National Environmental Literacy Assessment Project: Year 1, National Baseline Study of Middle Grades Students Final Research Report

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Grant # NA06SEC4690009

August 12, 2008

ACKNOWLEDGEMENTS

We send our sincerest gratitude to the United States Environmental Protection Agency and the National Oceanic and Atmospheric Administration, who provided funding for this project, and to The North American Association for Environmental Education, who administered the grant. To the network of data collectors, participating students, teachers, administrators, and schools, without whom we could not have accomplished our random sampling, we applaud your professionalism and efforts in the field.

And especially, we would like to recognize the following individuals, groups and organizations for their assistance and support:

- Mike Baker and Ginger Potter from the US EPA's Office of Environmental Education;
- Sarah Shoedinger from NOAA's Office of Education;
- Brian Day, Teresa Mourad, Brian Millsap, Paul Nowak, Mary Ocwieja, and other staff at NAAEE;
- David Lintern of GfK Roper;
- Christine Kraus and Sanjeewa Karunaratne of the Center for Survey Research and Analysis at the University of Connecticut;
- Cooperating School Principals and Participating Teachers;
- Data Collectors for volunteering to participate and support this research effort;
- Center for Instruction Staff Development and Evaluation;
- University of Wisconsin-Platteville: School of Education;
- University of Arkansas: Clinton School of Public Service, and Erica Fitzhugh;
- Florida Institute of Technology: Science & Mathematics Education Department, as well as Michael Gallo, Brit Martin, Katie Nall, Matthew Merbedone, Richard Santangelo, and Katie Guzmon.

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EXECUTIVE SUMMARY

This research project was designed primarily to meet recommendation number five, (*Support and strengthen long-term research initiatives)*, established by the U.S. Environmental Protection Agency's (EPA) National Environmental Education Advisory Council (NEEAC) and tendered to Congress in the 2005 Report to Congress, *Setting the Standard, Measuring Results, and Celebrating Successes*. More specifically, the Action Items supporting this recommendation include: a national measure of environmental literacy; the development of a comprehensive, research-based instrument for this purpose, as well as for use in more specific state and programmatic assessments so that comparisons can be made to the national assessment data. Other actions such as to indentify "proven" and "promising" programs and the study of these programs to understand their relative effectiveness in meeting the goals of environmental education and environmental literacy will be dealt with in subsequent studies.

The project is important because it provides instrumentation to measure environmental literacy and baseline environmental literacy data for 6^{th} and 8^{th} graders across the United States. This information can be used eventually to assess program effectiveness in the hope of raising environmental literacy across the nation. Similarly, this project supports and advances the goals of the National Environmental Education Act. More specifically it supports the EPA Office of Environmental Education's (OEE) Strategic Plan's research component recommending research that assesses the effectiveness of Environmental Education in meeting environmental protection and academic achievement goals. This project also addresses the National Oceanic and Atmospheric Administration's (NOAA) vision to incorporate social sciences into its research strategies. The data generated from this project and subsequent programmatic data may well have a direct impact on the design of NOAA's educational programming. Opportunities will eventually exist to assist NOAA in designing educational programming that has the highest possibility of success at meeting its academic objectives.

By providing instrumentation and baseline data on environmental literacy, this project will help to fulfill the NAAEE's mission of advancing environmental literacy. The results of this project

will provide resources and data to use in the development and advancement of quality environmental programming.

The administering partner for this project was the North American Association for Environmental Education (NAAEE). Key partners included researchers from the Center for Instruction, Staff Development and Evaluation; Florida Institute of Technology; the firm of Ron Meyers and Associates; and the University of Wisconsin - Platteville.

The *Middle School Environmental Literacy Survey* (*MSELS*) used in this study was developed and refined by Hungerford, Volk, Bluhm, McBeth, Meyers, and Marcinkowski. The *MSELS* includes several demographic items and measures of the following environmental literacy components: (a) ecological knowledge; (b) verbal commitment; (c) actual commitment, or environmental behavior; (d) environmental sensitivity; (e) issue identification and issue analysis skills; and (f) action planning. As such, it includes measures in each of the four domains that are critical to environmental literacy: Knowledge, Affect, Cognitive Skills, and Behavior. The *MSELS* contains multiple choice and Likert-type items, and was designed to be administered within a traditional 50-minute class period.

Three other survey forms were used in each school. Administrators were asked to complete School Information Forms and each cooperating teacher was asked to complete Program and Teacher Information Forms. A nationally stratified random sample of 6th and 8th grade classrooms was identified by theGfK Roper for this project. Then, in April, May and June of 2007, the National Middle School Student Environmental Literacy Assessment Project administered the instrument to the previously selected random sample in forty-eight schools across the United States. Dr. Meyers was the coordinator for the data collection.

Once collected, the data were sent to Dr. Marcinkowski at the Florida Institute of Technology for interpretation. Statistical software packages were used to calculate individual student scores for each section of the *MSELS*, to run statistical analyses on those scores, and to graph these results (e.g., the range, median, mean, standard deviation for each section of the *MSELS*). More specifically, four or more kinds of statistical analyses were conducted. First, these scores were

analyzed at the school level, as this is the sampling unit for this phase of the research. Second, scores for all sixth grades on each section of the *MSELS* were analyzed using descriptive statistics in an effort to generate a national profile of environmental literacy for this grade level. The same was done for scores for all eighth graders. Third, inferential statistics were used to compare sixth and eighth grade students' scores on sections of the *MSELS* to determine if there were any significant differences. Fourth, descriptive statistics were computed using information from the School, Program, and Teacher Forms, and from the demographic items in the *MSELS* (e.g., differences between classes from rural/suburban/urban schools, differences between classes based on primary program resources in use, differences between classes based on teachers' highest degree or workshops completed, differences on the basis of student gender or ethnic background). Finally, additional exploratory analyses are planned for a later time.

The research team expects to disseminate research findings in both ongoing and summative fashion through presentations at annual NAAEE conferences, at NAAEE's Research Commission gatherings, and at conferences sponsored by organizations related to environmental education; articles in environmental education journals and newsletters; articles in journals and newsletters in fields related to environmental education (e.g., outdoor education, interpretation, etc.); and articles in journals and publications within the larger educational community. The audience for these research findings includes professional educators and researchers as well as private and governmental agencies. It is hoped that other groups which interface EE would also take a serious interest in the findings of this study, e.g., classroom teachers, teacher educators, staff of informal and non-formal programs, environmental scientists, conservation educators, and others.

As noted above, the results from this study included weighted scores for all sixth graders and for all eighth graders on each scale (or index) included in the *MSELS*. Weighted results such as these are important because weighting permits the results of this study to represent the national population of sixth and eighth graders in the U.S. Table 1 (p. x) summarizes these results. This table identifies the number of items in and possible range of scores for each scale, as well as the mean, median, and modal scores on each scale for each of these grade levels. However, as important as weighted scores such as these may be, it is often difficult to interpret or use them in

Table 1.
Summary of Descriptive Statistics for Weighted Data, by Scale or Index, and by Grade

Parts of the MSELI	No. Items	Range	Grade	Sample Size		Mode	Median	Mean	Std. Dev.
				n	missing				
II. Ecological Foundations	17 Items (5 - 21)	0 - 17	6 8	934 921	108 42	13 13	12 12	11.24 11.62	3.26 3.32
III. How You Think About the Environment	12 Items (22 - 33)	12 - 60	6 8	1000 936	42 27	44 43	44 41	43.89 41.10	8.88 9.20
IV. What You Do About the Environment	12 Items (34 - 45)	12 - 60	6 8	974 921	68 41	40 40	39 35	38.44 35.14	9.15 9.39
V. You and Environmental Sensitivity	11 Items (46 – 56)	11 - 55	6 8	978 913	63 49	31 30	33 30	32.54 30.11	7.47 7.48
VI. How You Feel About the Environmental	2 Items (57 – 58)	2 - 10	6 8	987 930	55 32	10 10	9 8	8.14 7.82	2.00 2.06
VII.A. Issue Identification	3 Items (59, 60, 67)	0 - 3	6 8	902 885	139 77	1 1	1 1	1.31 1.29	0.93 0.95
VII.B. Issue Analysis	6 Items (61 – 66)	0 - 6	6 8	905 869	137 93	2 1	2 3	2.75 2.86	1.89 2.00
VII.C. Action Planning	8 Items (68 – 75)	0 - 20	6 8	874 820	168 142	2 2	6.97 7.00	7.25 7.86	5.44 5.64

this form. For this reason, these scores were adjusted and used to calculate composite scores (Table 2, p. xiii), which are summarized here to ease interpretation of and facilitate use of these results.

Figures 1 and 2 present the distributions of the environmental literacy composite scores (utilizing unweighted data) for all 6th grade students (Figure 1, p. xi) and for all 8th grade students (Figure 2, p. xi). Figure 3 (p. xii) presents the combined 6th and 8th grade students' composite score (also using unweighted data). Histograms are graphic representations of the distributions of scores. Considering a random sample such as ours, we would expect a normal (bell shaped) curve. The research team is pleased with these distributions.

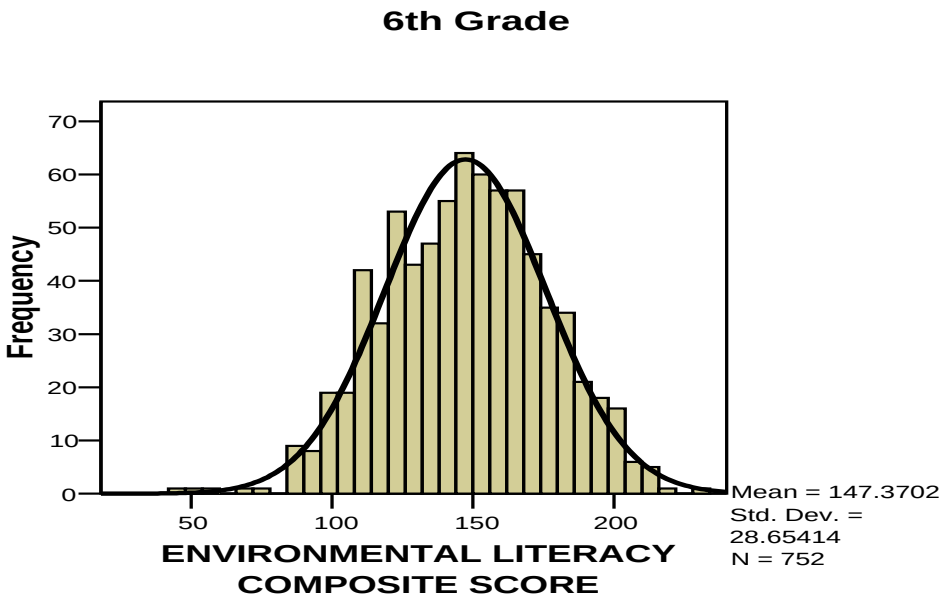

Figure 1. Histogram of the environmental literacy composite scores for all 6th grade students.

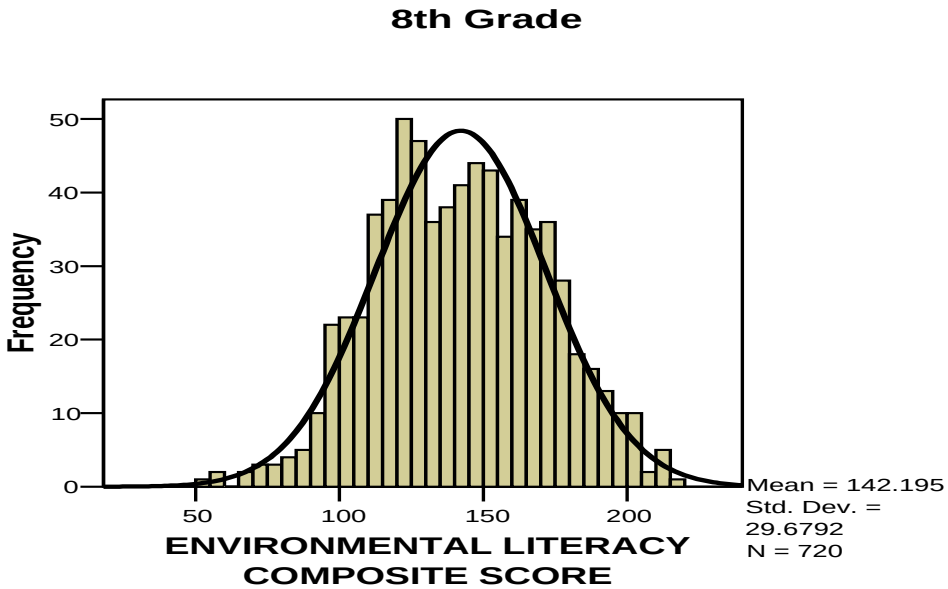

Figure 2. Histogram of the environmental literacy composite scores for all 8th grade students.

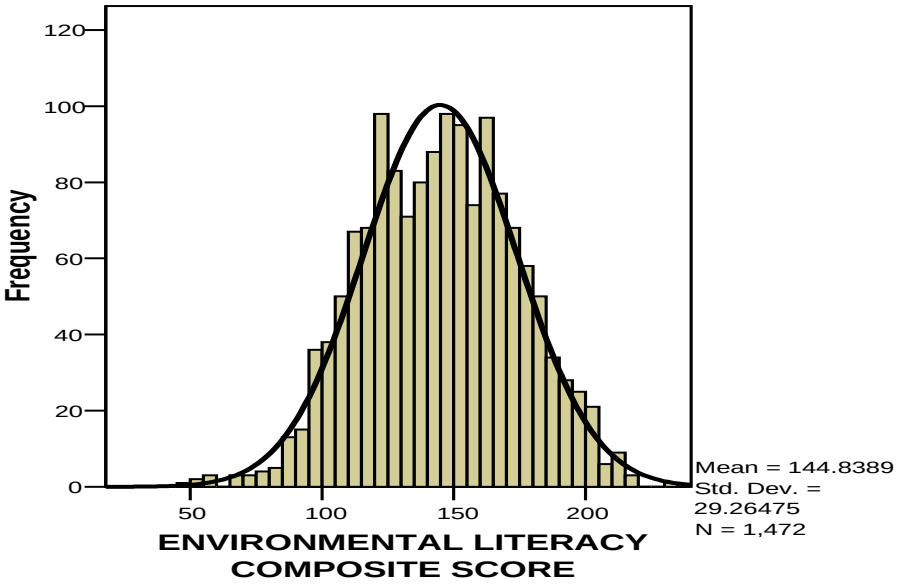

Figure 3. Histogram of the environmental literacy composite scores for all 6th and 8th grade students.

The normalcy of the distributions both validates the randomness of the sampling and adds to the validity of the *MSELS* as a measurement tool with the ability to discriminate levels of environmental literacy within these study populations.

In order to derive a composite score of all literacy components, scores on the individual sections of the *MSELS* were adjusted with multipliers so that the sum of each of the *four Components of Environmental Literacy* (Ecological Knowledge, Environmental Affect, Cognitive Skills, and Behavior) equated to 60. An Environmental Literacy Composite Score resulted from compiling the four Components of Environmental Literacy scores (possible composite score 240, with a range from 24 to 240). Table 2 (p. xiv) presents the environmental literacy composite scores. The 6th grade composite score was 143.99 and that of the 8th grade was 140.19 with an overall composite score of 142.14. These scores all fall in the mid-range of possible scores (97 – 168). The team cautions the reader to bear-in-mind that these composite scores are reflections of the environmental literacy components and are limited to the range of possible scores on the instrument used in this research. Although these scores do not have inherent value, their utility lies in their potential for comparing this sample to others.

Table 2.
Components of Environmental Literacy and Composite Scores

Parts of the *MSELS*	Components of Environmental Literacy	Grade	Combined Component Mean *	Grand Mean Combined 6th & 8th *	Environmental Literacy Composite Scores **		
					6th	8th	6 & 8
Ecological Foundations	A. Ecological Knowledge	6th	39.67	40.34	143.99	140.19	142.14
		8th	41.01				
How you Think About the Environment	B. Environmental Affect	6th	40.73	39.40			
You and Environmental Sensitivity							
How You Feel About the Environment		8th	38.06				
Issue Identification	C. Cognitive Skills	6th	25.15	25.56			
Issue Analysis							
Action Planning		8th	25.98				
What Your Do About the Environment	D. Behavior	6th	38.44	36.84			
		8th	35.14				

Note. For all reported measurements (Combined Component Mean, Grand Mean Combined 6th & 8th and the Environmental Literacy Composite Scores), n sizes fluctuated from variable to variable and are not reported on this table. N sizes fell within a range of 874 to 1000 for 6th grade students, and within a range of 820 to 936 for 8th grade students (total sample included 1,042 6th grade students and 962 8th grade students).
* Total possible points = 60
** Total possible points = 240

Additional insight into environmental literacy can be gained from examining the scores associated with the four components of environmental literacy included in the instrument used in this research (each component with a possible value of 60). Of the four environmental literacy components, the highest scores (combined 6th and 8th grade adjusted grand mean) were attained in Ecological Knowledge (40.34), with slightly lower scores in Environmental Affect and Behavior (39.40 and 36.84, respectively). The lowest scores were observed in the component of Cognitive Skills (25.56). In the components that focused on performance (i.e., which asked students to demonstrate knowledge or skills), the 8th graders out-scored the 6th graders. This might be expected due to developmental differences between the two age groups. In the components that relied on self-reports (affect and behavior), the 6th graders outscored the 8th

graders. Within the Cognitive Skills component, the highest values for both 6th and 8th graders were observed for Issue Analysis Skills, followed by Issue Identification Skills, and then by Action Planning Skills.

The development of environmental literacy is complex and can take many forms. This study provides us with a measure against which to compare future measures. Further analyses of these data (in particular with respect to the classroom and teacher information) might shed light on the impacts of environmental education efforts, where it was present in these classrooms. The research team anticipates an additional research effort that will purposively seek out and collect data from middle school settings where environmental education is in place. That will permit us to compare measures on environmental literacy variables across this representative sample of middle school classrooms and that purposive sample to determine if environmental education efforts can indeed make a difference in environmental literacy. It will also permit us to observe relative effectiveness of diverse environmental education programs and curriculums with respect to environmental literacy, in general, and with respect to the four components of environmental literacy addressed by the *MSELS*. We are confident in our ability to collect data on environmental literacy variables and to compare, in meaningful ways, efforts to develop these variables in the adolescent populations in the United States.

I. INTRODUCTION AND BACKGROUND

Historical Overview

Definition of Environmental Education

While there is no one definitive and universally accepted definition of environmental education (Disinger, 1983), there have been recognizable patterns to the manner in which the field of environmental education (EE) has developed over time within the United States. Since its origins in the 1960s, EE has been defined and described in several distinct ways (Disinger, 1983). During the 1960s and 1970s, a variety of short, one or two sentence definitions of EE were published (e.g., Harvey, 1977; UNESCO, 1977). Of these, one of the most noteworthy was the definition offered by University of Michigan faculty and graduate students in 1969 (Stapp et al., 1969). Eventually, these definitions were expanded into sets of goals, objectives, and guiding principles (e.g., UNESCO, 1977; Harvey, 1977; Hungerford, Peyton, & Wilke, 1980; Hart, 1981). Of these, the most widely recognized has been those agreed upon at UNESCO's Tbilisi Intergovernmental Conference (UNESCO, 1978). These provided the fundamental principles for proposals and recommendations that resulted from the historic United Nations Conference on Environment and Development (UNESCO, 1992) and subsequent international gatherings. The Tbilisi categories of objectives include Awareness, Knowledge, Affect, Skills, and Participation. When these categories of objectives are viewed in the context of the Tbilisi goals, they represent stepping stones to prepare and enable citizens, including students, to become actively involved in the prevention and resolution of environmental problems and issues.

Frameworks for Environmental Literacy

The formulation of frameworks for environmental literacy in the 1990s represents a third way to define EE. Based on available reviews of research (e.g., Iozzi, 1984; Hines et al., 1986/87), the aforementioned sets of goals, objectives, and guiding principles were permutated into frameworks for environmental literacy (e.g., Roth, 1992; Simmons, 1995; Wilke, 1995). The framework developed by Simmons served as the basis for a more recent review of research

(Volk & McBeth, 1997) and has guided NAAEE's National Guidelines for Excellence Project. In turn, these sets of guidelines have been used to inform and guide national initiatives in EE, such as the development of state certification programs, NAAEE's program to accredit state certification programs, and NCATE Standards. A second framework was developed by a team of researchers working on instruments to assess the environmental literacy of students and EE needs of teachers (Wilke, 1995). In general, these frameworks for environmental literacy have two broad features in common: (a) they reflect at least four of the Tbilisi categories of objectives, namely Knowledge, Affect, Skills, and Participation (Behavior); and (b) they address at least three major thematic emphases apparent across the history of EE within the U.S. (Stapp, 1974; Swan, 1975), namely the natural world, environmental problems and issues, and sustainable solutions to these problems and issues.

Prior Research in Environmental Education

There are a number of reasons why it continues to be difficult to summarize the body of research and evaluation in and closely related to EE. First, the number of studies conducted each year has continued to grow. There were simply more studies conducted in 2004 than in 1994, 1984, and 1974. Second, beyond this increase in volume, there has been a growth in the variety of research methodologies in use and research topics under investigation (Hart & Nolan, 1999). Third, there is no single entity, whether commercial or non-profit, that has assumed responsibility to accumulate, review, and summarize this body of research. While it was once possible for one or a few professionals to do this (e.g., Roth & Helgeson, 1972; Roth, 1976), it is now extremely difficult to do so. Following recent reviews of EE research by Hart and Nolan (1999) and Rickinson (2001), these authors commented on this difficulty. However, even when reviews are undertaken by larger teams of researchers, as has been done by members of NAAEE's Research Commission (Iozzi, 1981, 1984; Marcinkowski & Mrazek, 1996), large review teams can face professional and logistical barriers (e.g., the scarcity of funding needed to support credible reviews of the increasing volume and diversity of studies; team composition, commitment, and communication). Fourth, beyond the body of studies published in journals and as doctoral dissertations, there are other sets of studies that are reported but not published (e.g., studies undertaken as part of agency grants or contracts, on a program-specific consulting basis, by

Masters students). Few of the reviews cited above have included studies from this segment of the literature for a variety of reasons (e.g., the absence of information about or inability to access studies, variations in the quality or rigor of research methodology). Fifth, while there have been reasonably comprehensive collections of research for 1971-1980 (Iozzi, 1981) and for 1981-1990 (Marcinkowski & Mrazek, 1996), there has been no comparable effort to prepare such a collection of research published after 1990. In the absence of bibliographic and other types of collections, far more time and effort is required to review and summarize existing research.

Despite these limitations, there have been a number of useful reviews of research in and related to EE within North America over the past 25 years. More importantly, a number of these summarize evidence that is relevant to this project. These include Iozzi's (1983) narrative summaries of research for different EE goals or categories of objectives, Hines' (1986/87) meta-analysis of studies of correlates of responsible environmental behavior, Volk and McBeth's (1997) narrative summary and vote-count of studies of environmental literacy components, two narrative reviews of research pertaining to environmental sensitivity and significant life experiences (Chawla, 1998; Sward & Marcinkowski, 2001), and, to a lesser extent, Hart and Nolan's (1999) and Rickinson's (2001) narrative reviews of studies pertaining to sensitivity, knowledge, attitudes, and behavior. Of these, Hines' (1986/87) meta-analysis provides evidence regarding the selection of several environmental literacy components, Chawla's (1998) and Sward and Marcinkowski's (2001) provide evidence regarding the definition of one of those components, and Volk and McBeth's (1997) provide evidence regarding the status of environmental literacy in the U.S. These reviews, coupled with other studies and reviews (e.g., Simmons, 1995; Wilke, 1995; McBeth, 1997; Marcinkowski, 1993, 2004), provide evidence to support the selection, definition, and measurement of the environmental literacy components included in the study: environmental sensitivity, ecological knowledge, environmental emotion (attitudes), issue and action skills, verbal commitment (willingness to act), and actual commitment (behavior). The evidence from these sources has been drawn from research studies with relatively small samples that explored some or many of these variables, and studies with large samples that explored one or two of these variables. However, the literature is very clear that there have been no studies with both of these characteristics (i.e., a large sample size and a broad set of environmental literacy components).

Justification for the Study

The project is important because it addresses calls within U.S. EPA and NOAA for instrumentation to measure environmental literacy and for baseline data on environmental literacy with which to assess program effectiveness at raising environmental literacy, an important indicator of environmental stewardship behavior. With respect to instrumentation, after extensive piloting and refinement over a period of years (McBeth, 1997), the *Middle School Environmental Literacy Survey (MSELS)* was ready for use in this project. With respect to baseline data, the results of this research provide the environmental education community with its first-ever glimpse of the level of environmental literacy across the United States at the middle school level.

This project was designed to address two of the six recommendations for research established by the U.S. Environmental Protection Agency's (EPA) National Environmental Education Advisory Council (NEEAC) and tendered to Congress in the 2005 Report to Congress (i.e., the *National EE Research Agenda)*. Those two recommendations were: A) to conduct a national measure of environmental literacy, and B) to understand the relative effectiveness of instructional materials in meeting the goals of environmental education and environmental literacy. Further, this project fully supports and advances the goals of the National Environmental Education Act, and more specifically the EPA Office of Environmental Education's (OEE) Strategic Plan research component to support research that assesses the effectiveness of Environmental Education in meeting environmental protection and academic achievement goals. This project will provide valuable information as the agency prepares to respond to Administrator Johnson's charge to the Innovation Action Council to explore and better define: 1) EPA's vision of environmental stewardship; 2) the role of stewardship in the future of environmental protection; and, 3) how EPA can encourage stewardship that addresses environmental priorities and achieves results. This project represents a unique opportunity for OEE to move forward with its efforts to demonstrate the impact that EPA's funding has made in the effort to increase environmental literacy.

This project also directly addressed the vision and goals of the National Oceanic and Atmospheric Administration (NOAA). In its 2003 Strategic Vision, NOAA states: "We will establish an environmental literacy program to educate present and future generations about the changing Earth and its process … This program will improve the public's understanding of the natural environment and human response to natural hazards … " (NOAA, 2004, p. 2). In its Education Plan (2004), NOAA goes on to state "Our mission is an environmentally literate public and a diverse workforce who will use NOAA's products and services to make informed decisions that enable responsible actions" (p. 2). This is most apparent in Goal 1 within this Plan (p. 3). Further, this project falls under Strategy 5, which calls for "research on best educational practices in both formal and informal environmental science education" through leveraged partnerships (p. 5). The baseline data gathered in this project are needed to interpret future research into the effects of formal and informal education practices on the status of environmental literacy among school-aged youth and the adult public. The data generated from this project and subsequent programmatic data can have a direct impact on the design of NOAA's educational programming, notably those pertaining to other Strategies within this Plan that focus on educational materials, resources, and professional development programs. Curricular recommendations from this study will help NOAA to design educational programming that has the highest possibility of success at meeting its academic objectives.

In addition, by providing instrumentation, baseline data, and subsequent comparative data on environmental literacy, this project helps to fulfill the NAAEE's mission of advancing environmental literacy. The results of this project will provide findings and other resources to use in the Association's ongoing projects and initiatives to develop and advance the quality of environmental programming.

Why did this project focus on middle school learners? Early adolescents or students of middle school age were selected for inclusion in this study because this developmental age has been identified as the, "last best chance to avoid a diminished future" (Carnegie Council, 1989). In this statement the Carnegie Council communicated that the middle school years represent the time when early adolescents are developing the ability to think abstractly. Such cognitive abilities are strongly stated or implied in a variety of definitions or goals of environmental

education (EPA, 1992, 1996; Hungerford, Peyton, & Wilke, 1980; NAAEE, 1999, 2000; NEEAC, 1996, 2000; Simmons, 1995; Stapp et al, 1969, 1979; UNESCO, 1978). In adolescence, this new-found cognitive ability is accompanied by a view of the world that is much broader than that previously experienced. Adolescence is also a time when environmental issues are primary among their concerns and interests (Beane, 1993). Chronologically, the adolescent is progressing toward full participation as a citizen. Developmentally, he or she is moving through the acquisition and refinement of both abilities and inclinations to become engaged in environmental decision-making. In a research sense, targeting adolescents will also permit longitudinal studies as this cadre moves through its high school and college years. It was critical, then, to focus this project and our efforts on the middle school years.

This project represents Phase I of a larger-scale and longer-term research agenda. As conceptualized prior to submission of the Phase I proposal, Phases II and III would take the research forward through important additional steps. Phase II is designed to collect environmental literacy data on middle school students in classrooms that incorporate successful or widely used environmental education programs across the United States. These programs will be identified from the Resources for Educators literature (NAAEE, 1997, 1998a, 1998b) and from nominations from program representatives. Using these information sources, specific school and classroom sites will be identified and assessed using the *MSELS*. Results from these assessments can be used as a measure of program effectiveness and would be compared to baseline data from Phase I. Phase I and Phase II schools that appear to be decidedly effective in the development of environmental literacy will be selected for Phase III in-depth visits to more adequately address the variables associated with their success. Subsequently, the information gleaned from Phase III can be used by both private and governmental agencies in an effort to increase the effectiveness of environmental education programming.

A research study of this magnitude has never been undertaken in the field of environmental education within the U.S. However, the questions that could be answered in these investigations are among those which have been in the minds of environmental educators for many years. Are our educational efforts working? To what extent? How can we improve our efforts to become as effective as possible? What resources might be needed to make these new efforts effective?

The findings generated by this Phase I study, as well as Phase II and Phase III studies, will open to other researchers avenues of investigation that will, in time, improve environmental education substantially. By providing data relative to programs that appear to be successful at developing components of environmental literacy, researchers will be able to target schools and learning environments for further study.

Problem Statement

To date, few national assessments have been undertaken in environmental education within North America (Iozzi, 1981; Marcinkowski & Mrazek, 1996). Most of these studies have been conducted for dissertation studies, and have focused almost exclusively on student knowledge and/or attitudes. Thus, these studies reflect the older knowledge-attitude-behavior (K-A-B) model, which is not supported by research (Peyton, 1981; Sia, Hungerford, & Tomera, 1985/86; Hines, et al., 1986/87; Marcinkowski, 1989, 2001; Wilke, 1995; Volk & McBeth, 1997; Chawla, 1998; Zelezny, 1999; Sward & Marcinkowski, 2001; Kolmuss & Agyeman, 2002). Rather, these latter studies provide empirical support for the wider conception of environmental literacy that guides this project (Simmons, 1995; Wilke, 1995).

In 1990, a panel of professional environmental educators and researchers identified the need for national assessments of environmental literacy as part of a national research agenda for EE. Unfortunately, over the next decade, the only steps toward a national assessment of environmental literacy at any grade level in the U.S. were those reported by Wilke (1995), McBeth (1997), and Volk and McBeth (1997). Between the last of these studies and the initiation of this project, there were no further documented attempts to plan for and conduct a national assessment of this kind. Consequently, in its 2005 Report to Congress entitled *Setting the Standard, Measuring Results, and Celebrating Successes*, the National Environmental Education Advisory Council recognized the ongoing need for, and therefore included a separate action item for, the conduct of a national measure of environmental literacy.

Research Purpose

As noted earlier, there exists both a lack of evidence related to the status of environmental literacy in the U.S., and requests from the U.S. EPA's National Environmental Education Advisory Council for such information. The purpose of the first phase (Phase I) of a broader proposed research agenda is to address this lack of evidence and Council recommendation by conducting a national assessment of environmental literacy at the middle school level using a probability-proportional sample of 6th and 8th graders.

The two broad research questions that guided the design of this study and that will be addressed in Phase I are presented below.

1) What is the level of environmental literacy of sixth and eighth grade students across the United States on each of the following variables:
    a. ecological knowledge;
    b. verbal commitment;
    c. actual commitment;
    d. environmental sensitivity;
    e. general environmental feelings;
    f. environmental issue and action skills?

2) What is the general level of environmental literacy of sixth and eighth grade students across the U.S.?

Study Delimitations

The scope and methods of this study were delimited in several noteworthy ways. These include:

- this study was limited to students enrolled in public and private schools within the U.S. in the 2006-07 school year;

- for practical and financial reasons, the number of counties selected for school sampling purposes was limited to 50;
- only those schools that had students in both 6th and 8th grade classes were eligible to be selected into this sample and to participate in this study. Further, by intent, only those schools that had designated and separate 6th and 8th grade classes were eligible (i.e., schools with ungraded classes were not eligible);
- the population from which the study sample was drawn was limited to 6th and 8th grade students;
- while environmental literacy has been defined in broader terms (e.g., Simmons, 1995; Wilke, 1995), only the environmental literacy components identified in the research question above were surveyed;
- the survey that gathered student data on these components of environmental literacy was designed to be administered in a 50-minute time period. As a result, the number of possible items that could be included in the measure for each component was limited to allow for this practical time constraint; and
- data collection was planned for late Spring 2007 to allow students as much time as possible to learn and mature developmentally and, thereby, reflect this growth in their responses on this survey.

II. METHODOLOGY

Research Design

This national assessment of environmental literacy was a type of survey research (Frankel & Wallen, 2000). In this case, the purpose of this study was to describe environmental literacy characteristics of middle school students by collecting survey data over the period of several weeks.

A national probability-proportional sample of 6th and 8th grade classrooms was identified by GfK Roper. On-Site Data Collectors (researchers recruited through NAAEE's Research Commission) visited school sites, administered the assessment instrument, and collected demographic information related to the site. The Assessment Coordinator managed this effort, overseeing the distribution of assessment materials, monitoring data collection progress, and ensuring the return of assessment materials to Florida Institute of Technology for data entry and analysis.

Protection of Human Subjects

The study was performed ethically and in compliance with all appropriate regulations, including the U.S. Department of Health and Human Subjects Revised Regulations that pertain to all forms of human subjects research involving minors. To ensure this compliance, Florida Institute of Technology (Florida Tech) Institutional Review Board's (IRB) policies and procedures were utilized, as they were the academic institution for investigator Dr. Tom Marcinkowski. Dr. Marcinkowski worked closely with Dr. Michael Gallo of Florida Tech to prepare and submit the Human Subjects Research Proposal to the university's IRB. In February 2007, the IRB gave its approval for use of the surveys and supporting material, including the consent forms, with the schools, programs, teachers, and students, including student guardians, in early 2007.

The procedure for obtaining school consent was for GfK Roper to telephone the school's administrator authorized to approve participation, describe the study purpose and procedures, and ask for permission to proceed with the research in that school. If the school agreed, it scheduled the date for administration of the surveys in consideration of the school's schedule and the needs of the project (to not schedule tests within two weeks of the end of the school year). Once permission was granted, the Assessment Coordinator was informed, and he or his assistant sent the School Kit to the principal or his or her designee. The kit included a contract (purchase of service agreement) that explained the expectations (see Appendix 1). Teachers were surveyed about the environmental science/education programs under the authority of this agreement.

Teacher consent was obtained per FIorida Tech's IRB regulations, which require informed consent. A letter of introduction to the project for teachers and a passive consent form was included for each participating teacher in the School Kit, as part of the Teacher Packets (see Appendix 2).

For parental consent, GfK Roper asked the school administrator if the school required active or passive parental consent. Only two of the 48 schools required active consent. In these schools, students were able to participate in Phase I if and when their parents completed, signed, and returned a consent form. This is commonly referred to as "active consent" (Fraenkel & Wallen, 2000, pp. 48-49; Ary, Jacobs, & Razavieh, 2002, pp. 438, 510). In those cases, the School Kit sent to the school included a letter to parents explaining the project purpose, procedures, and a request for their consent for their child to participate (see Appendix 3). This letter was given to the students with the request that they give it to their parents, have a parent indicate if they are giving or refusing consent, and return the form to their teacher. The letter indicated that students would be provided an alternative activity in a separate area if the parents did not want their children to participate, and arrangements were made for this.

Forty-six of the forty-eight schools had passive consent procedures. In these situations, student guardians had, usually at the beginning of the academic year, signed a document giving the school permission to administer appropriate surveys and tests as part of their mission (see Appendix 3). For passive consent schools, parents were sent two copies of a letter explaining the

purpose of the study, the procedures, and asked to sign and return one copy of the form if they did not want their child to participate. Children whose parents declined participation were offered alternative activities outside the classroom during the survey administration. All non-responses by parents were viewed as offers of their consent.

Instrumentation

School Information Form

The School Information Form was used to gather school and district identification and contact information, school characteristics, and student demographics (see Appendix 4). This information was used: (1) by the Assessment Coordinator and others to ensure proper data collection; (2) by data analysts to ensure proper data entry, analysis, and reporting; and (3) by data analysts to access additional demographic information about each school and district from on-line databases maintained by the National Center for Education Statistics (NCES) for data analysis and/or reporting purposes.

Program Information Form

The Program Information Form was used to gather information on curricular and instructional program practices and types of environmental programs in each participating school and classroom (see Appendix 4). Program information was sought to enable the research team to characterize the types and prevalence of environmental education and science programs being used in schools. The 6th and 8th grade Program Information Forms were identical except for the reference to grade level in the title and specific items.

Teacher Information Form

The Teacher Information Form was used to gather teacher demographics, as well as solicit their views on the environment and environmental education (see Appendix 4). The information sought in the Program and Teacher sections was collected to provide for a more complete description of the sample, as well as to allow for the analysis and interpretation of differences between classrooms' scores on the *MSELS*. The names of schools, programs, and teachers were

kept strictly confidential. Once again, the 6th and 8th grade Teacher Information Forms were identical except for the reference to grade level in the title and in specific items.

