National Environmental Literacy Assessment, Phase Two: Measuring the Effectiveness of North American Environmental Education Programs with Respect to the Parameters of Environmental Literacy

~ Final Research Report ~

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EXECUTIVE SUMMARY

This report is the culmination of Phase Two of the National Environmental Literacy Assessment (NELA) project. Funding was provided by the National Oceanic and Atmospheric Administration (NOAA), and the project was administered by the North American Association for Environmental Education (NAAEE). Key partners included researchers from the University of Wisconsin – Platteville, the Center for Instruction, Staff Development and Evaluation in Illinois, and the Florida Institute of Technology.

In their focus on environmental literacy assessment, the NELA Research Team developed a multi-phased study, with the first phase designed to identify baseline levels of environmental literacy among sixth- and eighth-grade students in randomly selected U.S. schools with middle grades. That research used a probability proportional sample of 48 middle schools identified by GfK Roper. With that first phase accomplished (McBeth, Hungerford, Marcinkowski, Volk, & Meyers, 2008), these sixth- and eighth-grade baselines would serve as comparative measures for future NELA research efforts, as well as for other assessment efforts that may be undertaken by scholars and practitioners in environmental education.

The intent of the second phase of this research was to utilize the results of the baseline measures of environmental literacy in a comparative study. This strategy is supported by a number of documents. In its Report to Congress, *National EE Research Agenda*, the National Environmental Education Advisory Council (NEEAC, 2005) included a recommendation for research into the relative effectiveness of instructional materials and programs in meeting the goals of environment education. The National Oceanic and Atmospheric Administration supports the promotion of an environmental literate citizenry through the assessment of current educational efforts, recommendations for curricular development and educational practices, and developing partnerships (NOAA, 2009). Further, the North American Association of Environmental Education's (NAAEE) Strategic Plan (NAAEE, 2010) calls for high quality, research-based programs for advancing environmental literacy. Currently, no research studies have addressed these recommendations by attempting to compare different environmental

education programs within the United States over an extensive set of validated environmental literacy components.

Thus, this Phase Two research sought to answer two research questions. The first was to determine the level of environmental literacy of sixth-, seventh-, and eighth-grade students across the U.S., who participate in exemplary environmental education programs at their schools, on each of the following variables: ecological knowledge: verbal commitment; actual commitment; environmental sensitivity; general environmental feelings; environmental issue and action skills. The second was to determine how the level of environmental literacy of students in these programs compared to the Phase One baseline level of environmental literacy of sixth- and eighth-grade students across the U.S.

Sixty-four middle schools from 27 states comprised the purposeful sample included in this Phase Two study. These schools were nominated for their efforts in environmental education and were screened and selected into the study by the research team. The student sample included 3,134 sixth graders, 2,696 seventh graders, and 2,138 eighth graders. A total of 214 teachers also participated in the study.

Since Phase One surveyed the baseline sample using the *Middle School Environmental Literacy Survey* (*MSELS*), this instrument was also the primary instrument in this phase of the NELA project. The *MSELS* includes several demographic items and measures of the environmental literacy components reflected in the first research question noted above. As such, it includes measures in each of four domains that appear to be critical to environmental literacy: knowledge, affect, cognitive skills, and behavior.

Three other survey forms were also used in each school. Administrators were asked to complete School Information Forms, and cooperating teachers were asked to complete Program and Teacher Information Forms. In April, May and June of 2009, Data Collectors administered the instrument to the purposeful sample of sixth, seventh, and/or eighth graders in 64 schools in the United States and collected the completed School, Program, and Teacher Forms, which had been

mailed to the schools. The data collection procedures used in this Phase Two study of NELA replicated those of Phase One (McBeth et al., 2008).

Results for Research Question One

Research Question One sought to measure the environmental literacy of middle school students in schools with established and exemplary environmental education programming. Table 1 summarizes the descriptive results from the survey of all sixth-, seventh- and eighth-grade students in the Phase Two sample. This table identifies parts of the *MSELS* (and the variable measured by each part), the number of items in and possible ranges of scores for each part of the

Table 1 *Summary of Descriptive Results for all Phase Two Sixth-, Seventh-, and Eighth-grade Students on Parts of the MSELS*

Parts of the MSELS (variables measured)	No. of items	Range	Grade	Sample size *n*	Mean	Std. dev.	% of Possible points
II. Ecological Foundations (ecological knowledge)	17 Items (5 - 21)	0 - 17	6	3058	11.41	3.42	67%
			7	2654	11.89	3.50	70%
			8	2094	12.18	3.65	72%
III. How You Think About the Environment (verbal commitment)	12 Items (22 - 33)	12 - 60	6	3064	45.27	8.67	75%
			7	2644	43.34	9.32	72%
			8	2051	42.83	9.14	71%
V. You and Environmental Sensitivity (environmental sensitivity)	11 Items (46 – 56)	11 - 55	6	3015	33.00	7.37	60%
			7	2601	31.88	7.32	57%
			8	1999	31.03	7.55	56%
VI. How You Feel About the Environment (environmental feelings)	2 Items (57 – 58)	2 - 10	6	2840	8.60	1.98	86%
			7	2443	8.41	2.02	84%
			8	1876	8.30	2.09	83%
VII.A. Issue Identification (issue identification)	3 Items (59, 60, 67)	0 - 3	6	2809	1.08	0.95	36%
			7	2431	1.07	0.98	36%
			8	1789	1.17	0.97	39%
VII.B. Issue Analysis (issue analysis)	6 Items (61 – 66)	0 - 6	6	2793	2.75	1.97	46%
			7	2439	2.83	2.01	47%
			8	1816	2.97	2.09	48%
VII.C. Action Planning (action planning)	8 Items (68 – 75)	0 - 20	6	2667	7.47	5.36	37%
			7	2315	7.49	5.33	37%
			8	1684	7.89	5.53	39%
IV. What You Do About the Environment (actual commitment)	12 Items (34 - 45)	12 - 60	6	3041	40.85	9.13	68%
			7	2618	38.52	9.14	64%
			8	2024	38.30	9.24	64%

instrument, and the mean scores, standard deviations, and percent of possible points for each grade level involved in the study.

Because there were variations in the numbers of items and the range of points possible across the various parts of the *MSELS*, we can understand how the students performed, in a relative sense, by focusing on the percentage of possible points mean represents for a particular part of the *MSELS*, or variable. By doing so, we see a general pattern from higher to lower levels of environmental feelings, verbal commitment, ecological knowledge, actual commitment (behavior), sensitivity, issue analysis, action planning, and issue identification. The data were orderly and, with one exception, the seventh-grade percentages (and means) were equal to or fell between those of the sixth and eighth grade.

Phase Two was designed to investigate the results of environmental education programming within schools, so we also compared the samples using the school as the unit of analysis. Thus, descriptive statistical analyses were undertaken on a school-by-school basis, and for each grade level within each school, thereby creating grade-level cohorts for these analyses. Thus a school might have a sixth-grade cohort, a seventh-grade cohort, an eighth-grade cohort, or a combination of two or more grade-level cohorts. For the Phase Two sample, there were a total of 116 grade-level cohorts (43 sixth-grade cohorts, 40 seventh-grade cohorts, and 33 eighth-grade cohorts).

Table 2 presents the environmental literacy component and composite mean scores for the grade-level cohorts. These scores were derived from grade-level mean scores for each school in the sample. The first column in Table 2 lists the four environmental literacy components (Ecological Knowledge, Environmental Affect, Cognitive Skills, and Environmental Behavior), and identifies the specific variable(s) included within each component. To facilitate comparisons of literacy levels across components, *MSELS* scores were adjusted so that each of the environmental literacy components equated to a possible score of 60 points. An environmental literacy composite score resulted from adding the four components scores of the four literacy components, yielding a possible composite score of 240 points.

Table 2
Phase Two Environmental Literacy Component and Composite Mean Scores for Grade-level Cohorts

Components and measures of Environmental Literacy	Range of possible scores	6th Grade mean	7th Grade mean	8th Grade mean
Ecological Knowledge	0-60	41.68	44.11	43.77
Ecological Knowledge				
Environmental Affect	12-60	42.11	41.14	40.86
Environmental Sensitivity				
Environmental Feeling				
Verbal Commitment (Intention)				
Cognitive Skills	0-60	24.94	26.50	28.27
Issue Identification				
Issue Analysis				
Action Planning				
Environmental Behavior	12-60	40.90	39.89	39.46
Actual Commitment				
Environmental Literacy Composite Score	24-240	149.64	151.65	152.35

* Notes: For scores on **Ecological Knowledge** and on **Cognitive Skills**, *Low* = 0-20, *Moderate* = 21-40, and *High* = 41-60; For scores on **Environmental Affect** and on **Environmental Behavior**, *Low* = 12-27, *Moderate* = 28-44, and *High* = 45-60; For **Composite Scores**, Low = 24-96, Moderate = 97-168, and High = 169-240.

The highest component scores were noted in Ecological Knowledge followed by Environmental Affect, Environmental Behavior, and finally Cognitive Skills. The sixth-grade cohorts outscored the eighth-grade cohorts on the affective and self-reported behavior components, and the eighth-grade cohorts outscored the sixth-grade cohorts on the knowledge and skill components. With the exception of Ecological Knowledge, the seventh-grade cohorts score fell between those of the sixth- and eighth-grade cohorts. All of the scores on the Ecological Knowledge component (sixth-, seventh-, and eighth-grade cohorts) are considered in the high range, and all grade-level cohorts scored in the moderate range on the Environmental Affect, Cognitive Skills, and Environmental Behavior components.

Results for Research Question Two

Research Question Two compared these Phase Two findings with those of Phase One to determine if there were any key differences between the two samples on their levels of environmental literacy. Since the Phase One study did not include a seventh-grade sample, comparisons between the baseline and purposeful samples can only be made for sixth- and eighth-grade levels.

We used *z*-tests to compare results on each part of the *MSELS* for the Phase Two purposeful sample of sixth graders to results from the Phase One baseline sample of sixth graders, and for the Phase Two purposeful of eighth graders to the Phase One baseline sample of eighth graders. *Z*-test comparisons between Phase One and Phase Two sixth graders identified statistically significant differences (alpha = .006125) on the following environmental literacy variables: ecological knowledge, verbal commitment, environmental sensitivity, environmental feelings, issue identification, and actual commitment (behavior). With the exception of issue identification, Phase Two sixth-grade students outscored those from Phase One. For the eighth-grade samples, statistically significant differences (alpha = .006125) were noted on the following variables: ecological knowledge, verbal commitment, environmental sensitivity, environmental feelings, issue identification, issue analysis, and actual commitment (behavior). The only part on which the Phase One eighth graders out-scored those of Phase Two was issue identification.

We used *t*-tests for independent samples to compare Environmental Literacy Component and Composite score results for the Phase Two purposeful samples of sixth- and eighth- grade cohorts to their counterparts in the Phase One baseline samples. *T*-test comparisons of the Component and Composite scores identified significant differences (alpha = .01) between Phase One and Phase Two sixth- and eighth-grade cohorts on the Environmental Affect and Environmental Behavior components. In both cases the Phase Two sixth- and eighth-grade cohorts out-scored their counterparts in Phase One. Significant difference was also found between the Phase One and Phase Two Composite Scores, with the Phase Two eighth-grade cohorts out-scoring those of Phase One.

The distribution curves (histograms) found in Figures 1 and 2 summarize the results of these *t*-test comparisons. These distribution curves reflect the average scores for each of the school-by-school cohorts in each grade-level sample. Further, the values along the *x* axis in each distribution curve were plotted using standard deviation values from the baseline sample, thereby permitting a final comparison of the purposeful and baseline samples. Finally, the magnitude of the difference between these samples was calculated using Cohen's *d*, which identifies the practical or educational significance of any differences found (Cohen, 1988).

Figure 1 presents the distribution curves, along with accompanying information, for sixth-grade cohorts in the baseline and purposeful samples. The mean composite score of the sixth-grade purposeful sample (149.64) was greater than that of the sixth-grade baseline sample (143.65).

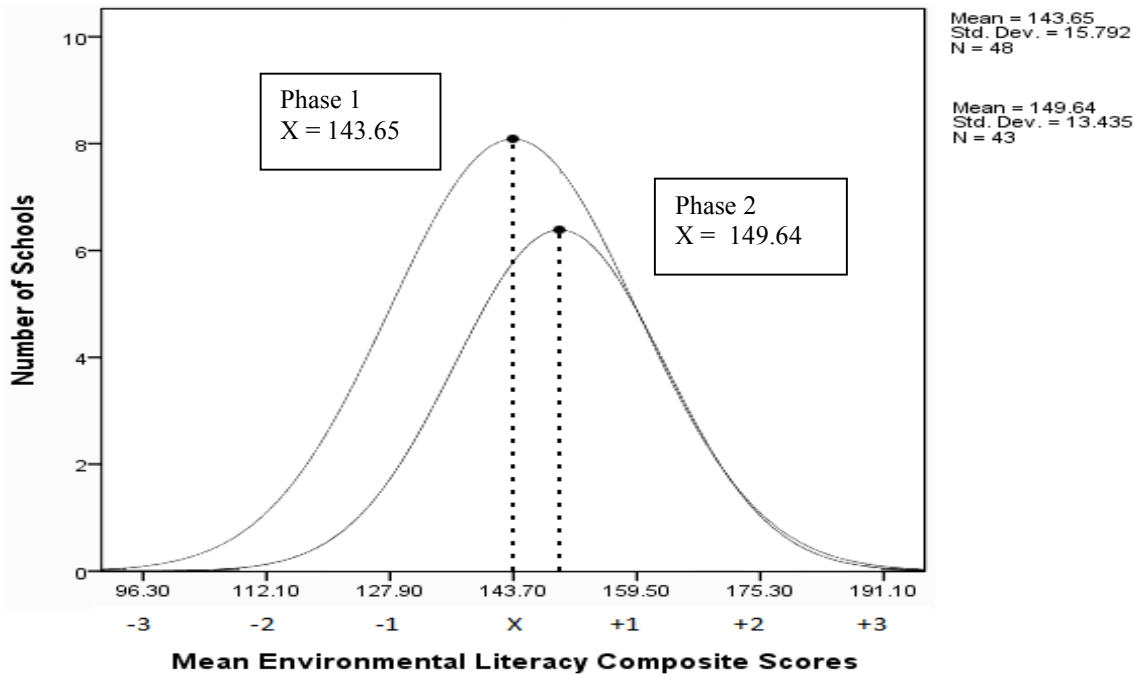

Figure 1. Distribution curves of composite scores for sixth-grade cohorts in the baseline and purposeful samples. The effect size is represented by the distance between the dotted lines.

With a baseline standard deviation of 15.792, the Cohen's *d* analysis yielded a small effect size (*d* = .37), indicating that the difference between these distributions was of small practical or education significance.

Figure 2 presents the distribution curves, along with accompanying information, for eighth-grade cohorts in the baseline and purposeful samples. The mean composite score for the eighth-grade purposeful sample (152.35) was greater than that of the baseline sample (140.32). With a baseline standard deviation of 15.286, the Cohen's *d* analysis yielded a medium effect size (*d* = .79). It is notable that although this effect size indicated that the difference between these two distributions was of medium practical or education significance, its value approached .80, the threshold of large significance as suggested by Cohen (1988, p. 25).

The statistically significant difference between baseline and purposeful eighth-grade cohorts on their Composite Scores is particularly encouraging. Schools who were nominated into the purposeful sample tended to have environmental programming sequenced across grades. Generally, sixth graders are at the entry stage in middle schools. In over 40% of schools in the

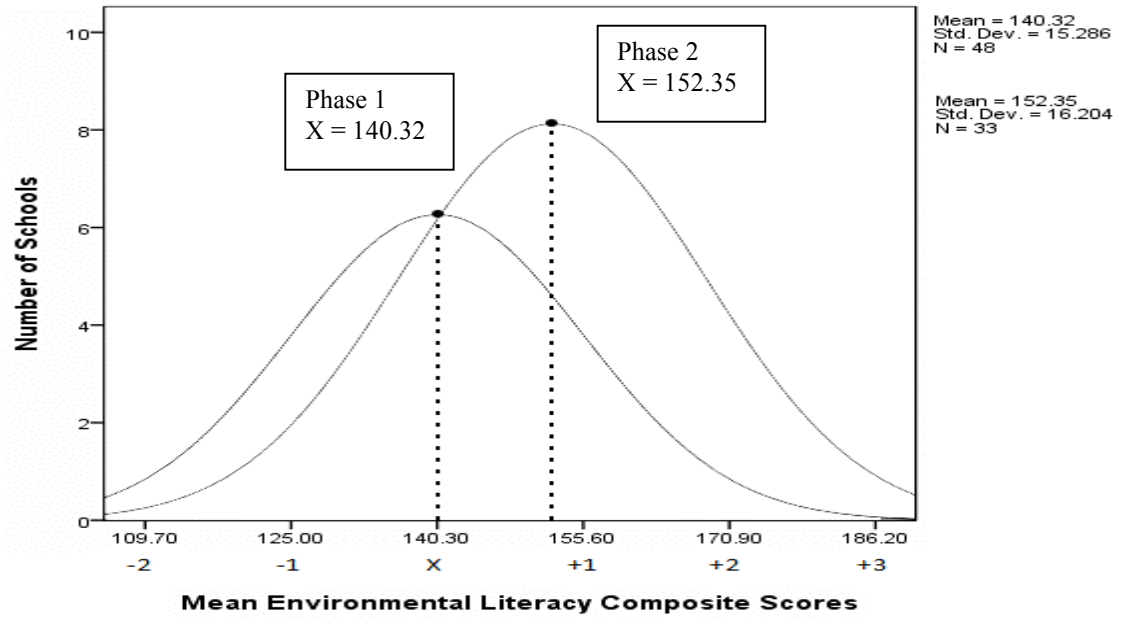

Figure 2. Distribution curves of composite scores for eighth-grade cohorts in the baseline sample and purposeful samples. The effect size is represented by the distance between the dotted lines.

Phase Two sample, eighth graders had a multi-year exposure to EE programming. This suggests that a progressive (continuing) exposure to environmental education programming may have a cumulative positive effect on the development of environmental literacy.

Scores displayed a relatively consistent pattern across both Phase One and Phase and Two studies, with sixth-grade cohorts out-scoring the eighth-grade cohorts on the affective and behavior components of environmental literacy, and eighth-grade cohorts outscoring sixth-grade cohorts on the knowledge and skills components. Results were also relatively consistent within the Phase Two sample, with seventh-grade cohorts scoring between sixth- and eighth-grade cohorts on all components except Ecological Knowledge. The pattern of results across the Phase One and Two studies supports a hypothesis posited in the Phase One report that, "These results might be expected due to developmental differences between the two age groups" (McBeth et al., 2008, p. 92). The ability of the MSELS to discriminate across grade levels, (the seventh-grade scores fell between the sixth and eighth, with the exception of Ecological Knowledge), adds to the research team's overall confidence in the validity and reliability of the MSELS, which was summarized in the Phase One report (McBeth et al., 2008).

It has become rather obvious from the comparison of Phase One to Phase Two results that the weakest dimension of environmental literacy lies in the skills related to environmental issues (Cognitive Skills component). In comparisons that used the student as the unit of analysis, the variables of issue identification, issue analysis, and action planning yielded the lowest percentage of possible points, ranging from 36% to 50% (see Table 14). These cognitive skill variables also yielded the smallest effect sizes in *z*-test comparisons and Cohen's *d* analyses (see Tables 20 and 21), with negligible effect sizes for both sixth graders (.000 to -.247) and eighth graders (.005 to -.126). We observed a similar situation in the distribution curves that were used to compare the grade-level cohorts, with a negligible effect size of -.087 for sixth graders (Figure 11) and a small effect size of .34 for the eighth graders (Figure 15). While it is important to note the increase in effect size from the sixth-grade to the eighth-grade *t*-test comparisons (-.087 to .34), it appears critical for EE programs to place more emphasis on cognitive skills associated with

understanding, investigating, analyzing, making decisions about, and taking action on environmental issues.

On a more positive note, although environmental behavior ranked fourth in percent of possible points among the eight environmental literacy variables (with a range of 58.5% to 64% for the baseline samples, and 64% to 68% for the purposeful samples), the environmental behavior component exhibited the largest effect sizes for both sixth- and the eighth-grade cohorts in the distribution curve comparisons (.80 and 1.27, respectively), It should be acknowledged that environmental behavior, as measured in this study, suffers the threats of all self-reported data. Even so, responsible environmental behavior is an ultimate aim of environmental education, and the growth related to environmental behavior that is exhibited by the Phase Two schools, as compared to the Phase One schools, is substantial and encouraging.

While we recognize that many variables influence environmental literacy, this study has shed light on the impact that school-based environmental education programming might have on young learners. Overall, it appears that the environmental education efforts of schools nominated into this Phase Two Study are effective in influencing environmental literacy in their students, as compared to those randomly selected schools in the Phase One Study. The educational gain made on the Environmental Literacy Composite Score by the Phase Two eighth-grade cohorts (70% of a standard deviation) is striking when compared to that of the sixth-grade cohorts (37% of a standard deviation). This difference in educational gain should not be overlooked.

A number of alternative hypotheses remain over which the Research Team had no control. For example, did students in the purposeful sample have higher overall levels of environmental literacy as a result of their participation in school-based environmental education programming, or, were these students enrolled in schools with environmental education programming because of the levels of environmental literacy they (or their parents) possessed? In other words, was the level of student literacy the result of, or *partially* the result of, parental or familial environmental literacy? Could these results have been the result of administrative and/or community support for environmental education? Did less than optimum conditions for survey administration in some

settings impact the quality of the data collected for both phases of NELA? Although appropriate actions were taken to reduce the effects of missing responses (again in both phases of NELA), was valuable information lost because of those missing responses?

Secondary analyses of data already collected through the course of Phase One and Phase Two of the NELA project may help to answer additional questions. In addition, an in-depth and exploratory study of high-performing schools, such as those identified in the two initial phases of NELA, might lead us to better understand the nuances inherent in the development of environmental literacy and the ways in which schools contribute to that development. Such s study might probe the following questions, among others: To what extent does familial environmental sensitivity influence student sensitivity? What role in the development of environmental literacy, if any, is played by demographic and social variables related to school and community? To what extent are classroom teacher variables important in the development of environmental literacy? To what extent can programmatic (curricular and instructional) variables impact the development of environmental literacy?

We still have much to learn about the development of environmental literacy. Although it appears that middle schools can increase the development of environmental literacy across several dimensions (variables and components), we are only beginning to understand the conditions that may enhance this developmental process and make it even more effective.

INTRODUCTION AND BACKGROUND

Scope of the National Environmental Literacy Assessment Project Phases One and Two

In 1990, a panel of professional environmental educators and researchers in the United States identified the need for national measures of environmental literacy as part of a national research agenda for EE (Wilke, 1990). Over the next decade, there was little movement toward such a national assessment, other than that reported by Wilke (1995), McBeth (1997), and Volk and McBeth (1997). This need for a national measure of environmental literacy was again recognized by the National Environmental Education Advisory Council (NEEAC), the citizen advisory council to the U.S. Environmental Protection Agency, in its 2005 Report to Congress (NEEAC, 2005). The call for a national assessment remained unheeded until 2006 when a group of researchers, including the authors, sought and received funding to undertake the task. This group of researchers became the National Environmental Literacy (NELA) Research Team.

In their focus on environmental literacy assessment, the NELA Research Team developed a multi-phased study. The first phase of this study (Phase One) was designed to identify baseline levels of environmental literacy among a randomly selected sample of students in middle school grades across the U.S. These baselines serve as a comparative measure for future NELA research efforts, as well as for general assessment efforts that may be undertaken by both scholars and practitioners in environmental education.

Phase Two of this multi-phased study was designed to measure the environmental literacy of middle school students in schools with established and exemplary environmental education programming. The research team also compared these Phase Two findings with those of Phase One to determine if there were any key differences between the two samples, that is, between middle school students who experienced environmental education programming as compared to middle school students in general. These comparisons can lead to valuable information concerning educational practices that show promise in the development of variables associated with environmental literacy. In both Phases, data were collected using the Middle School

Environmental Literacy Survey (*MSELS*), as well as three other surveys to gather information about the schools, programs, and classroom teachers.

Both Phase One and Phase Two have provided the foundation for the future work of NELA, which will explore more extensively related variables that might impact environmental literacy. Phase Three will include the secondary analyses of data on variables collected through supplemental instruments (i.e., teacher, program, and school surveys). This research (Phase Three) could provide important insights into the development of a number of environmental literacy variables. Also, these earlier two phases have allowed the team to identify "schools of interest", schools with environmental literacy composite scores in the top quartile. The in-depth study of these schools could provide valuable information into the educational conditions inherent in high performing schools (e.g., staffing, pedagogical, curricular, and cultural).

Ultimately, this multi-phase study was designed to provide environmental education professionals with guidance on the use of extant EE instructional materials or the development of new EE materials, delivery of instruction, and environmental conditions that may enhance the probability of further developing environmental literacy among middle school learners in the United States. This final report describes the work which built on the baseline assessment and lays the foundation toward "best" educational practices in the development of environmental literacy.

Overview of NELA Phase One

Phase One Research Problem and Purpose

With funding from the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) and support from the North American Association for Environmental Education (NAAEE), a team of researchers set out to address the national environmental literacy assessment needs described previously. The research team posed the two research questions listed 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.?

Phase One Methods

To address both of these research questions, the NELA Team contracted with GfK Roper to generate the national random sample that was used for this study. During data analysis, weights based on national population data available through the National Center for Educational Statistics at the U.S. Department of Education were applied to the *MSELS* part (or literacy variable) scores to account for any discrepancy between the intended and actual samples. Both the sampling protocol and application of weights helped ensure that the sample was representative of sixth- and eighth-grade students in the U.S. The resulting sample consisted of 48 schools and included 1,042 sixth and 962 eighth graders.

Data for Phase One were collected in the spring of 2007 using four data collection surveys: the Middle School Environmental Literacy Survey (*MSELS*), the Teacher Survey, the Program Survey, and the School Survey (McBeth, Hungerford, Marcinkowski, Volk, & Meyers, 2008). The *MSELS*, the main data source used for the analyses conducted during Phase One, contains eight parts. Each part represents an environmental literacy variable: ecological foundation knowledge, intention to act, sensitivity, emotion, issue identification, issue analysis, action planning, and environmental behavior.

Phase One Results

Levels of environmental literacy related to specific variables. Table 3 presents means, standard deviations, and percentage of points possible for the sixth- and eighth-grade samples, for each literacy variable included on the *MSELS*. It also includes information on the number of items used to measure each variable and on the range of points possible for each variable.

Table 3
Descriptive Statistics for Weighted Sixth- and Eighth- Grade Data for Environmental Literacy Variables – Phase One

Environmental Literacy variable	No. of items	Range	Grade	*n*	Mean	*SD*	Percentage of possible points
Ecological Knowledge	17	0-17	6	934	11.24	3.26	66%
			8	921	11.62	3.32	68%
Verbal Commitment (Intention to Act)	12	12-60	6	1000	43.89	8.88	73%
			8	936	41.10	9.20	68.5%
Environmental Sensitivity	11	11-55	6	978	32.54	7.47	59%
			8	913	30.11	7.48	55%
General Environmental Feelings	2	2-10	6	987	8.14	2.00	81%
			8	930	7.82	2.06	78%
Issue Identification	3	0-3	6	902	1.31	0.93	44%
			8	885	1.29	0.95	40%
Issue Analysis	6	0-6	6	905	2.75	1.89	46%
			8	869	2.86	2.00	48%
Action Planning	8	0-20	6	874	7.25	5.44	36%
			8	820	7.86	5.64	39%
Actual Commitment (Pro-Environmental Behavior)	12	12-60	6	974	38.44	9.15	64%
			8	921	35.14	9.39	58.5%

Source: McBeth, B & Volk, T.L. (2010). The National Environmental Literacy Project: A baseline study of middle grade students in the United States. *The Journal of Environmental Education,* 41(1), 55-67.

At both grade levels, scores were higher for ecological knowledge than for cognitive skills (issue identification, issue analysis, and action planning). Similarly, student scores were higher for verbal commitment (intention to act) than for actual commitment (pro-environmental behavior). Neither of these patterns is surprising in light of evidence about student performance on outcome

measures in environmental education (Leeming, Dwyer & Bracken, 1995; Volk & McBeth, 1997; Bogan & Kromrey, 1996). In general, knowledge application is less difficult than skill application, and the prevalence of verbal commitment (intention to act) over actual commitment (pro-environmental behavior) is well documented in the research surrounding responsible environmental behavior. It was also notable that students scored higher for general environmental feelings than for the more specifically worded verbal commitment (intention to act).

We were curious about what we might find regarding environmental sensitivity measures, since into the 1990s, relatively few studies had measured environmental sensitivity among youth (e.g., McBeth, 1997) as opposed to among adults (Chawla, 1998; Sward & Marcinkowski, 2005). Student scores were noticeably lower for environmental sensitivity, than for the other affective variables (intention to act and general environmental feelings). In fact, the scores that most nearly resembled those of environmental sensitivity were those for actual commitment (pro-environmental behavior). Again, prior research would support this relationship, as environmental sensitivity has long been considered a key predictor of responsible environmental behavior (Sia, Hungerford & Tomera, 1985/86; Sivek & Hungerford, 1989/90; Lierman, 1995; Marcinkowski, 2005).

In general, eighth graders outscored sixth graders on measures of knowledge and cognitive skills. As noted by Leeming et al. (1995), it would be expected that "older children would have more knowledge and earn higher scores on [a knowledge] instrument than would younger children" (p.24). On the other hand, sixth graders tended to outscore eighth graders on both the affectively oriented sensitivity, and general environmental feelings measures and on the more action-oriented intention and behavior measures. We would not necessarily expect to observe age progression for an attitude scale, because "attitudes change as a function of specific exposure and experiences, rather than as a result of increasing age," (Leeming et al., 1995, p. 24). While the former differences are relatively small, suggesting that eighth graders are not that much more knowledgeable or skilled than sixth graders, the latter differences were clearer and more pronounced, suggesting that sixth graders hold moderately stronger affective ties to the environment than do eighth graders.

General levels of environmental literacy. The results for the prior research question were reported for each of the distinct sections of the *MSELS*. By contrast, the second research question sought to identify the general level of environmental literacy of sixth- and eighth-grade students across the U.S. and a more holistic approach to the concept of environmental literacy was needed. We derived composite scores for the major components or conceptual variables of environmental literacy, so that interpretations might be made across them. Those major components were environmental knowledge, environmental affect, cognitive skills, and behavior. Table 4 presents information on the components of environmental literacy and composite scores.

Table 4

Environmental Literacy Component and Composite Scores for Phase One Sample

Components of Environmental Literacy as Measured on *MSELS*	**6th Grade Mean (*N* = 48)**	**8th Grade Mean (*N* = 48)**
Ecological Knowledge*	39.67	41.01
Ecological Knowledge		
Environmental Affect*	40.73	38.06
Verbal Commitment-Intention to Act		
Environmental Sensitivity		
General Environmental Feelings		
Cognitive Skills*	25.15	25.98
Issue Identification		
Issue Analysis		
Action Planning		
Behavior*	38.44	35.14
Pro-environmental behavior		
Actual commitment		
Environmental Literacy Composite Scores**	143.99	140.19

Note: Total possible points for each Component = 60; Total possible points for Composite Score = 240; Source: W. McBeth and T.L. Volk. (2010). The National Environmental Literacy Project: A baseline study of middle grade students in the United States. *Journal of Environmental Education 41*(1), 55-67.

Overall, the results of this research suggested that, as a group, sixth- and eighth-grades students in the U.S. are moderate to high in their ecological understandings. Their attitudes also appear to be moderately positive, especially in terms of positive feelings toward the environment and willingness to take positive actions toward the environment. Although the older students appeared to be more knowledgeable and more skilled in a cognitive sense than the younger students, the younger students appeared to have more positive feelings about the environment, a greater willingness to take positive actions toward the environment, and a higher level of participation in pro-environmental behaviors.

However, for all students, in a pattern echoing that of adults, their report of undertaking actual behaviors to remediate environmental conditions fell short of their verbal commitment and feelings. Lower still, was their grasp of critical thinking and decision-making skills that might be useful in helping to resolve environmental issues in their own communities and in society, at large. The Phase One report (McBeth et al., 2008) contains complete descriptions of the Phase One instrument, procedures, and findings.

Overview of NELA Phase Two

Phase Two Research Problem

With Phase One completed, the logical progression of this research was to utilize those results as a baseline measure of environmental literacy in a comparative study. This strategy is supported by a number of documents. In its Report to Congress, *National EE Research Agenda*, the National Environmental Education Advisory Council (NEEAC, 2005) included a recommendation for research into the relative effectiveness of instructional materials and programs in meeting the goals of environment education. The National Oceanic and Atmospheric Administration (NOAA) supports both environmental literacy efforts, and educational research into those efforts. NOAA's educational vision is of "(a)n informed society that uses a comprehensive understanding of the role of the ocean, coasts, and atmosphere in the global ecosystem to make the best social and economic decisions" (NOAA, 2009, p. 5). Similarly NOAA's first educational goal, Environmental Literacy, calls for "(a)n environmentally literate public supported by a continuum of lifelong formal and informal

education and outreach opportunities in ocean, coastal, Great Lakes, weather, and climate sciences" (p. 9), and Outcome 1.1 of this goal declares that, "NOAA education programs are developed and refined using the best available research on the effectiveness of environmental and science education" (p. 15). NOAA further identifies as Strategy 2 for this outcome, to "(d)evelop and implement a framework of assessment and evaluation strategies that add to and are based on educational research findings, and are consistent with interagency assessment and evaluation efforts" (p. 16). Currently, no research studies have addressed these principles by attempting to compare different environmental education programs over a set of validated environmental literacy components within the United States.

Phase Two was undertaken to identify the environmental literacy levels of a purposeful sample of North American middle school classes that were exposed to one (or more) programs/approaches from a set of currently operating environmental education programs/approaches. By comparing the relative effects of various environmental education programs to develop components of environmental literacy against a national baseline, the study addresses NEEAC's recommendation, NOAA's goal, and NAAEE's Strategic Plan.

The research team recognizes that environmental education programming is not the only variable likely to impact student performance on the *MSELS*. Numerous other variables may interact to produce the scores observed on the *MSELS* (e.g., student:teacher ratio, socio-economic status of students and teachers, teacher preparation and professional development, and so on). Because of this, the team has conducted a preliminary analysis of these variables to provide environmental education with some insights into the relative importance and magnitude of these additional variables.

There are a large and growing number of assessment, evaluation, and research studies within the field of environmental education. Some of these are published and available in the literature (Iozzi, 1981; Marcinkowski & Mrazek, 1996), while many others remain part of the unpublished "fugitive literature" as internal program reports or as reports to funding bodies.

Given the variability of this research, there are several problems apparent within the assessment, evaluation, and research literature. These would include:

- First, such studies tend to rely on the program's curriculum framework and/or the program's own goals and objectives in an attempt to ensure content validity. While many of these programs appear to address many of the same general environmental literacy components (Simmons, 1995), studies of these programs do not consistently assess learners over that set of environmental literacy components (Volk & McBeth, 1997). Consequently, this variety of assessment frameworks and tools make it difficult to compare and integrate study results across programs.
- Second, due to the program-specific nature of most of these studies and the assessment instruments used within them, most measurement tools are developed for use in one or a small number of program-specific studies. Beyond efforts to ensure these assessment instruments are content valid for the program in which they are to be used, there are often questions about the validity and reliability of those instruments (Iozzi, 1981; Leeming et al., 1993; Marcinkowski & Mrazek, 1996; Volk & McBeth, 1997).
- Third, given this tendency toward program-specific assessment frameworks and instruments, it is not surprising that there have been very few, if any, comparative studies of environmental education programs to date. Further, as pointed out in Phase One of this study, there appear to be few assessment instruments that can be used to assess learners over a wider set of environmental literacy components (e.g., the *MSELI* and the parallel *Secondary School Environmental Literacy Instrument*; Wilke, 1995). As a result, there have been no studies that attempt to compare different programs over a wider set of environmental literacy components within the U.S. In its 2004 Report to Congress entitled *National EE Research Agenda*, the National Environmental Education Advisory Council included a separate recommendation for research into the relative effectiveness of instructional materials and programs in meeting the goals of environmental education. These goals are reflected in and consistent with environmental literacy frameworks in use in the U.S. (Simmons, 1995; Wilke, 1995).

Phase Two Research Purpose and Research Questions

The purpose of this Phase Two study was to explore the level of environmental literacy among students in grades six, seven, and eight within public and private schools across the U.S. that are exposed to one or more of the various environmental education strategies targeted in this study. Thus, the survey used in this study will gather information on these students, including; environmental knowledge, skills, affective characteristics (feelings), and participation, as well as their grade level, age, gender, and ethnic background. An additional purpose of this study was to assess the effectiveness of substantive environmental education, which could result in the development of an environmentally literate citizenry.

The two broad research questions that guided the design of Phase Two were:

1. What is the level of environmental literacy of sixth-, seventh-, and eighth-grade students across the U.S., who participate in exemplary environmental education programs at their schools, 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. How does the level of environmental literacy of students in these programs compare to the Phase One baseline level of environmental literacy of sixth- and eighth-grade students across the U.S.?

Delimitations of the Phase Two Study

The scope and methods of this study (Phase Two) were delimited in several noteworthy ways. These include the following:

- this study was limited to students enrolled in public and private schools in the U.S. during the 2008-09 school year;
- for practical and financial reasons, the number of schools that could be selected into the study sample was limited to 70;
- the population from which the study sample was drawn was limited to schools with sixth-, seventh-, and/or eighth-grade students;
- only schools that had designated and separate sixth-, seventh-, and eighth-grade classes were eligible to participate (i.e., schools with ungraded classes were not eligible);
- only schools that had an environmental education program for one or more of these three grade levels in place for at least two years were eligible to be selected into the study sample;
- for practical reasons, only schools for which the research team received a completed Nomination Form and a follow-up Screening Survey were eligible to be selected into the study sample;
- while environmental literacy has sometimes been defined in broader terms (e.g., Simmons, 1995; Wilke, 1995), only the environmental literacy variables identified in Research Question One were included in the study;
- the instrument used to gather student data on these variables 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 variable was limited to allow for this practical time constraint; and
- data collection was planned for late spring 2009 to allow students as much time as possible to learn and mature developmentally and, thereby, to reflect this growth in their responses on this survey.

METHODOLOGY

Research Design

This comparative assessment of environmental literacy was a type of survey research (Frankel & Wallen, 2000). In this case, the purpose of the study was to describe environmental literacy characteristics of middle school students enrolled in schools with exemplary environmental education programming in place, and to compare those results to survey results from a previous national random sample of sixth- and eighth-grade students.

For this study, we recruited and selected a purposeful sample of schools with environmental education programming in place at the sixth-, seventh-, and/or eighth-grade level. Over a period of several weeks, On-Site Data Collectors (researchers recruited through NAAEE's membership network) visited school sites, administered the assessment instruments, and collected demographic information related to the school sites. 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 Phase Two 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. As Florida Institute of Technology (Florida Tech) was the academic institution for investigator Dr. Tom Marcinkowski, the policies and procedures of its Institutional Review Board (IRB) were utilized to ensure this compliance. Dr. Marcinkowski followed procedures nearly identical to those followed in Phase One to prepare and submit the Human Subjects Research Proposal, with all instruments and forms attached, to the university's IRB. In April 2009 (prior to data collection), the IRB gave its approval (see Appendix A) for use of the surveys and supporting material, including the consent forms, with the schools, programs, teachers, and students, and student guardians.

Several steps were taken to invite schools to participate in this study, and at each step efforts were made to provide information necessary for informed consent and to implement human subjects protections. The participation of all schools was voluntary and there was no penalty for discontinuing participation. Once a school was selected for the study, it received a contract (purchase of service agreement) that explained project expectations (see Appendix B). The school's return of the service contract, with appropriate administrative signature and the provision of the school's FEIN, signified school consent to participate in the study. Procedures for school recruitment and selection are described in detail in the Sampling Strategy portion of the Methodology section.

Teacher consent was obtained per Florida 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 a Teacher Packet, mailed to the school prior to the data collection (see Appendix C). Teachers were surveyed about the school's environmental education program under the terms of the school's service contract, and surveyed about their own background and perceptions under the terms of this Teacher Consent Form.

