the development of] a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes and motivation commitment to work individually and collectively toward solutions to current problems and the prevention of new ones. (Volk & McBeth, 1998, p. 2)

Two years later, the Tbilisi Declaration was signed at the Intergovernmental Conference on Environmental Education. It built upon the Belgrade workshop's foundation of environmental education by outlining the aim, categories, and objectives of the field, but focused more on the individual, and one's ability to use the concept of interdependence to understand problems and obtain the skills to solve them, while respecting ethical values. The five categories included awareness, knowledge, attitudes, skills, and participation (Volk & McBeth, 1998, pp. 2-3).

Today, there is a general consensus that environmental education is a process that creates awareness, appreciation, knowledge, and understanding of the relationship between humans and their many environments–natural, built, cultural, and technological, as well as an understanding

of the range of current environmental issues and the ability to use investigative, critical thinking, and problem-solving skills toward the resolution of these issues, with the ultimate aim of responsible environmental behavior (NEEAC, 1996; Ruskey, 1995). The bottom line of environmental education is an environmentally literate citizenry.

The term environmental literacy was originally coined in 1968 by Charles Roth, who defined it as "essentially the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems"(Roth, 1992, p. 1). It is important to note that although the intended outcome of environmental education is an environmentally literate citizenry, there are different competency levels of environmental literacy ranging from inability to sophisticated, and different development stages that essentially follow the categories of environmental education: awareness, concern, understanding, and action (Roth, 1992).

Status of Environmental Literacy in the United States

Over the last three decades, a patchwork of limited studies have been conducted on environmental literacy, each using different variables and instruments, which show that the American public is aware and concerned for the environment, yet has limited understanding of environmental issues and exhibits less than optimal responsible environmental behavior. For example, national polls reported American sympathy for the environmental movement or claims of being active within it, fluctuating from 62% in 1980, 81% in 1992, and 68% in 2001 (Coglianese, 2001). In addition, a 1994 public survey by the American Museum of Natural History on Science and Nature, reported that respondents ranked environmental destruction as the "greatest threat to human life," and listed the environment "as the second most important issue in science, (only behind medicine)" (Elder, 2003, pp. 18-19). Nevertheless, Americans lack

an understanding of environmental issues and knowledge necessary for responsible environmental behavior at the individual level, as well as at the societal level in the form of proposing and evaluating environmental public policy and regulations (Roper Starch Worldwide [RSW], 2001). For example, the RSW survey reported that 70% of Americans believed they knew a 'fair amount' about environmental issues, but two out of three adult Americans still failed a simple environmental quiz (Elder, 2003; RSW, 2001). This lack of environmental knowledge has also been reflected in additional studies, conducted between 1980 through 1994, which assessed environmental issue knowledge. Of 15 studies, ten reported extremely low to low levels of environmental knowledge among students and adults, and of the remaining five, only one reported high levels, one moderate, one reported no increase over a 10-year period, and the last reported that students in environmental programs had a higher level of knowledge than those in non-science or social science programs (Volk & McBeth, 1998).

Although the public shows interest and concern for environmental issues, its familiarity with the basic terminology used to discuss such issues appears to be limited. Moreover, a survey conducted by The Biodiversity Project in 1998 concluded that there is a considerable gap between conceptual appreciation of the environment and the ability to make lifestyle changes and participate in the public policy process. Thus, Americans may have reached the first two stages of environmental literacy competency, but have failed to reach the most sophisticated level of environmental literacy: understanding and action. Many believe that environmental awareness and knowledge will change one's attitude towards the environment, thereby resulting in responsible environmental behavior. However, research does not support this notion (Hsu, 2004). This result might be primarily because most citizens acquire awareness and knowledge through sources (i.e., regulations, media, religious institutions, family, community, workplace,

interest groups) which oftentimes provide only isolated pieces of information about environmental issues, rather than addressing and emphasizing the interconnectedness of environmental problems and solutions, and societal dependence on natural resources (Roth, 1992). Although it is essential that all sectors of society play a role in stimulating and fostering environmental literacy, the most appropriate sector of society with the potential to actively address and solve the complex systematic environmental problems is the nation's schools.

Environmental Literacy and Universities' Role

Recognizing the need for an environmentally literate citizenry, universities have been challenged by world leaders in various conferences to play a prominent role in preparing their students to analyze and resolve environmental problems. For instance, Agenda 21 of the 1992 United Nations Earth Summit Conference on Environment and Development (UNCED) created aggressive measures to increase environmental education in universities. In addition, the 1994 Council of State Governments developed Suggested State Legislation which requires the implementation of "programs that encourage environmental literacy and provide opportunities for environmental stewardship among the student population" which can be accomplished by "an environmental studies course requirement for all graduates, or the development of an integrated general education program that accomplishes environmental literacy through its integration in a variety of courses" (Wilke, 1995, pp. 1-2). Furthermore, 31 university leaders and international environmental experts convened in Talloires, France, in 1990, to attempt to define and promote the role of universities in environmental management and sustainable development. As a result, they created the Talloires Declaration, which specifies ten key actions that universities agree to take in order to address current and future environmental challenges. As of 2001, the Declaration

has been signed by over 275 university presidents and chancellors at institutions in over 40 countries. Although many conferences and declarations have been, and continue to be impetus and framework for many universities to strengthen environmental literacy through academic research, education, training, policy formation, and information exchange, for other universities, these events are purely symbolic acts addressing bold visions and vague notions (University Leaders for a Sustainable Future, 2001).

The Nuts and Bolts of Environmental Literacy in Higher Education

The central questions that educators and scientists grapple with are: what does it mean to be environmentally literate? What must students learn to meet the complex environmental challenges of the future? What are the most important environmental challenges that need to be addressed first and foremost? There are certain central ideas and concepts that cut across most, if not all, definitions of environmental education and literacy, as most scholars agree that all students should at least have basic awareness and understanding of how the earth works as a physical system, recognize the relationship between the natural environment and human impacts on it, and have an appreciation for the complexity of these interactions (Eagan & Orr, 1992). However, there are disparate views about the foundational knowledge necessary to become environmentally literate, as well as methods of achieving this goal. These disagreements are exemplified by a survey (Aldemaro, Stern, & Benz, 2001) of 642 environmental studies programs/departments of 359 colleges and universities, which found "no clear consensus among these [institutions] about what constitutes environmental literacy, for either majors, or the student body as a whole…reinforcing the conclusion that there is a lack of unifying principles and clarity about what environmental studies programs should be" (Elder, 2003, p. 56). As Charles Roth (1992) reiterated, "there became almost as many perceptions of the nature of environmental

literacy as there were people who used the term" (p. 7).

The specific elements which educators value within the broader goal of environmental literacy create fragmentation. For instance, some educators believe that ethical values should be included in environmental studies, while others feel that a student is environmentally literate with scientific knowledge and understanding alone. Many scholars find the inclusion of the concepts of sustainability and environmental stewardship in environmental literacy programs essential, yet others do not feel they should be considered top priority (Bartlett & Chase, 2004; Eagan & Orr, 1992). Some educators have strong opinions about the exact subject matter a citizen must comprehend in order to be considered environmentally literate. For example, David Orr (1991) proposes that

> no student should graduate from…[an] educational institution without basic comprehension of:
>
> - the laws of thermodynamics
> - basic principles of ecology
> - carrying capacity
> - energetics
> - least-cost, end-use analysis
> - how to live well in a place
> - limits of technology
> - appropriate scale
> - sustainable agriculture and forestry
> - steady-state economics
> - environmental ethics
>
> (p. 5)

The absence of a national consensus on environmental literacy standards including a definition, criteria, curricular framework or guidelines, or essential course material, are reflected in the considerable variation in the methods and extent to which universities infuse environmental literacy into their academic curricula. Virtually all universities incorporate the

environment in some way into their curricula through a range of different avenues, such as environmental outreach projects, internship programs, majors and minors, courses, interdisciplinary degree programs, and, to a lesser extent, university-wide environmental requirements. The National Wildlife Federation study ([NWF], 2001), which received 891 responses from the nation's 4,100 universities and colleges, found that 43% of universities and colleges offer an environmental studies major (35%) or minor (32%), but this promising response is countered by the knowledge that the vast majority of students are not enrolled in these programs (pp. 1,14). For example, by 1995 the University of Wisconsin-Stevens Point had the largest Natural Resources Program in the nation with 1,750 majors receiving "intensive environmental literacy instruction" (Wilke, 1995, p. 30), yet these students were a minority within the university's total 8,011 students (University of Wisconsin-Stevens Point, 2004).

Interdisciplinary Nature of Environmental Literacy

Most scholars acknowledge the inherent interdisciplinary nature of environmental literacy because environmental issues cut across all disciplinary lines. Following this notion, many educators encourage holistic learning through knowledge and understanding of the intersection and interconnectedness between different disciplines, thus facilitating student ability to generate new ideas and solutions to environmental problems. Many universities offer multidisciplinary environmental courses, however these courses tend to be concentrated within the physical sciences rather than social sciences. Traditionally educators have assumed that "environmental literacy is equivalent to, or a subset of, scientific literacy" and therefore environmental education has been primarily treated as an enrichment of science programs (Disinger & Roth, 1992, p. 3). This statement is supported in that the majority of environmental education courses are taught by science teachers and thus environmental education is mostly taught within science classes

(Simmons, 1989). The NWF study (2001) reported that 68% of universities offer environmental studies courses within their biology departments, 43% in chemistry, 33% in political science or sociology, 25% in business or economics, 22% in philosophy or religion, 12% in computer science or engineering, 11% education, 9% law, and 6% communications (pp. 1, 14). Various educators believe that even fields such as music should be incorporated within environmental studies because of its ability to "serve as a point of connection between humans and the natural world, …inspiring environmental action and advocacy while also helping to foster empathy for the natural world" (Turner & Freeman, 2004, p. 45). Others recognize the importance of incorporating environmental issues into business school curricula, rather than just offering a single elective course, because most "business operations and decision-making… [lack] management tools and problem-solving methods …involving the environment" (Benton, 1993, p. 37). In addition to individual courses, universities have created other opportunities for students to develop and increase levels of environmental literacy, such as internship programs (58%), independent research projects (69%), campus service projects (49%), community service projects (58%), and mastery learning (7%) (NWF, 2001). Some universities recommend that their students sign a graduation pledge (e.g., Humboldt State University, Stanford University, and Marquee University). Nevertheless, while many universities have environmental studies programs and offer cross-disciplinary environmental courses in various departments, it seems that unless these courses are required within a student's field of study, or are included in the core curriculum, beyond curiosity alone, most students never even enroll in a general environmental studies course (Wilke, 1995).

Environmental Literacy and Environmental Studies Requirements

Many individual universities have criteria that students must meet in order to acquire an environmental degree, which essentially qualify as literacy standards for environmental majors (Elder, 2003). However, only a small minority (8%) of the private and public universities and colleges in the NWF study (2001) required all students to take at least one course related to the environment. Another study with 496 respondents, reported only a small minority of public (7.0%) and private (14.5%) universities and colleges that "required all students to take one or more courses specifically intended to increase their environmental literacy" (Wolfe, 2001). However, when those public universities and colleges were contacted in 2006 to confirm the presence of such a requirement, only eight of the previous 14 institutions claimed having a requirement, dropping the percentage of public universities to 4.0%.

Table 1. Public universities and colleges that require all undergraduate students to take one or more courses specifically intended to increase their environmental literacy. Note that UGA is not on the list.