The Middle School Environmental Literacy Survey

Instrumentation was a critical consideration in accomplishing the purpose of this project, that is, to describe the status of environmental literacy among middle school students in the United States. Several characteristics were desirable in the instrument that would be used in the study:

- the instrument should reflect environmental literacy, as it is conceptualized in the United States;
- the instrument should include scales representing multiple components of environmental literacy;
- the scales included in the instrument should be valid and reliable;
- the instrument should be appropriate for use in grades six and eight, and be free of biases;
- the format of the instrument would lend itself to administration with a large sample, and would permit machine-scoring; and
- the length of the instrument would permit its completion within a normal middle school class period.

In their review of the status of environmental literacy in the United States, Volk and McBeth (1997) reported that the large majority of research instruments typically addressed only knowledge and affective components and did not have reported evidence of validity or reliability. They identified four literacy instruments that addressed three or more components of environmental literacy and that reported established validity and reliability. Those instruments included: the *Middle School Environmental Literacy Instrument (MSELI)*, developed by Bluhm, Hungerford, McBeth, and Volk (1995) for students in grades six to eight and including knowledge, affect, skills, and behavior subtests; the *Children's Environmental Attitude and Knowledge Scale (CHEAKS)* developed by Leeming, Dwyer, and Bracken (1995) for students in grades 1 -7 and including knowledge, attitude, and behavior scales; the *Secondary School Environmental Literacy Assessment Instrument* (Marcinkowski & Rehrig, 1995), directed at high school students and including knowledge, affect, skills, and behavior scales; and the *Ecology Attitude Inventory* (Maloney, Ward, & Braucht, 1975) directed at adults and including knowledge, attitude, and behavior scales. Two of the instruments (*MSELI* and *CHEAKS*) appeared promising for use in this study because of their targeted audience (middle school age students). The decision was made to use the *MSELI* as the basic instrument, and to include

portions of the *CHEAKS* (and/or other scales) as appropriate.

The *MSELI* (Bluhm, Hungerford, McBeth, & Volk, 1995) was one of the products of the Environmental Literacy Assessment Consortium (ELAC), a group of researchers from the University of Wisconsin-Stevens Point, Southern Illinois University at Carbondale, Florida Institute of Technology in Melbourne, and the University of Tennessee-Knoxville. This research was funded by the U.S. EPA through the National Consortium for Environmental Education and Training. Its purpose was to develop instruments to assess the environmental literacy or needs of several populations. As the basis for its work, the ELAC used an environmental literacy framework that reflected key historical definitions [of environmental literacy], the research and evaluation literature in environmental education, and the developing guidelines for excellence [NAAEE] in the United States (Wilke, 1995). The framework included seven components of environmental literacy (ecological knowledge, affect, socio-political knowledge, knowledge of environmental issues, cognitive skills, environmentally responsible behavior, and additional determinants of environmentally responsible behavior). Researchers from Southern Illinois University at Carbondale were charged with the development and refinement of a literacy instrument targeted at the middle school level. That instrument was developed and refined until its 7th edition was field-tested and reported as a final product of this effort (*MSELIv7*). To make the instrument more usable, its length was subsequently reduced in an eighth edition (*MSELIv8*).

It was this version of the literacy instrument that was modified for the National Environmental Literacy Assessment project. Several subtests of the *MSELIv8* were discarded or replaced, and several new scales were added to the new version of the instrument (*MSELIv9*) in preparation for the national assessment. Of critical concern throughout the modification was the need to balance the inclusion of variables that represent a valid overview of environmental literacy with realistic formatting, administration, and scoring parameters. In other words, we sought a valid instrument, which was both broadly representative of environmental literacy and, at the same time, relatively easy to administer, complete, and score. The resulting instrument is described below.

MSELIv9 retained the knowledge scale (Ecological Knowledge) from the earlier version. This scale, adapted from a lengthier test developed by the Wisconsin Center Environmental Education, was comprised of 17 item multiple-choice items. Two new affective measures were added. These included a modified 12-item Verbal Commitment scale, from the *CHEAKS* (Leeming et al, 1995), presented in five-point Likert-type response format and an 11-item Environmental Sensitivity scale (also in five-point Likert-type response format) based on the

body of environmental sensitivity research initiated by Tanner (1980) and Peterson (1981). The Actual Commitment scale (also in five-point Likert-type response format) from the *CHEAKS* was modified to be used as an environmental behavior scale. The cognitive skills scale included three subscales: Issue Identification, Issue Analysis, and Action Planning. Issue Identification was expanded from the one multiple-choice item found in the *MSELIv8* to three multiple-choice items in the new version. Issue Analysis, an open-ended item on the *MSELIv8*, was replaced by the Identifying Bias subscale of the *Critical Thinking Test for Environmental Education* (Cheak, 1999) which included six multiple-choice items. Action Planning, a multi-response item, was retained from the *MSELIv8*.

As stated above, in the development of the *MSELI*v9, serious attention was given to the validity of variables that appear to comprise "environmental literacy." The initial validity assessment consulted the literature of environmental education, particularly that related to environmental education as it is conceptualized in the United States. Table 3 presents the components of the *MSELIv9* along with an identification of agencies or researchers that have included those variables as goals of environmental education or components of environmental literacy.

Table 3.
Variables Measured in the 9th (2005) Edition of the "Middle School Environmental Literacy Instrument" as Compared to Selected Definitions and Goals of EE and to Environmental Literacy Frameworks

***MSELI* Subtests**	**Stapp, et al 1969, 1979**	**UNESCO, 1978**	**Hungerford, Peyton, & Wilke, 1980**	**EPA, 1992***	**Simmons, 1995**	**EPA, 1996***	**NAAEE 1999,2000**	**NEEAC, 1996, 2000**
Ecological Knowledge	X	X	X		X		X	X
Verbal Commitment	X	X			X			X
Actual Commitment	X	X	X		X			X
Environmental Sensitivity **		X			X			X
Issue Identification		X	X	X	X	X	X	X
Issue Analysis			X	X	X	X	X	X
Action Planning	X	X	X	X	X	X	X	X

* Federal Register Definition

The *MSELIv9* included measures of the four major domains that appear to be critical to environmental literacy: knowledge, affect, skill, and behavior (Roth, 1992; Simmons, 1995; Wilke, 1995). It should be noted that a number of environmental literacy components were not measured by this instrument because: (1) they are not developmentally appropriate for middle school students; and/or (2) it would require substantial time to measure and/or score these properly, e.g., knowledge of environmental problems/issues, knowledge of alternative solutions/ action strategies, attitudes, locus of control, assumption of personal responsibility, some problem/issue-related skills.

An attempt was made to establish construct validity for the *MSELIv9* through an 18-member panel. The sixteen panel members who returned validity assessments reflected a balance in terms of educational levels and responsibilities: four were middle school teachers; two were high school life/environmental science teachers; two were school district environmental education coordinators; six were university environmental educators/researchers; and two were officers in state/federal agencies related to environmental education.

The key question asked of the panelists was: Does this instrument reflect a reasonable definition of "Environmental Literacy"? All panel members responded in the affirmative to this query. In addition, over three-quarters of the panel members indicated that the instrument reflected no political, gender, or racial bias. Social concerns were raised by three of the panelists. Comments from the validity panelists led to revisions of selected items in *MSELIv9*. The panelists further agreed that the instrument was of suitable length and appropriate for use with sixth through eighth grade students. Overall, the *MSELIv9* showed a great deal of validity as demonstrated by the results of the validity assessment.

The *MSELIv9* was field-tested using 65 sixth, seventh, and eighth grade students from two locations, Molokai, HI and Steeleville, IL. One of the original concerns of the developers was the length of testing, i.e., completion time. This concern arose from the current testing climate in the United States, which often creates difficulty in recruiting classrooms and schools for research (i.e., in some situations, there is a reluctance to "lose" additional instructional time to testing). The three teachers who field tested the material reported no difficulties in the process and noted completion times between 28 and 41 minutes. Most of the completion times were around 40 minutes, which is within the limits of a class period in most middle school classrooms. Thus, the test appeared to be of a length that would permit a relatively short period of participation.

The field test scores were used to compute reliability estimates, using Cronbach's Alpha Coefficient to determine the internal consistency of the instrument and of the various scales and subscales. Alpha coefficients ranged between .701 and .869, with one exception. This exception was Issue Identification, a three-item scale, that yielded an alpha coefficient of .389. The total instrument reliability was .82. Those reliability estimates were deemed to be acceptable and are presented below.

Ecological Knowledge;	∂ = .794
Verbal Commitment;	∂ = .843
Actual Commitment;	∂ = .778
Environmental Sensitivity;	∂ = .764
Issue Identification;	∂ = .389
Issue Analysis;	∂ = .701
Action Planning;	∂ = .869
Total Instrument:	∂ = .817

Subsequent to the field-testing of the instrument and in light of recent activity in environmental sensitivity research, the environmental sensitivity scale was re-visited. This scale in the *MSELIv9* included environmental affect/sensitivity variables that reflected efforts historically undertaken to conceptualize and refine the psychological construct of environmental affect/ sensitivity (self/family, outdoor nature activities, reading/watching media about nature/ environment, role models). This re-visit of the scale focused upon identifying a new approach for environmental affect that focused upon emotion. This approach was based on input from Carnegie Mellon University's Office of Student Assessment that suggested identifying the simplest and most powerful affective constructs at the heart of environmental sensitivity, building a bank of items, testing them, and conducting psychometric scaling analysis to identify scales that emerge from the data. The underlying theory was that environmental love and hate would be strong indicators of affect, based upon psychological studies that have confirmed that these "common sense" emotions elicit reliable responses. The items were also derived from the method developed by Meyers (2002) for studying beliefs about the environment. Carrying out these procedures resulted in a bank of 45 items, which were pilot tested with 134 freshman and sophomores in Belleville, IL, and then analyzed using psychometric scaling to identify scales that emerged from the data. The results were used to add two emotion items to the instrument. These items used a five-point Likert-type response format ranging from strongly agree to strongly disagree.

The *MSELS* also included several demographic items (age, grade, gender, and ethnic background). These items were included for data analysis and reporting purposes, e.g., allowing for a comparison of M/F responses at each grade level. Responses to items in all sections of the *MSELS* were recorded on Scantron forms rather than on the instruments themselves. Scantron forms were used to reduce the time requirement and potential for data entry errors associated with manual data entry.

A final test of the instrument was the determination of its readability using the Flesch Reading Ease and Grade Level Indexes. These indexes, based on the average number of syllables per 100 words and the average number of words per sentence, provide an estimate of how easily the writing can be understood. The Flesch Reading Ease score for the final instrument was 66.4, indicating a standard reading ease. The Grade Level Index correlated the reading ease to Grades six and seven. These estimates were deemed acceptable for the instrument.

In an effort to make the instrument more consistent in format, three of the subtests were re-named: Verbal Commitment became "What You Think About the Environment;" Actual Commitment became "What You Do About the Environment;" and the new emotion items became "How You Feel About the Environment." In addition, the name of the instrument itself was changed, from the *Middle School Environmental Literacy Instrument* to the *Middle School Environmental Literacy Survey (MSELS)*, in order to reflect the addition and refinement of scales and to differentiate this version from earlier versions. Appendix 5 contains the *MSELS.*

Table 4 (p. 19) provides an overview of the *Middle School Environmental Literacy Survey* and tracks the general environmental literacy components through to the items and scales used to operationalize these into measures. It includes the components/general conceptual variables, conceptual variables, scale names, the number of items in each scale used in the *MSELS* and the possible points for each scale.

Additional Estimates of Construct Validity and Reliability for Scales in the MSELS

Members of the Research Team took several steps to generate additional estimates of the construct validity and reliability of scales within the *MSELS*. The methods used to establish the construct validity of the cognitive scales differed from the methods used to do so for the non-cognitive scales (i.e., Verbal Commitment, Actual Commitment, and Environmental Sensitivity).

In our first attempt to establishing construct validity for the instrument, we used a contrasted groups comparison (Leeming et al., 1995). The basis for this was a comparison of the correlation between student scores on the pilot test version (*MSELIv9*) and the teachers'

Table 4.
Overview of the "Middle School Environmental Literacy Survey"

Components of Environmental Literacy (General Conceptual Variables)	**Specific Conceptual Variables**	**Parts of the *MSELS****	**Item Number**	**N Items**	**Poss. Pts.**
A. Ecological Knowledge	Ecological Knowledge	Part II: Ecological Foundations	5 - 21	17	17
B. Environmental Affect	Verbal Commitment (Intention)	Part III: How You Think About the Environment	22-33	12	60
	Environmental Sensitivity	Part V: You and Environmental Sensitivity	46-56	11	55
	Environmental Feeling	Part VI: How You Feel About the Environment	57, 58	2	10
C. Cognitive Skills	Issue Identification	Part VII.A: Issue Identification	59, 60, 67	3	29
	Issue Analysis	Part VII.B: Issue Analysis	61 – 66	6	
	Action Planning	Part VII.C: Action Planning	68 - 75	10	
D. Behavior	Actual Commitment (Pro-environmental Behavior)	Part IV: What You do About the Environment	34 - 45	12	60
	Age, grade, gender, ethnic/racial background	Part I: About Yourself	1 - 4	4	NA

* Parts II – VII are scales that measure environmental literacy variables; Part I was included on the *MSELS* to collect demographic information about the students.

perceptions of students' environmental literacy. Teachers of 95 sixth, seventh, and eighth grade students from the two pilot test locations were asked to rank the students into high, middle, and low groups as regards their environmental literacy. The scores of the middle group were dropped and the scores of the students ranked as high in environmental literacy (Steeleville, n = 23; Kaunakakai, n = 11) were compared against those of the students ranked as low in

environmental literacy (Steeleville, n = 22; Molokai, n = 9) on all scales of the instrument, as well as on the total instrument. The results of the t-test comparisons are presented in Table 5 (p. 20). Significant differences (p = .05) were observed between students ranked high in environmental literacy and those ranked low in environmental literacy on four of the seven scales of the instrument. The scales for which there is contrasted group validity are those that attempt to measure cognitive dimensions of environmental literacy (i.e., Ecological Knowledge, Issue Identification, Issue Analysis, and Action Planning). In addition contrasted group validity was also observed in the total scores on the instrument. However, contrasted group validity was not established for the Verbal Commitment, Actual Commitment and Environmental Sensitivity scales.

Table 5.
Results of T-test Comparisons of Sixth, Seventh, and Eighth Grade Students Ranked High in Environmentally Literacy by Their Teachers vs. Those Ranked Low in Environmental Literacy

Variable	Group	N	Mean	SD	t	prob
Ecological Knowledge	H	34	13.706	2.329	8.163	0.000*
	L	31	8.839	2.464		
Verbal Commitment	H	34	42.382	8.780	1.114	0.270
	L	31	39.935	8.910		
Actual Commitment	H	34	34.824	9.574	-0.181	0.857
	L	31	35.258	9.801		
Environmental Sensitivity	H	34	34.882	7.651	0.884	0.380
	L	31	36.731	7.029		
Issue Identification	H	34	1.880	0.810	2.269	0.027*
	L	31	1.320	1.140		
Issue Analysis	L	34	4.620	1.560	5.498	0.000*
	L	31	2.480	1.570		
Action Planning	H	34	10.235	5.129	3.629	0.001*
	L	31	6.161	3.882		
Total Test	H	34	142.529	22.267	2.755	0.008*
	L	31	127.097	22.823		

* significant at p = .05

In light of the inability of those contrasted group comparisons to detect differences on the non-cognitive scales, in part due to difficulties presented by self-reported data, a second method of analysis of those scales was undertaken using the 6th and 8th grade data from this national baseline study. This method was factor analysis, which is commonly used to explore construct validity of non-cognitive measures. Two forms of factor analysis were undertaken: (a) exploratory factor analyses were conducted for 6th grade data using SPSS' Principal Component and Varimax Rotation analyses; and (b) confirmatory factor analyses were conducted for 8th grade data using SPSS' Maximum Likelihood and Goodness-of-Fit analyses.

For Part III. How You Feel About the Environment (a 12-item verbal commitment scale), these factor analyses revealed that two eigenvalues for the 6th grade data set were greater than 1, while three values for the 8th grade data set were greater than 1.0. In each case, the eignenvalue for and variance explained by Factor 1 was substantially larger than for the other factors (Grade 6: Factor 1 eigenvalue = 4.519, and variance = 37.655%; Grade 8: Factor 1 eigenvalue = 4.481, and variance = 31.831%). In the confirmatory analysis using 8th grade data, the results of the Goodness-of-fit Test found that the one-factor model was clearly the best fit (Chi-square = 460.134, df = 54, $p < .000$), indicating that this scale was unidimensional. However, due to the presence of several factors with eigenvalues greater than 1, exploratory analyses were undertaken using 6th grade data. The results of a two-factor Varimax Rotation indicated that five items loaded on Factor 1, with r values ranging from .568 to .794 (Items 22, 28, 31, 32, and 33), five items loaded on Factor 2, with r values ranging from .475 to .700 (Items 23, 24, 27, 29, and 30), and two items loaded nearly equally on both factors, with r values ranging from .384 to .451 (Items 25 and 26). All five items in Factor 1 reflect a willingness to engage in persuasive and consumer/economic actions in public settings, while all five items in Factor 2 reflect a willingness to engage in ecomanagement actions in home or personal contexts (Peyton & Hungerford, 1980).

For Part IV. What You Do About the Environment (i.e., a 12-item actual commitment scale), these factors analyses revealed that three eigenvalues for the 6th grade data set were greater than 1.0, and three values for the 8th grade data set were greater than 1.0. The eignenvalue for and

variance explained by Factor 1 was substantially larger than for the other factors (Grade 6: Factor 1 eigenvalue = 3.466, and variance = 28.884%; Grade 8: Factor 1 eigenvalue = 3.692, and variance = 19.53%). In the confirmatory analysis using 8th grade data, the results of the Goodness-of-fit Test using 8th grade data found that the one-factor model was clearly the best fit (Chi-square = 480.567, df = 54, $p < .000$), indicating that this scale was also unidimensional. Again, due to the presence of multiple factors with eigenvalues greater than 1, exploratory analyses were undertaken using 6th grade data. The results of a two-factor Varimax Rotation indicated that six items loaded on Factor 1, with r values ranging from .369 to .745 (Items 34, 35, 38, 40, 41, and 43), four items loaded on Factor 2, with r values ranging from .405 to .716 (Items 36, 37, 42, and 45), and one item loaded nearly equally on both factors (Item 39). Of the six items that loaded on Factor 1, four reflect participation in persuasive actions (i.e., only Items 41 and 43 did not), while all four items in Factor 2 appear to reflect participation in ecomanagement actions in home or personal contexts. These results are highly consistent with those presented above for Part III. However, it should be noted that in the exploratory analysis, one item did not load on either factor (Item 44), and in the confirmatory analysis, while Item 44 did load on Factor 1, this r value was low (.326). Further, in the confirmatory analysis, Item 34 did not load on Factor 1. The results for these two items point to a need for further analysis and investigation.

Two different sets of factor analyses were undertaken for Environmental Sensitivity (i.e., for Part V. Environmental Sensitivity alone, and for Part V. and Part VI. Environmental Feeling on a combined basis). For Part V. Environmental Sensitivity (11 items), factors analyses using the 6th grade data revealed that three eigenvalues were greater than 1.0, and three values for the 8th grade data set were greater than 1.0. The eignenvalue for and variance explained by Factor 1 was substantially larger than for the other factors (Grade 6: Factor 1 eigenvalue = 3.322, and variance = 30.202%; Grade 8: Factor 1 eigenvalue = 3.431, and variance = 25.169%). In the confirmatory analysis using 8th grade data, the results of the Goodness-of-fit Test found that the one-factor model was clearly the best fit (Chi-square = 472.522, df = 44, $p < .000$). Again, due to the presence of multiple factors with eigenvalues greater than 1, exploratory analyses were undertaken using 6th grade data. The results of a two-factor Varimax Rotation using 6th grade data indicated that seven items loaded on Factor 1, with r values ranging from .379 to .718 (Items 46, 47, 51, 52, 51, 54, and 56), three items loaded on Factor 2, with r values ranging from .602 to

.711 (Items 48, 49, and 53), and one item loaded on both factors (Item 50). All four of the items that loaded on Factor 2 reflected time spent time recreating in the outdoors alone or with family, while all but one of the items (Item 51) that loaded on Factor 1 reflected self-estimates of personal/familial sensitivity or factors other than time in the outdoors that appear to influence sensitivity (Tanner, 1980; Peterson, 1981; Chawla, 1998).

When factor analyses were conducted for Parts V. and VI. combined (13 items) using the 6th grade data and the 8th grade data, the result for each analysis revealed three eigenvalues greater than 1. Further, in each analysis, the variance explained by Factor 1 was again largest (6th Grade, Factor 1 = 28.677%, and 8th Grade, Factor 1 = 22.581%). When a confirmatory analysis was run using items from Parts V. and VI., the results of the Goodness-of-fit Test using 8th grade data found that the one-factor model remained the best fit (Chi-square = 804.03, df = 54, $p < .000$). These results indicate that the Environmental Sensitivity scale was unidimensional even when items from Part VI. were added to the items in Part V. However, in both separate and combined confirmatory analyses, Item 49 did not load on this single factor. Again, exploratory analyses were undertaken using 6th grade data. The results of the Varimax Rotation analysis indicted that the three-factor model was the best fit to these data, and that the two items from Part VI. Environmental Feeling were the only items that loaded on Factor 3 (Item 57: .521; and Item 58: .347).

In summary, the results of the factor analyses for these parts of the *MSLES* (or scales) revealed that the one-factor model for each scale was the best fit, confirming that each scale was unidimensional. This means that each scale did indeed measure the one conceptual variable it was designed to measure, and that each scale may therefore be deemed a valid measure of that variable (or psychological construct) for this middle grades population. These results also indicated that very few items did not fit these one-factor models. As suggested above, these items require further analysis and investigation.

Finally, analyses of the reliability of *MSELS* scales were undertaken using the 6th and 8th grade data from this national baseline study. As was done with the *MSELI*(v 9), Cronbach's Alpha Coefficient was used for this purpose. The resulting Alpha coefficients ranged between .717 and .847. These reliability estimates approximate those obtained in the field test for *MSELI* (v9)

reported above, and were deemed to be acceptable. These results are presented on the next page.

Part II. Ecological Knowledge:	6^{th}, ∂ = .717	8^{th}, ∂ = .737
Part III. Verbal Commitment:	6^{th}, ∂ = .847	8^{th}, ∂ = .843
Part IV. Actual Commitment:	6^{th}, ∂ = .781	8^{th}, ∂ = .758
Part V. Environmental Sensitivity:	6^{th} ∂ = .749	8^{th}, ∂ = .764
Parts V. and VI. (combined)	6^{th}, ∂ = .778	8^{th}, ∂ = .783

Sampling Strategy

Two populations were involved in this national assessment: sixth grade and eighth grade students. These target populations consisted of all sixth graders and all eighth graders in the United States over the 2006-07 school year. Because it was not feasible to survey all students in either population, sampling methods were used to generate a sample that was representative of each target population. Intact classes of students served as the sampling unit. In research terms, these intact classes are referred to as clusters. Given this, stratified random sampling methods were used to identify clusters. This method increased the probability that each grade-level sample was representative of the population from which it was drawn (Frankel & Wallen, 2000, pp. 108-109). Each sample included about 1,200 students, or approximately 50 intact classes. One of the major barriers to stratified random sampling is access to and appropriate use of national statistics on students, schools, and communities. To overcome this barrier, the Steering Committee subcontracted with a nationally recognized survey research firm to generate, contact, and confirm stratified random samples of sixth and eighth grade classes. Discussions pursuant to this were initiated with Mr. David Lintern at GfK Roper in April 2005.

Recruitment of Participating Schools

GfK Roper was contracted to develop a sampling strategy to identify the number and location of schools, staff and students for the surveys. Together, we developed a stratified random sampling strategy that included identifying 51 counties demographically representative of the U.S. and selecting a school in each county. Each school was to have two to four classes, balanced

between 6th and 8th graders, for a total of approximately 5000 students. GfK Roper identified the appropriate counties, then recruited schools, scheduled the test administration date, and informed the Assessment Coordinator when each school was secured. To provide incentives for each school's participation, $500 was promised (and contracted) to each for their successful participation (e.g., completing and returning each of the four surveys). During the highly iterative process of identifying schools, GfK Roper was not able to identify a willing school in 14 of the original counties. Thus, this agency selected new counties that fit the demographic profile and recruited schools in those counties. In two cases, this process was elongated to a point in the school year where data collection would have compromised the reliability of the results, so data were not collected. In a third case, the data collected was completed but the data set was lost. Data were collected and analyzed for 48 schools. For a full account of the sampling process see the GfK Roper Report in Appendix 6.

Data Collectors

An Assessment Coordinator (Dr. Ron Meyers), oversaw all aspects of data collection, with the support a team of On-Site Data Collectors. The responsibilities of this team included distribution and collection of: (a) Parental Consent Forms; (b) School, Program, and Teacher Information Form and Student Demographic Form; and (c) copies of the *MSELS* and Scantron forms on which students' responses were recorded. All completed forms were shipped to Dr. Marcinkowski at Florida Institute of Technology for data entry and analysis purposes. Details on data collection and related matters can be found in Appendix 7.

Data Collector Recruitment, Selection and Training

This study utilized a strategy of recruiting, selecting and training environmental educators to administer the survey. Each Data Collector was provided $400 stipend for each school surveyed to cover any expenses related to the project. Recruitment was conducted in several ways. On behalf of the research team, the NAAEE included a request for applicants to be data collectors in their monthly e-newsletter and on the homepage. Flyers were handed out to NAAEE members at the 2006 annual conference in several venues. Emails were sent to the membership lists of the

NAAEE Research Commission. These requests were forwarded to a number of NAAEE state affiliates and other science and education mailing lists, generating over 100 potential data collectors. All potential data collectors indicated some experience in environmental education and interest in supporting this study. Data Collectors were selected based upon that experience and interest, their proximity to the selected counties and/or schools, and finally, order of application. Of the 51 counties that were identified by GfK Roper, 35 were matched with a data collector from this original pool of applicants. Additional recruitment efforts identified data collectors for the unmatched counties and replacement counties that were identified by GfK Roper. Forty-five Data Collectors were eventually utilized.

Data collectors were prepared using several methods. A variety of materials was prepared to explain the data collection procedures, including a FAQ sheet, guidelines and procedures (see Appendix 8). These were made available to data collectors in the "Initial Contact Packet for Data Collectors" and the "Data Collector's Kit." A password-secured website was constructed on the NAAEE website, with all materials, including those given to the schools and teachers; and data collectors were asked to review those materials. The website was quite useful, as it enabled access by data collectors and principals to any project materials through the internet. This proved very useful in the few instances where materials were misplaced. The website included two discussion boards, one for data collectors and one for school administrators to post questions and comments. The boards were functional until midway through the data collection period (April to June 2007) but were little utilized. Feedback from the data collectors indicated that their training and preparation could be accomplished within a few hours. The majority of the feedback received from data collectors through email and telephone conversations indicated that the procedures were rather lengthy but very clear and helpful.

Data Collection Methods

Teacher Consent Form

Teachers were provided a letter explaining the project and a consent form. If teachers had issues with completing the Teacher Information Form, they were asked to discuss it with their administrator (see Appendix 2).

Parental Consent Forms

Two types of Parental Consent Forms were developed and used to ensure that the research conformed to ethical guidelines and to Department of Health and Human Subjects Revised Regulations that pertain to all forms of human subjects research involving minors (see Appendix 3). Each student in each class within the study samples was required to take this Parental Consent Form home to a parent or guardian. Students participated in the survey if and when a parent or guardian completed, signed, and returned this form. This is commonly referred to as "active consent" (Fraenkel & Wallen, 2000, pp. 48-49; Ary, Jacobs, & Razavieh, 2002, pp. 438, 510). However, some states, school districts, and schools regularly make use of "passive consent" forms and/or procedures. In these cases, parents or guardians are asked to complete, sign, and return the form only if they do not want their children to participate. All non-responses by parents are viewed as offers of their consent. Passive consent procedures were followed when a school's principal recommended their use.

Administration of Surveys

The surveys were administered between April 18 and June 5, 2007. Five were administered in later part of April, 16 in the first two weeks of May, 22 in the latter part of May, and four in the first week of June. The administration of the *MSELS* this late in the school year allowed the research team to capitalize on optimum student maturity and curricular impact in participating schools.

The School Information Forms were completed by school administrators or their designees; Program Information Forms were completed by the teacher(s) most familiar with the program; and Teacher Information forms were completed by the classroom teacher(s) of the classes being surveyed. Most of the forms were completed prior to or on the day of data collection. Two schools did not return completed School Information, Program Information, and Teacher Information Forms.

All student surveys were administered during regularly scheduled classes, most with multiple classes in a school cafeteria or library. As instructed in the Data Collector Guidelines and

Procedures, each Data Collector traveled to the school, tried to meet with the principal prior to the survey to review procedures, and checked the survey administration site to ensure suitability (e.g., that it is quiet, with a comfortable temperature, and so on).

The teachers introduced the data collector to the students using the script provided to them, and the data collectors introduced themselves and the purpose of the survey using a script provided to them (see Appendices 2 and 8). The Data Collectors brought the surveys along with pencils and Scantron response sheets to the school sites. They distributed these materials to the students, and remained in the classroom to answer questions and collect the materials when surveys were completed. The teachers also remained in the classroom to help maintain classroom order. Students, whose parents declined permission, were given an alternate activity in another classroom. In general, the standard 45 - 50 minute classroom period was sufficient to administer and complete the survey and Data Collectors reported that the administration of the surveys went smoothly.

It should to be noted that the timetable, as conceived by the Research Team, provided the Assessment Coordinator with 8-12 weeks between the time of his being informed of the school selection and the administration of the surveys. In reality, a period of about three weeks or less was provided. Because of the power of the NAAEE network, and the set of materials developed by the Research team, we were able to meet an extremely accelerated timetable in all but a few cases.

Data Entry, Formatting, Editing, and Analysis Methods

This description of methods was adapted from the report submitted by Dr. Tom Marcinkowski in October 2007 (see Appendix 9).

Organization and Provision of Data Files

The Data Collectors were asked to collect and return all documents to the Assessment Coordinator. Each set of materials was then checked for completeness. If documents were missing, the Assessment Coordinator or his assistant, Erica Fitzhugh, contacted the Data

Collector to develop a plan for obtaining the information. The 49 schools where the surveys were administered yielded 48 complete sets of student surveys (i.e., one set of data was lost in transit) and 47 complete sets of School, Program, and Teacher Information Forms (i.e., one set of data was lost in transit and two schools failed to return these forms). The schools with missing documentation were contacted repeatedly; however, the documentation was not forthcoming. All materials were sent to Dr. Tom Marcinkowski at Florida Tech.

Reading Scantron Responses Into Text Files

Dr. Marcinkowski provided Mr. Britt Martin, the Lead Technician with the Technology Support Center at Florida Tech, with a file folder for each school, which included information about the nature and number of responses contained on the Scantron forms. Using the scoring protocol for the *MSELS,* Mr. Martin prepared a script to read responses from the Scantron forms into a text file. The Scantron forms were prepared for machine reading (e.g., erasing incompletely erased responses and stray pencil marks) and the text file for each set of Scantron forms was labeled by school and by grade level (e.g., School 1 – 6 and School 1 -8).

Mr. Martin read each 6^{th} and 8^{th} grade data set into the Scantron reader. Forty-seven schools were large enough to warrant separate files for each sixth and eighth grade sample. For one small school, both sixth and eighth grade responses were reported within a single text file. This resulted in 95 text files, which were then imported into MS Excel spreadsheets creating a second set of 95 data files. The MS Excel files were checked against matching text files for accuracy.

Identification and Designation of Unusable Responses

During the process of matching data records (in data files) to Scantron forms (in file folders), it became apparent that there were several problems with data records. First, in some instances, students left blank all items within one or more sections of the *MSELS*. These were deemed missing responses. Second, in other instances, students responded to some items and left other items blank within a given section. When the number of blanks in a given data record is relatively large, this would adversely affect the calculation of scores and analysis of data. As a

result, members of the research team determined that if 25% or more of the possible responses in any section were not completed, the section would be deemed unusable and all responses within that section were treated as missing responses. The specific criteria used were as follows:

- II. Ecological Foundations (Items 5-21, or 17 items): four or more blanks;
- III. How You Think About the Environment, a measure of willingness or intention (Items 22-33, or 12 items): three or more blanks;
- IV. What You Do About the Environment, a measure of service and action (Items 34–45, or 12 items): three of more blanks;
- V. You and Environmental Sensitivity, a measure of psychological and experiential dimensions of sensitivity (Items 46-56, or 11 items): three or more blanks;
- VI. How You Feel About the Environment, a measure of attitudes toward or emotional connection to the environment (Items 57-58, or 2 items): one or both blank;
- VII.A. Issue Identification (Items 59, 60, 67, or 3 items): one or more blank; and
- VII.B. Issue Analysis, a measure of one's ability to identify values associated with stances on issues (Items 61-66, or six items): two or more blank.

The only exception to this rule was for the last section in the *MSELS*, VII.C. Action Planning, a measure of student ability to select action strategies (Items 68-75). Students were asked to select the two best action strategies on the Scantron sheet. As long as students selected at least one action strategy, their response was deemed acceptable.

Third, in some instances, student response sets were problematic. Two common problems with response sets were: (1) sequencing responses diagonally on the Scantron sheet to look like a Christmas tree (e.g., 1st item = A, 2nd Item = B, 3rd Item = C, 4th Item = D, and so on) and (2) selecting the same lettered response producing a straight line on the Scantron sheet for all items in a given section (e.g., all "a" or all "e"). In all cases, response patterns that resembled the Christmas tree response sets on one or more sections of the *MSELS* were deemed invalid and therefore unusable. Similarly, response sets that presented a straight-line pattern were determined invalid and unusable except for Section V. In this section, You and Environmental Sensitivity, this pattern of response was acceptable.

All missing responses and responses deemed unusable were highlighted in the MS Excel data files using yellow fill. This was done to make it easy to find and delete unusable responses during later phases of data preparation.

Conversion of Alpha Responses to Numeric Data

Previous steps taken to organize the data involved the use of alphabetic (alpha) data read into data files from completed Scantron forms. However, alpha data are not usable in quantitative analyses so they were converted from an alpha to a numeric form. Negatively worded items had to be coded for reverse scoring (i.e., A=5, B=4, C=3, D=2, E=1). Selected responses for Items 68-75, were coded with a "1" to avoid inflating student scores.

Treatment of Missing Responses

While the data records with 25% or more missing responses were identified and deemed unusable, there were still a rather large number of data records in which there was a smaller number of missing responses (blanks). Missing response, or blanks, in the data record for a given scale can reduce student scores for that scale and, in doing so, affect summary statistics (i.e., reduce scores in proportion to the number of blanks). To reduce, but not eliminate, the effects of this smaller number of missing responses on student scores and results, a form of multiple imputation commonly referred to as "hot deck imputation" (HDI) was used. The final 6^{th} and 8^{th} grade MS Excel master data files were distributed to the University of Connecticut's Center for Survey Research and Analysis (CSRA) for weighting and data analysis.

Data Analysis Methods

In order to accomplish the weighting of data and analysis of weighted data, we enlisted the assistance of personnel at the Center for Survey Research and Analysis (CSRA) at the University of Connecticut. A statistical software package was selected by CSRA to calculate individual student scores for each section of the *MSELS* and personnel at CSRA completed the first and second of the planned analyses of weighted scores (e.g., the range, median, mean, standard deviation for each section of the *MSELS*). For the third planned analysis, Dr. Meyers ran a comparison of 6^{th} vs. 8^{th} grade data using SPSS. For the fourth planned analysis, Dr. Marcinkowski, Mr. Richard Santangelo, and Ms. Katie Guzmon entered responses on School, Program, and Teacher Information Forms into MS Excel spreadsheets, and then used content

analysis methods to generate frequency counts. Several additional analyses were conducted. Dr. Meyers and Dr. McBeth generated the composite scores for Research Questions #2. Dr. Marcinkowski and Dr. Meyers carried out the charting of scores for those schools that had some type of environmental program. Personnel from CSRA reported the frequency distribution of responses that appear in, and that were used by Dr. Marcinkowski to prepare item difficulty charts for the Results section of this report. Finally, Mr. Matthew Merbedone and Dr. Marcinkowski conducted the factor analyses of *MSELS* scales reported earlier in this section.

Preparation of Composite Environmental Literacy Scores

Members of the research team spent considerable time over the course of this project discussing the pros and cons of calculating and reporting a single composite "environmental literacy score" for the 6th and 8th grade sample from each participating school. The cons included the fact that the components of environmental literacy measured by the *MSELS* reflected different Conceptual Variables (i.e., cognitive knowledge and cognitive skills, affect, and behavior), and that each measure included a different number of items and each resulted in a different range of possible raw scores. From this perspective, the calculation of composite scores would combine different kinds of learning and growth, and had the potential to mask smaller but noteworthy differences in measures with smaller raw scores. On the other hand, the pros included past and ongoing requests from educational policy makers, administrators, and practitioners for a single score. The team decided to calculate and include a composite environmental literacy score, as seen in Table 2 (p.xiii), Table 26 (p. 70), and Table 34 (p.90).