Parental consent also was obtained per Florida Tech's IRB regulations. The School Kit sent to the school included school-approved Parental Consent Forms, which explained to parents the project purpose and procedures, and included a request for their consent for their child to participate (see Appendix D). This form was handed out to 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 also 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-nine of the 64 schools (77%) used passive consent procedures, and the remaining 15 (23%) used active consent procedures. Schools that used passive consent sent parents and/or guardians a form explaining the purpose of the study and its procedures. The parent/guardians were requested to sign and return the form only if they did not want the child to participate (if parents consented to the child's participation in the study, they simply did not return the form and their

non-response indicated consent). Schools that used active consent also sent parents and/or guardians a form explaining the purpose of the study and the procedures. These parent/guardians were requested to indicate either their consent or objection to the child's participation in the study, and then to sign and return the form. Children whose parents declined participation were offered alternative activities outside the classroom during the survey administration.

Instrumentation

The instrumentation in this study was very similar to that used in the prior study. This similarity in instrumentation permitted us to compare the results from the two samples (i.e., the purposeful sample of schools with environmental education programming and the national random sample used in our baseline study). We used four separate survey forms to collect data, each with a different purpose. The first three instruments, School Information Form, Program Information Form, and Teacher Information Form, were in paper and pencil format, and all names of schools, programs, and teachers entered into the three forms were kept strictly confidential. The student instrument (Middle School Environmental Literacy Survey) was in the form of a print booklet, with student responses entered into a scantron form. No student names were solicited, so these responses were anonymous.

School Information Form

The School Information Form was developed by McBeth et al. (2008) for use in Phase One of the National Environmental Literacy Assessment Project (the national baseline study of middle grades students). No modifications to this instrument appeared necessary for this study, and we used this survey in its entirety. We asked administrative personnel at each school to complete the survey, which provided us with school and district identification and contact information, as well as information on school characteristics and student demographics (see Appendix E). 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

Program information was sought to enable the research team to characterize the types and prevalence of environmental education programs being used in schools. We asked teachers or directors familiar with grade-level environmental education program(s) in the school to complete this instrument, the purpose of which was to gather information on the curricular and instructional program practices and the types of environmental education programs in place in the school (see Appendix E). In order to more accurately collect information about the environmental education programs, and about curricular and instructional program practices in use in each classroom, we expanded several items used in the original 2008 instrument.

Teacher Information Form

Teacher Information Form was used to gather teacher demographics, as well as to solicit educator views on the environment and environmental education (see Appendix E). The Teacher Information Form used in the 2008 study was also used in its entirety for this research study, with no modifications.

The Middle School Environmental Literacy Survey

The student survey used in this study was a slightly modified version of the Middle School Environmental Literacy Survey (*MSELS*, 2006), the instrument used in Phase One of the National Environmental Literacy Assessment project (see Appendix F). This section will briefly describe the instrument, and its validity and reliability claims. We will also explain the instrument modifications introduced for this study. For a more extensive description of the development and testing of the *MSELS*, the reader is referred to the final report for NELA Phase One (available at http://www.oesd.noaa.gov/NAEE_Report/).

In this phase (Phase Two) of the National Environmental Literacy Assessment project, as in the previous phase, the research team felt that the following instrumentation parameters were important:

- the instrument should reflect environmental literacy as it is conceptualized in the United States;
- it 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 the middle grades, and be free of biases;
- the format of the instrument should lend itself to administration with a large sample, and should permit machine-scoring; and
- the length of the instrument should 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) found that research instruments related to environmental literacy typically addressed only knowledge and affective components and few had established validity or reliability. They identified two literacy instruments that addressed three or more components of environmental literacy, reported established validity and reliability, and that were appropriate for a middle level audience. One of those instruments was the *Middle School Environmental Literacy Instrument (MSELI)*, developed by Bluhm, Hungerford, McBeth, and Volk (1995) for students in grades six to eight, with knowledge, affect, cognitive skills, and behavior subtests. The other was the *Children's Environmental Attitude and Knowledge Scale (CHEAKS)* developed by Leeming, Dwyer, and Bracken (1995) for students in grades 1 -7, with knowledge, attitude, and behavior scales. The researchers used the *MSELI* as the basic instrument, and incorporated portions of the *CHEAKS* (and/or other scales) as appropriate. Of critical concern throughout the modification process 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, the *Middle School Environmental Literacy Survey (MSELS)* includes material from the *MSELI*, along with items, tests, and/or sub-tests drawn from Cheak (2000), Leeming, Dwyer and Bracken (1995), Meyers (2002), Peterson (1982, 2005), Quale (1993), and Tanner (1980). The eight subtests of the *MSELS* are consistent with four major domains of environmental literacy: knowledge, affect, cognitive skills and behavior. Variables that are measured by the *MSELS* include ecological knowledge (17 items), verbal commitment (12 items), environmental sensitivity (11 items), general environmental feelings (2 items), issue

identification, issue analysis skills (9 items), and action planning skills (8 items), and actual commitment or environmental behavior (12 items),

In the *MSELS*, the items related to knowledge and skills utilize multiple-choice responses, and the items related to affect and behavior utilize a Likert-type response format. An additional section of the *MSELS* collects demographic information about survey respondents (4 items). Table 5 provides an overview of the *Middle School Environmental Literacy Survey* and tracks the general environmental literacy components through to the items and parts of the instrument that operationalize these into measures. It includes the environmental literacy components, specific conceptual variables, parts of the *MSELS*, number of items in each part of the instrument, and the possible points for each part of the instrument.

The initial validity assessment of the *MSELS* was based on a comparison of elements of the instrument and the body of EE research literature, and construct validity was established using an expert panel. The panel verified that the instrument reflected a reasonable definition of environmental literacy, was non-biased and was appropriate for a middle school audience. A field test of the instrument indicated that it could be administered within a 50-minute time frame and provided further measures of construct validity using contrasted groups comparison for the scales that focused on knowledge and skills.

Construct validity was established for the non-cognitive scales (affective and self-reported measures) through factor analyses of data from the sixth- and eighth-grade samples in the Phase One national baseline study. The results of the factor analyses for these scales of the *MSLES* revealed that the one-factor model for each scale was the best fit, confirming that each scale was one-dimensional. Reliability estimates using Cronbach's Alpha Coefficient were obtained from the field test of the *MSELS* and Alpha coefficients ranged from .389 to .869 for the different parts of the instrument. Additional reliability analyses using the 6^{th} and 8^{th} grade data from the Phase One national baseline study yielded Alpha coefficients ranging from .717 to .847.

Table 5

Overview of the Middle School Environmental Literacy Survey

Components of Environmental Literacy	Specific Conceptual Variables	Parts of the *MSELS**	Item Number	*N* Items	Poss. Pts.
Ecological Knowledge	Ecological Knowledge	Part II: Ecological Foundations	5 - 21	17	17
Environmental Affect	Verbal Commitment (Intention to Act)	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
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	8	
Behavior	Actual Commitment (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 measure environmental literacy variables; Part I was included on the *MSELS* to collect demographic information about the students.

A readability test applied to the final instrument, the Flesch Reading Ease test, yielded a score of 66.4, indicating a standard reading ease. The Flesch-Kincaid Grade Level Index correlated the reading ease to grades six and seven. These indexes are based on the average number of syllables per 100 words and the average number of words per sentence.

Several modifications were introduced to the *MSELS* for its use in Phase Two of the environmental literacy project. Since funding was sought for this project from NOAA, it appeared appropriate to introduce elements aligned to the oceanic/marine/coastal aspects of this agency's mission. Thirteen items were altered slightly to include terms related to coastal or

wetlands aspects. In all cases, the main idea, skill, or concept related to the item remained the same. Several examples of these alterations are provided below.

Example 1. In an item that focused on predator-prey relationships, a foil response was changed from "A caterpillar eats a leaf." to "A fish eats an aquatic plant."

Example 2. An item stem that referred to habitat alteration was changed from a grasslands setting to that of a mangrove forest.

Example 3. A recreational item that specified walking and hiking was expanded to include canoeing and kayaking.

Sampling Strategy

Study Design

The study called for a sample consisting of sixth-, seventh-, and eighth-grade students in the United States who participated in school-based environmental education programs during the 2008 – 2009 school year. This purposeful sample would permit us to address the first research question, which posed a determination of environmental literacy levels of U.S. middle school students who participated in established environmental education programs at their schools. Similarly, this purposeful sample would permit us to address the second research question, which sought a comparison between environmental literacy levels of these students with national baseline literacy levels identified by a prior study (McBeth et al, 2008). To provide an incentive for participation, $500 was offered to each school for the successful completion and return of the four surveys.

In order to shape our search for schools to include in the study, we devised a three-step process. In the first step of this process, we identified schools with exemplary environmental education programs through a solicitation of nominations. Subsequently, those schools were invited to complete the nomination process by responding to a screening survey about the school and about the environmental education program(s) in place. Information from that survey was then used to select the schools into the sample. The entire process is described below.

Initially, we identified several categories of schools that might have exemplary environmental education programs in place. Thus, we envisioned that data collection sites might include: (1) schools which were part of networks (e.g., EIC schools, EarthForce/Green Schools, Blue Ribbon School, etc.); (2) schools that implemented programs or approaches (e.g. WET, WILD, PLT, IEEIA, etc.); (3) environmentally focused Charter and Magnet Schools; and (4) Independent Schools, or schools that were not formally affiliated with the other categories. In order to ensure that these were schools with established environmental education programs, we stipulated that a particular EE program or approach had been in place at the middle grade level (grades 6, 7, and/or 8) for two or more years, and in a minimum of two classes.

Recruitment of Schools

We developed a nomination flyer that explained the purpose and parameters of the study, and directed the nominator to identify as many as three schools that might be eligible for the study, to provide information on a designated contact at the school (name, address, telephone, and email), and to provide the nominator's personal contact information as well (see Appendix G). Our campaign to solicit nominations of schools for consideration was initiated at the annual conference of the North American Association of Environmental Education (October 14 – 20, 2008) and targeted the professional members of the association and, subsequently, the state affiliations of that organization. These flyers were included in the NAAEE conference packets and were distributed personally to educational program and network leaders and agency personnel associated with environmental education efforts. We also visited with each booth in the conference exhibit hall and solicited nominations. The impending research was announced at several sessions of the conference, attention was called to the flyers in the conference packets, and members of the research team met with interested individuals.

Following the conference our recruitment efforts continued, as members of the research team initiated personal contact, in the way of telephone calls and emails, with additional educational program and network leaders, and agency personnel who had not been in attendance at the conference, and followed up on other contacts made at the conference. The nomination flyer (in PDF format) was provided to these individuals for distribution and inclusion in their newsletters. In efforts to include charter and magnet schools with environmental education programming,

members of the research team sought contacts with these schools identified through an Internet search for environmental magnet schools and green charter schools, and through the Green Charter School Networks. Individual schools identified in this manner were contacted and invited to self-nominate for the study. School nominations were solicited and received during the period from October 30, 2008 to March 17, 2009, and resulted in a recruitment pool of 110 schools. A preliminary review of these nominations resulted in the elimination of four nominees because of inappropriate grade levels and overrepresentativeness of a particular program. From this point, the Assessment Coordinator managed school recruitment/selection and data collection. For a full account of these processes see the Assessment Coordinator Report in Appendix H.

The Assessment Coordinator sent the designated contact person at each of the remaining 106 schools an email with a FAQs sheet attachment, and an attachment that described the study and invited the school to complete the nomination process by responding to and returning a Screening Survey (see Appendix G). The designated contacts usually were a classroom teacher and/or administrator. The Screening Survey was contained within the body of the email and invitees were directed to return the completed survey by an identified date (usually within 7 – 10 days). The return of the Screening Survey was a necessary step in completion of the nomination process. When surveys were not returned by the requested date, we made email and telephone contact to encourage survey response.

As surveys were returned by the nominated schools, they were briefly reviewed to ensure that all pertinent information was provided. Again, if information was incomplete or unclear, we communicated with the contact by email and/or telephone to encourage full completion of the survey and the nomination process. The process of sending out and receiving Screening Surveys occurred between January 15, 2009 and April 15, 2009.

Sixteen schools declined the invitation to complete the survey, indicating that they either did not meet the selection criteria or that they were unable to participate due to scheduling or other constraints. An additional 12 schools were eliminated from the recruitment pool because of non-response to the invitation and Screening Survey. Three schools were also eliminated because they returned incomplete surveys and failed to respond to repeated requests for complete and/or

clarifying information. This resulted in a recruitment pool of 75 school participants. Table 6 summarizes the development of the sample for the study.

School Selection and Criteria

Completed screening surveys were shared with the entire research team and used to determine if the nominated school met the project criteria for selection and participation. Criteria for participation included the following: 1) The school must have an environmental education program at the sixth-, seventh-, and/or eighth-grade level; 2) This program must be used with a minimum of two classes; and 3) The program must have been in place for a minimum of two years (including the current school year). During this selection process, five schools were eliminated from the recruitment pool because they did not meet the prescribed criteria for participation. The 70 schools that met the criteria and completed the nomination process were selected into the sample.

Table 6
Development of Sample for Study

Event	*n*
Nominations received	110
Preliminary elimination	- 4
Nomination pool (Invited to complete nomination process)	106
Declined invitation to participate in study	- 16
Did not respond to invitation to participate in study	- 12
Returned survey, but did not respond to requests for clarification of missing/ambiguous information	- 3
Recruitment pool (completed nomination process)	75
Eliminated because they did not meet participation criteria	- 5
Selected Sample	70
Withdrew due to scheduling constraints	- 5
Eliminated due to anomalies in data collection	- 1
Study Sample	64

Contacting and Contracting with School Administrators

The Assessment Coordinator sent each of these schools a second email confirming their acceptance. Attached to the email was the Letter of Selection and NAAEE Service Contract, individualized for each school. Schools were requested to return the signed contract immediately in order for a data collector to be assigned to their school (see Appendix B). At this point, an additional five schools removed themselves from participation because of time constraints related to completing an internal (district) research review process or to other school scheduling concerns.

After we received a signed contract from each of the 65 schools that now comprised our sample, the school was asked to verify its expected numbers of students, classes, and teachers involved in the data collection and to confirm the type of parental consent forms needed — active or passive (see Appendix B). This was done to increase accuracy and reduce errors prior to preparing and mailing the School and Data Collector Kits.

Data Collectors

Recruitment, Selection and Contracting

In order to conduct the study at 65 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 expenses related to the project.

A database was developed that included lists of NELA Phase One data collector applicants, all NAAEE members, and membership lists of the NAAEE Research Commission and was used in the recruitment of data collectors. To this database was added the list of schools selected for the study. The combined database was sorted by zip code, and persons living within a reasonable distance from the selected schools were emailed a message briefly describing the study and inviting them to apply to participate in the study as data collectors (see Appendix I). In order to maintain confidentiality, the schools were not identified in the initial request to potential data collectors. In addition, to further reduce external threats, no one affiliated with a participating school was selected as a research assistant. Final selection considered an applicant's level of education, professional EE affiliation and membership in NAAEE. In total, 31 individuals were

selected to collect data from the 65 participating schools. Details on data collection and related matters can be found in Appendix J.

Orientation and Training

Data collectors were oriented to the overall study and prepared for data collection via a project website hosted by NAAEE. The password protected website outlined all aspects of data collection procedures, including the project guidelines, timeline, and on-site administration of the student assessment. Several of the first data collectors to undergo the online training process experienced difficulty, but clarifications accomplished via exchanges of emails and phone calls between the Assessment Coordinator and the trainees, resolved those problems.

Correspondence and Arrangements

Upon successful completion of the data collection training process, each certified data collector was emailed a Purchase of Service Agreement by the Assessment Coordinator. In addition, the Assessment Coordinator emailed to all data collectors (DCs) information for their selected school(s). The DCs then proceeded to contact their school(s) via phone or email to arrange an agreed upon assessment date. In all cases, the data collector went to the school, tried to meet with the building principal prior to the survey to review procedures, establish a testing schedule, and check the site to ensure suitability for testing. Once the data collection was scheduled, the DC notified the Assessment Coordinator of the arrangements. In several cases, schools had difficulty in finding available time in their busy spring schedules for the assessment. All schools were eventually accommodated and the last data collection was scheduled for June 12, 2009.

Data Collection Methods

Distribution of Data Collection Materials

School Kits were prepared according to information supplied by the individual school and mailed to arrive prior to the scheduled student assessment date. School Kits included a Letter to the School Administrators, Principal Guidelines and Procedures, and Materials Verification Sheet (See Appendix B). These kits also included a number of documents mentioned earlier: Teacher Consent Forms, and Letter to Teachers (Appendix C), Active and/or Passive Parental Consent Forms (Appendix D), and School, Program, and Teacher Information Forms (Appendix

E). Care was taken to ensure that parental consent forms were available to schools at least one week prior to their scheduled assessment date. Several schools opted to print their own copies for distribution, prior to receiving their School Kit, in order to accommodate their schedules. Several schools, with large multi-lingual populations, requested parental consent forms in Spanish and were sent appropriate translations.

The Assessment Coordinator assembled each Data Collector's Kit to reflect the total number of schools and students they would be assessing for the entire project. Kits included: Phase Two Procedures, Guidelines and Timeline, Data Collector's Script, Teacher Introduction, *MSELS* booklets, student Scantron (response) forms, pencils, a materials checklist and a return FedEx mailing label. All Data Collector Kits were mailed and arrived prior to the first scheduled assessment date for that particular DC.

On-Site Data Collection and Verification

The surveys were administered between April 27, 2009 and June 12, 2009. The School Information Form (SIF) was generally completed by school administrators or their designees prior to or on the student assessment day. The Program Information Form (PIF) and Teacher Information Form (TIF) were also generally completed prior to student assessment by the teachers directly involved in the environmental education program instruction. As part of the School Packet, administrators were sent a Materials Verification Form. The intent of this document was to ensure that each school received the necessary materials for completion of the contract deliverables. In addition, the data collector was instructed to use this form to ensure that all forms were completed and collected on the actual student assessment day.

The *MSELS* was administered to students during their regularly scheduled classes. Many of the schools opted to survey multiple classes in a large group setting such as the school cafeteria or library. Data collectors met with the participating classroom teachers, collected all active consent forms prior to testing, and confirmed that alternative activities had been arranged for uninvolved students.

Several steps for data collectors and teachers were outlined in the guidelines to reduce variability in the testing procedures. Teachers utilized a prepared script for introduction of the data collector. Additionally, teachers were required to remain in the room to help maintain order and student comfort during the assessment. Upon beginning a survey session with students and teachers, the DC also read (aloud from a prepared script) the instructions for administering the assessment. After distribution of the testing materials, students were given further instructions concerning the completion of identifying information on their response sheets (e.g. teacher name, school name, grade level). As students completed their surveys, the data collector was instructed to collect the testing materials and check each response sheet for the appropriate information.

The Data Collectors reported that, in general, the administration of the surveys proceeded smoothly. The recommended time for administration of the *MSELS* was 50 minutes and most data collectors arranged for a 60-minute time slot. This allowed for the additional time necessary to settle the students, prep them with instructions, and distribute materials.

Two schools experienced difficulty with regard to the parental consent protocols, which resulted in a lower than desirable participation rate. Both schools distributed active parent consent forms, even though their district policies specified the passive consent protocol. For the first school, all other data collection procedures were followed and it was retained in the study sample. In the second situation, in an effort to address the low participation rate, school personnel elected to require all students to complete the survey, not just those with parental consent. Because the scantron response sheets precluded self-identification, there was no way to distinguish between valid and invalid student surveys. This resulted in the elimination of that school from the study and the destruction of its study-related materials.

Submission of Data

The data collectors were provided a checklist itemizing which documents to collect and return to the Assessment Coordinator. These included the *MSELS* booklets, all student response sheets (used and unused), School, Program, and Teacher Information Forms. In addition, they had been provided a prepaid FedEx mailing label which allowed them to return the testing materials in the same boxes they had received their original testing kit. The Assessment Coordinator, upon

receipt of the materials, checked each school data packet for completeness. Only two of the total 65 data packets were returned incomplete. One was missing the school, program, and teacher information forms and the other was returned without the testing booklets. The Assessment Coordinator acquired the missing forms directly from those schools involved and also verified that the missing booklets had been shredded by the data collector. Complete data sets were received from 65 schools and then mailed to Dr. Tom Marcinkowski in six batches between June 1, 2009 and July 21, 2009 for data entry and analysis. At this point, the irregularity related to the misuse of active consent forms and subsequent invalid administration of the student survey at one of the schools came to light. Because this situation resulted in an invalid data set from that school, it was removed from the sample, as indicated above.

Data Entry, Formatting, and Editing Methods

This description of methods was adapted from the report submitted by Dr. Tom Marcinkowski and Ms. Jennifer Engelhardt in August 2010 (see Appendix K).

Organization and Provision of Data Files

The Data Collectors were asked to collect and return all documents to Ms. Karen Cifranick, the Assessment Coordinator, who checked each set for completeness. If documents were missing, the Assessment Coordinator contacted the Data Collector to develop a plan for obtaining the missing information. This process was completed by September 2009. This resulted in 64 valid sets of student surveys and 64 complete sets of School, Program, and Teacher Information Forms. All materials were sent to Dr. Tom Marcinkowski at Florida Tech.

Reading Scantron Responses Into Text Files

To initiate this process, Dr. Marcinkowski oriented Ms. Jennifer Engelhardt, Research Assistant, and Dr. Elvan Sahin, Visiting Research Associate, to the tasks associated with the preparation of Scantron forms for data entry and with data entry. With assistance from technicians in Florida Tech's Technology Support Center, this group conducted practice sessions to become familiar with the creation of text files for each class, entering forms and working with forms that were not read on the first pass by the Scantron reader, partitioning data in text files, importing text files into MS Excel, formatting those MS Excel files, and labeling each data file (e.g., by school and

by grade). During these practice sessions, group members rotated roles and responsibilities until everyone understood the data entry process and that process ran smoothly. At that point, Ms. Engelhardt and Dr. Sahin worked together to enter all remaining student surveys.

Initially, Scantron forms were entered and data files were created for each participating class. However, following discussions with members of the Research Team, a decision was made to read all classes within the same school and grade level into a single data file. These procedures resulted in the creation of 175 text files and 175 corresponding Microsoft Excel files. Data folders were created for each grade level within each school (i.e., separate data folders for all 6th, all 7th, and all 8th grade data files from the same school). In turn, these grade-level folders were placed in one folder for each school.

Formatting and Editing MS Excel Files

Once all MS Excel files had been created and properly labeled, Dr. Marcinkowski, Ms. Engelhard, and Dr. Sahin began to ready these MS Excel files for scoring and analysis. In the first step, each of the 175 MS Excel files was formatted. This involved copying and pasting the data set in each file to: (a) create 11 blank columns in Columns A-K; and (b) to create two blank rows in Rows 1 and 2. Columns A-K were filled with information used to code each data set (e.g., school information, sampling categories, grade level, teacher ID, class period, and student ID). In Row 1, each column was labeled with the corresponding Item number from the MSELS, and Row 2 was labeled with the correct answer or point value, for scoring purposes.

Once item numbers (columns) and Student ID numbers (rows) had been added to each MS Excel file, Ms. Engelhardt and Dr. Sahin compared each Scantron form to each data record, matching Student ID number in the MS Excel file to the Student ID number on each Scantron form. They 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, they were able to review data records to ensure that Scantron responses had been properly read into each data file.

As they reviewed the data records, these individuals looked for two types of irregularities in the data set. The first irregularity concerned blank responses. When the reviewers encountered a blank in the data file, they checked the corresponding response on the Scantron form. If the Scantron response was also blank (i.e., the item was left unanswered by the student), the reviewers left that response blank in the data file. If the reader had erroneously assigned a blank to a completed student response on the Scantron form, the reviewers manually entered the student response into the data record.

The second irregularity was related to multiple responses to a single-response item, to which the Scantron reader assigned a "?." The reviewers checked each of these occurrences. When the corresponding response on the Scantron form contained two or more responses to a single-response item, (e.g., A and D), the reviewers converted that multiple response to a blank, to be subjected to imputation (see Treatment of Missing Responses, below). In, addition, there were instances in which students had entered one response, changed their minds about the response, erased that response, and entered a second response. If the erasure of the first entry was not complete, the reader might detect it as an additional response (to a single-response item) and assign a "?." When the reviewers found such occurrences, they disregarded the partially erased responses and manually entered the student-intended responses into the data file.

A second round of formatting was undertaken on these MS Excel files in preparation for scoring and analysis. The same answer and scoring key used to score student responses to the MSELS in the Phase One baseline study was used to score student responses in the Phase Two study. Further, new columns were inserted between each scale to create a column in which to enter scores on each part of the MSELS. Each new blank column was labeled with the corresponding scale (in Row 1), and the range of possible scores was entered (in Row 2).

Treatment of Missing Responses

The same procedures used to address missing responses in the Phase One data set were used to do so in the Phase Two data set. First, the data records with 25% or more missing responses on any part of the MSELS were identified and deemed unusable. Thus, for each part containing this percent of missing responses, all responses were deleted from the data set. Second, some student

responses reflected what is commonly referred to as a response set: (a) selecting the same lettered response for all items in a given scale (e.g., all "a" or all "e"); and (b) sequencing responses in a visible pattern such as a Christmas tree. In all instances, response patterns that had a clear visible pattern on one or more scales were deemed invalid and unusable, and were deleted for the part(s) of the MSELS to which this response set applied.

After these two steps had been completed, there were still a sizeable number of data records in which there was a smaller number of missing responses. 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). Therefore, to reduce, but not eliminate, the effects of this smaller number of missing responses on student scores and results, a form of multiple imputation referred to as hot deck imputation (HDI) was used to fill in as many of these blanks as appropriate (i.e., blanks in data records for which there was at least one data record from the same class with a 60% or greater match on that part of the MSELS).

Conversion of Alpha to Numeric Responses

All activities undertaken in the previous steps 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 accomplish these tasks. However, alpha data are not usable in quantitative analyses, but must be converted from an alpha to a numeric form. Ms. Englehardt and Dr. Sahin used the "find" and "replace" tools in MS Excel to convert alpha to numeric data for all items (i.e., A=1, B=2, C=3, D=4, E=5). Several steps were taken in the scoring of items. First, the answer key in Row 2 of each data file was used to score each item in the parts of the MSELS that measured knowledge and skill (e.g., "1" for correct and "0" for incorrect). Second, there were six negatively worded items that required reverse scoring. Consequently, Ms. Englehardt and Dr. Sahin completed the reverse scoring for these six items in all files (i.e., A=5, B=4, C=3, D=2, E=1).

The scoring for the items in Part VII.C, Action Planning (Items 68-75) was complicated. For these items, the scoring protocol involved the use of a weighted numerical value for each of the various action strategies. Scoring involved the use of only two selected action strategies, even when students selected more than two. So as to reduce any confusion or error in scoring this set

of items, Ms. Engelhardt and Dr. Sahin followed the scoring directions from the Phase 1 study. 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 for 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. For all other parts of the MSELS, each student's scores on all items for each part of the MSELS were summed, and those sums were entered into the column for those scores in the formatted spreadsheet.

Final Preparation of Data Sets for Data Analysis

Data files were prepared to permit analyses of data set pertinent to Research Question One (i.e., results from Phase 2) and Research Question Two (i.e., how results from Phase 2 compared to results from the Phase 1 Baseline Study). Data files also were prepared to support analyses that would yield results that paralleled those presented in the Final Report for the Phase 1 Baseline Study (e.g., Tables 1, 24, and 34). Finally, data files were prepared to permit analyses that reflected different units of analysis (e.g., analysis of data for each grade level within each school needed for School Reports and Nominator Reports, as well as for each grade level across all schools). In addition to the creation of the MS Excel data files described in this section, data files were merged and created to support these analyses included the following:

- when data files for each class had been created, it was necessary to merge data from all classes at the same grade level within the same school into a single file; and
- copying student records from sixth-grade classes in all participating schools into a single data file, and then doing the same for all seventh- and all eighth-grade classes.

Data Analysis Methods

A number of descriptive and inferential statistical analyses were outlined in the proposal for the Phase Two study. This section will describe the actual statistical and non-statistical analyses used to analyze data in this Phase Two study, and will explain briefly deviations in procedure from those that were planned.

An initial step in data analysis involved the tabulation of frequency counts for responses on closed- and open-ended questions included in the Screening Survey used to guide the selection of participating schools. This same type of tabulation was performed on responses to the School Information Forms, the Program Information Forms, and the Teacher Information Forms that were administered at all schools in the sample.

Once the data files for each grade level within and across schools had been prepared, raw scores for each student on each part of the *MSELS* were calculated using tools available in Microsoft Excel. In turn, the raw scores were used to generate descriptive statistics, including mode, median, mean, and standard deviation, for small cohorts of students (e.g., all students in a single grade in one school) and larger cohorts of students (e.g., all students in a single grade aggregated for all schools). Following the same procedures used in the Phase One study (McBeth et al., 2008, Table 6), these mean or average scores on each part of the *MSELS* were used to generate mean scores for each of the four environmental literacy components (Ecological Knowledge, Environmental Affect, Cognitive Skills, and Behavior) which, when summed, provided Environmental Literacy Composite scores.

The results of these descriptive statistical analyses were reported in three different ways. First, they were included in the individualized School Reports, which were prepared for each of the 64 participating schools. Second, these results were compiled by program and included in Nominator Reports for each of the 21 agencies, programs, and networks that had at least two schools participating in the study (see section on School and Nominator Reports below for additional information and refer to Appendix L for sample School and Nominator Reports). Third, these results are presented in this report in the section entitled Results for Research Question One, in the form of tables, graphs, and accompanying prose.

We initially planned to conduct inferential statistical comparisons between grade levels within specific programs. One way to do this would be to group schools by their nominating programs and make those comparisons between grade levels. However, as indicated by responses to the Screening Surveys and Program Information Forms, very few schools within the sample had a program that was wholly, or even mostly based on one environmental education curricular or

instructional model. Rather, most schools reported the use of a combination of instructional resources and programs, disallowing this comparison within specific programs. Further confounding the intended comparison were the number of situations in which the type of environmental program differed from one grade level to the next within a school.

Another obstacle to the attempt to make inferential comparisons across grade levels was the uneven inclusion of students from each grade level, both within and across schools. Only 19 of the 64 participating schools offered an environmental program at all three grade levels. On the other hand, 32 of these 64 schools offered an environmental program for only one of these grades, and this grade level varied from school to school (sixth grade only: $n = 17$; seventh grade only: $n = 10$; eighth grade only: $n = 5$). Due to these and other differences, statistical comparisons of scores from one grade level to another, both within each school and across schools, would not have generated results that could be interpreted clearly. As a result, these analyses were deemed inappropriate and were not undertaken.

The descriptive results from the Phase Two purposeful sample were compared to the descriptive results from the Phase One baseline, using inferential statistical analyses. The first of these inferential analyses involved the use of *z*-tests to compare results on each part of the *MSELS* for the Phase Two purposeful sample of sixth graders to results from the Phase One baseline sample of sixth graders, and for the Phase Two purposeful of eighth graders to the Phase One baseline sample of eighth graders. A *z*-test is used to compare the results for a sample (Phase Two) to the results for the population (Phase One). Due to the number of comparisons for each grade level (i.e., 8), the Bonferroni method (Cohen, 1988), was used to adjust the pre-set alpha level (.05/8 = .0625), so as to avoid indicating that there was a statistically significant difference when there may not have been one (i.e., committing a Type I error). The second of these inferential analyses involved the use of *t*-tests for independent samples to compare Environmental Literacy Component and Composite score results for the Phase Two purposeful sample to the Phase One baseline sample of sixth graders. A second set of *t*-test analyses compared the Phase Two purposeful sample to the Phase One baseline sample of eighth graders. Once again, due to the number of comparisons for each grade level (i.e., 5), the Bonferroni method (Cohen, 1988), was used to adjust the pre-set alpha level (.05/5 = .01).

Even when Bonferroni adjustments are made to the pre-set alpha level, a limitation of *z*-tests and *t*-tests is that the probability level of the resulting *z*- or *t*-score is influenced by the size of the sample. More specifically, when sample sizes are very large, small mean differences and small *z* or *t*-scores will have a very small probability level, but can be reported as statistically significant. To avoid confusing statistical significance (e.g., small *p* values) with practical or educational significance (e.g., larger mean differences), Cohen's *d* (Cohen, 1988) was used to make such comparisons without consideration of sample size.

In each Cohen's *d* test, the mean of the population (Phase One sample) was subtracted from the mean of the sample (Phase To sample), and then divided by the standard deviation of the population. The results of Cohen's *d* are commonly referred to as *effect size*. Cohen indicated that *d* = .2 was considered a small effect size, d = .5 was a medium effect size, and d = .8 was considered a large effect size. In this study, the need to use Cohen's *d* was greater in the case of *z*-tests due to the use of individual students as the unit of analysis (i.e., as opposed to the use of grade-level cohorts as the unit of analysis in *t*-tests). These effect size values are reported in the form of tables and graphs (histograms).

In addition to these descriptive and inferential statistical analyses, the research team undertook a preliminary, exploratory analysis of Phase Two school and program characteristics. The first step involved using Composite scores to partition schools into quartiles, first within each of the three grade levels, and then on a merged basis. Schools in the top quartile were those with the highest Composite scores; schools in the bottom quartile had the lowest Composite scores. Subsequently, responses from top and bottom quartile schools on selected items in the SIF, PIF, and Screening Survey were entered into Microsoft Excel spreadsheets in such a way as to permit basic descriptive comparisons between these two sets of schools. This analysis was undertaken for two reasons: (a) to determine if there appeared to be any noticeable differences between top and bottom quartile schools in terms of school and program characteristics; and (b) to begin to identify those school and program characteristics that deserve careful attention in any secondary analysis of the Phase Two data.

School and Nominator Reports

Each school was furnished with an individualized School Report (see Appendix L) following the initial data analyses. These reports included: a table that identified the sixth- and eighth-grade environmental literacy raw scores and composite scores from the baseline environmental literacy results from Phase One; a table that identified the environmental literacy raw scores and composite scores for each grade in that school participating in Phase Two; and a graph that compared composite scores from the respective grades in that school to sixth- and eighth-grade composite scores from the Phase One Baseline Study. School Reports were generated and sent to schools on March 9, 2010.

When a school was one of several nominated by an individual program, network, or approach, its results, in the form of a Nominator Report, were also sent to the head of the program, or to the individual who nominated that school (see Appendix K). These Nominator Reports also included information related to the additional curricular and instructional resources in use by each school program as described by schools in their Screening Surveys and Program Information Forms. Although the Nominator Report included information from all schools that represented a specific program, in no case were names of schools matched to their results. Instead, each school was identified with a letter (e.g., School A, School B, etc.), as a means to guarantee anonymity to the school. Reports were not sent to individuals or programs that had nominated fewer than two schools. These reports were sent on April 12, 2010.

Overview of Study Limitations

The major limitations of this study are described below.

- The Research Team planned and budgeted for the collection of data from 70 schools. Nominations were received on behalf of 110 schools, and 75 schools returned Screening Surveys. Although 70 schools were invited to participate in the study, 5 withdrew after their selection, because of scheduling conflicts. Usable data were received from 64 of the 65 remaining schools, resulting in a sample of size of 64 schools.

- Due to the manner in which the Research Team selected schools for inclusion into this study, this research sample should be viewed as purposeful, representing a specific population (i.e., schools nominated because of their respected and established environmental programming at the sixth-, seventh, and/or eighth-grade level). Due to the nature of the sample, we should not consider it representative of all schools in the U.S. with environmental programming in the sixth, seventh, and/or eighth grades.

- The manner in which schools were selected and chosen to participate involved methods other than random sampling. In addition, the number of participating schools associated with each specific program/approach was small (i.e., no more than five schools). Most importantly, information from the Screening Surveys indicated that nearly all of the participating schools used multiple curricular and instructional resources. For these reasons, it was impossible to draw a direct connection between data obtained from the *MSELS* and specific curricular and instructional resources. Therefore, the results obtained for schools nominated to represent specific environmental programs/approaches should not be generalized to those programs/approaches.

- The occurrences of invalid or missing responses increased as students progressed through the *MSELS*.

- In several instances, specific School Information Forms and the NCES Database provided conflicting demographic information. These differences were mainly in numbers related to grade-level configurations, student:teacher ratio, student ethnicity, and free-lunch percentages, and may well reflect the year-to-year fluctuations of particular schools. Where possible, data from the School Information Form was given priority, and was supplemented by that from the NCES Database. In the case of student:teacher ratios, discrepancies were so prevalent that we chose to include data from both sources.

RESULTS

Description of the Sample

This study used a nomination and selection process to obtain a purposeful sample of schools with established environmental education (EE) programming for grades six, seven, and/or eight. By design, this sample included schools with different kinds of EE programs. The surveys developed for Phase One, with minor modifications, were used in this study to gather information about the schools in the sample, the EE programs in which middle grades students participated, and selected teachers with whom they worked (see Appendix E). In addition, the same student demographic items included in the *MSELS* for the Phase One study were used in this study. Thus, the research team gathered and will report information on the schools, programs, teachers, and students included in the study sample.

Geographic Distribution of the Sample

The geographic distribution of schools in this study was of lesser importance than in Phase One. (i.e., the Phase One sample was a probability-proportional sample intended to be representative of sixth and eighth grades in the U.S., while the Phase Two sample was purposeful and not intended to be representative). Nonetheless, the general geographic distribution of schools in this study may be of interest, and is summarized here. The 64 participating schools were located in 27 states (Table 7). The states with the greatest number of participating schools were Maryland (n = 9), South Carolina (n = 6), and Florida (n = 5). Arizona, Iowa, Washington, and Wisconsin followed closely, each with four schools participating.

Table 7
Phase Two Distribution of Schools from Which Data Were Collected and Analyzed, by State (n = 64)

AR – 1	HI – 1	MA – 1	NY - 1	VA - 1
AZ – 4	IA – 4	MD – 9	OR - 1	VT - 1
CA – 2	IL – 2	ME – 2	PA - 1	WA - 4
CO – 3	IN – 1	MO –1	SC - 6	WI - 4
FL – 5	KY – 2	NJ – 2	TN - 2	WV - 1
GA – 1	LA – 1			

Kinds of Environmental Education Programs in the Sample

As described in Methodology, it was important that the purposeful sample include the variety of EE programming apparent in the middle grades. At the most general level (Categories) this included the selection of schools that made primary use of available EE curricular and instructional materials (Programs), made primary use of instructional approaches not tied to specific print curricula (Approaches), were based primarily on an affiliation with an environmental or EE network (Network), or represented a magnet school program or charter school designation (Magnet/Charter). The number of participating schools in each of these categories, as well as those that did not fall into any of these categories (Independents), is summarized in Table 8. This table also identifies the number of participating schools that reflect sub-categories (Program Types), and the specific programs apparent in these schools.

The greatest number of participating schools fell in the Program category (n = 28), in part due to the large number of federal agency, national, and regional programs included there. The next largest two categories included Approaches and Networks, with ten schools in each of those categories. The Independent category included nine schools, and the Magnet/Charter category included seven. At the level of Program Type or Program, the greatest number of participating schools either made use of "Environment as an Integrating Concept" (EIC), an approach developed and advanced by Lieberman (Lieberman & Hoody, 1998), or were Green Charter Schools *(*n = 5 each). The next greatest number of participating schools included those that used the U.S. Forest Service *Natural Inquirer* program, used *Project WET*, were members of the Maryland Association of Environmental and Outdoor Education (MAEOE) *Green School* program, or were affiliated with Maryland's *North Bay* program (n = 4 each).

Schools

Sixth-, seventh-, and and/or eighth-grade classes from 64 schools participated in this study. Information about these schools was obtained from the School Information Form completed and submitted by each school's administrator or representative, as well as from the U.S. Department of Education's National Center for Educational Statistics (NCES) Database available at http://nces.ed.ov/globallocator. As Table 9 reports, 41 of the 64 participating schools (64%) were regular public schools. An additional 16 participating schools were a more specific type of

Table 8
Number of Schools in the Phase Two Sample, by Sampling Category, Program Type, and Program

Category	Program Type	Program	*n*
1. Programs (*n* = 28)	Federal Agency Programs	USFS Natural Inquirer	4
		USFS Residential Camp	3
		NOAA BWET	1
	National Programs	WET	4
		PLT	2
		PLT/WILD	2
		IEEIA	2
		WILD	1
	Regional Programs	NorthBay	4
		Eii	3
		WI KEEP	2
2. Approaches (*n* = 10)		EIC	5
		Place-Based	2
		EKU EE Endorsement	2
		Inquiring with GIS	1
3. Networks (*n* = 10)		MAEOE Green Schools	4
		Earth Day	2
		Earth Force	2
		Earth Partnership	2
4. Magnet/Charter (*n* = 7)	Enviromental Magnet Schools		2
	Green Charter Schools		5
5. Independent (*n* = 9)			9

public school (i.e., magnet, charter, or laboratory school), bringing the total number of public schools to 57 (89%). It is noteworthy that while the research team selected two magnet schools and five charter schools to participate under the Magnet/Charter Sampling Category (Table 8), a total of six magnet schools and nine charter schools participated in this study (i.e., schools selected to participate from other Sampling Categories also happened to be magnet and charter schools). It also is noteworthy that the number and percent of private schools in this sample (*n* = 7, 11%) is noticeably smaller than in the Phase One sample (*n* = 16, 33%).