Name of Public University	Requirement in 2001 (Wolfe)	Requirement in 2006
University of Minnesota-Twin Cities	Yes	Yes
Colorado School of Mines	Yes	Yes
Bemidji State University	Yes	Yes
James Madison University	Yes	Yes
University of Wisconsin-Stevens Point	Yes	Yes
Mary Washington College	Yes	Yes
University of Science and Arts of Oklahoma	Yes	Yes
University of Nebraska-Lincoln	Yes	No
New Jersey Institute of Technology	Yes	No
Northwestern State University	Yes	No
San Jose State University	Yes	No
South Dakota State University	Yes	No
University of Northern Iowa	Yes	No
Ramapo College of New Jersey	Yes	No

Far more institutions in the U.S. have Scientific Literacy Requirements than Environmental Literacy Requirements (ELR) or Environmental Studies Requirements (ESR), which go beyond science by integrating seemingly unrelated disciplines. It seems logical that most institutions with ELRs or ESRs are small community colleges, due to the ease of implementation as opposed to the bureaucratic and heterogeneous value barriers faced by large state universities.

Three examples give some measure of ELRs at different institutions. Since the early 1990s the University of Wisconsin-Stevens Point has included an ELR in its general degree requirements through mandatory student completion of an environmental literacy course approved as fulfilling four criteria:

1. Describe the relationship of human society to natural systems and how the two have affected each other.
2. Analyze a wide variety of historic and current environmental issues, ranging from local to global importance.
3. Describe the ecological, political, social, and economic implications of selected environmental issues and assess alternative solutions to those issues.
4. Identify, describe, and evaluate their own individual impacts on the environment.
   (Wilke, 1995)

The courses which satisfy this requirement include: American Environmental History, Urban Environmental History, The Physical Environment Under Stress, Environmental Ethics, Introduction to Environmental Study and Environmental Education, and Policy and the Environment (Wilke, 1995).

Albion College, located in Michigan, is another small liberal-arts institution that requires all students to take an approved course in order to satisfy an Environmental Studies Requirement. In order to be approved, a course must:

1. substantially enhance student's understanding of the earth's environment;
2. deal substantially with the consequences of human intervention into natural systems;

3. show the applicability of more than one traditional discipline to environmental issues; and
4. focus on the perspectives that environmental studies brings to the discipline. (Albion College, 2004)

The University of Georgia 's ELR, established in 1993, requires that all undergraduate students take one of the 86 courses that fulfill the two ELR criteria:

1. Basic scientific principles which govern natural systems, and
2. the consequences of human activity on local, regional, and global natural systems.

Although these universities have made strides towards increasing environmental literacy in their institutions, environmental literacy must be incorporated in the entire university curriculum to attain the most sophisticated level of environmental literacy and most effective outcome.

Infusing Environmental Literacy in General Education Curriculum

The ultimate goal of incorporating environmental literacy in the general education curriculum has been emphasized throughout the environmental literacy literature. Fortunately, the majority of universities in the country have environmental education programs in some form, however only a handful have initiated comprehensive programs that promote extensive environmental literacy in the populace. For example, Tufts University established an Environmental Literacy Institute in 1990 to train the faculty of virtually all disciplines to incorporate a sophisticated level of environmental literacy into their courses (Roth, 1992). Infusion examples include "an English course using novels… to discuss how the environment relates to culture; a drama [course] using role playing [to address] environmental themes; and a mechanical engineering course… focus[ed] on getting more energy efficiency out of a machine" (Wilke, 1995, p. 29). This infusion approach also offers the practical benefits of environmental

education not becoming solely another add-on to the curriculum, as well as eliminating the burden of students having to add another course to their core requirements (Simmons, 1989). However, the feasibility of accomplishing this has proven difficult because the cross-disciplinary nature of the field goes against the grain of the structure of the mainstream educational system by focusing on the structure, patterns, and relationships that define how society and the environment functions rather that only isolated elements (Orr 1991; Elder, 2003). Moreover, the broad array of definitions of environmental literacy and approaches that universities take to produce graduates at different levels of environmental literacy are disconcerting and scattered, causing problems in coordination and cooperation, and hampering the development of comprehensive environmental literacy programs.

Assessments: Where Universities Shine and Where They Need Improvement.

Assessing the environmental literacy competency of students after participating in environmental studies and literacy programs and/or taking environmentally related courses are critical for the refinement of these programs as well as identification and improvement of teaching methods and techniques (Leeming, Dwyer, Porter, & Cobern, 1993). Furthermore, these assessments help determine the efficacy of the heterogeneous definitions and criteria of environmental literacy adopted officially or unofficially by universities. In addition, the environmental literacy of teachers should be evaluated, in terms of their own definition of environmental literacy, preferred teaching style and material, and expected outcome of the program or course they teach.

Various assessments of environmental studies courses have been conducted in order to realize the success of these programs. The large majority of surveys conducted have focused on

awareness and knowledge, and far less have assessed action outcome. Of these studies, all reported increases in levels of student knowledge about and concern for basic environmental issues and principles after taking a course (Battles, Reichard, Rich, & Franks, 2001; Benton, 1993; Carpenter, 1981; Hsu 2004; Leeming et al., 1993; Mangas, Martinez, & Pedauye**,** 1997; McMillan, Wright, & Beazley, 2004). A few studies found an increase in individual responsible environmental behavior, but surveyed students two months after the end of the courses, and thus no data exist on whether the observed effects persist over a longer time period (Benton, 1993; Leeming et al., 1993). An assessment was also conducted on three courses that fulfill the ELR at UGA, which reported the same results as above, but unfortunately, responsible behavioral change was not evaluated (Alkaff, 1996). Although these surveys are encouraging evidence that environmental courses have increased students' environmental literacy, more in-depth assessment must be undertaken in order to determine whether students are achieving the outcome competency levels defined and/or outlined by their university.

Assessing the University of Georgia's ELR

Various studies have assessed different components of UGA's ELR (Garrison, 1993; Alkaff, 1996; Moody et al, 2005; Environmental Literacy Requirement Review Committee [ELRRC], 2003). The majority of students and faculty support the idea of an ELR, but it was determined ineffective in 2003 by the Environmental Literacy Requirement Review Committee due to various problems, such as the lack of measurement and assessment of the efficacy of the ELR, in terms of whether the approved courses actually fulfill the University's two criteria (many of which they believe do not), and "whether students… are leaving the University being environmentally literate, (i.e., having basic knowledge in both scientific and ethical or policy

components of study" ; ELRRC, 2003, p. 4). The Committee also found the two criteria vague and had a difficult time determining "what exactly the University expects students to understand about the environment to be environmentally literate" (ELRRC, 2003, p. 5). Previous studies found that almost 50% of faculty thought the ELR criteria were unsatisfactory (Moody et al, 2005), and that the criteria were not properly addressing the environmental responsibility component of environmental literacy, by relying on the Knowledge-Awareness-Action model that "has not shown any validity for a cause/effect relationship"(Garrison 1993, p. 10). Alkaff (1996) recommended longitudinal studies on the environmental action skills of "'environmentally literate' graduates [in order] to determine the lasting lifestyle changes in regard to environmental behavior skills as a direct result of taking the environmental literacy courses(s)" (p. 123).

Conclusion

Even though many universities have environmental studies programs, courses, and requirements, and these have increased student's levels of environmental literacy, the vast majority of students in the United States are not exposed to these programs, which is reflected in surveys which show that the American public is largely environmentally illiterate (RSW, 2001). Therefore, it can be assumed that universities have much to improve upon in order for their students to reach adequate environmental literacy competency levels. Yet, the question remains, even if universities achieve their own institutional goals, will they be producing citizens with the level of environmental literacy adequate for addressing and finding solutions to the environmental challenges of the 21st century? It is essential that an agreement is reached about what constitutes an environmentally literate citizenry and that each institution be committed to reaching this standard. However, without a coherent body of standards including a common definition of environmental literacy and essential foundational knowledge, no baseline exists to

measure the progress of environmental literacy programs in comparison to those of other universities throughout the country. This, in turn, makes it difficult for institutions to look for role models and adopt successful guidelines, material, and educational techniques to develop or improve their own environmental literacy programs (Elder, 2003).

CHAPTER III

SURVEYING STUDENTS AND FACULTY PARTICIPATING IN THE UNIVERSITY OF GEORGIA'S ENVIRONMENTAL LITERACY REQUIREMENT

Various universities have signed declarations promising to infuse environmental stewardship and environmental literacy into their university curricula (University Leaders for a Sustainable Future, 2001), and a few—estimated 7% for public institutions and 14.4% for private institutions in one study (Wolfe, 2001) and an estimated 8.0% for public and private institutions in another study (National Wildlife Foundation, 2001)—have even instituted environmental literacy requirements (ELR) where all undergraduates must take at least one course with environmental content before they graduate. The University of Georgia (UGA) is among this small percentage of public institutions with an ELR. However, the UGA ELR is having problems, and even though the requirement has been modified over the years, the University is currently considering abolishing it. This threat is surprising because all students and faculty actually participating in the ELR have never been surveyed about the requirement. These data are not only important to UGA, but also to other institutions wishing to implement or improve their own ELR. It is important to understand the benefits and shortcomings of such a requirement.

Brief History of UGA's ELR

In 1989, then-UGA President Charles B. Knapp proposed establishing a university-wide initiative that would stand above the disciplinary concerns of its schools and colleges. He identified the environment as an appropriate focus because of its potential significance and the

reputation of the University in environmental studies. Ultimately, his suggestion resulted in the formation of an environmental policy that addressed an ELR at UGA:

> The University of Georgia recognizes the critical importance of environmental problems in today's world. It is committed to environmental responsibility. The University will foster environmental studies by establishing an environmental literacy requirement for undergraduates and by addressing environmental issues throughout the curriculum. Further, the University will emphasize environmental stewardship in extension and service activities. It will encourage an interdisciplinary approach to teaching, research, and service that strengthens holistic environmental appreciation. The University will teach environmental responsibility by its own example, through environmentally sound management operations (University of Georgia Curriculum Committee, 1998).

This focus on environmental responsibility resulted in an ELR with six criteria. Due to concern over the number of hours required for students to graduate and concern for the overall effectiveness of the requirement**,** the ELR was revised in 1998, and the original six criteria were reduced to two (UGA Bulletin, 2006).

Table 2. The University of Georgia's original six ELR criteria and their reduction in 1998 from six to two.

Year	Criteria
1993-1998	1. Basic scientific principles which govern natural systems, using these to understand the limits and major factors associated with the earth's capacity to sustain life;
	2. Linkages among living things, including humans, and their dependency on each other as well as the physical environment;
	3. Consequences of human activity on local, regional and global natural systems;
	4. Impact of changes within natural systems of life, health and welfare;
	5. Cultural, economic, and political, past and present forces that affect environmental attitudes and decision making; and
	6. Role of ethics and morality in individual and group decision-making related to the environment.
1999 Present	1. Basic scientific principles which govern natural systems.
	2. Consequences of human activity on local, regional and global natural systems.

The original idea was that the ELR would be a dynamic requirement, which would be periodically reviewed by both internal and external panels and overseen by a coordinator. In its current version, undergraduate students must choose one of approximately 80 courses that fulfill the ELR (henceforth, ELR courses). Although the ELR has been reviewed internally, it has never had an external review or been assigned a coordinator. Over the years, differences among the faculty and lack of funding have weakened the ELR to such an extent that the University is considering abolishing it.