While this procedure might satisfy the concern associated with unequal points and permit the researchers to provide a composite score, it does not address all concerns. Thus, the members of the research team also agreed to report (Table 6, p. 33) the range of possible scores, the multipliers, and the adjusted scores in order to demonstrate how the adjusted scores were derived. In summary, 6^{th} and 8^{th} grade mean scores were used to prepare grand means for each scale. The grand means for the scale or scales related to each of the four Conceptual Variables (noted above) were combined and multiplied by a multiplier (a weighting factor) to yield a

maximum possible adjusted score of 60 for each of the four Conceptual Variables. In turn, these four weighted scores were summed to yield a maximum possible total or composite score of 240.

Table 6.
Methods Used to Transform Raw Scores on MSELS Variables into Adjusted Scores

Components of Environmental Literacy (General Conceptual Variables)	**Specific Conceptual Variables**	**Parts of the *MSELS***	**Item Number**	**N items**	**Range of Possible Scores**	**Multiplier**	**Adjusted Score**
A. Ecological Knowledge	Ecological Knowledge	Part II: Ecological Foundations	5 - 21	17	0-17	3.529	60
B. Environmental Affect	Verbal Commitment (Intention)	Part III: How You Think About the Environment	22-33	12	12-60	0.5	30
	Environmental Sensitivity	Part V: You and Environmental Sensitivity	46-56	11	11-55	0.4615	25
	Environmental Feeling	Part VI: How You Feel About the Environment	57, 58	2	2-10	0.4615	5 60
C. Cognitive Skills	Issue Identification	Part VII A : Issue Identification	59, 60, 67	3	0 – 3	6.67	20
	Issue Analysis	Part VII B: Issue Analysis	61 – 66	6	0 – 6	3.33	20
	Action Planning	Part VII C: Action Planning	68 - 75	1	0 - 20	1.00	20 60
D. Behavior	Actual Commitment (Pro-environmental Behavior)	Part IV: What You do About the Environment	34 - 45	12	12 - 60	1.00	60
			Total	**68**	**37- 231**		**240**

Overview of Study Limitations

The major limitations of this study are described below.

- Of the original 51 counties, usable data were collected from schools in 34 of these counties, and from schools in 14 replacement counties. Data were not available for analysis from schools in three of the original counties.

- There is evidence that surveys administered to school children late in the academic year can impact the validity and reliability of the results. On the one hand, the research team made a conscious decision to conduct the survey in the Spring semester to ensure the maximizing of educational and developmental impacts on the subjects. On the other hand, this decision ran the risk of compromising the validity and reliability of collected data because of this late year scheduling of data collection.

- Two errors in the instrument were found during the early administrations of the *MSELS* to students. Item 9, a multiple-choice item, included only three lettered response options, leaving off the fourth ("b"), but did include the correct response. Items 57 and 58, Likert-type items, included "Strongly Agree" at both ends of the response continuum when one end of the continuum for each item should have read "Strongly Disagree." After consideration of how to correct the items, it was determined by the team that correcting the error on 5000 surveys, many of which had already been sent, would be too difficult to attempt. Instead, data collectors were advised of the errors and were sent a revised script to read to students to correct the errors on their survey. The errors were noted for follow-up during data analysis, when we would examine the responses to assess if the item reliabilities had been compromised. During the preparation of the data sets for analysis, there appeared to be instances in which the error on Items 57 and 58 could have impacted the data.

- A sizable number of the responses on the last section of the survey, *Action Planning*, were either completed inappropriately or missing. This could have been due to test fatigue, to the inability of students to follow directions, or to time constraints caused by improper survey administration. The incomplete data lead to this section of the survey

being useful only for the aggregate Grade 6 and Grade 8 results and the Environmental Literacy Composite score. These data were unusable in all other calculations.

- The random nature of the sample required extensive coordination between GfK Roper, the Data Coordinator, Data Collectors, and school district personnel. In some instances, the Data Coordinator had only days to identify a Data Collector and connect her with the school district being surveyed. In these cases, communication became challenging causing a lack of readiness for survey administration.

- In some cases school districts either did not submit or did not complete School, Program, and/or Teacher forms, reducing the data available to describe the sample and to conduct exploratory, multivariate analyses.

III. RESULTS

Description of the Sample

As described in II. Methodology, GfK Roper was contracted to generate a random sample of counties, schools, and classes for this study using a multi-stage sampling design. However, the sampling information available to and used by GfK Roper was proprietary and therefore unavailable to the research team. To permit the research team to describe these schools and classes, surveys were developed and used to gather information about the schools in the sample, programs in which students in the sample participated, and selected teachers with whom they worked (see Appendix 4). In addition, several demographic items were included in Part I of the *MSELS*. Thus, the research team accumulated and will report information on the counties, schools, teachers, and students included in the final study sample.

Counties

In the first stage of GfK Roper's multi-stage sampling design, GfK Roper generated a probability-proportional sample of 50 counties, and later added a 51st county. These 51 counties were located in 30 states. In 34 of these 51 counties, GfK Roper personnel were able to obtain a commitment to participate from the administrator in at least one school that appeared on their list of candidate schools for that county (Table 7, pp. 37-38).

In 14 of the 51 counties, GfK Roper personnel identified a replacement county with comparable demographics. In all but two cases, the replacement county was from the same state as the original county. These exceptions were the replacement of Montague County, TX with Saline County, AR, and Maricopa County, AZ with Bernalillo County, NM. In each of these 14 replacement counties, GfK Roper personnel were able to secure a commitment to participate from the administrator of one school in the county (Table 7, pp. 37-38).

Data collection in three of the original 51 counties proved problematic. First, one of the original counties was identified for participation in late spring (Otero County, NM). However, none of the schools on GfK Roper's list of candidate schools for this county indicated a willingness to

Table 7.
The GfK Roper Sample of Original and Replacement Counties, by State

States	Original Counties	Replacement Counties	Counties From Which Data Were Collected And Analyzed
AL	Jefferson	Madison	Madison, AL
AZ	Maricopa	Bernalillo, NM	Bernalillo, NM
CA	Contra Costa		Contra Costa, CA
CA	Los Angeles		Los Angeles,CA
CA	Los Angeles		
CA	Riverside		Riverside, CA
CA	San Diego		San Diego,CA
CA	Solano		Solano, CA
CO	Lake	Weld	Weld, CO
FL	Baker	Flagler	Flagler, FL
FL	Broward		Broward, FL
FL	Hillsborough		Hillsborough, FL
FL	Miami-Dade		Miami-Dade, FL
FL	Polk		Polk, FL
GA	Coweta		Coweta, GA
GA	Lee		Lee, GA
ID	Ada		Ada, ID
IL	Cook		Cook, IL
IL	Madison		Madison, IL
IN	Jefferson		Jefferson, IN
KY	Boyd		Boyd. KY
LA	Evangeline		Evangeline, LA
MA	Middlesex		Middlesex, MA
MD	Carroll	Frederick	Frederick, MD
MI	Berrien	Calhoun	Calhoun, MI
MI	Oakland		Oakland, MI
MN	Hennepin		Hennepin, MN
MO	St Louis		
NC	Cabarrus	Columbus	Columbus, NC
NC	New Hanover		New Hanover, NC
NH	Belknap	Grafton	Grafton, NH
NJ	Mercer	Middlesex	Middlesex, NJ
NM	Otero		
NY	Chemung		Chemung, NY
NY	Monroe	Niagara	Niagara, NY
NY	Queens		Queens, NY

Table 7. (continued)

OH	Allen	Clark	Clark, OH
OH	Licking		Licking, OH
OK	Oklahoma		Oklahoma, OK
PA	Allegheny		Allegheny, PA
PA	McKean	Schuykill	Schuykill, NY
SC	Beaufort		Beaufort, SC
TN	Cumberland		Cumberland, TN
TX	Angelina		Angelina, TX
TX	Dallas		Dallas, TX
TX	Harris		Harris, TX
TX	Montague	Saline, AR	Saline, AR
VA	Alexandria	Arlington	Arlington, VA
VA	Roanoke City		Roanoke City, VA
WA	Pierce		Pierce, WA
WI	Racine		Racine, WI

* Note: Italicized states and counties indicate schools that were selected as part of the sample, but that did not participate in the study.

participate in response to phone calls from GfK Roper personnel, and it became too late in the school year to identify and recruit a replacement county. Second, a school in another of the original counties did respond and did agree to participate in the study (Los Angeles County, CA). However, this willingness to participate was communicated very late in the school year. The research team decided not to include this county due to possible threats to validity and reliability that might arise when surveying students at the very end of the school year. Third, a school in another of the original counties did respond and did agree to participate (St. Louis County, MO). The data were collected from this school, but were misplaced in transit from the Data Collector to the Assessment Coordinator.

In summary, the administration of the *MSELS* to sixth and eighth grade students yielded usable sets of data from 48 counties representing 48 school districts (Table 7, above). The three problematic counties mentioned above are included in this table.

Schools

Sixth and eighth grade classes in 48 schools participated in this study. Of these, 46 schools reflected all intended study parameters, although two contained ungraded classes. Information about these 48 schools was obtained from the School Information Forms submitted by each school, as well as from the U.S. Department of Education's NCES database <http://nces.ed.gov/globallocator>.

As indicated in Table 8 (p. 40), this sample of 48 schools included 32 public schools (67%), 2 private independent schools (4%), and 14 private religious schools (29%). Of these 32 public schools, nearly all were regular public schools. There was only one magnet school, one charter school, and one school of choice.

As of 2007, the U.S. Department of Education's NCES database included both the older system for categorizing schools on the basis of their location and community size, as well as the newer system. The distribution of schools using the older categorization system, as verified against the NCES database, is reported in Table 8. The largest number was located in the fringes of large cities (n=16; 33%), and then in mid-sized cities (n=9; 19%), as is apparent in the sample of counties reported above.

These 48 schools reflected different grade level configurations. The greatest number of participating schools was for "true" middle schools that included grades 6-8 (n=22; 46%). There were also several schools that included grades 5-8 and 6-9 (n=3; 6%). Nearly all of these were public schools. The next greatest number of schools included more traditional, K-8 or 1-8 elementary schools (n=15; 31%). The sample also included several combinations of elementary, middle, and/or secondary schools; i.e., K-9, 5-12, or 6-12 (n=3; 6%), and several comprehensive K-12 schools (10%).

A school's total enrollment can be influenced by both location (NCES Category) and the range of grade levels it serves (Grades). The total enrollment of schools is one indication of the relative number of 6^{th} and 8^{th} grade classes and students from which a sample could be drawn

Table 8.
Selected Educational Characteristics of Schools Included in the Study Sample (n=48)

Type of School	**n**
Public	
Regular	29
Magnet	1
Charter	1
School of Choice	1
Private, Independent	2
Private, Religious	
Baptist	1
Catholic	8
Lutheran	3
Other Christian	2

NCES Category	**n**
Large City	5
Mid-Sized City	9
Fringe, Large City	16
Fringe, Mid City	4
Large Town	2
Small Town	4
Rural, Outside MSA/CBSA*	3
Rural, Inside MSA/CBSA*	5

Grade Level Configuration	**n**
K-8	14
K-9	1
K-12	5
1-8	1
5-8	2
5-12	1
6-8	22
6-9	1
6-12	1

Enrollment	**n**
Under 100	2
100-199	6
200-299	5
300-399	4
400-499	4
500-599	3
600-699	5
700-799	5
800-899	3
900-999	3
1000-1099	2
1100-1199	1
1300-1399	1
1400-1499	1
1700-1799	1
1800-1899	1
1900-1999	1

Student:Teacher Ratio	**n**
10:1	2
12:1	2
13:1	4
14:1	3
15:1	5
16:1	6
17:1	3
18:1	4
19:1	1
20:1	3
21:1	1
22:1	3
24:1	2
26:1	2
27:1	2
28:1	2
29:1	1
30:1	1
31:1	1

* Note: MSA/CSBA stands for Metropolitan Statistical Area/Core Based Statistical Area, and refers to large or mid-sized cities.

(e.g., virtually all 6th and 8th graders in very small schools vs. 1/10th of 6th and 8th graders in very large schools). Schools in the sample varied substantially on total enrollment; the smallest total enrollment figure was 60 and the largest was 1900. More specifically, the smallest 6th grade enrollment was 7, and 8th grade enrollment was 6, while the largest 6th grade enrollment was 493 and 8th grade enrollment was 664.

One of the general indicators used commonly to describe schools and the nature of instruction in a school is the student: teacher ratio (i.e., the ratio of all students to all teaching personnel in a school). In theory, lower ratios indicate that there is greater potential for increased contact between teachers and students, and for more personalized instruction. Very large ratios indicate that the potential for this kind of contact and instruction is decreased. The student: teacher ratios for schools in this sample ranged from a low of 10:1 to a high of 31:1. As a whole, 30 schools reported ratios smaller than 20:1 (63%).

Another way of characterizing the schools that constituted the study sample is by describing the student population attending each school. As indicated in Table 9 (p. 42), in 29 of these 48 schools (62%), 70% or more of the student population consisted of White, Non-Hispanic students. This stands in contrast to the fact that only one school had a student population that consisted of 70% or more Hispanic students, and one other school contained a student population with this same percentage of Black, Non-Hispanic students. This table also clearly indicates that the two ethnic groups that were least represented in the 48 schools in the study sample were students of Asian/Pacific Islander descent and American Indian/Alaskan Native descent. In only seven schools was 5% or more of the student population of Asian/Pacific Islander descent, and in only one school was 5% or more of American Indian/Alaskan Native descent.

Data were also collected on the Social Composition of the schools in this study. Seventy-five percent of the schools had students involved in the free lunch program and sixty-four percent had students involved in the reduced lunch program. Only two schools (4%) reported a migrant population and 17 schools (35%) reported students who qualified for limited English Proficiency (LEP) or English as a Second Language (ESOL) programming. Eighteen schools (38%) reported having students eligible for support under the federal Individuals with Disabilities Education Act

Table 9.
Selected Ethnic and Social Characteristics of Schools Included in the Study Sample (n=48)

Ethnic Composition of Schools

Percent	Am. Indian/ AK Native	Asian/ Pacific Isl.	Hispanic	Black Non-Hispanic	White Non-Hispanic
0 or NR	20	8	2	5	0
<1%	20	14	8	11	0
1-5%	7	19	19	11	0
6-10%	0	5	4	5	2
11-20%	1	2	5	7	2
21-30%	0	0	2	4	5
31-40%	0	0	3	3	1
41-50%	0	0	1	0	3
51-60%	0	0	0	1	3
61-70%	0	0	3	0	3
71-80%	0	0	1	1	7
81-90%	0	0	0	0	7
>90%	0	0	0	0	15

Social Composition of Schools *

Percent	Free Lunch	Reduced Lunch	Migrant	LEP/ ESOL	Fed. IDEA	Spec. Needs
0 or NR	12	17	46	31	30	30
<1%	2	0	2	7	2	1
1-5%	3	10	0	4	1	2
6-10%	2	8	0	3	6	4
11-20%	6	8	0	2	9	9
21-30%	7	1	0	0	0	0
31-40%	5	3	0	1	0	1
41-50%	6	0	0	0	0	1
51-60%	1	0	0	0	0	0
61-70%	1	0	0	0	0	0
71-80%	2	0	0	0	0	0
81-90%	0	0	0	0	0	0
>90%	0	0	0	0	0	0

* Note: One school combined its reported percentages of free lunch- and reduced lunch-eligible students, so the "n" for these columns is 47.

(IDEA) and the same number of schools (18 or 38%) reported having students with special needs.

Teachers

Teachers who taught in the 6th and 8th grade classes selected to participate in this survey were asked to fill out and return a Teacher Information Form. A total of 93 teachers from 47 of the 48 schools in the sample returned completed or nearly completed Teacher Information Forms. Data from those forms are reported in Table 10 (p. 44) and Table 11 (p. 45).

Teachers were asked to respond to three demographic items; gender, age, and ethnic background. The number of females in both the 6th grade teacher sample (n=35; 75%) and 8th grade teacher sample (n=28; 61%) was substantially larger than was the number of males. Teacher age in both samples ranged from 21-60. Of the teachers who completed the item on ethnic background, a substantial majority in both the 6th grade sample (n=44; 94%) and 8th grade sample (n=40; 93%) indicated that they were White, Non-Hispanic.

Teachers were also asked to respond to an item pertaining to their educational background (i.e., degrees earned). In the 6th grade sample, most teachers indicated that they had earned either a Bachelors degree (n=26; 55%) or Masters degree (n=17; 36%). In the 8th grade sample, most teachers indicated that they had earned a Bachelors degree (n=23; 50%) or a Masters degree (n=14; 30%); five of these teachers (11%) indicated that they had earned a "Masters Plus 30" degree.

Finally, teachers were posed several questions about their teaching credentials and teaching experience. One item pertained to the teaching credentials these teachers had earned. Eighty-nine percent of 6th grade teachers and 87% of 8th grade teachers in the sample indicated that they were certified to teach. A more careful analysis of these data revealed that none of the teachers who were uncertified or working toward certification were teaching in public schools in the study sample

Table 10.
Self-Reported Characteristics of Grade 6 Teachers Whose Classes were Included in the Study Sample (n=47)

Teacher Demographics

Gender	
N/A	0
Female	35
Male	12

Age	
N/A	0
<21	0
21-30	11
31-40	13
41-50	8
51-60	13
>60	2

Ethnicity	
N/A	0
Native Am./AK Native	0
Asian/Pacific Islander	1
Hispanic	0
Black, Non-Hispanic	2
White, Non-Hispanic	44
Biracial	0
Multiracial	0

Educational Background

Highest Degree	
N/A	1
Bachelor	26
Masters	17
Masters+30	2
Specialist	0
Doctorate	0
Other	1

Teaching Credentials and Experience

Teacher Certification	
N/A	0
Yes	42
Working Toward	3
No	2

Years	Total Years of Teaching	Years at Middle Level
N/A	0	1
<1	1	1
1-5	17	17
6-10	15	14
11-15	5	5
16-20	5	5
>20	4	4

Current Teaching Position

Grades	
N/A	0
6-8	39
6-8 + Lower Grades	7
6-8 + Higher Grades	1
6-8 + Lower & Higher Grades	0

Subject Areas*	
N/A	0
Science	34
Social Studies/History	11
Language Arts/English	14
Mathematics	13
Health/PE	1
Computers	2
Agriculture	1
Leadership	1

N/A = No Answer

- Note: The frequencies in this column total to more than the n size of this sample because numerous teacher-respondents indicated that they taught two or more school subjects.

Table 11.
Self-Reported Characteristics of Grade 8 Teachers Whose Classes were Included in the Study Sample (n=46)

Teacher Demographics

Gender	
N/A	3
Female	28
Male	15

Age	
N/A	3
<21	0
21-30	6
31-40	13
41-50	11
51-60	10
>60	3

Ethnicity	
N/A	3
Native Am./AK Native	0
Asian/Pacific Islander	0
Hispanic	1
Black, Non-Hispanic	1
White, Non-Hispanic	40
Biracial	1
Multiracial	0

Educational Background

Highest Degree	
N/A	4
Bachelor	23
Masters	14
Masters+30	5
Specialist	0
Doctorate	0
Other	0

Teaching Credentials and Experience

Teacher Certification	
N/A	2
Yes	40
Working Towards	2
No	2

Years	Total Years of Teaching	Years at Middle Level
N/A	0	0
<1	0	0
1-5	8	11
6-10	10	10
11-15	9	11
16-20	5	7
>20	14	7

Current Teaching Position

Grades	
N/A	2
6-8	32
6-8 + Lower Grades	5
6-8 + Higher Grades	6
6-8 + Lower & Higher Grades	1

Subject Areas*	
N/A	0
Science	23
Social Studies/History	10
Language Arts/English	10
Mathematics	11
Health/PE	3
Computers	2
Agriculture	1

N/A = No Answer

- Note: The frequencies in this column total to more than the n size of this sample because numerous teacher-respondents indicated that they taught two or more school subjects.

Several items pertained to the number of years these teachers had been teaching. Among this sample of 6th grade teachers, 33 (70%) had taught for 10 years or less, while 14 (30%) had taught for more than 10 years. This sample of 8th grade teachers had more teaching experience. Fewer teachers had taught for 10 years or less (n=18; 39%), and a greater percentage (n=28; 61%) had taught for more than 10 years. Of the latter, 14 of the 8th grade teachers (30%) had taught for more than 20 years, the longest of which was 40 years.

Lastly, teachers were asked several questions pertaining to their current teaching positions. With respect to the grade level(s) at which they were currently teaching, a substantial majority of 6th grade teachers (n=39; 83%) and 8th grade teachers (n=32; 70%) indicated that they taught exclusively in grades 6-8 (i.e., middle schools). With respect to subject areas, a majority of 6th grade teachers reported that they taught Science (n=34; 72%). Among 8th grade teachers, one-half indicated that they taught Science (n=23; 50%). Other subjects represented were Social Studies, Math, Language Arts/English, Health/PE, Computers, Agriculture, and Leadership.

Toward the end of the Teacher Information Form, members of the research team included two items pertaining to teacher perceptions of environmental education and three items pertaining to teacher perceptions of the environment. As indicated in Table 12 (p. 47), a sizable majority of both 6th and 8th grade teachers indicated that it was either "considerably" or "extremely" important that K-12 students were exposed to EE (6th: n=37, 79%; 8th: n=37, or 80%) and that EE was "considerably" or "extremely" important to them personally (6th: n=39, or 83%; 8th: n=35, or 76%). On the item pertaining to teachers' level of environmental sensitivity, a greater percent of 6th grade teachers rated themselves as "considerably" or "extremely" sensitive (n=39; 83%) than did 8th grade teachers (n=32; 70%). On the item pertaining to teachers' level of environmental concern, the response pattern for considerable or extreme concern was similar (6th: n=41, 87%; and 8th: n=35,81%). However, on the item pertaining to teachers' level of active involvement in environmental protection efforts in their community/region, fewer teachers rated themselves as "considerably" or "extremely" active (6th: n=10, 21%; 8th: n=7, 15%).

Table 12.
6th and 8th Grade Teachers' Perceptions of Environmental Education and of the Environment

Teacher Perceptions of Environmental Education

	#9a: Importance of Exposing K-12 to EE		#9b: Importance of EE to You	
	Grade 6-Grade 8		Grade 6-Grade 8	
Teacher Ratings	n	n	n	n
N/A	2	3	2	3
1: Not at All	0	0	0	0
2: Slightly	0	0	1	0
3: Moderately	8	6	5	8
4: Considerably	13	14	16	15
5: Extremely	24	23	23	20

Teacher Perceptions of the Environment

	#10a: Level of Env. Sensitivity		#10b: Level of Env. Concern		#10c: Level of Env. Action	
	Grade 6-Grade 8		Grade 6-Grade 8		Grade 6-Grade 8	
Teacher Ratings	n	n	n	n	n	n
N/A	2	3	2	3	2	3
1: Not at All	0	0	0	0	5	3
2: Slightly	0	1	0	1	13	17
3: Moderately	6	10	4	7	17	16
4: Considerably	20	22	20	18	7	4
5: Extremely	19	10	21	17	3	3

N/A = No Answer

Students

Within the 48 schools in the study sample, a total of 2,004 usable student responses were received and included in data analyses. Of these, 1,042 students were 6th graders, and 962 students were 8th grades. For students from the two ungraded schools in the sample (n=38), three methods were used to ensure that each student's grade level was properly identified (i.e., student responses to Item 2 on the *MSELS*, bundling of Scantron forms by school personnel, and follow-up phone calls to school administrators).

In addition to the item on student grade level, Part I of the *MSELS* included three other demographic items. A summary of responses to those three items is presented in Table 13 (p. 49). Item 1 pertained to student age. A large majority of 6th graders reported their age as 11 or 12 (92%), with a small percent reporting their age as 13 or 14 (8%). Similarly, a large majority of 8th graders reported their age as 13 or 14 (93%), with a small percent as 15 (7%), and as 11 or 12 (less than 1%).

Item 3 pertained to student gender. The 6th grade sample was nearly evenly divided between females and males, while there were about 5% more females than males in the 8th grade sample.

Item 4 pertained to student ethnicity. About 65% of students in both the 6th and 8th grade sample indicated that they were White, Non-Hispanic, while about13-15% of the students indicated that they were Hispanic and 10-15% indicated that they were Black, Non-Hispanic. About 3-5% of these students checked off American Indian/Native Alaskan or Asian/Pacific Islander.

Weighting of the Sample

As detailed in the *NAAEE/NELA 2007 School-Based Research Report* by GfK Roper, the study sample was constructed as a multi-stage sample (i.e., counties, then schools, and then classes). Within each stage of this multi-stage design, there was a potential that sampling procedures might reduce the extent to which the study sample reflected the national population of 6th and 8th grade students. For example, in the first stage, because probability proportionate to size (PPS) sampling ensured that larger counties are represented in the sample by assigning higher

Table 13.
Self-Reported Demographic Characteristics of 6th and 8th Grade Students in the Sample

Demographics	**6th Grade** n = 1,042		**8th grade** n = 962	
Age	**n**	**%**	**n**	**%**
11 years or younger	262	25%	2	.2%
12 years	700	67%	1	.1%
13 years	71	7%	251	26%
14 years	6	.6%	640	67%
15 years or older	0	--	68	7%
Missing Responses	3	.3%	0	--
Gender	**n**	**%**	**n**	**%**
Female	530	51%	504	52%
Male	506	49%	453	47%
Missing Responses	6	.6%	5	.5%
Ethnicity	**n**	**%**	**n**	**%**
American Indian/Alaska Native	27	3%	28	3%
Asian/Pacific Islander	53	5%	43	4%
Hispanic	154	15%	121	13%
Black, Non-Hispanic	100	10%	142	15%
White, Non-Hispanic	680	65%	619	64%
Missing Responses	28	3%	9	1%

* Note: Percentages within each demographic group may not add up to 100% due to rounding.

probabilities of selection to them, there is an increased probability of selecting large counties. It was also possible that in the process of selecting replacement counties, some of the demographic characteristics of the original county could have been altered. In the second stage, there was a possibility that the selection of what might appear to some to be a disproportionately large number of private religious schools (n=14) could further reduce the extent to which the study sample reflected the national population. Finally, at the school level, the use of purposeful or even convenience sampling, rather than random sampling, to select the classes to participate may have this and/or other effects on the data set and results. Personnel at GfK Roper took several precautions prior to data collection to reduce the chance that these kinds of factors would

adversely affect the study sample and, thereby, the study results. For example, in the first stage, the disproportionate probability of selecting large counties was rectified by county probability weights.

Steps were also taken following data collection but prior to data analysis to ensure that the study sample would represent the national profile of 6th and 8th grade students. The University of Connecticut's Center for Survey Research and Analysis (CSRA) was contracted to weight the data set in a manner that was consistent with this kind of sampling design. Using population parameters available in National Center for Education Statistic's (NCES) Common Core Data (CCD) tables and information about the sample provided to CSRA by Dr. Marcinkowski (e.g., counties in which schools were located, the size of each school sample, student demographic data), CSRA personnel prepared these weightings. "Post-stratification weights were applied to make adjustments to the sample by taking into account different probabilities of selection and making the sample reflective of the underlying population characteristics by treating demographic and geographic response differentials. Post-stratification adjustment for non-response has been made proportionate to regional enrollment (i.e., four U.S. regions: Northeast, Midwest, South and West) and by race and gender. These weighting class adjustments by region, race and gender were created using an iterative raking weighting process. A total number of 3 iterations were carried out until compounding weights converged" (Personal communication, S. Kurunaratne, November 9, 2007).

The final geographic weights (by region) and demographic weights (by race and gender) for both the 6th and 8th grade sample are presented in Table 14 (pp. 51-52). In Table 14, "unweighted count" refers to the sample count, and "weighted count" refers to what the count should be for a sample of this size if it represented the population. The weight is simply the number by which the "unweighted count" must be multiplied to match the "weighted count" or population estimate. If the sample (unweighted count) represented the population on any geographic or demographic parameters, the weighting would be 1.00.

Table 14.
Demographic and Geographic Weights for the 6th and 8th Grade Sample

GRADE 6					
Regional Weights					
	Unweighted Count	**Unweighted %**	**Weighted Count**	**Weighted %**	**Weight**
Northeast	149	14%	183	18%	1.2282
Midwest	196	19%	232	22%	1.1837
South	463	44%	377	36%	0.8143
West	234	22%	250	24%	1.0684
Total	1042		1042		
Race & Gender Weights					
	Unweighted Count	**Unweighted %**	**Weighted Count**	**Weighted %**	**Weight**
White male	336	33%	307	30%	0.9137
White female	344	34%	289	29%	0.8401
Black male	51	5%	87	9%	1.7059
Black female	49	5%	84	8%	1.7143
Hispanic male	71	7%	97	10%	1.3662
Hispanic female	83	8%	92	9%	1.1084
Other male	42	4%	30	3%	0.7143
Other female	40	4%	28	3%	0.7000
Total	**1016**		**1014**		
GRADE 8					
Regional Weights					
	Unweighted Count	**Unweighted %**	**Weighted Count**	**Weighted %**	**Weight**
Northeast	138	14%	170	18%	1.2319
Midwest	190	20%	215	22%	1.1316
South	441	46%	349	36%	0.7914
West	193	20%	228	24%	1.1813
Total	**962**		**962**		

Table 14. (continued)					
Race & Gender Weights					
	Unweighted Count	**Unweighted %**	**Weighted Count**	**Weighted %**	**Weight**
White male	288	30%	293	31%	1.0174
White female	331	35%	277	29%	0.8369
Black male	67	7%	81	8%	1.2090
Black female	75	8%	79	8%	1.0533
Hispanic male	57	6%	86	9%	1.5088
Hispanic female	64	7%	83	9%	1.2969
Other male	38	4%	28	3%	0.7368
Other female	32	3%	26	3%	0.8125
Total	**952**		**953**		

For the 6th grade sample, the geographic weights ranged from a low of .8143 for the South to a high of 1.2282 for the Northeast, and the race and gender weights ranged from a low of .7000 for Other Females to a high of 1.7143 for Black Females. For the 8th grade sample, the geographic weights ranged from a low of .7914 for the South to a high of 1.2319 for the Northeast, and the race and gender weights ranged from a low of .7368 for Other Males to a high of 1.5088 for Hispanic Males. None of these weights exceeded 1.72, and half were within .2 units of 1.0. Mr. Karunaratne, a data analyst with CSRA, indicated that these weights were lower than those found and used in many comparable studies. Collectively, these weights indicated that the multi-stage sampling design came reasonably close to generating a sample that reflected the national population of 6th and 8th grade students.

However, to ensure that the sample did reflect this population, these weights were applied to the data set, and used in the analysis of aggregate data for the 6th and 8th grade presented in the following section. In this way, the results reported the study sample do reflect this national population, at least on these selected parameters.

Results for Research Question One

Research Question One states: What is the level of environmental literacy of sixth and eighth grade students across the U.S. on each of the following variables:

a. ecological knowledge;
b. verbal commitment;
c. actual commitment;
d. environmental sensitivity;
e. general environmental feelings;
f. environmental issue and action skills?

Overview of Results

The simplest way to report the results from this national environmental literacy assessment is in the form of descriptive statistics for the entire 6th grade sample and the entire 8th grade sample. To permit these analyses, Dr. Marcinkowski provided CSRA with one data file containing records for all 6th graders and another data file for all 8th graders. Personnel at CSRA generated student scores for each scale or index, except for Part VII.C. Action Planning. [Note: Part VII.C. Action Planning was scored by personnel at Florida Tech due to the manner in which responses were weighted]. However, as described in the previous section, prior to running statistical analyses of scores on each scale or index, CSRA personnel weighted the data set so that the study samples resembled the national population of 6th and 8th graders. Thus, the results of these statistical analyses not only represent the study samples, but also serve as baseline scores for 6th and 8th graders in the U.S.

The results of these analyses of aggregated 6th and 8th grade scores are summarized in Table 15 (p. 54). On the cognitive scales, student scores were, on average, higher on the knowledge scale (Part II. Ecological Foundations: Grade 6 = 11.2/17 or 66%; Grade 8 = 11.6/17 or 68%) than on the skills scale (Part VII.A/B/C. Issue Identification, Issue Analysis, and Action Planning: Grade 6 = 11.3/29 or 39% ; Grade 8 = 12.0/29 or 41%). Similarly, on the action-oriented scales, student scores were, on average, higher on the intention to act scale (Part III. How You Think

Table 15.
Summary of Descriptive Statistics for Weighted 6th and 8th Grade Data, by Scale or Index

Parts of the MSELI	No. Items	Range	Grade	Sample Size		Mode	Median	Mean	Std. Dev.
				n	missing				
II. Ecological Foundations	17 Items (5 - 21)	0 - 17	6 8	934 921	108 42	13 13	12 12	11.24 11.62	3.26 3.32
III. How You Think About the Environment	12 Items (22 - 33)	12 - 60	6 8	1000 936	42 27	44 43	44 41	43.89 41.10	8.88 9.20
IV. What You Do About the Environment	12 Items (34 - 45)	12 - 60	6 8	974 921	68 41	40 40	39 35	38.44 35.14	9.15 9.39
V. You and Environmental Sensitivity	11 Items (46 – 56)	11 - 55	6 8	978 913	63 49	31 30	33 30	32.54 30.11	7.47 7.48
VI. How You Feel About the Environment	2 Items (57 – 58)	2 - 10	6 8	987 930	55 32	10 10	9 8	8.14 7.82	2.00 2.06
VII.A. Issue Identification	3 Items (59, 60, 67)	0 - 3	6 8	902 885	139 77	1 1	1 1	1.31 1.29	0.93 0.95
VII.B. Issue Analysis	6 Items (61 – 66)	0 - 6	6 8	905 869	137 93	2 1	2 3	2.75 2.86	1.89 2.00
VII.C. Action Planning	8 Items (68 – 75)	0 - 20	6 8	874 820	168 142	2 2	6.97 7.00	7.25 7.86	5.44 5.64

About the Environment: Grade 6 = 43.9/60 or 73%; Grade 8 = 41.1/60 or 68.5%) than on the self-reported behavior scale (Part IV. What You Do About the Environment: Grade 6 = 38.4/60 or 64%; Grade 8 = 35.1/60 or 58.5%). Neither of these scoring patterns is surprising in light of past evidence about student performance on outcome measures in environmental education. However, into the 1990s, relatively few studies had measured environmental sensitivity among youth (e.g., McBeth, 1997) as opposed to among adults (Chawla, 1999; Marcinkowski & Sward, 2001). On this scale, student scores were, on average, lower than both intention and behavior scores (Part V. You and Environmental Sensitivity: Grade 6 = 32.5/60 or 59%; Grade 8 = 30.1/60 or 55%). The highest scores were observed on the General Environmental Feelings index (Part VI. How You Feel About the Environment: Grade 6 = 8.1/10 or 81%; Grade 8 = 7.8/10 or 78%).

In terms of simple comparisons between these 6th and 8th grade results, on average, 8th graders tended to slightly outscore 6th graders on the measure of knowledge and cognitive skill. On the other hand, 6th graders tended to outscore 8th grades on both the affectively oriented sensitivity measure and the more action-oriented intention and behavior measures. While the former differences are relatively small, suggesting that 8th graders are not that much more knowledgeable or skilled than 6th graders, the latter differences are clearer and more pronounced, suggesting that 6th graders hold moderately stronger affective ties to the environment than do 8th graders.

Part II, Ecological Foundations

The results for the 17-item measure of ecological knowledge are presented in Table 16 (p. 56). These results indicate that the mean score for 8th grades (X = 11.62, or 68%) was slightly greater than for 6th graders (X = 11.24, or 66%). In both samples, the standard deviation was larger than 3, indicating that the scores for slightly more than 68% of the 6th grade sample ranged from about 8.0 - 14.5, and for the 8th grade sample from 8.3 - 14.9. Further, in both samples, the mean was slightly lower than the median and mode, indicating that the distribution of scores for each sample was slightly negatively skewed.

Part III, How You Think About the Environment

The results for the 12-item measure of verbal commitment (intention to act) are presented in Table 17 (p.56). These results indicate that the mean score for 6th graders (X = 43.89 out of 60) was greater than for 8th graders (X = 41.10 out of 60). For both samples, the standard deviation approached or slightly exceeded 9.0, indicating that these scores varied substantially among students in each sample. More specifically, the scores for slightly more than 68% of the 6th grade sample ranged from about 35.0 - 52.8, and for the 8th grade sample from 32.9 - 50.4. For both the 6th and 8th grade sample, the mean and median scores were nearly the same, indicating that the scores each sample were nearly normally distributed.

Table 16.
Descriptive Results on Part II. Ecological Foundations (Ecological Knowledge)

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	11.24	11.62
S.D.	3.26	3.32
Median *	12.00	12.00
Mode *	13.00 (n=122)	13.00 (n=116)
Lowest Score	1.00 (n=1)	2.00 (n=3)
Highest Score	17.00 (n=11)	17.00 (n=36)
Missing Responses	108	42

* Note: Possible Points = 17

Table 17.
Descriptive Results on Part III. How You Think About the Environment (Verbal Commitment or Intention to Act)

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	43.89	41.10
S.D.	8.88	9.25
Median *	44.00	41.00
Mode *	44.00 (n=64)	43.00 (n=48)
Lowest Score	12.00 (n=4)	12.00 (n=6)
Highest Score	60.00 (n=21)	60.00 (n=15)
Missing Responses	42	27

* Note: Possible Points = 60

Part IV, What You Do About the Environment

The results for the 12-item measure of actual commitment (pro-environmental behavior) are presented in Table 18, below. These results indicate that the mean score for 6th graders (X = 38.44 out of 60) was greater than for 8th graders (X = 35.14 out of 60). For both samples, the standard deviation exceeded 9, indicating that these scores also varied substantially among students in each sample. Specifically, the scores for slightly more than 68% of the 6th grade sample ranged from 29.3 - 47.6, and for the 8th graders from 25.8 - 44.5. Once again, for both the 6th and 8th grade sample, the mean and median scores were nearly the same, indicating that the scores for each sample were nearly normally distributed.