Table 9
Selected Educational Characteristics of Schools in the Study Sample (N = 64)

Type of School	***n***
Public	
Regular	41
Magnet	6
Charter	9
University Lab School	1
Private, Independent	5
Private, Religious	2

NCES Category	***n***
City: Large	7
City: Mid-Size	1
City: Small	3
Suburb: Large	11
Suburb: Midsize	7
Suburb: Small	1
Town: Fringe	3
Town: Distant	11
Town: Remote	1
Rural: Fringe	10
Rural: Distant	7
Rural: Remote	2

Student:Teacher Ratio*

	SIF(*n*)	NCES (*n*)
7:1	2	2
8:1	0	1
10:1	2	3
11:1	3	2
12:1	2	7
13:1	5	8
14:1	3	5
15:1	9	11
16:1	4	8
17:1	5	3
18:1	3	4
19:1	5	4
20:1	3	1
21:1	0	1
22:1	2	1
23:1	3	0
24:1	2	0
25:1	4	0
26:1	2	0

Grade-level Configuration	***n***
PreK-6	3
PreK-12	2
K-6	1
K-8	8
2-8	1
3-6	1
5-8	5
6-7	2
6-8	35
6-12	1
7-8	4
7-12	1

Enrollment	***n***
Under 100	4
100-199	6
200-299	8
300-399	8
400-499	3
500-599	10
600-699	6
700-799	5
800-899	4
900-999	2
1000-1099	3
1100-1199	2
1200-1299	1
1300-1399	2

* Note: *Student:Teacher Ratio* data reported on School Information Forms (SIF) for 2008-2009 often differed from data reported in the U.S. Department of Education's NCES Database for 2007-2008 or 2008-09, so both ratios are reported here. The number of schools under the SIF column ($n = 59$) is smaller than the sample size ($N = 64$) due to incomplete responses on the SIF. The number of schools under the NCES column ($n = 61$) is small than the sample size ($N = 64$) due to missing data in the NCES Database.

With respect to the grade-level configuration of participating schools, more than half contained only grades six through eight ($n = 35$, 55%), a pattern commonly found in middle schools. This is only slightly larger than in the Phase One sample (46%). The grade-level configuration

associated with the next greatest number of participating schools was kindergarten through grade eight (n = 8, 12.5%). Also reported were the configurations of grades five through eight (n = 5, 8%) and grades seven and eight — commonly associated with junior high schools (n = 4, 6%). The remaining schools (n = 12, 18.75%) reflected a variety of grade-level arrangements.

Total student enrollment in a school can be influenced by location (NCES Category), and by the range of grade levels it serves (Grades). The total enrollment of schools is one indication of the relative number of sixth-, seventh-, and eighth-grade classes and students that might have been participating in a school's environmental education program, and might have been included in this study. Schools in the sample varied substantially on total enrollment; the smallest total enrollment figure was less than 100 (n = 4) and the largest was greater than 1300 (n = 2) The greatest number of schools had a total enrollment of between 500-599 students (n = 10). Slightly more than two-thirds of participating schools reported an enrollment of between 200-900 (n = 44, 69%).

One of the general indicators used commonly to describe schools and the nature of instruction in schools 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 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. As reported in Table 9, there was a wider range of student:teacher ratios reported in the School Information Form (SIF) than was found for these same schools in the NCES Database. In the SIF, the student:teacher ratios for schools in this sample ranged from a low of 7:1 to a high of 26:1. It is noteworthy that the ratios in the NCES Database did not reflect the larger ratios reported in the SIF (i.e., in the NCES Database only two schools had a ratio greater than 20:1, while in the SIF, 13 schools reported ratios greater than this). Nonetheless, on the SIF, a total of 43 schools reported ratios smaller than 20:1 (67%), which was comparable to the number of schools with a ratio smaller than this in the Phase One baseline study (i.e., 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 10, over half of these schools

(37 out of 64, or 58%) had a student population in which 71% or more of the students were of White, Non-Hispanic ethnicity. By contrast, only two schools had a student population consisting of 71% or more of Hispanic ethnicity and only two had a student population with 71% or more of Black, Non-Hispanic ethnicity. Only one school had a student population with more than 71% of Asian students. This table also clearly indicates that the two ethnic groups that were least represented in this 64 school sample were students of Asian/Pacific Islander descent and American Indian/Alaskan Native descent. Only thirteen schools had a student population in which more than 5% of students were of Asian/Pacific Islander descent, and only three schools had a student population in which more than 5% of students were of American Indian/Alaskan Native descent. These results indicate that the Phase Two sample of schools was only slightly more diverse than was the Phase One sample of schools.

Data also were collected on the Social Characteristics of the schools that participated in this study (Table 10). At least 86% of these schools had students involved in the free-lunch program, and at least 80% had students involved in the reduced-lunch program. Only seven schools (11%) reported a migrant population; in all cases they represented 5% or less of the student population. Thirty-four schools (53%) reported students who qualified for Limited English Proficiency (LEP) or English as a Second Language (ESOL) programming. Twenty-five schools (39%) reported having students eligible for support under the federal Individuals with Disabilities Education Act (IDEA), although a greater number of schools (42 or 66%) reported having students with special needs. These results indicate that the schools in the Phase Two sample were more diverse than the schools in the Phase One sample, with the exception of the percent of students eligible for federal IDEA support, which was comparable (McBeth et al., 2008, Table 9, p. 42).

Teachers

Teachers of the sixth-, seventh-, and eighth-grade classes that participated in this study were asked to complete and return a Teacher Information Form (TIF). A total of 214 teachers from the 64 schools in the sample returned a completed or nearly completed a TIF. This included at least one teacher but as many as 10 teachers from each participating school. Because of the large

Table 10
Selected Ethnic and Social Characteristics of Schools Included in the Study Sample (N = 64)

Ethnic Composition of Schools

Percent	Am. Indian/ AK Native	Asian/ Pacific Isl.	Hispanic	Black Non-Hispanic	White Non-Hispanic
n	*n*	*n*	*n*	*n*	
0 or NR	15	4	3	6	1
<1%	32	16	4	3	0
1-5%	14	31	33	24	0
6-10%	1	5	9	9	2
11-20%	1	6	10	9	3
21-30%	1	1	1	4	1
31-40%	0	0	1	3	0
41-50%	0	0	1	3	9
51-60%	0	0	0	0	5
61-70%	0	0	0	1	6
71-80%	0	0	0	1	6
81-90%	0	1	2	0	14
>90%	0	0	0	1	17

Social Characteristics of Schools*

Percent	Free Lunch	Reduced Lunch	Migrant	LEP/ ESOL	Fed. IDEA	Spec. Needs
	n	*n*	*n*	*n*	*n*	*n*
0 or NR	9	13	57	30	39	22
<1%	1	0	4	9	0	2
1-5%	2	13	3	15	0	5
6-10%	10	16	0	6	6	7
11-20%	9	17	0	2	15	26
21-30%	9	4	0	1	1	0
31-40%	10	0	0	0	1	1
41-50%	5	1	0	0	0	0
51-60%	4	0	0	1	1	1
61-70%	1	0	0	0	0	0
71-80%	3	0	0	0	0	0
81-90%	1	0	0	0	1	0
>90%	0	0	0	0	0	0

* Note: When ethnic and social composition data were reported in School Information Forms (SIFs), those data were reported here. When those data were not reported, data from the U.S. Department of Education's NCES Database were used. When questions arose about data in SIFs (e.g., rounding), data from the NCES Database were consulted.

number of teachers who taught at more than one grade level, data from those forms are reported in Table 11, and are aggregated, rather than broken down by grade.

Teachers were asked to respond to three demographic items; gender, age, and ethnic background. The number of females in the teacher sample (n = 157; 73%) was substantially larger than was the number of males. Teacher age in this sample ranged from 21 to older than 60. Of the teachers who completed the item on ethnic background, a substantial majority of teachers in this sample (n = 195; 91%) indicated that they were White, Non-Hispanic.

Teachers were also posed an item pertaining to their educational background (i.e., degrees earned). Nearly all teachers indicated that their highest earned degree was either a Bachelors degree (n = 106; 50%) or Masters degree (n = 69; 32%). Of these teachers, 27 (13%) indicated that they had earned a "Masters Plus 30" degree, and 6 had earned advanced graduate degrees.

Finally, teachers were posed several questions about their teaching credentials and teaching experience. One item pertained to the teaching credentials these teachers had earned. A total of 197 teachers (92%) indicated that they had earned a teacher certification, while another eight (4%) indicate that they were working toward teacher certification, and nine (4%) indicated they had no certification. A more careful analysis of these data revealed that of the eight teachers working toward certification, five taught in regular public schools, two in magnet schools, and one in a charter school. Further, of the nine teachers who indicated they were not certified, five taught in private schools, two in charter schools, and two in regular public schools. Several items pertained to the number of years these teachers had been teaching. Among those teachers who responded to this item (n=192), 105 (55%) had taught for 10 years or less, and 87 (45%) had taught for more than 10 years. Of these 87 teachers, 39 had taught for more than 20 years, the longest of which was 40 years**.**

Teachers were posed several questions pertaining to their current teaching positions. With respect to the grade level(s) at which they were currently teaching, a substantial majority (n=193; 90%) indicated that they taught exclusively in grades six through eight (i.e., the middle school grades). With respect to subject areas, a majority of teachers reported that they taught

Table 11

Self-Reported Characteristics of Teachers with Classes in the Study Sample (N = 214)

Teacher Demographics

Gender	*n*
N/A	2
Female	157
Male	55

Age	
N/A	3
<21	0
21-30	38
31-40	66
41-50	48
51-60	49
>60	10

Ethnicity	*n*
N/A	3
Native Am./AK Native	2
Asian/Pacific Islander	1
Hispanic	1
Black, Non-Hispanic	8
White, Non-Hispanic	195
Biracial	3
Multiracial	1

Educational Background

Highest Degree	*n*
N/A	6
Bachelor	106
Masters	69
Masters+30	27
Specialist	3
Doctorate	3
Other	0

Teaching Credentials and Experience

Teacher Certification	*n*
N/A	0
Yes	197
Working Toward	8
No	9

Years	Total Years of Teaching	Years at Middle Level
	n	*n*
N/A	22	8
<1	1	0
1-5	50	65
6-10	54	65
11-15	29	33
16-20	19	15
>20	39	28

Current Teaching Position

Grades Currently Teaching	*n*
N/A	2
6-8	193
6-8 + Lower Grades	13
6-8 + Higher Grades	4
6-8 + Lower & Higher Grades	2

Current Subject Areas*	*n*
N/A	0
Science	135
Social Studies/History	56
Language Arts/English	59
Mathematics	61
Health/PE	14

Notes: (1) N/A = No Answer. (2) Because Teacher Information Forms indicated that teachers taught in multiple grade levels, these data were aggregated for reporting purposes. (3) Under *Subject Areas*, frequencies exceed the number of teachers because teachers taught in more than one subject area.

Science (*n*=135; 63%) and a sizable percent of these teachers indicated that they taught Mathematics (29%), Language Arts/ English (28%), and Social Studies/History (26%). A more careful analysis of these data indicated that 67 teachers (31%) taught in more than one subject area, with the most common combinations being Science and Mathematics (*n*=13) and Social Studies and Language Arts/English (*n*=13), followed by all four major subjects (*n*=8) and all four major subjects as well as others (*n*=8). The latter two combinations tend to be more common in self-contained classrooms, but less common in middle and junior high schools. Finally, despite the nature of this sample, only six teachers indicated that they taught courses that reflected some aspect of EE content and/or methods (e.g., Environmental Science, Informal Environmental Education, Leadership and Camping, Outdoor Skills).

With a few exceptions, the Phase Two sample of teachers resembled that of the Phase One sample of teachers. These exceptions included: a larger percent of Phase Two teachers taught in grades six through eight (90% of Phase Two teachers versus 83% of Phase One teachers); a smaller percentage of Phase Two teacher taught science (63% vs. 72%); a the greater number of Phase Two teachers had advanced graduate degrees (53% vs. 48%).

Toward the end of the TIF, members of the research team included two items pertaining to teacher perceptions of environmental education. As indicated in Table 12, a substantial majority of teachers indicated that it was either "considerably" or "extremely" important that K-12 students were exposed to EE (*n*=197; 92%) and that EE was "considerably" or "extremely" important to them personally (*n*=194; 91%). On both of these items, the percent of Phase Two teachers who responded in this manner exceeded the percent of Phase One teachers by 12%. Further, on both of these items, of those who selected "extremely," the percent of Phase Two teachers exceeded the percent of Phase One teachers by at least 16%.

In addition, the TIF included three items in which teachers were asked to rate themselves on indicators that reflect their experience and background related to the environment (i.e., each of which reflects a different EE goal and corresponds to one of the *MSELS* scales). On the item pertaining to teachers' level of environmental sensitivity, again, a substantial majority of teachers

Table 12
Perceptions of Phase One and Phase Two Teachers on Environmental Education

		Frequency of response, by phase			
		Phase One Grades 6 and 8 (*N* = 93)		Phase Two Grades 6, 7, and 8 (*N* = 214)	
Item	**Teacher Ratings**	***n***	**%**	***n***	**%**
#9a. Importance of Exposing K-12 Students to EE	N/A	5	5%	4	2%
	Not at All	0	---	0	---
	Slightly	0	---	0	---
	Moderately	14	15%	13	6%
	Considerably	27	29%	52	24%
	Extremely	47	51%	145	68%
#9a. Importance of EE to You	N/A	5	5%	4	2%
	Not at All	0	---	0	---
	Slightly	0	---	0	---
	Moderately	13	14%	16	7%
	Considerably	31	33%	61	29%
	Extremely	43	46%	133	62%
#10a. Your Level of Environmental Sensitivity	N/A	5	5%	4	2%
	Not at All	0	---	0	---
	Slightly	1	15	0	---
	Moderately	16	17%	16	7%
	Considerably	42	45%	107	50%
	Extremely	29	31%	87	41%
#10b. Your Level of Environmental Concern	N/A	5	5%	4	2%
	Not at All	0	---	0	---
	Slightly	1	1%	1	<1%
	Moderately	11	12%	16	7%
	Considerably	38	41%	85	40%
	Extremely	38	41%	108	50%
#10c. Your Level of Environmental Action	N/A	5	5%	4	2%
	Not at All	8	9%	2	1%
	Slightly	8	9%	2	1%
	Moderately	33	35%	83	39%
	Considerably	11	12%	80	37%
	Extremely	6	6%	26	12%

Notes: (1) N/A = No Answer. (2) Because Teacher Information Forms indicated that teachers taught in multiple grade levels, these data were aggregated for reporting purposes. (3) Percentages may not add up to 100% due to rounding.

rated themselves as "considerably" or "extremely" sensitive (n=194; 91%). As in the items above, the percent of teachers who did so exceeded the percent of Phase One teachers who rated themselves in this manner by 15%, with 10% of this difference attributable to ratings of "extremely." On the item pertaining to teachers' level of environmental concern, the response pattern for considerable or extreme concern was similar (n = 193; 90%), although the difference between the Phase Two and Phase One sample who rated themselves in this manner decreased to 8%. Lastly, on the item pertaining to teachers' level of active involvement in environmental protection efforts in their community/region, nearly half of the Phase Two teachers rated themselves as "considerably" or "extremely" active (n = 106; 49%). This stands in sharp contrast to the much smaller percent of Phase One teachers who rated themselves in this manner (18%). These differences favor the Phase Two sample and appear to be consistent with the purposeful nature of this sample (i.e., teachers who work in a school that was nominated for its environmental education programming).

Students

Within the 64 schools in the study sample, a total of 7,965 usable student responses were received and included in data analyses (i.e., nearly four times as large as the Phase One sample of students). Of these, 3,134 students were sixth graders, 2,693 students were seventh graders, and 2,138 students were eighth graders. In addition to the item on student grade level (Item 2), Part I of the *MSELS* included three other demographic items. A summary of responses to those three items is presented in Table 13.

Item 1 pertained to student age. A large majority of sixth graders reported their age as either 11 years or younger or 12 (89%), with a small percent reporting their age as 13 or 14 (5%). Among seventh graders, a large majority reported their age as 12 or 13 (92%), with small percentages of students younger or older than this. Finally, a sizable majority of eighth graders reported their age as 13 or 14 (78%), although the percent of missing responses from eighth graders was large (13%), and could account for this apparent decrease from sixth and seventh grades.

Item 3 pertained to student gender. In all three grades, the percent of females and males differed by 4% or less, slightly favoring females in sixth and eighth grades, and males in seventh grade.

Table 13
Self-Reported Demographic Characteristics of Sixth-, Seventh-, and Eighth-grade Students - Phase Two

Demographics	**6th Grade** *N* = 3,134		**7th Grade** *N* = 2,693		**8th grade** *N* = 2,138	
Age	***n***	**%**	***n***	**%**	***n***	**%**
11 years or younger	840	27%	11	.4%	5	.2%
12 years	1,929	62%	653	24%	9	.4%
13 years	163	5%	1,819	68%	439	20%
14 years	8	.2%	166	6%	1,234	58%
15 years or older	3	.1%	24	.9%	163	.7%
Missing Responses	191	6%	20	.7%	288	13%
Gender	***n***	**%**	***n***	**%**	***n***	**%**
Female	1,487	47%	1,308	49%	959	45%
Male	1,446	46%	1,342	50%	875	41%
Missing Responses	201	6%	43	2%	304	14%
Ethnicity	***n***	**%**	***n***	**%**	***n***	**%**
American Indian/Alaska Native	100	3%	80	3%	53	2%
Asian/Pacific Islander	165	5%	178	6%	169	8%
Hispanic	220	7%	234	9%	231	11%
Black, Non-Hispanic	330	10%	269	10%	318	15%
White, Non-Hispanic	1,982	63%	1,844	69%	1,020	48%
Multiple Responses	26	.8%	26	1%	14	.7%
Missing Responses	311	10%	62	2%	333	16%

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

Item 4 pertained to student ethnicity. About 65% of students in both the sixth- and seventh-grade samples indicated that they were White, Non-Hispanic. While the percent of eighth-grade students in this ethnic group was only 48%, again, this percent of missing responses was large (16%) and could account for this apparent variation from sixth- and seventh-grade percentages. The next largest ethnic groups represented by students in the study sample in each grade were Black, Non-Hispanic, (10% to 15%), Hispanic (7% to 11%), and Asian/Pacific Islander (5% to 8%). Between 2 - 3% of these students checked off American Indian/Native Alaskan, and 1% or less offered multiple responses. When results are aggregated across schools and considered by grade level, the Phase Two sample of students resembles the Phase One sample of students, with a few minor exceptions (e.g., a smaller percent of sixth-grade Hispanic students and a larger percentage of eighth-grade Asian/Pacific Islander students in the Phase Two sample).

Results for Research Question One: The Phase Two Sample

Research Question One states: What is the level of environmental literacy of sixth-, seventh-, eighth-grade students across the U.S. who participated in exemplary environmental education programs at their schools, on each of the following variables:

a. ecological knowledge (Part II : Ecological Foundations)?
b. verbal commitment (Part III: How You Think About the Environment)?
c. actual commitment (Part IV: What You Do About the Environment)?
d. environmental sensitivity (Part V: You and Environmental Sensitivity)?
e. general environmental feelings (Part VI: How You Feel About the Environment)?
f. environmental issue and action skills (Part VII: Issue Identification, Issue Analysis, and Action Planning)?

Descriptive Statistics for All Students

As is reflected in the report for Phase One of this national environmental literacy assessment, the simplest way to report the results for Phase Two is in the form of descriptive statistics for the entire sample of participating sixth graders (N = 3,134), seven graders (N = 2,693), and eighth graders (N = 2,138). The results of these analyses of aggregated sixth-, seventh-, and eighth-graders' scores are summarized in Table 14. Part II and Part VII.A., B., and C. of the *MSELS* were cognitive measures. Average scores on Part II, Ecological Knowledge increased from the sixth grade (11.41, or 67% of possible points) to the seventh grade (11.89, or 70%) to the eighth grade (12.18, or 72%). A similar increase in average scores across the three grades was found on two of the three cognitive skill measures, Part VII.B, Issue Analysis, and Part VII.C, Action Planning. However, this was not found on Part VII.A, Issue Identification, where sixth grades slightly outscored seventh graders. In comparison to the average knowledge scores, these average skill scores tended to be noticeably lower (for Part VII.A: 36% to 39%; for Part VII.B: 46% to 50%; and for Part VII.C: 37% to 40%).

On the first affective measure, average scores on Part III, How You Think About the Environment, decreased from the sixth grade (45.27, or 75%) to the seventh grade (43.34, or 72%) to the eighth grade (42.83, or 71%). A similar decrease in average scores across the

Table 14

Descriptive Results for Sixth-, Seventh-, and Eighth-grade Samples on Parts of the MSELS for All Students

Parts of the MSELS	*N* items	Range	Grade	Sample size		Mode*	Median	Mean	*SD*	% of Possible points
				n	missing					
II. Ecological Foundations	17 Items (5 - 21)	0 - 17	6	3058	76	14.00	12.00	11.41	3.42	67%
			7	2654	39	15.00	13.00	11.89	3.50	70%
			8	2094	44	14.00	13.00	12.18	3.65	72%
III. How You Think About the Environment	12 Items (22 - 33)	12 - 60	6	3064	70	47.00	46.00	45.27	8.67	75%
			7	2644	49	47.00	44.00	43.34	9.32	72%
			8	2051	87	42.00	43.00	42.83	9.14	71%
V. You and Environmental Sensitivity	11 Items (46 – 56)	11 - 55	6	3015	119	34.00	33.00	33.00	7.37	60%
			7	2601	92	31.00	32.00	31.88	7.32	58%
			8	1999	139	31.00	31.00	31.03	7.55	56%
VI. How You Feel About the Environment	2 Items (57 – 58)	2 - 10	6	2840	294	10.00	10.00	8.60	1.98	86%
			7	2443	250	10.00	9.00	8.41	2.02	84%
			8	1876	262	10.00	9.00	8.30	2.09	83%
VII.A. Issue Identification	3 Items (59, 60, 67)	0 - 3	6	2809	345	1.00	1.00	1.08	0.95	36%
			7	2431	262		1.00	1.07	0.98	36%
			8	1789	349	1.00	1.00	1.17	0.97	39%
VII.B. Issue Analysis	6 Items (61 – 66)	0 - 6	6	2793	341	1.00	2.00	2.75	1.97	46%
			7	2439	254	1.00	2.00	2.83	2.01	47%
			8	1816	322	1.00	3.00	2.97	2.09	50%
VII.C. Action Planning	8 Items (68 – 75)	0 - 20	6	2667	467	2.00	7.00	7.47	5.36	37%
			7	2315	378	2.00	7.00	7.49	5.33	38%
			8	1684	454	2.00	8.00	7.89	5.53	40%
IV. What You Do About the Environment	12 Items (34 - 45)	12 - 60	6	3041	93	43.00	42.00	40.85	9.13	68%
			7	2618	75	36.00	39.00	38.52	9.14	64%
			8	2024	114	36.00	38.00	38.30	9.24	64%

* Note: In cases where the statistical program was unable to identify the mode (i.e., the most frequent response) the space for mode was left blank

three grades was found on the other two affective measures, Part V, You and Environmental Sensitivity, and Part VI, How You Feel About the Environment, as well as on the measure of behavior, Part IV, What You Do About the Environment. Among these four parts of the *MSELS*, average scores tended to be highest for Part VI (86% to 83%), next highest for Part III. (75% to 71%), lower for Part IV (68% to 64%), and lowest for Part V (60% to 56%).

Descriptive Statistics, School-by-School

A second set of descriptive statistical analyses was undertaken on a school-by-school basis, and for each grade level within each school. Table 15 presents a summary of the results of these analyses (i.e., mode, median, mean scores and standard deviations, by scale, grade level, and school). These means and standard deviations are reported for each grade level within a participating school. The term *cohort* is used to refer to the entire sample of students in a single grade level within a school. Thus a school may have a sixth-grade cohort, a seventh-grade cohort, an eighth-grade cohort, or a combination of two or more grade-level cohorts (sixth and seventh, sixth and eighth, seventh and eighth, or sixth, seventh, and eighth). For the Phase Two sample, there were a total of 116 grade-level cohorts (43 sixth-grade cohorts, 40 seventh-grade cohorts, and 33 eighth-grade cohorts).

On Part II, Ecological Knowledge (**EK**), the highest average score was achieved by the seventh-grade cohort in School #38 (16.6 out of 17, or 98%), and the lowest average score was achieved by the sixth-grade cohort in School #44 (9.06, or 53%). Thus, on Part II, the difference between the highest and lowest average score was 7.54 points on a 17-point scale

Part VII consisted of three sections. On Part VII.A, Issue Identification Skills (**ID**), the highest average score was achieved by the eighth-grade cohort in School #3 (2.43, or 81%), and the lowest average score was achieved by the sixth-grade cohort in School #48 (0.50, or 17%). The difference between the highest and lowest average score was 1.93 points on a three-point scale.

On Part VII.B, Issue Analysis Skills (**IA**), the highest average score was achieved by the seventh-grade cohort in School #38 (5.40 out of 6, or 90%), and the lowest average score was achieved by the seventh-grade cohort in School #6 (1.56, or 26%). Thus, on Part VII.B, the difference between the highest and lowest average score was 3.84 points on a six-point scale.

On Part VII.C, Action Planning Skills (**AP**), the highest average score was achieved by the seventh-grade cohort in School #47 (12.50 out of 20, or 62.5%), and the lowest average score was achieved by the eighth-grade cohort in School #62 (3.85, or 19%). Thus, on Part VII.C, the difference between the highest and lowest average score was 8.65 points on a 20-point scale.

Table 15

Results for Sixth-, Seventh-, and Eighth- Grade Samples on Parts of the MSELS, by School

School ID	Grade	*n*[a]		Results, by part of the *MSELS*							
				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	7	31	Mean	12.71	44.90	35.03	33.61	8.73	1.14	3.00	9.96
			SD	2.56	8.30	9.49	6.00	2.15	0.80	1.96	5.59
	8	29	Mean	11.38	40.86	35.00	32.45	8.04	1.19	2.93	7.27
			SD	2.97	9.90	9.60	8.80	2.29	0.96	2.18	4.88
2	6	17	Mean	11.06	44.29	40.59	33.35	8.06	1.06	2.76	7.20
			SD	3.21	7.93	7.33	7.05	2.35	0.83	2.31	4.72
	7	17	Mean	11.18	42.13	38.38	35.50	8.33	1.13	2.88	8.75
			SD	3.89	8.20	7.81	4.82	2.47	1.15	2.31	4.91
	8	16	Mean	11.63	42.25	39.56	32.94	8.87	1.27	4.25	8.47
			SD	2.99	6.68	7.73	7.30	2.13	1.10	1.73	6.08
3	6	28	Mean	12.07	50.46	46.61	35.46	9.67	1.44	2.92	9.96
			SD	2.85	6.11	7.77	6.34	0.73	0.89	1.89	5.16
	7	20	Mean	11.95	44.37	38.58	27.21	8.61	1.16	3.11	8.42
			SD	3.63	7.61	7.24	6.03	1.65	1.01	2.25	5.71
	8	7	Mean	15.71	48.71	39.57	32.29	9.14	2.43	5.14	12.43
			SD	1.38	6.18	9.29	7.23	0.90	0.79	0.69	5.16
4	7	133	Mean	12.85	41.73	37.02	32.66	8.14	0.92	2.45	8.28
			SD	3.48	9.42	8.42	6.67	1.84	0.88	1.97	5.13
5	7	48	Mean	11.98	45.58	37.54	32.31	8.69	1.23	3.33	7.55
			SD	3.14	7.86	8.39	7.23	1.79	1.02	1.88	5.93
6	6	94	Mean	10.25	44.11	39.52	31.79	7.84	0.82	2.29	6.45
			SD	3.40	8.11	8.87	8.24	2.39	0.88	1.74	5.42
	7	96	Mean	9.27	38.07	34.89	29.53	7.36	0.66	1.56	5.88
			SD	3.19	10.88	9.44	7.73	2.40	0.81	1.49	5.06
	8	94	Mean	11.21	37.06	35.28	27.36	6.90	0.69	1.71	6.09
			SD	3.92	8.97	8.60	7.58	2.52	0.76	1.62	5.40
8	7	73	Mean	12.56	44.73	39.75	32.85	8.86	1.30	3.10	8.13
			SD	3.52	8.96	8.93	6.64	1.86	0.92	1.95	5.09
9	6	5	Mean	14.00	53.80	48.40	37.00	10.00	1.75	3.60	7.50
			SD	0.71	6.26	7.50	6.44	0.00	0.96	1.34	4.93
	7	6	Mean	14.20	54.83	49.67	38.33	10.00	1.80	4.00	5.33
			SD	1.79	3.54	5.72	6.02	0.00	0.84	1.41	5.77
	8	8	Mean	12.50	52.50	47.00	35.88	9.88	1.63	3.38	12.88
			SD	2.39	5.26	3.55	5.36	0.35	0.92	1.51	5.36
10	6	14	Mean	12.29	43.79	40.71	34.14	9.00	1.36	3.73	10.44
			SD	2.67	9.33	9.24	6.04	1.04	0.92	2.00	5.75
	7	14	Mean	12.50	43.43	39.79	31.43	8.85	1.00	2.86	5.64
			SD	2.79	8.98	6.46	7.11	1.52	0.91	1.99	4.58
	8	10	Mean	12.80	43.30	37.70	32.80	9.00	1.44	3.80	8.33
			SD	3.16	11.47	8.22	6.99	1.33	0.88	1.55	7.81

Note: 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).

[a]*n* represents the total number of students in that grade from that school. Actual number of responses for each scale varies due to missing and unusable data.

Table 15 (continued)

School ID	Grade	n[a]		Results, by part of the *MSELS* EK (0-17)	VC (12-60)	AC (12-60)	ES (11-55)	EF (2-10)	ID (0-3)	IA (0-6)	AP (0-20)
11	6	111	Mean	10.86	45.75	40.39	34.43	8.18	0.90	2.25	6.58
			SD	3.82	8.39	8.41	6.77	2.28	0.86	1.94	5.40
	7	62	Mean	11.03	43.44	37.47	33.77	8.84	1.10	3.08	8.05
12			*SD*	3.24	9.40	8.98	7.23	1.83	1.00	1.93	5.35
	8	48	Mean	12.21	43.69	39.52	33.58	8.85	1.15	3.38	8.25
			SD	2.87	8.48	7.94	6.47	1.82	0.85	2.13	5.32
	6	338	Mean	12.73	45.83	42.45	32.87	9.02	1.26	3.34	7.57
			SD	3.03	8.38	8.98	6.94	1.64	0.99	2.06	5.42
13	7	178	Mean	11.53	43.03	39.98	32.34	8.20	1.09	2.79	6.90
			SD	4.06	10.19	10.06	8.47	2.27	1.00	2.28	5.38
	8	85	Mean	12.00	43.10	40.09	30.71	8.83	1.23	2.91	8.19
			SD	3.52	8.63	9.08	7.90	1.52	1.01	2.11	5.14
	6	84	Mean	9.64	42.96	38.15	30.22	8.49	0.77	2.33	7.56
14			*SD*	3.12	9.33	9.25	7.36	1.96	0.90	1.74	5.82
	7	69	Mean	9.43	39.56	35.91	32.50	7.65	0.62	1.62	6.44
			SD	3.88	9.41	8.90	8.34	1.91	0.73	1.42	4.46
15	6	48	Mean	11.96	40.27	32.65	28.46	8.33	0.98	2.76	7.41
			SD	4.05	11.11	8.94	6.59	2.17	0.98	2.06	4.86
16	7	262	Mean	10.66	44.78	39.31	30.72	8.41	0.73	1.97	6.09
			SD	3.12	8.25	8.45	7.07	1.92	0.83	1.69	5.09
17	8	154	Mean	9.19	38.67	35.93	32.87	7.64	0.82	1.92	6.56
			SD	4.08	7.85	8.34	8.15	2.13	0.82	1.79	5.07
	7	26	Mean	12.12	46.15	40.23	35.04	8.75	1.00	3.00	8.96
18			*SD*	2.82	7.07	8.48	7.32	1.65	0.91	1.83	5.30
	8	24	Mean	12.67	43.83	41.00	32.63	8.75	1.35	2.50	7.91
			SD	3.14	9.72	10.21	5.67	1.94	0.88	2.23	6.28
19	8	22	Mean	13.09	44.36	38.86	35.27	9.27	1.50	4.33	10.11
			SD	3.87	6.81	9.15	7.41	1.08	1.06	2.06	4.37
20	8	65	Mean	12.95	43.06	38.16	32.75	9.13	1.14	3.05	7.78
			SD	3.49	8.35	8.80	7.61	1.63	0.93	1.93	5.38
21	7	94	Mean	11.56	41.61	36.93	30.69	7.84	1.12	2.99	7.76
			SD	3.33	9.33	8.61	6.10	2.35	1.00	2.05	5.30
22	6	79	Mean	11.71	46.21	41.86	32.71	8.94	1.24	2.80	7.20
			SD	2.82	8.11	7.53	6.29	1.59	0.99	1.88	5.06
	6	20	Mean	11.67	41.95	38.17	31.44	7.93	1.32	2.83	4.39
			SD	2.50	10.79	9.68	7.56	2.40	1.06	1.54	4.46
23	7	16	Mean	14.44	41.44	39.94	29.69	8.13	1.40	4.31	8.88
			SD	1.71	10.97	10.94	7.08	2.09	0.91	1.82	4.47
	8	18	Mean	13.28	43.61	36.33	29.78	8.41	1.22	3.06	11.89
			SD	2.56	8.13	8.19	6.55	1.46	0.88	2.18	5.99
24	6	58	Mean	13.69	49.26	45.57	32.36	9.24	1.84	4.79	10.93
			SD	1.70	5.38	6.01	5.62	1.32	0.87	1.54	5.67

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[a]*n* represents the total number of students in that grade from that school. Actual number of responses for each scale varies due to missing and unusable data.

Table 15 (continued)

School ID	Grade	n[a]		Results, by part of the *MSELS*							
				EK (0-17)	VC (12-60)	AC (12-60)	ES (11-55)	EF (2-10)	ID (0-3)	IA (0-6)	AP (0-20)
25	6	44	Mean	12.65	46.45	40.23	32.30	8.44	1.13	3.12	8.60
			SD	2.74	8.31	10.35	7.03	2.09	0.91	1.82	5.57
26	8	332	Mean	12.44	44.03	40.17	31.45	8.42	1.13	2.69	7.61
			SD	3.39	9.09	9.32	7.62	1.97	1.04	2.06	4.88
	6	58	Mean	11.21	46.45	43.09	32.46	8.77	1.33	3.57	7.27
			SD	2.46	8.20	8.87	6.45	2.00	1.04	1.85	4.82
27	7	49	Mean	13.65	46.02	41.37	31.65	8.92	1.50	3.88	7.96
			SD	2.64	6.98	8.90	7.76	1.62	0.88	2.18	5.91
	8	50	Mean	13.94	42.38	37.62	29.52	8.35	1.23	4.15	8.16
			SD	2.68	8.07	8.22	6.30	1.66	1.00	1.77	4.81
28	8	165	Mean	10.86	39.43	32.94	30.69	7.41	0.89	1.97	6.99
			SD	3.82	9.44	8.13	8.11	2.30	0.81	1.69	5.24
	6	10	Mean	13.80	41.90	35.30	32.50	8.22	0.89	2.78	7.00
			SD	3.26	6.95	9.39	6.10	2.59	0.78	2.28	3.46
29	7	10	Mean	14.40	49.11	41.89	32.78	9.33	1.60	3.80	11.33
			SD	1.78	5.13	8.45	6.69	1.66	0.97	2.30	6.08
	8	15	Mean	11.93	36.36	34.92	29.00	6.93	1.36	4.07	7.21
			SD	3.47	11.08	11.54	6.24	3.00	1.01	2.20	4.90
30	6	47	Mean	10.43	46.57	42.77	35.04	8.83	0.87	2.84	6.37
			SD	3.22	8.43	9.67	7.36	1.77	0.85	1.77	5.28
31	8	197	Mean	13.51	44.04	38.44	30.68	8.37	1.32	3.66	8.70
			SD	2.87	8.33	8.55	6.59	2.14	0.91	2.04	5.53
32	6	44	Mean	10.22	46.70	41.23	32.66	8.73	0.92	1.65	5.97
			SD	3.00	7.45	8.02	9.37	1.97	0.81	1.32	4.82
	6	20	Mean	14.30	42.45	41.30	33.50	8.85	1.75	4.30	7.89
			SD	2.34	7.02	7.79	7.90	1.79	0.91	1.89	4.59
33	7	22	Mean	14.73	41.32	39.41	30.59	8.23	1.68	4.09	10.18
			SD	1.70	11.49	10.60	6.35	2.52	0.72	1.80	4.35
	8	3	Mean	12.00	48.33	42.67	36.67	7.67	1.67	4.33	8.67
			SD	6.24	5.51	7.51	2.89	1.53	1.15	2.08	5.77
34	7	229	Mean	12.56	41.89	35.70	31.46	8.39	1.04	2.91	8.25
			SD	3.63	8.68	8.61	7.27	1.87	1.00	2.01	5.56
35	6	83	Mean	12.34	47.37	43.89	34.11	9.22	1.57	3.79	9.89
			SD	2.20	7.29	7.40	5.78	1.33	0.93	1.85	5.27
36	6	51	Mean	12.53	45.00	41.47	33.84	9.08	1.22	3.33	10.00
			SD	2.87	6.72	8.26	7.01	1.26	0.90	2.00	5.32
37	6	69	Mean	13.45	46.70	42.93	32.49	8.93	1.26	3.92	7.82
			SD	2.75	8.95	9.01	7.45	1.70	0.96	1.94	5.16
	6	229	Mean	9.68	43.00	38.74	32.07	7.79	0.95	1.84	6.47
38			*SD*	3.47	10.07	9.37	7.97	2.40	0.93	1.74	4.99
	7	5	Mean	16.60	52.60	46.40	31.00	10.00	1.20	5.40	7.33
			SD	0.89	3.21	6.19	6.60	0.00	1.30	0.89	6.43

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[a]*n* represents the total number of students in that grade from that school. Actual number of responses for each scale varies due to missing and unusable data.