One formal and two informal studies surveyed UGA undergraduate students and faculty about the ELR. The first informal evaluation involved interviews of faculty and students (Garrison, 1993). The study concluded that environmental responsibility, the goal of the UGA's environmental policy, was not adequately defined in the ELR and therefore, the faculty interpreted the goal of the ELR in contradictory ways. For example, faculty responses ranged from, "Yes, the ultimate goal of the program is to produce behavior change," to "The professor's job is to convey knowledge only. It's up to the student to change" (Garrison, 1993, pp. 9-10).

The second informal study involved comparable self-evaluations to determine students' knowledge before, immediately after, and eight months after taking one of three ELR courses (Introductory Ecology, Introductory Geography, and Introductory Anthropology; Alkaff, 1996). Although significant differences existed among courses, students significantly increased their knowledge of the environment and retained this information for at least eight months.

The third study was a formal survey of the ELR. A total of 408 students and 103 faculty were randomly sampled, and therefore, the study represented the general faculty and undergraduate student populations. Although many students (43.2%) and faculty (43.7%) were unaware of the ELR, the vast majority of students (89.3%) and faculty (94.2%) supported the

idea of an ELR (Moody et al., 2005). Nevertheless, almost half (47.5%) of the faculty was dissatisfied with the ELR criteria.

Independent of these studies, an internal UGA committee also reviewed the ELR in 2003. The committee concluded the ELR had five major problems: 1) no means of evaluating the ELR's efficacy, 2) too many courses satisfying the ELR, 3) no testing of principles of environmental literacy, 4) no data on extent to which ELR prevents students from graduating in 4 years, and 5) difficulty in determining what constitutes environmental literacy (Environmental Literacy Requirement Review Committee, 2003). The last problem is the same problem identified by Garrison (1993). The committee recommended creating an environmental literacy examination, and abolishing the ELR if funding was insufficient for this examination.

Despite these formal and informal studies and the UGA internal review, a survey of all students and faculty participating in the ELR courses has not been conducted, nor has the ELR been analyzed in depth for awareness, support, and satisfaction. Therefore, we surveyed all students and faculty taking or teaching ELR courses in the Fall 2005 and Spring 2006 semesters.

Methods

A survey was developed consisting of two questionnaires, one for students and one for faculty (Appendices A and B, respectively). The student questionnaire consisted of 19 questions, which, excluding two questions on demographics, was divided into five categories: a) awareness (3 questions), b) course efficacy (5 questions), c) criteria efficacy (2 questions), d) student outcome (5 questions), and e) ELR support and satisfaction (2 questions). The faculty questionnaire was similar with three exceptions. First, the number of questions differed slightly (20 questions). Second, the student outcome was changed to reflect faculty opinion of student outcome. Third, 14 faculty taught more than one ELR course and their responses varied

depending on the course. Therefore, there were 100 questionnaires for 86 faculty. The surveys were administered at the end of the Fall 2005 and Spring 2006 semesters. Because there were no significant differences observed in the results between the two semesters, all the data were combined.

There are a total of 86 ELR courses listed on the UGA Bulletin (Appendix C). Of these courses, 76 have been taught recently or will be offered in the near future, and 10 are no longer offered (Office of Curriculum Services, 2005). Eleven ELR courses were either taught in the summer or offered on an irregular basis (e.g., offered odd or even years); these courses were not surveyed. Therefore, a total of 65 courses were offered during the fall 2005 and spring 2006 semesters. These courses were composed of 142 class sections taught in 25 departments across seven colleges (Appendix D).

Results

Demographics

Overall, of the 65 ELR courses offered during the fall 2005 and spring 2006 semesters, 58 (89.2%) were surveyed, which consisted of 120 (84.5%) of the 142 classes (Appendix E). There were a total of 13,740 students enrolled in these 58 courses, of which 7,268 (52.9%) were surveyed. A total of 100 faculty taught the 65 courses offered in 2005-06 and 86 (86.0%) were surveyed.

Of the 7,268 student responses, 59.2% were female and 40.8% were male (Appendix F). In terms of year of study, 34.8% were freshman, 31.1% were sophomore, 19.9% were juniors, and 14.2% were seniors. The highest percentage (45.1%) of students was in the College of Arts and Sciences. Of the 86 faculty surveyed, 25.6% were female and 74.4% were male (Appendix G). Forty-eight percent of the faculty had taught at the University since the ELR's inception in

1993.

Students

Awareness

The majority of students (67.7%) were unaware of the ELR. Of those students who were aware of the ELR, 67.9% were aware that the course they were taking satisfied the ELR, while 32.1% were not. In addition, of those students who were aware of the ELR, 55.4% reported having already taken a class to satisfy the ELR, 25.9% had not, and 18.8% were uncertain if they had or had not.

Satisfaction with ELR courses and ELR criteria

The majority of students were satisfied that 1) their course fulfilled both of the two ELR criteria (Criterion #1, 75.5%; Criterion #2, 88.0%), 2) their course satisfied the ELR (66.4%), and 3) the two ELR criteria were adequate in fulfilling the ELR (86.1%).

Courses were ranked by students according to their satisfaction/dissatisfaction in fulfilling the ELR (Appendix H). If an outstanding course was identified as having ≥90% satisfaction and a failing course identified as having ≤70% satisfaction (or ≥30% dissatisfaction), then students identified 60 classes—half the total number of classes—as outstanding and only 12 classes as failures.

Table 3. Individual classes with which ≥30% of the students were dissatisfied as satisfying the ELR.

Course Title	Dissatisfaction (%)
CHEM 1110-1110L (Elementary Chemistry)	58.6
AAEC 4650 (Environmental Economics)	44.4
PBIO 1210 (Principles of Plant Biology)	44.4
GEOL(ANTH) 4700 (Archaeological Geology)	40.0
BIOL 1107-1107L (Principles of Biology I)	37.0
ANTH 1102 (Introduction to Anthropology)	35.7

CHEM 1110-1110L (Elementary Chemistry)	35.0
GEOL 1122 (Earth's History of Global Change)	34.4
ENTO(CRSS)(PATH) 4740-4740L (Integrated Pest Management)	33.3
PBIO 1220 (Principles of Plant Biology)	33.3
RLST 4840 (Environmental Interpretation for Recreation)	33.3
GEOL 1122 (Earth's History of Global Change)	30.8

In addition, there was some faculty-to-faculty variation with different classes within courses (Appendix I). In the most extreme example, student satisfaction for three classes in Basic Concepts in Biology (BIOL 1103) taught by different professors was 33.4, 74.3, and 87.9%.

Even though a majority of students were satisfied with their ELR class, slightly less than a majority (49.7%) thought that their course covered a sufficient number of environmental issues. Over a quarter (27.8%) of the students reported "global warming" as the most important environmental issue discussed in their course. Other than "pollution" (12.0%), all other environmental issues were less than 10% (Appendices J and K).

Table 4. The most important environmental issues that students thought were discussed in their ELR course.

Environmental Issues	Number of Responses	% of Total
Global warming	1,181	27.8
Pollution	512	12.0
Abiotic and biotic interactions	411	9.7
Resource use, conservation, and management	395	9.3
Population growth	296	7.0
Biodiversity loss	249	5.9
Habitat destruction/deforestation	226	5.3
Role of humans/environmental ethics	212	5.0
Agricultural impacts/issues	203	4.8
Human impact on the environment	172	4.0

Water quality issues	105	2.5
Environmental impact on humans	74	1.7
Economics/governmental issues	42	1.0
Subtotal	4,078	96.0
None/do not know	172	4.0
Total	4,250	100.0

Student outcome

The majority (73.5%) of students thought they had a high to moderate level of environmental literacy before taking the course, while just over a quarter (26.5%) reported having a low level, to none at all. The majority of students thought their knowledge (76%) and concern (65%) for environmental issues had increased a great, considerable, and moderate extent as a result of taking the course. However, only 26.3% of the students changed their behavior. Of those students (24.4%) who changed their behavior, 64.9% said they modified their daily activities, 6.3% said they joined an organization, 10.0% said they did both, and 18.8% responded with other.

When the data were cross-tabulated, students with low levels of environmental literacy reported a great, considerable, and moderate increase in knowledge (77.2%) and concern (66.7%) (Appendices L and M, respectively). Surprisingly, the majority of students who reported high to moderate levels of environmental literacy before taking a course also reported similar increases in knowledge (77.0%) and concern (65.2%) to a great, considerable, and moderate extent as a result of taking an ELR course. Similarly, the students whose courses influenced them to take action the most were those with high to moderate levels of environmental literacy before taking the course (58.4%), followed by those with low levels of environmental literacy, to none at all (37.9%). The small percentage of students having no environmental literacy before taking the course increased their knowledge (56.3%) and concern (51.1%) for environmental issues

only slightly or not at all (Appendix N).

Idea of an ELR

Finally, the majority (84.0%) of students supported the idea of an ELR, and two thirds (66.7%) of students thought the procedure UGA had chosen to produce environmentally literate students was satisfactory. Of those students who were dissatisfied, 9.3% said that fewer courses should fulfill the ELR, 3.3% said only one course should fulfill the ELR, 5.6% said a different procedure is needed altogether, and 15.1% had no opinion.

Faculty

Awareness

The vast majority of faculty (87.2%) was aware of the ELR. Of the faculty who were aware of the ELR, 92.1% were aware that the specific course they were teaching satisfied the ELR. However, of the faculty who were aware of the ELR, a surprising 78.7% were unfamiliar with the two ELR criteria.

Satisfaction with ELR courses

Once the faculty was given the two ELR criteria and the ELR procedure explained to them, the majority were satisfied that their class fulfilled the ELR (83.8%), Criterion #1 (88.0%), and Criterion #2 (89.0%) to a great, considerable, or moderate extent. Faculty were not asked to rank courses, but to report whether or not the class they were teaching satisfied the ELR. Fourteen faculty thought that the 12 courses (22 classes) they taught did not satisfy the ELR.

Table 5. ELR Courses faculty taught that they thought should not satisfy the ELR (22 classes within 12 courses, taught by 14 faculty).

Course	Number of Classes
BIOL 1103 (Basic Concepts in Biology)	6
BIOL 1107 (Principles of Biology I)	3
FORS 3020 (Forest Ecology)	1
GEOG 1101 (Introduction to Human Geography)	3
GEOG 1111 (Introduction to Physical Geography)	1
GEOG 1112 (Introduction to Weather and Climate)	1
GEOG 1113 (Introduction to Landforms)	1
GEOL 1121 (Earth Processes and Environments)	1
HONS 2080 (Honors Science)	1
PATH 3530 (Introductory Plant Pathology)	1
PBIO 1210 (Principles of Plant Biology)	2
RLST 4840 (Environmental Interpretation for Recreation)	1

When asked the reason behind the course's unsatisfactory nature, typical faculty responses were: "Instructor has no clear mandate to concentrate sufficiently on environmental issues" to "If I had known this was one of these courses I would have emphasized principles more," to "My course does not fulfill it because the environmental component is just one small (too small) portion of the objective of the course" (Appendix O).

There was little agreement between the 22 classes that faculty thought were unsatisfactory for the ELR and the classes with which students were dissatisfied. Faculty thought that only three courses (RLST 4840, Environmental Interpretation for Recreation; BIOL 1107, Principles of Biology I; PBIO 1210, Principles of Plant Biology) were unsatisfactory of the 12 courses that had ≥30% student dissatisfaction; conversely, faculty thought that seven courses were unsatisfactory of the 60 courses that had ≥90% student satisfaction.