Table 18.
Descriptive Results on Part IV. What You Do About the Environment (Actual Commitment or Pro-environmental Behavior)

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	38.44	35.14
S.D.	9.15	9.39
Median *	39.00	35.00
Mode *	40.00 (n=49)	40.00 (n=48)
Lowest Score	12.00 (n=4)	12.00 (n=11)
Highest Score	60.00 (n=4)	60.00 (n=3)
Missing Responses	68	41

* Note: Possible Points = 60

Part V, You and Environmental Sensitivity

The results for the 11-item measure of environmental sensitivity are presented in Table 19 (p. 58). These results indicate that the mean score for 6th graders (X = 32.54 out of 55) was greater than for 8th graders (X = 30.11 out of 55). For both samples, the standard deviation approached 7.5, indicating that these scores also varied substantially among students in each sample. Specifically, the scores for slightly more than 68% of the 6th grade sample ranged from 25.1 - 40.0, and for the 8th graders from 22.6 - 37.6. As was found for Parts III. and IV, the mean and

Table 19.

Descriptive Results on Part V. You and Environmental Sensitivity

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	32.54	30.11
S.D.	7.47	7.48
Median *	33.00	30.00
Mode *	31.00 (n=64)	30.00 (n=55)
Lowest Score	11.00 (n=4)	11.00 (n=7)
Highest Score	55.00 (n=1)	55.00 (n=1)
Missing Responses	64	49

* Note: Possible Points 55

median score for both the 6th and 8th grade sample were about the same, indicating that the scores for each sample were nearly normally distributed.

Part VI, How You Feel About the Environment

The results for the 2-item measure of environmental feeling are presented in Table 20, (p.59). These results indicate that the mean score for 6th graders (X = 8.14 out of 10) was slightly greater than for 8th graders (X = 7.82 out of 10). In both samples, the standard deviation was equal to or slightly greater than 2.0. Thus, the scores for slightly more than 68% of the 6th graders ranged from 6.1 to 10, and for the 8th graders from 5.8 - 9.9. For the 8th grade sample, the mean and median scores were nearly equivalent, indicating that scores for this sample were about normally distributed. However, this was not quite true for the 6th grade sample; the mean and median differed by .86 on a 10-point scale, indicating that this distribution of scores was slightly negatively skewed.

Part VII, Issue Identification, Issue Analysis, and Action Planning

The results for the 3-item measure of issue identification skills are presented in Table 21. (p.59). These results indicate that the mean score for 6th grades (X = 1.31, or 44%) was nearly identical

Table 20.
Descriptive Results on Part VI. How You Feel About the Environment

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	8.14	7.82
S.D.	2.00	2.06
Median *	9.00	8.00
Mode *	10.00 (n=350)	10.00 (n=271)
Lowest Score	2.00 (n=17)	2.00 (n=26)
Highest Score	10.00 (n=350)	10.00 (n=271)
Missing Responses	55	32

* Note: Possible Points = 10

to the mean score for 8th graders (X = 1.30, or 43%). For both samples, the standard deviation was lightly less than 1. Thus, the scores for slightly more than 68% of the 6th graders and 8th graders ranged from about 0.4 - 2.25. It is noteworthy that these items appeared toward the end of the *MSELS,* and that the number of missing responses increased substantially, more than doubling among 6th graders (i.e., 13% of this sample).

Table 21.
Descriptive Results on Part VII.A. Issue Identification Skills

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	1.31	1.30
S.D.	0.93	0.95
Median *	1.00	1.00
Mode *	1.00 (n=328)	1.00 (n=328)
Lowest Score	0.00 (n=197)	0.00 (n=201)
Highest Score	3.00 (n=97)	3.00 (n=106)
Missing Responses	140	77

* Note: Possible Points = 3

The results for the 6-item measure of issue analysis skills are presented in Table 22, below. These results indicate that the mean score for 6th grades (x = 2.75, or 46%) was slightly lower than for 8th graders (x = 2.86, or 48%). For the 6th grade sample, the standard deviation approached 1.9, while in the 8th grade sample it was 2.0. In each sample, the scores varied substantially; the scores for slightly more than 68% of the 6th grade sample ranged from about 0.9 - 4.6, and for the 8th graders from .9 - 4.9. For the 8th grade sample, the mean and median scores were nearly equivalent, indicating that scores for this sample were about normally distributed. However, this was not true for the 6th grade sample; the mean and median scores differed by .75 on a 6-point scale, indicating that this distribution of scores was positively skewed. Finally, as with Part VI.A., the number of missing responses was again large, either nearly equivalent to or slight larger than was found for Part VII.A (i.e., for 6th grade: 13%; and for 8th grade: 10%).

Table 22.
Descriptive Results on Part VII.B. Issue Analysis Skills

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	2.75	2.86
S.D.	1.89	2.00
Median *	2.00	3.00
Mode *	2.00 (n=181)	1.00 (n=182)
Lowest Score	0.00 (n=106)	0.00 (n=105)
Highest Score	6.00 (n=102)	6.00 (n=125)
Missing Responses	137	93

* Note: Possible Points = 6

The results for the measure of action planning skills are presented in Table 23 (p. 61). These results indicate that the mean score for 6th grades (X = 7.25 out of 20) was lower than for 8th graders (X = 7.86 out of 20). The standard deviation was either slightly below or slightly above 5.5, indicating that these scores varied substantially among students in each sample. The scores for slightly more than 68% of the 6th grade sample ranged from 1.8 - 12.7, and for 8th graders from 2.2 - 13.5. For the 6th grade sample the mean and median scores were nearly

equivalent, indicating that the scores for this sample were almost normally distributed. However, this was not true for the 8th grade sample; the mean and median scores differed by .86 on a 20-point scale, indicating that this distribution of scores was positively skewed. Finally, in part because this was the final section in the *MSELS*, the number of missing responses was far greater than for any other part of the *MSELS* (i.e., from 6th grade: 16%; and for 8th grade: 15%).

Table 23.
Descriptive Results on Part VII.C. Action Planning Skills

	6th Grade n = 1,042	**8th Grade** n = 962
Mean *	7.25	7.86
S.D.	5.44	5.64
Median *	6.97	7.00
Mode *	2.00 (n=174)	2.00 (n=125)
Lowest Score	0.00 (n=88)	0.00 (n=86)
Highest Score	20.00 (n=37)	20.00 (n=46)
Missing Responses	168	142

* Note: Possible Points = 20

Weighted Environmental Literacy Scores, By School

To this point, the response to Research Question 1 only includes aggregated results for the total sample of 6th and 8th grade students. To expand upon this, members of the Research Team discussed the potential benefits of preparing and reporting disaggregated results (i.e., results for the 6th and 8th grade sample from each participating school). They recognized that some professionals in the field would find disaggregated results to be of great interest, and that disaggregated results would support future study of what appear to be low- and high- achieving schools. For these and other reasons, under the contract between CISDE and CSRA, CSRA personnel were asked to conduct school-by-school and grade-by-grade analyses using their weighted data sets, and to report those to the Research Team. Table 24 (pp. 62-66) presents a summary of the results of these analyses (i.e., mean scores and standard deviations, by scale, grade level, and school).

Table 24.
Weighted Results for 6th and 8th Grade Samples on Environmental Literacy Scales, by School

				Results, by Scale *							
School ID	**Grade**	**n****		**EK** (0-17)	**VC** (12-60)	**AC** (12-60)	**ES** (11-55)	**EF** (2-10)	**ID** (0-3)	**IA** (0-6)	**AP** (0-20)
1	6	17	Mean	12.37	45.10	40.62	34.74	8.92	1.74	3.52	7.34
			SD	3.26	11.27	7.45	6.69	2.02	1.04	1.72	4.66
	8	15	Mean	13.38	40.25	34.27	28.95	8.63	1.48	3.89	7.86
			SD	2.71	7.15	8.32	7.71	1.46	1.01	1.72	5.13
2	6	15	Mean	12.64	41.02	35.54	32.67	8.78	1.60	3.85	10.50
			SD	1.67	10.07	9.97	5/94	1.40	1.03	1.87	5.00
	8	15	Mean	12.72	45.56	36.74	31.44	8.78	1.34	2.88	7.69
			SD	2.34	7.96	9.17	5.73	1.57	0.93	2.16	5.25
3	6	33	Mean	9.28	44.87	40.54	32.67	8.60	1.51	2.87	7.03
			SD	3.49	6.07	10.14	6.38	1.70	0.92	2.23	5.11
	8	25	Mean	11.38	41.36	35.00	29.85	8.03	1.16	2.47	5.86
			SD	2.55	10.40	9.41	8.38	2.43	1.03	1.69	3.96
5	6	30	Mean	9.44	45.03	39.24	34.65	8.21	1.21	1.77	4.36
			SD	3.04	6.93	7.75	7.65	1.84	0.88	1.15	4.21
	8	26	Mean	10.06	41.59	38.77	28.51	7.43	0.88	1.44	2.72
			SD	3.72	12.55	11.31	6.42	2.59	0.92	1.36	3.25
6	6	30	Mean	12.09	48.00	43.15	31.74	9.21	1.72	2.27	7.90
			SD	2.36	5.22	7.19	5.88	1.39	0.56	1.63	5.42
	8	29	Mean	10.06	42.49	34.76	27.29	7.83	1.20	2.18	9.94
			SD	2.24	7.42	9.50	6.67	1.30	0.89	1.33	6.83
7	6	29	Mean	10.17	43.94	38.71	32.19	7.67	1.31	1.64	7.63
			SD	2.88	8.44	9.34	6.61	1.53	1.03	1.38	5.06
	8	27	Mean	8.74	40.68	32.23	26.56	7.04	0.68	2.25	9.03
			SD	4.77	8.91	7.55	8.03	1.91	0.76	1.59	5.65
8	6	30	Mean	8.68	43.55	39.09	31.28	7.52	0.79	1.57	5.57
			SD	3.20	10.75	11.50	8.01	1.83	0.79	1.10	4.82
	8	24	Mean	10.44	41.57	35.89	28.54	6.70	1.14	1.47	7.71
			SD	2.95	7.87	7.16	7.87	2.14	0.71	1.25	6.24
9	6	23	Mean	13.89	43.90	39.04	34.02	8.94	1.81	3.05	6.81
			SD	2.79	9.66	8.89	6.50	1.28	0.88	2.04	4.86
	8	23	Mean	12.99	43.22	37.89	33.03	8.16	1.45	3.24	8.20
			SD	2.19	10.03	12.59	8.64	1.74	0.82	2.22	5.46
10	6	21	Mean	8.40	43.71	42.94	34.06	7.51	0.76	1.49	5.62
			SD	3.33	10.07	7.25	8.15	2.45	0.77	1.20	4.55
	8	16	Mean	11.08	45.31	34.70	29.93	6.77	1.50	2.40	9.55
			SD	3.32	9.01	9.57	6.46	6.47	1.14	1.96	6.01
11	6	17	Mean	11.17	45.53	38.56	34.26	8.08	1.10	2.06	5.32
			SD	3.17	9.98	9.65	7.84	2.14	0.91	1.54	4.30
	8	16	Mean	10.56	41.28	34.00	30.92	7.95	1.01	1.77	6.39
			SD	3.34	7.47	9.05	8.73	2.47	0.88	1.92	4.67

* Note: Scale abbreviations refer to the following Parts of the *MSELS*: EK = Ecological Knowledge (Part II); VC = Verbal Commitment (Part III); AC = Actual Commitment (Part IV); ES = Environmental Sensitivity (Part V); EF = Environmental Feeling (Part VI); ID = Issue Identification Skills (Part VII.A); IA = Issue Analysis Skills (Part VII.B); AS = Action Planning Skills (Part VII.C).

** Note: in this column, n represents the total number of students in that grade from that school. Readers should be aware that the actual number of responses for each scale varies due to missing and unusable data.

Table 24, (continued)

				Results, by Scale *							
School ID	**Grade**	**n****		**EK** (0-17)	**VC** (12-60)	**AC** (12-60)	**ES** (11-55)	**EF** (2-10)	**ID** (0-3)	**IA** (0-6)	**AP** (0-20)
12	6	5	Mean	11.00	43.88	32.80	23.03	7.77	2.25	1.54	8.92
			SD	1.38	2.55	3.27	5.15	0,92	0.48	1.66	8.47
	8	15	Mean	9.36	35.14	31.49	26.37	6.26	0.86	2.62	7.12
			SD	2.83	12.88	11.90	8.04	2.99	0.62	1.61	5.87
13	6	18	Mean	11.51	46.46	40.15	30.63	8.96	1.44	4.08	9.33
			SD	2.70	7.91	9.03	6.58	1.27	0.93	1.88	4.84
	8	17	Mean	14.80	49.50	41.44	29.88	9.18	1.81	4.93	11.55.
			SD	1.68	6,36	6.35	6.41	1.58	0.55	0.96	12
14	6	15	Mean	11.53	39.09	31.08	28.64	8.33	1.62	3.19	8.04
			SD	3.10	9.23	7.85	5.18	1.75	0.70	1.74	6.57
	8	16	Mean	12.61	41.46	38.73	30.73	8.71	1.84	4.12	9.93
			SD	3.73	8.01	7,96	8.12	1.70	0.88	2.26	4.24
15	6	18	Mean	11.02	45.47	39.54	33.61	8.65	1.36	2.89	7.59
			SD	3.17	8.27	7.23	6.58	1.61	0.79	1.66	6.03
	8	16	Mean	11.99	40.29	32.80	29.56	7.19	1.54	3.07	8.65
			SD	3.04	9.58	9.80	9.20	2.20	0.91	2.32	5.61
16	6	16	Mean	11.17	40.82	35.13	32.62	8.51	1.69	4.16	10.02
			SD	2.65	8.17	6.84	7.37	1.79	1.01	1.92	3.99
	8	16	Mean	9.28	37.96	31.50	30.69	6.70	0.78	1.98	6.21
			SD	3.59	6.51	10.52	8.29	2.33	0.74	1.52	5.74
17	6	22	Mean	13.72	51.01	48.57	37.85	9.91	1.56	4.61	9.75
			SD	1.40	6.03	6.31	6.10	0.28	0.97	0.95	6.15
	8	23	Mean	13.65	50.26	47.53	35.15	9.65	1.62	4.46	10.45
			SD	1.38	7.41	6.12	6.58	0.77	1.05	1.75	4.09
18	6	24	Mean	12.23	45.11	35.78	30.67	7.99	1.01	2.08	7.10
			SD	2.96	8.76	11.30	7.41	2.56	0.88	1.57	5.91
	8	24	Mean	12.64	42.80	38.12	30.10	8.85	1.41	3.19	9.35
			SD	2.35	6.85	6.21	6,56	1.41	0.95	2.05	6.53
19	6	29	Mean	10.96	45.62	37.58	33.39	8.06	0.99	2.30	6.13
			SD	4.22	6.37	7.52	7.13	1.72	1.02	1.71	5.37
	8	24	Mean	10.91	43.93	34.65	31.10	8.40	1.28	2.39	8.53
			SD	3,46	8.14	7.59	7.22	1.56	0.83	2.09	6.12
20	6	25	Mean	9.49	42.10	36.61	32.19	7.55	0.80	2.06	5.55
			SD	3.16	10.26	11,17	7.52	1.91	0.83	1.70	5.69
	8	23	Mean	10.30	39.75	33.59	31.96	7.38	0.76	1.72	4.61
			SD	2.49	8.49	5,43	7.43	2.31	0.78	1.70	5.13
21	6	15	Mean	10.18	41.01	32.97	31.54	7.46	1.04	2.30	6.39
			SD	2.87	10.70	10.43	7.39	2.35	0.81	1.45	5.41
	8	15	Mean	11.78	40.14	35.04	32.79	7.20	1.18	3.37	8.26
			SD	2.45	11.60	9.75	9.38	2.50	0.89	2.06	5.49

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** Note: in this column, n represents the total number of students in that grade from that school. Readers should be aware that the actual number of responses for each scale varies due to missing and unusable data.

Table 24. (continued)

				Results, by Scale *							
School ID	**Grade**	**n****		**EK** (0-17)	**VC** (12-60)	**AC** (12-60)	**ES** (11-55)	**EF** (2-10)	**ID** (0-3)	**IA** (0-6)	**AP** (0-20)
22	6	16	Mean	11.72	43.83	36.41	30.30	9.05	1.00	3.21	7.40
			SD	3.03	7.03	8.70	4.57	1.33	0.86	1.75	4.33
	8	16	Mean	10.57	37.15	28.63	28.19	8.05	1.44	3.46	7.29
			SD	3.14	7.19	5.54	5.50	1.83	0.91	1.73	4.88
23	6	20	Mean	13.25	42.64	38.20	31.60	8.02	0.99	2.78	7.25
			SD	2.06	10.33	11.16	7.58	2.02	0.96	1.67	5.00
	8	21	Mean	9.91	36.35	33.23	33.86	6.38	1.12	1.34	4.65
			SD	3.73	10.66	10.59	7.47	2.66	0.53	1.14	4.69
24	6	17	Mean	13.92	42.77	38.21	33.01	7.74	1.68	3.95	7.97
			SD	2.07	12.20	10.61	8.61	2.70	0.95	2.05	5.62
	8	16	Mean	12.45	40.32	35.44	28.91	8.25	1.34	2.95	6.99
			SD	2.51	9.80	12.81	6.96	1.80	0.79	2.07	5.73
25	6	25	Mean	11.83	45.20	37.45	32.28	8.45	1.51	2.82	9.24
			SD	2.58	7.40	7.77	8.04	2.13	0.98	1.77	5.16
	8	23	Mean	10.88	38.32	32.95	29.02	7.08	0.99	1.73	7.62
			SD	3.99	8.40	10.06	8.20	2.27	0.90	1.90	5.27
26	6	25	Mean	11.06	45.32	37.68	36.23	8.34	1.41	2.53	6.99
			SD	3.68	8.59	7.53	5.81	1.39	0.96	2.21	4.98
	8	24	Mean	11.28	42.65	41.20	33.68	7.98	1.43	2.65	6.94
			SD	2.99	7.74	8.26	6.13	2.03	0.93	2.06	7.25
27	6	24	Mean	13.25	47.74	40.45	33.45	9.08	1.53	4.13	10.85
			SD	1.84	4.88	6.15	6.16	1.39	1.04	2.25	5.07
	8	27	Mean	10.60	35.41	31.40	26.56	7.76	0.94	1.90	6.02
			SD	4.02	8.65	8.95	7.47	2.05	0.93	2.08	4.80
29	6	19	Mean	7.12	39.55	39.00	32.55	7.57	1.04	1.17	3.83
			SD	3.18	8.13	7.37	7.73	1.94	0.75	1.19	3.66
	8	15	Mean	11.49	40.26	31.04	30.00	8.57	1.22	3.20	8.88
			SD	3.56	7.56	9.04	7.63	1.64	1.11	1.89	6.10
30	6	17	Mean	12.05	42.16	38.87	31.02	7.84	1.85	3.56	7.90
			SD	2.41	10.52	9.83	8.81	2.26	0.97	1.93	5.18
	8	17	Mean	9.51	35.87	31.96	29.05	7.20	1.19	2.44	6.84
			SD	3.14	8.39	9.30	6.62	2.21	1.06	1.87	5.61
31	6	20	Mean	12.60	45.85	41.36	32.27	8.26	1.47	3.75	9.33
			SD	2.86	11.31	11.38	9.47	2.61	0.80	1.83	6.08
	8	19	Mean	11.80	45.49	39.00	34.68	8.30	1.86	2.93	8.18
			SD	2.57	10.73	9.92	5.58	2.46	0.82	1.92	4.40
32	6	24	Mean	8.39	47.36	41.15	32.27	8.57	1.00	1.80	8.02
			SD	2.93	6.84	7.48	5.00	1.74	0.63	1.57	6.83
	8	23	Mean	11.76	43.15	38.03	29.50	8.21	0.94	2.61	7.74
			SD	4.12	9.20	9.76	7.47	2.15	0.69	1.40	4.01

* Note: Scale abbreviations refer to the following Parts of the *MSELS*: EK = Ecological Knowledge (Part II); VC = Verbal Commitment (Part III); AC = Actual Commitment (Part IV); ES = Environmental Sensitivity (Part V); EF = Environmental Feeling (Part VI); ID = Issue Identification Skills (Part VII.A); IA = Issue Analysis Skills (Part VII.B); AS = Action Planning Skills (Part VII.C).

** Note: in this column, n represents the total number of students in that grade from that school. Readers should be aware that the actual number of responses for each scale varies due to missing and unusable data.

Table 24. (continued)

				Results, by Scale *							
School ID	**Grade**	**n****		**EK** (0-17)	**VC** (12-60)	**AC** (12-60)	**ES** (11-55)	**EF** (2-10)	**ID** (0-3)	**IA** (0-6)	**AP** (0-20)
33	6	31	Mean	11.77	38.27	32.61	30.67	7.42	1.16	3,17	6.50
			SD	2.10	8.07	5.66	6.44	1.77	0.63	2.11	6.14
	8	25	Mean	12.70	38.13	34.04	30.13	7.69	1.62	3.09	5.82
			SD	3.00	7.65	8.81	7.61	1.58	1.22	2.27	4.56
34	6	21	Mean	10.08	46.92	40.12	34.69	8.22	1.85	2.96	9.48
			SD	3.03	10.20	12.42	6.04	1.84	0.97	1.33	5.76
	8	22	Mean	11.53	42.87	36.54	32.41	7.47	1.18	3.72	8.63
			SD	3,33	8.12	10.12	8.16	2.39	0.94	1.60	4.84
35	6	22	Mean	11.72	42.12	39.64	30.43	8.42	1.64	3.10	5.68
			SD	2.64	6/61	8.43	5.13	1.75	1.00	1.83	5.93
	8	20	Mean	12.94	42.82	35.80	29.92	8.71	1.83	4.33	13.70
			SD	2.29	9.15	9.66	4.78	1.52	1.11	1.86	4.00
36	6	25	Mean	13.03	47.90	38.77	32.40	8.14	1.34	3.12	7.48
			SD	2.31	6.99	9.37	9.14	1.50	0.77	2.00	5.23
	8	23	Mean	13.72	42.96	37.02	27.86	7.45	1.97	4.51	10.91
			SD	1.78	5.75	6.23	4.70	1.60	1.10	1.33	5.93
37	6	24	Mean	10.35	47.72	39.67	35.46	7.37	0.94	1.75	4.68
			SD	3.89	7.15	7.63	6.94	2.94	0.96	1.26	3.28
	8	23	Mean	12.58	41.66	35.36	34.16	7.63	1.17	2.41	9.31
			SD	2.83	9.38	8.93	5,91	2.15	0.91	1.75	5.68
38	6	24	Mean	11.25	35.07	30.11	30.26	7.42	1.25	2.42	4.30
			SD	2.39	10.67	8.60	8.16	2.18	0.94	1.58	4.49
	8	23	Mean	13.20	38.02	31.67	29.18	7.79	1.29	2.81	6.72
			SD	3.37	9.86	8.66	8.00	2.32	1.01	2.45	5.15
39	6	29	Mean	8.43	35.03	32.18	27.46	6.64	0.72	1.33	4.65
			SD	2.90	9.34	9.21	9.91	2.48	0.80	1.39	5.31
	8	18	Mean	10.42	41.90	32.36	26.72	7.57	1.13	2.38	7.27
			SD	4.41	7.60	10.63	10.72	1.76	0.97	2.07	6.66
40	6	30	Mean	9.52	42.49	38.46	31.02	6.73	0.71	1.40	7.91
			SD	2.86	5.83	7.99	6.48	2.03	0.78	1.39	5.34
	8	23	Mean	9.64	37.03	33.65	28.22	6.59	0.39	1.67	4.85
			SD	4.06	9.67	9.64	7.52	1.97	0.50	1.10	3.91
41	6	21	Mean	11.41	45.30	41.61	35.13	8.22	1.19	3.07	5.17
			SD	2.15	7.53	5.05	9.30	2.20	0.75	1.86	4.13
	8	20	Mean	13.71	41.43	37.82	29.71	8.04	1.54	4.14	9.95
			SD	2.64	9.47	6.20	7.24	1.41	0.88	1.80	5.13
42	6	16	Mean	11.49	43.83	38.04	34.38	8.80	1.20	2.81	6.95
			SD	2.47	11.32	10.39	8.41	1.82	1.04	1.54	4.95
	8	15	Mean	10.85	39.94	32.52	24.91	7.85	1.05	2.82	10.27
			SD	2.75	7.42	8.95	5.55	1.74	0.74	2.15	6.17

* Note: Scale abbreviations refer to the following Parts of the *MSELS*: EK = Ecological Knowledge (Part II); VC = Verbal Commitment (Part III); AC = Actual Commitment (Part IV); ES = Environmental Sensitivity (Part V); EF = Environmental Feeling (Part VI); ID = Issue Identification Skills (Part VII.A); IA = Issue Analysis Skills (Part VII.B); AS = Action Planning Skills (Part VII.C).

** Note: in this column, n represents the total number of students in that grade from that school. Readers should be aware that the actual number of responses for each scale varies due to missing and unusable data.

Table 24. (continued)

				Results, by Scale *							
School ID	**Grade**	**n****		**EK** (0-17)	**VC** (12-60)	**AC** (12-60)	**ES** (11-55)	**EF** (2-10)	**ID** (0-3)	**IA** (0-6)	**AP** (0-20)
43	6	16	Mean	7.24	38.34	34.80	35.21	7.47	0.82	1.28	3.98
			SD	3.82	6.69	6.60	9.75	2.09	0.86	0.85	3.98
	8	14	Mean	10.91	35.33	30.76	33.08	6.58	0.79	1.16	4.25
			SD	3.96	7.76	8.72	4.19	1.83	0.82	1.36	5.56
44	6	16	Mean	13.40	41.83	32.71	33.19	9.13	1.78	4.16	9.62
			SD	1.53	8.20	8.29	8.84	1.23	0.97	1.42	4.73
	8	15	Mean	14.81	42.96	34.48	30.77	8.56	1.60	4.43	10.38
			SD	2.10	9.56	9.92	6.96	1.76	0.97	1.93	6.36
45	6	21	Mean	13.32	45.06	37.99	31.01	7.80	1.40	3.99	8.22
			SD	1.97	6.92	9.17	6.79	1.67	1.02	1.74	5.37
	8	17	Mean	13.00	40.77	34.27	29.90	8.48	1.22	3.40	9.14
			SD	2.21	8.25	5.91	7.69	1.42	0.84	1.53	5.47
46	6	21	Mean	8.91	41.47	37.81	28.49	7.56	0.58	2.00	8.19
			SD	2.71	7.17	3.96	7.72	1.78	0.56	0.00	5.05
	8	18	Mean	9.95	36.81	32.57	31.64	7.78	1.06	2.08	5.21
			SD	3.62	8.35	8.51	8.56	1.63	0.92	2.11	6.54
47	6	17	Mean	12.27	47.40	41.42	32.67	9.01	1.91	4.25	9.53
			SD	3.29	6.97	7.58	7.21	1.52	0.97	1.67	6.24
	8	15	Mean	12.73	46.73	41.75	34.18	9.00	1.60	2.87	7.93
			SD	2.06	7.00	7.77	5.05	1.39	0.82	2.10	5.87
48	6	16	Mean	14.57	47.71	41.02	34.79	9.40	1.82	4.25	11.66
			SD	2.21	7.20	9.01	7.36	1.09	0.67	1.98	4.41
	8	16	Mean	12.57	41.72	35.09	32.32	8.95	1.57	3.50	7.65
			SD	1.96	10.87	11.40	7,64	1.24	0.90	1.78	5.38
49	6	23	Mean	12.52	44.54	38.68	31.93	8.15	1.76	3.63	7.48
			SD	2.57	8.16	7.05	5.34	1.99	0.86	1.72	5.20
	8	22	Mean	11.55	40.44	32.86	29.09	7.77	1.55	3.07	3.89
			SD	2.85	10.74	8.83	7.46	2.01	1.12	2.11	3.89
50	6	32	Mean	13.50	45.16	40.09	34.32	7.16	1.02	2.43	5.74
			SD	2.45	7.71	11.10	8.96	2.65	0.82	1.86	5.98
	8	24	Mean	12.97	39.47	31.98	28.04	7.15	1.95	4.03	7.55
			SD	2.48	9.13	6.49	5.73	2.00	0.98	1.64	6.13

* Note: Scale abbreviations refer to the following Parts of the *MSELS*: EK = Ecological Knowledge (Part II); VC = Verbal Commitment (Part III); AC = Actual Commitment (Part IV); ES = Environmental Sensitivity (Part V); EF = Environmental Feeling (Part VI); ID = Issue Identification Skills (Part VII.A); IA = Issue Analysis Skills (Part VII.B); AS = Action Planning Skills (Part VII.C).

** Note: in this column, n represents the total number of students in that grade from that school. Readers should be aware that the actual number of responses for each scale varies due to missing and unusable data.

Comparisons Between the 6th and 8th Grade Samples

As mentioned in the Methods section of this report, the third planned analysis of data involved a comparison of 6th and 8th grade students' scores on each Part of the *MSELS*. Using SPSS, Dr. Ron Meyers conducted t-test comparisons of these two independent samples, using raw or unweighted mean scores, to determine if the groups were statistically different in their responses on eight different measures (i.e., parts or scales). The results of these analyses are summarized in Table 25, below.

Table 25.
Results of T-test Comparisons of the 6th and 8th Grade Samples

Variables	Grade	N *	Mean *	SD *	t	prob **
II. Ecological Knowledge	6	1042	10.95	3.856	-2.836	0.0046**
	8	962	11.42	3.622		
III. Verbal Commitment	6	1033	43.83	8.942	6.987	0.000**
	8	953	41.01	9.067		
IV. Actual Commitment	6	1023	38.23	9.037	8.045	0.000**
	8	942	34.89	9.350		
V. Environmental Sensitivity	6	1021	32.47	7.384	6.937	0.000**
	8	942	30.14	7.449		
VI. Environmental Feeling	6	993	8.26	1.940	4.527	0.000**
	8	930	7.85	2.033		
VII.A. Issue Identification	6	986	1.33	.938	0.802	0.4225
	8	928	1.29	.945		
VII.B. Issue Analysis	6	959	1.87	1.444	-0.489	0.6248
	8	902	1.91	1.470		
VII.C. Action Planning	6	878	7.55	5.401	-1.790	0.0736
	8	817	8.03	5.592		

* Note: The N sizes, mean scores, and standard deviation values reported above differ from those reported in Tables 1 (p. x) and 15 (p. 54) because those Tables used data weighted by CSRA, while the analyses reported in Table 25 did not.
** Note: statistically significant at p = .00625

Due to the fact that eight comparisons were made using the same 6th and 8th grade data sets, members of the research team were aware of and concerned about the potential for what researchers refer to as "test-wise inflation of Alpha." This means that there is a greater chance that multiple analyses will generate results that appear to be statistically significant at a designated Alpha level, such as $p < .05$, when they are not significant. One common way to adjust for this possibility is to divide the pre-set Alpha level by the number of analyses to be run. In this case, with $p < .05$ and with eight t-tests, the adjusted Alpha level or level of statistical significance for these analyses was .00625. At this adjusted Alpha level, statistically significant differences were found between the 6th and 8th grade samples on five of these eight scales (i.e., not for any of the Part VII. scales for issue and action skills). The 8th grade sample significantly outscored the 6th grade sample on Part II. Ecological Knowledge (i.e., a cognitive measure), although this difference was barely significant at this adjusted Alpha level. On the other hand, as noted above in the descriptive results for each Part or scale, the 6th grade sample significantly outscored the 8th grade sample on Parts II, III, IV, and V (i.e., the four non-cognitive measures).

Results for Research Question Two: Environmental Literacy Composite Scores for the 6th Grade, 8th Grade, and Combined Sample

Research Question Two states: What is the general level of environmental literacy of sixth and eighth grade students across the U.S.?

The response to this question must be understood within the context of the lack of research to which the results of this study can be compared (e.g., there are no quantitative standards or norms for environmental literacy). If the results of this study could be compared to another measure, we could assess the relative rise, fall, or stability of environmental literacy within this developmental level. However, with no such measure, we would anticipate that the results of this study would become the basis against which future assessments can be compared.

The results for research question #1 were reported for each of the school samples for each of the distinct sections of the *MSELS*. In response to research question #2, a more holistic approach to

the concept of environmental literacy was needed. Thus, Table 26 (p. 70) identifies the sections that compose the components of environmental literacy. In order to derive a composite score of all literacy components, the means for all 6th grade and 8th grade scores on the individual sections of the *MSELS* were adjusted with multipliers so that the sum of each of the four Components of Environmental Literacy equated to 60. Each component of environmental literacy, as measured by the *MSELS*, is then reported by grade. Finally, the combined composite scores on all of the components are reported by grade level, as well as combined grades (6 and 8), and are reported as environmental literacy composite scores. Weighted data were used for these computations.

Within the *MSELS*, Part II. Ecological Foundations serves as the component of environmental literacy referred to as Ecological Knowledge. The combined component means for Ecological Knowledge, after applying the multiplier, became 39.67 for the 6th grade, 41.01 for the 8th grade and 40.34 for the grand mean combined of the 6th and 8th grades. The Environmental Affect literacy component is composed of three parts of the *MSELS:* Part III. How You Think About the Environment; Part V. You and Environmental Sensitivity; and Part VI. How You Feel About the Environment. The combined component means for Environmental Affect for 6th and 8th grades were 40.73 and 38.06, respectively, and the grand mean combined was 39.40. The Cognitive Skills literacy component is composed of Parts VII.A. Issue Identification, VII.B. Issue Analysis, and VII.C. Action Planning. We can derive composite scores for each of these skill components by using the weighted results (Table 1, p. x) and the multiplier (Table 6, p. 33). When this is done, the highest values for both 6th and 8th graders were observed for issue analysis skills (6th: 9.16; and 8th: 9.52), followed by issue identification skills (6th: 8.74; and 8th: 8.60), and then by action planning skills (6th: 7.25; and 8th: 7.86). The Cognitive Skills combined component mean was 25.15 for the 6th grade and 25.98 for the 8th grade. The grand mean combined for Cognitive Skills was 25.56. The Behavior literacy component is represented by Part IV. What You Do About the Environment. The combined Behavior component score was 38.44 for the 6th grade, 35.14 for the 8th grade, and 36.84 for the grand mean combined. Finally, the Environmental Literacy composite scores (the combined means of all environmental literacy components for the 6th, 8th, and 6th & 8th combined) were 143.99, 140.19, and 142.14, respectively.

Table 26.
Components of Environmental Literacy and Composite Scores

Parts of the *MSELS*	Components of Environmental Literacy	Grade	Combined Component Mean *	Grand Mean Combined 6th & 8th *	Environmental Literacy Composite Scores **		
					6th	8th	6 & 8
Ecological Foundations	A. Ecological Knowledge	6th	39.67	40.34	143.99	140.19	142.14
		8th	41.01				
How you Think About the Environment	B. Environmental Affect	6th	40.73	39.40			
You and Environmental Sensitivity							
How You Feel About the Environment		8th	38.06				
Issue Identification	C. Cognitive Skills	6th	25.15	25.56			
Issue Analysis							
Action Planning		8th	25.98				
What Your Do About the Environment	D. Behavior	6th	38.44	36.84			
		8th	35.14				

Note. N sizes fluctuated from variable to variable and are not reported on this table. N sizes fell within a range of 874 to 1000 for 6th grade students, and within a range of 820 to 936 for 8th grade students (total sample included 1,042 6th grade students and 962 8th grade students).
* Total possible points = 60
** Total possible points = 240

Figures 4 (p. 71), 5 (p. 71), and 6 (p. 72) present the environmental literacy composite scores as histograms. Histograms are statistical representations of the normalcy of a distribution. Each histogram or figure presents the mean, standard deviation, and number of students included in these results (using the unweighted data). The 6th grade distribution represents an n of 752, a mean of 147.37, and a standard deviation of 28.65. The 8th grade distribution represents an n of 720, a mean of 142.20 and a standard deviation of 29.68. The combined 6th and 8th grade environmental literacy composite score represents an n of 1472, a mean of 144.84, and a standard deviation of 29.26. [Note: The n sizes reported here were smaller than the total n sizes (6th grade: 752 of 1,042; 8th grade: 720 of 962; and Combined: 1,472 of 2,004) due to the fact that SPSS included in its computation only those students with scores on all *MSELS* scales or indexes.]