Table 15 (continued)

School ID	Grade	n[a]		Results, by part of the *MSELS*							
				EK (0-17)	VC (12-60)	AC (12-60)	ES (11-55)	EF (2-10)	ID (0-3)	IA (0-6)	AP (0-20)
39	6	22	Mean	10.77	43.77	38.14	33.23	8.52	1.22	3.18	7.05
			SD	2.79	9.23	8.86	7.41	1.78	0.94	2.08	4.81
	7	26	Mean	12.00	45.15	40.04	32.58	9.04	1.27	3.54	8.12
			SD	2.99	7.07	11.54	6.84	1.72	0.92	2.00	6.06
	8	18	Mean	13.56	48.94	47.44	37.00	9.56	1.56	3.89	8.94
			SD	2.85	8.19	6.59	5.06	0.92	1.10	2.11	6.72
40	6	74	Mean	10.99	46.81	40.89	33.92	9.06	0.94	2.46	7.99
			SD	2.84	7.54	8.31	6.51	1.40	0.89	1.66	4.72
	7	80	Mean	12.91	45.49	38.54	32.68	8.51	1.08	2.71	7.62
			SD	3.05	7.47	7.90	6.97	1.94	0.92	1.84	4.79
41	6	26	Mean	10.62	44.92	39.31	34.38	8.16	0.75	2.19	7.17
			SD	3.72	8.43	10.72	9.17	2.30	0.68	1.77	4.90
42	7	145	Mean	11.68	39.17	35.68	31.81	7.87	0.88	2.33	6.54
			SD	3.80	10.30	10.12	8.81	2.38	0.90	1.83	4.80
43	6	20	Mean	12.50	46.35	42.50	33.35	9.26	1.20	2.89	9.41
			SD	2.80	12.55	13.76	7.05	1.63	1.01	1.88	5.69
	7	21	Mean	13.29	47.60	41.25	30.48	9.05	1.10	3.53	6.81
			SD	2.35	9.21	10.70	6.52	1.51	1.17	2.09	4.61
	8	23	Mean	15.00	48.83	45.87	31.65	8.95	1.32	3.26	7.80
			SD	2.61	6.45	7.33	5.97	1.36	0.78	1.96	6.44
44	6	175	Mean	9.06	42.09	38.20	33.78	7.68	0.83	1.83	5.52
			SD	3.72	8.54	9.18	7.54	2.35	0.88	1.57	4.90
45	7	127	Mean	11.78	44.49	38.90	34.40	8.63	0.95	2.63	6.83
			SD	3.62	9.29	9.65	7.16	2.07	0.92	1.82	5.44
46	6	40	Mean	13.58	46.98	44.90	36.90	8.73	1.33	3.65	10.82
			SD	2.74	7.85	8.33	6.96	2.37	1.10	2.03	6.16
	7	29	Mean	14.97	42.69	43.28	30.55	8.97	1.62	5.03	10.41
			SD	1.43	9.40	9.10	5.50	1.84	0.98	0.98	5.75
	8	33	Mean	14.15	44.70	42.48	30.58	9.12	1.64	4.36	9.00
			SD	2.79	6.92	7.59	7.00	1.45	1.08	1.78	5.93
47	7	11	Mean	13.64	47.73	45.27	37.82	9.20	1.13	2.80	12.50
			SD	1.50	5.33	6.02	7.35	1.48	1.25	1.81	6.22
	8	8	Mean	14.13	48.63	43.13	37.00	8.75	1.00	4.33	11.88
			SD	2.03	10.20	10.06	3.21	1.58	1.20	2.25	6.47
48	6	12	Mean	12.17	48.08	43.25	33.50	9.75	0.50	1.91	7.00
			SD	1.90	6.69	8.64	8.31	0.62	0.52	1.38	4.27
	7	6	Mean	14.17	43.67	42.00	32.00	9.00	1.50	3.17	8.00
			SD	2.32	6.25	7.59	10.10	1.10	0.55	2.48	3.46
	8	15	Mean	11.60	48.07	41.33	35.27	9.73	0.93	3.53	8.53
			SD	3.70	9.06	11.72	9.60	0.46	0.92	2.00	5.78

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[a]*n* represents the total number of students in that grade from that school. Actual number of responses for each scale varies due to missing and unusable data.

Table 15 (continued)

School ID	Grade	n[a]		Results, by part of the *MSELS*							
				EK (0-17)	VC (12-60)	AC (12-60)	ES (11-55)	EF (2-10)	ID (0-3)	IA (0-6)	AP (0-20)
	6	200	Mean	11.71	47.25	41.48	33.31	8.63	1.00	2.45	6.98
			SD	3.90	7.82	8.62	7.51	1.96	0.95	2.06	5.24
49	7	185	Mean	11.55	43.74	38.22	29.48	8.22	1.02	3.06	6.89
			SD	3.70	9.91	8.84	7.38	2.35	0.94	2.07	5.39
	8	195	Mean	12.78	42.91	37.08	28.06	8.17	1.10	2.78	6.87
			SD	3.52	9.75	9.63	7.38	2.33	0.97	2.04	5.52
	6	61	Mean	13.52	45.75	42.15	30.62	8.97	1.56	4.22	11.13
			SD	2.33	8.30	8.61	6.33	1.39	1.09	1.78	4.95
50	7	56	Mean	13.73	45.00	42.13	31.27	9.02	1.48	4.34	9.84
			SD	1.86	9.39	8.67	7.55	1.51	0.94	1.78	5.43
	8	33	Mean	13.09	42.91	38.81	28.88	8.39	1.81	4.38	9.00
			SD	4.07	10.50	10.35	7.37	2.14	0.98	1.59	5.39
	6	3	Mean	10.00	50.67	34.67	26.67	7.67	0.33	2.00	4.00
			SD	2.65	8.50	9.81	10.69	0.58	0.58	1.00	6.93
51	7	15	Mean	9.87	46.60	40.24	31.20	8.60	0.93	2.20	8.00
			SD	3.18	6.90	7.08	6.79	1.68	0.88	1.26	4.99
	8	33	Mean	11.18	46.48	38.39	28.21	8.52	0.75	3.16	7.81
			SD	2.63	7.14	8.80	5.93	1.46	0.88	2.20	5.88
52	6	74	Mean	11.86	45.62	39.78	32.54	9.04	1.00	2.62	6.64
			SD	2.79	8.92	9.99	5.98	1.72	0.93	1.77	5.42
	7	18	Mean	14.06	50.83	45.28	33.83	9.17	2.00	4.72	11.72
53			*SD*	1.63	5.62	7.35	5.36	1.04	0.94	1.32	5.54
	8	20	Mean	14.60	47.80	45.00	34.55	9.20	2.17	4.80	11.47
			SD	2.39	10.84	7.84	8.09	1.47	0.51	1.32	5.32
54	6	43	Mean	11.12	41.19	34.71	29.70	7.53	0.72	2.70	7.76
			SD	3.06	10.46	10.09	7.35	2.61	0.97	1.86	5.92
	6	180	Mean	10.76	45.41	41.50	34.87	8.64	1.01	2.09	6.38
55			*SD*	3.41	9.30	9.15	7.90	1.99	0.93	1.75	5.28
	7	238	Mean	11.72	43.55	39.43	32.68	8.33	1.08	2.56	7.29
			SD	3.24	8.63	8.21	6.84	2.05	0.92	1.94	5.28
56	7	83	Mean	12.61	45.06	39.83	32.01	8.65	0.78	3.60	7.80
			SD	2.70	10.39	9.53	7.14	1.76	0.83	1.96	5.02
	7	11	Mean	9.55	40.00	36.63	32.89	6.50	0.78	2.00	6.00
57			*SD*	3.98	12.92	8.67	7.06	2.51	0.83	1.73	3.59
	8	14	Mean	9.07	44.00	37.93	32.29	6.86	1.07	1.71	4.23
			SD	3.00	9.07	9.27	7.74	2.38	0.92	1.07	4.82
58	6	113	Mean	11.32	43.40	37.92	32.17	8.18	0.91	2.49	7.26
			SD	3.64	8.87	9.39	8.04	2.16	0.73	1.76	4.79

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[a]*n* represents the total number of students in that grade from that school. Actual number of responses for each scale varies due to missing and unusable data.

Table 15 (continued)

School ID	Grade	n[a]		Results, by part of the *MSELS* EK (0-17)	VC (12-60)	AC (12-60)	ES (11-55)	EF (2-10)	ID (0-3)	IA (0-6)	AP (0-20)
	6	68	Mean	11.75	50.12	44.60	34.72	9.16	1.24	3.45	8.57
			SD	2.86	6.73	8.40	6.52	1.39	1.07	2.11	4.76
59	7	79	Mean	12.12	46.31	42.83	34.04	8.63	1.26	2.99	7.15
			SD	3.43	6.67	6.91	5.90	1.88	0.96	2.19	5.29
	8	81	Mean	12.79	47.82	42.77	32.14	9.11	1.67	3.93	10.56
			SD	3.06	6.51	7.68	5.72	1.46	0.97	2.11	5.63
	6	23	Mean	14.32	48.05	42.73	32.32	9.05	1.48	4.25	7.86
60			*SD*	2.03	6.56	7.11	7.33	1.76	1.03	1.52	4.27
	7	24	Mean	12.04	45.42	40.00	32.04	8.71	1.35	3.87	7.50
			SD	3.76	10.71	11.36	6.53	2.45	1.19	1.94	4.96
	6	7	Mean	14.00	51.43	43.86	36.14	9.86	1.50	4.29	7.57
			SD	1.83	4.12	7.06	7.97	0.38	1.05	1.38	6.92
61	7	7	Mean	14.71	45.00	44.71	35.57	8.71	1.71	3.29	5.86
			SD	2.36	6.95	7.39	6.85	1.70	0.49	2.06	4.56
	8	3	Mean	11.33	43.67	36.00	36.33	10.00	1.00	2.00	10.67
			SD	4.04	2.08	8.89	1.15	0.00	1.73	2.65	9.02
	6	193	Mean	12.17	44.17	39.33	31.71	8.63	0.91	2.60	6.24
62			*SD*	3.41	7.61	7.95	7.85	1.79	0.90	1.97	4.83
	8	20	Mean	8.80	42.40	38.65	30.95	7.16	0.70	2.10	3.85
			SD	3.43	5.62	9.08	8.88	2.54	0.66	1.62	5.03
	6	65	Mean	11.09	42.73	38.95	32.28	8.61	1.03	2.82	6.75
			SD	2.97	8.46	9.09	7.23	2.13	0.94	1.98	5.60
63	7	72	Mean	11.69	41.56	36.36	30.93	8.90	1.28	3.06	6.82
			SD	3.11	9.49	9.54	6.97	1.45	1.00	1.84	5.41
	8	44	Mean	11.90	40.11	36.46	30.83	8.61	1.35	2.72	5.72
			SD	3.63	11.03	10.14	7.42	1.55	0.95	2.00	4.85
64	6	130	Mean	11.22	44.60	41.60	32.98	8.53	1.01	2.44	7.47
			SD	3.25	8.00	8.13	7.64	2.01	0.88	1.69	5.19
65	6	54	Mean	10.90	46.37	42.37	33.13	9.02	0.92	2.58	9.71
			SD	3.08	7.13	8.56	7.32	1.72	0.92	2.00	5.34

Note: 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).
[a]*n* represents the total number of students in that grade from that school. Actual number of responses for each scale varies due to missing and unusable data.

Part VI, How You Feel About the Environment (**EF**) consisted of two items, each worth five points. Four of the 116 grade-level cohorts (School #9 sixth and seventh graders, School #38 seventh graders, and School #61 eighth graders) achieved the highest average score (10.00, out of 10). The lowest average score was achieved by seventh graders in School #57 (6.50, or 65%). Thus, for Part VI, the difference between the highest and lowest average score was 3.5 points on

a 10-point scale. It is noteworthy that seventh graders in School #38 also achieved the highest average score on Part II, Ecological Knowledge (**EK**), and Part VII.B, Issue Analysis Skills (**IA**).

It is equally noteworthy that seventh graders in School #9 achieved the highest average score on the remaining parts of the *MSELS*. Their average score on Part V, You and Environmental Sensitivity (**ES**) was 38.33 on a 55-point scale (70%), on Part III, How You Think About the Environment (**VC,** or verbal commitment) was 54.83 on a 60-point scale (91%), and on Part IV, What You Do About the Environment (**AC**, or actual commitment) was 49.67 on a 60-point scale (83%). Further, this was one of the four grade-level cohorts to receive the highest score possible score on Part VI.

The lowest average score on Part V, You and Environmental Sensitivity (**ES**) was achieved by sixth graders in School #51 (26.67). Thus, for Part V, the difference between the highest and lowest average score was 11.66 points on a 55-point scale. Further, the lowest average scores on Part III, How You Think About the Environment (**VC**) was achieved by the eighth graders in School #29 (36.36). Thus, for Part III, the difference between the highest and lowest average score was 18.47 points on a 60-point scale. Finally, the lowest average scores on Part IV, What You Do About the Environment (**AC**) was achieved by the sixth graders in School #15 (32.65). Thus, for Part III, the difference between the highest and lowest average score was 17.02 points on a 60-point scale.

Component and Composite Mean Scores, School-by-School

The third statistical analysis of Phase Two data for Research Question One involved the calculation of component and composite scores on a school-by-school basis. This analysis used the same procedures as in the analysis of Phase One data (McBeth et al., 2008, pp. 82-83). The range of possible scores on two of the four component scores was 0 - 60 (Ecological Knowledge and Cognitive Skills). On the other two component scores, the range was 12 - 60 (Environmental Affect and Environmental Behavior). The scores from the four components were combined to form the composite score. The range of possible composite scores was 24 - 240. The results of the analyses for the sixth-grade cohorts are presented in Table 16, for the

Table 16

Phase Two Environmental Literacy Component and Composite Mean Scores for Sixth Grade Cohorts, by School, N = 43

School ID	Ecological Knowledge	Environmental Affect	Cognitive Skills	Behavior	Composite Score
9	49.41	48.60	31.16	48.40	177.57
24	48.31	43.82	39.15	45.57	176.85
61	49.41	46.95	31.86	43.86	172.08
46	47.92	44.55	31.84	44.90	169.21
60	50.33	43.13	31.88	42.73	168.27
50	47.71	41.15	35.59	42.15	166.60
33	50.46	40.77	33.88	41.30	166.41
35	43.55	43.69	33.58	43.89	164.71
3	42.60	46.05	29.28	46.61	164.54
37	47.47	42.46	29.27	42.93	162.13
59	41.47	45.31	28.33	44.60	159.71
10	43.37	41.81	31.93	40.71	157.82
36	44.22	42.31	29.23	41.47	157.23
13	44.92	42.25	27.09	42.45	156.71
43	44.11	42.84	27.03	42.50	156.48
25	44.64	42.04	26.53	40.23	153.44
27	39.56	42.26	28.03	43.09	152.94
22	41.32	42.34	24.79	41.86	150.31
65	38.47	42.64	24.44	42.37	147.92
49	41.32	42.98	21.81	41.48	147.59
48	42.95	44.00	16.70	43.25	146.90
29	48.70	39.74	22.20	35.30	145.94
52	41.85	42.00	22.03	39.78	145.66
40	38.78	43.24	22.45	40.89	145.36
64	39.60	41.46	22.34	41.60	145.00
30	36.81	43.71	21.63	42.77	144.92
2	39.03	41.26	23.46	40.59	144.34
62	42.95	40.70	20.97	39.33	143.95
39	38.01	41.16	25.78	38.14	143.09
55	37.97	42.79	20.08	41.50	142.34
63	39.14	40.24	23.01	38.95	141.34
11	38.32	42.55	20.07	40.39	141.33
23	41.18	39.15	22.61	38.17	141.11
58	39.95	40.33	21.62	37.92	139.82
41	37.48	42.10	19.46	39.31	138.35
32	36.07	42.45	17.60	41.23	137.35
6	36.17	40.34	19.55	39.52	135.58
15	42.21	37.11	23.14	32.65	135.11
54	39.24	37.79	21.55	34.71	133.29
14	34.02	39.35	20.46	38.15	131.98
38	34.16	39.89	18.94	38.74	131.73
44	31.97	40.18	17.15	38.20	127.50
51	35.29	41.19	12.86	34.67	124.01

seventh-grade cohorts in Table 17, and for the eighth-grade cohorts in Table 18. In all of the tables, the schools are ordered, from the highest to the lowest, by composite score.

Among the results for the 43 sixth-grade cohorts in Table 16, students in School #33 had the highest average score on the Ecological Knowledge component (50.46 out of 60), while students in School #44 had the lowest average score on this component (31.97). On the Environmental Affect component, students in School #9 had the highest average score (48.6 out of 60), and students in School #15 had the lowest average score (37.11). On the Cognitive Skill component, students in School #24 had the highest average score (39.15 out of 60), and students in School #51 had the lowest average score (12.86). Further, on the Behavior component, students in School #9 had the highest average score (48.4 out of 60), and students in School #15 had the lowest average score (32.65). Finally, among these 43 sixth-grade cohorts, students in School #9 had the highest average Composite score (177.57 out of 240), and students in School #51 had the lowest average Composite score (124.01).

Among the results for the 40 seventh-grade cohorts in Table 17, students in School #38 had the highest average score on the Ecological Knowledge component (58.58 out of 60), while students in School #6 had the lowest average score on this component (32.71). On the Environmental Affect component, students in School #9 had the highest average score (49.73 out of 60), and students in School #6 had the lowest average score (36.06). On the Cognitive Skill component, students in School #53 had the highest average score (40.78 out of 60), and students in School #6 had the lowest average score (15.47). Further, on the Behavior component, students in School #9 had the highest average score (49.67 out of 60), and students in School #6 had the lowest average score (34.89). Finally, among these 40 seventh-grade cohorts, students in School #38 had the highest average Composite score (183.52 out of 240), and students in School #6 had the lowest average Composite score (119.13).

Among the results for the 33 eighth-grade cohorts in Table 18, students in School #3 had the highest average score on the Ecological Knowledge component (55.44 out of 60), while students in School #62 had the lowest average score on this component (31.06). On the Environmental Affect component, students in School #9 had the highest average score (47.37 out of 60), and students in School #6 had the lowest average score (34.34). On the Cognitive

Table 17

Phase Two Environmental Literacy Component and Composite Mean Scores for Seventh-grade Cohorts, by School, N = 40

School ID	Ecological Knowledge	Environmental Affect	Cognitive Skills	Behavior	Composite Score
38	58.58	45.23	33.31	46.40	183.52
53	49.62	45.26	40.78	45.28	180.94
9	50.11	49.73	30.65	49.67	180.16
46	52.83	39.59	37.97	43.28	173.67
29	50.82	44.00	34.65	41.89	171.36
47	48.14	45.57	29.36	45.27	168.34
61	51.91	42.94	28.23	44.71	167.79
50	48.45	41.09	34.16	42.13	165.83
33	51.98	38.58	35.01	39.41	164.98
27	48.17	41.74	30.88	41.37	162.16
23	50.96	38.17	32.57	39.94	161.64
48	50.01	40.76	28.57	42.00	161.34
43	46.90	42.05	25.90	41.25	156.10
59	42.77	42.85	25.51	42.83	153.96
60	42.49	41.52	29.39	40.00	153.40
8	44.32	41.62	27.12	39.75	152.81
39	42.35	41.79	28.38	40.04	152.56
18	42.77	43.29	25.62	40.23	151.91
56	44.50	41.29	24.81	39.83	150.43
40	45.56	41.76	23.84	38.54	149.70
1	44.85	41.99	27.55	35.03	149.42
5	42.28	41.71	26.84	37.54	148.37
10	44.11	40.30	21.83	39.79	146.03
3	42.17	38.72	26.52	38.58	145.99
55	41.36	40.70	23.64	39.43	145.13
2	39.45	41.29	25.88	38.38	145.00
4	45.35	39.70	22.58	37.02	144.65
13	40.69	40.22	23.46	39.98	144.35
34	44.32	39.34	24.88	35.70	144.24
45	41.57	42.11	21.48	38.90	144.06
12	38.92	40.92	25.65	37.47	142.96
63	41.25	39.16	25.55	36.36	142.32
49	40.76	39.25	23.88	38.22	142.11
21	40.80	38.59	25.19	36.93	141.51
51	34.83	41.67	21.53	40.20	138.23
42	41.22	37.90	20.17	35.68	134.97
16	37.62	40.45	17.52	39.31	134.90
57	33.70	38.18	17.86	36.63	126.38
14	33.28	38.31	15.97	35.91	123.47
6	32.71	36.06	15.47	34.89	119.13

Skill component, students in School #3 had the highest average score (45.76 out of 60), and students in School #6 had the lowest average score (16.38). Further, on the Behavior

Table 18
Phase Two Environmental Literacy Component and Composite Mean Scores for Eighth-grade Cohorts, by School, N = 33

School ID	Ecological Knowledge	Environmental Affect	Cognitive Skills	Behavior	Composite Score
3	55.44	43.48	45.76	39.57	184.25
53	51.52	44.09	41.92	45.00	182.53
39	47.85	45.96	32.3	47.44	173.55
9	44.11	47.37	35.01	47.00	173.49
47	49.86	45.44	32.98	43.13	171.41
43	52.94	43.16	27.46	45.87	169.43
46	49.94	40.67	34.46	42.48	167.55
59	45.14	42.94	34.79	42.77	165.64
33	42.35	44.63	34.23	42.67	163.88
19	46.19	42.74	34.53	38.86	162.32
50	46.19	38.66	35.66	38.81	159.32
31	47.68	40.04	29.69	38.44	155.85
27	49.19	38.66	30.18	37.62	155.65
10	45.17	40.94	30.58	37.70	154.39
48	40.94	44.81	26.48	41.33	153.56
23	46.87	39.43	30.22	36.33	152.85
2	41.04	40.42	31.09	39.56	152.11
18	44.71	41.02	25.24	41.00	151.97
12	43.09	41.43	27.18	39.52	151.22
20	45.70	40.85	25.54	38.16	150.25
26	43.90	40.42	24.11	40.17	148.60
13	42.35	39.80	26.07	40.09	148.31
49	45.10	38.18	23.47	37.08	143.83
61	39.98	43.23	24.00	36.00	143.21
29	42.10	34.76	29.83	34.92	141.61
51	39.45	40.19	23.33	38.39	141.36
63	42.00	38.26	23.78	36.46	140.50
1	40.16	38.12	24.97	35.00	138.25
28	38.32	37.30	19.49	32.94	128.05
57	32.01	40.07	17.06	37.93	127.07
6	39.56	34.34	16.38	35.28	125.56
62	31.06	38.78	16.74	38.65	125.32
17	32.43	38.04	18.42	35.93	124.80

component, students in School #39 had the highest average score (47.44 out of 60), and students in School #28 had the lowest average score (32.94). Finally, among these 33 eighth-grade cohorts, students in School #3 had the highest average Composite score (184.25 out of 240), and students in School #17 had the lowest average Composite score (124.80).

School Component and Composite Means, by Grade Level

The fourth analysis of Phase Two data for Research Question One involved the aggregation of grade-level cohort scores across schools, and the calculation of average scores for each of the four environmental literacy components, as well as the environmental literacy composite score for each grade level. The results of these analyses are summarized in Table 19.

Table 19
Environmental Literacy School Component and Composite Mean Scores for Phase Two, by Grade-level Cohorts

Components and measures of Environmental Literacy	Range of possible scores	6th Grade mean (*N* = 43)	7th Grade mean (*N* = 40)	8th Grade mean (*N* = 33)
Ecological Knowledge	0-60	41.68	44.11	43.77
Ecological Knowledge				
Environmental Affect	12-60	42.11	41.14	40.86
Environmental Sensitivity				
Environmental Feeling				
Verbal Commitment (Intention)				
Cognitive Skills	0-60	24.94	26.50	28.27
Issue Identification				
Issue Analysis				
Action Planning				
Environmental Behavior	12-60	40.90	39.89	39.46
Actual Commitment				
Environmental Literacy Composite Score	24-240	149.64	151.65	152.35

Notes: For scores on Ecological Knowledge and on Cognitive Skills, Low = 0-20, Moderate = 21-40, and High = 41-60; For scores on Environmental Affect and on Environmental Behavior, Low = 12-27, Moderate = 28-44, and High = 45-60; For Composite Scores, Low = 24-96, Moderate = 97-168, and High = 169-240.

First, of the three grade levels, the aggregated sixth-grade level (n = 3,134) had the highest mean scores on the Environmental Affect component (42.11) and on the Behavior component (40.90). For each of these components, the aggregated eighth-grade sample (n = 2,138) had the lowest mean score (40.86 and 39.46, respectively). Second, the aggregated eighth-grade level had the highest mean score on the Cognitive Skill component (28.27), and the aggregated sixth-grade level had the lowest mean score (24.94). Finally, the mean Composite scores increased from the

aggregated sixth-grade level (149.64 out of 240), to the aggregated seventh-grade level (151.65), to the aggregated eight-grade level (152.35).

The ordering of these results closely reflects the order apparent in the results presented in Table 14. The only difference in the order of results presented in these two tables was for the Ecological Knowledge component. In Table 19, the aggregated seventh-grade sample (n = 2,693) had a higher mean score (44.11), than that of the aggregated eighth-grade sample (43.77); in Table 14, the eighth-grade mean was higher than the seventh-grade mean. These minor disparities were due to differences in the unit of analysis in each of these analyses. The earlier analysis used the students as a unit of analysis, and aggregated those students by grade level. Table 14 presents the means for the aggregated sixth-grade sample, for the aggregated seventh-grade sample, and for the aggregated eighth-grade sample. The later analysis used the grade level cohort as a unit of analysis (all students at a specific grade level at a specific school), and aggregated those cohorts by grade level. Table 19 presents the means for the aggregated sixth-grade cohorts, for the aggregated seventh-grade cohorts, and for the aggregated eighth-grade cohorts.

Distributions of School Composite Scores by Grade Level

To ease and support the interpretation of average Composite score results presented in Tables 16, 17, 18, and 19, the scores for each grade-level cohort were plotted in the form of histograms. The distribution of average Composite scores for the 43 sixth-grade cohorts is presented in Figure 3. The mean of this distribution is 149.64 and the standard deviation is 13.435. The distribution of the average scores for the sixth-grade cohorts is skewed to the right, or positively skewed (Chase, 1999).

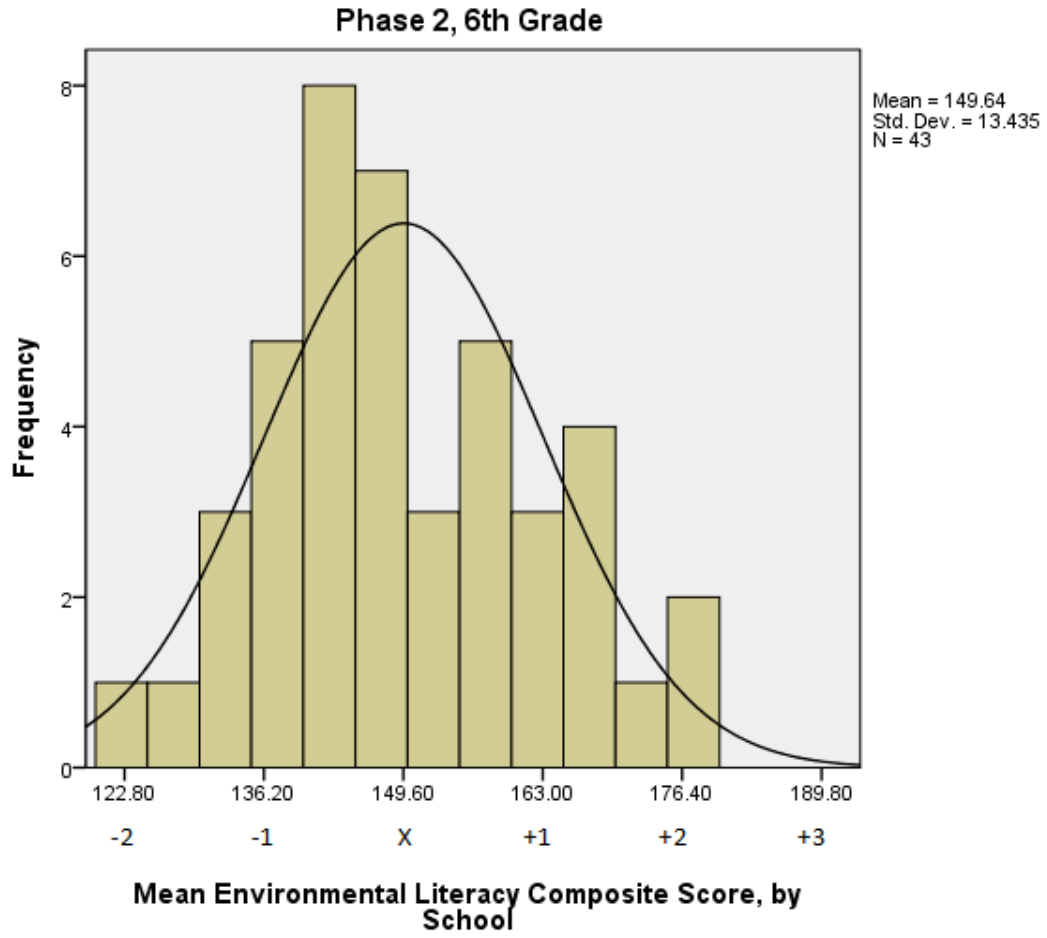

Figure 3. Phase Two distribution of average Environmental Literacy Composite scores for the sixth grade, by school.

The distribution of average Composite scores for the 40 seventh-grade cohorts is presented in Figure 4. The mean of this distribution is 151.65 and the standard deviation is 15.008. The distribution of the average scores for the seventh-grade cohorts is slightly skewed to the right of the mean, largely due to the large number of average cohort scores just below the mean.

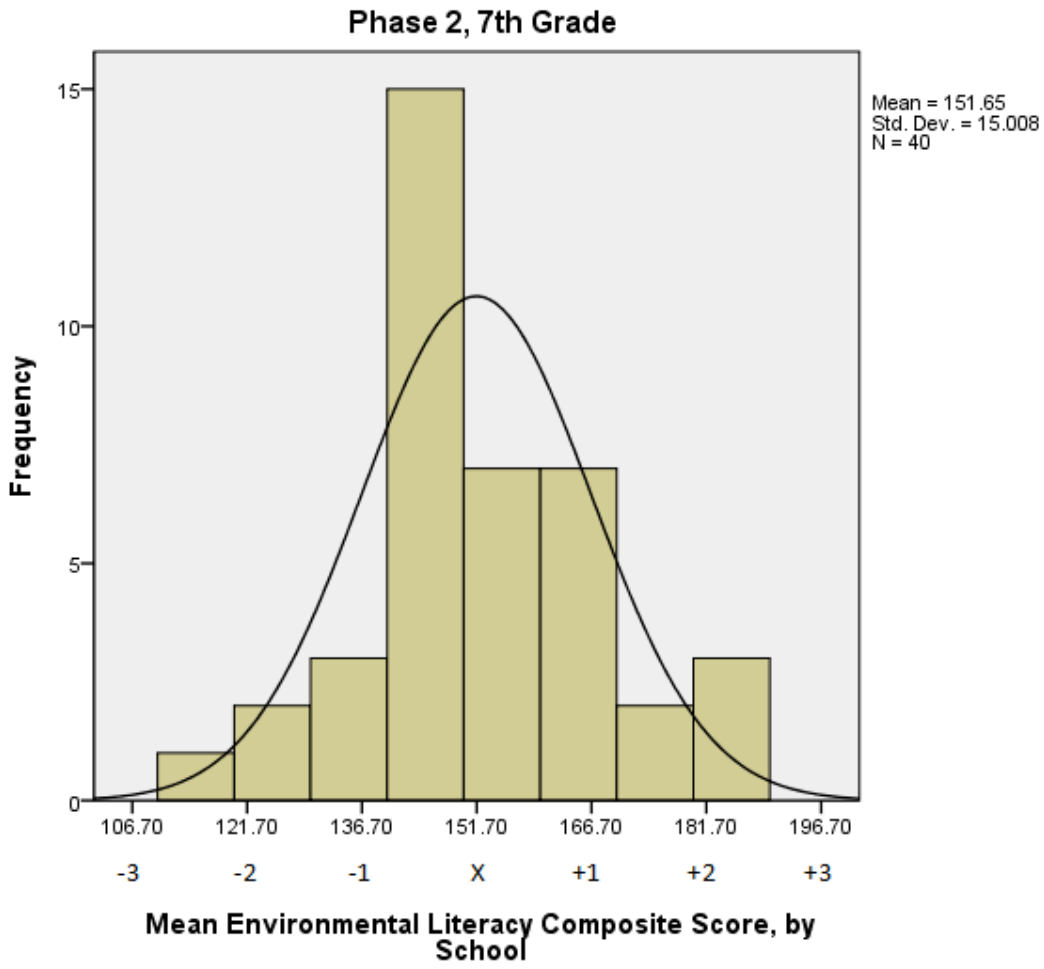

Figure 4. Phase Two distribution of average Environmental Literacy Composite scores for the seventh grade, by school.

The distribution of average Composite scores for the 33 eighth-grade cohorts is presented in Figure 5. The mean of this distribution is 152.35 and the standard deviation is 16.0204. The distribution of the average scores for the eighth-grade cohorts is closer to a normal distribution, although the distribution of average scores below this mean does not reflect a normal distribution pattern.

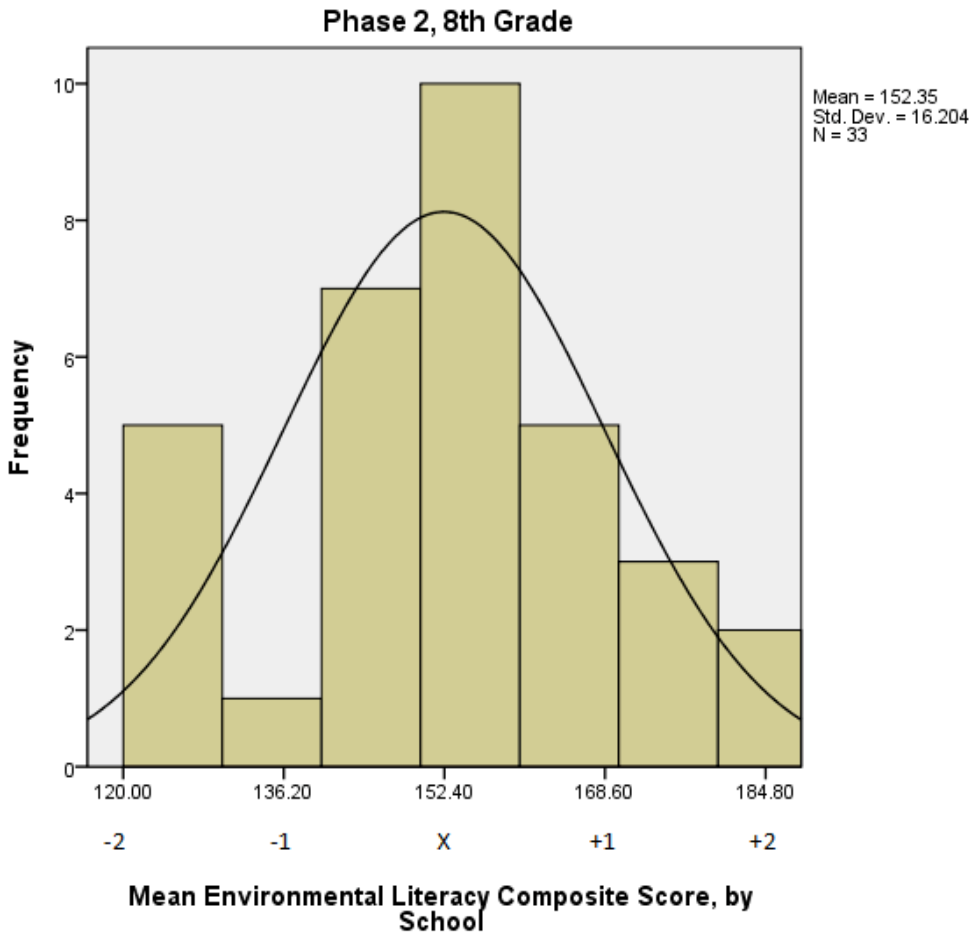

Figure 5. Phase Two distribution of average Environmental Literacy Composite scores for the eighth grade, by school.

Results for Research Question Two: Comparisons to the Baseline Sample

Research Question Two states: How does the level of environmental literacy of students in these programs compare to the Phase One baseline level of environmental literacy of sixth and eighth-grade students across the U.S.?

Z-test and Cohen's *d* Comparisons of Sixth Graders

Three sets of statistical analyses were used to compare the Phase Two results obtained from the purposeful sample of schools (i.e., those with environmental education programs) to Phase One results from the national baseline sample reported by McBeth et al. (2008). The first set of comparisons involved the use of *z*-tests. In general, *z*-tests are used to compare the mean for a given sample to the mean of the population from which that sample was drawn in order to determine if there is a significant difference. Because the Phase One sample was a stratified random or probability-proportional sample, and because the Phase One means and standard deviations were weighted to reflect the national population of sixth and eighth graders, those Phase One results are used as population estimates for these two grade levels in *z*-test calculations. However, because the Phase One sample included only sixth and eighth graders, only *z*-tests comparing the Phase One sixth graders to the Phase Two sixth graders and the Phase One eighth graders to the Phase Two eighth graders could be conducted (i.e., no such comparisons were possible for Phase Two seventh graders). Since separate *z*-tests were used to compare the Phase One mean scores to Phase Two mean scores on each of the eight parts of the *MSELS*, the Bonferronni method (Cohen, 1988) was used to adjust the alpha level for this number of statistical comparisons (alpha = .05/8, or .00625).

The results of these comparisons of sixth graders in Phases One and Two are presented in Table 20. When mean scores were compared, the sixth graders in the Phase Two purposeful sample outscored the sixth graders in the Phase One baseline sample on six of the eight parts of the *MSELS*. The exceptions to this occurred on Part VII.A, Issue Identification, where Phase One sixth graders outscored Phase Two sixth graders, and on Part VII.B, Issue Analysis, where the Phase One and Phase Two mean scores were the same. As a result, these are the only two parts of the *MSELS* for which *z*-scores were not greater than zero; the *z*-score for Issue Identification

Table 20

Z-test and Cohen's d Comparisons of Phase One and Phase Two Mean Scores for Sixth-Grade Student Samples

Part of *MSELS* and Variable (Possible Score)	Sample	Sample Size	Mean	*SD*	*SE* of Mean	*z*-Score	Prob-ability	Effect Size[a] (% of *SD* unit)
II. Ecological Knowledge (0 – 17)	Phase One Phase Two	934 3058	11.24 11.41	3.26 3.42	.05895	2.88	.0002*	+5.2%
III. Verbal Commitment (12 – 60)	Phase One Phase Two	1000 3064	43.89 45.27	8.88 8.67	.16042	8.60	.0000*	+15.5%
V. Environmental Sensitivity (12 – 60)	Phase One Phase Two	974 3015	32.54 33.00	7.47 7.37	.13604	3.38	.0003*	+6.2%
VI. Environmental Feelings (2 – 10)	Phase One Phase Two	987 2840	8.14 8.60	2.00 1.98	.03753	12.26	.0000*	+23.0%
VII.A. Issue Identification (0 – 3)	Phase One Phase Two	902 2809	1.31 1.08	0.93 0.95	.01755	-13.10	.0000*	- 24.7%
VII.B. Issue Analysis (0 – 6)	Phase One Phase Two	905 2793	2.75 2.75	1.89 1.97	.03576	0.00	.5000	- - - - -
VII.C. Action Planning (0 – 20)	Phase One Phase Two	874 2667	7.25 7.47	5.44 5.36	.10534	2.09	.0183	+4.0%
IV. Environmental Behavior (12 – 60)	Phase One Phase Two	974 3041	38.44 40.85	9.15 9.13	.16593	14.52	.0000*	+26.3%

*Significant at $p<.006125$ ── determined using the Bonferroni method (Cohen, 1988) of dividing the pre-set alpha level ($p < .05$) by the number of *z*-tests run (8).

[a]Effect Size was estimated as Phase Two mean - Phase One mean/ Phase One *SD*; reported as a percentage of the Phase One SD (e.g., 100% = +1 *SD*).

was -13.10 and the *z*-score for Issue Analysis was 0.00. Of these eight comparisons, all *z*-scores were found to be statistically significant at the adjusted alpha level ($p<.006125$) except for Part VII.B, Issue Analysis and Part VII.C, Action Planning. It should be noted that the difference on Part VII.A, which favored Phase One, was statistically significant. To summarize, these results indicate that on five of the eight parts of the *MSELS*, the Phase Two purposeful sample significantly outscored the Phase One baseline sample, and on one part of the *MSELS*, the Phase One baseline sample significantly outscored the Phase Two purposeful sample

One of the common criticisms of *z*-tests and the probability level for resulting *z*-scores is that these are sensitive to the size of the sample (i.e., the larger the sample size, the greater the chance of finding statistically significant results). In the case of these analyses, the Phase One baseline sample of sixth graders (n = 1,042) and Phase Two purposeful sample of sixth graders (n = 3,134) were sufficiently large for this to be a concern. Further, due to the influence of the sample sizes on these statistical results, mean differences of less than one point were found to be statistically significant on Parts II, V, VI, VII.A, and VII.C of the *MSELS*. Over time, researchers and educators have raised questions about the practical or educational significance of results such as these, despite their statistical significance. As a result, statistical approaches were developed to compare results from a practical or educational significance perspective by removing the influence of sample size. One of these analyses is Cohen's *d* (Cohen, 1988). Cohen's *d* is used to calculate the difference between two means, divided by the standard deviation (SD); this often accompanies the reporting of *z*-test, *t*-test, and ANOVA results. In simpler terms, Cohen's *d* reflects the difference between two means when they are plotted on the same standard distribution curve. The results of this comparison can be represented as a percent of the standard deviation, and are commonly referred to as an *effect size*. Cohen (1988, p. 25) also defined a *small* effect size as $d \geq .2$ (20% of one SD), a *medium* effect size as $d \geq .5$ (50% of one SD), and a *large* effect size as $d \geq .8$ (80% of one SD).