ELR Criteria

The majority (73.8%) of faculty thought that the two ELR criteria were adequate for a course to cover in order to satisfy the ELR. When those who felt the criteria were inadequate were asked the reason why, 36.4% felt that there should be additional criteria included (addressing cultural, political, economic, and ethical factors), 13.6% felt the criteria should be better defined, 40.9% felt the criteria should be better defined and have additional criteria included, and 9.1% answered other.

Desired student outcome

In terms of the overall undergraduate level of environmental literacy at UGA, only 16.3% of the faculty considered the student body environmentally literate, 48.8% considered students environmentally illiterate, and 34.9% were uncertain. These percentages are in direct contrast to the large percentage of students (73.5%) who thought that they had a high to moderate degree of environmental literacy before taking their ELR course. The majority (67.1%) of faculty thought an ELR course should increase student knowledge and skills to address environmental issues rather than knowledge alone (32.9%).

When faculty were asked to list three major environmental issues that would be essential knowledge for any environmentally literate student, the responses varied, but over 40% mentioned knowledge of abiotic and biotic interactions, and separately resource use, conservation, and management (Appendices P and Q).

Table 6. Faculty list of major environmental issues they felt were essential knowledge of an environmentally literate student (81 respondents).

Environmental Issues	Number of Responses	% of Total
Abiotic and biotic interactions	60	25.0
Resource use, conservation, and management	37	15.4
Role of humans/environmental Ethics	22	9.2
Economics/governmental issues	16	6.7
Global warming	15	6.3
Population growth	15	6.3
Habitat destruction/deforestation	14	5.8
Biodiversity loss	14	5.8
Pollution	13	5.4
Water quality issues	8	3.3
Agricultural impacts/issues	7	2.9
Environmental impact on humans	2	0.8
Human impact on the environment	17	7.1
Total	240	100.0

The vast majority (86.8%) felt that all or most of the issues they reported were covered in the ELR course they were currently teaching.

ELR

Although the majority (84.0%) of faculty supported the idea of an ELR, over half (53.5%) thought that the way the University implemented the ELR was unsatisfactory. Of those who were dissatisfied, 23.2% said that fewer courses should fulfill the ELR, 14.0% said a different procedure is needed altogether, and 18.6% had no opinion.

Discussion

Positive and negative aspects of the ELR

For universities and colleges considering an ELR, UGA's requirement had three positive and three negative aspects. First, and most important, the requirement enjoyed widespread support and satisfaction by both faculty and students actively participating in the requirement.

These results are similar to Moody et al. (2005), who also reported earlier widespread support and satisfaction for the requirement, but by randomly sampled students and faculty. There should be no reason why an ELR would not receive the same support and satisfaction at other institutions with an ELR.

Second, students report increased knowledge of and concern for environmental issues, even if they thought they were already environmentally literate. It was assumed that students with low levels of environmental literacy would show the greatest increases in knowledge and concern for the environment, and indeed these increases did occur. However, it was also assumed that students with high levels of environmental literacy before taking an ELR course would show less of an increase; this assumption was incorrect: these students showed both an increase in knowledge (76.0%) and an increase in concern (65.2%). This increase suggested that the worth of an ELR was across a wide percentage of students and not just those whose environmental literacy was low.

Third, even if only a quarter of the students changed their behavior to address environmental issues, any change in behavior should be considered as positive, especially since action is the most widely accepted final competency level for environmental literacy among scholars, organizations, and institutions (e.g., Roth, 1992; Ruskey, 1995; National Environmental Education Advisory Council,1996; Volk and McBeth, 1998; Elder, 2003). Another reason for the small percentage change in behavior may be that if 73.5% of the students think that they are environmental literate before taking the ELR course, then student behavior may have already changed before taking the course.

In spite of overwhelming positive feedback on the ELR support, satisfaction, and outcome, there were three negative aspects. First, students were largely unaware of the

requirement. These results are dissimilar from those of Moody et al. (2005), who reported 43.2% unawareness among randomly sampled students. In this study, 67.7% of students–those actually taking an ELR course–were unaware of the requirement, a 24.5% increase. Furthermore, even though the faculty was aware of the ELR, the majority of faculty were unfamiliar with the two criteria that they must cover to satisfy the requirement. Also, because of the large number of courses fulfilling the requirement, some students unknowingly took an ELR course without ever realizing that it satisfied the ELR.

Second, there was both student and faculty dissatisfaction with their class in fulfilling certain components of the ELR. A majority of students thought that an insufficient number of environmental issues were covered in their course. Similarly, some of the faculty were dissatisfied with their own course in fulfilling the ELR because of disagreements with the ELR criteria, inadequate time, and the unsuitability of the subject material in fulfilling the ELR. This dissatisfaction was also perceived by the ELR Review Committee, who felt that some ELR courses "[did] not appear to have environmental issues as a core of their class" (Environmental Literacy Requirement Review Committee, 2003, p. 5).

The third and final negative aspect was the lack of a faculty consensus on their role as to how students can achieve environmental responsibility, the goal of environmental literacy. The majority of faculty thought an ELR course should increase student knowledge and skills to address environmental issues. Here the majority of faculty are in agreement with various studies (Ramsey, 1981; Hungerford and Volk, 1990; Moseley, 2000; Hsu, 2004) that report environmental responsibility must include the necessary prerequisites of 1) knowledge, 2) concern, and 3) environmental problem-solving skills, and having only one or two of these prerequisites is insufficient. Unfortunately, there was still a minority of faculty who felt that

knowledge alone was adequate for environmental responsibility. This assumption may be illustrated in the large percentage of students who increased their knowledge and concern, but did not change their behavior. Therefore, even though UGA is committed to environmental responsibility (University of Georgia Curriculum Committee, 1998), it can be assumed that some students are graduating without the skills to address environmental issues, are not changing their behavior, and thus are not environmentally literate.

Recommendations

The three negative aspects suggest three recommendations. First, the insufficient student awareness, faculty unfamiliarity, and outdated ELR list of courses stem from the ELR's lack of a coordinator. Over the requirement's history, various ELR Committees have consistently recommended having a coordinator, but without success. Logically, a coordinator would: 1) publicize the requirement to incoming students, 2) ensure that all faculty teaching ELR courses were made aware and reminded of the ELR criteria they were required to cover, and 3) update the ELR course list. For the time being, in lieu of a coordinator, we have created and distributed an ELR brochure in an effort to inform incoming freshman of the requirement. In addition, we plan on creating and distributing an ELR information pamphlet to faculty.

Second, the ELR criteria, ELR courses, and the environmental literacy level of students need thorough and continuous evaluation. In terms of ELR criteria, again, despite the many recommendations by various ELR committees, the two ELR criteria have never been reviewed by an external panel. When the six ELR criteria were reduced to two criteria in 1998, no guidelines were ever included. No provision was ever made for the criteria to be updated to reflect the increasing interdisciplinary nature of environmental education or to include the nontraditional (i.e., cultural, political, economic, and ethical) elements. Part of this problem, as

the majority of the faculty reported, was the unsatisfactory way UGA implemented the ELR and how a different procedure might be needed to produce environmentally literate students, such as reducing the courses that satisfy the ELR, and perhaps creating opportunities and additional requirements for students to develop and increase levels of environmental literacy, such as internship programs, independent research projects, campus service projects, community service projects, and mastery learning (National Wildlife Foundation, 2001).

In terms of the ELR courses, they need periodic evaluation, especially with the continuous influx of new faculty, to ensure that the courses continue to fulfill the ELR. While the majority of faculty were happy to be evaluated, or to say that their course satisfied the ELR, some faculty were reluctant to be evaluated, or to say that their course satisfied the ELR. It is possible that some of these reluctant faculty did not want to give in-depth analysis of the ELR for fear of losing their autonomy or being reprimanded for not satisfying the ELR. Nevertheless, it is essential that all courses that faculty or students or both reported as unsatisfactory receive immediate attention and either be improved or delisted. For example, in both this survey and Moody et al. (2005), elementary chemistry had the highest percentage of student dissatisfaction, but there is no means to improve this course or to have this course delisted. It is also important that many of the classes within the same course had significantly different approval ratings, further supporting the need for periodic individual class evaluation. Regardless, the process of listing and delisting courses is the responsibility of the University Curriculum Committee, which has not reviewed any courses since the ELR's modification in 1998.

In terms of environmental literacy levels, the students also need to be accurately evaluated in order to reduce the discrepancy between perceived faculty and student environmental literacy. This evaluation would involve giving a pre- and post-environmental

literacy test to students taking the ELR course, or before and after attending UGA. For example, in 2000 and 2003, Michigan State University conducted an environmental evaluation to assess the level of environmental literacy of incoming freshman and graduating seniors (Mertig, 2005). In this way, everyone would have an improved understanding of student knowledge, concern, and responsible behavior for environmental issues. This evaluation would allow for courses to be modified more effectively to address and focus on those essential issues unfamiliar to students.

Third, faculty's lack of consensus on the essential environmental issues that a student should know in order to be considered environmentally literate, and the faculty's opinion on how environmental literacy is achieved need to be addressed in some form of interactive evaluation (e.g., Delphi survey). Coordination and cooperation among departments and faculty are also necessary for effective internal and interdisciplinary discussion about the ELR, allowing for the sharing of ideas and techniques that could assist in continual requirement improvement. Although there is no standard definition or subject material for environmental literacy (Elder, 2003), it is important that each university agrees on these matters or the requirement fails to have a unified, refined, and effective objective against which to measure progress.

CHAPTER IV

CONCLUSION

The ELR is an apparent success story in the sense of widespread support and satisfaction, but suffers from lack of awareness, evaluation and enforcement, and a faculty consensus on the goal of environmental literacy and what environmental issues are essential.

Overall UGA has done an excellent job in taking the initiative to create a university-wide ELR, a feat unmatched by the vast majority of other state universities. The results of this study point to the relative effectiveness of the ELR. However, like any program, the task of keeping the program alive is a difficult one, especially when there has been such a lack of oversight, resources, and coordination. In order to improve the status of the requirement to an acceptable level of public awareness and to increase its effectiveness, the many ELR committee's recommendations and results from informal and formal studies need to be taken seriously. Otherwise it will continue on the road to abolishment.

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APPENDICES

Appendix A. Student Questionnaire. Evaluating the University of Georgia's Environmental Literacy Requirement.

Course call #:
(Please enter on answer sheet under "Identification #" and fill in the corresponding circles).

What is your College:
(Please turn your answer sheet over and find the number that corresponds to your college from the code list below. Mark choice A of this number row. Make a mark for one college only!)

Code:

29. Agriculture and Environmental Sciences
30. Arts and Sciences
31. Business
32. Education
33. Environment and Design
34. Pharmacy
35. Public Health
36. Public and International Affairs
37. Social Work
38. Family and Consumer Sciences
39. Forest Resources
40. Journalism and Mass Communication

Directions:
Please fill in the question number that corresponds to the answer sheet with the letter that best fits, in your opinion, the question asked.

1) Gender:
   A. Female
   B. Male

2) Year of Study:
   A. Freshman
   B. Sophomore
   C. Junior
   D. Senior

3) Are you aware of UGA's Environmental Literacy Requirement?
    A. Yes
    B. No (skip to #6)

4) Are you aware that this course satisfies the Environmental Literacy Requirement?
    A. Yes
    B. No

5) Aside from this course, have you already taken a class that satisfies your Environmental Literacy Requirement?
    A. Yes
    B. No
    C. Uncertain

Please read the following statement:
In order to fulfill the Environmental Literacy Requirement, all undergraduate students must take a course from a list of approximately 80 that satisfy two criteria. These courses are required to produce students who are able to comprehend and critically evaluate:

1. Basic scientific principles which govern natural systems, and
2. Consequences of human activity on local, regional, and global natural systems.