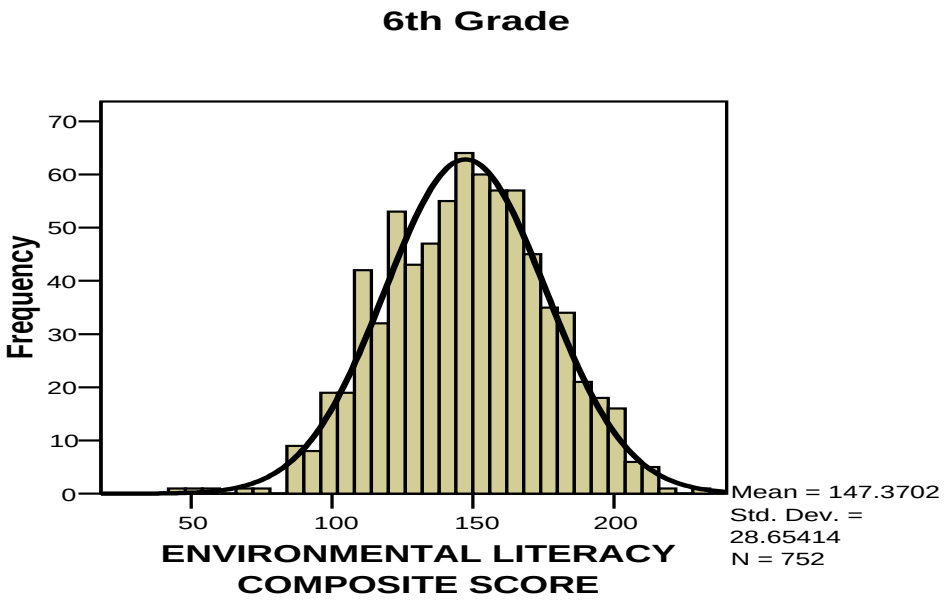

Figure 4. Histogram of the environmental literacy composite scores for all 6th grade students.

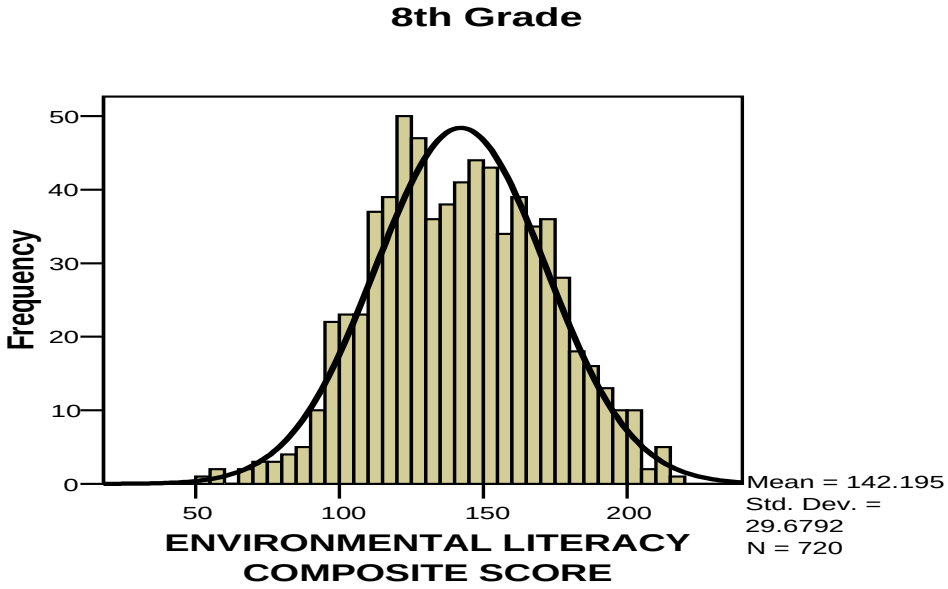

Figure 5. Histogram of the environmental literacy composite scores for all 8th grade students.

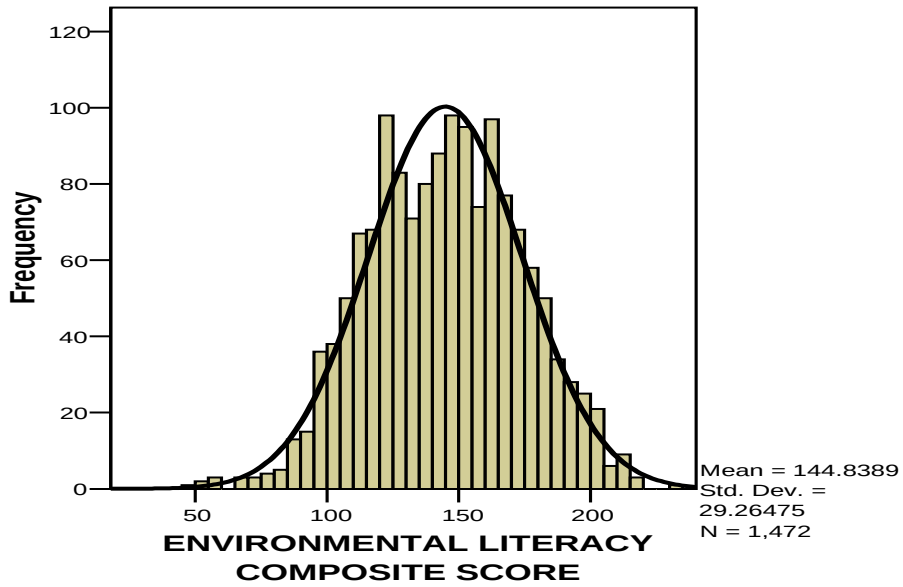

Figure 6. Histogram of the environmental literacy composite scores for all 6th and 8th grade students.

Descriptive Results for Schools and Classes with Environmental Programs

Two of the forms used to gather additional information contained items about the school's environmental programs. Information about environmental programs was collected for two reasons: (a) members wanted to be able to determine if any unusual results for a given participating school might be attributable, at least in part, to the presence of some type of environmental program in that school, and therefore may warrant follow-up study in Years 3 and 4; and (b) members of the research team wanted to determine if any of the schools participating in Year 1 resembled any of the schools that may be selected to participate in Year 2 of this study. For these reasons, the School Information Form asked if the participating school had a school-wide environmental theme (Item 2.B). Fully or partially completed forms were obtained from all 48 schools in the study sample. In addition, both the 6th and 8th grade versions of the Program Information Form asked teachers if their school offered some type of environmental program for students in grades 6, 7, and/or 8 (Item 1). Completed Program Information Forms were obtained from a total of 93 teachers in 47 of these 48 schools. The team received completed forms from

two or more teachers in 42 of these schools, and from one teacher in five of these schools. Data from these forms were analyzed and charted for exploratory purposes.

As indicated in Table 27 (pp. 74-75), a total of 18 schools indicated that they had some type of school-wide environmental program (n=2) or environmental program in one of more of the middle grades (n=16). Of these, programs were offered in 6th grade classes in 17 schools, and in 8th grade classes in 13 schools. Based on the information provided in these forms, these environmental programs were loosely classified as either: (a) an environmental science program (n =2); (b) a program with another, more specific environmental theme, notably "green," "litter," "energy," "carbon footprint," or "agriculture" (n = 5); (c) a camping program (n = 2); (d) an environmental club (n = 4); or (e) an unidentified program (n = 6). These frequency counts add up to 19 simply because one school had a camping program in the 6th grade and an energy themed program in the 8th grade.

The results for these 18 schools are somewhat interesting and informative, particularly when the scores from these school programs are compared to the 6th and 8th grade means reported in Table 24 (pp. 62-68). Comparisons between this purposeful sample and the total sample on the four measures with the greatest number of items will be made: Part V. You and Environmental Sensitivity (11 items); Part II. Ecological Foundations (17 items); Part III. How You Think About the Environment (12 items); and Part IV. What You Do About the Environment (12 items). Individually and collectively, these comparisons offer some insights into how well the students in these programs performed on the *MSELS*.

In eight of these 17 6th grade programs (47%), students scored above the aggregate 6th grade mean on Part V. You and Environmental Sensitivity (32.54). Of these eight, three had average scores greater than 35, one of which had an average scores greater than 37 (i.e., 37.9 out of 55). In six of these 13 8th grade programs (46%), students scored above the aggregate 8th grade mean

Table 27.
Descriptive Results for Schools and Classes with an Environmental Program, by Scale

			Means and Standard Deviations for Each Part of the *MSELS**									
School ID #	Grade	Program** Type	n***	Mean SD	EK	VC	AC	ES	EF	ID	IA	AP
9	6	Env. Science	21-23	Mean	13.9	43.9	39.0	34.0	8.9	1.8	3.1	6.8
				SD	2.8	9.7	8.9	6.5	1.3	0.9	2.0	4.9
11	6	Env. Club	14-17	Mean	11.2	45.5	38.6	34.3	8.1	1.1	2.1	5.3
				SD	3.2	10.0	9.7	7.8	2.1	0.9	1.5	4.3
	8	Env. Club	12-16	Mean	10.4	41.3	34.0	30.9	8.0	1.0	1.8	6.4
				SD	3.3	7.5	9.0	8.7	2.5	0.9	1.9	4.7
13	6	Env. Club	16-18	Mean	11.5	46.5	40.2	30.6	9.0	1.4	4.1	9.3
				SD	2.7	7.9	9.0	6.6	1.3	0.9	1.9	4.8
	8	Env. Club	15-17	Mean	14.8	49.5	41.4	29.9	9.2	1.8	4.9	11.5
				SD	1.7	6.4	6.4	6.4	1.6	0.5	1.0	5.1
16	6	Theme: Agric.	11-16	Mean	11.2	40.8	35.1	32.6	8.5	1.7	4.2	10.0
				SD	2.6	8.2	6.8	7.4	1.8	1.0	1.9	4.0
	8	Theme: Agric	14-16	Mean	9.3	38.0	31.5	30.7	6.7	.8	2.0	6.2
				SD	3.6	6.5	10.5	8.3	2.3	0.7	1.5	5.7
17	6	Theme: Carbon Footprint	15-22	Mean	13.7	51.0	48.6	37.9	9.9	1.2	4.6	9.8
				SD	1.4	6.0	6.3	6.1	0.3	1.0	1.0	6.2
	8	Theme: Carbon Footprint	23	Mean	13.7	50.3	47.5	35.2	9.7	1.6	4.5	10.5
				SD	1.4	7.4	6.1	6.6	0.8	1.0	1.8	4.1
18	6	Theme: Green	21-23	Mean	12.2	45.1	35.8	30.7	8.0	1.0	2.1	7.1
				SD	3.0	8.8	11.3	7.4	2.6	0.9	1.6	6.0
	8	Theme: Green	15-24	Mean	12.6	42.8	38.1	30.1	8.9	1.4	3.2	9.4
				SD	2.3	6.8	6.2	6.6	1.4	1.0	2.0	6.5
23	6	N/A	18-20	Mean	13.3	42.6	38.2	31.6	8.0	1.0	2.8	7.3
				SD	2.1	10.3	11.2	7.6	2.0	1.0	1.7	5.0
26	8	N/A	19-24	Mean	11.3	42.7	41.2	33.7	8.0	1.4	2.6	6.9
				SD	3.0	7.7	8.3	6.1	2.0	0.9	2.6	7.2
27	6	Camp	20-24	Mean	13.2	47.7	40.5	33.4	9.1	1.5	4.1	10.9
				SD	1.8	4.9	6.2	6.2	1.4	1.0	2.2	5.1
30	6	N/A	12-16	Mean	12.0	42.2	38.9	31.0	7.8	1.9	3.6	7.9
				SD	2.4	10.5	9.8	8.8	2.3	1.0	1.9	5.2
	8	N/A	13-17	Mean	9.5	35.9	32.0	29.1	7.2	1.2	2.4	6.8
				SD	3.1	3.4	9.3	6.6	2.2	1.1	1.9	5.6
32	6	Env. Club	19-24	Mean	8.4	47.4	41.2	32.3	8.6	1.0	1.8	8.0
				SD	2.9	6.8	7.5	5.0	1.7	0.6	1.6	6.8
	8	Env. Club	21-23	Mean	11.8	43.1	38.0	29.5	8.2	.9	2.6	7.7
				SD	4.1	9.2	9.8	7.5	2.2	0.7	1.4	4.0
36	6	Theme: Litter	22-25	Mean	13.0	47.9	38.8	32.4	8.1	1.3	3.1	7.5
				SD	2.3	7.0	9.4	9.1	1.5	0.8	2.0	5.2

* Note: Scale abbreviations refer to the following Parts of the *MSELS*: EK = Ecological Knowledge (Part II); VC = Verbal Commitment (Part III); AC = Actual Commitment (Part IV); ES = Environmental Sensitivity (Part V); EF = Environmental Feeling (Part VI); ID = Issue Identification Skills (Part VII.A); IA = Issue Analysis Skills (Part VII.B); AS = Action Planning Skills (Part VII.C).

** Note: In the Program Information Form, some school personnel indicated that they had a school-wide or grade-specific environmental program of some kind in Items 1-2, but did not indicate a name in Item 3. These are indicated by an N/A in the "Program Type" column.

*** Due to the fact that the number of usable responses received from a particular grade and school varied for each scale, this range represents the smallest and largest number of usable responses received from the grade/school.

Table 27. (Continued)

			Means and Standard Deviations for Each Part of the *MSELS*									
School ID #	Grade	Program* Type	n		EK	VC	AC	ES	EF	ID	IA	AP
40	6	Env. Science	20-30	Mean	9.5	42.5	38.5	31.0	6.7	.7	1.4	7.9
				SD	2.9	5.8	8.0	6.5	2.0	0.8	1.4	5.3
41	6	N/A	20-21	Mean	11.4	45.3	41.6	35.1	8.2	1.2	3.1	5.2
				SD	2.2	7.6	5.0	9.3	2.2	0.8	1.9	4.1
	8	N/A	17-20	Mean	13.7	41.4	37.8	29.7	8.0	1.5	4.1	1.0
				SD	2.6	9.5	6.2	7.2	1.4	1.0	1.8	5.1
43	6	N/A	12-16	Mean	7.2	38.3	34.8	35.2	7.5	.8	1.3	4.0
				SD	3.8	6.7	6.6	9.8	2.1	0.9	0.8	4.0
	8	N/A	12-14	Mean	10.9	35.3	30.8	33.1	6.6	.8	1.2	4.3
				SD	4.0	7.8	8.7	4.2	1.8	0.8	1.4	5.6
45	6	Env. Club	18-20	Mean	13.3	45.1	38.0	31.0	7.9	1.4	4.0	8.2
				SD	2.0	6.9	9.2	6.8	1.7	1.0	1.7	5.4
	8	Env. Club	14-17	Mean	13.0	40.8	34.3	29.9	8.5	1.2	3.4	9.1
				SD	2.2	8.2	5.9	7.7	1.4	0.8	1.5	5.5
47	6	N/A	13-17	Mean	12.3	47.4	41.4	32.7	9.0	1.9	4.2	9.5
				SD	3.3	7.0	7.6	7.2	1.5	1.0	1.7	6.2
	8	N/A	14-15	Mean	12.7	46.7	41.7	34.2	9.0	1.6	2.9	7.9
				SD	2.1	7.0	7.8	5.0	1.4	0.8	2.1	5.9
49	6	Camp	20-23	Mean	12.5	44.5	38.7	31.9	8.1	1.8	3.6	7.5
				SD	2.6	8.2	7.0	5.3	2.0	0.9	1.7	5.2
	8	Theme: Energy	15-22	Mean	11.6	40.4	32.9	29.1	7.8	1.5	3.1	3.9
				SD	2.9	10.7	8.8	7.5	2.0	1.1	2.1	3.9

* Note: Scale abbreviations refer to the following Parts of the *MSELS*: EK = Ecological Knowledge (Part II); VC = Verbal Commitment (Part III); AC = Actual Commitment (Part IV); ES = Environmental Sensitivity (Part V); EF = Environmental Feeling (Part VI); ID = Issue Identification Skills (Part VII.A); IA = Issue Analysis Skills (Part VII.B); AS = Action Planning Skills (Part VII.C).

** Note: In the Program Information Form, some school personnel indicated that they had a school-wide or grade-specific environmental program of some kind in Items 1-2, but did not indicate a name in Item 3. These are indicated by an N/A in the "Program Type" column.

*** Due to the fact that the number of usable responses received from a particular grade and school varied for each scale, this range represents the smallest and largest number of usable responses received from the grade/school.

on this scale (30.11). Of these six, four 8th grade programs had average scores greater than 33, one of which had an average score greater than 35 (i.e., 35.2 out of 55).

In 12 of these 17 6th grade programs (70%), students scored above the aggregate 6th grade mean on Part II. Ecological Foundations (11.24). Of these 12, four had average scores greater than 12, and six had average scores greater than 13. In seven of these 13 8th grade programs (54%), students scored above the aggregate 8th grade mean on this scale (11.62). Of these seven, four 8th grade programs had average scores greater than 13, one of which had an average score greater than 14 (i.e., 14.8, or 87%).

In 11 of these 17 6th grade programs (65%), students scored above the aggregate 6th grade mean on Part III. How You Think About the Environment, a measure of verbal commitment or intention to act (43.89). Of these 11 programs, five had average scores greater than 47, one of which had an average score greater than 50 (i.e., 51 out of 60). In eight of the 13 8th grade programs (62%), students scored above the aggregate 8th grade average on this scale (41.1). Of these eight, three 8th grade programs had average scores above 46, two of which had average scores above 49 (i.e., 49.5 and 50.3 out of 60).

Finally, in 12 of these 17 6th grade programs (70%), student scored above the aggregate 6th grade mean on Part IV. What You Do About the Environment, a self-reported measure of actual commitment or pro-environmental behavior (38.44). Of these 12, four had average scores greater than 41, one of which had an average score greater than 48 (i.e., 48.6 out of 60). In seven of the 13 8th grade programs (54%), students scored above the aggregate 8th grade average on this scale (35.14). Of these seven, four 8th grade programs had average scores greater than 41, one of which was greater than 47 (i.e., 47.5 out of 60).

In summarizing these comparisons, it appears as if both 6th and 8th grade programs in 18 schools performed on average on Part V. You and Environmental Sensitivity (i.e., the sample from about half of these programs scored at the aggregate mean for that grade level). This also appeared to be true for the performance of the 13 8th grade programs on Part II. Ecological Foundations, and on Part IV. What You Do About the Environment. On the other hand, it is evident that a greater than expected number of the 17 6th grade programs performed above average on Part II. Ecological Foundations, Part III. How You Think About the Environment, and Part IV. What You Do About the Environment. This was true for the 13 8th grade programs on only Part III. How You Think About the Environment. Beyond this, there were several school programs whose performance was noteworthy on one or more of these scales.

Frequency Distribution of Responses, by Part of the *MSELS*

The results of one additional set of exploratory analyses will be reported in this section. These analyses were conducted and reported by CSRA, and included the frequency of correct and

incorrect responses for each item in cognitive knowledge and skill scales, as well as the frequency of response for each item in the non-cognitive scales (i.e., affective and behavioral scales). Of these, the former were used by members of the Research Team to calculate item difficulty (i.e., the percentage of correct responses), while the latter can be used to gain some insight into overall response patterns to affective and behavioral items. These results are summarized in the six sub-sections below.

Item Difficulty Results for Part II. Ecological Foundations (Ecological Knowledge)

Table 28 (p. 78) contains the level of item difficulty for each of the 17 items in this scale for the 6th and for 8th grade sample in the form of decimals. Item difficulty values can range from a low of 0.00 (i.e., no student responds correctly) to 1.00 (i.e., all students respond correctly).

For the aggregate 6th grade sample, item difficulties range from a low of .35 (Item 18) to a high of .92 (Item 6). For the 6th grade sample, none of these items would be considered very difficult (i.e., .20 or below), and only three items had an item difficulty at or below .50. Further, only one of these items would be considered very easy (i.e., .85 or higher) (Chase, 1999, p. 159). Finally, for the 6th grade sample, six items exhibited a level of difficulty between .50 - .65, which tends to spread out the distribution and provide a more accurate picture of the percent of students who have and have not mastered the ecological concepts embedded in these items. These items are ranked 3rd - 8th in the 6th grade column in this Table (p. 78).

For the aggregate 8th grade sample, item difficulties range from a low of .36 (Item 18) to a high of .93 (Item 6). For the 8th grade sample, none of these items would be considered very difficult (i.e., .20 or below), and only one item had an item difficulty below .50. Further, only one of these items would be considered very easy (i.e., .85 or higher) (Chase, 1999, p. 159). Finally, for the 8th grade sample, seven items exhibited a level of difficulty between .50 - .65, which has the same benefits as described above. These items were ranked 2nd - 8th in the 8th grade column in this Table (p. 78).

In summary, it is noteworthy that the levels of item difficulty for the 6th and 8th grade samples were so similar. Six of the items were ranked the same for both samples, and the relative ranks were never more than two places apart for the two samples. Further, a difference in the levels of item difficulty for the 6th and 8th grade samples exceeded .05 on only four items (i.e., Items 8, 14, 18, and 19), and none of these differences exceeded .10.

Table 28.
Level of Item Difficulty of Items in Part II. Ecological Foundations

Item #	Grade	N	Item Difficulty (Percent Correct)	Difficulty by Rank, 6th Grade	Difficulty by Rank, 8th Grade
5	6	1001	.66	9	
	8	947	.67		9
6	6	1003	.92	17	
	8	946	.93		17
7	6	1001	.78	12	
	8	945	.79		13
8	6	998	.50	3	
	8	944	.58		4
9	6	996	.67	10	
	8	947	.70		10
10	6	1003	.81	14	
	8	948	.84		16
11	6	997	.71	11	
	8	946	.73		11
12	6	1003	.82	15	
	8	948	.78		12
13	6	996	.43	2	
	8	941	.51		2
14	6	999	.56	6	
	8	948	.63		8
15	6	1000	.52	4	
	8	946	.54		3
16	6	998	.58	7	
	8	946	.60		5
17	6	1002	.79	13	
	8	946	.80		14
18	6	991	.35	1	
	8	942	.36		1
19	6	1000	.54	5	
	8	947	.62		6
20	6	1005	.84	16	
	8	948	.81		15
21	6	995	.64	8	
	8	945	.62		6

Frequency Distribution of Responses on Part III, How You Think About the Environment

Reporting the frequency distribution of responses is appropriate for items that measure affect and behavior, particularly when the response scale for such items is ordinal in nature. The items in this scale were designed to measure students' verbal commitment or intentions to act (i.e., affective predispositions toward behaviors), and the response scale was a modified Likert-type scale. Consequently, the frequency distribution of responses for each item is reported in the form of percentages for each grade level in Table 29, below.

Table 29.
Frequency Distribution of Responses, as Percentages and by Grade, for Part III. How You Think About the Environment

				Frequency Dist. of Responses, as Percentages *				
Item #	**Grade**	**n**	**Miss. Resp.**	**Very True**	**Mostly True**	**Not Sure**	**Mostly False**	**Very False**
22	**6**	**1027**	**15**	**27**	**31**	32	6	5
	8	**951**	**11**	**22**	**34**	28	8	7
23 **	**6**	**1029**	13	9	14	27	**26**	**24**
	8	**952**	10	9	19	30	**25**	**17**
24	**6**	**1028**	**14**	**28**	**33**	21	9	9
	8	**953**	**9**	**24**	**27**	23	14	12
25 **	**6**	**1029**	**13**	8	11	26	**26**	**29**
	8	**952**	**10**	10	13	28	**27**	**22**
26	**6**	**1030**	**12**	**31**	**30**	20	11	9
	8	**950**	**12**	**26**	**29**	20	15	10
27 **	**6**	**1030**	**12**	10	10	18	**20**	**42**
	8	**952**	**10**	11	13	19	**24**	**33**
28	**6**	**1032**	**10**	**32**	**29**	23	9	7
	8	**951**	**11**	**22**	**26**	31	12	9
29	**6**	**1031**	**11**	**34**	**25**	25	9	7
	8	**953**	**9**	**25**	**31**	23	12	8
30	**6**	**1029**	**13**	**68**	**16**	8	3	5
	8	**953**	**9**	**60**	**20**	10	4	6
31	**6**	**1032**	**10**	**26**	**23**	31	9	11
	8	**951**	**11**	**16**	**23**	29	16	16
32	**6**	**1032**	**10**	**21**	**23**	29	12	15
	8	**952**	**10**	**14**	**19**	28	18	21
33	**6**	**1031**	**11**	**35**	**27**	20	9	9
	8	**951**	**11**	**26**	**27**	23	13	11

* Note: The bolded frequency counts reflect the most frequent response patterns.
** Note: Items 23, 25, and 27 were negatively worded items. These frequency distributions reflect students' actual responses, not a reverse scoring of these items.

As noted in this Table, three of the 12 items in this scale were "negatively worded" (i.e., " I would **not** …"). For Item 23, 50% of 6th grades and 42% of 8th grades selected "Mostly False" or "Very False." For Item 25, these percentages were 55% of 6th grades and 49% of 8th graders, and for Item 27, these percentages were 62% of 6th graders and 57% of 8th graders. A careful review of this Table indicates that the percentage of "Mostly False" and "Very False" responses for all other positively worded items (i.e., "I would …") did not approach these levels, and rarely exceeded 25% (i.e., 6th grade: Item 32; and 8th grade: Items 24, 31, 32).

It is equally noteworthy that students in both the 6th and 8th grade did not respond uniformly to all positively worded items. For example, for Item 30 (a lifestyle item involving resource conservation at home), 84% of 6th graders and 80% of 8th graders responded "Very True" or "Mostly True." Interestingly, students did not respond as positively to other items that appear to be related to this (e.g., Items 24 and 29). Further, on none of the other positively worded items did these percentages exceed 62% (i.e., 20% less than for Item 30). On the other hand, for Item 32 (an action item involving verbal persuasion), only 44% of 6th graders and 33% of 8th graders selected "Very True" or "Mostly True." Once again, students did not respond as hesitantly to other items related to this (e.g., Items 31 and 33). Further, on none of the other positively worded items did the percentages for "Very True" and "Mostly True" fall below 49% for 6th graders or 39% for 8th graders. These results are not surprising in that some behaviors or actions are more private and require less knowledge and skill than do others, and are reasonably consistent with the factor analysis results for this scale presented in the Methods section of this report. Taken together, these analyses suggest that, as a whole, students did respond to the specific wording in the items in this scale, and tended not to provide a patterned response.

Frequency Distribution of Responses on Part IV, What You Do About the Environment

As was done for Part III. How You Think About the Environment, and as noted in Table 30 (p. 81), this scale included two negatively worded items, Items 34 and 45 (i.e., the first and last item in this scale). Item 45 appears to follow a similar pattern of response to the negatively worded items in Part III. How You Think About the Environment. On this item, 54% of 6th graders and 52% of 8th graders selected "Very False" or "Mostly False." However, the same was not true

for Item 34. On this item, only 16% of 6th graders and 13% of 8th graders selected these responses. While it is possible that having a negatively worded item as the first item could have

Table 30.
Frequency Distribution of Responses, as Percentages and by Grade, for Part IV. What You Do About the Environment

				Frequency Dist. of Responses, as Percentages *				
Item #	**Grade**	**n**	**Miss. Resp.**	**Very True**	**Mostly True**	**Not Sure**	**Mostly False**	**Very False**
34 **	6	1022	20	60	12	12	**6**	**10**
	8	938	24	67	9	10	**5**	**8**
35	6	1018	24	**21**	**20**	15	15	30
	8	940	22	**15**	**16**	14	18	37
36	6	1017	25	**55**	**20**	7	8	11
	8	940	22	**43**	**24**	9	10	14
37	6	1019	23	**45**	**28**	10	9	7
	8	941	21	**39**	**28**	11	12	10
38	6	1020	22	**28**	**13**	29	9	30
	8	941	21	**20**	**10**	20	14	37
39	6	1019	23	**36**	**21**	15	11	17
	8	937	25	**26**	**21**	19	13	22
40	6	1020	22	**15**	**15**	22	18	30
	8	939	23	**9**	**13**	20	23	35
41	6	1018	24	**11**	**16**	21	21	31
	8	940	22	**6**	**9**	18	21	46
42	6	1021	21	**48**	**26**	13	7	6
	8	942	20	**41**	**28**	15	8	8
43	6	1016	26	**27**	**23**	11	18	22
	8	942	20	**20**	**18**	12	21	28
44	6	1018	24	**44**	**11**	10	7	28
	8	942	20	**33**	**15**	11	10	31
45 **	6	1015	27	19	12	15	**15**	**39**
	8	938	24	23	11	13	**18**	**34**

* Note: The bolded frequency counts reflect the most frequent response patterns.
** Note: Items 34 and 45 were negatively worded items. These frequency distributions reflect student responses, not a reverse scoring of these items

thrown off some students, student responses on the subsequent items do not reflect this. On the other hand, a more plausible reason for this response pattern may be that this item reflected an action involving written persuasion that, in fact, relatively few students had actually undertaken. This explanation seems to be reasonably consistent with the results obtained for Item 32 in Part III. How You Think About the Environment.

Again, it is equally noteworthy that students in both the 6th and 8th grade did not respond uniformly to all positively worded items. Further, as noted earlier, they did not respond as positively to actual behavior items (in Part IV.) as they did to intended behavior items (Part III.). For example, both 6th and 8th graders tended to respond very favorable to items involving resource conservation at home. On these items (Items 36, 37, and 42), at least 73% of 6th graders and 67% of 8th graders selected "Very True" or "Mostly True." Further, on none of the other positively worded items did these percentages exceed 57% for 6th graders and 48% for 8th graders (i.e., nearly 20% less than for those three lifestyle items). On the other hand, for Item 40 (an action item involving verbal persuasion), only 30% of 6th graders and 22% of 8th graders selected "Very True" or "Mostly True." Responses for Item 41 are equally low (27% of 6th graders and 15% of 8th graders), although this item pertains to reading material about the environment. However, as previously, students did not respond as hesitantly to other items related to Item 40 (e.g., Items 38 and 39). Further, on none of the other positively worded items did the percentages for "Very True" and "Mostly True" fall below 41% for 6th graders or 30% for 8th graders. These results are similar to those described above for Part III. and are reasonably consistent with the factor analysis results for this scale presented in the Methods section of this report.

As was stated for Part III. How You Think About the Environment, above, when the results above are viewed collectively, they suggest that, as a whole, students did respond to the specific wording in the items in this scale, and tended not to provide a patterned response.

Frequency Distribution of Responses on Part V, You and Environmental Sensitivity

The 11 items in this scale were designed to measure students' level of environmental sensitivity, and the response scale was a modified Likert-type scale. The frequency distribution of responses for each item is reported in the form of percentages for each grade level in Table 31 (p. 83).

Item 46 is a single item self-rating of students' own level of environmental sensitivity. Among 6th graders, 22% rated themselves as environmentally sensitive to a "Great" or "Large" extent, while 36% rated themselves as sensitive to a "Small" or "No" extent. A larger percent of 8th

graders rated themselves “Great” or “Large” (28%), and a smaller percent of 8th graders rated themselves “Small” or “No” (31%), resulting a more normal distribution. Item 47 is a single

Table 31.
Frequency Distribution of Responses, as Percentages and by Grade, for Part V. You and Environmental Sensitivity

				Frequency Distribution of Responses				
Item #	**Grade**	**N**	**No Resp.**	**Great X (a)**	**Large X (b)**	**Moderate X (c)**	**Small X (d)**	**No X (e)**
46	6	1,009	33	7	15	41	23	13
	8	939	23	8	20	41	21	10
47	6	1,008	34	6	17	40	26	10
	8	937	25	8	21	42	19	9
48	6	1,016	26	4	12	19	26	39
	8	940	22	6	11	23	27	33
49	6	1,019	23	35	23	19	10	13
	8	940	22	35	22	17	13	13
50	6	1,018	24	8	16	28	24	23
	8	937	25	10	16	29	23	21
51	6	1,018	24	39	24	19	10	8
	8	940	22	51	21	13	7	7
52	6	1,017	25	47	16	17	9	12
	8	941	21	54	17	14	8	8
53	6	1,016	26	10	14	25	26	26
	8	938	24	14	18	26	21	22
54	6	1,018	24	21	27	26	13	12
	8	941	21	37	27	20	9	7
55	6	1,019	23	18	21	25	15	21
	8	941	21	27	25	23	14	11
56	6	1,015	27	22	17	25	18	18
	8	938	24	24	26	23	15	13

item rating of familial levels of environmental sensitivity. The results for the 6th grade closely resemble those reported above for Item 46, although a smaller percent of 8th graders rated their familial level of environmentally sensitive as “Small” or “No” (28%).

Items 48-53 refer to different kinds of outdoor activities. In Item 48, it is readily apparent that a relatively small percent take part in family vacations and outings (“Great” and “Large”: 6th graders = 16%; and 8th graders = 17%). A similar pattern appears in Item 50, which applies to walks and hiking (“Great” and “Large”: 6th graders = 24%; and 8th graders = 26%). However, on

Item 51, a majority of each sample indicated that they bird-watch or engage in nature photography ("Great" and "Large": 6th graders = 63%; and 8th graders = 72%). This difference between engagement in outdoor recreation and in non-consumptive wildlife outdoor activities is subtle but apparently important for the students in this sample. Further, it is noteworthy that for Item 49, a majority within each sample indicated that they engaged in consumptive wildlife activities such as hunting and fishing ("Great" and "Large": 6th graders= 58%; and 8th graders = 57%). Finally, the results for Items 52 and 53 indicate that 6th and 8th graders are more than twice as likely to engage in outdoor activities as part of youth groups (Item 52, "Great" and "Large": 6th graders = 63%; and 8th graders = 71%) than on their own (Item 53, "Great" and "Large": 6th graders = 24%; and 8th graders = 32%).

The final three items in this scale asked about other possible influences on the level of environmental sensitivity. Of these, the results indicate that a greater percent of 6th and 8th graders found reading books and magazines about nature/environment to be enjoyable (Item 54, "Great" and "Large": 6th graders = 48%; and 8th graders = 64%) than TV shows, videos and DVDs (Item 55, "Great" and "Large": 6th graders = 39%; and 8th graders = 52%). The latter was rated as about as influential as teachers and youth leader role models (Item 56, "Great" and "Large": 6th graders = 39%; and 8th graders = 50%). While it may have been interesting to compare how influential teachers and youth leaders (Item 56) were to family members (Item 47), these questions were phrased differently, so such a comparison cannot be made.

There appeared to be only six items in which the percent of 6th graders and percent of 8th graders who selected "Great" or "Large" differed to any noticeable degree. The greatest differences were found on Items 54 (16% difference), 55 (13% difference), and 56 (11% difference). Differences were also apparent on Items 51 (9% difference), 52 (8% difference), and 53 (8% difference). All differences were in favor of the 8th grade sample.

Frequency Distribution of Responses on Part VI, How you Feel About the Environment

The two items in this scale were designed to measure students' feelings toward the environmental, and the response scale was again a modified Likert-type scale. The frequency

distribution of responses for each item is reported in the form of percentages for each grade level in Table 32, below. It should be noted again that there was a glitch in the wording of the Likert-type response scale for the two items in this scale (i.e., "Strongly Agree" was used mistakenly in

Table 32.
Frequency Distribution of Responses, as Percentages and by Grade, for Part V. How You Feel About the Environment

				Frequency Distribution of Responses as Percentages				
Item #	**Grade**	**n**	**Missing Responses**	**Strongly Agree**	**Slightly Agree**	**Neutral/ Undecided**	**Slightly Disagree**	**Strongly Disagree**
57	6	993	49	44	28	19	6	4
	8	930	32	34	29	25	6	5
58	6	993	49	4	6	17	23	51
	8	930	32	5	7	20	22	47

place of "Strongly Disagree"). As discussed in the Methods section of this report, to adjust for this, Data Collectors were notified of this and asked to address this in all subsequent data collection efforts. Further, those students who selected either (a) "Strongly Agree" or (e) "Strongly (Dis)Agree" for <u>both</u> items were dropped from the data set as unusable responses. Finally, students who responded to neither item or to only one item were also deemed unusable. Consequently, the number of missing responses in Table 32 is attributable to a number of factors, so the number of missing responses attributable to this glitch is not disproportionately large.

As one might expect, the percent of students who "Strongly Agree" or "Agree" with Item 57 ("love": 6th graders = 72%; 8th graders = 63%) is nearly equivalent to the percent of those who "Disagree" or "Strongly (Dis)Agree" with Item 58 ("hate": 6th graders = 74%; 8th graders = 69%). Based on these response patterns, it is evident that a large majority of 6th and 8th graders had reasonably strong emotional feelings toward the environment.

Item Difficulty Results for Parts VII.A. and VII.B., Issue Identification and Issue Analysis (Skills)

As in Part I. Ecological Foundations, there were correct and incorrect responses to the three items that assessed Issue Identification Skills and the six items that assessed Issue Analysis

Skills. Table 33, below presents the level of item difficulty for these nine items for the 6th and 8th grade sample in the form of decimals. As previously noted, item difficulty values can range from a low of 0.00 (i.e., no student responds correctly) to 1.00 (i.e., all students respond correctly). On both sets of items, the number of missing responses was noticeably larger than for

Table 33.
Level of Item Difficulty of Items in Part VII.A. Issue Identification and Part VII.B. Issue Analysis Skills

Sub-Scale	**Item #**	**Grade**	**n**	**Missing Responses**	**Item Difficulty**
VII. A. Issue Identification Skills	59	6	970	72	.32
		8	925	37	.32
	60	6	976	66	.58
		8	923	39	.61
	67	6	938	104	.39
		8	901	61	.36
VII.B. Issue Analysis Skills	61	6	955	87	.55
		8	895	67	.57
	62	6	952	90	.34
		8	891	71	.37
	63	6	949	93	.41
		8	895	67	.45
	64	6	951	91	.40
		8	895	67	.44
	65	6	949	93	.56
		8	895	67	.55
	66	6	948	94	.44
		8	884	78	.45

previous scales, which contributed to a decision by the research team not to include the Action Planning item in this analysis.