For the second set of statistical analyses, Cohen's *d* was used to compare the Phase One to Phase Two sixth graders on each part of the *MSELS*. Phase One standard deviation values were used in these calculations to permit the research team to present effect sizes that reflect the relative position of the Phase Two mean above or below the Phase One mean. The results of these

comparisons also are summarized in Table 20. The results indicate that *small* effect sizes were found on three of the eight parts of the *MSELS*: two parts in which the Phase Two purposeful sample outscored the Phase One baseline sample (Part IV, Environmental Behavior: $d = .263$, or 26.3%; and Part VI, Environmental Feelings: $d = .23$, or 23%), and the part on which the Phase One sample outscored the Phase Two sample (Part VII.A, Issue Identification: $d = .24$, or 24%). While the Cohen's d values for four of the remaining parts of the *MSELS* were positive, indicating that the Phase Two sample outscored the Phase One sample, these d values fell well below $d = .2$, reflecting a negligible effect size.

Z-test and Cohen's *d* Comparisons of Eighth Graders

The same procedures used to prepare for and conduct these comparisons of sixth graders were used in these comparisons of eighth graders. The results of the z -test comparisons of eighth graders in Phases One and Two are presented in Table 21. When mean scores were compared, the eighth graders in the Phase Two purposeful sample outscored the eighth graders in the Phase One baseline sample on seven of the eight parts of the *MSELS*. The exception to this occurred on Part VII.A, Issue Identification, where Phase One eighth graders outscored Phase Two eighth graders. As a result, this is the only part of the *MSELS* for which the corresponding z-score was not greater than zero ($z = -5.34$). Of these eight comparisons, all z-scores were found to be statistically significant at the adjusted alpha level ($p < .006125$), except for *Part II.B, Issue Analysis and Part VII.C, Action Planning.* To summarize, these results indicate that on five of the eight parts of the *MSELS*, the Phase Two purposeful sample significantly outscored the Phase One baseline sample, and on one part of the *MSELS*, the Phase One baseline sample significantly outscored the Phase Two purposeful sample.

The results of the Cohen's d comparisons of eighth graders in Phases One and Two also are included in Table 21. The results indicate that *small* effect sizes were found on two of the eight parts of the *MSELS* on which the Phase Two purposeful sample outscored the Phase One baseline sample: Part IV, Environmental Behavior: $d = .337$ (33.7%) and Part VI, Environmental Feeling: $d = .233$ (23.3%). While the Cohen's d values for five of the remaining parts of the

Table 21
Z-test and Cohen's d Comparisons of Phase One and Phase Two Mean Scores for Eighth-Grade Student Samples

Part of *MSELS* and Variable (Possible Score)	Sample	Sample Size	Mean	*SD*	*SE* of Mean	*z*-Score	Prob-ability	Effect Size[a] (% of *SD* unit)
II. Ecological Knowledge (0 – 17)	Phase One Phase Two	921 2094	11.62 12.18	3.32 3.65	.07255	7.72	.0000 *	+16.9%
III. Verbal Commitment (12 – 60)	Phase One Phase Two	936 2051	41.10 42.83	9.20 9.14	.20314	8.52	0000 *	+18.8%
V. Environmental Sensitivity (12 – 60)	Phase One Phase Two	913 1999	30.11 31.03	7.48 7.55	.16730	5.50	.0000 *	+12.3%
VI. Environmental Feelings (2 – 10)	Phase One Phase Two	930 1876	7.82 8.30	2.06 2.09	.04756	10.09	.0000 *	+23.3%
VII.A. Issue Identification (0 – 3)	Phase One Phase Two	885 1789	1.29 1.17	0.95 0.97	.02246	-5.34	.0000 *	- 12.6%
VII.B. Issue Analysis (0 – 6)	Phase One Phase Two	869 1816	2.86 2.97	2.00 2.09	.04693	2.34	.0097	+5.5%
VII.C. Action Planning (0 – 20)	Phase One Phase Two	820 1684	7.86 7.89	5.64 5.53	.13744	0.22	.4051	+0.5%
IV. Environmental Behavior (12 – 60)	Phase One Phase Two	921 2024	35.14 38.30	9.39 9.24	.20872	15.14	.0000 *	+33.7%

*Significant at $p<.006125$ — determined using the Bonferroni method (Cohen, 1988) of dividing the pre-set alpha level ($p < .05$) by the number of *z*-tests run (8).
[a]Effect Size was estimated as Phase Two mean - Phase One mean/ Phase One SD; reported as a percentage of the Phase One *SD* (e.g., 100% = +1 *SD*).

MSELS were positive, indicating that the Phase Two sample outscored the Phase One sample, these *d* values fell below *d* = .2, reflecting a negligible effect size.

Bar Graph Comparisons of Component and Composite Scores

Component and composite scores for the Phase Two purposeful sample of sixth-, seventh-, and eighth-grade cohorts were presented in Table 10, Table 11, and Table 12, respectively. To aid in interpreting those results, the research team decided to present the component and composite scores in the form of bar graphs. The bar graphs include the average component and composite scores for the Phase One sixth- and eighth-grade cohorts, thereby permitting additional comparisons of the Phase Two and Phase One samples. It should be noted that school component and composite scores were not a focus of the Phase One baseline study and therefore, no analysis of this type was undertaken for that study. These graphs (essentially, the result of secondary analyses of data from the earlier study) were prepared for this Phase Two report to permit visual comparisons of the score distributions from the two studies. They can be found in Appendix M.

Average component and composite scores for each of the 43 sixth-grade cohorts in the Phase Two purposeful sample are presented in Figure 6, along with the average component and composite scores for the Phase One baseline sample of sixth graders. The average score for the Phase One sixth-grade sample on the Ecological Knowledge component was 39.77. Of the 43 sixth-grade cohorts in Phase Two, 25 (58%) had a higher average score than this Phase One average score. The average for the Phase One sixth-grade sample on Environmental Affect was 40.08. Of the 43 sixth-grade cohorts in Phase Two, 36 (84%) had a higher average score than the Phase One average score. The average score for the Phase One sixth-grade sample on the Cognitive Skills component was 25.53. Of the 43 sixth-grade cohorts in Phase Two, 18 (42%) had a higher average score than this Phase One average score. The average component score for the Phase One sixth-grade sample on the Environmental Behavior component was 38.17. Of the 43 sixth-grade cohorts in Phase Two, 35 (81%) had a higher average score than this Phase One average score. Further, the average Composite score for the Phase One sixth-grade sample was 143.65. Of the 43 sixth-grade cohorts in Phase Two, 28 (65%) had a higher average Composite score than the Phase One average score. In summary, two-thirds of the Phase Two purposeful

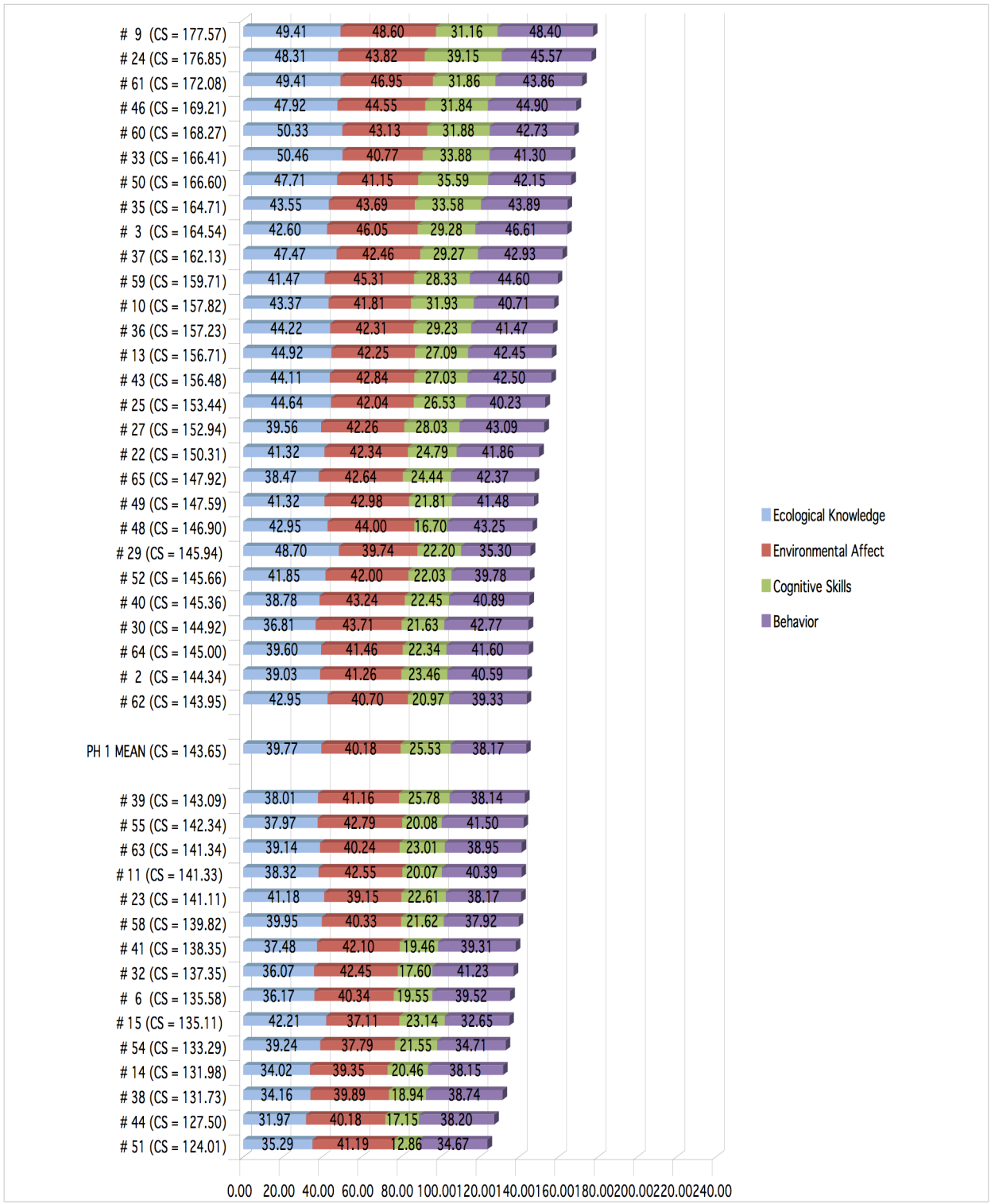

Figure 6. Component and Composite scores for Phase Two sixth-grade cohorts and average Component and Composite scores for Phase One sixth-grade cohorts.

sample of sixth graders had higher average Composite scores than the Phase One baseline sample, and a large portion of this difference appears to be attributable to Environmental Affect and Environmental Behavior component scores.

The average component and composite scores for each of the 40 seventh-grade cohorts in the Phase Two purposeful sample are presented in Figure 7. Because there was no seventh-grade sample in the Phase One baseline study, the average component and composite scores for the Phase One baseline samples of both sixth and eighth graders were included in this graph.

The average score on the *Ecological Knowledge* component for the Phase One baseline sixth-grade sample was 39.77 and eighth-grade sample was 41.08. Of the 40 seventh-grade cohorts in Phase Two, 33 (83%) had a higher average score than this Phase One sixth-grade mean, and 30 (75%) had a higher average score than this Phase One eighth-grade mean. The average scores on the Environmental Affect component were 40.18 for the Phase One baseline sixth-grade sample and 38.25 for the Phase One eighth-grade sample. Of the 40 seventh-grade cohorts in Phase Two, 27 (68%) had a higher average score than this Phase One sixth-grade mean, and 36 (90%) had a higher average score than this Phase One eighth-grade mean.

The average scores on the Cognitive Skills component were 25.53 for the Phase One baseline sixth-grade sample and 25.93 for the eighth-grade sample. Of the 40 seventh-grade cohorts in Phase Two, 23 (58%) had a higher average score than this Phase One sixth-grade mean, and 18 (45%) had a higher average score than this Phase One eighth-grade mean. Further, the average scores on the Environmental Behavior component were 38.17 for the Phase One baseline sixth-grade sample and 35.05 for the Phase One eighth-grade sample. Of the 40 seventh-grade cohorts in Phase Two, 29 (73%) had a higher average score than this Phase One sixth-grade mean, and 38 (95%) had a higher average score than this Phase One eighth-grade mean.

The average Composite scores were 143.65 for the Phase One baseline sixth-grade sample and 140.32 for the Phase One eighth-grade sample. Of the 40 seventh-grade cohorts in Phase Two, 30 (75%) had a higher average score than the Phase One sixth-grade mean, and 34 (85%) had a

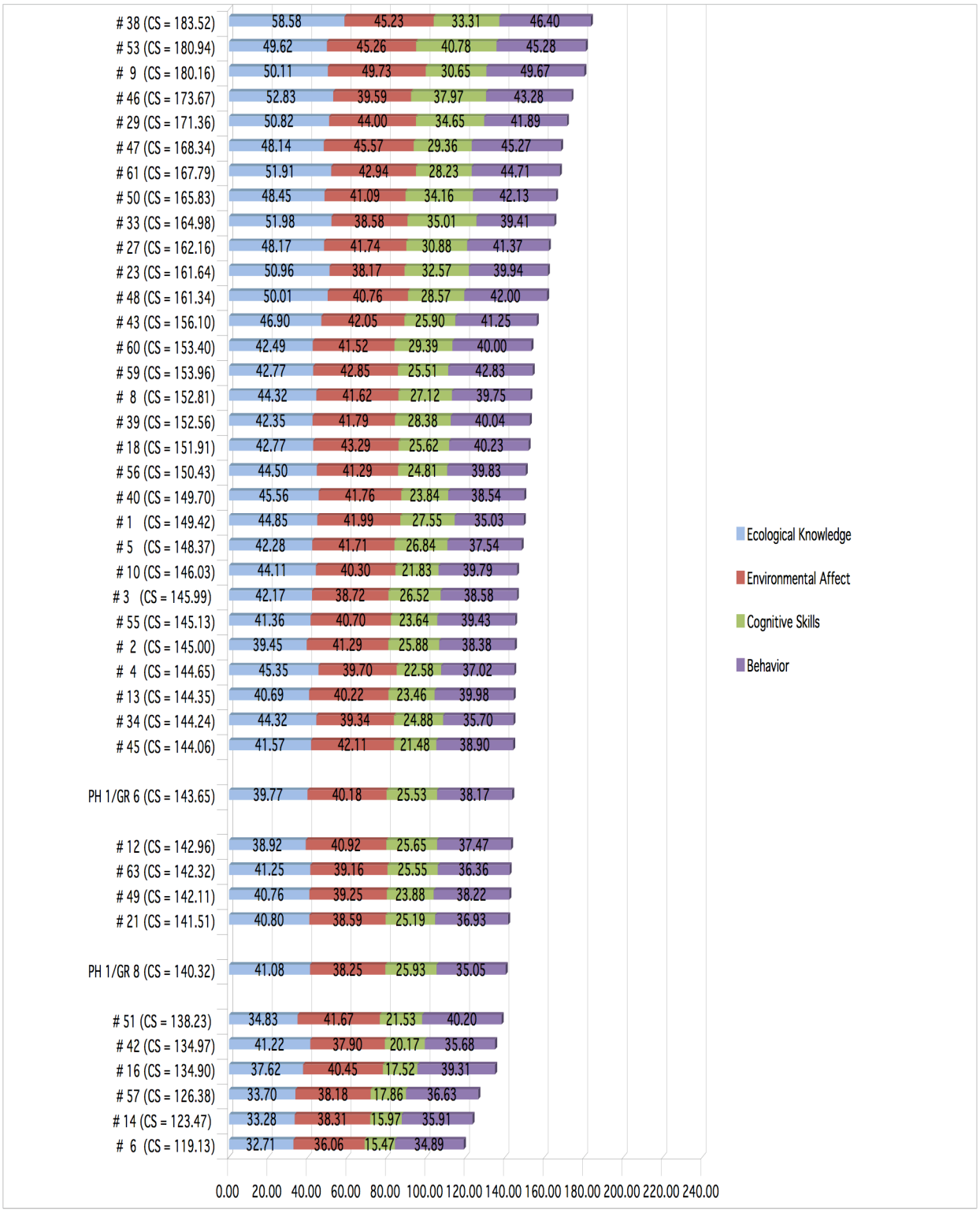

Figure 7. Component and Composite scores for Phase Two seventh-grade cohorts and average Component and Composite scores for Phase One sixth- and eighth-grade cohorts.

higher average score than the Phase One eighth-grade mean. In summary, three quarters of the Phase Two purposeful sample of seventh graders had a higher average Composite score than the Phase One baseline sample of sixth graders. This difference appears to be attributable to Ecological Knowledge component scores and, to a lesser extent, Environmental Behavior and Environmental Affect component scores. The Skills component score made the least contribution to this composite score difference. Further, more than four-fifths of the Phase Two purposeful sample of seventh graders had a higher Composite score than the Phase One baseline sample of eighth graders. This difference appears to be attributable to Environmental Affect and Environmental Behavior component scores and, to a lesser extent, to Ecological Knowledge component scores.

The average component and composite scores for each of the 33 eighth-grade cohorts in the Phase Two purposeful sample are presented in Figure 8. The average score for the Phase One eighth-grade sample on the Ecological Knowledge component was 41.08. Of the 33 eighth-grade cohorts in Phase Two, 24 (73%) had a higher average score than this Phase One average score. The average score for the Phase One eighth-grade sample on the Environmental Affect component was 38.25. Of the 33 eighth-grade cohorts in Phase Two, 27 (82%) had a higher average score than this Phase One average score. The average score for the Phase One eighth-grade sample on the Cognitive Skills component was 25.93. Of the 33 eighth-grade cohorts in Phase Two, 20 (61%) had a higher average score than this Phase One average score. Further, the average score for the Phase One eighth-grade sample on the Environmental Behavior component was 35.14. Of the 33 eighth-grade cohorts in Phase Two, 30 (91%) had a higher average score than this Phase One average score.

The average Composite score for the Phase One eighth-grade sample was 140.32. Of the 33 eighth-grade cohorts in Phase Two, 27 (82%) had a higher average score than this Phase One average score. In summary, more than four-fifths of the Phase Two purposeful sample of eighth graders had a higher average Composite score than the Phase One baseline sample of eighth graders. This difference appears to be attributable to Environmental Affect and Environmental Behavior component scores and, to a lesser extent, Ecological Knowledge and Cognitive Skills component scores.

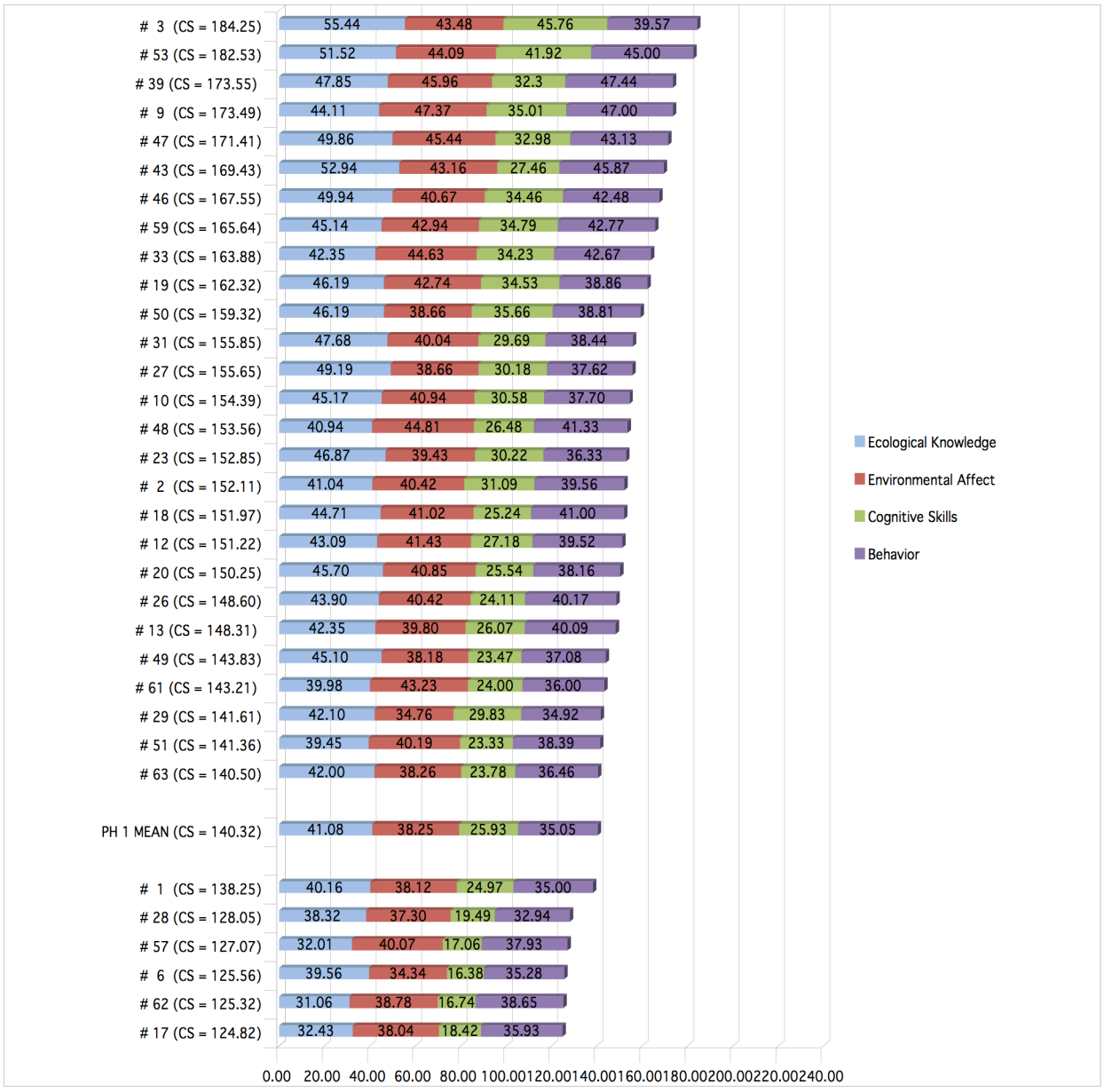

Figure 8. Component and Composite scores for Phase Two eighth-grade cohorts and average Component and Composite scores for Phase One eighth-grade cohorts.

Independent *T*-test Comparisons of Component and Composite Scores

Independent *t*-tests were used to determine if there were significant differences between the distributions of the component and composite scores of the Phase One sixth-grade baseline sample (found in Figure M1) and the Phase Two sixth-grade purposeful sample (Figure 6).

Similar *t*-tests analyses were conducted to determine if there were significant differences between the distributions of the component and composite scores of the Phase One eighth-grade baseline sample (found in Figure M2) and the Phase Two eighth-grade purposeful sample (Figure 8). As in the bar graphs, the unit of analysis consisted of grade-level cohorts (Phase One: 48 sixth- and 48 eighth-grade cohorts; Phase Two: 43 sixth- and 33 eighth-grade cohorts). While the statistical procedures for the previously reported *z*-tests and these *t*-tests are very similar, the use of grade-level cohorts in these *t*-test analyses greatly reduced the concern that large sample sizes would influence (inflate) the statistical significance of test results. Further, to control for the influence of the number of statistical tests conducted at each grade level, the Bonferroni method (Cohen, 1988) was used to adjust the alpha level for determining statistical significance ($p < .05/5 = p < .01$). The results of these independent *t*-test analyses for both sixth-and eighth-grade samples are summarized in Table 22.

The sixth-grade cohorts in the Phase Two purposeful sample had higher average scores than their sixth-grade counterparts in the Phase One baseline sample on three of the four environmental literacy components and on the composite score (see Table 22). The exception to this was on the Cognitive Skills component. Differences favoring the Phase Two sixth graders were statistically significant on the Environmental Affect and Environmental Behavior component, as well as on the Composite score.

Also, in Table 22 we can see that the eighth-grade cohorts in the Phase Two purposeful sample had higher average scores than the eighth-grade cohorts in the Phase One baseline sample on all four of the environmental literacy components, and therefore on the composite score. Further, as found in the sixth-grade comparisons, these results indicate that the differences favoring the Phase Two sixth graders were statistically significant on the Environmental Affect and Environmental Behavior component, as well as on the Composite score.

Histogram Distributions for and Cohen's *d* Comparisons of Component Scores

One way of summarizing the results of these *t*-test comparisons of the Phase One baseline and Phase Two purposeful sample is in the form of distribution curves, called histograms. Thus,

Table 22

Grade-level T-test Comparisons of Environmental Literacy Component and Composite Mean Scores for Phase One Random and Phase Two Purposeful Samples

Environmental Literacy components	Grade and sample	*n*	Mean	*SD*	*df*	*t*-score	Probability
Knowledge	6th Grade Random	48	39.77	6.41	89	1.601	.057
	6th Grade Purposeful	43	41.68	4.78			
	8th Grade Random	48	41.08	5.22	79	2.214	.015
	8th Grade Purposeful	33	43.77	5.58			
Affect	6th Grade Random	48	40.18	4.03	89	2.784	.004*
	6th Grade Purposeful	43	42.11	2.21			
	8th Grade Random	48	38.25	2.58	79	4.140	.000*
	8th Grade Purposeful	33	40.86	3.05			
Skills	6th Grade Random	48	25.53	6.79	89	0.448	.328
	6th Grade Purposeful	43	24.94	5.74			
	8th Grade Random	48	25.93	6.82	79	1.509	.069
	8th Grade Purposeful	33	28.27	6.91			
Behavior	6th Grade Random	48	38.17	3.43	89	3.931	.000*
	6th Grade Purposeful	33	40.90	3.18			
	8th Grade Random	48	35.05	3.47	79	5.554	.000*
	8th Grade Purposeful	33	39.46	3.56			
Composite Score	6th Grade Random	48	143.65	15.79	89	1.937	.028
	6th Grade Purposeful	43	149.64	13.44			
	8th Grade Random	48	140.32	15.29	79	3.398	.001*
	8th Grade Purposeful	33	152.35	16.20			

* = significant at .01 level. The significance level ($p < .01$) was determined using the Bonferroni method (Cohen, 1988) by dividing the pre-set alpha level ($p < .05$) by the number of *t*-tests run (5) for each grade level.

distributions curves were prepared for each of the four component scores and the composite score for sixth-grade and for eighth-grade samples. These distribution curves reflect the average scores for each of the school-by-school cohorts in each grade-level sample. Further, the values

along the *x* axis in each distribution curve were plotted using standard deviation values for the Phase One baseline sample, thereby permitting a final comparison of the Phase Two and Phase One samples. Finally, the magnitude of the difference between these samples was calculated using Cohen's d.

The following pages will present the above information for the sixth- and eighth-grade samples for the Ecological Knowledge, Environmental Affect, Cognitive Skills, and Environmental Behavior component scores. The distribution curves for average Composite scores for the Phase Two and Phase One sixth- and eighth-grade samples will be presented in the section of the report entitled Conclusions and Discussion.

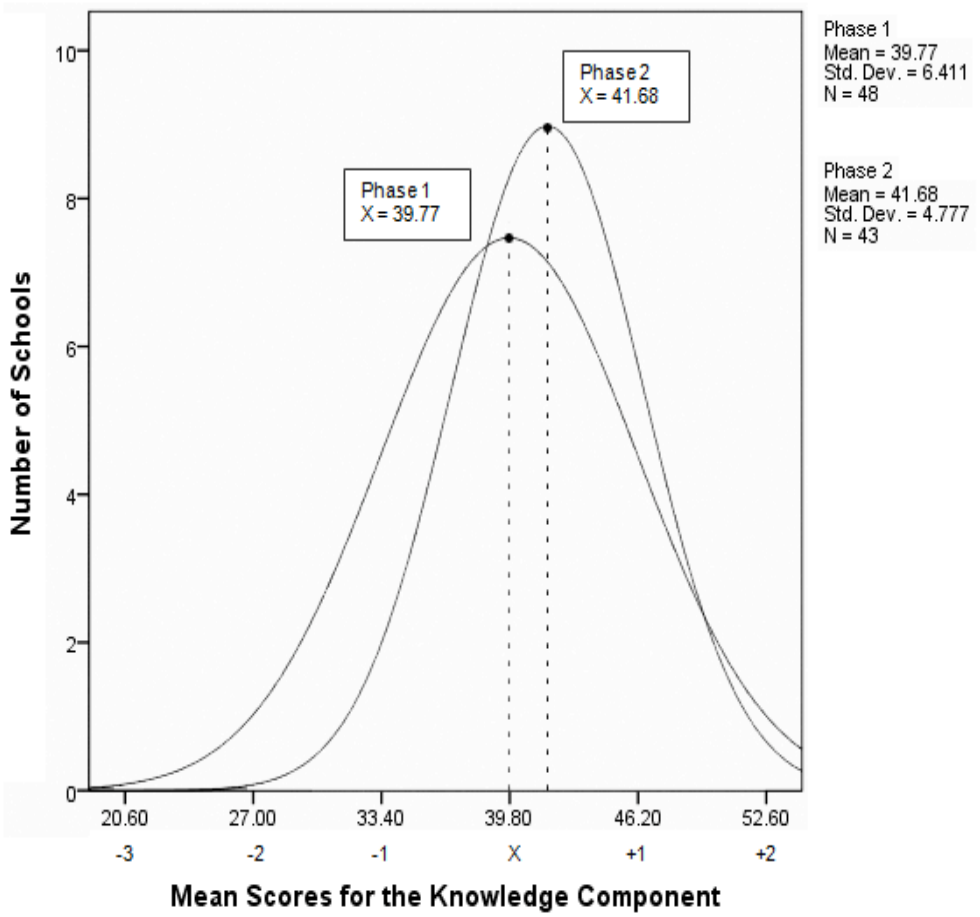

Figure 9. Distribution curves for the average Ecological Knowledge Component scores of Phase One baseline and Phase Two purposeful sixth-grade cohorts. The effect size is represented by the distance between the dotted lines.

The distribution curves for the average scores by sixth-grade cohorts in each school in the Phase One baseline and Phase Two purposeful samples on the Ecological Knowledge component are presented in Figure 9. This figure indicates that the mean score for the Phase Two sixth-grade sample (41.68), was higher than that of the Phase One sixth-grade sample (39.77) on this component. Further, the range of scores for the Phase Two sixth-grade sample was narrower than that of the Phase One sample, as evident in the smaller Phase Two standard deviation (*SD* = 4.777). Cohen's *d* analysis yielded a small effect size (*d* = 0.30) for this component. Thus, the two samples differed by 30% of a standard deviation.

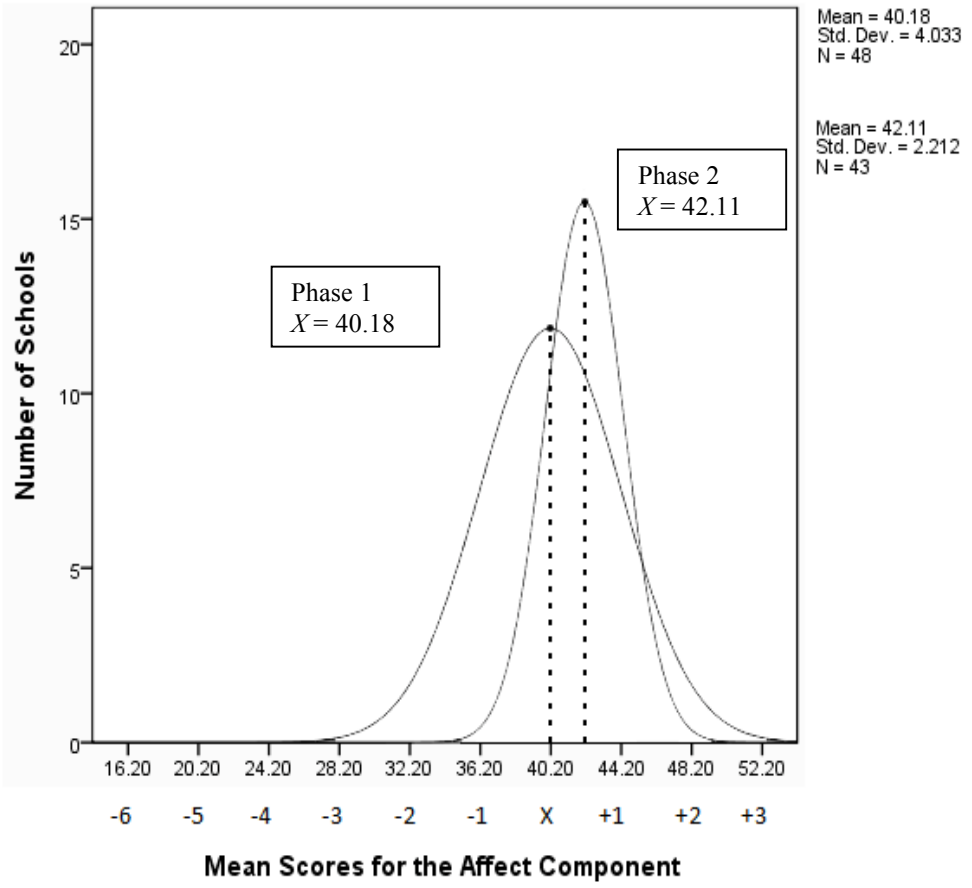

Figure 10. Distribution curves for the average Environmental Affect Component scores of Phase One baseline and Phase Two purposeful sixth-grade cohorts. The effect size is represented by the distance between the dotted lines.

Figure 10 presents the distribution curves for the sixth-grade cohorts on the Environmental Affect component. As these curves indicate, the average score of the Phase Two sixth-grade sample (42.11) was higher than that of the Phase One sixth-grade sample (40.18) on this component. Also, the range of scores for the Phase Two sixth-grade sample was narrower than that of the Phase One sample, as evident in the smaller Phase Two standard deviation (*SD* = 2.212). Cohen's *d* analysis yielded an effect size that approached medium (*d* = 0.48) for this component. Thus, the two samples differed by 48% of a standard deviation.

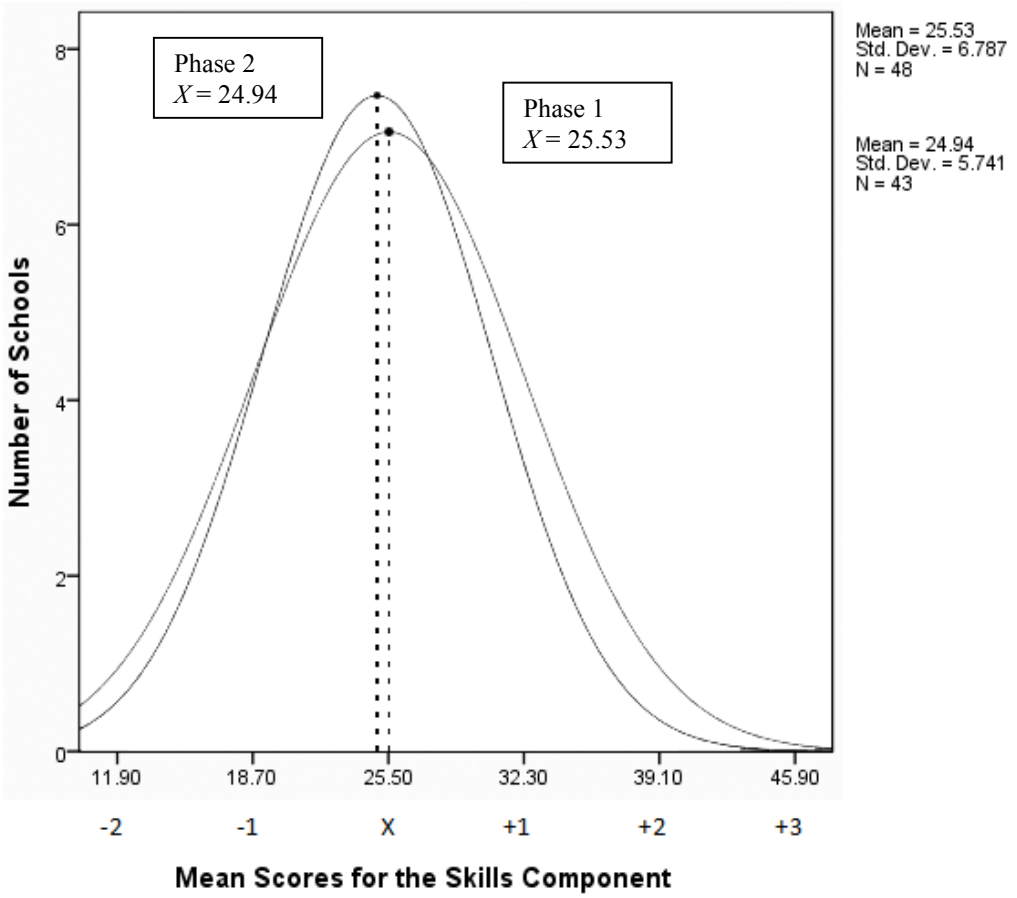

Figure 11. Distribution curves for the average Cognitive Skills Component scores of Phase One baseline and Phase Two purposeful sixth-grade cohorts. The effect size is represented by the distance between the dotted lines.

The distribution curves for these samples on the Cognitive Skills component are presented in Figure 11. This figure indicates that the average score of the Phase One sixth-grade sample (25.53) was higher than that of the Phase Two sixth-grade sample (24.94) on this component. This figure also indicates that the Phase Two sixth-grade sample had a slightly narrower range of scores (*SD* = 5.741) than the Phase One sixth-grade sample (*SD* = 6.787). Overall, these distributions were very similar. Cohen's *d* analysis yielded a negligible, negative effect size (*d* = -0.087) for this component. Thus, the two samples differed by 8.7% of a standard deviation.

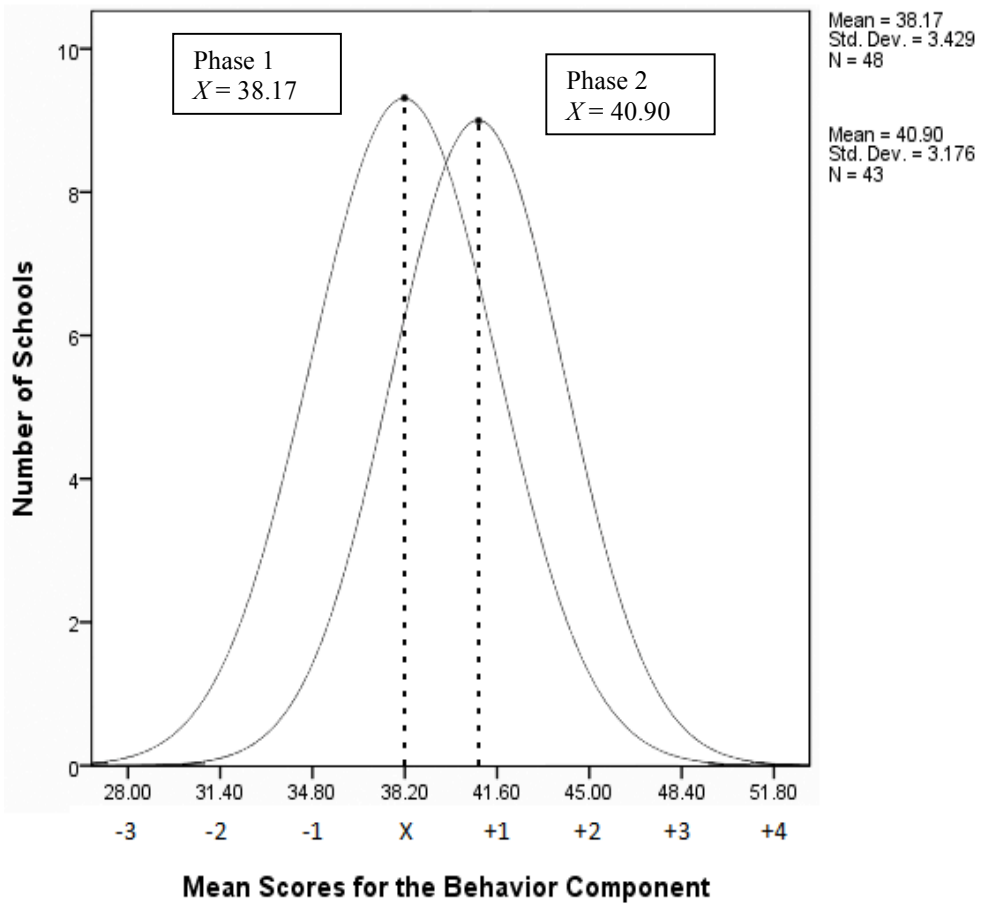

Figure 12. Distribution curves for the average Environmental Behavior Component scores of Phase One baseline and Phase Two purposeful sixth-grade cohorts. The effect size is represented by the distance between the dotted lines.