6) To what extent are basic scientific principles which govern natural systems covered in this course? (Example: Second Law of Thermodynamics)
    A. Great extent
    B. Considerable extent
    C. Moderate extent
    D. Slight extent
    E. No extent

7) To what extent are the consequences of human activity on local, regional, and global natural systems covered in this course? (Example: loss of biodiversity).
    A. Great extent
    B. Considerable extent
    C. Moderate extent
    D. Slight extent
    E. No extent

8) In terms of current environmental issues do you feel this course covered:
    A. A sufficient number
    B. Could have covered more
    C. Lacking, but did cover a few major issues
    D. Barely covered any
    E. None at all

9) What do you think was the most important environmental issue discussed in this course? (Please write on back of answer sheet in clear area).

10) Do you think that the above criteria are adequate for a course to satisfy the Environmental Literacy Requirement?
    A. Yes (skip to #12)
    B. No

11) Why do you think the criteria are inadequate?
    A. Should include additional criteria (addressing cultural, political, economic, and ethical factors)
    B. Should better define the existing criteria
    C. Should better define the existing criteria and include additional criteria (addressing cultural, political, economic, ethical, etc. factors)
    D. Other

12) How would you rate your level of environmental literacy before taking this course?
    A. High
    B. Moderate
    C. Low
    D. None

13) To what extent has your awareness and knowledge of environmental issues and problems increased as a result of this course?
    A. Great extent
    B. Considerable extent
    C. Moderate extent
    D. Slight extent
    E. No extent

14) Has your concern about environmental issues and problems increased as a result of this course?
    A. Great extent
    B. Considerable extent
    C. Moderate extent
    D. Slight extent
    E. No extent

15) Has the content of this course influenced you to take action to address environmental issues and problems?
    A. Yes
    B. No (Skip to #17)

16) In what ways have you taken action?

A. Modified daily activities
B. Joined organization(s)
C. Both
D. Other

17) Do you think that this course fulfills the Environmental Literacy Requirement?
A. Yes
B. No
C. No opinion

18) Do you think the idea of an Environmental Literacy Requirement at UGA is:
A. Very important
B. Somewhat important
C. Somewhat unimportant
D. Not important at all

19) Do you think the way UGA has implemented the Environmental Literacy Requirement is satisfactory (i.e., students must take one out of approximately 80 courses that cover the Environmental Literacy Requirement criteria)?
A. Yes, its fine
B. No, fewer courses should fulfill the Environmental Literacy Requirement
C. No, only one course should fulfill the Environmental Literacy Requirement
D. A different procedure for fulfilling an Environmental Literacy Requirement should be in place
E. No opinion

Thank you.

Appendix B. Faculty Questionnaire. Evaluating the University of Georgia's Environmental Literacy Requirement.

Course Call #:
(Please enter on answer sheet under "Identification #" and fill in the corresponding circles)

Directions:
Please fill in the question number that corresponds to the answer sheet with the letter that best fits, in your opinion, the question asked.

1) Gender:

A. Female
B. Male

2) Number of years teaching
A. 20 +
B. 14-19
C. 8-13
D. 4-7
E. 1-3

3) Are you aware of UGA's Environmental Literacy Requirement?
A. Yes
B. No

4) Are you aware that this course is one of approximately 80 that satisfies the Environmental Literacy Requirement?
A. Yes
B. No

5) How long have you taught this course?
A. 10-12 yrs
B. 7-9 yrs
C. 4-6 yrs
D. 2-3 yrs
E. 1 yr

6) How many times have you taught this course during the above period?
A. 20 +
B. 14-19
C. 8-13
D. 4-7

E. 1-3

7) Do you teach (have you taught) other courses that fulfill the Environmental Literacy Requirement?
   A. Yes
   B. No
   C. Uncertain

8) UGA has established two criteria for evaluating whether a course satisfies the Environmental Literacy Requirement. If asked, would you know what they are?
   A. Yes
   B. No

9) Please list 3 major environmental topics/ issues that you feel are essential knowledge of an environmentally literate student: (Please write on back of answer sheet in ½ of the clear area).

10) How many of the topics/issues you listed are addressed in this course?
   A. All
   B. Most
   C. Few
   D. None

In order to fulfill the Environmental Literacy Requirement, all undergraduate students must take at least one course from a list of approximately 80 that satisfy two criteria. These courses are required to produce students who are able to comprehend and critically evaluate:

1. Basic scientific principles which govern natural systems, and
2. Consequences of human activity on local, regional, and global natural systems.

11) To what extent are basic scientific principles which govern natural systems covered in this course?
   A. Great extent
   B. Considerable extent
   C. Moderate extent
   D. Slight extent
   E. No extent

12) To what extent are the consequences of human activity on local, regional, and global natural systems covered in this course?
   A. Great extent
   B. Considerable extent
   C. Moderate extent
   D. Slight extent
   E. No extent

13) Do you think that the current criteria are adequate for a course to satisfy the Environmental

Literacy Requirement?

1. Yes (skip to #15)
1. No 14) If No, why do you feel the criteria are inadequate?

A. Should include additional criteria (addressing cultural, political, economic, and ethical factors)
B. Should better define the existing criteria
C. Should better define the existing criteria and include additional criteria (addressing cultural, political, economic, ethical, etc. factors)
D. Other

15) Do you think the Environmental Literacy Requirement should provide students with knowledge only, or also skills which allow for responsible behavioral change and environmental action?

A. knowledge only
B. knowledge and skills
C. neither

16) Do you consider UGA's undergraduate student body environmentally literate?

A. Yes
B. No
C. Don't know

17) Do you think the idea of an Environmental Literacy Requirement at UGA is:

A. Very important
B. Somewhat important
C. Somewhat unimportant
D. Not important at all

18) Do you think that your course satisfies the Environmental Literacy Requirement?

A. Yes
B. No

19) Why/ why not? (please write on back of answer sheet in clear area).

20) Do you think the way UGA has implemented the Environmental Literacy Requirement is satisfactory (i.e., students must take one course out of approximately 80 courses that cover the Environmental Literacy Requirement criteria)?

A. Yes, its fine
B. No, fewer courses should fulfill the Environmental Literacy Requirement
C. No, only one course should fulfill the Environmental Literacy Requirement
D. A different procedure for fulfilling an Environmental Literacy Requirement should be in place
E. No opinion

Thank you

Appendix C. 1) All ELR courses still offered (Office of Curriculum Services, 2005), 2) all ELR courses and faculty surveyed Fall 2005 and Spring 2006, 3) percent of student respondents per class, 4) percent student satisfaction with their class in satisfying the ELR, 5) and faculty dissatisfied with class they were teaching in fulfilling the ELR

Course	ELR courses offered	Students	Faculty	Semester	% of total enrollment that responded
AAEC 3060 - Principles Resource Economics	Y (Yes)	Y (Yes)	Y	Spring 06	51.9
		Y	Y	Fall 05	41.7
		N (No)	N	Spring 06	0.0
AAEC 4650-Environmental Economics	Y	Y	Y	Spring 06	62.5
AAEC 4800/6800-4800L/6800L-Water Resource Economics	Y	Y	Y	Fall 05	88.9
AAEC 4930/6930-Environmental Law and Governmental Regulation	Y	Y	Y	Fall 05	53.3
ADSC 2010, ADSC 2010L-Introductory Animal and Dairy Science	Y	N	Y	Fall 05	0.0
		Y	N	Spring 06	64.9
ADSC 4010-Issues of in Animal Agriculture	Y	Y	Y	Spring 06	73.3
ANTH 1102-Introduction to Anthropology	Y	N	Y	Fall 05	0.0
		Y	Y	Fall 05	57.0
		Y	Y	Spring 06	21.9
		Y	Y	Spring 06	57.6
		Y	N	Fall 05	10.1
		Y	Y	Spring 06	47.2

ANTH 4070/6070-Cultural Ecology	Y	Y	Y	Spring 06	80.0
ANTH 4790/6790 Human Adaptation	N				
BIOL 1103 - Basic Concepts in Biology	Y	Y	Y	Spring 06	42.6
		Y	Y	Fall 05	77.6
		Y	Y	Spring 06	55.7
		Y	Y	Fall 05	42.7
		Y	Y	Spring 06	53.3
		Y	Y	Fall 05	1.6
		Y	Y	Spring 06	56.8
BIOL 1104-Organismal Biology	Y	Y	Y	Fall 05	47.3
		Y	Y	Spring 06	55.1
BIOL 1107-1107L-Principles of Biology I	Y	Y	Y	Spring 06	66.1
		Y	Y	Fall 05	44.6
		Y	Y	Fall 05	44.9
BIOL 1108-1108L-Principles of Biology II	Y	Y	Y	Spring 06	40.0
		Y	Y	Spring 06	61.1
		Y	Y	Fall 05	58.3
CHEM 1110-1110L Elementary Chemistry	Y	Y	Y	Spring 06	34.1
		Y	Y	Fall 05	48.9
CMLT 3210-Ecocriticism	N	N	Y	Fall 05	0.0

CRSS(FORS) 1020-Introduction to Water Resources	Y	Y	Y	Fall 05	35.3
CRSS 2010-2010L-Crop Science	Y	Y	Y	Fall 05	23.3
CRSS(FORS) 3060-3060L Soils and Hydrology	Y	Y	Y	Fall 05	44.9
		N	N	Fall 05	0.0
		Y	Y	Fall 05	62.5
		Y	Y	Spring 06	47.9
CRSS 4340/6340-4340L/6340L-Weed Science	Y	Y	Y	Fall 05	88.2
CRSS(HORT) 4590/6590-4590L/6590L- Soil Fertility	Y	Y	Y	Fall 05	75.0
CRSS 4670/6670-Environmental Soil Chemistry	Y	Y	Y	Spring 06	58.8
ECOL(LAND) 1000-1000L-Ecological Basis of Environmental Issues	Y	Y	Y	Fall 05	29.6
	Y	Y	Y	Spring 06	94.4
ECOL(BIOL) 3500-3500L-Ecology	Y	Y	Y	Fall 05	95.0
	Y	Y	Y	Spring 06	41.3
	Y	Y	Y	Spring 06	0.0
ECON 2100-Economics of Environmental Quality	Y	Y	Y	Fall 05	50.0
EETH(AESC) 4190/6190 Agricultural Ethics	N				
EHSC 3060-Introduction to Environmental Health Science	Y	Y	Y	Spring 06	95.8
		Y	Y	Fall 05	65.3
EHSC 4490/6490-Environmental Toxicology	Y	Y	N	Fall 05	77.8
ENTO 3740-3740L-Agricultural Entomology	Y	Y	Y	Fall 05	62.5
		Y	Y	Fall 05	87.5
		Y	Y	Fall 05	75.0