For the three Issue Identification items, the greatest percent of students in both the 6th and the 8th grade sample selected the correct response for Item 60, which was related to predators on agricultural herds (6th graders = 58%; 8th graders = 61%). The percent of 6th and 8th graders who responded correctly on the other two issue identification items was noticeably smaller, indicating

that students had greater difficulty making sense of those issues (Item 67 on land use: 6th graders = 39%; 8th graders = 36%; and Item 59 on forest ecology and timber harvest: 6th graders and 8th graders = 32%).

For the six Issue Analysis items, item difficulty levels (percentages) ranged from the upper 30s (Item 62: 8th graders = 37%) to the upper 50s (Item 61: 8th graders = 57%). On all six of these items, the difference between item difficulty levels for the 6th and 8th grade samples never differed by more than 4%. Overall, students on both samples found all six of these items to be moderately difficult, indicating that a majority of students in both samples had difficulty differentiating between and/or applying the five values used in these items even when those values were defined or described for them.

IV. CONCLUSIONS AND DISCUSSION

This section will reiterate conclusions related to the two research questions that guided this study and present a discussion of these findings.

Research Question One

Research Question One: What is the level of environmental literacy of sixth and eighth grade students across the U.S. on each of the following variables: ecological knowledge, verbal commitment, actual commitment, environmental sensitivity, general environmental feelings, and environmental issue and action skills?

Findings

As measured using the *Middle School Environmental Literacy Survey*, Ecological Knowledge was measured by Part II: Ecological Foundations, with a possible score of 17, with a 6th grade mean score of 10.95 and an 8th grade mean score of 11.42. Verbal Commitment was measured by Part III: How You Think About the Environment with a possible score of 60. The 6th grade mean score was 43.83 and the 8th grade mean score was 41.01. Actual Commitment was measured by Part IV: What You Do About the Environment with a possible score of 60. The 6th grade mean score was 38.23 and the 8th grade mean score was 34.89. Environmental Sensitivity was measured by Part V: You and Environmental Sensitivity with a possible score of 55. The 6th grade mean score was 32.47 and the 8th grade mean score was 30.14.

General Environmental Feelings was measured by Part VI: How You Feel About the Environment with a possible score of 10. The 6th grade mean score was 8.26 and the 8th grade mean score was 7.85. Three parts of the instrument were used to measure Selected Environmental Issue and Action Skills (Cognitive Skills). Part VII.A: Issue Identification had a possible score of 3. The 6th grade mean score was 1.33 and the 8th grade mean score was 1.29. Part VII.B: Issue Analysis had a possible score of 6. The 6th grade mean score was 1.87 and the

8th grade mean score was 1.91 Part VII.C: Action Planning had a possible score of 20. The 6th grade mean score was 7.55 and the 8th grade mean score was 8.03.

The older students, the 8th graders, evidenced higher means than the 6th graders on Ecological Knowledge and on the Selected Environmental Issue and Action Skills. The 6th graders had higher means on Verbal Commitment, Actual Commitment, Environmental Sensitivity, and General Environmental Feelings. Significant differences were observed between 6th and 8th graders on Ecological Knowledge, Verbal Commitment, Actual Commitment, Environmental Sensitivity, and Environmental Feeling. These differences favor the 6th graders on all variables except in the case of Ecological Knowledge.

Research Question Two

Research Question Two: What is the general level of environmental literacy of sixth and eighth grade students across the U.S.?

Findings

An Environmental Literacy Composite Score was derived by compiling the four Components of Environmental Literacy scores (possible composite score of 240, with a range from 24 to 240). Table 34 (p. 90) presents the environmental literacy composite scores. For this analysis and with respect to the performance on this particular instrument, the range was further divided into three levels of environmental literacy, low (24-96), moderate (97-168), and high (169-240). The 6th grade composite score was 143.99 and that of the 8th grade was 140.19 with a combined 6th and 8th composite score of 142.14. These scores all fall in the mid-range (97-168), of possible scores reflecting a moderate level of environmental literacy.

Additional insight into environmental literacy can be gained from examining the scores (see Table 34, p. 90) associated with the four components of environmental literacy included in the instrument used in this research (each component adjusted to a possible value of 60). Of the four literacy components, the highest scores for the 6th and 8th grade were attained in Ecological Knowledge with a Grand Mean Combined 6th & 8th of 40.34 and Combined Component Means

of 39.67 and 41.01 for 6th and 8th grades, respectively. The range for Ecological Knowledge was (0-60) with a range level of low (0-20), moderate (21-40), and high (41-60). Slightly lower scores were obtained in Environmental Affect with a Grand Mean Combined 6th & 8th grade

Table 34.
Environmental Literacy Composite Scores with Ranges and Levels

Components of Environmental Literacy	Grade	Combined Component Mean	Grand Mean Combined 6th & 8th	Environmental Literacy Composite Scores		
				6th	8th	6 & 8
Ecological Knowledge Range = 0-60 Range levels: Low = 0-20 Moderate = 21-40 High = 41-60	6th	39.67 (moderate)	40.34 (moderate)	143.99 (moderate) Range Levels: Low = 24-96 Moderate = 97-168 High = 169-240	140.19 (moderate) Range Levels: Low = 24-96 Moderate = 97-168 High = 169-240	142.14 (moderate) Range Levels: Low = 24-96 Moderate = 97-168 High = 169-240
	8th	41.01 (moderate)				
Environmental Affect Range = 12-60 Range levels: Low = 12-27 Moderate = 28-44 High = 45-60	6th	40.73 (moderate)	39.40 (moderate)			
	8th	38.06 (moderate)				
Cognitive Skills Range = 0-60 Range levels: Low = 0-20 Moderate = 21-40 High = 41-60	6th	25.15 (moderate)	25.56 (moderate)			
	8th	25.98 (moderate)				
Behavior Range = 12-60 Range Levels: Low = 12-27 Moderate = 28-44 Low = 45-60	6th	38.44 (moderate)	36.84 (moderate)			
	8th	35.14 (moderate)				

Note. For all reported measurements (Combined Component Mean, Grand Mean Combined 6th & 8th and the Environmental Literacy Composite Scores), n sizes fluctuated from variable to variable and are not reported on this table. N sizes fell within a range of 874 to 1000 for 6th grade students, and within a range of 820 to 936 for 8th grade students (total sample included 1,042 6th grade students and 962 8th grade students).

score of 39.40 and Combined Component Means of 40.73 for the 6th grade and 38.06 for the 8th grade. The Behavior Grand Mean Combined 6th & 8th score was 36.84 with Combined Component Means of 38.44 for the 6th grade 35.14 for the 8th grade. Both Environmental Affect and Behavior share the same range (12-60) and thus the same range levels [low (12-27), moderate (28-44), and high (45-60)]. The lowest scores were observed in the component of Cognitive Skills Grand Mean Combined 6th & 8th score of 25.56 and Combined Component Means of 25.15 for the 6th grade 25.98 for the 8th grade. The range for Cognitive Skills was (0-60) with a range level of low (0-20, moderate (21-40), and high (41-60). All of the Components of Environmental Literacy measured in this study, for both 6th and 8th grade students, fall within the moderate range.

It is interesting to note that in the scores for components that focused on performance (i.e., that asked students to demonstrate knowledge or skills), the 8th graders out-scored the 6th graders. This might be expected due to developmental differences between the two age groups. In the components that relied on self-reports (affect and behavior), the 6th graders outscored the 8th graders. Within the cognitive skills component, the highest values for both 6th and 8th graders were observed for issue analysis skills, followed by issue identification skills, and then by action planning skills.

Discussion

This research provided instrumentation to measure environmental literacy, and collected baseline environmental literacy data for 6th and 8th graders across the United States. As such, it might be regarded as a status study of environmental literacy among middle school students in the United States. This information will eventually be used to assess program effectiveness in the hope of raising environmental literacy across the nation. By providing instrumentation and baseline data on environmental literacy, this project helped to fulfill the shared mission of EPA, NOAA and NAAEE of advancing environmental literacy and environmental quality. The results of this project will provide resources and data to use in the development and advancement of quality environmental education programming.

Thoughts on the impacts of this study and future studies follow.

1. Insight into middle school environmental literacy was gained by examining the scores associated with the four components of environmental literacy included in the instrument used in this research (each component adjusted to having a possible value of 60). The highest scores (combined 6th and 8th grade adjusted grand mean) were attained in ecological knowledge (40.49), with slightly lower scores in environmental affect and behavior (39.41 and 36.56, respectively). The lowest scores were observed in the component of cognitive skills (26.30). In the components that focused on performance (i.e., that asked students to demonstrate knowledge or skills), the 8th graders out-scored the 6th graders. These results might be expected due to developmental differences between the two age groups. In the components that relied on self-reported information (affect and behavior), the 6th graders outscored the 8th graders.

It is clear to these investigators that research should be undertaken to identify the factors (e.g., socio-economic, educational, and cultural) that contribute to the disparities across variables that can be measured by the *MSELS*. Another avenue of research might be the investigation of developmental variables among middle school students that may contribute to these disparities.

2. A casual review of the composite scores of 6th and 8th grade classes reveals that there are middle schools that lie at the extreme ends of a continuum of scores. These schools, in particular, become "schools of interest" and a thorough study of them should reveal those attributes that result in the rather obvious disparities regarding environmental literacy. This could well help researchers and theorists identify promising educational practices as they relate to environmental literacy.

Other schools of interest were, of course, those that communicated to the researchers that they had some type of environmental program. The comparison of schools with environmental programming versus those without such programming was not a primary focus of this study. However, exploratory analyses suggest that such a comparison might be a direction for future research. Eighteen of the 48 schools participating (38%) reported that they had some type of environmental program on a school-wide basis, or in place in 6th or 8th grade classes. Seventeen

of the 48 schools with sixth grade classes reported having an environmental program and 13 of the 48 schools with eighth grade classes reported the existence of an environmental program. Only seven of these reported programs could be considered as environmental science or environmental education in nature. Nevertheless, preliminary examination of these schools with (self described) environmental programs indicated that their composite means (6^{th} grade, 8^{th} grade, and combined 6^{th} and 8^{th}) were higher than those of schools not reporting the existence of environmental programming. Given the wide variety of programs, one cannot interpret these findings too widely. However, it is interesting enough to note it here, and to recommend it for further investigation.

3. In addition, it is important to remember that a large assortment of environmental education programs and practices exist in the U.S. In light of this, research using the *MSELS* to undertake additional study of schools and programs will provide data to compare the consequences of those programs with respect to the literacy variables investigated in this study.

A critical aspect of this discussion is the fact that the development of environmental literacy is complex and can take many forms. This study is important in that it provides us with a measure against which to compare future measures. Further analyses of these data (in particular with respect to the classroom and teacher information) might shed light on the impacts of environmental education efforts, where it was present in these classrooms.

The research team anticipates an additional research effort that will purposively seek out and collect data from middle school settings where environmental education is in place. This will permit the team to compare measures on environmental literacy variables across the representative sample of middle school classrooms from this study as well as the purposive sample. This comparison will help to determine if environmental education efforts can, indeed, make a difference in environmental literacy. It will also permit us to observe relative effectiveness of diverse environmental education programs and curriculums with respect to environmental literacy. We are confident in the ability to collect data on environmental literacy variables and to compare, in meaningful ways, efforts to develop these variables in the adolescent populations in the United States.

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APPENDICES

Appendix 1: Materials Prepared for School Principals

Note: All forms are as distributed, with two exceptions: Font sizes have been decreased so the original fits on this page, and all forms to be returned were printed on blue paper.

NAAEE
NORTH AMERICAN ASSOCIATION FOR ENVIRONMENTAL EDUCATION
Promoting excellence in environmental education

2000 P Street NW Suite 540 Washington DC 20036-6921
Tel: (202) 419-0412 Fax: (202) 419-0415
www.naaee.org

August 12, 2008

Dear District Administrator,

Please accept this letter as an introduction into the National Environmental Literacy Assessment Research (NELA) project, a coordinated effort of the North American Association for Environmental Education (NAAEE), the National Oceanographic and Atmospheric Association (NOAA), and the Environmental Protection Agency (EPA). Your school is one of fifty across the United States that we would like to include in this important project. Several agencies, organizations, and individuals have been working diligently toward the goal of establishing an environmentally literate population without the benefit of being able to compare their efforts to a benchmark; the NELA project was designed to help develop this benchmark at the middle grades.

The Steering Committee of NELA believes that it is primarily during the middle grades of 6th through 8th that students begin to develop a holistic view of the environment. In fact, in *Turning Points*, the Carnegie Council (1998) identified young adolescence as the, "last best chance to avoid a diminished future." Since adolescence marks the beginning of abstract thinking or the ability to think more globally, we have selected the 6th and 8th grades to provide a measurement that approximates the beginning of this developmental stage.

Several people have spent the last year preparing for this data collection phase of the NELA project. We hope that our preplanning will make the data collection progress as smoothly and as inconveniently as possible for you.

A data collector (a research assistant) from your region of the country will contact you to plan for and administer the survey. The data collector will also make sure that all forms are signed, collected and sent to Dr. Ron Meyers, the Assessment Coordinator for the Project. Prior to the test administration date, you will receive packets containing all of the **required** forms:

1. School Principal Packet:
   - Principal Guidelines and Procedures
   - Principal Purchase of Service Agreement (PSA)
   - Self Addressed Stamped Envelope to return the PSA
   - Principal Copy - School Materials Verification Form (to be completed upon (a) receiving this packet and again (b) upon completion and submission of all materials)
   - School Information Form (to be completed by the Principal or designee)

- Parental Active Consent Form (Blue) or Parental Passive Consent Form to be used per your district policy (to be distributed to the parents of the 6th and 8th grade students in the participating grades.)Packet II: Teachers. Separate 6th and/or 8th Grade Teachers Envelopes are provided for each participating 6th and 8th grade teacher (these forms are to be completed by **EACH** teacher from a participating classroom):
- Teacher Cover Letter
- Teacher Consent Form
- Teacher Information Form

- The 6th and 8th Grade Program Information Forms. These are provided for the teacher who is most familiar with the nature of the science/environmental course of study in each of the participating 6th and 8th grade classes. In other words, teachers should neither summarize information for both 6th grade classes or both 8th grade classes on one form, nor should 6th and 8th grade teachers summarize responses for both grade levels on one form.

It is very important to this project that all of the forms be completed as described. Your data collector will discuss the arrangements that will be made for the students to take the survey and will also discuss the arrangement that have been made for any students whose parents or guardians have not given permission for them to participate.

To thank you for your cooperation, each school will receive $500 once completed surveys and paperwork have been returned to our central processing location.

On behalf of the Steering Committee for the NELA project, I would like to thank your for your participation and cooperation in this most important study. If you have any questions concerning the NELA project, please feel free to contact me at mcbeth@uwplatt.edu. If you have questions concerning the data collection that cannot be answered by your regional data collector, please feel free to contact Dr. Ron Meyers, Assessment Coordinator, at 412-527-9317, or rbmeyers@clintonschool.uasys.edu.

My Sincere Thank You,

William C. McBeth, Ph.D.,
NELA Project Coordinator
Associate Professor, University of Wisconsin-Platteville

North American Association for Environmental Education
2000 P Street NW Ste 540 Washington DC 20036

DATE:

TO:

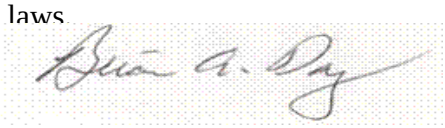
SS#
Tel: ( ) -

FROM: Brian A. Day, Executive Director, NAAEE

PURCHASE OF SERVICE AGREEMENT: *[NELA Agreement between Middle School Principal and NAAEE]* To accomplish the successful administration of the school, teacher, program forms, and MSEL Survey with 6th and 8th grade students, Cassie Angelo has agreed to provide the following services from March 15th- May 15th.

Description	Rate	Total
Ensure that the School Information Survey is completed Identify participating classes of 6th, 8th grade students\ Ensure that active parental consent forms are completed, where needed Ensure that teachers of participating classes complete teacher survey Ensure that participating teachers complete program information survey Ensure that time is scheduled for students to complete MSELI Survey, and survey is completed Conduct exit interview with data collector to complete exit interview sheet verifying all forms completed and returned	$500 to school for educational resources	$500
TOTAL		**$500**

First name Last name (hereafter known as "Contractor") agrees to fulfil this agreement as an independent contractor. The Contractor under the terms of this Agreement will not be considered to be the employee of NAAEE under the meaning or application of any federal or state laws, including but not limited to unemployment insurance or workers' compensation laws, and will not be entitled to any of the benefits of an NAAEE employee. The Contractor assumes all liabilities and obligations imposed by any such laws.



Signature/date	Signature/date
First Name Last Name	Brian A. Day
Contractor	Executive Director

**********RE

TURN THIS FORM AS SOON AS YOUR SCHOOL ASSIGNMENTS ARE DETERMINED TO: Ron Meyers, Assessment Coordinator, Clinton School of Public Service, 1200 President Clinton Avenue, Little Rock AR 72201.

School Materials Verification Form

There are two intended uses of this form:
(a) to allow and encourage the School Principal to verify that all relevant project materials were received by checking off the boxes in the left-hand column; and
(b) to encourage the School Principal and the on-site Data Collector to verify that all relevant project materials were completed and returned by checking off the boxes in the right-hand column and then signing the bottom of this form.

Received	Project Materials	Completed/Returned
	Packet I: School Principal	
	Principal Guidelines & Procedures	
	Principal PSA & Request for Payment	
	School Information Form	
	Packet II for 6th Grade Teacher:	
	A. Teacher Consent Form	
	B: 6th Grade Program Information Form	
	C: 6th Grade Teacher Information Form	
	Packet II for Each 8th Grade Teacher:	
	A: Teacher Consent Form	
	B: 8th Grade Program Information Form	
	C: 8th Grade Teacher Information	
	Parental Consent Forms:	
	* for Each 6th Grade Class	
	* for Each 8th Grade Class	
	To be distributed by the Data Collector:	
	Copies of the MSEL Survey Instrument	
	MSEL Survey Response/Scantron Forms	

_____ _____

School Principal Signature and Date(s) Data Collector Signature and Date

The National Environmental Literacy Assessment Project

School Principal Guidelines and Procedures

Procedures for Enclosed Packets and Forms

If your school has not yet scheduled the administration of the MSELS, the Data Collector (Research Assistant) working with us will be in contact shortly to do so.

The items included in these packets and forms seek information that is vital to this national research project. Please take steps to ensure that all of these forms are completed by appropriate school personnel or parents/legal guardians, as described below.

Packet I: School Principal includes the ***School Principal Purchase of Service Agreement Form***. This should be completed first and mailed to Dr. Meyers in the envelope provided to confirm your participation.

The *School Information Form,* should be completed by a school administrator at their earliest convenience (e.g., the Principal or her/his designee). Several of the items in this section may require access to district and school records, and/or on-line database entries for the district and school available through the National Center for Educational Statistics (NCES).

The ***School Materials Verification Form*** is to ensure that you received and completed the proper materials. You will review this with the NELA Data Collector assigned to your school when you meet at the conclusion of the administration of the MSELS to your students.

Random Selection of Participating Classes. Fortunately, environmental/science teachers are often passionate about their teaching and are eager to participate in this type of survey. However, it is critical that you select the classes that will participate using some random selection method. We would request that even if teachers who have strong science/environmental interests have asked to participate, and you have agreed, that you follow these guidelines. To make our survey nationally representative, we need to randomly select classes of students. We cannot have that representative sample if Principals intentionally select the more "environmental" classes in each school, based upon their teachers being strongly pro-environmental, or a special class on the environment. If principals do that, we will have a survey of students taking environmental classes, and be unable to identify what the average American student's environmental literacy. Your assistance with this is vital and appreciated. A convenient way to randomly select the classes is to number all the possible 6^{th} grade classes 1- x and throw a die to select those that will participate, and then do this for the 8^{th} grade classes. Please do not number any classes higher than six, as using two dice for this method will not work. Please distribute the Teacher Envelopes to the randomly selected teachers whose classes will be participating.

Packet II, Teachers Envelopes, contains sets of materials to be completed by teachers of the classes to whom the MSELS is being administered, and a teacher most familiar with nature of the science/environmental course of study.

One Envelope has been prepared for each teacher whose class is participating. (The MSELS and the scantron response forms will be brought to the school by the NELA Data Collector on the day the MSELS is administered.) Each includes a Teacher Cover Letter and a ***Teacher Consent Form***. Please

have the teachers complete and return the consent form to you so the Data Collector can pick these up from you during your exit meeting immediately after the administration of the MSELS.

The ***6th and 8th Grade Program Information Forms*** should be distributed to, read by, and signed by the teacher who is most familiar with the nature of the science/environmental course of study in each of the participating 6th and 8th grade classes. In other words, teachers should **neither** summarize information for both 6th grade classes or both 8th grade classes on one form, **nor** should 6th and 8th grade teachers summarize responses for both grade levels on one form. Please collect the completed Program Information Forms from the teachers and have these available at the exit meeting with the Data Collector.

Teacher Information Form. Each teacher who has signed a Teacher Consent Form is asked to complete their own Teacher Information Form. Under no circumstances should more than one teacher present or summarize responses on one form. Please collect these from the participating teachers and have these available for the exit meeting with the Data Collector.

Each of these participating 6th and 8th grade teachers should distribute one copy of the appropriate ***Parental Consent Form*** to each student in her/his class at least one week prior to the agreed upon survey administration date. If your school requires active consent forms, please be sure to collect these and provide them to the Data Collector at the exit meeting. We would ask that you provide an alternate activity for students whose parents do not consent for their participation. Since we are asking that the teacher for each class be present during the administration of the MSELS, we would ask that those teachers not be tasked with responsibility for students who are not participating in the MSELS. We have a script for them to introduce the Data Collector, and expect that their presence will be helpful to both the students and the Data Collector for ensuring the smooth administration of the MSELS.

All of these forms should be completed and included among the materials submitted by your school. Any school administrator or teacher who has questions about this project the survey, or these packets and forms, are encouraged to contact project personnel using contact information provided in the Teacher Consent Form.

Thank you again for your participation in this historic project.

Appendix 2: Materials Prepared for Teachers

2000 P Street NW Suite 540 Washington DC 20036-6921
Tel: (202) 419-0412 Fax: (202) 419-0415
www.naaee.org

NAAEE
NORTH AMERICAN ASSOCIATION FOR ENVIRONMENTAL EDUCATION
Promoting excellence in environmental education

August 12, 2008

Dear Participating Sixth and Eighth Grade Teachers:

Please accept this letter as an introduction into the National Environmental Literacy Assessment Research (NELA) project. Your receipt of this letter means two things: (1st) your School Principal has accepted an invitation from GfK Roper for your school to serve as one of fifty middle schools across the United States to participate in this important project; and (2nd) you have been asked by your School Principal to serve as the teacher contact for one of the participating 6th or 8th grade classes in your school.

Several agencies, organizations, and individuals have been working diligently toward the goal of an environmental literate population without the benefit of being able to compare their efforts to a benchmark; the NELA project was designed to help develop this benchmark for the middle grades. With this goal in mind, several people have spent the last year preparing for this data collection phase of the NELA project. We hope that our preplanning will make the data collection progress as smooth and as convenient as possible for you.

If it has not happened already, a data collector (a research assistant) from your region of the country will contact your School Principal to plan for the administration of the survey. The data collector will also make sure that all forms are signed, collected, and sent to Dr. Ron Meyers. The packets that have been sent to your Principal received contain all of the **required** forms. The packets and forms of particular relevance to you are as follows.

2. **Packet I: School Information**
   This Packet included:
   - Active **or** Passive Parental Consent Forms: The form that you should plan to use is the one that your School Principal designates as meeting your school district's policy regarding parental consent procedures. If this has not happened already, your School Principal of her/his designee will soon ask you to distribute this form to all parents and guardians of 6th or 8th grade students in the participating class.

3. **Packet II: Program and Teacher Information Packet**
   A copy of this packet is to be distributed to and completed by each participating 6th and 8th grade teacher
   - Teacher Consent Form and Teacher Information Form.
   - The Program Information Form is to be completed by **the lead, environmental, or science** teacher that works with **each** participating classroom. We need the form completed for each class taking the MSELS. In other words, teachers should neither summarize information for both 6th grade classes or both 8th grade classes on one form, nor should 6th and 8th grade teachers summarize responses for both grade levels on one form. We recognize this is duplicative but need the data collected this way so we can properly do our data analysis.

It is very important to this project that all of these forms be completed as described. The data collector for your school will discuss with your School Principal and with you and your fellow teachers the arrangements to be made for the students to take the survey, as well as arrangement for any students whose parents or guardians do not give permission for them to participate.

On behalf of the Steering Committee for the NELA project, I would like to thank you for your participation and cooperation in this most important study. If you have any questions concerning the NELA project, please feel free to contact me at <mcbeth@uwplatt.edu>. If you have questions concerning the data collection that cannot be answered by your regional data collector, please feel free to contact Dr. Ron Meyers at <rbmeyers@clintonschool.uasys.edu>.

My Sincere Thank You,

William C. McBeth, Ph.D.,
NELA Project Coordinator
Associate Professor, University of Wisconsin-Platteville

TEACHER CONSENT FORM

The National Environmental Literacy Assessment Project: Year 1 National Survey

A class in which you teach was selected to participate in a national survey of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. This survey is part of the "National Environmental Literacy Assessment Project," a research project funded by the Environmental Protection Agency (EPA), and supported by the National Oceanic and Atmospheric Administration (NOAA) and North American Association for Environmental Education (NAAEE). *The information below addresses the consent requirements of this study. Please read through this information carefully.*

The purpose of this survey is to explore the level of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. The survey sample was developed by GfK Roper. Using census data, they selected 50 counties from across the country, and then randomly selected one public or private school in each county that had both 6th and 8th grade classes. Then, they asked the Principal if that school could participate in this survey. If the Principal agreed, they randomly selected 6th and 8th grade classes to participate. Yours is one of those classes.

The two forms you are asked to complete are: (1) a Program Information Form, which has been designed to gather information about any environmental program in which this class participates, as well as about common classroom practices; and (2) a Teacher Information Form, which has been designed to
gather information about the lead, environmental, or science teacher for this class of students. We estimate that these forms will take approximately 45 minutes to complete.

While each form asks for the teacher's name, this is done solely to (a) identify the teacher who completed a form should there be any need for follow-up; and (b) permit the program and teacher information to linked to the completed surveys for that class during data entry and analysis. Please note that each school, class, and teacher will be assigned an ID number during data entry. *Thus, the only members of the project team who will ever know your name are those involved in data entry. No other member of this team will know your name or be able to connect your responses to you. Beyond this, none of your responses will ever be singled out in reports or presentations of the results of this survey*.

It is hoped that this survey will result in an improved understanding of environmental literacy in the middle grades across the U.S. A report of this survey will be provided to EPA, NOAA, and NAAEE, and results will be presented at conferences and in research journals. Upon request, the project team will forward a summary of survey results to your school. Beyond this, survey results may be used in Years 2-6 of this project, as well as to guide improvements to environmental education programs for middle grades.

If you agree to participate, the only thing that you are asked to do is complete these two forms as completely and accurately as possible, and then submit them to your School Principal or to the data collector on the day this survey is administered to your class.

If you do not wish to participate in this survey, please discuss this with your School Principal.

Finally, you may withdraw from participation at any time and without penalty. Further you have a right to ask questions about this survey at any time. To do so, you may contact Dr. Ron Meyers, Assessment Coordinator, University of Arkansas: (501) 683-5231, or <rbmeyers@clintonschool.uasys.edu> or Dr. Bill McBeth, Project Director, University of Wisconsin - Platteville: (608) 342-1284 or <mcbeth@uwplatt.edu>. In addition, you may contact Florida Institute of Technology's Institutional Review Board for the Protection of Human Subjects through its staff office at (321) 674-8120.

TEACHER INTRODUCTION OF THE DATA COLLECTOR TO CLASS

Today we'll be participating in a survey. I'd like you to give your full attention to the person who'll be handing out questionnaires. This is Mr./Ms. _____, who will be working with us today.

When you're completing the questions, it's important that you give answers that show how you feel, what you think or what you do. All answers will be kept strictly confidential. You're not going to put your name on the questionnaire so nobody, not even I, will know what answers you gave. When finished, you will put your questionnaire, with no name on it, into a box where it will be mixed together with all of the other questionnaires. There are no right or wrong answers to the questions, so please be completely honest when filling out the questionnaire. If there is a question that you feel you cannot answer honestly, please leave it blank.

If you have any questions, please ask the person giving out the questionnaire.

Appendix 3: Parental Consent Forms

1. Passive Parental Consent Form
2. Active Parental Consent Form

2000 P Street NW Suite 540 Washington DC 20036-6921

Tel: (202) 419-0412 Fax: (202) 419-0415
www.naaee.org

NORTH AMERICAN ASSOCIATION FOR ENVIRONMENTAL EDUCATION

Promoting excellence in environmental education

PASSIVE PARENTAL CONSENT FORM

The National Environmental Literacy Assessment Project

Your child was selected to participate in a national survey of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. This survey is part of the "National Environmental Literacy Assessment Project," a research project funded by the Environmental Protection Agency (EPA), and supported by the National Oceanic and Atmospheric Administration (NOAA) and North American Association for Environmental Education (NAAEE). The information below addresses the parental consent requirements of this study. Please read through this information.

The purpose of this survey is to explore the level of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. The sample for this survey was developed by GfK Roper. Using census data, they selected 50 counties from across the country, and then randomly selected one pubic or private school in each county that had both 6th and 8th grade classes. Then, they asked the Principal if that school could participate in this survey. If the Principal agreed, they randomly selected 6th and 8th grade classes to participate. Your child is in one of those classes.

This pencil-and-paper survey consists of seven sections, and is designed to gather information on students' environmental knowledge, skills, affective characteristics (feelings), and participation, as well as their age, gender, and ethnic background. This survey will be administered by one of the project Data Collectors in a supervised school setting approved by the School Principal during normal school hours, and will take approximately 45 minutes to complete.

The survey and Data Collector will not ask for your child's name, and if any child does write in her/his name on the response form, it will be erased. Thus, no one on the project team will ever know your child's name or be able to connect your child's response to her/him. Beyond this, no individual student's responses will ever be singled out in reports or presentations of the results of this survey.

It is hoped that this survey will result in an improved understanding of environmental literacy in the middle grades across the U.S. A report of this survey will be provided to EPA, NOAA, and NAAEE, and results will be presented at conferences and in research journals. Upon request, the project team will forward a summary of the survey results to your child's school. Beyond this, these survey results may be used in Years 2-6 of this project, as well as to guide improvements to environmental education programs for the middle grades.

If you do not want data collected from your child's participation included in this study, please sign and date the bottom portion of this form, check the box below, and have your child return the form to his or her teacher. If you do this, your child will participate in an activity designed by the school during the survey.

You may withdraw your child from participation at any time without penalty. Further you have a right to ask questions about this survey at any time. To do so, you may contact Dr. Ron Meyers, Assessment Coordinator, University of Arkansas: (501) 683-5231, or <rbmeyers@clintonschool.uasys.edu> or Dr. Bill McBeth, Project Director, University of Wisconsin - Platteville: (608) 342-1284 or <mcbeth@uwplatt.edu>. Finally, you may contact Florida Institute of Technology's Institutional Review Board for the Protection of Human Subjects through its staff office at (321) 674-8120.

☐ I do not want data collected as a result of my child's participation included in the study.

_____ _____ _____

Child or Ward Signature of Parent or Guardian Date

_____ _____

Signature of Investigator Date

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Tel: (202) 419-0412 Fax: (202) 419-0415
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ACTIVE PARENTAL CONSENT FORM

PARENT COPY

The National Environmental Literacy Assessment Project: Year 1 National Survey

Invitation to Participate
We are inviting your child to participate in a national survey of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. In order for your child to participate in this survey we need to receive your consent (permission). This survey is part of the "National Environmental Literacy Assessment Project," a multi-year research project funded by the Environmental Protection Agency (EPA), and supported by the National Oceanic and Atmospheric Administration (NOAA) and the North American Association for Environmental Education (NAAEE). The following questions and answers address the informed parental consent requirements of this study, and explain how we will maintain the anonymity and confidentiality of students' responses. Please take a few moments to read these questions and answers, and then complete the next-to-last section of this form.

1. What is the purpose of this project? The purpose of this Year I survey is to explore the level of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. This survey will gather information on these students' environmental knowledge, skills, affective characteristics (feelings), and participation, as well as their grade level, age, gender, and ethnic background (see #3, below).

2. How was your child chosen? The sample for this survey was developed by GfK Roper. Using national census data, GfK Roper selected 50 counties from across the country, and then randomly selected one pubic or private school in each county that included both 6th and 8th grade classes. Then, they asked the Principal in each school if she/he was willing to have that school participate in this survey. If the Principal agreed, GfK Roper randomly selected up to two 6th and 8th grade classes to participate in this survey. Your child is in one of those classes.

3. What is involved in participating? Students will be asked to complete a 45-minute pencil-and-paper survey that has seven sections: (I) About Yourself; (II) Ecological Foundations; (III) How You Think About the Environment; (IV) What You Do About the Environment; (V) You and Environmental Sensitivity; (VI) How You Feel About the Environment; and (VII) Issue Identification, Issue Analysis, and Action Planning. ***If you agree to permit your child to participate in this survey, the only things you need to do are: (1) read and sign this consent form; and (2) return this signed form to your child's teacher in a timely manner.***

4. What are the costs associated with your child's participation? We do not anticipate any risks from your child's participation in this survey. Other than the time involved, there is no participation cost to you or your child.

5. What are the benefits associated with your child's participation? The primary benefit of your child's participation in this survey is an improved understanding of environmental literacy in the middle grades across the U.S. A formal report of this Year 1 survey will be provided to EPA, NOAA, and NAAEE, and survey results will be presented at conferences and in research journals. Upon request, the project team will forward a summary of the results of this survey to your child's school, which can then be shared with you. Beyond this, results of this Year I survey may be used: (a) to guide research plans for Years 2-6 of this project; (b) as part of the analysis and interpretation of results obtain in Years 2-6; and (c) to guide improvements to environmental education programs for the middle grades.

6. How will your child's participation be kept anonymous and confidential? Your child will be asked to not write her/his name on the survey response form. If any child does write in her/his name on this form, it will be erased. Thus, no one on the project team will ever know your child's name or be able to connect your child's

response to her/him. ***Beyond this, no individual student's responses will ever be singled out in reports or presentations of the results of this survey***.

7. What are your and your child's rights as participants? You may ask any questions at any time about this survey and they will be answered to your satisfaction. In addition, your child's participation in this survey is voluntary. You may refuse to allow your child to participate in, and you may withdraw your child from, this survey at any time. Neither your refusal nor your withdrawal will result in any penalty or loss of benefits to which your child is entitled, and your child will participate in an alternative activity, designed by the school, during the administration of this survey.

8. Who do you contact for more information? If you have any questions about this project, you can contact Dr. Ron Meyers, Assessment Coordinator, at the University of Arkansas by phone or email: (501) 683-5231, or <rbmeyers@clintonschool.uasys.edu>. In addition, you may contact Dr. Bill McBeth, Project Director, at the University of Wisconsin - Platteville by phone or email: (608) 342-1284 or <mcbeth@uwplatt.edu>. Finally, you may contact Florida Institute of Technology's Institutional Review Board for the Protection of Human Subjects. This Board may be contacted through its staff office at (321) 674-8120.

Section to be Completed by the Child's Parent or Legal Guardian

Please indicate that you have read and understand this informed parental consent statement by checking one of these boxes, and then filling in the information below.

I voluntarily agree to allow my child to participate in this survey.

I do not agree to allow me child to participate in this survey.

_____ _____

Parent's or Legal Guardian's Signature Date

_____ _____

Print Name of Parent or Legal Guardian Print Your Child's Name

Section to be Completed by the Project Director

Through this form, members of the survey research team and I have explained and defined in detail the procedures under which the parent(s) or legal guardian(s) gives her/his consent to allow this child to participate in this survey.

_____ _____

Project Director's Signature Date

_____

Print Name of the Project Director

Appendix 4. School, Program, and Teacher Information Forms

Note: All forms are as distributed, with two exceptions: Font sizes have been decreased so the original fits on this page, and all forms to be returned were printed on blue paper.

1. School Information Form
2. 6th Grade Program Information Form
3. 6th Grade Teacher Information Form
4. 8th Grade Program Information Form
5. 6[8h] Grade Teacher Information Form

School Information Form

Name of School: _____

School Address: _____

_____

School District: _____

School Principal: _____

School Phone: _____ School Fax: _____

Person(s) Completing This Packet: _____

Position or Title: _____

Phone: _____ Email: _____

Item 1. Grade Levels in Your School (*Please check all that apply*)
__ k __1 __2 __3 __4 __5 __6 __7 __8 __9 __10 __11 __12

Item 2. School Designations. Please identify your school's primary designation(s), theme(s), recognition(s), and network affiliation(s) by checking and filling in all that apply in A, B, and C, below.