The distribution curves for these samples on the Environmental Behavior component are presented in Figure 12. This figure indicates that the average score of the Phase Two sixth-grade sample (40.90) was higher than that of the Phase One sixth-grade sample (38.17) on this component. This figure also indicates that the Phase Two sixth-grade sample had a slightly narrower range of scores (SD = 3.176) than the Phase One sixth-grade sample (SD = 3.429). Cohen's d analysis yielded a large effect size (d = 0.80) for this component. Thus, the two samples differed by 80% of a standard deviation.

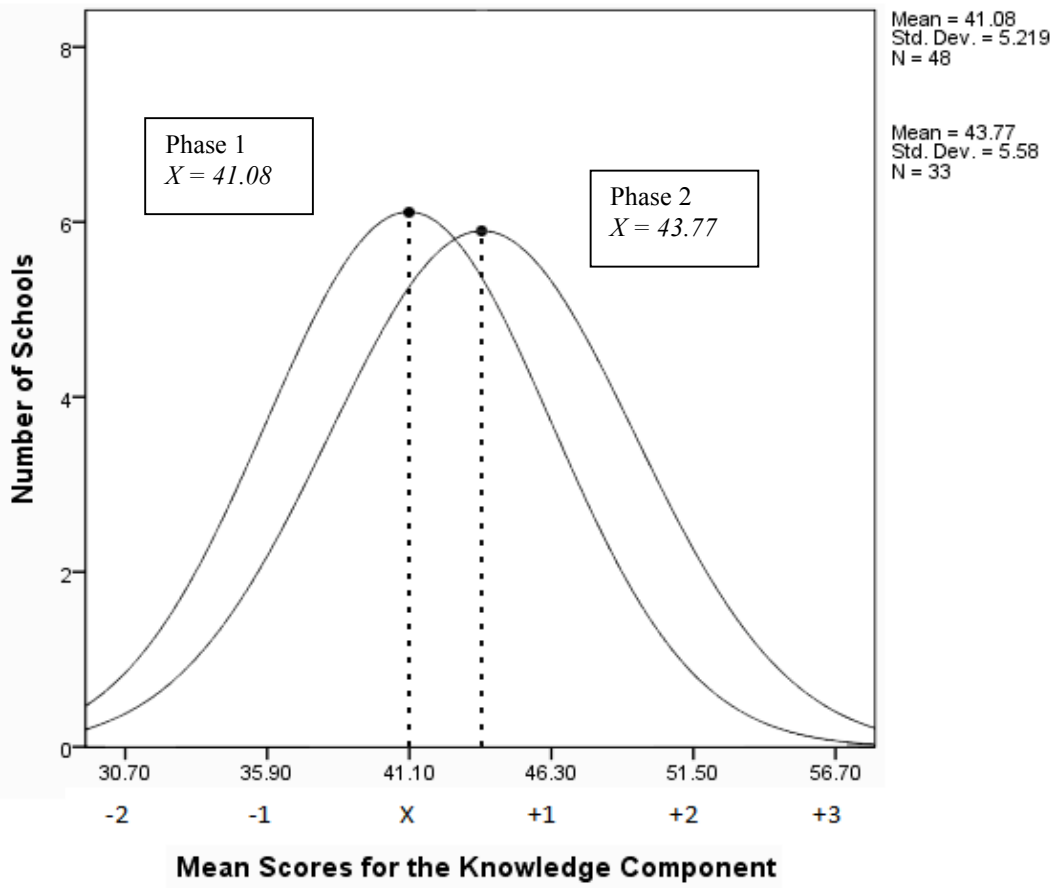

Figure 13. Distribution curves for the average Ecological Knowledge Component scores of Phase One baseline and Phase Two purposeful eighth-grade cohorts. The effect size is represented by the distance between the dotted lines.

The distribution curves for the average scores by eighth-grade cohorts in each school in the Phase One baseline and Phase Two purposeful samples on the Ecological Knowledge component are presented in Figure 13. This figure indicates that the average score of the Phase Two eighth-grade sample (43.77) was higher than the Phase One eighth-grade sample (41.08) on this component. This figure also indicates that the Phase One eighth-grade sample had a range of scores that was slightly narrower (*SD* = 5.219) than the Phase Two eighth-grade sample (*SD* = 5.58). Cohen's *d* analysis yielded a medium effect size (*d* = 0.52) for this component. Thus, the two samples differed by 52% of a standard deviation.

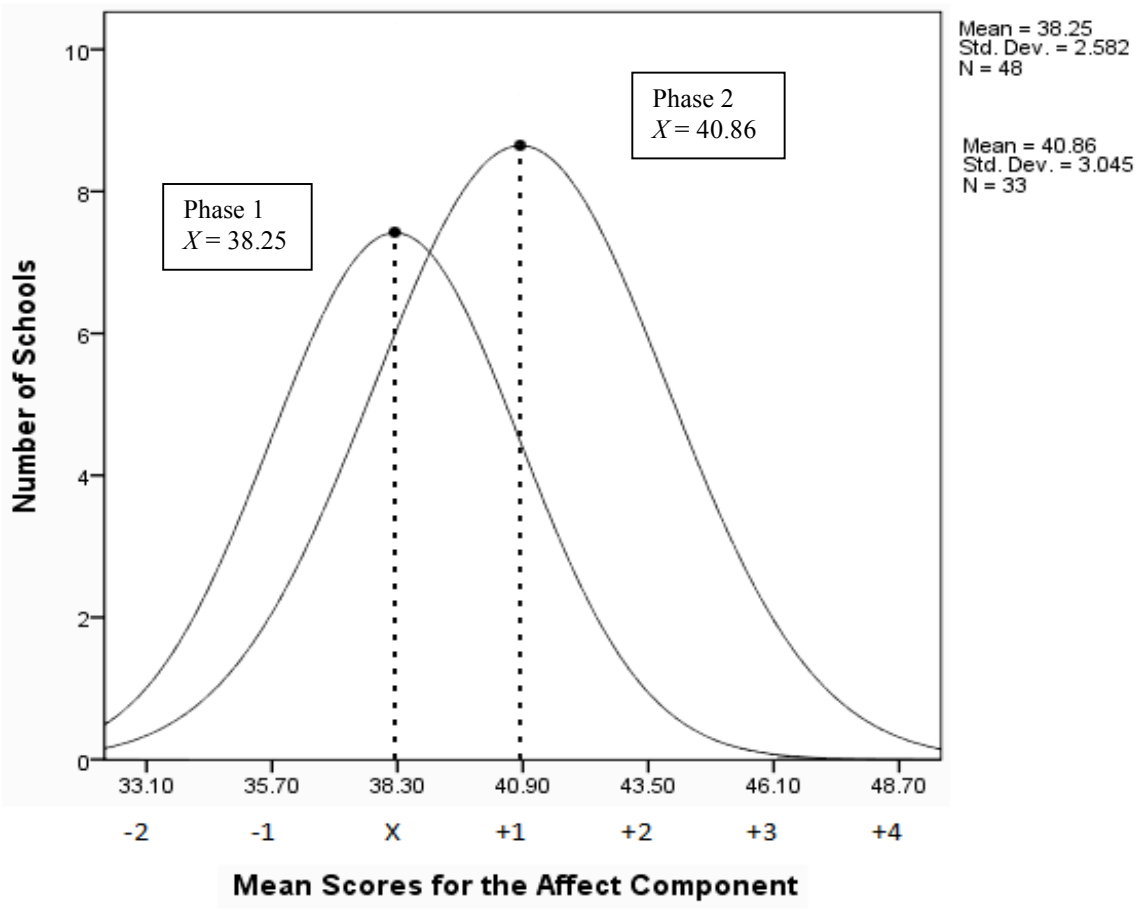

Figure 14. Distribution curves for the average Environmental Affect Component scores of Phase One baseline and Phase Two purposeful eighth-grade cohorts. The effect size is represented by the distance between the dotted lines.

The distribution curves for these samples on the Environmental Affect component are presented in Figure 14. This figure indicates that the average score of the Phase Two eighth-grade sample (40.86) was higher than the Phase One eighth-grade sample (38.25) on this component by a full standard deviation. As a result, Cohen's *d* analysis yielded a large effect size ($d = 1.01$) for this component. Thus, the two samples differed by 101% of a standard deviation. This figure also indicates that the Phase One eighth-grade sample had a narrower range of scores ($SD = 2.582$) than the Phase Two eighth-grade sample ($SD = 3.045$).

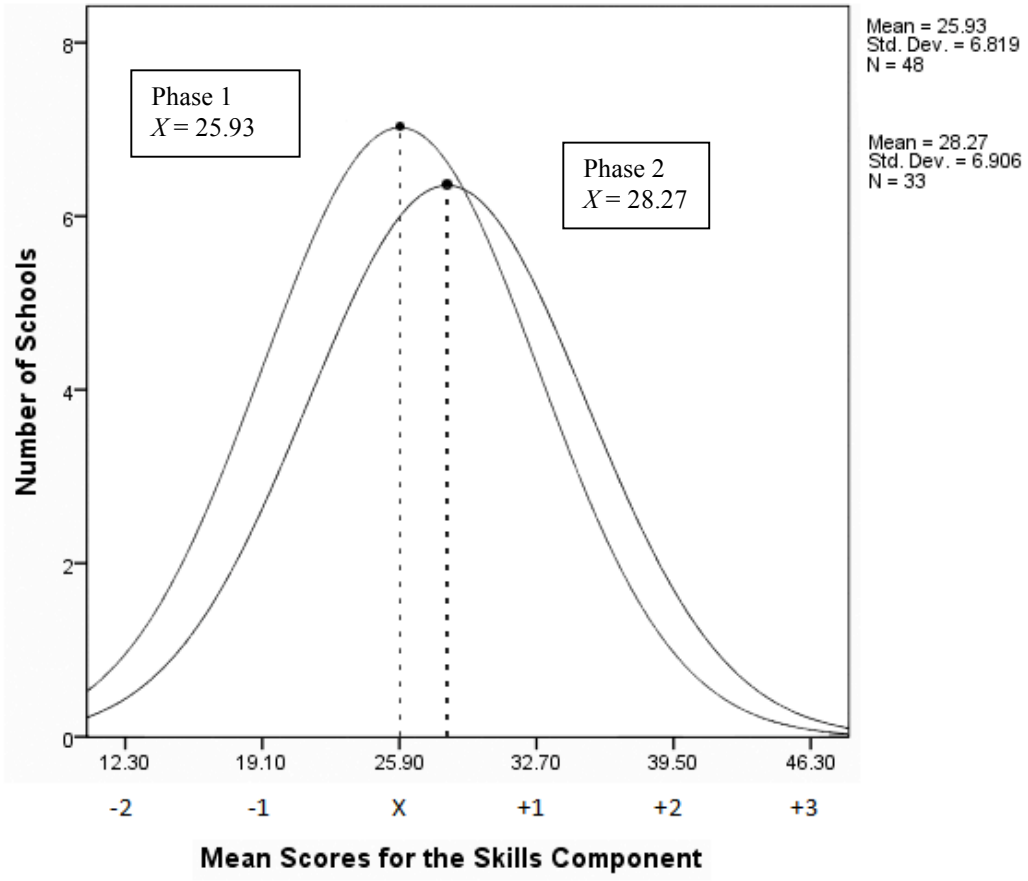

Figure 15. Distribution curves for the average Cognitive Skills Component scores of Phase One baseline and Phase Two purposeful eighth-grade cohorts. The effect size is represented by the distance between the dotted lines.

The distribution curves for the average scores by eighth-grade cohorts in each school in the Phase One baseline and Phase Two purposeful samples on the Cognitive Skills component are presented in Figure 15. This figure indicates that the average score of the Phase Two eighth-grade sample (28.27) was higher than that of the Phase One eighth-grade sample (25.93) on this component. This figure also indicates that the Phase Two and Phase One eighth-grade samples had a nearly equivalent range of scores (Phase Two *SD* = 6.906; Phase One *SD* = 6.819). Cohen's *d* analysis yielded a medium effect size (*d* = 0.34) for this component. Thus, the two samples differed by 34% of a standard deviation.

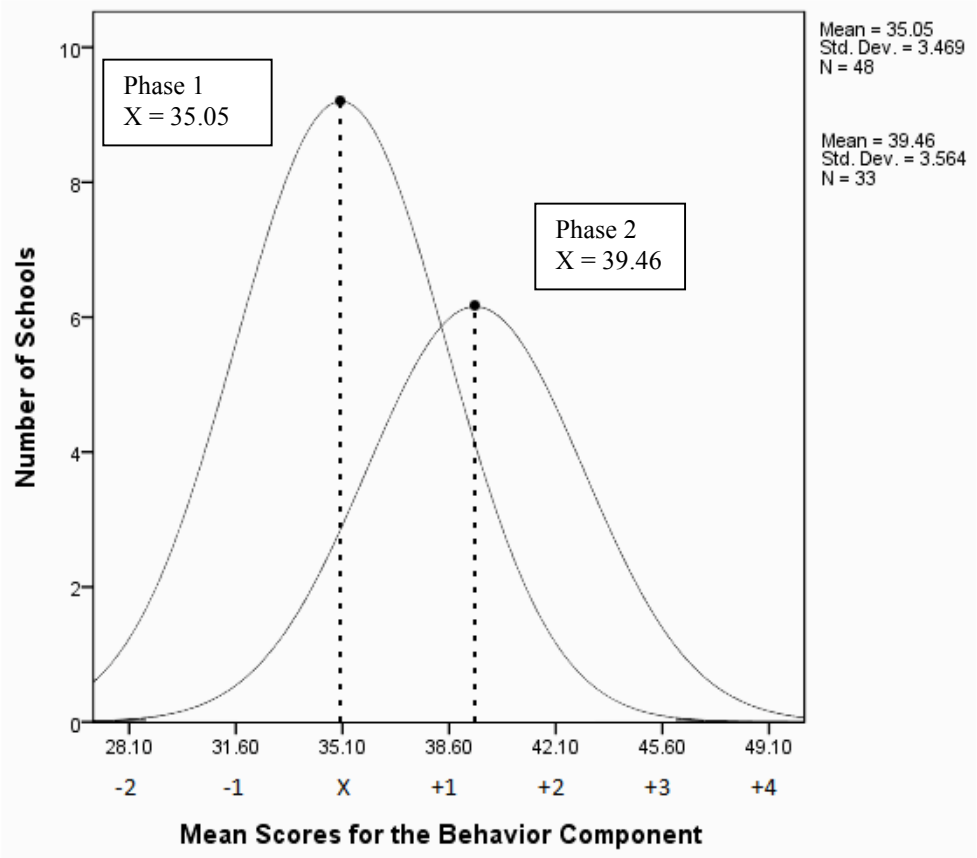

Figure 16. Distribution curves for the average Environmental Behavior Component scores of Phase One baseline and Phase Two purposeful eighth-grade cohorts. The effect size is represented by the distance between the dotted lines.

The distribution curves for these samples on the Environmental Behavior *c*omponent are presented in Figure 16. This figure indicates that the average score of the Phase Two eighth-grade sample (39.46) was higher than the Phase One eighth-grade sample (35.05) on this component by more than a full standard deviation. As a result, Cohen's *d* analysis yielded a large effect size ($d = 1.27$) for this component. Thus, the two samples differed by 127% of a standard deviation. This figure also indicates that the Phase One eighth-grade sample had a slightly narrower range of scores ($SD = 3.469$) than the Phase Two eighth-grade sample (SD = 3.564).

Additional Results from Preliminary Exploratory Analyses of Phase Two Data

As the results in these tables and figures indicate, there was considerable variability and noticeable differences in component and composite scores within the Phase Two sample. One way of addressing these differences is by separating the cohorts from each school into quartiles on the basis of their composite scores. We first determined the approximate number of cohorts within each grade level that would fall into each quartile (i.e., Sixth Grade, where $N = 43$, 10 - 11 schools per quartile; Seventh Grade, where $N = 40$, about 10 schools per quartile; and Eighth Grade, where $N = 33$, about 8 schools per quartile). The next step in this analysis involved the determination of discernable breaks in the distribution of average composite scores for school cohorts within each grade level, particularly for the top and bottom quartiles of schools. For the Sixth Grade, the top quartile included 162 to 177 and the bottom quartile included 124 to 139; for the Seventh Grade, the top quartile included 164 to 183 and the bottom quartile included 119 to 142; and for the eighth grade, the top quartile included 165 to 184 and the bottom quartile included 124 to 143. A third step in this analysis involved placing all schools in the top quartile in the sixth-, seventh-, and eighth-grade samples in one chart, and then following the same procedure for all schools whose average composite scores fell in the bottom quartile into a second chart. This was done to determine which, if any, of these schools appeared in the top quartile or in the bottom quartile within more than one grade-level sample.

The results of this analysis for the top quartile of schools are summarized in Table 23. These results indicate that this top quartile included 10 schools for the Phase Two sixth-grade sample, nine schools in the Phase Two seventh-grade sample, and eight schools in the Phase Two eighth-grade sample. However, this sample included two schools with cohorts in all three grades that fell in the top quartile (Schools #9 and #46), as well as six schools with cohorts in two grades that fell in the top quartile (Schools #61, #33, #50, #3, #53, and #47). As a result, the top quartile for the entire Phase Two sample included a total of 17 schools.

The results of this analysis for the bottom quartile of schools are summarized in Table 24. These results indicate that this bottom quartile included 10 schools for the Phase Two sixth-grade sample, 10 schools in the Phase Two seventh-grade sample, and 11 schools in the Phase Two

Table 23

Identification and Ranking of Phase Two Schools in the Top Quartile, as Determined by Composite Scores

School ID Number	**6th Grade** **Rank** (Composite Score) (*n* = 10 of 42)	**7th Grade** **Rank** (Composite Score) (*n* = 9 of 40)	**8th Grade** **Rank** (Composite Score) (*n* = 8 of 33)
9	**1** (177.57)	**3** (180.16)	**4** (173.49)
24	**2** (176.85)		
61	**3** (172.08)	**7** (167.79)	
46	**4** (169.21)	**4** (173.67)	**7** (167.55)
60	**5** (168.27)		
33	**6** (166.41)	**9** (165.98)	
50	**7** (166.60)	**8** (165.83)	
35	**8** (164.71)		
3	**9** (164.54)		**1** (184.25)
37	**10** (162.13)		
38		**1** (183.52)	
53		**2** (180.49)	**2** (182.53)
29		**5** (171.36)	
47		**6** (168.34)	**5** (171.41)
39			**3** (173.55)
43			**6** (169.43)
59			**8** (165.64)

eighth-grade sample. However, this sample included two schools with cohorts at all three grades that fell in the bottom quartile (Schools #6 and #51), as well as four schools with cohorts in two grades that fell in the bottom quartile (Schools #14, #63, #49, and #57). As a result, the bottom quartile for the entire Phase Two sample included a total of 23 schools.

When the schools in these two tables were compared, it was found that three of the schools had one or more grade-level cohorts within both top and bottom quartiles (#29, #38, and #61). While it might appear somewhat unusual that some schools had grade-level cohorts that fell within both the top and bottom quartiles, there are a number of plausible, explanations for this (e.g., the environmental education program at one grade level in a school might be strong, and, in comparison, relatively weak at another grade level). Nonetheless, this is the one of the findings

Table 24
Identification and Ranking of Phase Two Schools in the Bottom Quartile, as Determined by Composite Scores

School ID Number	**6th Grade Rank** (Composite Score) (*n* = 10 of 42)	**7th Grade Rank** (Composite Score) (*n* = 10 of 40)	**8th Grade Rank** (Composite Score) (*n* = 11 of 33)
58	**34** (139.82)		
41	**35** (138.35)		
32	**36** (137.35)		
6	**37** (135.58)	**40** (119.13)	**32** (125.56)
15	**38** (135.11)		
54	**39** (133.29)		
14	**40** (131.98)	**39** (123.47)	
38	**41** (131.73)		
44	**42** (127.50)		
51	**43** (124.01)	**35** (138.23)	**27** (141.61)
12		**31** (142.96)	
63		**32** (142.32)	**28** (140.50)
49		**33** (142.11)	**24** (143.83)
21		**34** (141.51)	
42		**36** (134.97)	
16		**37** (134.90)	
57		**38** (126.38)	**31** (127.07)
61			**25** (143.21)
29			**26** (141.61)
1			**29** (138.25)
28			**30** (128.05)
62			**33** (125.32)
17			**34** (124.82)

in these preliminary, exploratory analyses that will require further analysis and investigation if it is to be more fully understood.

Despite this, schools that fell into the top and/or bottom quartiles were subjected to further comparisons. More specifically, a MS Excel spreadsheet was created to chart selected characteristics of schools in the top and bottom quartiles. This included 24 school and environmental education program characteristics drawn from the sampling process, Screening Survey, School Information Form and corresponding National Center for Educational Statistics Database, and Program Information Form (i.e., factors on which there was only one value for

each characteristic). Data gathered on the Teacher Information Form were not included in these comparisons because multiple teachers in each grade level completed these forms (i.e., there was no simple one-to-one correspondence, so comparisons involving teacher data would require more in-depth analyses).

Simple visual comparisons of the schools in these quartiles on these 24 characteristics yielded some interesting, but very preliminary findings. Few, if any, apparent differences were found between top and bottom quartile schools on 17 of those 24 characteristics. On the other hand, some apparent differences were found on seven of those 24 characteristics. A summary of information on these characteristics for each school is presented in Table 25.

The third column of Table 25 identifies the type of school (**Type**), as well as the grade levels within each school (**Levels**) in the top and bottom quartiles. Of the seven private schools included in the Phase Two sample, five had grade-level cohorts included in the top quartile. Two of these five schools also had grade-level cohorts included in the bottom quartile. While this is a small sub-sample of private schools, there does appear to be a disproportionate number of this type of school falling within the top quartile.

The fourth column in Table 25 presents data on the total number of students enrolled in each school (**Total Enrollment**). Of the 17 schools in the top quartile, 10 (59%) had total student enrollments of less than 300, while only 7 of the 23 (30%) schools in the bottom quartile had a total school enrollment of this size. On the other hand, 5 of the 17 schools in the top quartile (29%) had a total student enrollment of greater than 500 students, while 11 of the 23 schools in the bottom quartile (48%) had a total student enrollment of that size.

The fifth column in Table 25 presents data on two indicators of the ethnic composition of the student body in each school: the percent of white (Caucasian) students and the percent of non-white (non-Caucasian) students **(Ethnicity)**. In all 17 of the schools in the top quartile, 50% or more of each school's student body was white, and in only two of these schools (12%) was the percent of non-white students 40% or greater. On the other hand, in 14 of the 23 schools in the

Table 25

Selected Characteristics That Appear to Differentiate Between Schools in the Top and Bottom Quartiles

Schools and Grades in the Top Quartile

ID	Top Qrtl. Grades	Type, Levels	Total Enrollment	% Ethnicity White	% Ethnicity Non-White	% Free Lunch	Curriculum Organization	Organization of Teachers	Program Duration (weeks)
3	6-8	Pub 6-8	919	61	39	17	Themes-Intgr..	Departmental	40-45
9	6-7-8	Pub 6-8	1394	92	8	9	Other	Cross-Disc. Teams	36
24	6	Pri Ind 6-8	182	50	50	NA	Other	Cross-Disc. Teams	28
29	7	Pri Ind PK-12	200	88	12	NA	Sep. Subjects	Departmental	12
33	6-7	Pub Lab 6-8	168	86	14	0	Themes-Intgr.	Cross-Disc. Teams	36
35	6	Pub 6-8	604	95	5	3	Other	Cross-Disc. Teams	
37	6	Pub 3-6	316	68	32	6	Theme-Sep.	Departmental	16
38	7	Pub 6-8	769	92	8	21	Themes-Intgr.	Cross-Disc. Teams	26
39	8	Pub K-8	224	54	46	22	Themes-Intgr.	Departmental	35
43	8	Pub 6-8	66	61	39	NA	Themes-Sep.	Self-Contained	wkly
46	6-7-8	Pub K-8	360	77	23	5	Themes-Sep.	Other	40
47	7-8	Pub 7-8	20	85	15	2	Themes-Intgr.	Other	36
50	6-7	Pub 6-8	828	96	4	7	Themes-Intgr.	Self-Contained	28
53	7-8	Pri Ind 7-8	38	95	5	NA	Themes-Intgr.	Cross-Disc. Teams	12
59	8	Pub 6-8	265	61	39	19	Sep. Subjects	Cross-Disc. Teams	36
60	6	Pri Rel 6-12	262	80	20	NA	Themes-Sep.	Cross-Disc. Teams	wkly
61	6-7	Pri Rel K-8	160	88	12	NA	Other	Self-Contained	36

Schools and Grades in the Bottom Quartile

ID	Top Qrtl. Grades	Type, Levels	Total Enrollment	% Ethnicity White	% Ethnicity Non-White	% Free Lunch	Curriculum Organization	Organization of Teachers	Program Duration (weeks)
1	8	Pub 7-12	228	96	4	51	Themes-Intgr.	Dept. & Cross-Disc.	35
6	6-7-8	Pub K-8	951	43	57	36	Themes-Intgr.	Departmental	30
12	7	Pub 7-8	119	96	4	11	Themes-Sep.	Self-Contained	4
13	6	Pub 6-8	1211	65	35	9	Themes-Intgr.	Departmental	25
14	6-7	Pub 6-8	652	63	37	40	Sep. Subjects	Departmental	6
16	7	Pub PK-12	740	54	46	16	Themes-Intgr.	Departmental	40-45
17	8	Pub 6-8	626	43	57	67	NA	NA	20
21	7	Pub 5-8	705	88	12	10	Themes-Sep.	Cross-Disc. Teams	5
28	8	Pub 6-8	620	47	53	50	Themes-Intgr.	Departmental	36
29	8	Pri Ind PK-12	200	88	11	NA	Sep. Subjects	Departmental	12
32	6	Pub K-6	495	4	96	39	Themes-Intgr.	Departmental	40
38	7	Pub K-8	224	92	8	74	Themes-Intgr.	Cross-Disc. Teams	26
41	6	Pub PK-6	373	60	40	73	Themes-Intgr.	Departmental	40
42	7	Pub 6-8	438	97	3	46	Themes-Intgr.	Departmental	6
44	6	Pub 6-8	227	88	12	57	Themes-Sep.	Dept. & Cross-Disc.	wkly
49	7-8	Pub 6-8	1307	49	51	21	Sep. Subjects	Departmental	36
51	6-7-8	Pub 6-8	678	12	88	75	Sep. Subjects	Self-Contained	36
54	6	Pub 6-8	572	73	27	35	NA	NA	15
57	7-8	Pub 6-8	357	10	90	72	Sep. Subjects	Self-Contained	wkly
58	6	Pub 6-7	449	47	53	48.5	Sep. Subjects	Departmental	4
61	8	Pri Rel K-8	160	88	12	NA	Other	Self-Contained	36
62	8	Pub 6-8	933	19	81	52	Themes-Intgr.	Departmental	12
63	7-8	Pub 6-8	213	90	10	20	Themes-Sep.	Cross-Disc. Teams	wkly

bottom quartile (61%) 50% or more of the student body was white, and in 11 of those schools (48%) the percent of non-white students was 40% or greater.

The sixth column in Table 25 presents data on the percent of students in each school's student body that were eligible for federal support through that school's free lunch program **(% Free Lunch)**. This is often used by researchers as an indicator of the socio-economic status of the student body, their families, and the neighboring community. In none of the 17 schools in the top quartile did the percent of students eligible for the free lunch program exceeded 25%. On the other hand, in 15 of the 23 schools in the bottom quartile (65%), the percent of students eligible for the free lunch program was equal to or greater than 35%.

The seventh column in Table 25 presents the primary mode of curriculum organization in use in the environmental education program in each school (**Curriculum Organization —** as separate subjects, common themes in separate subjects, common themes through integration of subjects, or other). Of these choices, *separate subjects* was selected by only two of the schools in the top quartile (12%), but was selected by six of the 23 schools in the bottom quartile (26%).

The eighth column in Table 25 identifies the primary manner in which teachers within the environmental education program in each school were organized (**Organization of Teachers —** self-contained, departmentalized, cross-disciplinary teams, or other). Of these choices, *cross-disciplinary teams* was selected by eight of the 17 schools in the top quartile (47%), but was selected by only five of the 23 schools in the bottom quartile (22%). Further, departmentalized was selected by only four of the 17 schools in the top quartile (24%), but was selected by 14 of the 23 schools in the bottom quartile (61%).

The last column in Table 25 presents information about the duration of the environmental education program in each school (**Program Duration** in weeks). Of the 17 schools in the top quartile, none reported a program duration of fewer than 12 weeks, while 5 of the 23 schools in the bottom quartile reported a program duration of fewer than 12 weeks (22%). Further, only three of 17 schools in the top quartile reported a program duration of fewer than 26 weeks (18%),

while 10 of the 23 schools in the bottom quartile reported a program duration of fewer than 26 weeks (48%).

In summary, on a very preliminary basis, there appear to be differences in the types of schools, student body characteristics, curricular and instructional organization, and program duration within schools in these quartiles. More in-depth analyses of these and other data are needed in order to develop a clearer and more complete understanding of whether and in what manner apparent differences such as these may influence student levels of environmental literacy. Finally, there exists a need to explore hypothesized relationships regarding the degree to which these and other selected variables influence the development of environmental literacy in students.

CONCLUSIONS AND DISCUSSION

This section will present conclusions related to the two research questions that guided Phase Two as well as a discussion of these findings.

Conclusions for Research Question One

Research Question One

What is the level of environmental literacy of sixth-, seventh-, and eighth-grade students across the U.S., who participated in exemplary environmental programs at their schools, on each of the following variables: ecological knowledge, verbal commitment, actual commitment, environmental sensitivity, general environmental feelings, and environmental issue and action skills*?*

Findings Related to Student Means on Parts of the *MSELS*

The measure of Ecological Knowledge resulted in a sixth-grade mean of 11.41, a seventh-grade mean of 11.89, and an eighth-grade mean of 12.18. Since the part of the instrument that measured this variable had a point range from 0 to 17, these means represent from 67% to 72% of possible points. Three dimensions of Environmental Affect were measured on the *MSELS.* Average scores for Verbal Commitment, (with a range of 12 to 60) included 45.27 for the sixth grade, 43.34 for the seventh grade, and 42.83 for the eighth grade (71% to 75% of possible points). Results related to a second affective dimension, Environmental Sensitivity (with a range of 11 to 55) followed this same pattern, with a sixth-grade mean of 33.00, a seventh-grade mean of 31.88, and an eighth-grade mean of 31.03 (52% to 60% of possible points). Average scores on General Environmental Feelings the third dimension of affect (with a range of 2 to 10) included a sixth-grade mean of 8.60, a seventh-grade mean of 8.41, and an eighth-grade mean of 8.30 (83% to 86% of possible points).

There were also three parts of the *MSELS* that measured issue-related Cognitive Skills. Issue Identification (with a range of 0 to 3) yielded a sixth-grade mean of 1.08, a seventh-grade mean

of 1.07, and an eighth-grade mean of 1.17 (36% to 39% of possible points). For Issue Analysis (with a range of 0 to 6), the sixth-grade mean was 2.75, the seventh-grade mean was 2.83, and the eighth-grade mean was 2.97 (46% to 50%). Action Planning (with a range of 0 to 20) yielded a sixth-grade mean of 7.47, a seventh-grade mean of 7.49, and an eighth-grade mean of 7.89 (37% to 39%). Actual Commitment, a measure of self-reported environmental behavior, had a range of 12 to 60. The sixth-grade mean for the variable was 40.85, the seventh-grade mean was 38.52 and the eighth-grade mean was 38.30 (64% to 68%).

Findings Related to Environmental Literacy Component Means of Grade-level Cohorts

Another way to compare these two samples was across grade-level cohort means. A grade-level cohort represented all students at a designated grade level within a school. On the component, Ecological Knowledge, the mean of the Phase Two sixth-grade cohorts was 41.68, that of the seventh-grade cohorts was 41.11 and that of the eighth-grade cohorts was 43.77. Each of these means fell in the high range for that component (41 to 60). On the component, Environmental Affect, the sixth-grade cohort mean was 42.11, the seventh-grade cohort mean was 41.14, and the eighth-grade cohort mean was 40.86. The means of the sixth- and seventh-grade cohorts fell in the high range (41 to 60). The mean of the eighth-grade cohorts fell just below this high range. On the component, Cognitive Skills, the sixth-grade cohort mean was 24.94. The seventh-grade cohort mean was 26.50, and the eighth-grade cohort mean was 28.27. All three of these means fell within the moderate range for this component (21 to 40). On the component, Environmental Behavior, the mean of the sixth-grade cohorts was 40.90, that of the seventh-grade cohorts was 39.89 and that of the eighth-grade cohorts was 39.46. All three of these means were in the moderate range (28 to 44). On the Environmental Literacy Composite Score, the sixth-grade cohort mean was 149.64, the seventh-grade cohort mean was 151.65, and the eighth-grade cohort mean was 152.35. Each of these means fell in the moderate range (97 to 168).

Conclusions for Research Question Two

Research Question Two

How does the level of environmental literacy of students in these programs compare to the baseline level of environmental literacy of sixth- and eighth-grade students across the U.S. (Phase One)?

Findings Related to Comparisons of Sixth- and Eighth-grade Student Samples

The Phase One baseline sample included sixth and eighth graders only. The Phase Two purposeful sample included sixth, seventh, and eighth graders. Because, there was no seventh grade sample within the Phase One baseline study, all comparisons related to the second research question will be made across the sixth- and eighth-grade samples only.

Z-tests were used to compare the means of the Phase Two purposeful sample with those of the Phase One random sample ($p < .006125$). At the sixth-grade level, the Phase Two purposeful sixth grade sample significantly outscored the Phase One baseline sixth-grade sample on five of the eight environmental literacy variables (knowledge, verbal commitment, environmental sensitivity, general environmental feelings, and environmental behavior). The Phase One baseline sixth-grade sample significantly outscored the Phase Two purposeful sample on issue identification. The Cohen's *d* analyses indicated that small effect sizes (small differences) were found for environmental behavior and general environmental feelings (two variables on which the purposeful sixth-grade sample significantly outscored the random sixth-grade sample), as well as for issue identification (the one variable on which the random sample significantly outscored the purposeful sample). The Cohen's *d* values for knowledge, verbal commitment, environmental sensitivity, and action planning, although favoring the purposeful sample, were negligible, indicating a negligible educational difference.

Z-test comparisons indicated that eighth graders in the Phase Two purposeful sample significantly outscored the Phase One baseline sample on five of eight environmental literacy variables (knowledge, verbal commitment, environmental sensitivity, general environmental feelings, and environmental behavior). The Phase One eighth graders significantly outscored the

Phase Two eighth graders on issue identification. The Cohen's *d* analyses of the above results indicated that small effect sizes (small differences) were found for environmental behavior and general environmental feelings (two variables on which the purposeful eighth-grade sample significantly outscored the random eighth-grade sample). The Cohen's *d* values for knowledge, verbal commitment, environmental sensitivity, and action planning, although favoring the purposeful sample, were negligible indicating a negligible educational difference.

Findings Related to Comparisons of Sixth- and Eighth-grade School Cohort Samples

T-test comparisons were used to determine significant differences on environmental literacy component and composite scores between the Phase Two purposeful sample and the Phase One random sample for both sixth- and eighth-grade cohorts. For the sixth grade cohorts, statistically significant differences ($p < .01$) favoring the Phase Two purposeful sample were observed on the Environmental Affect and Environmental Behavior components. For the eighth-grade cohorts, statistically significant differences ($p < .01$) favoring the Phase Two purposeful sample were observed on the Environmental Affect and Environmental Behavior components, and on the Composite score.

We also analyzed the differences between Phase One and Phase Two samples by plotting the Phase One and Phase Two distribution curves of the environmental literacy component and composite scores. These analyses allowed for a direct comparison between the two samples and permitted visual representation of the effect size (Cohen's *d*), an indicator of practical or educational significance. Figures 9 through 16 presented comparisons of the Phase One and Phase Two grade level distribution curves, means, and standard deviations on a component by component basis, along with the effect size that resulted form each Cohen's *d* analysis (see pp. 83 through 90). Within each figure, effect size is represented by the distance between the dotted lines that indicate the means for Phases One and Two.

For the components of knowledge, affect, skills, and behavior, the sixth-grade effect sizes (Cohen's *d*s) were + .30, + .48, - .087, + .80, respectively. [Note: the negative effect size associated with skills favored the baseline sample.] The Cohen's *d* values indicated a small effect size for the knowledge and affect components, a negligible effect size for the skills component,

and a large effect size for the behavior component. For the components of knowledge, affect, skills, and behavior, the eighth-grade effect sizes (Cohen's *d*s) were + .52, + 1.01, + .34, and + 1.27, respectively. While there was a small effect size for the cognitive skills component at the eighth-grade level, there was a medium effect size for the knowledge component, and large effect sizes for the affect and behavior components.

Figure 17 presents the comparison between the distribution of composite scores for all sixth-grade cohorts in the Phase One random sample and that of all sixth-grade cohorts in the Phase Two purposeful sample. The Phase Two sixth-grade composite mean of 149.64 was greater than the Phase One sixth-grade composite mean of 143.65. The Cohen's *d* analysis yielded a small effect size (*d* = .37), indicating that the difference between these distributions was of small practical or education significance.

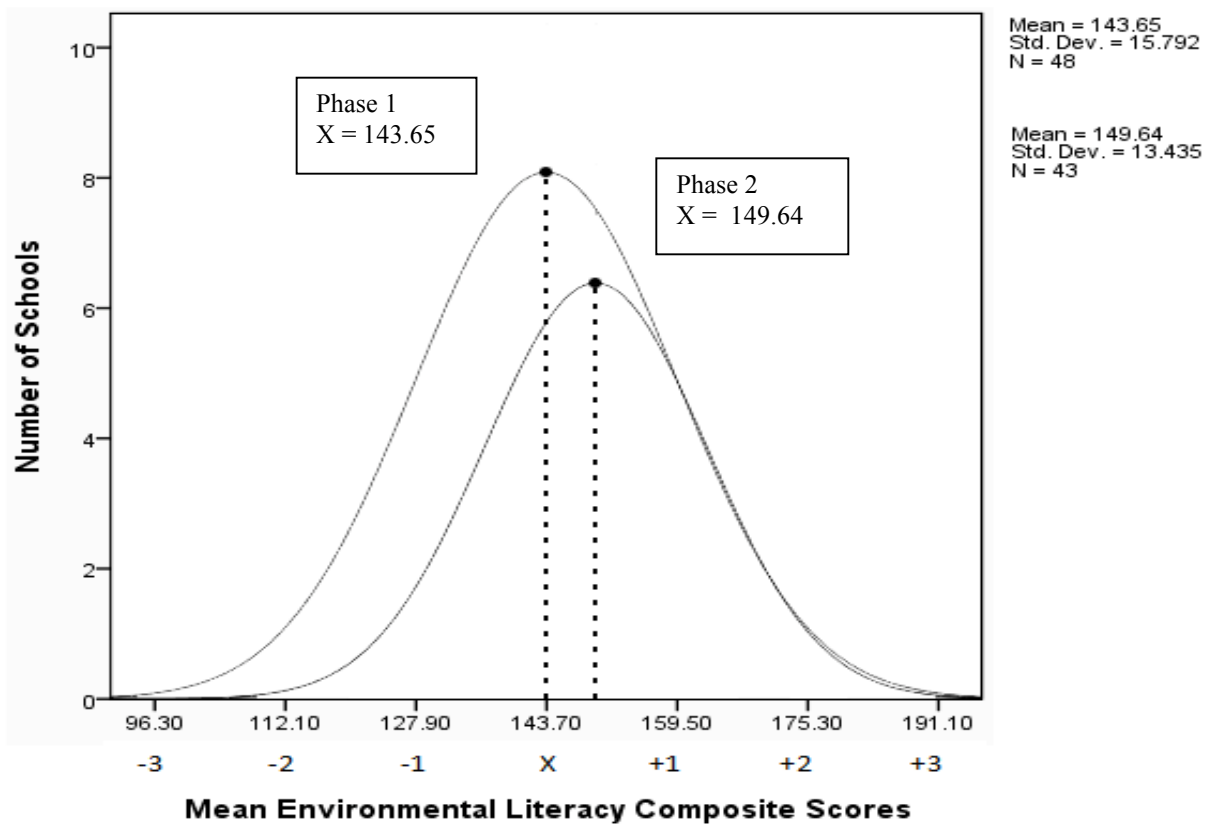

Figure 17. Phase One and Phase Two Distribution Curves of the composite scores for all schools with sixth-grade students. Effect size is represented by the distance between the dotted lines.