ENTO(CRSS) 4250/6250 4250L/6250L-Pesticide	Y	Y	Y	Spring 06	60.0
		N	Y	Spring 06	0.0
Management and Utilization-Should be ENTO(CRSS)(PATH) 4250/6250-4250L/6250L					
ENTO(CRSS)(PATH) 4740/6740-4740L/6740L-Integrated Pest Management	Y	Y	Y	Spring 06	100.0
FORS(MARS) 1100-Natural Resources Conservation	Y	Y	Y	Spring 06	56.4
		Y	Y	Fall 05	71.9
FORS 2100-International Issues in Natural Resources and Conservation	Y	Y	Y	Fall 05	87.0
FORS 3020-3020L-Forest Ecology	Y	Y	Y	Spring 06	71.8
		Y	Y	Fall 05	65.8
GEOG 1101-Introduction to Human Geography	Y	Y	Y	Fall 05	66.8
		Y	Y	Spring 06	58.8
		Y	Y	Spring 06	78.4
		Y	Y	Spring 06	77.4
		Y	Y	Fall 05	65.8
		Y	Y	Fall 05	72.4
		Y	Y	Spring 06	51.6
		Y	Y	Fall 05	71.1
GEOG 1111-Introduction to Physical Geography	Y	Y	Y	Spring 06	49.0
		Y	Y	Spring 06	64.6
		Y	Y	Spring 06	52.9
		N	Y	Fall 05	0.0
		Y	Y	Spring 06	31.0
		Y	Y	Fall 05	0.0
		Y	Y	Fall 05	46.1
GEOG 1112-Introduction to Weather and Climate	Y	Y	Y	Fall 05	44.0
		Y	N	Fall 05	42.0
		Y	Y	Fall 05	38.9
		Y	Y	Spring 06	42.2
		Y	Y	Spring 06	51.7
		Y	Y	Spring 06	51.2
		Y	N	Fall 05	67.8
		Y	Y	Spring 06	57.5
GEOG 1113-Introduction to	Y	N	Y	Spring 06	0.0
		Y	Y	Spring 06	58.9

Landforms		N	N	Fall 05	16.1
		Y	Y	Fall 05	76.7
GEOG 1125-Resources, Society, and the Environment	Y	Y	Y	Fall 05	76.3
		Y	Y	Spring 06	81.2
GEOG 2250H-2250D-Resources, Society, and the Environment	Y	Y	Y	Spring 06	90.0
GEOG 3210-Biogeography	Y	Y	Y	Spring 06	94.4
GEOG(PBIO) 4220/6220	Y	Y	Y	Spring 06	42.1
GEOG 4810/6810 Conservation Ecology and Resource Management	N				
GEOL 1121-Earth Processes and Environments	Y	Y	Y	Fall 05	75.3
		N	N	Fall 05	0.0
		Y	Y	Fall 05	81.6
		N	N	Spring 06	0.0
		Y	Y	Fall 05	65.6
		N	N	Spring 06	0.0
		Y	Y	Spring 06	82.1
		Y	Y	Fall 05	72.3
		Y	Y	Spring 06	66.1
		Y	Y	Fall 05	100.0
		N	Y	Spring 06	0.0
		Y	Y	Spring 06	72.9
		Y	Y	Fall 05	75.9
GEOL 1122-Earth's History of Global Change	Y	Y	Y	Fall 05	81.5
		Y	Y	Spring 06	87.5
		Y	Y	Spring 06	58.0
		N	N	Fall 05	98.5
		Y	Y	Spring 06	66.3
GEOL 1250-1250L-Physical Geology	Y	N	N	Fall 05	0.0
		N	Y	Spring 06	0.0
GEOL 2120 Introduction to Environmental Geology	N				
GEOL 3030-Elementary Oceanography	Y	Y	N	Spring 06	29.5
GEOL 3120-3120LGeological Hazards	Y	Y	Y	Spring 06	50.0
GEOL 3250 Earth Resources and the Environment	N				

GEOL 3300 Paleobiotas	N				
GEOL-4220/6220 Hydrogeology	Y	Y	Y	Fall 05	63.9
GEOL(ANTH) 4700/6700-Archaeological Geology	Y	Y	N	Fall 05	44.4
GEOL 4750/6750-Earth Sciences for Middle School Teachers	Y	Y	Y	Fall 05	84.6
HONS(BIOL)(CHEM)(GEOL)(PHYS) 2070/ 2080H Honors Science	Y	Y	Y	Spring 06	83.3
HORT 2000-Horticultural Science	Y	Y	Y	Fall 05	48.4
		Y	Y	Spring 06	62.2
HORT 4890/6890 Biodiversity and the World's Food Crops	N				
HORT 4990/6990-Environmental Issues in Horticulture	Y	Y	Y	Fall 05	86.4
LAND 1500-Design and the Environment	Y	Y	Y	Fall 05	66.7
MARS 1010-1010L-The Marine Environment	Y	N	Y	Fall 05	0.0
		Y	Y	Fall 05	11.3
MARS 1020-1020L-Biology of the Marine Environment	Y	Y	Y	Spring 06	100.0
		Y	Y	Spring 06	37.8
PATH(ANTH)(PBIO) 3010 Fungi: Friends and Foes	Y	Y	Y	Fall 05	47.5
		N	Y	Spring 06	0.0
PATH 3530-3530L Introductory Plant Pathology	Y	Y	Y	Spring 06	87.5
		Y	Y	Fall 05	70.0
		N	N	Spring 06	0.0
		N	Y	Spring 06	0.0
PBIO 1210-Principles of Plant Biology	Y	Y	Y	Fall 05	72.5
		Y	Y	Fall 05	63.3
PBIO 1220-Principles of Plant Biology	Y	Y	Y	Spring 06	8.0
PBIO 3650-Natural History of Georgia Plants	Y	N	Y	Fall 05	0.0
PHIL(EETH) 4220/6220 Environmental Ethics	Y	Y	Y	Fall 05	51.7
RLST(FORS) 3310 Outdoor Recreation and Environmental Awareness	Y	N	Y	Fall 05	0.0

RLST 4840-Environmental Interpretation for Recreation	Y	Y	Y	Fall 05	68.8
SOCI 3400 Environmental Sociology	N				
SOCI(POLS)(ANTH) 3450 Sociopolitical Ecology	N				
TYMI 3550 Environment,	N				
Science, and Technology					
Totals	76 courses offered	120 classes surveyed	86 faculty surveyed		47.8

Appendix D. UGA's 25 departments and 7 colleges offering ELR Courses.

College	Department	Number of ELR courses in department	Number of ELR courses offered in Fall 2005 and Spring 2006
1. Agriculture and Environmental Sciences	AAEC ADSC CRSS ENGR ENTO HORT PATH POUL	4 2 8 1 3 2 2 1	4 2 7 0 3 2 2 1
	Total	23	21
2. Arts and Sciences	ANTH BIOL CHEM CMLT GEOG GEOL HONS MARS PBIO(BTNY) PHIL	2 4 1 1 8 14 1 2 3 1	2 4 1 1 8 9 1 2 3 1
	Total	38	32
3. Business	ECON	1	1
	Total	1	1
4. Education	ESOC RLST	1 2	1 2
	Total	3	3
5. Environment and Design	ECOL LAND(EDES)	4 1	2 1
	Total	5	5
6. Public Health	EHSC(MMIB)	3	2
	Total	3	2
7. Forest Resources	FORS	4	3
	Total	4	3
Total		76	65

Colleges without ELR Courses:
1. Public and International Affairs
2. Social Work
3. Family and Consumer Sciences
4. Journalism and Mass Communication
5. Veterinary Medicine
6. Law School

Abbreviations of departments with courses that satisfy the ELR.

AAEC - Agricultural and Applied Economics
ADSC - Animal and Dairy Science
ANTH - Anthropology
BIOL - Biology
BTNY (PBIO) - Botany (Plant Biology)
CHEM - Chemistry
CMLT - Cumulative Literature
CRSS - Crop and Soil Science
ECOL - Ecology
ECON - Economics
EHSC (MMIB) - Environmental Health Science (Medical Microbiology)
ENGR - Engineering
ENTO - Entomology
ESOC - Social Science Education
FORS - Forestry
GEOG - Geography
GEOL - Geology
HONS - Honors
HORT - Horticulture
LAND (EDES) - Landscape Design/ Environmental Design
MARS - Marine Sciences
PATH - Plant Pathology PBIO - Plant Biology
PHIL - Philosophy
EETH - Environmental Ethics
POUL - Poultry
RLST - Recreation Leisure Studies

Appendix E. Fact Chart: Courses, Classes, Students, and Faculty

	Fall 2005	Spring 2006	Total
Courses			
Total	48	39	65
Surveyed	41	37	58
% of total	85.4%	94.8%	89.2%
Classes/sections			
Total	74	68	142
Surveyed	62	58	120
% of total	83.8%	85.3%	84.5%
Students			
Total in classes	7897	7295	15,192
Total in respondent classes	6948	6792	13,740
Surveyed	3536	3732	7,268
% of total enrolled	44.8%	51.2%	47.8%
% of total respondent classes	50.9%	54.9%	52.9%
Faculty			
Total	69	54	100
Surveyed	56	49	86
% of total	81.2%	90.7%	86.0%

Appendix F. Student Questionnaire Comparison.

Question and Response	Fall 2005	Spring 2006	Total
	Percent within Question Responses		
Gender:			
Female	57.9	60.5	59.2
Male	42.1	39.5	40.8
Year of Study:			
Freshman	29.1	40.3	34.8
Sophomore	31.3	30.8	31.1
Junior	22.7	17.4	19.9
Senior	16.9	11.6	14.2
College:			
Agriculture and Environmental Sciences	14.4	7.4	10.65
Arts and Sciences	42.5	47.3	45.10
Business	15.3	15.6	15.44
Education	7.0	7.9	7.50
Environment and Design	2.6	1.9	2.25
Public Health	1.6	1.0	1.31
Public and International Affairs	5.0	6.1	5.60
Social Work	0.6	0.7	0.70
Family and Consumer Sciences	3.0	3.1	3.06
Forest Resources	2.7	1.8	2.22
Journalism and Mass Communication	5.2	7.0	6.16
Aware of ELR:			
Yes	29.0	35.3	32.3
No	71.0	64.7	67.7
Aware course satisfies ELR:			
Yes	68.7	67.4	67.9
No	31.3	32.6	32.1
Already taken ELR course:			
Yes	46.2	62.5	55.4
No	32.9	20.4	25.9
Uncertain	20.9	17.1	18.8

Course covers Criteria #1:			
Great extent	15.8	17.7	16.8
Considerable extent	30.0	29.4	29.7
Moderate extent	28.4	29.6	29.0
Slight extent	17.8	16.9	17.3
No extent	8.0	6.4	7.2
Course covers Criteria #2:			
Great extent	32.9	33.7	33.3
Considerable extent	32.1	31.3	31.7
Moderate extent	23.0	22.9	23.0
Slight extent	9.7	10.4	10.1
No extent	2.3	1.7	2.0
Current environmental issues adequately covered:			
Sufficient number	51.5	48.0	49.7
Could have covered more	26.3	25.6	25.9
Covered only a few major issues	14.5	17.4	16.0
Barely covered any	6.7	7.5	7.1
None at all	1.0	1.5	1.3
Criteria adequate for ELR:			
Yes	85.5	86.5	86.1
No	14.2	13.5	13.9
Why criteria are inadequate:			
Need additional criteria	33.9	29.5	31.7
Better define existing criteria	21.8	20.7	21.3
Both of the above	33.9	40.1	37.0
Other	10.5	9.7	10.1
Rate level of environmental literacy before taking course:			
High	15.5	17.5	16.6
Moderate	57.0	56.8	56.9
Low	24.0	22.8	23.4
None	3.4	2.9	3.1