A. Primary School Designation

___ Regular Public School ___ Magnet School

___ Private, Independent School ___ Charter School

___ Private, Religious School ___ School of Choice

___ Other (Please ID): _____

B. Schoolwide Science or Environmental Theme

If your school has a science or environmental theme, what is it?

_____

C. Other School Designations, Recognitions, and Network Affiliations

___ Title 1 School ___ National School of Excellence

___ Turning Point School ___ Blue-Ribbon School (NCLB)

___ Other National and State Designations or Recognitions (Please name each): _____

_____

___ Education Network Affiliation(s) (Please name each): _____

_____

___ Other (Please ID): _____

6th Grade Program Information Form

Contact Information

Your Name: _____ Date Completed: _____

School Name: _____ E-mail: _____

Item 1. Does your school offer some type of environmental program for students in the following grades:

a. 6th grade? ___No ___Yes

b. 7th grade? ___No ___Yes

c. 8th grade? ___No ___Yes

Item 2. If you checked "Yes" to 1.a, is this sixth grade class (in this study) part of this environmental program?

___No ___Yes

If you checked "Yes" for Item 2, please complete ***Items 3 - 6****.*
If you checked "No" for Item 2, please skip to ***Item 7****.*

Item 3. Does your program have a name (title)?

___ No

___ Yes, the name of this environmental program is: _____

_____

___ Yes, but each grade-level program has a different name or focus. (*Please identify each*)

6th: _____

7th: _____

8th: _____

Item 4. For how many years has this environmental program been in existence? _____

_____

6th Grade Teacher Information Form
(For the Teacher of the Participating Class, Grade 6)

Contact Information

Your Name: _____ Date Completed: _____

School Name: _____ E-mail: _____

Item 1. Your Years of Teaching Experience

For how many year have you been teaching ...

a. ... at any/all levels (total number of years)? _____

b. ... at the middle grades level? _____

Item 2. Your Teaching Position(s)

a. For your <u>current teaching position</u>, please check the grade level(s) and subject area(s) in which you teach.

Grade Level(s): __5 __6 __7 __8 __9 __Other (ID): _____

Subject Area(s): __Science __Math __Social Studies

__English __Health/PE __Other (ID): _____

b. For <u>previous teaching positions (years teaching)</u>, please check all grade level(s) and subject area(s) in which you have taught. (*Check all that apply*)

Grade Level(s): __5 __6 __7 __8 __9 __Other (ID): _____

Subject Area(s): __Science __Math __Social Studies

__English __Health/PE __Other (ID): _____

Item 3. Your Teaching Certificate(s)

a. I am currently certified to teach in this state. *(Check one*)

___ Yes, I am.

___ No, but I am currently working toward certification.

___ No, I am not.

8th Grade Program Information Form

Contact Information

Your Name: _____ Date Completed: _____

School Name: _____ E-mail: _____

Item 1. Does your school offer some type of environmental program for students in the following grades:

a. 8th grade? ___No ___Yes

b. 7th grade? ___No ___Yes

c. 8th grade? ___No ___Yes

Item 2. If you checked "Yes" to 1.a, is this eighth grade class (in this study) part of this environmental program?

___No ___Yes

If you checked "Yes" for Item 2, please complete ***Items 3 - 6****.*
If you checked "No" for Item 2, please skip to ***Item 7****.*

Item 3. Does your program have a name (title)?

___ No

___ Yes, the name of this environmental program is: _____

_____

___ Yes, but each grade-level program has a different name or focus. (*Please identify each*)

6th: _____

7th: _____

8th: _____

Item 4. For how many years has this environmental program been in existence? __

Item 5. Involvement in and Uses of Environmental Education (EE)

a. Is your 8th grade environmental program affiliated with an EE network (e.g., PLT, EIC, GREEN, Green Schools)? ___No ___Yes

If you checked 'Yes' in a., please name and briefly describe this network. _____

_____

_____

b. Does your 8th grade program use any specific EE curricula?
___No ___Yes

If you checked 'Yes' in b., please name up to three EE curricula that are widely used in your 8th grade program.

* _____
* _____
* _____

c. Has your 8th grade program consistently used any EE approach other than those identified in a. and b.? ___No ___Yes

If you checked 'Yes' in c., please identify each major approach.

* _____
* _____
* _____
* _____

Item 6. Briefly describe the overall purpose, focus/scope, and any other significant features of this 8th grade environmental program (e.g., after-school clubs, school greening projects*).*
(Feel free to use additional pages if/as necessary.)

_____
_____
_____
_____
_____
_____
_____

The following items are to be completed for this eighth grade class.

Item 7. Which of the following are included as major goals and objectives for this 8th grade class? (*Check all that apply*)

___ Knowledge of natural sciences (e.g., natural history, earth sciences, ecology, environmental sciences)
___ Knowledge of social studies (e.g., history, geography, sociology, government, economics)
___ Communication skills (e.g., written and oral communication, graphic communication in math/science)
___ Higher order/critical thinking skills (e.g., inquiry/investigation, analysis, synthesis, and evaluation skills)
___ Development of affective dispositions (e.g., sensitivity, empathy, attitudes, values, responsibility, self efficacy)
___ Awareness of problems and issues in the community (e.g., health, crime, elderly, pollution, endangered species)
___ Community investigation skills (e.g., library/Internet research, scientific inquiry, social investigation skills)
___ Community service skills (e.g., skill in planning, implementing, evaluating, and reporting service projects; interpersonal and media skills)

Item 8. Curricular/Instructional Organization in this 8th Grade Class

a. Which of the following best characterizes the curricular organization for this 8th grade class? (*Check only one)*
___ separate subjects with little or no integration
___ treatment of selected common themes in separate subjects
___ treatment of broad common themes through integration of subjects
___ other (please describe): _____
_____

b. Which of the following best characterizes the organization of teachers in this 8th grade class? (*Check only one)*
___ self-contained teaching
___ departmentalized teaching
___ cross-disciplinary team teaching
___ other (please describe): _____
_____

c. Which of the following are the most common ways in which students are organized for instruction in this 8th grade class? (*Rank each that is used, with 1=most common, 2=next most common, and so on)*

___ whole class
___ groups/teams
___ individualized
___ other (please describe): _____
_____

Item 9. Which of the following teaching/learning settings are used in this 8th grade class? (*Check all settings that are prominent or commonly used)*

___ classrooms ___ science lab
___ computer lab ___ school library
___ school grounds ___ field trip/study sites
___ community settings
___ other (please identify): _____

Item 10. Please list up to three teaching methods/strategies that are most commonly used in this 8th grade class (e.g., lecture, discussion, cooperative, hands-on, projects, service-learning).

(1) _____
(2) _____
(3) _____

Item 11. Which of the following assessment approaches are used in this 8th grade class? (*Rank those that are most important for assessing student progress, with 1=most common)*

___ informal assessment (teacher observations, teacher questions/student responses, student interviews)
___ alternative/authentic assessment (performance tasks, papers and projects, other portfolio entries)
___ traditional assessment (teacher-made quizzes and tests)
___ standardized assessment (state achievement tests, items taken from or similar in format to achievement tests)
___ other (please describe): _____
_____

Item 12. Briefly describe any <u>other prominent and distinct feature(s)</u> of the program for this 8th grade class that are not clearly or adequately identified in previous items. (Feel free to i*nclude additional pages if/as necessary.*)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Thank you for completing this form!

8th Grade Teacher Information Form
(For the Teacher of the Participating Class, Grade 6)

Contact Information
Your Name: _____ Date Completed: _____
School Name: _____ E-mail: _____

Item 1. Your Years of Teaching Experience
For how many year have you been teaching ...
a. ... at any/all levels (total number of years)? _____
b. ... at the middle grades level? _____

Item 2. Your Teaching Position(s)
a. For your current teaching position, please check the grade level(s) and subject area(s) in which you teach.
Grade Level(s): __5 __6 __7 __8 __9 __Other (ID): _____
Subject Area(s): __Science __Math __Social Studies
__English __Health/PE __Other (ID): _____

b. For previous teaching positions (years teaching), please check all grade level(s) and subject area(s) in which you have taught. (*Check all that apply*)
Grade Level(s): __5 __6 __7 __8 __9 __Other (ID): _____
Subject Area(s): __Science __Math __Social Studies
__English __Health/PE __Other (ID): _____

Item 3. Your Teaching Certificate(s)
. I am currently certified to teach in this state. *(Check one*)
___ Yes, I am.
___ No, but I am currently working toward certification.
___ No, I am not.

b. Please identify each professional teaching certificate you have earned. (*Please do not include temporary certificates*)
Early/Elementary: _____
Middle Grades: _____
Secondary: _____
Other: _____

Item 3 cont'd

c. Please identify each add-on certificate/endorsement you hold (if any).

* _____
* _____
* _____
* _____

Item 4. Higher Education Degrees You Earned

Please check each degree you have earned, and identify the area(s) in which you have earned each degree.

___ Bachelors, Area(s): _____
___ Masters, Area(s): _____
___ Masters + 30, Area: _____
___ Specialist, Area: _____
___ Doctorate, Area: _____
___ Other (ID Type & Area of Degree): _____

Item 5. Your Environmental Education (EE) Training

a. How many college/university courses in or involving EE have you completed in each of the following areas?

___ EE content ___ combined EE content/methods
___ EE methods ___ EE field/clinical experience
___ EE foundations ___ Other (ID): _____

Item 5, Continued

b. Over the last 10 years, about how many inservices/workshops in EE have you completed? _____

How many of those fit each time period (length) below?

____ less than a full day ____ between 3-7 days
____ between 1-2 days ____ longer than a week

c. Identify and briefly describe any EE course(s) and inservice workshop(s) that have had a direct influence on your middle grades class (e.g., you still use those methods or materials).

* _____
* _____
* _____

Item 6. Your Gender ___Female ___Male

Item 7. Your Age Group

___under 21 ___21-30 ___31-40 ___41-50 ___ 51-60 ___ over 60

Item 8. Your Ethnic/Racial Background (*Check the best response*)

___ American Indian/Alaskan Native
___ Asian/Pacific Islander
___ Hispanic
___ Black (non Hispanic)
___ White (non Hispanic)
___ Biethnic/biracial (*any two of the above*)
___ Multiethnic/multiracial (*more than two of the above*)

Item 9. Your Views on Environmental Education (EE)
(*Circle the number that best reflects your thoughts/feelings*)

a. How important is it that K-12 students are exposed to EE?

1	2	3	4	5
Not at all	Slightly	Moderately	Considerably	Extremely

b. How important is EE to you personally?

1	2	3	4	5
Not at all	Slightly	Moderately	Considerably	Extremely

Item 10. Your Views on the Environment
(*Circle the number that best reflects your thoughts/feelings*)

a. How sensitive are you toward the environment?

1	2	3	4	5
Not at all	Slightly	Moderately	Considerably	Extremely

b. How concerned are you about environmental problems/issues?

1	2	3	4	5
Not at all	Slightly	Moderately	Considerably	Extremely

c. How active are you in environmental protection efforts in your community or region?

1	2	3	4	5
Not at all	Slightly	Moderately	Considerably	Extremely

Thank you for completing this form!

Appendix 5. *Middle School Environmental Literacy Instrument*

Note: The Middle School Environmental Literacy Survey is proprietary and has been omitted from this draft report.

Appendix 6. Report by Mr. David Lintern, GfK Roper, with Responses to Questions About the Report

GfK Roper Report

NAAEE/NELA 2007 School-Based Research

Sample Design

A multi-stage sample design was used to select a school-based sample. The population of inference from this sample is all 6th and 8th grade students who attend schools that have both grades in the school.

In Stage 1, enrollment of 6th and 8th graders was computed for all counties in the United States. Fifty counties were selected, with selection made through systematic random sampling, stratified geographically, with probability proportional to population (enrollment). [Note: Los Angeles county in California was randomly selected twice due to its large population of schools with both sixth and eighth grade students.]

In Stage 2, schools are drawn from among all those in each selected county, with the probability of selection for each school proportional to the number of students enrolled in grades six and eight in that school.

In Stage 3, a sample of classes is drawn from each school. Each school selected for inclusion in the study submits a list of all classes for a given universally required subject (a subject that all students in a given grade must take) for the qualifying grades in that school. A systematic random sample of a predetermined number of these classes is then drawn for each of the assigned grades, separately for each school. In addition, when possible, classes are drawn such that no two meet during the same time period, so that the administration of the questionnaires to the selected classes can be sequentially accomplished during the course of the school day.

Selected classes constitute a census of all students in the class and are the selected sample for the study.

Replacement Schools

Recruit attempts are made for the initial 50 schools; however, not all attempts are successful in getting cooperation to participate in the survey. Where cooperation is not attained, a replacement sample school is selected. The process for selecting replacement schools combines random selection as in Stage 2 to identify a set of sampled replicates and some judgment in the preference of replacements in the replicate. Judgment is used over pure randomness in a desire to substitute the initial selection with a homogenous school. Homogeneity is characterized foremost by being in the same region as the initial selection, secondly by having similar enrollment, and thirdly by having a similar demographic composition. For example, if the initial selection has enrollment of 50% Hispanic, it would not be desirable to substitute with a school that is 10% Hispanic, so from five randomly selected replacement schools, preference is given to the school most like the initial school. This process would continue until all schools in the county have been exhausted.

Replacement Counties
When all schools in an initially-selected county decline to participate, an alternative county is selected. The process for selecting replacement counties combines random selection to identify a county similar to the initial selection. Judgment is used over pure randomness in a desire to substitute the initial selection with a homogenous county. Homogeneity is characterized by being in the same region (ideally the same state), of similar enrollment, and of similar demographic composition.

Weighting

Weighting aligns the achieved sample with population distributions on desired characteristics. For this survey, it is important to have the achieved sample reflect the distribution of all students in schools that have both 6^{th} and 8^{th} grades. The final sample should reflect this population distribution of 6^{th} and 8^{th} grades and within each grade the distributions of males and females by race/ethnicity.

Weighting is accomplished in two stages. The first stage scales the number of interviews by grade at each school to that schools enrollment for the grade. This first stage weight becomes a pre-weight to the second stage. We recommend using information from the National Center for Education Statistics (NCES) for this purpose.

In the second stage, data are weighted to simultaneously adjust for the two grades, sex, and race/ethnicity. We recommend using information from the National Center for Education Statistics (NCES) for this purpose.

The final weight then balances the achieved sample to approximate unbiased estimates of the population of inference.

GfK Roper Response to Report Questions

MEMORANDUM

To: Bill McBeth
Date: August 17, 2007
Re: Questions about Roper NAAEE/NELA Sample Design Report

Following are our responses (*in italics*) to your questions and comments regarding the Sample Design Report prepared by GfK.

Sample Design

1. How did you draw the sample of counties; which databases were used?

MDR (Market Data Retrieval) is a publisher of education information and statistics. GfK purchased a database from MDR that was used to filter down all schools to only those schools that house both 6th and 8th grades. Counties were then selected probability proportionate to size.

2. Which procedures and/or criteria were used to identify counties in Stage 1? In specific, we need to be able to report two different aspects of this: (a) the extent to which the overall sample of counties was representative of the U.S. population as a whole (in terms of confidence intervals or a similar metric); and (b) the socio-demographic characteristics for each of the selected counties as it relates to the national population.

To answer this question, the data would need to be weighted, which was collected by and is being handled by NAAEE/NELA. As such, GfK cannot determine confidence intervals as we do not have the data and thus have not collected population parameters for weighting purposes. To determine confidence intervals, we suggest running the statistics that are needed in comparison to population parameters. In addition to weighting parameters, there are other indicators of SES that can be attached to schools but this requires procuring those external sources.

3. This is much the same as in #1. In what ways was each of the schools (from stage #2) representative of the county from which it was selected? What can we report as our level of confidence in the selection of schools?

Once the counties were selected, GfK used the MDR database to filter down all schools to only those schools that house both 6th and 8th grades. All students in the county were then listed consecutively, and a random number generator was then used to select nth student in the county, and that nth student's school was the initial school contacted in that county. As many as five schools were selected per county in this manner as a replicate of potential replacements. Regarding confidence intervals, as for item 2 above, in the collection of

statistics for weighting the data, we suggest that NAAEE/NELA capture county-level SES information.

4. What kinds of instructions did GfK Roper personnel give to the schools for the selection of classes to survey? The description in Stage #3 indicates that a "systematic random sample[ing]" technique was used. However, my recollection was that it was more a sample of convenience (e.g., if the 1st, 2nd, and 3rd school on the list declined, personnel contacted the 4th school, and so on). If there were more than one type of instructions given to schools for class selection we need to be able to report the options or varied instruction that were given (e.g., who would be responsible for selecting classes, how they should do so).

The recruiters were instructed to follow the script below upon reaching a principal/decision-maker. In some schools, this was done over the phone rather than via fax/email:

> *(If school agrees:) Our study requires that classes be randomly selected from your school. Therefore, I would like to request that you email or fax me a listing of all the classes from the following grades (List grades. State number of classes to be chosen from each grade.) We will notify you of the classes that are chosen for the study, so that the teachers can be notified.*

In most cases, the reporting of classes for specific grades fell to the principal or principal's assistant, though in a couple of cases the principal gave the task to a department or teacher. Regardless of who performed the selection, that person received the same instructions from the recruiters. The recruiters were dependent on the individual at the school to follow this process.

Replacement Counties and Schools

1. I believe that there were 13 replacement counties. What were the specific procedures and/or criteria used to identify and subsequently select these counties?

As per our original Sample Design and Weighting document, criteria for selection of replacement counties was based on geographic proximity to the original county, combined with data about school enrollment, the number of schools, and demographic composition.

2. What is our confidence that the replacement counties reflect the original counties? In other words, how well do replacement counties match original counties on selected sociodemographic factors?

In addition to randomly selecting the replicate of potential replacements, the criteria above (geographic proximity to the original county, combined with data about school enrollment, the number of schools, and demographic composition) were used to attempt to inject homogeneity into the selection of replacement counties.

3. Who determined that there were no more schools in a given county, and that a replacement county was needed? Further, what procedures and criteria were used to make these decisions?

The determination for no more schools occurred through complete exhaustion of all possible schools in a county, i.e. all schools with 6th and 8th grade students were contacted and none desired to participate. Thus, this is something that generally occurred in the smallest counties/counties with only a small number of eligible schools. This may also occur when a county/state has a policy that requires approval from a regulatory body (e.g. Education Department) for any in-school/student research.

Weighting

In the second paragraph, second sentence "interviews" should be changed to surveys. Also, I am not sure what the second sentence in the second paragraph is saying.

"The first stage scales the number of interviews by grade at each school to that schools enrollment for the grade." –

*This sentence is describing a school level factor or constant that lifts the number of completed surveys to enrollment for each grade. For example, if we have 30 completed surveys from 6th graders in school A and 6th grade enrollment in school A is 60, then we compute a factor of 2 for that school to scale up the surveys to enrollment (30 surveys * 2 factor = 60 enrollment).*

Appendix 7. Report by Dr. Ron Meyers, Assessment Coordinator

Project Report for:

Bill McBeth, Principal Investigator, National Middle School Student Environmental Literacy Assessment Project

Prepared by:

Ron Meyers, Ph.D.
Assessment Coordinator, NELA

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rev. August 3, 2007

SUMMARY

In April, May and June of 2007, the National Middle School Student Environmental Literacy Assessment Project administered four sets of surveys at forty-nine schools selected as a probability proportional sample across the United States to 2,009 students. Thus, we collected both the most representative data on environmental literacy for middle school students in the U.S., and perhaps the largest sample, providing the strongest data set to date in the nation.

For each of the schools four surveys were administered to assess: school demographics; 6th and 8th grade environmental education programming; teachers of participating 6th and 8th grade classes demographics and teaching styles, and; selected 6th and 8th grade student classes environmental literacy, using the Middle School Environmental Literacy Survey v10. For the surveys of schools, programs, and educators, we will be able to identify what types of environmental education programs are in use at these schools, how educators view the importance of environmental education and the environment, along with a myriad of other demographic characteristics of schools, educators, and students. The surveys can be found in Appendix 1. note that all project documents are copyrighted, and that permission to use any of the projects must be obtained. Please feel free to request permission so that they may be useful to your work. The MSELS v10 is not to be used in other research projects in order to avoid the potential for students taking this survey have a test-retest effect if they are selected for participation in future studies. If an assessment similar to this is needed, please contact CISDE (cisde@midwest.net) for permission to use an earlier version of the instrument, the MSELI v8.

INSTRUMENTATION

The Middle School Environmental Literacy Survey (MSELS) v10 is a modification of the Middle School Environmental Literacy Instrument (MSELI) v9, an instrument extensively tested in 2004 and 2005, with strong evidence found to support its validity and reliability (cite). Those efforts built upon a long history of testing and revision since 1994 for an instrument containing the four general conceptual variables in use today, with scales for several of the individual general conceptual variables developed by Ramsey in 1978 and Peterson in 1978. In anticipation of conducting this first national assessment of middle school student environmental literacy, the MSELI v9 was reviewed

again in 2005 for conceptual and operational validity and reliability by Hungerford, Volk, and Meyers.

The review determined that the construct and measurement for environmental sensitivity needed further exploration, and thus was undertaken. The MSELS includes four components for environmental literacy: Ecological Foundations (Knowledge), Environmental Sensitivity, and Cognitive Skills. See Table 1 for a tracking table from these general components through to the number of items used for the scales used to operationalize these into measures. It includes the components/general conceptual variables, conceptual variables, scale names, and the number of items in each scale used in the *MSELS* v10.

Components/Elements of Environmental Literacy (General Conceptual Variables)	**Conceptual sub Variables (CSV)**	**(Index) Scale names**	**Item no.**	**N items**
Ecological Knowledge	same	Scale I. Ecological Foundations	5 - 21	17
Environmental Affect (Commitment/ Sensitivity/ emotion)	1) Verbal Commitment	CSV 1: Scale II. How You Think About the Environment	1) 22-33	1) 12
	2) Self identified environmental sensitivity (Self, family)	CSV 2-5: Scale IV. You and Environmental Sensitivity	2) 46, 47	2) 2
	3) Outdoor nature activities (family, family/alone, alone)		3) 48 - 53	3) 6
	4) Reading/ watching media about nature/ environment		4) 54, 55	4) 2
	5) Role Models		5) 56	5) 1
	6) Emotion	CSV 6: Scale V. How You Feel About the Environment	6) 57, 58	6) 2 Subtotal 25
Cognitive Skills	1) Issue Identification	VI.. Issue Identification, Issue Analysis and Action Planning	1) 59, 60, 67	1) 3
	2) Issue Analysis		2) 61 - 66	2) 6
	3) Action Planning		3) 67 - 75	3) 1 Subtotal 10
Behavior	Self Reported Pro environmental behavior	Scale III. What You do About the Environment	34 - 45	12
Demographics	Age, grade, gender, ethnic/racial background	VII.. About Yourself	1 - 4	4
			Total	68

Table 1: MSELS v10 general conceptual variables, conceptual subvariables, scale names and number of items

The presence of six subconceptual variables for environmental affect/sensitivity reflects the effort historically undertaken to conceptualize and refine the psychological construct of environmental affect/sensitivity. The major revisions to the MSELI v9 focused upon identifying a new scale for environmental affect that focused upon emotion.

Our approach was also based on input from Carnegie Mellon University's Office of Student Assessment. They suggested we identify the simplest and most powerful affective constructs at the heart of ES, in addition to incorporating constructs used in prior studies, build a bank of items, test them, and conduct psychometric scaling analysis to identify scales that emerge from the data. We theorized that environmental love and hate would be strong indicators of affect, based upon psychological studies that have confirmed that these "common sense" emotions elicit reliable responses We built a bank of 45 items for testing, pilot tested them in 2005 with 134 freshman and sophomores at Belleville High School in Belleville, IL, then conducted psychometric scaling analysis to identify scales that emerged from the data. The results were used to add a new two item scale, "How you feel about the environment", which assessed environmental love and hate. Jeffrey West, their teacher, was a professional colleague of one of PI's, willing to support the research effort. (Our thanks to him for his extensive assistance with printing and administering the survey).

Two process of printing the surveys introduced two errors found during the first administration of them to student. Item 9 included only three response options, leaving off the fourth, but included the correct response (option c). In addition, the first response options included extra words intended for response option 2. After consideration of how to correct the item, it was determined by the team that correcting the error on 5000 surveys, many of which had already been sent, would be too difficult to attempt. We advised data collectors of the error and revised the script to students to have them correct the errors on their survey. We noted the problem for follow-up during data analysis, when we would examine the responses to assess if the item reliabilities had been compromised.

A second error in Items 57 and 58, comprising the entire "How your feel about the environment scale", was the inclusion of two "strongly agree" response options. Data collectors were advised of the error, and sent a revised script to read to students to correct the response option on their surveys. Again, the items and scale need to be given scrutiny during data analysis to assess if this error reduced the reliability of the responses.

SURVEY ADMINISTRATION

Data Collectors

School Recruitment

GfK Roper was contracted to develop a sampling strategy to identify the number and location of schools, staff and students for the surveys. Together we developed a stratified random sampling strategy to identify 50 schools in 50 counties demographically representative of the U.S. Each school was to have 2- 4 classes, balanced between 6th and 8th graders, for a total of approximately 5000 students. GfK - Roper identified the appropriate counties, then recruited schools, scheduled the test administration date, and informed the Assessment Coordinator when each school was secured. To incent each school's participation, $500 was promised to each for their successful participation (e.g., completing and returning each of the four surveys). During the highly iterative process of identifying schools, GfK Roper did not identify a willing school in 13 of the original counties, requiring them to identify new counties that fit the demographic profile and recruit schools in those counties. In one case, the school and the data collector were unable to establish a workable date to administer the survey, leading to a total of 49 schools having surveys administered. Data was collected and analyzed for 48 schools, as one data set was lost during the process.

Data Collector Recruitment

To conduct the study at 49 locations around the U.S., a strategy of recruiting, selecting and training environmental educators to administer the survey was used. Each data collector was provided $400 for each school they surveyed to cover any expenses related to the project. This incentive was quite powerful. Recruitment was conducted in several ways. On our behalf, the NAAEE included a request for applicants to be data collectors in their monthly e-newsletter and on the homepage. Flyers were handed out to NAAEE members at the 2006 annual conference in several venues. Emails were sent to the membership lists of the NAAEE Research Commission. These requests were forwarded to a number of NAAEE state affiliates and other science and education mailing

lists, generating over 100 hundred applications. When the initial set of fifty counties to be included in the survey was identified by GfK Roper, approximately thirty-five data collectors from or somewhat near those counties were identified as having applied to be data collectors. They were asked if they were willing to administer the surveys. In some cases, data collectors traveled over one hundred miles to survey their schools, a significant effort. Approximately fifteen counties did not have applicants, and, in addition, thirteen of the original counties were changes due to unavailability of willing schools in the original sample, requiring further recruitment efforts. The recruitment process was iterative in this sense, with rolling recruitment and training conducted as counties were replaced in the sample. The recruitment was done through appeals to state affiliates and direct contact of the assessment coordinator to professional colleagues living near the selected counties. This demonstrates the power of the NAAEE network.

The project schedule initially allowed for a minimum of eight weeks from the time a school was selected to the date of surveying. Due to several factors, of the 33 schools for which the date of being informed of the school's selection and the date of scheduled administration, five were provided with one calendar week or less notice, 18 were provided with 1 - 2 weeks notice, six were provided with 2-3 weeks notice, and 2 with four weeks notice. In some cases, data collectors were recruited and trained on two day notice. Forty-five data collectors were eventually utilized at the 49 schools. Two data collectors worked with two schools each, and one data collector administered surveys at three schools. The suggested notification,

Data Collector Selection

All data collectors indicated some experience in environmental education and interest in supporting the study. Data collectors were selected based upon that experience, interest, proximity to the selected counties and/or schools, and finally in order of application.

Training/Preparation

Data collectors were prepared using a variety of methods. A range of materials were prepared to explain project procedures, including a project FAQ sheet, guidelines and procedures, etc. These

documents are in Appendix 2. Data collectors were generally sent two packets of materials. When they were contracted, they were sent the first packet, "Initial Contact Packet for Data Collectors, then, when their school was selected, they were sent the final one, a "Data Collectors Kit." If the data collector was recruited after the school was selected, they were sent all materials at once. They indicated that their training and preparation could be done in a few hours of reading. The majority of the feedback received from data collectors through email and telephone conversations indicated that the procedures were rather lengthy but very clear and helpful.

A password secured website was constructed on the NAAEE website, with all materials, including those given to the schools and teachers; and data collectors were asked to review those materials as well. The website was quite useful, as it enabled access by data collectors and principals to any project materials through the internet, which proved very useful on a number of occasions when materials were misplaced. The website included two discussion boards, one for data collectors and one for school administrators to post questions and comments. The boards were not functional until midway through the data collection period (April to June 2007). As a result, there was little utilization. They might have been of use in replacing direct email communication. Overall, NAAEE was very helpful in setting up the website, the secured webpage, and making project related materials available.

While the overall strategy for training data collectors appears to have passed our expectation, issues of parental consent were problematic. Only one of the 49 schools that participated required active consent. The remaining 48 had on file written permission from the parents to administer surveys to students. However, a number of schools and data collectors erroneously interpreted the materials we sent them to require parents to sign and return the passive consent forms we provided to the school administrator. This reduced the number of participating students when teachers mistakenly believed that only students who had signed consent forms could participate. It is difficult to estimate the numbers of students not surveyed because of this, but in several classes where this confusion was document, about 50% of the students did not participate. The practice of sending two copies of the passive consent form to parents, with instructions to sign and return one if they did not want their child to participate was particularly confusing, based upon the number of inquiries made by data collectors. It is recommended that the forms be revised to make the instructions on the form clearer.

Administration of Surveys

The first surveys were administered on April 18, 2007 and the last on June 5. Five were given in later April, 16 in the first two weeks of May, 22 administered on or between May 16 and May 31, and four in the first week of June. The School information surveys were generally completed by school administrators or their designees prior to or on the day the data collector went to the school. Only one school did not complete the school information survey. The 6th and 8 grade Program Information surveys were also completed by 48 of the 49 schools by the teacher most familiar with program. This was done either prior to or on the day the survey was administered. While data on how many of the School Information and 6th and 8th Grade Program Information Surveys were completed prior to, versus, on the day the data collector visited the school, it is clear that the strategy of having data collectors as a part of the project to ensure that the forms were completed and returned was a critical part of the projects success. All MSLES were administered to students during their regularly scheduled classes, most done with multiple classes in a school cafeteria or library. In all cases, the data collector went to the school, tried to meet with the principal prior to the survey to review procedures and check the site to ensure suitability. The Data Collector Guidelines and Procedures stated that the, "DC should visit room where students will take MSELS, to ensure that the environmental conditions are suitable (i.e., that it is quiet, room temperature is ok, etc. This is important, as variations in test conditions may affect results)."

The teachers introduced the data collector using the script provided to them (see Appendices), and the data collector introduced himself or herself and the purpose of the survey using a script provided to them (see Appendices). The data collector brought the surveys with them to ensure that neither the teacher nor the students saw the survey prior to its administration. The data collector also brought pencils with them, handed out the surveys, the scantron response sheets, and the pencils to the students, and remained in the classroom to answer questions and collect the materials when students were completed. The teachers also remained in the classroom to help maintain classroom order and student comfort. Students whose parents declined permission were given an alternate activity in another classroom. In one case, a substitute teacher was present, was not able to maintain good order, resulting in less than optimal test conditions, as reflected in the low response rates and too consistent responses (e.g., all responses are the same to the questions on a scale). Those surveys were flagged with a note to the data analyst, will be assessed for validity, and deleted

or included in the final data set according to rules to be established for doing so. In another case, the principal was the teacher and used the first ten minutes of the class for other business, and dismissed students ten minutes early, resulting in students not being able to complete the surveys.

In general, the standard 45 - 50 minute classroom period was sufficient time to administer the survey and have students complete it. A review of the response sheets should indicate what percentage of students were able to complete the MSELS. In general, data collectors reported that the administration of the surveys went smoothly, once the schools were identified and the administration of them scheduled. Regarding the scheduling, the practice of having GfK Roper schedule the dates for administration was very helpful, as it secured the dates. In a few cases, data collectors or schools needed to reschedule and worked it out to their satisfaction. Two of the first schools scheduled for administration were not surveyed on their initial dates, due to miscommunication between GfK Roper and the assessment coordinator. In one additional case, there was their confusion about the date for administration of the survey, as GfK Roper scheduled the date but did not inform either the assessment coordinator or the data collector of that date.

It needs to be noted that the initial timetable of providing the assessment coordinator with 8-12 weeks between the time of being informed of the schools selection and needing to administer the surveys at them was appropriate. In general, about 3 weeks was provided, in a number of cases only one week was provided, and in a few, a few days. Because of the power of the NAAEE network, and the set of effective materials developed by the NELA team we were able to meet an extremely accelerated timetable in all but a few cases.

In conclusion, the overall strategy of hiring, training, and utilizing data collectors to administer the surveys was very successful.

Data Handling

The data collectors were asked to collect and return all documents, including the surveys, in one package. This was done in the majority of cases, as only a few schools sent their School Information Form, Program Information Forms, and/or 6th and 8th grade teacher forms directly to the assessment coordinator. Each set of materials was then checked for completeness. If surveys or other documents were missing, which was not unusual, the assessment coordinator or his assistant,

Erica Fitzhugh, contacted the data coordinator to develop a plan for obtaining and sending the information. The materials were sent to Dr. Tom Marcinkowski in three batches. Of the 49 schools where the surveys were administered, 47 provided all required information. The two schools did not provide their School Information Forms, 6 and 8th Grade Program Information Forms, and 6th and 8th Grade Teacher Information Forms. The schools were contacted repeatedly in an effort to obtain the data, but due to summer break the data collector was unable to do so.

Administrative Notes

The strategy of having an Assessment Coordinator paid to accomplish the task, with sufficient funds to have an assistant, was vital to the projects success. The number of hours spent on the project was not tracked, and should have been. It is estimated that the project, not including team meeting, required approximately 400 hours labor for the assessment coordinator and an equivalent effort from his assistant. The remarkably high labor investment was necessary for a number of reasons, including the overall complexity of the project (4 surveys, 67 schools, over 100 potential data collectors), the use of replacement counties (necessitating additional recruitment efforts under severe time constraints), and the inability of the project to provide a list of schools to be surveyed until very late in the process. In some cases, a data collector was recruited, trained, materials sent, and the surveys administered in four business days. Accomplishing this was labor intensive. It is strongly recommended that at least eight weeks be provided between providing the names of the schools and the administration of inquiry activities in the future.

In conclusion, the overall strategy of hiring, training, and utilizing data collectors to administer the surveys was very successful. We have built a network of a number of trained data collectors, and many indicated interest in continuing to work with the NELA team in the future.

Financially, the accelerated timetable required the extensive use of overnight and two-day FedEx mailings. Establishing a FedEx account was very helpful, given the capacity of such accounts to track mailings, etc. The project was able to reallocate funds to cover the increased expense ($4,430 total) by halving the printing budget, coming in only $52.20 over budget. The partial budget is below in Figure 1.

Category	Expense to Date	Budget	
Printing	$2,509.35	5500	
Supplies	$611.26	1000	
Postage (for 12 mailings)	$4,431.59	1000	
	$7,552.20	$7,500.00	-$52.20

Figure 1: Assessment Coordinator partial budget

The process for paying data collectors and schools was for the assessment coordinator to first secure contracts with them. The initial contracts were problematic, with NAAEE staff providing a template that indicated that the Purchase of Service Agreements (PSA) were to be sent to their office. Our directions instructed them to be sent to the Assessment Coordinator. This resulted in much confusion, and the PSA's were revised midprocess to indicate that they should be sent to the Assessment Coordinator. Once the Assessment Coordinator verified that all materials were properly completed, he authorized payment. Perhaps due to staffing changes at NAAEE, the original protocol to have each data collector and school paid immediately upon the assessment coordinators submission of the request for payment was changed. NAAEE sought to pay all parties in one batch, and after discussion agreed to pay in three batches. The delay in payment had a high cost against the goodwill built with the data collectors and schools. In the future, it is suggested that a performance contract be used to incent good performance where possible.

Submitted by Ron Meyers, National Assessment Coordinator,

Addendum:
It should be noted that 1 of the 49 data sets was lost on transit between the Assessment Coordinator and the Florida Institute of technology.
Some of the delay in payment to the on-site-data collectors and participating schools was due to the misplacement of the payment lists by the Assessment Coordinator.
Bill McBeth, Principal Investigator

Appendix 8: Materials Prepared for Data Collectors

Note: All forms are as distributed, with two exceptions: Font sizes have been decreased so the original fits on this page, and all forms to be returned were printed on blue paper.

National Middle School Environmental Literacy Assessment (NELA) Recruitment FAQ's

1. **What is NELA?** NELA is a multi-year research project. Year one will explore the level of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. This survey will gather information on these students' environmental knowledge, skills, affective characteristics (feelings), and participation, as well as their grade level, age, gender, and ethnic background. It will also gather information on the curriculum and teachers in participating schools. If funded, Phase II will gather student environmental literacy data from classes which incorporate environmental education as a part of instruction and to compare these data to the baseline data from Phase I. The classrooms in Phase II might incorporate widely-used EE programs or programs identified from the literature as those of prominence or those where there is an expressed interest to participate Schools that appear to be effective in the development of environmental literacy will be selected for Phase III in-depth visits to conduct investigations of the variables associated with their success.