Figure 18 presents the comparison between the distributions of composite scores for all eighth-grade cohorts in the Phase One random sample and all eighth-grade cohorts in the Phase Two purposeful sample. The Phase Two eighth-grade composite mean of 152.35 was greater than the Phase One eighth-grade composite mean of 140.32. The Cohen's *d* analysis yielded a medium effect size (*d* = .79), indicating that the difference between these two distributions was of medium practical or education significance. However, it should be noted that this statistic approached the value of *d* =.80, the threshold of large significance as suggested by Cohen (1988, p. 25).

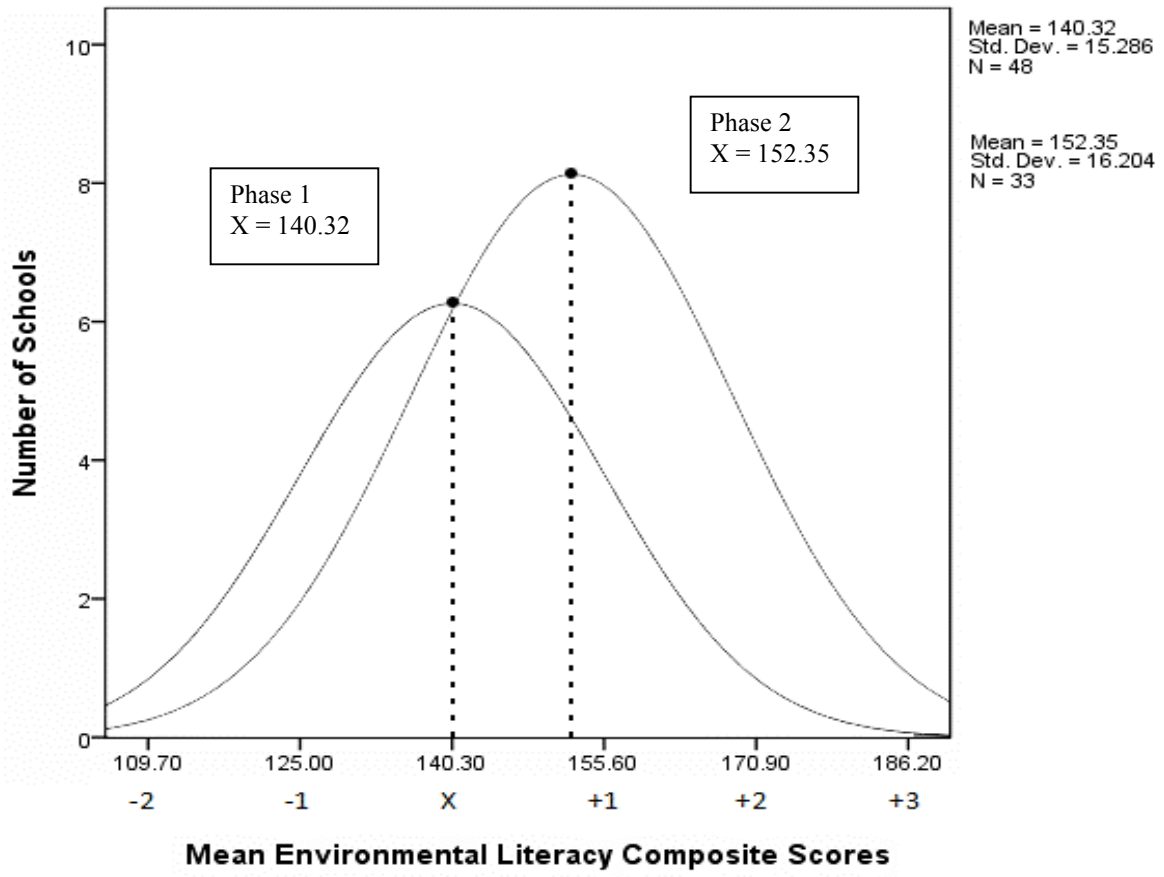

Figure 18. Phase One and Phase Two Distribution Curves of the composite scores for all schools with eighth-grade students. Effect size is represented by the distance between the dotted lines.

Discussion

It appeared that students in schools with environmental education programming followed patterns similar to those of their counterparts in the baseline study on measures of specific environmental literacy variables. For the most part, older students out-scored younger students on variables that focused on performance (i.e., that asked students to demonstrate knowledge [ecological knowledge] or skills [issue identification, issue analysis, action planning]), as might be expected due to developmental differences. The reverse of this was observed on the variables associated with self-reports (verbal commitment, environmental sensitivity, general environmental feelings and environmental behavior). On each of these self-reported variables, a scoring progression was observed, with younger students achieving higher scores than older students, That is, sixth graders achieved higher scores than seventh, and seventh graders achieved higher scores than eighth graders.

When we consider the major components of environmental literacy, it appears that students participating in the environmental education programming in schools in this sample have a high level of environmental knowledge; all grade level means that fell within the high range for this component. Although sixth and seventh graders also appear to have a high level of environmental affect, this is not the case for eighth graders, who apparently drop off somewhat in their feelings for the environment. Sixth, seventh and eight graders all report moderate levels of pro-environmental behavior, and all three grade levels are lowest in terms of cognitive skills. It is troubling to note that those issue-related skills, whether measured as discrete variables or as a combined component, were among the lowest scores reported on the *MSELS*. This finding is problematic in the face of the serious environmental conditions and issues with which humankind wrestles, issues that demand critical and reasoned responses. At this point, it appears that the most obvious weakness in environmental education programming may lie in this area.

The comparisons between the baseline and purposeful sample resulted in a number of interesting and intriguing findings. It appears that students in schools with environmental education programming have significantly higher levels of the specific environmental literacy on the variables of ecological knowledge, verbal commitment, environmental sensitivity, environmental feelings, and actual commitment (behavior), than their counterparts from the random sample. It

also appears that the two samples were similar in the area of cognitive skills, except for the issue identification variable. Students in the baseline sample appear to have significantly higher levels of this environmental literacy variable than those from schools with environmental education programming.

The profiles for both samples are similar as regards the major components of environmental literacy. In a relative sense, sixth graders in schools with environmental education programming, as well as sixth graders students in general, have a higher level of affect than of ecological knowledge and a higher level of ecological knowledge than of behavior. Eighth graders in schools with environmental education programming, as well as eighth graders students in general, have a higher level of ecological knowledge than that of affect and a higher level of affect than that of behavior. For both sixth and eighth graders, levels of cognitive skills are lower than those of the other three components. We must also note that, although similar, the profile for the purposeful sample of schools random sample of schools appears to be somewhat elevated over the profile of the random sample of schools.

Implications and Future Study

The results of this study provide pertinent information concerning how environmental education is being implemented in selected schools across the United States. The Phase Two study was originally designed to place schools into categories according to the curricular or instructional model they used in their environmental education programming. It soon became apparent that very few schools within the sample had a program that was wholly, or even mostly, based on one environmental education curricular or instructional model. This means that there were few "pure" methods of delivering environmental education among the schools in this study. Instead, most school-based environmental education programs were comprised of a mixture of resources and models. These mixtures disallowed programmatic comparisons within the scope of this study and warrant further examination.

The results of this Phase Two study also provide insight into the development of environmental literacy variables by students from middle schools with environmental education programming. The comparisons of component and composite mean scores indicate that many of these schools

are experiencing success in their efforts to help students develop the knowledge and affective characteristics of environmental literacy. These comparisons, however, also suggest a need to improve cognitive skills associated with environmental literacy.

The differences between the Phase One and Phase Two samples may most easily be seen in the effect sizes associated with the distribution curves of the component means. It appears reasonable that the effect sizes (Cohen's *d*) for the eighth graders are larger in magnitude than those of the sixth graders. In many of the schools in the purposeful sample, the sixth graders were at the entry level in an environmental education program. In 27 of the schools in the purposeful sample (42%), the eighth graders had experienced one or two prior years of environmental education programming. Thus, we might expect to see larger differences between the purposeful and random sample at the eighth-grade level than at the sixth grade level, as students "grow" in their environmental literacy through cumulative efforts in environmental education.

For purposes of exploratory analysis, composite scores were used to segment the purposeful sample into quartiles at each grade level. Of particular interest were the top (high performing) and bottom (low performing) schools. An exploratory analysis of demographic and instructional information related to these schools indicated that at least seven school and program characteristics appeared to differentiate between schools in the top and bottom quartiles. Prominent among these were the ethnic composition of the student body, the proportion of students eligible for the schools' free and reduced lunch program, the manner in which teachers were organized for instructional purposes, and the duration of the program. These and other characteristics bear more careful analysis and further investigation.

It appears that students participating in school-based environmental education programming have higher levels of environmental knowledge, and indicated higher levels of environmental affect and behavior than their counterparts in the baseline study. We do not know whether this is a result of the environmental education programming itself, or of the extent to which other influences might impact environmental literacy (e.g., social, familial, teacher-related, etc.). Secondary analyses of data already collected through the course of Phase One and Phase Two of

the NELA project may help to answer these and additional questions. To what extent does familial environmental sensitivity influence student sensitivity? What role, if any, do school- and community-related demographic and social variables play in the development of environmental literacy? To what extent are teacher variables important in the development of environmental literacy? What are the programmatic (curricular and instructional) variables that impinge on its development? In order to understand the nuances inherent in the development of environmental literacy, an in-depth and exploratory study of high performing schools identified in the two initial phases of NELA may serve as a rich source of answers to important questions concerning the development of environmental literacy.

We still have much to learn about the development of environmental literacy. Although it appears that middle schools can increase the development of environmental literacy across several dimensions (variables and components), we are only beginning to understand the conditions that may enhance this developmental process and make it even more effective.

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APPENDICES

Appendix A

Compliance with Human Subjects Protection

RESEARCH INVOLVING HUMAN SUBJECTS
Expedited/Full Application

This information listed below should be submitted to Florida Tech's IRB if the proposed research has more than minimal risk (none of the Exempt conditions apply) or if the research utilizes a special population (children, prisoners, institutionalized individuals, etc.).

Part 1 – General Information

Title of Project:	Measuring the Effectiveness of North American Environmental Education Programs with Respect to the Parameters of Environmental Literacy [Phase 2 of the National Env. Literacy Assessment Project]
Date of Submission:	April 6, 2009
Expected Project Start Date:	April 20, 2009
Expected Project Duration:	Data Collection: to June 20, 2009; Final Reporting: to Sept. 1, 2010

Principal Investigator:	Dr. Bill McBeth
Title:	
Academic Unit:	Department of Teaching, University of Wisconsin - Platteville
Phone:	(608) 342-1284
Email:	mcbeth@uwplatt.edu

Co Investigator:	Dr. Tom Marcinkowski
Title:	Associate Prof., Science and Environmental Education
Academic Unit:	Science and Mathematics Education Department
Phone:	674-8946
Email:	marcinko@fit.edu

Co Investigator:	Dr. Trudi Volk
Title:	Executive Director
Academic Unit:	Center for Staff Development, INstruction, and Evaluation (CISDE)
Phone:	(618) 457-8927
Email:	CISDE@midwest,net

Part 2 - Project Sponsorship Information (current or planned)

1. Is the research to be funded with federal funds, or are federal funds being applied for?

Yes	X	No		Name of Funding Source	NOAA, U.S. Dept. of Commerce

If yes, please provide one copy of the grant proposal.

2. Is the research to be funded by a private sponsor?

Yes		No	X	Name of Funding Source	

Part 3 - Other Study Information. This study (survey) functions as Phase 2 of a multi-year National Assessment of Environmental Literacy (NELA) Project, and has been funded under a grant from NOAA (U.S. Department of Commerce). The Year 1 or Phase 1 study, funded by U.S. EPA, was a national survey of a probability-proportional sample of 6th and 8th graders across the U.S., which was completed in 2008, and helped develop a national baseline level of environmental literacy for students in those grades.

Institutional Review Board Office
Dr. Lisa Steelman, Chair IRB
School of Psychology
(p) 674-8104
lsteelma@fit.edu
http://www.fit.edu/research/committees/irb/index.

Researcher Information

Your IRB protocol has been:

- ✓ Approved
- ☐ Approved with changes requested by IRB
- ☐ Not approved

If your protocol has been approved:

- ✓ Your research has been approved by Florida Tech's IRB for **one year** from today. If your research runs beyond this date, please submit a Continuing Review Form.
  Date: April 13, 2009
- ✓ **Changes** required by IRB:

  _____

  _____
- ✓ Should an **adverse event** that is serious and unexpected happen to a participant as a result of participating in your research study, you must submit an Adverse Events Reporting Form within 24 hours of the event.
- ✓ Your IRB identification number is: 09-020

If your protocol has NOT been approved:

- ✓ You may resubmit your protocol addressing the issues noted by the Board in the attached letter or you may submit an Appeals Form.

All forms may be found on the IRB website.

Appendix B
Materials Prepared for School Principals

Letter of Selection
School Contract – Purchase of Service Agreement
School Correspondence #3 – Request for Information
Letter to Administrators
Principal Guidelines and Procedures
Study Materials Verification Form

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

3/25/09

Dear District Administrator and Teachers,

On behalf of the National Environmental Literacy Assessment (NELA) Research Team, I am very pleased to inform you that your nomination is complete and you have been selected as one of the schools in this ground breaking study. The NELA will include approximately seventy schools and over nine thousand sixth through eighth graders. We are glad that you are among this group. The selection process was time consuming, but now we will begin to set the data gathering process in motion.

Also as an attachment to this email, you will find a service provider contract and a NELA FAQS sheet (that includes an overview of the research project). We ask that a principal or other administrator print out the contract and provide your school's FEIN number and other information as indicated. Then, it should be signed and returned it to Karen Cifranick at the address indicated on the bottom of the contract. You may also wish to keep a copy of this contract for your files.

This will set in motion the data collection phase of this research project for your school. Shortly after you return the signed contract, you will receive a package containing instructions, surveys to be completed by you and your teachers involved in the environmental program in your school, and parental permission forms. Please become familiar with all those materials and ensure that they are completed as instructed in the package.

Also within the next few weeks, you will be contacted by an individual, who is assisting us in the project as a Data Collector. The Data Collector will arrange for the administration of the student survey, the Middle School Environmental Literacy Survey (MSELS), and will work with you to coordinate the date, time, and location. On the agreed-upon date, the Data Collector will travel to your school to administer the student survey and will conduct an exit interview with you to make sure all of the necessary surveys and forms have been completed. With the completion of the forms and surveys, your school's payment will be processed by the North American Association for Environmental Education and sent to the school. In late summer or early fall 2009, your school will receive a report comparing the effects of your efforts in environmental education to our baseline results from Phase 1 of this research project.

We look forward to working with you on this important research project.

Sincerely,

William C. McBeth

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

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

DATE:
TO: **FEIN# _____**

FROM: Brian A. Day, Executive Director, NAAEE

PURCHASE OF SERVICE AGREEMENT

NELA Agreement between Middle School Principal and NAAEE

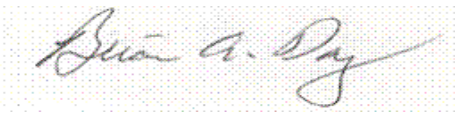
Purpose: To accomplish the successful administration of the school, teacher, program forms, and MSELS Survey with the 6th, 7th, and/or 8th grade students involved in your environmental program.

The School Administrator indicated below agrees to provide the following services from April 10, 2009 through May 31, 2009.

Description	Rate	Total
Ensure that the School Information Survey is completed; Identify participating classes of 6th, 7th and/or 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 the MSELS Survey, and that survey is completed; and Conduct exit interview with data collector to complete exit interview sheet verifying that all forms have been completed and returned.	$500 to school for educational resources	$500
TOTAL		**$500**

_____ (hereafter known as "Contractor")
(Please print Administrator's name and title.)

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

_____ Brian A. Day
(Print name here)

Contractor Executive Director

****

PLEASE COMPLETE THIS FORM AS SOON AS POSSIBLE. SIGN, DATE, AND RETURN IT TO: Karen Cifranick, Assessment Coordinator, 1915 Kingston Ave, Norfolk VA 23503

School Correspondence Email #3

I would like to thank you and acknowledge receipt of your signed contract with the NELA project. I will be sending a packet of information to your school soon via FedEx. In addition, a research assistant (data collector) will be assigned to work with you to complete the deliverables outlined in the contract. They will contact you and set up an appointment to visit your school and work with you and your administrator to determine the testing date(s).

At this point, we need additional information from you. Please read carefully the following and respond as soon as possible. Your response will help us ensure that there are sufficient materials to complete the data collection in your school. Below the section on INFORMATION NEEDED FROM YOU, you will see a section entitled RETURN TO ME. Please copy that section and paste it into a REPLY message to me. Then provide me with the appropriate numbers and send it back as soon as possible. I will base the number of copies I need for your school on your answers.

INFORMATION NEEDED FROM YOU:

1. **Number of Classes and number of Students** - In the screening survey (completed earlier by you), we asked for approximate numbers of classes and approximate numbers of students involved in your environmental program. Now, we need to know the **EXACT** number of classes and students at each grade level, so that we can determine the correct amount of Student Surveys that will be required for the assessment. [Note: These Student Surveys will be brought to your school by the Data Collector on the agreed-upon day of data collection.]

2. **Program Information Forms** – A Program Information Form should be completed for **each grade level having an environmental program** in your school. A grade level program would include all the environmental instruction and activities that students at that grade level typically experience as a part of their schooling.

In some schools, that will be one program per grade level. If one environmental program is in place at a grade level, we ask that one Program Information Form be completed for that grade level.

Other schools might have more variety with teachers at one grade level incorporating ***significantly*** different instructional elements than other teachers at that grade level. If more than one program is in place at a grade level, we ask that different Program Information Forms be completed for each of the programs at that grade level.

3. **Teacher Information Forms** – We also ask that **each teacher who is involved** in teaching in your environmental program complete a Teacher Information Form.
4. **Parental Consent Forms-** The appropriate form is required to be completed by each student prior to the survey administration date. We know that some schools and districts use an **Active Consent** process (the parents/ guardians are informed of activities such as this survey and are required to give consent in order that their child may participate). We also know that other schools and districts use a **Passive Consent** process (the parents/guardians are informed of activities such as this survey and their child may participate UNLESS they indicate otherwise). Choose which is appropriate for your students and indicate the one you require below. ***See the attached forms for further details.***
Any questions, please don't hesitate to contact me (757-480-1107).
Karen Cifranick, NELA Assessment Coordinator

- -

PLEASE COPY, PASTE, ANSWER, AND RETURN TO ME THE FOLLOWING INFORMATION:
(If the answer is zero (0) or not applicable (N/A), please indicate that in the space provided.)

1. How many **6th grade classes** are involved in an environmental program in your school?
How many **6th grade students**?

How many **7th grade classes** are involved in an environmental program in your school?
How many **7th grade students**?

How many **8th grade classes** are involved in an environmental program in your school?
How many **8th grade students**?

2. How many **Program Information Forms** should be included in your School Packet?

3. How many **Teacher Information Forms** should be included in your School Packet?
4. Which type of **Parental Consent Form** do you require? Active or Passive?

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

February 7, 2011

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 seventy 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 develop this comparison 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, 7th 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 pre-planning will make the data collection process a smooth and convenient one 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 Ms. Karen Cifranick, 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
   - 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 or Parental Passive Consent Form to be used per your district policy (to be distributed to the parents of the 6th, 7th and 8th grade students in the participating grades.)

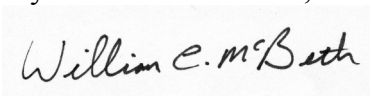
2. School Teacher Packet:
   (Separate Teachers' Envelopes are provided for each participating 6th, 7th and 8th grade teacher. These forms are to be completed by **EACH** teacher):
   - Teacher Cover Letter
   - Teacher Consent Form
   - Teacher Information Form
   - Program Information Forms: These 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, 7th and 8th grade classes. In other words, teachers should NOT summarize responses for 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 Ms. Karen Cifranick, Assessment Coordinator, at (757) 480-1107, or <cifranick@yahoo.com>.

My Sincere Thank You,



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

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 Middle School Environmental Literacy Survey (MSELS), the Data Collector (Research Assistant) working with us will be in contact with you soon 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.

You should have already received via email the School Letter of Selection, School Contract (blue) and NELA FAQ Sheet. The School Contract should have been returned to Ms. Cifranick. If you have not yet done this, please do so as soon as possible.

The School Kit includes two different packets. School Principal Packet, and the Teacher Packet(s)

School Principal Packet
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 ***Study Materials Verification Form*** is to ensure that you received and completed the proper materials. If any forms are missing, please contact the Assessment Coordinator Ms. Karen Cifranick: (757) 480-1107, or <cifranick@yahoo.com>. You will review this list with the National Environmental Literacy Assessment (NELA) Data Collector assigned to your school when you meet at the conclusion of the administration of the MSELS to your students.

Selection of Participating Classes. Your school was nominated for participation in this national study because of its environmental program, This study is not the kind in which researchers seek a random sample of classes across the nation; that was accomplished in the first phase of this national research project (2006-08; view report at <www.oesd.noaa.gov/NAEE_Report>). In this second phase of the project (2008-10), we are purposefully seeking classes that are actively involved in your school's environmental program. We welcome the participation of teachers and students in such classes at the 6th, 7th, and 8th grade levels. Fortunately, teachers who work in environmental programs like yours are often passionate about their teaching and are eager to participate in this type of study. Further, we welcome participation from all classes involved in your environmental program. However, if you need or wish to limit the number of participating classes, please select those that best exemplify your program (i.e., those with your best teachers and your best students). Once you have identified the classes that will be participating, please distribute a Teacher Envelope (below) to each teacher.

Teacher Packet(s) contains sets of materials to be completed by teachers of classes of students to whom the Middle School Environmental Literacy Survey (MSELS) is to be administered. (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.)

One Envelope has been prepared for each class of students that will be participating. Each includes a Teacher Cover Letter and a ***Teacher Consent Form*** for each teacher with major instructional responsibilities for that class. Teachers do not need to return the form.

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

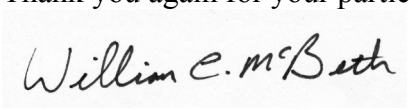
One ***Program Information Form*** should be distributed to and completed by the teacher(s) who is/are most familiar with the nature of the environmental program in each of the participating 6th, 7th, and 8th grade classes (i.e., one Program Information Form for each participating class at each grade level). In other words, teachers should **neither** summarize information for more than one class on one form, **nor** should they summarize responses for more than one grade level 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.

You should give each of the participating teachers the appropriate ***Parental Consent Form*** for each student in his or her class at least one week prior to the agreed upon survey administration date. We know that some schools and districts use an Active Consent process (the parents/ guardians are informed of activities such as this survey and are required to give consent in order that their child may participate). We also know that other schools and districts use a Passive Consent process (the parents/guardians are informed of activities such as this survey and their child may participate UNLESS they indicate otherwise). As researchers, we are required to keep active consent files on file. 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 are not required to keep passive consent forms on file. If your school uses passive consent forms, you may dispose of them after the survey is administered.

We ask that you make sure that your teachers make arrangements for an alternate activity for students whose parents do not consent to their participation. Since we request that the teacher for each class be present during the administration of the MSELS, we also 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, is encouraged to contact project personnel using contact information provided in the Teacher Consent Form.

Thank you again for your participation in this historic project.



Dr. William C. McBeth
Project Coordinator

NELA Study 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. If upon receipt any materials are missing, please contact the Assessment Coordinator, Ms. Karen Cifranick, (757) 480-1107 or cifranick@yahoo.com.; and
(b) to encourage the School Principal and the Regional 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
☐	Cover Letter to Principal	
☐	Principal General Guidelines & Procedures	
☐	School Contract & Request for Payment	☐
☐	Principal Packet: School Information Form	☐
☐	Packet for Each 6th Grade Teacher:	
	A: Cover Letter & Teacher Consent Form	
	B: Program Information Form	☐
	C: Teacher Information Forms (min. 1 per class)	☐
	D. Teacher Guidelines & Procedures	☐
☐	Packet for Each 7th Grade Teacher:	
	A: Cover Letter & Teacher Consent Form	☐
	B: Program Information Form	☐
	C: Teacher Information Forms (min. 1 per class)	☐
	D. Teacher Guidelines & Procedures	☐
☐	Packet for Each 8th Grade Teacher:	☐
	A: Cover Letter & Teacher Consent Form	☐
	B: Program Information Form	
	C: Teacher Information Forms (min. 1 per class)	☐
	D. Teacher Guidelines & Procedures	☐
☐	Parental Consent Forms:	
	* for Each 6th Grade Class	☐
	* for Each 7th Grade Class	☐
	* for Each 8th Grade Class	☐
To be distributed by the Data Collector:		
	Copies of the student survey (MSELS)	☐
	Response/Scantron Forms	☐

_____ _____

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

Appendix C
Materials Prepared for Teachers

Teacher Cover Letter
Teacher Consent Form
Script for Teacher Introduction of Data Collector

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April, 2009

Dear Participating Sixth, Seventh, 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 for your school to participate in the second phase of this important national study of environmental programs and environmental literacy; and (2nd) you have been asked by your School Principal to serve as the teacher contact for one of the participating 6th, 7th, 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 first phase of this NELA project (2006-08) was designed to help develop this benchmark for the middle grades. Now that the final report for that study has been completed (see <www.oesd.noaa.gov/NAEE_Report>), members of this research team have spent considerable time preparing for this second phase of the NELA project. We hope that our planning 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. This data collector will also make sure that all forms are signed, collected, and sent to Ms. Karen Cifranick. The packets that have been sent to your Principal contain all of the **required** forms. The packets and forms of particular relevance to you are as follows.

3. **Packet VII: School Principals** 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 or her/his designee will soon ask you to distribute this form to all parents and guardians of 6th, 7th, or 8th grade students in the participating class.

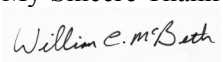
4. **Packet VII: Program and Teacher Information Packet**
A copy of this packet is to be distributed to and completed by each participating 6th, 7th, and 8th grade teacher (i.e., all of these forms are to be completed by **the lead** teacher from each participating classroom):

- Teacher Consent Form;
- Program Information Form; and
- Teacher Information Form.

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 Ms. Karen Cifranick at <cifranick@yahoo.com>.

My Sincere Thank You,



William C. McBeth, Ph.D.,
NELA Project Coordinator

TEACHER CONSENT FORM

The National Environmental Literacy Assessment Project:

Year 2 National Study of School-Based Environmental Programs and Approaches

A class in which you teach was selected to participate in a national study of environmental literacy among 6th, 7th, and 8th grade students in public and private schools across the U.S. This study is part of the "National Environmental Literacy Assessment Project," a research project funded by the Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA), and supported by the 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 study is to explore the level of environmental literacy among students in 6th, 7th, and 8th grade classes within public and private schools across the U.S. that are exposed to one or more of the selected environmental programs or approaches targeted in this study. The study sample was developed using a nomination form and a process for selecting schools that make use of each program or approach. Professionals affiliated with these programs, approaches, school systems, and schools provided extensive support during the nomination and selection process. Once selected, members of the research team asked the Principal if that school could participate in this study. If the Principal agreed, they identified the 6th, 7th, 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, and they would only contact you for clarification purposes. 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, unless we seek and you provide such permission in writing at a later date.*

It is hoped that this survey will further contribute to an understanding of environmental literacy in the middle grades across the U.S. , and the contributions of environmental programs and approaches to it. A report of this survey will be provided to the NOAA, EPA and NAAEE, and results will be presented at conferences and in research journals. The project team will forward a summary of survey results to your school. Beyond this, survey results may be used in Years 3-6 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 Ms. Karen Cifranick , Assessment Coordinator: (757) 480-1107, or <cifranick@yahoo.com> 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 D
Parental Consent

Parent Active Consent Form
Parent Passive Consent Form
Spanish Passive Consent

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ACTIVE PARENTAL CONSENT FORM

The National Environmental Literacy Assessment Project, Phase 2: National Study of School-Based Environmental Programs

Invitation to Participate

We are inviting your child to participate in Phase 2 of a national study of environmental literacy among 6th, 7th, 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 the National Oceanic and Atmospheric Administration (NOAA), and supported by 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 study is to explore the level of environmental literacy among students in 6th, 7th, and 8th grade classes within public and private schools across the U.S. that are exposed to one or more of the various type of environmental programs targeted in this study. The survey to be used in this study 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? Members of the research team identified a sizable number of recognized environmental programs. A nomination form was circulated widely to help identify schools that offered such a program, and a follow-up survey was used to confirm school interest and collect needed information about each school's environmental program. Then, a process for selecting these schools was developed. Professionals affiliated with these programs, school systems, and schools provided extensive support during the nomination and selection process. Once selected, members of the research team asked authorized School District and/or School Administrators if their school could participate in this study. If the Administrator agreed, then all 6th, 7th, and 8th grade classes in that school's environmental program were invited to participate in this study. Your child is in one of those classes.

3. What is involved in participating? Students will be asked to complete a 50-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. **At no time will your child be identified in the study.**

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. and the contribution of these selected environmental programs to that end. A formal report of this Phase 2 study will be provided to NOAA, EPA, and NAAEE, and survey results will be presented at conferences and in research journals. 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 study may be used: (a) in conference presentation, research journals, and other project reports; (b) to guide research plans for Phases 3 of this project; (c) as part of the analysis and interpretation of results from Phases 1 through 3 of this project; and (d) 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 study***.

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, please understand that your child's **participation is voluntary**; i.e., you have the right to refuse to allow your child to participate in this study**.** Refusal to participate will involve no penalty or loss of benefits to which your child is entitled. Further, you may withdraw your child from participation at any time without penalty or loss of benefits. Finally should you refuse to allow or withdraw your child's participation in this survey, 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 Ms. Karen Cifranick, Assessment Coordinator, by phone or email: (757) 480-1107 or <cifranick@yahoo.com>. 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 my child to participate in this survey.

_____ _____

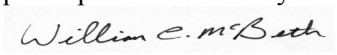
Parent's or Legal Guardian's Signature Date

_____ _____

Print Name of Parent or Legal Guardian Print of 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.



_____ March 30, 2009

Project Director's Signature Date

William C. McBeth

Project Director

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Tel: (202) 419-0412 Fax: (202) 419-0415
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The National Environmental Literacy Assessment Project, Phase 2:
National Study of School-Based Environmental Programs

Your child was selected to participate in Phase 2 of a national study of environmental literacy among 6th, 7th, 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 carefully.*

The purpose of this study is to explore the level of environmental literacy among students in 6th, 7th, and 8th grade classes in public and private schools across the U.S. who are exposed to one or more of the environmental programs targeted in this study. Members of the research team identified a large number of recognized environmental programs. A nomination form was circulated widely to identify schools that offered such a program, and a follow-up survey was used to confirm school interest and collect needed information about each school's environmental program. Then, a process for selecting these schools was developed. Professionals affiliated with these programs, school systems, and schools provided extensive support during the nomination and selection process. Once selected, members of the research team asked authorized School District and/or School Administrators if their school could participate in this study. If the Administrator agreed, then all 6th, 7th, and 8th grade classes in that school's environmental program were invited to participate in this study. Your child is in one of those classes.

The 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. It 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 50 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. and the contribution of these selected environmental programs and approaches to that end. A report of this study will be provided to NOAA, EPA, and NAAEE, and results will be presented at conferences and in research journals. 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 Phases 3 and 4 of this project, as well as to guide improvements to environmental education programs for the middle grades.

Please understand that your child's **participation is voluntary.** Refusal to participate will involve no penalty or loss of benefits to which your child is entitled. Further, please understand that you may withdraw your child from participation at any time without penalty or loss of benefits to which your child is entitled.

If you agree to allow your child to participate in this survey, nothing further needs to be done.

If you do <u>not</u> want your child to participate in this survey, please: (1) check the box below; (2), fill-in, sign and date the bottom portion of this form; and (3) have your child return this form to his or her teacher. If you do this, your child will participate in an alternative activity designed by the school during the survey.

Finally, you have the right to ask questions about this study at any time. To do so, you may contact Ms. Karen Cifranick: (757) 480-1107, or <cifranick@yahoo.com> or Dr. Bill McBeth, Project Dir., University of Wisconsin - Platteville: (608) 342-1284 or <mcbeth@uwplatt.edu>. You may also 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 my child or ward to participate in the survey.

_____	_____	_____
Name of Child or Ward	Signature of Parent or Guardian	Date

_____	_____
Signature of Investigator	Date

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El Proyecto Nacional de Valoración de Conocimientos Ambientales, Fase 2: Estudio Nacional de Programas Ambientales Basados en Escuelas

Su niño(a) fué elegido(a) para participar en la Fase 2 de un estudio nacional de conocimientos ambientales entre estudiantes de 6º, 7º, y 8º grado en escuelas públicas y privadas a través de los Estados Unidos. Este estudio es parte del "Proyecto Nacional de Valoración de Conocimientos Ambientales**,"** un proyecto de investigación fundado por la Agencia de Protección Ambiental (EPA), y apoyado por la Administración Oceánica y Atmosférica Nacional (NOAA) y la Asociación Norteamericana para la Educación Ambiental (NAAEE). *La información a continuación cubre los requerimientos de consentimiento de los padres requeridos para este studio. Por favor léa esta información cuidadosamente.*

El propósito de este estudio es la exploración del nivel de conocimientos ambientales entre estudiantes de 6º, 7º, y 8º grado en escuelas públicas y privadas a través de los Estados Unidos quienes están expuestos a uno o más de los programas a los cuales este estudio está enfocado. Miembros del equipo de investigación identificaron un gran número de programas ambientales. Un formato nominatorio fué ampliamente circulado para identificar escuelas que ofrecen estos programas, y una encuesta en seguimiento fué utilizada para confirmar el interés de las escuelas y para recolectar información necesaria acerca del programa ambiental de cada escuela. Después se desarrolló un proceso para elegir estas escuelas. Profesionales afiliados con estos programas, sistemas educativos, y escuelas proveyeron apoyo extenso durante el proceso de nominación y selección. Una vez seleccionada, los miembros del equipo de investigación preguntaron a Adminstradores autorizados de la Escuela y/o el Distrito Escolar si su escuela podría participar en este estudio. Si el Administrador dió su acuerdo, todas las clases de 6º, 7º, y 8º grado en el programa ambiental de esa escuela fueron invitadas a participar en este estudio. Su niño(a) está en una de esas clases.

El estudio en papel y lápiz consiste de siete secciones y está diseñado para recolectar información sobre el conocimiento ambiental, habilidad, características afectivas (sentimientos) y participación, además de su edad, sexo, y etnicidad. Este estudio será administrado por uno de los Recolectores de Data del proyecto en un escenario escolar aprobado por el Director de la Escuela durante horas normales de operación y tomará aproximadamente 50 minutos para completar.

El estudio y el Recolector de Data no preguntarán por el nombre de su hijo(a), y si algún niño(a) escribiese su nombre en el formato de respuesta, su nombre será borrado. *Luego entonces, nadie en el equipo del proyecto conocerá el nombre de su hijo(a) o será capaz de relacionar las respuestas de su hijo(a) con el o ella. Adicionalmente, las respuestas individuales de cualquier estudiante nunca serán presentadas por sí mismas en reportes o presentaciones de los resultados de este estudio.*

Se espera que este estudio resulte en un entendimiento mejorado de los conocimientos ambientales en los grados de educación media a través de los Estados Unidos y de las contribuciones de estos selectos programas ambientales y esfuerzos a ese fín. Un reporte de este estudio será entregado a NOAA, EPA, y NAAEE, y los resultados serán presentados en conferencias y publicaciones de investigación. El equipo del proyecto mandará un resumen de los resultados del estudio a la escuela de su hijo(a). Más allá de esto, los resultados podrán ser usados en las Fases 3 y 4 de este proyecto, así como servir de guía para mejorar los programas de educación ambiental de los grados de educación media.

Por favor entienda que la **participación de su hijo(a) es voluntaria**. La negación a participar de ninguna manera ocasionará penalidades o pérdida de beneficions a los cuales su hijo(a) tiene derecho. Además, por favor entienda que usted puede retirar a su hijo(a) de la participación en el estudio en cualquier momento sin penalidades o pérdida de beneficions a los cuales su hijo(a) tiene derecho.

Si usted autoriza a su hijo(a) a participar en este estudio, no tiene que hacer nada más.

Si usted no desea que su hijo(a) participe en este estudio, por favor haga lo siguiente: (1) marque el recuadro de abajo; (2)complete y firme con fecha la porción inferior de esta cédula; y (3)haga que su hijo(a) entregue esta cédula a su maestro(a). Si usted hace lo anterior, su hijo(a) participará en una actividad alterna diseñada por la escuela mientras el estudio toma lugar.

Finalmente, usted tiene el derecho de preguntar acerca de este estudio en cualquier momento. Para hacerlo, usted puede contactar a Ms. Karen Cifranick: (757) 480-1107, o <cifranick@yahoo.com> o al Dr. Bill McBeth, Director del Proyecto, University of Wisconsin - Platteville: (608) 342-1284 o <mcbeth@uwplatt.edu>. Usted también puede contactar a la Comisión de Revisión Institucional para la Protección de Sujetos Humanos del Florida Institute of Technology mediante su oficina de personal al (321) 674-8120.

☐ No deseo que mi hijo(a) participe en el estudio.

_____	_____	_____
Nombre del niño(a)	Firma del Padre o Guardián	Fecha

_____	_____
Firma del Investigador	Fecha

Appendix E
School, Program and Teacher Forms

School Information Form
Program Information Form
Teacher Information Form

School Information Form

Name of School: _____

School Address: _____

_____

School Principal: _____

School Phone: _____ School Fax: _____

Person(s) Completing This Form: _____

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 designations, recognitions, and network affiliations by checking or filling in all that apply in A and B, below.*

A. Primary School Designation(s)

___ Regular Public School ___ Magnet School

___ Private, Independent School ___ Charter School

___ Private, Religious School ___ School of Choice

___ Other (Please ID): _____

B. 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): _____

Item 3. Please provide any additional information or explanation for the designations, recognitions, or network affiliations identified in Item 2. (*Feel free to include additional pages if/as necessary.*)

_____

_____

_____

_____

_____

_____

_____

_____

For Items 4-8, please use information available through the central district office and your school office and, if needed, at the U.S. Department of Education's National Center for Educational Statistics (NCES) web site: <http://nces.ed.gov/globallocator/>. For the latter, please visit the main page for your school, as well as the pages accessed by clicking on "More Information" and "District Information."

Item 4. Type of Region(s) or Area(s) Served by Your School

District Description: _____

NCES Locale/Code: _____

Item 5. Your Student Enrollment for This School Year

Total Student Enrollment: _____

Student Enrollment, by Grade: 6:_____ 7:_____ 8:_____

Item 6. Your Student/Teacher (S/T) Ratio for This School Year

School S/T Ratio: _____ District S/T Ratio: _____

Item 7. Ethnicity of Your Student Body for This School Year. *Please identify the Number and/or Percent of students in each group.*

For the School Year: _____	Number	Percent
American Indian/Alaskan Native	_____	_____
Asian/Pacific Islander	_____	_____
Hispanic	_____	_____
Black (non Hispanic)	_____	_____
White (non Hispanic)	_____	_____
Other (ID): _____	_____	_____
Other (ID): _____	_____	_____

Item 8. Additional Characteristics of Your Student Body

For this school year, please enter the total number of students that fit each of the following descriptors. Under "Data Source," please indicate whether these data are from your school,district, the NCES Database, or another source. Under "School Year," please indicate the school year for which those data are reported.