Resulting awareness/ knowledge increase:			
Great extent	13.7	14.4	14.1
Considerable extent	31.6	30.6	31.1
Moderate extent	31.3	30.3	30.8
Slight extent	18.3	18.4	18.3
No extent	5.1	6.3	5.7
Resulting environmental concern increase:			
Great extent	12.8	13.2	13.0
Considerable extent	25.4	24.7	25.0
Moderate extent	27.4	26.6	27.0
Slight extent	20.4	21.0	20.7
No extent	14.0	14.5	14.3
Resulting change of behavior:			
Yes	25.9	26.6	26.3
No	74.1	73.4	73.7
Type of behavior change:			
Modified daily activities	62.5	67.0	64.9
Joined organization(s)	6.9	5.8	6.3
Both	10.8	9.2	10.0
Other	19.7	18.0	18.8
Class satisfies ELR:			
Yes	65.7	67.1	66.4
No	9.8	10.9	10.3
No opinion	24.6	22.0	23.3
Idea of ELR is important:			
Very important	37.7	37.5	37.6
Somewhat important	47.4	45.4	46.4
Somewhat unimportant	10.4	11.8	11.1
Not important at all	4.5	5.3	4.9
Procedure UGA implemented for ELR:			
Yes, its fine	66.5	66.9	66.7
No, fewer courses	9.3	9.3	9.3
No, only one course	3.1	3.4	3.3

Different procedure needed	5.7	5.5	5.6
No opinion	15.4	14.8	15.1

Appendix G. Faculty Questionnaire Comparisons. *These questions concern faculty demographics and opinions and do not concern the ELR Course they taught. Therefore these results represent the total number of faculty per semester

**These questions concern faculty opinions about the course they taught. Therefore because faculty (3 faculty taught 2 different courses in 2005, 6 faculty taught 2 different courses in 2006, and 2 faculty taught 3 different courses and 10 faculty taught 2 different courses in 2005-06 Academic Year) all gave varying responses to questions concerning these courses, these results contain some duplicate faculty(3 in 2005, 6 in 2006, 14 in the 2005-06 Academic Year). There are no duplicate faculty for classes within courses.

Question and Response	56 Faculty* 59 Faculty**	50 Faculty* 56 Faculty**	86 Faculty* 100 Faculty**
	Percent within Question Responses		
**Gender:*	*Fall 2005*	*Spring 2006*	*Total*
Female	32.1	28.0	25.6
Male	67.9	72.0	74.4
** Number of years teaching:*			
20+	30.4	34.0	32.6
14 – 19	16.1	12.0	15.1
8 – 13	19.6	16.0	16.3
4 – 7	21.4	26.0	22.1
1 – 3	12.5	12.0	14.0
**Aware of ELR:*			
Yes	87.5	86.0	87.2
No	12.5	14.0	12.8
***Aware course satisfies ELR (of those aware of ELR):*			
Yes	83.1	80.4	92.1
No	16.9	19.6	7.9
***How long taught course:*			
10 - 12 Years	23.7	32.1	28.0

7 - 9 Years	16.9	14.3	15.0
4 - 6 Years	20.3	16.1	18.0
2 - 3 Years	25.4	19.6	22.0
1 Year	13.6	17.9	17.0
*** Number of times taught course:*			
20+	10.3	12.5	12.1
14 – 19	10.3	14.3	10.1
8 – 13	25.9	19.6	23.2
4 – 7	20.7	17.9	19.2
1 – 3	32.8	35.7	35.4
**Teach other ELR courses:*			
Yes	33.9	51.8	32.6
No	45.8	33.9	48.8
Uncertain	20.3	14.3	18.6
**Know 2 Criteria:*			
Yes	24.5	25.6	21.3
No	75.5	74.4	78.7
***Course addresses topics listed:*			
All	58.6	71.4	64.6
Most	27.6	16.1	22.2
Few	10.3	10.7	11.1
None	3.4	1.8	2.0
***Course covers Criteria #1:*			
Great extent	35.6	39.3	38.0
Considerable extent	22.0	23.2	23.0
Moderate extent	25.4	28.6	27.0
Slight extent	13.6	8.9	10.0
No extent	3.4	0.0	2.0
***Course covers Criteria #2:*			
Great extent	37.3	33.9	37.0
Considerable extent	27.1	35.7	34.0
Moderate extent	22.0	17.9	18.0
Slight extent	10.2	12.5	9.0
No extent	3.4	0.0	2.0

**Criteria adequate for ELR:*			
Yes	74.5	67.3	73.8
No	25.5	32.7	26.2
**Criteria are inadequate (of NO responses above):*			
Need additional criteria	28.6	50.0	36.4
Better define existing criteria	14.3	6.3	13.6
Both of the above	50.0	37.5	40.9
Other	7.1	6.3	9.1
**Should ELR provide knowledge/skills:*			
Knowledge only	34.5	28.0	32.9
Knowledge and skills	65.5	72.0	67.1
Neither	0.0	0.0	0.0
**Consider students environmentally literate:*			
Yes	17.9	14.0	16.3
No	50.0	54.0	48.8
Uncertain	32.1	32.0	34.9
**Idea of ELR important:*			
Very important	50.9	65.3	57.6
Somewhat important	36.4	28.6	31.8
Somewhat unimportant	7.3	2.0	5.9
Not important at all	5.5	4.1	4.7
***Course satisfies ELR:*			
Yes	76.3	87.3	83.8
No	23.7	12.7	16.2
No opinion	0.0	0.0	0.0
**Procedure UGA implemented for ELR:*			
Yes, its fine	48.2	36.0	46.5
No, fewer courses	16.1	24.0	20.9
No, only one course	0.0	0.0	0.0
Different procedure needed	23.2	16.0	14.0
No opinion	12.5	24.0	18.6

Appendix H. Student and faculty satisfaction with class they are taking and teaching in fulfilling the Environmental Literacy Requirement, respectively.

Course	Students			Faculty
	Satisfied (#)	Dissatisfied (#)	Satisfied (%)	Dissatisfied
AAEC 3060 - Principles Resource Economics	8		100.0	
AAEC 3060 - Principles Resource Economics	12	1	92.3	
AAEC 4650 - Environmental Economics	5	4	55.6	
AAEC 4800/6800 - 4800L/6800L-Water Resource Economics	13	1	92.9	
AAEC 4930/6930 - Environmental Law and Governmental Regulation	15		100.0	
ADSC 2010-2010L - Introductory Animal and Dairy Science	17	3	85.0	
ADSC 4010-Issues of in Animal Agriculture	11		100.0	
ANTH 1102 - Introduction to Anthropology	58	8	87.9	
ANTH 1102 - Introduction to Anthropology	54	11	83.1	
ANTH 1102 - Introduction to Anthropology	34	10	77.3	
ANTH 1102 - Introduction to Anthropology	14	5	73.7	
ANTH 1102 - Introduction to Anthropology	27	15	64.3	
ANTH 4070/6070 - Cultural Ecology	29		100.0	
BIOL 1103 - Basic Concepts in Biology	3		100.0	x
BIOL 1103 - Basic Concepts in Biology	152	21	87.9	
BIOL 1103 - Basic Concepts in Biology	73	12	85.9	x
BIOL 1103 - Basic Concepts in Biology	108	24	81.8	x
BIOL 1103 - Basic Concepts in Biology	96	24	80.0	x
BIOL 1103 - Basic Concepts in Biology	60	19	75.9	x
BIOL 1103 - Basic Concepts in Biology	85	32	72.6	x
BIOL 1104 - Organismal Biology	88	17	83.8	
BIOL 1104 - Organismal Biology	74	27	73.3	
BIOL 1107-1107L - Principles of Biology I	61	16	79.2	x
BIOL 1107-1107L - Principles of Biology I	84	30	73.7	x
BIOL 1107-1107L - Principles of Biology I	51	30	63.0	x
BIOL 1108-1108L - Principles of Biology II	91	11	89.2	
BIOL 1108-1108L - Principles of Biology II	118	16	88.1	
BIOL 1108-1108L - Principles of Biology II	80	23	77.7	
CHEM 1110-1110L - Elementary Chemistry	26	14	65.0	
CHEM 1110-1110L - Elementary Chemistry	12	17	41.4	

CRSS(FORS) 1020 - Introduction to Water Resources	5		100.0	
CRSS 2010-2010L - Crop Science	7		100.0	
CRSS(FORS) 3060-3060L - Soils and Hydrology	4		100.0	
CRSS(FORS) 3060-3060L - Soils and Hydrology	29	2	93.5	
CRSS(FORS) 3060-3060L - Soils and Hydrology	31	3	91.2	
CRSS 4340/6340-4340L/6340L - Weed Science	13	1	92.9	
CRSS(HORT) 4590/6590-4590L/6590L - Soil Fertility	27	1	96.4	
CRSS 4670/6670-Environmental Soil Chemistry	9		100.0	
ECOL(LAND) 1000-1000L - Ecological Basis of Environmental Issues	165	1	99.4	
ECOL(LAND) 1000-1000L - Ecological Basis of Environmental Issues	93	1	98.9	
ECOL(BIOL) 3500-3500L - Ecology	111	2	98.2	
ECOL(BIOL) 3500-3500L - Ecology	38	1	97.4	
ECOL(BIOL) 3500-3500L - Ecology	9	1	90.0	
ECON 2100 - Economics of Environmental Quality	48	6	88.9	
EHSC 3060 - Introduction to Environmental Health Science	29	1	96.7	
EHSC 3060 - Introduction to Environmental Health Science	43	2	95.6	
EHSC 4490/6490 - Environmental Toxicology	14	3	82.4	
ENTO 3740-3740L - Agricultural Entomology	6		100.0	
ENTO 3740-3740L - Agricultural Entomology	10		100.0	
ENTO 3740-3740L - Agricultural Entomology	3	1	75.0	
ENTO(CRSS)(PATH) 4250/6250-4250L/6250L - Pesticide Management and Utilization	4	1	80.0	
ENTO(CRSS)(PATH) 4740/6740-4740L/6740L - Integrated Pest Management	4	2	66.7	
FORS(MARS) 1100 - Natural Resources Conservation	58	1	98.3	

FORS(MARS) 1100 - Natural Resources Conservation	17	1	94.4	
FORS 2100 - International Issues in Natural Resources and Conservation	14		100.0	
FORS 3020-3020L - Forest Ecology	20	2	90.9	x
FORS 3020-3020L - Forest Ecology	23	3	88.5	
GEOG 1101 - Introduction to Human Geography	46	5	90.2	x
GEOG 1101 - Introduction to Human Geography	43	6	87.8	
GEOG 1101 - Introduction to Human Geography	38	6	86.4	
GEOG 1101 - Introduction to Human Geography	119	19	86.2	
GEOG 1101 - Introduction to Human Geography	87	17	83.7	
GEOG 1101 - Introduction to Human Geography	36	8	81.8	x
GEOG 1101 - Introduction to Human Geography	79	18	81.4	
GEOG 1101 - Introduction to Human Geography	87	20	81.3	x
GEOG 1111 - Introduction to Physical Geography	52	2	96.3	
GEOG 1111 - Introduction to Physical Geography	77	3	96.3	
GEOG 1111 - Introduction to Physical Geography	38	2	95.0	
GEOG 1111 - Introduction to Physical Geography	17	1	94.4	
GEOG 1111 - Introduction to Physical Geography	34	2	94.4	x
GEOG 1111 - Introduction to Physical Geography	89	22	80.2	
GEOG 1112 - Introduction to Weather and Climate	75	4	94.9	
GEOG 1112 - Introduction to Weather and Climate	46	3	93.9	
GEOG 1112 - Introduction to Weather and Climate	68	7	90.7	
GEOG 1112 - Introduction to Weather and Climate	9	1	90.0	
GEOG 1112 - Introduction to Weather and Climate	30	4	88.2	