2. **What organizations are participating in NELA?** NELA is a multi-year research project funded through an inter-agency agreement between the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA) and supported by the North American Association for Environmental Education (NAAEE). It is being led by a team of faculty from the University of Wisconsin-Platteville, Florida Institute of Technology, the Center for Instruction, Staff Development and Evaluation, the University of Arkansas, and Northern Illinois University. Contact information is below.

3. **I am interested in becoming a Data Collector. When do I start?** You can start today by completing the Data Collector (DC) recruitment form, and emailing it to Dr. Ron Meyers, Assessment Coordinator, at rmeyers1 at gmail.com today. In early February 2007, the counties selected to participate in the Assessment by GfK Roper will be posted on this website. Interested Data Collectors should inform Dr. Meyers of the counties they want to collect data in as soon as possible. Data Collectors will be selected in early February, and will be asked to sign personal service agreements by the end of February. Selected Data Collectors should then learn the Assessment protocols, and schedule school assessment dates. All literacy assessment surveys should be conducted in the middle of April 2007.

4. **How much is the stipend for Data Collectors?** A $400 stipend will be provided to the Data Collector for each school from which they successfully collect all requested data. The $400 is to cover all expenses, including travel and meals. No additional funds are provided for travel.

5. **What data are being collected?** The NELA includes four "surveys" that we call packets:
   - one on **School Information** that identifies the demographics of participating schools,
   - one on **Program Information** that identifies a range of information about the school's curriculum, including environmental aspects,
   - one on **Teacher Information** for the teachers of classes participating in the survey to complete, and
   - the **Middle School Environmental Literacy Assessment Survey (MSELS)** for students to complete.

6. **How many schools can I coordinate data collection for?** Data Collectors can collect data at as many schools as is reasonable, keeping in mind that the schools will be selected at random by GfK Roper, so they will probably be many hundreds of miles apart. The Assessment Coordinator will work with applicants to determine the schools with which they will work.

7. **When will Data Collectors be paid?** Payment for Data Collector's will be authorized when the Assessment Coordinator receives and confirms that the schools have successfully completed all four surveys. The checks will be sent as soon as possible upon receipt of materials.

8. **What does it involve for Data Collectors?** Data collectors complete a web-based orientation identifying all protocols and procedures when they complete their Personal Service Agreements, (this should take 1-2 hours). Then they call the School Principal confirm the number of classes and students taking the MSELS, and establish a date for administration of the four surveys. The data collector goes to the school the day the MSELS is to be given, meets with the principal to confirm procedures, administers the surveys, and meets with the principal immediate after administration of the MSELS to confirm that everything has been completed. Then the data collector sends all materials back to Dr. Meyers.

9. **How many schools, classes, teachers and students will participate in the Assessment?** Fifty schools will be selected at random from across the lower 48 states in the United States. About 200 classes and teachers will participate, and about 5,000 students.

10. **Who is responsible for generating the sample of schools?** The sample for this survey will be developed by GfK Roper. Using census data, they will select 50 counties from across the country and then randomly selected one public or private school in each county that had both 6th and 8th grade classes. Then, they will ask the Principal if that school will participate in this survey. If the Principal agrees, then GfK Roper determines how many 6^{th} and 8^{th} grade classes from that school should participate so the overall sample is representative. If the Principal agrees the school can participate, then the school does participate, and the principal randomly selects that number of 6th and 8th grade classes to participate.

11. **What kinds of schools are being selected?** GfK Roper will select schools from a list that includes private, public, and charter schools.

12. **How many classes per school will be participating?** From 2-4 classes per school will participate. GfK Roper will identify how many classes at each school will participate.

13. **How will participating classes in each school be selected?** The School principal will randomly select the participating classes. It is critical that the classes be selected at random, so we can have a random sample of what is occurring in classes across the U.S. If principals select classes with an environmental theme, the sample will no longer be random, and will over represent the amount of environmental education being taught in schools, and the average environmental literacy of U.S. middle school students.

14. **Does there have to be an equal number of sixth and eight grade classes in my school?** No, there does not. GfK Roper will identify the number of classes in each grade so the right number are selected for the entire country.

15. **What students will be participating?** Sixth and eight grade classes will participate.

16. **What will happen if a student does not want to participate?** The school will arrange an alternative activity for all students who do not wish to participate in the survey.
17. **Can I sign up my school or class to participate in NELA?** Unfortunately, year one of the NELA cannot accommodate this. If year two is funded, we will try to accommodate specific requests for inclusion.
18. **What is the project timeline?** We are recruiting people interested in being Data Collectors now, will identify the counties where participating schools will identified in February 2007, will identify the specific participating schools in mid to late February 2007, and administer all four surveys by mid April 2007.
19. **What do participating schools receive?** Participating schools receive $500 for successfully completing and returning all four surveys.
20. **When do schools receive their compensation?** Payment to Schools will be authorized when the Assessment Coordinator receives and confirms that the schools have successfully completed and returned all four surveys. The checks will be sent as soon as possible after receipt of materials and confirmation that they are complete.

Contact information:
Dr. Bill McBeth, Principal Investigator, University of Wisconsin-Platteville, mcbeth at uwplatt.edu
Dr. Ron Meyers, Assessment Coordinator, University of Arkansas, rmeyers1 at gmail.com, 412-527-9317

Research Team Members:
Harold Hungerford, CISDE, cisde at midwest.net
Tom Marcinkowski, Florida Institute of Technology, marcinko at fit.edu
Bora Simmons, Northern Illinois University
Trudi Volk, CISDE, cisde at midwest.net

NAAEE
NORTH AMERICAN ASSOCIATION FOR ENVIRONMENTAL EDUCATION
Promoting excellence in environmental education

2000 P Street NW Suite 540 Washington DC 20036-6921
Tel: (202) 419-0412 Fax: (202) 419-0415
www.naaee.org

August 12, 2008

Dear _____,

Thank you for agreeing to be a data collector for the National Middle School Environmental Literacy Assessment (NELA). This letter and the attachments provide a brief background to the project, guidelines and procedures for your work, and a Purchase of Service Agreement between you and the Project. Our plan is for you to be able to complete this project with several phone calls and/or emails and only one visit to your school. Your $400 stipend is to cover your time, and all expenses, including your travel. We will provide all surveys and supplies needed to administer the Assessment.

Please be sure to complete the attached Personal Service Agreement between the Project Principals and yourself. Please contact him if you have any questions or problems with the proposed sites. Then read the attached Data Collector (DC) Guidelines and Procedures document and the Project Timeline. Finally, go to the project website (http://www.naaee.org/programs-and-initiatives/research/nela/) and log in to the *internal* project website to confirm that you can do so. On the website, you can see the list of sites for which we still need Data collectors. Please check to see if you can be a DC for additional sites (and earn $400 for each one!), and/or help us identify other potential DC's. If you can administer additional counties, please contact Dr. Meyers and we will work out procedures for doing so.

Background of NELA

Excellence in environmental education requires that we understand student's environmental literacy, defined as, "An environmentally literate person is one who has the environmental knowledge, affective dispositions, skills to be able to investigate and weigh various sides of environmental issues, and actively engage in problem-solving and decision making on those issues." Unfortunately, there has never been an experimental national scientific study of the environmental literacy. This will be the first one, an historic event in environmental education. We have taken extraordinary care to design every element of the study so it can provide a valid and reliable assessment of U.S. middle school student's environmental literacy. Your role on the team is to be THE person in the field. We understand that your questions and input will help us make sure that the project works.

Our investigation of student environmental literacy is designed to be a six year project. Year 1 has been funded by U.S. EPA's Office of Environmental Education and the National Oceanic and Atmospheric Administration and is administered by the North America Association for Environmental Education (NAAEE). The team includes: Dr. Bill McBeth, University of Wisconsin, Platteville; Dr. Trudi Volk, Executive Director, CISDE; Dr. Harold Hungerford, President, CISDE; Dr. Tom Marcinkowski, Florida Institute of Technology; Dr. Ron Meyers, University of Arkansas, and; Dr. Bora Simmons, Northern Illinois University. GfK Roper has helped us design the study and identify the participating schools.

Research Methods

We are conducting a modified (probability proportional) random sampling to identify 5,000 middle school students who are representative of the nation's 6th and 8th graders. From each school 2 to 4 classes will be selected at random by the principal, with approximately 25 students each. We do not want classes that are considered "environmentally related" to be intentionally selected by the principal, and need your help to make sure that the 6th and 8th grade classes that are selected are done so randomly. Each school has been carefully selected to participate in the assessment, and your work to ensure that we obtain good data from those schools is vital to our ability to have a representative national sample.

The research includes four different surveys, called forms. The first is, "School Information Form", to be completed by the school principal or their designee. That allows us to understand the school demographics so we can assess how this is related to environmental literacy and other information collected on the surveys. The second is,

"Program Information Form." This will be sent to the principal, who will give it to the teachers of the 6th and 8th grade classes whose students will be taking the student survey. The third is, "Teacher Information Form" which explores the background of teachers of the students taking the Middle School Environmental Literacy Survey (MSEL Survey). The MSEL Survey explores the environmental literacy of the students, based upon seven broad constructs of environmental literacy: ecological foundations knowledge; how children think about the environment, the actions they are willing to take to protect it; what children do about environment, or the actions they take to protect it; their environmental sensitivity; how they feel about the environment; and their environmental issue and action skills.

The "Data Collectors Guidelines and Procedures" explains in detail how we need you to conduct the entire process. We ask that you take several hours to review the Guidelines and become familiar with them. If you have any questions on these procedures, or feel they need modification to make the process work, please contact me so we can help answer your questions – and know which procedures needed to be modified. This will also help us quickly consider, and if needed, adjust the project across the sample. Having the surveys administered consistently by all data collectors is critical to ensuring the data you collect, and the results we find, are high quality.

Use of the Data
The data generated through the surveys will be analyzed to identify the environmental literacy of students across the nation, as a baseline of data. Through future surveys we will be able to identify trends in environmental literacy by comparing the results to the baseline and additional year data. We will also be able to characterize the environmental programming being conducted in schools across the nation. Together, this information will help us assess the effectiveness of EE programs in the country and identify those variables that influence the effectiveness of EE programs. We will carefully analyze all data to assess the relationships of the various concepts that are investigated. The findings will be used to generate recommendations for how to improve curriculum, instruction, and assessment.

Confidentiality and Anonymity
We are not going to collect any information that would enable us to identify individual students who take this survey. We will ask them to not write their names on their survey. The information from the survey will therefore be anonymous. Since no names will be collected, there will be nothing to keep confidential.

Future Surveys
The project team envisions that during Year 2 of the project we will identify promising and/or widely used programs and approaches or programs where an interest to participate has been expressed. We hope that the data collectors involved in collecting data for those schools will be able to participate again in the project. In Years 3, 4 and 5 researchers across the field of environmental education will be invited to conduct in-depth studies using a diverse range of research methods and methodologies. Year 6 is planned to summarize all research. Funding has been obtained for Year 1, and is being sought for years 2-6.

We are very excited to have you as a vital part of our national team. We look forward to working with you this spring. If you want to see the results of your efforts, I'd like to encourage you to join us at the NAAEE Research Symposium being held November 12th and 13th, and the NAAEE conference being held November 14th through 17th in Virginia Beach, Virginia. I would love to be able to personally thank you for your efforts. Please feel free to email (rbmeyers@clintonschool.uasys.edu) or call me (412-527-9317) with any questions or concerns.

Sincerely,

Ron Meyers, Assessment Coordinator, NELA
Assistant Professor, Environmental Policy, Education, and Ethics
Clinton School of Public Service, University of Arkansas

North American Association for Environmental Education
2000 P Street NW Ste 540 Washington DC 20036

DATE:

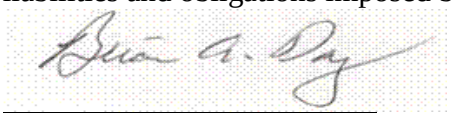
TO: Name
Address SS#
City State Zip Tel: ( ) -

FROM: Brian A. Day, Executive Director, NAAEE

PURCHASE OF SERVICE AGREEMENT: *[NELA Agreement between Data Collector and NAAEE]* To accomplish the successful administration of the school, teacher, program, and MSELS with 6th and 8th grade students, _____ has agreed to provide the following services from _____:

Description	Rate	Total Schools
Contact Assessment Coordinator as needed with questions; confirm participating classes, and administration date. Coordinate with participating schools to schedule MSEL S administration Ensure that the following forms are completed and sent to the Assessment Coordinator: School Information Form; Teacher Form; Program Information Form, School Materials Verification Form and the Summary Sheet of Student Participation. Personally administer the MSEL Survey, collect survey booklets and response sheets. Conduct exit interview with Principal to complete School Materials Verification Form Return forms, surveys and materials to Assessment coordinator	$400 per school	
School(s)/county(ies) assigned:		
TOTAL		

First name Last name (hereafter known as "Contractor") agrees to fulfil this agreement as an independent contractor. The Contractor under the terms of this Agreement will not be considered to be the employee of NAAEE under the meaning or application of any federal or state laws, including but not limited to unemployment insurance or workers' compensation laws, and will not be entitled to any of the benefits of an NAAEE employee. The Contractor assumes all liabilities and obligations imposed by any such laws.



_____ _____
Signature/date Signature/date
Brian A. Day First Name Last Name
Executive Director Contractor

****

RETURN THIS FORM AS SOON AS YOUR SCHOOL ASSIGNMENTS ARE DETERMINED TO: Ron Meyers, Assessment Coordinator, Clinton School of Public Service, 1200 President Clinton Avenue, Little Rock AR 72201.

NELA Project

Data Collector Guidelines, Procedures and Timelines

A. Data Collector (DC) Selection and School Assignment

1. Potential DC goes to NAAEE NELA website, logs in or creates profile, downloads, completes Data Collector Sign-Up Sheet, sends it via email to Dr. Meyers, Assessment Coordinator (AC). (February 1-28)
2. GfK Roper selects counties to participate in NELA. (Early- Mid March)
3. NAAEE posts counties participating in NELA. (Early- Mid March)
4. Potential DC regularly checks project website for posting of counties available for data collectors, sends email to Dr. Meyers indicating what counties they wish to coordinate. Dr. Meyers may also contact potential DC's (Early- Late March)
5. Potential DC is emailed her/his county assignment by Dr. Meyers, and confirms her/his acceptance of the assignment to Dr. Meyers. If school assignments are known then, Dr. Meyers will also present DC with school assignment. (Early- Late March)
6. Potential DC receives and reads Initial Contact Packet for Data Collector. This includes a cover letter, these DC Guidelines/Procedures, and a Data Collector Purchase of Service Agreement (PSA) for the schools for which they will collect data. (Early- Late March)
7. Potential DC completes the Data Collector PSA and returns it to Dr. Meyers. They are then a contracted DC. (Mid to late February)
8. If needed, contracted DC is presented at a later time with another request for school assignment by Dr. Meyers, and confirms her/his acceptance. (Early- Late March)

B. Project Orientation

1. DC works out log-in name and password to access internal NELA site with NAAEE personnel. (Mid to late February)
2. DC logs into the internal NELA web-site, and completes posted orientation procedures and review of project surveys and forms (pdf). (Mid to late February)
3. DC logs into and may post questions/comments on DC message board in the secure segment of the NAAEE project web-site. (Mid February to April)
4. DC confirms her/his readiness to proceed with all posted DC duties by e-mail to Dr. Meyers. (Mid to late February)

C. Initial Contact with Your School Principal(s) (Mid to late February)

1. DC contacts School Principal by phone to introduce her/himself: Confirms that all of the materials in the School Packet have been received.
    a. DC confirms that School Principal has returned their Personal Service Agreement to Dr. Meyers. If not, DC urges the School Principal to do so.
    b. Confirms that School has agreed to complete four different types of forms:
        i. School Information Form (completed by the Principal or designee)
        ii. Program Information Form for 6th or 8th Grades (completed by teachers of students participating in survey)
        iii. Teacher Information Form (completed by teachers of students participating in MSEL Survey)
        iv. MSEL Survey (completed by students, administered by Data Collector)
    c. Confirms that the participating 6th and 8th grade teachers have been selected at random. Please ensure that the teachers doing environmentally-related courses have not been intentionally selected, as that would devastate the ability of the Assessment to accurately identify what is occurring in average, randomly selected schools and classes of students. If the principal has intentionally selected environment-related teachers and classes, please have them to reselect classes and teachers.
    d. Confirms the class periods of randomly selected teachers, the number of students in each class.
    e. Asks if the Principal has any project-related questions. (Principals will have already been sent School Kit of information concerning the project. These materials are listed on the NELA Materials Documents Tracking Sheet).
2. DC and the School Principal confirm if School requires active or passive parental consent for students to participate in survey, and finalize/review procedures for obtaining consent.

D. Identification of a Date for On-Site Data Collection/Administration, number of students participating (These steps should be done during the same discussion as in Step C) (Mid to late February)

1. DC confirms with the School Principal that the Teacher Packets and Parental Consent Forms have been distributed to participating 6th and 8th grade teachers.
2. DC asks Principal how many students are in participating classes and emails this information to Dr. Meyers.
3. DC and the School Principal identify the week(s) in early or the middle of April for on-site data collection. If dates in April will not work, DC works with the School Principal to identify possible dates for data collection that are four (4) or more weeks prior to the end of the school year. DC encourages the School Principal to check on possible dates with participating teachers.
4. DC and the School Principal mutually agree on a date (one day for all administration) for on-site data collection.
5. DC and the School Principal and participating teachers agree on how survey will be administered (e.g., one-time administration in an assembly/cafeteria (preferred), separate administrations to 6th and to 8th graders, or separate administrations to each class period), and the scheduling of the administration(s).
6. DC confirms with the School Principal and participating teachers that alternative activities for students who do not have Parental Consent have been set up. We are asking that teachers remain present during the administration of the MSELS and complete the Program Information and Teacher Information surveys during this time, so they will not be available to supervise students in alternative activities. The details of who will take non participating students to alternate activities and supervise them need to be worked out.
7. DC confirms with Dr. Meyers: whether the school is active or passive consent, how the consents will be obtained, and that the date and manner the surveys will be administered are ok.

E. Preparations for Data Collection (Mid to late March)

DC receives Data Collectors Kit, including: Packet III Data Collector General Materials (Second Data Collector Cover Letter, Data Collector's Copy - School Material Verification Form (checklist) (Blue), Return Package: Postage, mailing label) and Packet IV: Data Collector MSEL Survey Administration Materials (Script for Administering MSELI, Customized sets of Scantron sheets (Blue), Survey booklets (Blue), Pencils, Rubber bands)

1. DC asks the School Principal OR participating teachers to confirm the total number of 6th and 8th grade students, as well as the number who have Parental Consent (who will participate in the survey).
2. DC requests from Dr. Meyers an appropriate number of MSEL Survey, Scantron forms, and pencils (number who will participate).
3. DC receives Data Collectors Kit (Packets 3 & 4) from and sends confirmation of receipt to Dr. Meyers.
4. DC sends e-mail reminder to the School Principal and participating teachers about the date and administration plan/schedule for the upcoming on-site data collection within 2-3 days of that date. (Mid April)

F. On-Site Data Collection (Mid April)

1. DC arrives early, signs in, greets the School Principal, and discusses plans for the day.
2. DC collects Parental Consent Forms from Principal.
3. DC should visit room where students will take MSELS, to ensure that the environmental conditions are suitable (i.e., that it is quiet, room temperature is ok, etc. This is important, as variations in test conditions may affect results)

For each administration of MSELS:

4. Shortly before administration, DC talks with the classroom teacher:
    a. DC collects "Parental Consent Forms" from the teacher, and reminds teacher that students without Parental Consent should go to the alternate activity (and leave the room).
    b. DC asks teacher how to handle any potential problems during administration (e.g., student misbehavior).
    c. DC ask teacher to stay in the room, but to stay seated during the survey and complete the Program Form and Teacher Information Form. DC explains that these protocols help us administer the surveys consistently across the country.

d. DC asks teacher not respond to any student questions during the survey, to allow the DC to handle them,
e. DC asks teacher to complete the Program Information Form and Teacher Information Form while student complete the MSEL Survey.

5. As 1st step in administration of MSEL Survey:
    a. DC is either introduced by the teacher or introduces her/himself to the class,
    b. DC reads the statement on the nature and purpose of this survey to the class (See MSEL Survey Administration Script),
    c. DC reminds students that their answers on this survey will have no effect on their class grades,
    d. DC indicates that this will take about 45 minutes, and
    e. DC asks students to raise her/his hand if they have questions during the survey
6. As 2nd step in administration of MSEL Survey:
    a. DC distributes a Scantron form and pencil to each student,
    b. DC asks each student to write in the name of her/his teacher, their grade level, and the class period, but not their own name, at the top of this form
    c. DC asks students if they have ANY questions about to how to fill in Scantron forms, and responds to those questions (e.g., be sure to fill in each bubble completely, and to erase wrong answers completely)
    d. DC asks students to put their pencil down and turn over their Scantron form when they are finished
7. As 3rd step in administration of survey:
    a. DC distributes a copy of the MSELS to each student and asks students not to begin yet
    b. DC asks students to follow along as they read the opening directions and the directions for each section
    c. DC asks students to read all items carefully and to respond to all items in all section honestly and to best of their ability
    d. DC asks students to begin
    e. DC keeps track of the completion time for each administration of the survey, keeping track of the range (the amount of time it took for the first student and last student to complete the survey) as well as the approximate mode (amount of time it took for the majority of

students to complete the survey). Upon completion, DC collects Scantron forms, and then surveys (they can keep pencils)

8. At the end of each administration:
    a. DC thanks the students and teacher for their participation and cooperation with this survey
9. After all administrations:
    a. DC meets with School Principal to check completed materials against the School Verification Form, and locate any missing materials,
    b. If all materials are completed and present, the School Principal and DC sign and date School Verification Form
    c. If all materials are completed and collected, including the School Verification Form, the DC should thank the School Principal for her/his cooperation

G. Post-Administration Steps (Immediately after administering surveys)

1. DC sends e-mail to Drs. Meyers and McBeth on the status of on-site administration and completion/submission of materials, with cc to the School Principal.
2. Dr. Meyers responds to DC and School Principal either: (a) thanking them for their efforts, and authorizing the mailing of materials for that school to Dr. Meyers; or (b) seeking information about any missing or incomplete materials, and what steps will be taken to complete and provide those materials
3. When Dr. Meyers has received all completed materials for that school, he will authorize payment by NAAEE to: (a) the School, as described in that Contract; and (b) the DC, as described in that Contract

DATA COLLECTOR SCRIPT

Hello, my name is _____. I'm conducting a very important survey with kids your age across the United States.

I'm going to give everyone in the class one of these questionnaires **(HOLD UP A QUESTIONNAIRE)**. It has questions in it that you're going to be answering to help us find out what you think about the environment?.

This is not a test. There aren't any right or wrong answers – you just answer whatever you think is the right answer for you. DO NOT put your name on the questionnaire. Your answers will be private. When you're done filling out the survey, close the booklet and put it in this box. **(HOLD UP THE CLASSROOM BOX)**. All the questionnaires will be put together, so that when we get them back, we won't ever know whose is whose.

Please turn to page 8 and correct questions 57 and 58. Option "e" should be strongly disagree.

When you're filling out the survey, if a question asks about something you don't know about, just don't answer that question.

(PASS OUT QUESTIONNAIRES)

Appendix 9. Report by Dr. Tom Marcinkowski, Data Analysis Coordinator

Procedures for Entering, Organizing, Editing, and Preparing Student Data for Scoring and Analysis

Prepared by Dr. Tom Marcinkowski, Florida Institute of Technology

October 30, 2007

Phase 1: Reading Scantron Responses into Text Files

This first phase involved a number of related activities. Dr. Marcinkowski provided Mr. Britt Martin, Lead technician with Florida Tech's Technology Support Center, with the file folder for each school provided by Dr. Meyers, as well as with information about the nature and number of responses contained on the Scantron forms in each file. Mr. Martin prepared a script to read responses on each set of Scantron forms into a text file. Dr. Marcinkowski and Mr. Martin agreed that for the final items, Items 68-75 pertaining to Action Strategies, this script would read only responses that reflected *MSELS* directions (i.e., options marked "a") and ignore all other responses (i.e., options marked "b" through "e"). Further, both Mr. Martin and Dr. Marcinkowski spent considerable time preparing sets of Scantron forms for machine reading (e.g., erasing incompletely erased responses and stray pencil marks). Finally, Dr. Marcinkowski provided Mr. Martin with information on how to label the text file for each set of Scantron forms by school and by grade level (e.g., School 1 – 6 and School 1 -8).

Once the script and Scantron forms were ready, and the manner in which resulting text files were to be labeled was clear, Mr. Martin proceeded to read each 6^{th} and 8^{th} grade data set into the Scantron reader, creating a text file for each, and labeling each accordingly. This resulted in 95 text files; i.e., one for each 6^{th} and 8^{th} grade sample, by school. The exception to this was for School 12, where the combined sample of 6^{th} and 8^{th} grade students was small enough to warrant reading them into a single text file, although these responses were separated by grade level and by a blank row. Mr. Martin then imported each of these text files into MS Excel spreadsheets, thereby creating a second set of 95 data files. Dr. Marcinkowski used the school and grade level labels to match each text files to its corresponding MS Excel file.

Phase 2: Formatting and Editing MS Excel Files

Once all MS Excel files had been created and properly labeled, Dr. Marcinkowski began to ready these MS Excel files for scoring and analysis. In the first step, each of the 95 MS Excel files was formatted. This involved copying and pasting the data set in each file to (a) create nine blank columns in Columns A-I; and (b) to create two blank rows in Rows 1 and 2. Columns A-I were filled with information used to code each data set, as follows:

- Col. A: School ID number;
- Cols. B & C: type of school (public, private non-religious, private religious);
- Col. D: State ID number;
- Col. E: whether the county was one of the original 50 counties or a replacement county;

- Col. F: County ID number;
- Col. G: range of grades in the school (K-8 = 1; 6-8 = 2; 7-9 = 3, 6-12 = 4; etc.);
- Col. H: grade level; and
- Col. I: Student ID number (i.e., from 1 to n in each data file).

Similarly, in Row 1, each column was labeled with the corresponding Item number from the MSELS, and Row 2 was left blank.

Once item numbers (columns) and Student ID numbers (rows) had been added to each MS Excel file, Dr. Marcinkowski matched each Scantron form to each data record, and wrote the Student ID number from the MS Excel file on each Scantron form. He checked whether student responses to Item 2 on the MSELS, Grade Level, corresponded to the grade level for each MS Excel file and, as needed, moved any data records to the proper grade-level file. Once this was accomplished, he was able to review data records to ensure that Scantron responses had been properly read into each data file. He went through each data record to determine if each blank in that data record corresponded to a blank on the matching Scantron form. When the Scantron reader had missed student responses (e.g., those lightly penciled in, responses missed by the Scantron reader), these were type into the data file. At the same time, he checked all "?" symbols in that data record to ensure that the matching Scantron form did include multiple responses. When multiple responses were encountered, both Scantron responses were entered into the data file (e.g., A/D). When it was apparent that the Scantron reader had misread partially erased responses as a second response, the corresponding ?s in each data file was replaced with the marked Scantron response. Once this was done for each of the 95 data files, these data files very closely matched the sets of Scantron forms sent by Dr. Meyers.

A second round of formatting was undertaken on these MS Excel files in preparation for scoring and analysis. The answer key to be used to score responses on each item provided by Drs. Volk and Hungerford was entered into Row 2 of each data file. Further, new columns were inserted between each scale (e.g., before Item 5 and after Item 21 to separate items in the II. Ecological Foundations scale and to create a column in which to enter scores on this scale). Each new blank column was labeled with the corresponding scale (Row 1), and the range of possible scores was entered (Row 2). In one instance a column of responses had to be moved to cluster items in the same scale (i.e., Items 59, 60, and 67 comprised the three-item issue identification sub-scale, so responses to Item 67 were moved to the column adjacent to Item 60).

Phase 3: Identification and Designation of Unusable Responses

During the process of matching data records (in data files) to Scantron forms (in file folders), Dr. Marcinkowski recognized that there were several problems with data records. First, in some instances, student had failed to respond to all of the items comprising one or more of the scales in the MSELS. These were deemed missing responses.

Second, in some instances, students had responded to some items and left other items blank within a given scale. When the number of blanks in a given data record is relatively large, this would adversely affect the calculation of scores and analysis of data. As a result, in August 2007,

members of the research team determined the number of blanks in each scale that would be deemed acceptable and unacceptable. The following decision rules were used to identify an unacceptable number of blanks (i.e., at or above 25%):

- II. Ecological Foundations (Items 5-21, or 17 items): four or more blanks;
- III. How You Think About the Environment, a measure of willingness or intention (Items 22-33, or 12 items): three or more blanks;
- IV. What You Do About the Environment, a measure of service and action (Items 34–45, or 12 items): three of more blanks;
- V. You and Environmental Sensitivity, a measure of psychological and experiential dimensions of sensitivity (Items 46-56, or 11 items): three or more blanks;
- VI. How You Feel About the Environment, a measure of attitudes toward or emotional connection to the environment (Items 57-58, or 2 items): one or both blank;
- VII.A. Issue Identification (Items 59, 60, 67, or 3 items): one or more blank; and
- VII.B. Issue Analysis, a measure of one's ability to identify values associated with stances on issues (Items 61-66, or six items): two or more blank.

When the number of blanks in a given scale within a data record met or exceeded the number of unacceptable blanks (above), the student's responses on that scale were deemed unusable. The only exception to this was for the last scale in the *MSELS*, VII.C. Action Planning, a measure of students' ability to select action strategies (Items 68-75). Students were asked to select the two best action strategies and designate each by filling in "a." As long as students selected at least one action strategy, their response was deemed acceptable (i.e., there was no unacceptable level of blanks).

Third, in some instances, student responses reflected what is commonly called a response set. Two common forms of response sets are selecting the same lettered response for all items in a given scale (e.g., all "a" or "e"), and sequencing responses to look like a Christmas tree (e.g., 1st item = A, 2nd Item = B, 3rd Item = C, 4th Item = D, and so on). In all cases in this study, response patterns that resembled Christmas trees on one or more scales were deemed invalid and therefore unusable. However, this same rule was <u>not</u> applied to data records in which the same letter was selected over a series of items, because on affective scales such as III. through VI. the consistent selection of "c" (Unsure) was deemed acceptable. However, three of these scales included negatively worded or "wake up" items as a check on the internal consistency (reliability) of responses, allowing the usability of responses within a response set to be determined. Specifically, scales III. How You Think About the Environment and IV. What You Do About the Environment included items that contained the word "not" in bold and underlined (i.e., meaning reversal items). Scale III. contained three of these items (Items 23, 25, and 27), while scale IV. contained two of these items (Items 34 and 45). In addition, scale VI. How You Feel About the Environment, contained two items, one of which was clearly stated in a positive direction (i.e., "love") and the other in a negative direction (i.e., "hate"). In all instances in which students selected the same lettered response for all items in these scales, thereby failing to differentiate responses on negatively worded items, these responses were also deemed unreliable and therefore unusable.

All missing responses and responses deemed unusable were highlighted in the MS Excel data files using yellow fill. This was done to make it easy to find and delete unusable responses during later phases of data preparation, for none of these responses were to be used in the calculation of scores or in any subsequent analyses of data.

Phase 4: Conversion of Alpha to Numeric Responses

All of the steps undertaken in Phases 1 through 3 involved the use of alphabetic (alpha) data read into data files from completed Scantron forms, primarily because it was easier to use alpha data to do undertake these tasks. However, alpha data are not usable in quantitative analyses; rather, they must be converted from an alpha to a numeric form. With the support of Dr. Mike Gallo, Ms. Katie Nall, a Ph.D. student in Mathematics Education and recipient of a University Graduate Scholarship, was asked to assist with the alpha to numeric conversion of data in all MS Excel files. Mrs. Nall wrote a script in Visual Basic to make these alpha-to-numeric conversions, and then used that script to make these conversions in all 95 MS Excel files (i.e., A=1, B=2, C=3, D=4, E=5).

At the same time, Mrs. Nall completed two additional tasks. First, as noted under Phase 3, there were six negatively worded items that required reverse scoring. Dr. Marcinkowski identified those items for Mrs. Nall, and she completed the reserve scoring for these six items in all files (i.e., A=5, B=4, C=3, D=2, E=1).

Second, the scoring for the last set of items, Items 68-75, was complicated for two reasons: (a) scoring would involve the use of a weighted numerical value for each of the various action strategies; and (b) scoring would involve the use of only two selected action strategies even when students selected more than two because this is the way the directions for this set of items and the corresponding scoring protocols read. So as to reduce any confusion or error in scoring this set of items, Mrs. Nall followed the scoring directions provided by Dr. Marcinkowski, with advice from Drs. Hungerford and Volk. In cases where more than two action strategies had been selected (i.e., marked with “a” and converted “1”), the numerical values for the two selected action strategies with the lowest weightings were summed. This was done in an effort to avoid inflating student scores over this set of items, which would have occurred had the numerical values from more than two selected strategies or the two selected action strategies with the highest weightings been used to score these responses.

Phase 5: Treatment of Missing Responses

While the data records with 25% or more missing responses were identified and deemed unusable in Phase 3, there were still a rather large number of data records in which there was a smaller number of missing responses (blanks). Missing response, or blanks, in the data record for a given scale can reduce student scores for that scale and, in doing so, affect summary statistics (i.e., reduce scores in proportion to the number of blanks). To reduce, but not eliminate, the effects of this smaller number of missing responses on student scores and results, Dr. Mike Gallo, advised Dr. Marcinkowski to consider using a form of multiple imputation commonly

referred to as “hot deck imputation” (HDI). Information about multiple imputation was circulated to members of the research team in the form of e-mail attachments for their review and comment. In light of the potential value of and limited concern about the use of HDI, Dr. Marcinkowski made the decision to subject all 95 MS Excel numeric files to HDI.

Basically, HDI involves three steps. First, for each data record in which blanks are found, the researchers search for one of more closely matching data records within the same data file (i.e., by school and by grade level). The criterion for acceptance as a matching record used in this study was 60% or more of common responses (e.g., for II. Ecological Foundations, matching records had at least 11 of 17 identical responses). Second, corresponding values from matching records are compared and, when appropriate, used to “fill in” missing responses. In this study, when no matching record(s) were found, the missing response remains blank and was filled in with blue. When one matching record was found, the corresponding value from the matching record was used to fill in each missing response. In instances where more than one matching record was found, the best matching records were compared. If there was a consistent or reasonably consistent corresponding value, then it is used to fill in the missing response. However, when multiple matching records do not yield a consistent corresponding value, the missing response was left blank and filled in with blue. Third, it is incumbent on researchers involved in HDI to prepare a detailed record of all imputation decisions, to include all missing responses (i.e., within each data file, by Item and Student ID number), all matching records, and all imputation decisions.

Using the strategies described above, Dr. Marcinkowski and Mrs. Nall used HDI to search for and, when appropriate fill in, missing responses in each data file. Dr. Marcinkowski did so for Schools 1 – 30, and Mrs. Nall did so for Schools 31 - 50. Each maintained a detailed record of all missing responses (blanks) encountered and of all imputation decisions. In all cases, within the data files, imputed values used to fill in blanks were highlighted in red font.

Phase 6: Final Preparation of Data Sets

Following the completion of HDI, the final preparation of data sets involved two steps. First, as required in the contract with the Center for Survey Research and Analysis (CSRA) at the University of Connecticut, a MS Excel master file was created for all 6th grade data. Starting with School 1 and progressing to School 50, each set of 6th grade responses was copied into this master file. Once each was copied and pasted, all responses deemed unusable (Phase 3, fill in yellow) were deleted, a search was run to delete any additional unusable responses on Items 57 and 58 (i.e., scores of 5 on one item and 1 on the other) and for any missed blanks, and other cosmetic edits were made (e.g., to use the same blue fill for all remaining blanks, to change all Student ID numbers to black font). The same procedures were used to prepare a master file for 8th grade data.

Second, these two MS Excel master files were sent to Mrs. Nall for the final step in data preparation. To prepare these two data files for scoring and analysis, she undertook a second round of numeric conversions. As noted under Phase 4, in her first alpha-to-numeric conversions, all items were scored 1-5. However, in order to calculate scores for scale II. Ecological

Foundations, IIV.A. Issue Identification, and VII.B. Issue Analysis, numeric scores had to be converted to 0's (for all incorrect responses) and 1's (for all correct responses). Mrs. Nall wrote a script in Visual Basic to make these conversions using the scoring key included in all alpha and numeric files, and then made those conversions. Scores on these scales were not calculated, as this was to be done by the data analyst at CSRA. Mrs. Nall sent these final 6th and 8th grade data files back to Dr. Marcinkowski, who ran checks to ensure that the conversions from 1-5 to 0-1 were accurate. No conversion errors were found in any of the cases in which this check was run.

Phase 7: Provision of Final Master Data Files

These final 6th and 8th grade MS Excel master data files were distributed to CSRA, to Dr. McBeth, Project PI, and to Dr. Trudi Volk, Manager of the CSRA Contract, on Tuesday, October 23. They were sent to CSRA to permit Mr. Sanjeewa Karunaratne to prepare these data sets for weighting and data analysis. They were sent to Dr. McBeth and Dr. Volk to notify each that these responsibilities within the CSRA contract had been fulfilled, to allow them to review the data set and make any needed adjustments to *MSELS* directions and items (e.g., for Items 68-75), and for back-up purposes.