GEOG 1112 - Introduction to Weather and Climate	15	2	88.2	
GEOG 1112 - Introduction to Weather and Climate	28	7	80.0	
GEOG 1112 - Introduction to Weather and Climate	17	6	73.9	
GEOG 1113 - Introduction to Landforms	24	5	82.8	x
GEOG 1113 - Introduction to Landforms	35	9	79.5	x
GEOG 1125 - Resources, Society, and the Environment	53	1	98.1	
GEOG 1125 - Resources, Society, and the Environment	60	2	96.8	
GEOG 2250H-2250D - Resources, Society, and the Environment	26		100.0	
GEOG 3210 - Biogeography	30	3	90.9	
GEOG(BTNY) 4220/6220 - Ecological Biogeography	8		100.0	
GEOL 1121 - Earth Processes and Environments	48	1	98.0	
GEOL 1121 - Earth Processes and Environments	41	1	97.6	
GEOL 1121 - Earth Processes and Environments	32	1	97.0	
GEOL 1121 - Earth Processes and Environments	55	3	94.8	x
GEOL 1121 - Earth Processes and Environments	53	4	93.0	
GEOL 1121 - Earth Processes and Environments	48	4	92.3	
GEOL 1121 - Earth Processes and Environments	28	3	90.3	
GEOL 1121 - Earth Processes and Environments	33	4	89.2	
GEOL 1121 - Earth Processes and Environments	13	4	76.5	
GEOL 1122 - Earth's History of Global Change	8	1	88.9	
GEOL 1122 - Earth's History of Global Change	31	8	79.5	
GEOL 1122 - Earth's History of Global Change	18	8	69.2	
GEOL 1122 - Earth's History of Global Change	21	11	65.6	
GEOL 3030 - Elementary Oceanography	14		100.0	

GEOL 3120 - 3120L - Geological Hazards	3		100.0	
GEOL 4220/6220 - Hydrogeology	15	1	93.8	
GEOL(ANTH) 4700/6700 - Archaeological Geology	6	4	60.0	
GEOL 4750/6750 - Earth Sciences for Middle School Teachers	5	1	83.3	
HONS(BIOL)(CHEM)(GEOL)(PHYS)-2070/2080H Honors Science	5		100.0	x
HORT 2000 - Horticultural Science	122	19	86.5	
HORT 2000 - Horticultural Science	81	14	85.3	
HORT 4990/6990 - Environmental Issues in Horticulture	17		100.0	
LAND 1500 - Design and the Environment	12	2	85.7	
MARS 1010 - 1010L - The Marine Environment	25		100.0	
MARS 1020 - 1020L - Biology of the Marine Environment	16		100.0	
MARS 1020 - 1020L - Biology of the Marine Environment	81	8	91.0	
PATH(ANTH)(PBIO) 3010 - Fungi: Friends and Foes	31	6	83.8	
PATH 3530 - 3530L - Introductory Plant Pathology	5		100.0	x
PATH 3530-3530L - Introductory Plant Pathology	5	1	83.3	
PBIO 1210 - Principles of Plant Biology	47	6	88.7	x
PBIO 1210 - Principles of Plant Biology	5	4	55.6	x
PBIO 1220 - Principles of Plant Biology	4	2	66.7	
PHIL(EETH) 4220/6220 - Environmental Ethics	10		100.0	
RLST 4840 - Environmental Interpretation for Recreation	2	1	66.7	x
Total	4,699	734	86.5	22

Appendix I. Comparison of student satisfaction of classes within courses. Portrays the influence faculty have on student satisfaction of a class fulfilling the ELR. Different classes with the same instructor were averaged and reported as a single class.

Course	Section/Class					
	1	2	3	4	5	6
AAEC 3060	92.3%	100.0				
ANTH 1102	73.7	73.7	82.6			
BIOL 1103	33.4	74.3	87.9			
BIOL 1107	71.1	73.7				
BIOL 1108	83.5	88.1				
CHEM 1101	41.4	65.0				
CRSS 3060	91.2	93.5	100.0			
ECOL 1000	98.9	99.4				
ECOL 3500	90.0	97.4	98.2			
EHSC 3060	95.6	96.7				
ENTO 3740	75.0	100.0	100.0			
FORS 3020	88.5	90.9				
GEOG 1101	81.3	81.4	85.0	86.0	86.4	87.8
GEOG 1111	80.2	94.4	94.4	95.0	96.3	96.3
GEOG 1112	73.9	80.0	88.8	92.3	94.9	

Appendix J. The most important environmental issue students thought was discussed in their ELR class in Fall 2005.

Environmental Issues	# Responses	% Total
Global warming	492	26.7
Pollution	203	11.0
Abiotic and biotic interactions	209	11.3
Resource use, conservation, and management	178	9.7
Population growth	109	5.9
Biodiversity loss	91	4.9
Habitat destruction/deforestation	68	3.7
Role of humans/environmental Ethics	97	5.3
Agricultural impacts/issues	136	7.4
Water quality issues	78	4.2
Human impact on the environment	74	4.0
Environmental impact on humans	33	1.8
Economics/governmental issues	16	0.9
Subtotal	1,784	92.8
None/do not know	59	3.2
Total	1,843	100.0

Appendix K. The most important environmental issue students thought was discussed in their ELR class in Spring 2006.

Environmental Issues	# Responses	% Total
Global warming	689	28.6
Pollution	309	12.8
Abiotic and biotic interactions	202	8.4
Resource use, conservation, and management	217	9.0
Population growth	187	7.8
Biodiversity loss	158	6.6
Habitat destruction/deforestation	158	6.6
Role of humans/environmental ethics	115	4.8
Human impact on the environment	98	4.1
Agricultural impacts/issues	67	2.8
Water quality issues	27	1.1
Environmental impact on humans	41	1.7
Economics/governmental issues	26	1.1
Subtotal	2,294	91.2
None/do not know	113	4.7
Total	2,407	100.0

Appendix L. Cross-tabulation between 1) Level of student environmental literacy before taking course and 2) Extent knowledge increased due to course.

		Extent environmental knowledge increased due to course					
		Great	Considerable	Moderate	Slight	No	Total
Level of environmental literacy before course	High	216	291	311	251	104	1173
		18.4%	24.8%	26.5%	21.4%	8.9%	100.0%
	Moderate	513	1,406	1,278	658	180	4,035
		12.7%	34.8%	31.7%	16.3%	4.5%	100.0%
	Low	252	485	545	307	71	1,660
		15.2%	29.2%	32.8%	18.5%	4.3%	100.0%
	None	17	24	56	92	33	222
		7.7%	10.8%	25.2%	41.4%	14.9%	100.0%
	Total	998	2,206	2,190	1,308	388	7,090
		14.1%	31.1%	30.9%	18.4%	5.5%	100.0%

Appendix M. Cross-tabulation between 1) Level of student environmental literacy before taking course and 2) Extent environmental concern increased due to course.

		Extent environmental concern increased due to course					
		Great	Considerable	Moderate	Slight	No	Total
Level of environmental literacy before course	High	203	242	258	226	243	1,172
		17.3%	20.6%	22.0%	19.3%	20.7%	100.0%
	Moderate	481	1,039	1,168	828	506	4,022
		12.0%	25.8%	29.0%	20.6%	12.6%	100.0%
	Low	220	442	441	355	195	1,653
		13.3%	26.7%	26.7%	21.5%	11.8%	100.0%
	None	20	43	44	60	52	219
		9.1%	19.6%	20.1%	27.4%	23.7%	100.0%
	Total	924	1,766	1,911	1,469	996	7,066
		13.1%	25.0%	27.0%	20.8%	14.1%	100.0%

Appendix N. Cross-tabulation between 1) Level of student environmental literacy before taking course and 2) Content of course influenced to take action.

		Content of course influenced to take action		
		Yes	No	Total
Level of environmental literacy before course	High	366	796	1,162
		31.5%	68.5%	100.0%
	Moderate	1,077	2,923	4,000
		26.9%	73.1%	100.0%
	Low	376	1251	1,627
		23.1%	76.9%	100.0%
	None	31	178	209
		14.8%	85.2%	100.0%
	Total	1,850	5,148	6,998
		26.4%	73.6%	100.0%

Appendix O. Reasons why faculty were unsatisfied with their ELR class in fulfilling the ELR.

"It's a cell molecular course."

"My course does not fulfill it because the environmental component is just one small (too small) portion of the objective of the course."

"Instructor has no clear mandate to concentrate sufficiently on environmental issues."

"Not enough time to cover science and public/private policy. Apparently too many 'departmental major' specific environmental literacy courses of dubious quality designed to reduce 'burden' on their majors."

"My course is a survey course on human geography topics, in which environmental concerns are explicit in only one section of the course (and implicit in more than one section). As such I think the course enhances the goal of environmental literacy, but it does not provide a detailed enough treatment of environmental issues to fulfill the requirement."

"This course teaches how to portray issues to public."

"Unaware that this course fulfilled the requirement. I have focused only on 1 of 2 requirements. There is little room in this course to meet the first criteria- but more room to do more with the second criteria. If each course must meet both, then this course should not be included. More reasonably, students should take 2 courses, 1 to meet each criteria."

“If I had known this was one of these courses I would have emphasized principles more.”

“This course does not focus enough on the consequences of human activity.”

“This course only deals with past environments and their study not contemporary ones.”

“Somewhat. One too many topics to cover.”

“This course concentrates on cells, molecules, genetics, and biochemistry.”

“My course does not fulfill it because the environmental component is just one small (too small) portion of the objective of the course.”

“Too broad in many disciplines.”

“This course does not fulfill second literacy criteria.”

Appendix P. Faculty list of major environmental issues they felt were essential knowledge of an environmentally literate student in Fall 2005 (52 Respondents).

Environmental Issues	# Responses	% Total
Abiotic and biotic interactions	42	25.0
Resource use, conservation, and management	23	13.7
Economics/governmental issues	16	9.5
Role of humans/environmental ethics	14	8.3
Global warming	11	6.5
Population growth	10	6.0
Biodiversity loss	10	6.0
Water quality issues	7	4.2
Agricultural impacts/issues	7	4.2
Pollution	6	3.6
Habitat destruction/deforestation	5	3.0
Environmental impact on humans	3	1.8
Subtotal	154	91.7
Human impact on the environment	14	8.3
Total	168	100.0

Appendix Q. Faculty list of major environmental issues they felt were essential knowledge of an environmentally literate student in Spring 2006 (48 Respondents).

Environmental issues	# Responses	% Total
Abiotic/biotic interactions	47	30.3
Resource use, conservation, and management	19	12.3
Economics/governmental issues	3	1.9
Role of humans/environmental ethics	14	9.0
Global warming	10	6.5
Population growth	7	4.5
Biodiversity loss	8	5.2
Water quality issues	4	2.6
Agricultural impacts/issues	5	3.2
Pollution	12	7.7
Habitat destruction/deforestation	11	7.1
Environmental impact on humans	2	1.3
Subtotal	142	91.6
Human impact on the environment	13	8.4
Total	155	100.0