The Number of Students Who Qualify ...	Data Source	School Year
_____ ... as Free Lunch Eligible	_____	_____
_____ ... as Reduced Price Lunch Eligible	_____	_____
_____ ... as Migrant Students	_____	_____
_____ ... as LEP or ESOL Eligible	_____	_____
_____ ... for Federal IDEA Funds	_____	_____
_____ ... as having Special Needs (NCLB)	_____	_____

Program Information Form

Grades 6, 7, and 8

Contact Information

Your Name: _____ Date Completed: _____

School Name: _____ Grade Level: _____

Contact Phone Number: _____ E-Mail: _____

Item 1. For the grade level you have written in above, please indicate which class(es) participate in your school's environmental program: (please check only one)

_____ only in the class or classes in this grade participating in this survey.
_____ in some, but not all, other classes in this grade.
_____ in all classes in this grade in this school.

Item 2. Name or Theme of Your Environmental Program

a. Does your environmental program have a name (title)?

___ No ___ Yes

b. If "Yes":

* if this program is school-wide or applies to several grades, the name of your environmental program is: _____

* if this program applies only to all classes in this grade, the name or theme of your environmental program is: _____

* if this program applies only to classes participating in this survey, but not to all classes in this grade, the name or theme of your environmental program is:

_____

Item 3. Involvement in and Uses of Environmental Education (EE)

a. Is the environmental program in this grade affiliated with an EE network (e.g., EIC, Earth Force, Green Schools, Earth Day, Earth Partnership, etc.)?

___No ___Yes

If 'Yes,' please name and briefly describe your participation in each network.

_____

_____

_____

b. Does your program use any specific EE curricula at this grade level (e.g., PLT, Project WILD, Project WET, Wonders of Wetlands, Windows on the Wild, IEEIA, etc.)?

___No ___Yes

If 'Yes,' please name up to three EE curricula that are most widely used.

* _____
* _____
* _____

c. Has your program consistently used any EE program or approach other than those identified in a. and b. (e.g., federal, state, or local programs; place-based, service-learning, action research; etc.)?

___No ___Yes

If 'Yes," please identify and briefly describe each major program/approach.

* _____
* _____

* _____

* _____

Item 4. Additional Major Features of Your Environmental Program

a. Briefly describe the overall purpose or goals, focus, and scope of the environmental program in the participating class(es) in this grade.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Item 5. Which of the following are included as <u>major</u> educational goals and objectives for the participating class(es) in this grade? (*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/action skills (e.g., skill in planning, implementing, evaluating, and reporting service projects; interpersonal and media skills)

Item 6. Curricular/Instructional Organization in the Participating Class(es) in This Grade

a. Which of the following <u>best</u> characterizes the <u>curriculum organization</u> in the participating class(es)? (*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 <u>best</u> characterizes the <u>organization of teachers</u> in the participating class(es)? (*Check only one)*

___ self-contained teaching

___ departmentalized teaching

___ cross-disciplinary team teaching

___ other (please describe): _____

_____

c. Which of the following are the <u>most common ways</u> in which students are <u>organized for instruction</u> in the participating class(es)? (*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 7. Which of the following <u>teaching/learning settings are used</u> in the participating class(es) at this grade? (*Check all settings that are prominently or commonly used)*

___ classrooms ___ science lab

___ computer lab ___ school library

___ school grounds ___ field trip/study sites

___ community settings

___ other (please identify): _____

Item 8. Please identify <u>up to three</u> teaching methods/strategies that are most commonly used in the participating class(es) at this grade. (*Check only three*)

_____ Lecture _____ Labs

_____ Discussion _____ Projects

_____ Cooperative Learning _____ Inquiry

_____ Hands-on _____ Service Learning

_____ Other (please identify)_____

_____ Other (please identify)_____

_____ Other (please identify)_____

Item 9. Which of the following <u>assessment approaches</u> are used in the participating class(es) in this grade? (*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 10. Briefly describe any other major features of the environmental program in the participating class(es) in this grade that are not clearly or adequately identified in previous items. (e.g., after-school clubs, school greening projects).

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for completing this form!

Teacher Information Form

Lead Instructor of the Participating Class *

(* Note: If there are multiple instructors, ask each to complete this form.)

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, K-12 (total number of years)? _____

b. ... at the middle grades level (grades 5-9)? _____

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. Are you currently certified to teach in this state? *(Check one*)

___ Yes, I am.

___ No, but I am currently working toward certification.

___ No, I am not.

Item 3. Your Teaching Certificate(s) (*continued*)

b. Please identify <u>each professional teaching certificate</u> you have earned. (*Please do not include temporary certificates*)

Early/Elementary: _____

Middle Grades: _____

Secondary: _____

Other: _____

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

* _____
* _____
* _____
* _____

Item 4. Higher Education Degrees You Earned

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

___ 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 <u>college/university courses</u> 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. Your Environmental Education (EE) Training (*continued*)

b. Over the last 10 years, about how many <u>inservices/workshops</u> 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

Appendix F
Middle School Environmental Literacy Survey

This instrument was used in Phase One of the National Environmental Literacy Assessment project, and was altered somewhat for use in this Phase Two study (see pp. 18 – 19 of the report). It is not to be used or distributed in any manner without permission from the Center for Instruction, Staff Development & Evaluation, Carbondale, IL USA <cisde@midwest.net>.

NOTE: Those interested in obtaining a copy of the 2009 version of the MSELS used in this Phase Two study should contact Dr. Bill McBeth (mcbeth@uwplatt.edu), or Drs. Harold Hungerford and Trudi Volk (cisde@midwest.net)

Middle School Environmental Literacy Survey

This Environmental Literacy Survey has several parts. Please read the directions for each part carefully. For each item, select what you think is the best answer for the item and then fill in the circle next to the letter of that answer on the response sheet. See the example below. Write only on your response sheet. Do not write your answers in this booklet or make any marks on its pages.

Example: Which one of these mammals can fly?

(a) elephant
(b) mouse
(c) bat
(d) dog
(e) not sure

You would fill in the (c) circle on the response sheet: (a) (b) ● (d) (e)

I. About Yourself

1. Please darken in the letter on your response sheet that tells us how old you are.

   a) 11 years or younger
   b) 12 years
   c) 13 years
   d) 14 years
   e) 15 years or older

2. On your response sheet, darken in the square that indicates your grade.

   a) Six b) Seven c) Eight

3. On your response sheet, darken in the square that indicates your gender.

   a) Female
   b) Male

4. Please darken in the letter on your response sheet that identifies your Ethnic/Racial background.

   a) American Indian/Alaskan Native
   b) Asian/Pacific Islander
   c) Hispanic
   d) Black, Non-Hispanic
   e) White, Non-Hispanic

II. Ecological Foundations

Directions:	On your answer sheet, darken in the letter of the response that correctly answers the question.

5. A flower with colorful petals and a sweet smell would most likely be pollinated by:

   a) rain.
   b) wind.
   c) a gardener.
   d) insects.

6. A small bird eats a butterfly that has been eating some nectar from a flower. Then the bird is eaten by a hawk. This is an example of:

   a) mutualism.
   b) a food chain.
   c) competition.
   d) survival of the fittest.

7. Which of the following is a predator-prey relationship?

   a) A flea bites a dog.
   b) A robin eats a worm.
   c) A caterpillar eats a leaf.
   d) A deer eats grass that has a grasshopper in it.

8. A fox dies. This creates a problem for:

   a) the fleas that were drinking the fox's blood.
   b) a rabbit that has a nest nearby.
   c) another fox whose territory is nearby.
   d) an animal that hunts in the same area that the fox did.

9. Termites eat only wood; however they cannot digest it. Tiny organisms that live in termites' stomachs and intestines digest the wood. The relationship the tiny organisms and the termites have is:

   a) helpful to one and has no effect on the other.
   b) helpful to one and harmful to the other.
   c) helpful to both of them.
   d) helpful to neither of them.

10. A cat and a snake are hunting the same mouse. What is the relationship between the cat and the snake?

    a) One is using the other but not harming it.
    b) They are competing with each other.
    c) They are helping each other.
    d) One is trying to eat the other one.

(Please continue.)

11. If there were no decomposers on Earth, what would happen?

a) Dead plants and animals wouldn't become part of the soil.
b) Many human diseases would disappear.
c) More meat would be available for humans to eat.
d) Little would change.

12. A grassland turns into a desert. What will most likely happen to the animals that live in the grassland?

a) Most will leave or die.
b) They would have more babies to survive.
c) Those that eat grass would adapt to new food.
d) Many will pass on traits that would help their young survive in the desert.

13. Some people started a program in a national forest to protect deer. They started killing wolves. Ten years later there were no wolves in the forest. For a few years after the wolves were gone there were more deer than there had ever been. Then suddenly there were almost no deer. The people who wanted to protect the deer didn't know that:

a) deer only live to be a few years old.
b) fires would kill so many deer.
c) other animals would eat so much of the deer's food.
d) the deer would eat all of the food and that many would starve.

14. The original source of energy for almost all living things is:

a) the sun.
b) water.
c) the soil.
d) plants.

15. A dead bird is decomposing. What happens to the energy that was stored in the bird's body?

a) Nothing happens to it. Once the bird is dead the energy is lost.
b) It passes through the organisms that decomposed the bird.
c) It is destroyed by solar radiation.
d) The bird used up its energy when it was alive.

16. A rabbit eats some corn. The energy from the corn goes into the rabbit. The next day a fox eats the rabbit. The fox gets very little of the energy that was in the corn. Why?

a) A fox can't digest corn.
b) The rabbit had already digested the corn.
c) Corn doesn't have much energy.
d) Most of the corn's energy was used by the rabbit.

(Please continue.)

17. Most of the oxygen in the atmosphere comes from:

a) insects.
b) plants.
c) the soil.
d) the sun.

18. Which of the following would give humans the most food energy from 1,000 pounds of plants?

a) Feed the plants to insects, feed the insects to fish, and then humans eat the fish.
b) Humans eat the plants.
c) Feed the plants to cattle then humans eat the cattle.
d) Feed the plants to fish then humans eat the fish.

19. After living things die, they decompose. As a result of this process nutrients are:

a) released back into the environment to be recycled.
b) destroyed by the bacteria of decay.
c) changed from nutrients to oxygen and water vapor.
d) evaporated due to the heat produced during decomposition.

20. Which of the following is a part of the water cycle?

a) erosion.
b) ocean tides.
c) evaporation.
d) decomposition.

21. A pollutant gets into an ecosystem and kills large numbers of insects. How might this affect the ecosystem?

a) Plants are not damaged so it doesn't affect the ecosystem.
b) It damages part of the ecosystem so it may affect the whole ecosystem.
c) It kills only insects so the other animals in the ecosystem stay healthy.
d) Most animals eat plants so it doesn't affect the ecosystem much.

(Please continue.)

III. How You Think About the Environment

Directions:	On your answer sheet, darken in the letter of the response that tells us *how you think* about the environment.

	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
22. I would be willing to stop buying some products to save animals' lives.					
23. I would **not** be willing to save energy by using less air conditioning.					
24. To save water, I would be willing to use less water when I bathe.					
25. I would **not** give my own money to help the environment.					
26. I would be willing to walk to more places in order to reduce air pollution.					
27. I would **not** be willing to separate my family's trash for recycling.					
28. I would give my own money to help protect wild animals.					
29. To save energy, I would be willing to use dimmer light bulbs.					
30. To save water, I would be willing to turn off the water while I brush my teeth.					
31. I would be willing to pass out environmental information about a local issue.					
32. I would be willing to write letters asking people to help reduce pollution.					
33. I would be willing to ask people who don't recycle to start doing it.					

(Please continue.)

IV. What You Do About the Environment

Directions:	On your answer sheet, darken in the letter of the response that tells us *what you do* about the environment.

	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
34. I have **not** written someone about a pollution problem.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
35. I have talked with my parents about how to help with environmental problems.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
36. I turn off the water in the sink while I brush my teeth to conserve water.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
37. To save energy, I turn off lights at home when they are not in use.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
38. I have asked my parents not to buy products made from animal fur.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
39. I have asked my family to recycle some of the things we use.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
40. I have asked others what I can do to help reduce pollution.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
41. I often read stories that are mostly about the environment.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
42. I let a water faucet run only when it is necessary.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
43. I close the refrigerator door while I decide what to get out of it.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
44. I have put up a bird house or a bird feeder near my home.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False
45. I do **not** separate things at home for recycling.	a) Very True	b) Mostly True	c) Not Sure	d) Mostly False	e) Very False

(Please continue.)

V. You and Environmental Sensitivity

Directions:	We are going to ask you a number of questions about environmental sensitivity. ***Environmental sensitivity means having positive feelings toward the environment.*** On your answer sheet, darken in the letter of the response that tells us the extent to which *the statement is true for you*.

	a) To a Great Extent	b) To a Large Extent	c) To a Moderate Extent	d) To a Small Extent	e) To No Extent
46. Please give your best estimate of the extent to which you are *environmentally sensitive*.					
47. Please give your best estimate of the extent to which your family is *environmentally sensitive*.					
48. To what extent do you take part in family vacations or outings in the outdoors?					
49. To what extent do you hunt or fish?					
50. To what extent do you take part in activities such as going for walks, hiking, bicycling, canoeing, or kayaking?					
51. To what extent do you take part in bird-watching or nature photography?					
52. To what extent do you go camping with youth groups or organizations (Boy Scouts, 4-H, Girls Club, etc.).					
53. To what extent do you spend time in the out-of-doors alone - not as part of a class or youth group?					
54. To what extent do you enjoy reading books or magazines about nature and the environment?					
55. To what extent do you enjoy watching televisions shows, videos, CDs, or DVDs about nature and the environment?					
56. To what extent do you have a teacher or youth leader who is a role model for environmental sensitivity?					

(Please continue.)

VI. How You Feel About the Environment

Directions:	On your answer sheet, darken in the letter of the response that tells us the extent to which you *agree or disagree* with each statement.

57. I love the environment.	a) Strongly Agree	b) Slightly Agree	c) Neutral or Undecided	d) Slightly Disagree	e) Strongly Disagree
58. I hate the environment.	a) Strongly Agree	b) Slightly Agree	c) Neutral or Undecided	d) Slightly Disagree	e) Strongly Disagree

VII. Issue Identification, Issue Analysis and Action Planning

Directions:	Below, you will see a short passage, giving you information about an environmental issue. After you read the passage, please select the statement that you believe *best identifies the environmental issue* described in the passage.

A Timber Argument

Some time ago an argument arose over timber management in the Shawnee National Forest in southern Illinois. Forest managers made a timber sale of two large areas of pine trees. These trees had been planted nearly a century ago to stop erosion on abandoned farm soil.

The National Forest staff wanted to sell the pine trees because: (1) they were old and ready to harvest, and (2) they wanted them to be replaced by oak and hickory trees that are native to the area.

Environmentalists opposed to the timber sale protested the sale and potential timbering of the pine trees. They believed that cutting large blocks of pines would create gaps in the canopy that would reduce nesting sites for migratory birds. They also believed that erosion would set in before the oaks and hickories could establish themselves. Furthermore, they believed that as the pines died on their own, they would provide soil nutrients.

The environmentalists also claimed that this was the only area in the national forest where trees were allowed to be harvested. A court decision had stopped timber harvests in all of the rest of the forest. They believed that the forest service was getting around the court decision for this particular area by calling it "ecological restoration" and not commercial harvesting.

59. On your answer sheet, darken in the letter of the statement that best identifies the environmental issue in the above passage.

a) Should logging in the Shawnee National Forest for ecological restoration be allowed?
b) Should environmentalists be allowed to protest a legal timber sale in the Shawnee National Forest?
c) Should nesting sites for migratory song birds be destroyed by logging in the Shawnee National Forest?
d) Should "ecological restoration" be a part of forest management in the Shawnee National Forest?
e) Not Sure

(Please continue.)

Directions:	Below, you will see another short passage, giving you information about a different environmental issue. You will notice that each sentence is numbered. Don't worry about that right now. We will use those numbers to refer to the sentences in the next task. Right now, your task is to identify the issue described in the passage. After you read the passage, please select the statement that you believe *best identifies the environmental issue* you read about. Next, we'll ask you to read more paragraphs that give different views of the same issue. Some of the human players and their beliefs about the issue will be given.

Controversy in the Wild West

[1]The coyote is a romantic symbol of the wild West. [2]Some people think this predator keeps deer populations in check. [3]The facts do not support this however. [4]Although coyotes prey on fawns, they usually do not kill adult deer.

[5]As wildlife habitat is lost, deer move into populated urban areas. [6]The larger numbers of deer increase threats to highway safety and to farm crop damage.

[7]A small town in Wyoming holds a coyote hunt each year. [8]Hunters from all over the US come to the contest to hunt and kill coyotes. [9]Folks are split on their views about such a contest. [10]Some think the hunt should be allowed. [11]Others think it is inhumane treatment of animals when the goal of the contest is prize money.

---

60. On your answer sheet, darken in the letter of the statement that best identifies the environmental issue in the above passage.

a) To what extent is the coyote a romantic symbol of the wild West?
b) To what extent are deer important links in the food chain?
c) To what extent should hunters be allowed to kill coyotes for sport?
d) To what extent do deer contribute to highway safety problems?
e) Not Sure

Hunters disagree. [12]"We are not hunting for contest prize money," said Jule Stuple. [13]"It is a chance for us to get together and enjoy friends, who share common interests." [14]Maro Filey, another hunter, puts it this way. [15]"The coyote is smart and I respect him. [16]I don't hunt him because I hate the coyote, but we do need a system of checks and balances. [17]There are too many of them."

[18]Jaz Rowe, with a state park agency, has a different opinion. [19]"Hunters killing coyotes only increases their numbers. [20]They respond by producing bigger litters of young."

[21]Only a small percentage of Americans are hunters. As a group, they are very vocal about their position on hunting. [22]"It's rooted in our culture," said Fino Lawrie. [23]"That's important to us." [24]Many ranchers agree with the hunters. [25]"Nearly 70% of the sheep lost in this state are lost because of coyotes," said Billie Ford. [26]"That means I don't produce as much wool for market."

[27]The governor wrote a letter to the opponents of the contest. It stated: "The coyote is unregulated in this state. They are allowed to be hunted." [28]Val Turner, an animal activist, holds yet another view.

(Please continue.)

[29]At a press conference he commented, "Shooting coyotes doesn't solve predator problems. [30]There are other predators on sheep besides coyotes — like dogs and eagles."

Directions:	Use the value definitions listed below to answer the items that follow the list. You may use any of the values more than once, but choose only one to answer each question. In each case you are asked to identify the value represented by the player. On your answer sheet, darken in the letter of the value indicated by each person.

The Value	**The Definition**
Environmental	pertaining to human activities with natural resources such as plants, animals, air, water, and soil.
Legal	relating to national, state, or local laws; law enforcement; law suits.
Social	pertaining to shared human empathy, feelings, and status.
Ethnocentric	pertaining to a focus on the fulfillment of ethnic/cultural goals.
Economic	relating to the use and exchange of money, materials, and/or services.

61. The value indicated by Jule Stuple (sentences 12 and 13) is:
    a) Environmental b) Legal c) Social d) Ethnocentric e) Economic

62. The value indicated by Maro Filey (sentences 14, 15, 16, and 17) is:
    a) Environmental b) Legal c) Social d) Ethnocentric e) Economic

63. The value indicated by Fino Lawrie (sentences 22 and 23) is:
    a) Environmental b) Legal c) Social d) Ethnocentric e) Economic

64. The value indicated Billie Ford (sentences 25 and 26) is:
    a) Environmental b) Legal c) Social d) Ethnocentric e) Economic

65. The value indicated by the governor (sentence 27) is:
    a) Environmental b) Legal c) Social d) Ethnocentric e) Economic

66. The value indicated by Val Turner (sentences 28, 29, and 30) is:
    a) Environmental b) Legal c) Social d) Ethnocentric e) Economic

(Please continue.)

Directions:	Below, you will see one more short passage, giving you information about a different environmental issue. Again, after you read the passage, you are to select the statement that you believe *best identifies the environmental issue* described in the passage. Next we'll ask you to read more paragraphs that give additional information about the issue and to tell us what might be done to help resolve the issue.

A Question of Progress

Recently the city of Ironton experienced a problem. This problem was a land-use management one. A developer talked to Mr. and Mrs. Tillman who owned a farm. The developer offered to buy the Tillman farm to build a mall.

The Tillman farm was inside the city limits. It was an ideal location for a mall. The developer was Mr. Henry Smith. Smith said he would pay one million dollars ($1,000,000) for the farm. The Tillmans knew that the farm was only worth about $50,000 as farmland. They decided to sell if Ironton's city officials would give permission. Ironton's officials had to approve selling farmland for business purposes.

Mr. Smith went to the city officials. He asked to get permission to build a mall using the Tillman farmland. He explained that the mall would bring millions of dollars to Ironton. It would also encourage additional development on that side of town. Many jobs would be created. The officials agreed to study Smith's request. They would act on this request at their next meeting.

The *Ironton Daily News* published Mr. Smith's request the next day. Reactions were immediate. Several groups disagreed with the proposal. Others supported it. They wanted the mall to be built.

---

67. On your answer sheet, darken in the letter of the statement that best identifies the environmental issue in the above passage.

a) Should Ironton's city officials be involved in a land-use management decision?
b) Should city officials allow the Tillman farm to be converted to a shopping mall?
c) Should the city of Ironton build a mall on the Tillman farm?
d) Should the Tillmans be able to sell land worth only $50,000 for $1,000,000 (one million dollars)?
e) Not Sure

The County Agricultural Association opposed the mall. It believed that the area was losing too much farmland to commercial development. The local builders' union supported the mall. The union thought the development would provide jobs for its unemployed members.

The local Sierra Club argued against the mall. It felt that development would threaten a rare natural area located next to the farm.

The Tillmans talked to the *Ironton Daily News*. They told the reporter they wanted to sell their farm. They said that the money would be great for retirement. They also said that they should be able to sell their land because it was theirs. They could do anything they wanted with it.

One month after the initial proposal, city officials decided to allow the mall to be built.

(Please continue.)

Assume that you are a citizen in Ironton. You discover that others feel the same way about this local issue as you do. Basically, you do not want the mall to be built on the Tillman farmland.

Directions:	Below, you will find eight (8) different action strategies. These action strategies are ones that might be used to prevent the mall from being built. **But, you are to select only two of them.** Your task is to read carefully through each strategy, and then select what you believe are ***the two (2) best action strategies*** from all the strategies listed in the statements below. On your answer sheet, ***darken in the letter a*** for the two statements that you selected. **Do not** darken letters b, c, d, or e for those two statements. **Do not** darken any letter in the other six statements.

68. Write to your U. S. Senators and ask for a federal law to be passed to prohibit the sale of the Tillman farmland.

69. Write to your state representative and urge him/her to write and get a law passed prohibiting the sale of the Tillman farmland.

70. Organize a group to hold a bake sale of cookies and cakes in an attempt to raise enough money to purchase the Tillman farmland for the same price that Mr. Smith offered.

71. Circulate a petition opposing the building of the mall and present this petition to Ironton's city officials.

72. Organize a group of citizens with the same position as yours to write persuasive letters to the Editor of the *Ironton Daily News* for publication.

73. Organize a group of citizens with the same position as yours and offer its services to the Sierra Club in the hope that a coalition of groups could influence city officials to reverse their decision.

74. Organize a group of citizens with the same position as yours and ask for a meeting with the Chamber of Commerce in which the group would threaten to boycott the mall if it is built.

75. Make an anonymous phone call to Mr. Smith threatening to sabotage the construction equipment if the mall development plan goes through.

You have completed the survey and may put down your pencil.
Thank you for participating!

Appendix G
School Recruitment and Selection Documents

Nomination Flyer
NELA FAQs for Schools
School Correspondence #1 – Screening Survey
School Correspondence #2 – Acceptance into Study

National Middle School Environmental Literacy Assessment (NELA)

1. **What is NELA?** NELA is a multi-year research project. Phase I explored the level of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. We used a survey to gather information on these students' environmental knowledge, skills, affective characteristics (feelings), and participation, as well as their grade level, age, gender, and ethnic background. We also gathered information on the curriculum and teachers in participating schools. In Phase II, we will gather student environmental literacy data from classes that incorporate environmental education as a part of instruction and compare these data to the baseline data from Phase I. We will also seek funding for a Phase III of the project, which will offer opportunities to many other researchers to conduct in-depth investigations of the variables associated with success in schools and programs that appear to be effective in the development of environmental literacy.

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 researchers from the University of Wisconsin-Platteville, Florida Institute of Technology, the Center for Instruction, Staff Development and Evaluation, Rochester Institute of Technology. Contact information can be found on the reverse of this sheet.

3. **What programs are eligible to participate in Phase II of the NELA project?** We are recruiting outstanding EE programs that are in place at the 6th, 7th, and/or 8th grade levels. Our data collection sites might include: (1) schools which are part of networks, e.g., EIC schools, EarthForce/Green Schools, Blue Ribbon School, etc.; (2) schools which implement programs or approaches, e.g. WET, WILD, PLT, IEEIA, etc.); (3) environmentally focused Charter and Magnet Schools; and (4) Independent Schools. Nominations of exemplary school-based environmental programs were solicited from Program/Network leaders who were encouraged to nominate exemplary schools using their programs. Charter, magnet, and independent schools were also encouraged to self-nominate. As we considered schools for participation, we looked for those in which a particular EE program or approach has been in place at the middle

grade level (grades 6, 7, and/or 8) for two or more years and in a minimum of two classes. Each participating school will receive a modest stipend for its participation.

4. **What data will be collected?** The NELA includes four surveys:
   - 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.

5. **How many schools, classes, teachers and students will participate in the Assessment?** Seventy schools will be selected. We anticipate that 300 – 400 classes and teachers will participate and about 9,000 students.

6. **What is the project timeline?** Data Collectors will work with the selected schools during March and April to set up the data collection arrangements. We anticipate that all surveys will be administered in April and May of 2009.

Contact information:

Bill McBeth, Project Director, University of Wisconsin-Platteville, mcbeth@uwplatt.edu, 608-342-1284

Karen Cifranick, Assessment Coordinator, Center for Instruction, Staff Development and Evaluation, cifranick@yahoo.com, 757-480-1107

Other Research Team Members:

Harold Hungerford,
Center for Instruction, Staff Development and Evaluation, cisde@midwest.net

Tom Marcinkowski,
Florida Institute of Technology, marcinko@fit.edu

Ron Meyers,
Rochester Institute of Technology, Meyers@RonMeyersAndAssociates.com

Trudi Volk,
Center for Instruction, Staff Development and Evaluation, cisde@midwest.net

2008 – 2009 National Environmental Literacy Assessment: Grades 6, 7, & 8 Nomination Form

Deadline for nomination - December 15, 2008!

Please complete this form in ink. Detach it and mail or fax it to:

Literacy Program Nomination
Center for Instruction, Staff Development and Evaluation
1925 New Era Road
Carbondale, IL 62901
*Fax # 618-457-8927 (Won't fax? Try pressing *51 as soon as the phone picks up.)*

This national research project is designed to measure the effectiveness of outstanding environmental education programs with respect to the goal of environmental literacy. Said programs can be formal, informal, nonformal or a combination of these types. The programs can be national in scope but also may be very local in nature. Nominees should represent exemplary 6th, 7th, and/or 8th grade EE classrooms. All programs nominated will be considered for inclusion in the study. Final selections will be the responsibility of the Research Team.

Please inform your nominee(s) that a member of the research team will follow-up for additional information.

Nominator's Name (Your Name): _____
Your Contact Information including phone and email: _____
_____
_____
Nominated Program: _____

School(s) in which program is in place (name up to three (3) schools – continue on reverse)

1. School name _____
Person(s) to Contact: _____
Contact Information (Address, Phone and E-mail): _____
_____
_____

Use spaces on the reverse side to nominate additional schools. Thank you.

2. School name _____
Person(s) to Contact: _____
Contact Information (Address, Phone and E-mail): _____
_____
_____

3. School name _____
Person(s) to Contact: _____
Contact Information (Address, Phone and E-mail):_____
_____
_____

If you have questions, please contact one of the individuals listed below.

Bill McBeth, University of Wisconsin-Platteville, mcbeth@uwplatt.edu, 608-342-1284;
Karen Cifranick, CISDE, cifranick@yahoo.com, 757-480-1107;
Harold Hungerford, CISDE, cisde@midwest.net, 618-457-8927; or
Trudi Volk, CISDE, cisde@midwest.net, 618-457-8927.

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

1. **What is NELA?** NELA is a multi-year research project. Phase I explored the level of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. We used a survey to gather information on these students' environmental knowledge, skills, affective characteristics (feelings), and participation, as well as their grade level, age, gender, and ethnic background. We also gathered information on the curriculum and teachers in participating schools. In Phase II, we will gather student environmental literacy data from classes that incorporate environmental education as a part of instruction and compare these data to the baseline data from Phase I. We will also seek funding for a Phase III of the project, which will offer opportunities to many other researchers to conduct in-depth investigations of the variables associated with success in schools and programs that appear to be effective in the development of environmental literacy.

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grade level (grades 6, 7, and/or 8) for two or more years and in a minimum of two classes. Each participating school will receive a modest stipend for its participation.

4. **What data will be collected?** The NELA includes four surveys:
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Bill McBeth, Project Director, University of Wisconsin-Platteville, mcbeth@uwplatt.edu, 608-342-1284

Karen Cifranick, Assessment Coordinator, Center for Instruction, Staff Development and Evaluation, cifranick@yahoo.com, 757-480-1107

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Ron Meyers,
Rochester Institute of Technology, Meyers@RonMeyersAndAssociates.com

Trudi Volk,
Center for Instruction, Staff Development and Evaluation, cisde@midwest.net

School Correspondence Email #1

My name is Karen Cifranick. I am sending you this email because your school has been nominated to participate in a National Environmental Literacy Assessment project (NELA).

This environmental literacy research is supported by the North American Association for Environmental Education (NAAEE), through a grant from the National Oceanic and Atmospheric Administration (NOAA). It represents an effort to recognize successful environmental programs at the middle level and to collect information about the students in those programs.

If your program is selected to participate in the research and agrees to do so, a member of our research team will visit your school in late spring for a single 50 minute administration of a survey to students in your environmental program. We do not want this research to intrude on the educational activities in your school and will work with you to identify the time that will work best for you. Administrators and teachers of the program will also be asked to complete several survey forms to provide information about your school and its students, the program itself and the backgrounds of those providing instruction in your program. In appreciation for your participation, your school will receive a $500 stipend, following the completion of all data collection.

The director of the NELA project is Dr. Bill McBeth, University of Wisconsin–Platteville (mcbeth@uwplatt.edu, 608-342-1284). Other research team members include Drs. Harold Hungerford and Trudi Volk at the Center for Instruction, Staff Development and Evaluation (cisde@midwest.net, 618-457-8927) and Dr. Tom Marcinkowski, Florida Institute of Technology (marcinko@fit.edu, 321-674-8946).

To aid us in selecting the schools and programs that will participate in the research, we need information about your school and your environmental program. It should only take 10-15 minutes to answer the questions below. The easiest way to do this would be to hit the *REPLY* button on your email and then provide the information solicited by each question in the reply message to me.

We are making final selections at this time, so please send this information back to me by March 13th.

****
Please provide the information below:

1. Your School:

2. Name and Title of person responding:

3. Name of Environmental Program:

4. Place an X before the descriptor that BEST fits your school (Please select only one).

___Public, regular

___Public, Magnet

___Public, Charter

___Public, School of Choice

___Public, Other (Please explain):

___Private, independent

___Private religious

___Other (Please explain):

5. Grade Levels Involved in Your School's Environmental Program (Again, place an X before each grade level in which an environmental education program is in place). After you have indicated grade level involvement, please type in the number of classes that are involved in the program, and the approximate number of students for each grade.

___6th grade: ___ Number of classes; _____Approximate number of students

___7th grade: ___ Number of classes; _____Approximate number of students

___8th grade: ___ Number of classes; _____Approximate number of students

6. How long has the nominated program been in place in your school? (If the length of implementation differs by grade level, please indicate that).

7. Approximate length of Your School's Environmental Program (Again, if this answer differs by grade level, please indicate.)

_____Number of weeks per school year

_____Average number of contact hours per week

8. We want our sample to reflect the many different programs and approaches in environmental education. Please look over the list below. It names 15 programs, approaches, networks and sources. We'd like you to indicate which of these are part of your program, if any. For all that are part of your program, *please write in the percentage* that it contributes to your overall program. For items a - e (gov't agencies) please type in the name of the agency program that you use. For items f - j, please estimate the average number of activities you use from that source.

a. ___U.S. EPA (Name of program you use:_____)

b. ___NOAA Name of program:_____)

c. ___U.S. Forest Service (Name of program:_____)

d. ___U.S. Fish & Wildlife Service (Name of program:_____)

e. ___National Park Service (Name of program:_____)

f. ___Project Learning Tree (# of activities used: _____)

g. ___Project WILD (# of activities used: _____)

h. ___Project WET (# of activities used: _____)

i. ___Windows on the Wild (# of activities used: _____)

j. ___Wonders of Wetlands (# of activities used: _____)

k. ___EIC Schools (Lieberman/SEER)

l. ___Earth Force/GREEN

m. ___Green Charter Schools

n. ___Green Schools

o. ___Investigating and Evaluating Environmental Issues and Actions-IEEIA (Hungerford's model)

p. ___Other (please identify):

q. ___Other (please identify):

9. We are interested in characteristics of your environmental program. Does your environmental program make use of or participate in any other recognized approach to EE? If so, which one(s)?

__After-school club

__School grounds/study site(s)

__School/District nature center

__Resident/Community outdoor program

__Extended field study

__Service-learning

__Action research

__Other (please identify):

10. If you use or participate in a program that was developed at the state, district, or local level, please indicate that below and provide the name of the program.

___State level (Name of Program:_____)

___Multi-county/Multi-district level (Name of Program:_____)

___School District (Name of Program:_____)

___School level (Name of Program:_____)

___Other (Name of Program:_____)

NOTE: Any of these may involve government, NGOs, universities, and/or other entities.

11. What kind of implementation do you have for the environmental program? (Place an X before only one response. If this answer differs by grade level, please indicate.)

___It is a separate subject.

___It involves the infusion of environmental content into two or more subjects (e.g., science and social studies or science and language arts).

___It uses the environment as an integrating concept across all (or most) subject areas.

___It reflects a school-wide environment-based mission.

___Other: (Please, identify):

12. Environmental Literacy is usually described as having a number of major components. Please provide your best estimate of the extent to which the program is designed to address the following literacy components (place an X before the response that best reflects your program for each component):

A. Ecological or Environmental Knowledge.
___No Extent
___Moderate Extent
___Great Extent

B. Development of Attitudinal Dimensions: Commitment to Issue Resolution, Environmental Sensitivity, etc.
___No Extent
___Moderate Extent
___Great Extent

C. Development of Inquiry or Investigation Skills Related to Environmental Problems and Issues.
___No Extent
___Moderate Extent
___Great Extent

D. Development of Decision Making or Problem Solving Skills Related to Environmental Issue Resolution
___No Extent
___Moderate Extent
___Great Extent

E. Participation in Environmental Action, i.e. Helping to Resolve Issues.
___No Extent
___Extent
___Great Extent

13. What other prominent features or characteristics of your program would you like to mention?

14. In summary, why do you think this program is a good candidate for inclusion for this study?

15. We hope that this project will lead to future environmental education research. Would you be willing to work with a researcher who might come into your school and make a more thorough study of this program? That research activity would not take place this school year and your answer will not have any bearing on your inclusion in this study.

16. Additional Comments – Please include any thoughts on why you feel that this entity would be a strong candidate for this environmental literacy study.

Thank You!

Karen Cifranick, Assessment Coordinator
cifranick@yahoo.com
757-480-1107

School Correspondence Email #2

Congratulations, your school has been accepted for participation in the National Environmental Literacy Assessment!

Please find the attached Letter of Selection from the Project Coordinator and a Service Contract from the North American Association for Environmental Education (NAAEE).

A school administrator must print the contract, provide the FEIN number and other information that is missing, sign it, and return it no later than April 3, 2009 to:

Karen Cifranick, Assessment Coordinator
1915 Kingston Avenue
Norfolk, VA 23503

Please do this immediately. We need verification of your acceptance to participate in order to assign your school a data collector, who will administer the survey to your students later this spring.

If you have any further questions, please don't hesitate to contact me.

Sincerely,

Karen Cifranick
NELA Assessment Coordinator
757-480-1107

Appendix H
Report by Ms. Karen Cifranick, Assessment Coordinator

Project Report for:
Bill McBeth, Project Director,
National Environmental Literacy Assessment, Phase 2

Prepared by:
Karen Cifranick
Assessment Coordinator

August 5, 2010

SUMMARY

This report documents the efforts by the Assessment Coordinator to manage the data collection process in the each of the schools selected for inclusion in Phase Two of the National Environmental Literacy Assessment between January 15, 2009 and June 12, 2009. In all, a total of 65 schools and 31 data collectors were included in this phase of the research. The data collection procedure included contracting with School Administrators and data collectors, corresponding with schools and data collectors to arrange assessment dates. organizing the distribution and collection of all assessment materials, submitting data for analysis, and arranging payment of school and research assistant stipends upon completion of all deliverables.

Contact and Contracting with School Administrators

Once the names of nominated schools had been received by the research team, each school was sent an email by the Assessment Coordinator inviting them to participate in the study and asking them to complete an initial Screening Survey (see Appendix H). Attached to this email was a document addressing anticipated questions, NELA Frequently Asked Questions (FAQ). Emails were directed to a designated contact person at each school that usually consisted of a classroom teacher and/or administrator. As screening surveys were returned by the nominated schools to the Assessment Coordinator, they were shared with the entire research team and used to determine if the nominated school met the project criteria for selection and participation. In a number of cases, additional emails were sent by the Assessment Coordinator to schools reminding them to return their screening survey in order to be considered for participation in the project. In

addition, follow-up phone calls were made in order to obtain anys missing information. The first screening survey was returned on January 15, 2009 and the last was received on April 15, 2009.

Once a school was determined to have met project criteria and was accepted for participation in the study, a second email was sent confirming their acceptance (see Appendix H). Attached to this email was the *Letter of Selection and NAAEE Service Contract* (Appendix B), individualized for each school. Schools were requested to return the signed contract immediately in order for a data collector to be assigned to their school. The first school contracts were sent on March 25 and several were returned as early as March 30, 2009. The last school contracts were sent on April 15 and received as late as May 13, 2009.

After receiving a school's signed contract, a third email was sent asking the school to confirm information originally submitted by them in their screening survey (Appendix B). Schools were asked to verify their expected numbers of students, classes, and teachers involved in the data collection and additionally confirm the type of parental consent forms needed (active or passive). This was done to increase accuracy and reduce errors prior to preparing and mailing the School and Data Collector Kits.

Recruitment, Selection and Contracting of Data Collectors

To conduct the study at 65 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. To recruit data collectors, a database was developed that included lists of the NELA Phase One data collector applicants, all NAAEE members, and membership lists of the NAAEE Research Commission. To this database was added the list of schools selected for the study. The combined database was sorted by zip code and persons living within a reasonable distance from the school were emailed a request to assist with the study. The schools were not identified in the initial request in order to maintain confidentiality. In addition, no one affiliated with the participating schools, was selected as a Data Collector to further reduce external threats. Final selection considered an applicant's level of education, professional EE affiliation and membership in NAAEE. The most schools assigned to any one data collector were six and these were spread

over two states. In total, 31 individuals were selected to collect data from the 65 participating schools.

Orientation and Training

Data collectors were oriented to the overall study and prepared for data collection via a project website hosted by NAAEE. The password protected website outlined all aspects of data collection procedures, including the project guidelines, timeline, and on-site administration of the actual student assessment. Several of the first data collectors to undergo the online training process experienced difficulty. This occurred because minor updates in the materials from Phase One to Phase Two had not uploaded prior to access by the very first trainees (e.g. Phase One only surveyed grades 6 and 8; Phase Two surveyed grades 6, 7, and 8). The necessary clarifications were accomplished via an exchange of emails and phone calls between the Assessment Coordinator and the trainees. The first data collector was certified and contracted on April 4, 2009 and the last on May 20, 2009.

Correspondence and Arrangements

Each certified data collector was emailed a Purchase of Service Agreement (PSA*)* (Appendix I) by the Assessment Coordinator upon successful completion of the data collection training process. In addition, each data collector (DC) was emailed contact information for their selected school(s). Instructed to follow the Data Collector's Procedures, Guidelines, and Timelines (Appendix I), the DC then proceeded to contact their school(s) via phone or email to arrange an agreed upon assessment date. In all cases, the data collector went to the school, tried to meet with the building principal prior to the survey to review procedures, establish a testing schedule, and check the site to ensure suitability for testing. Once the data collection was scheduled, the DC notified the Assessment Coordinator of the arrangements. In several cases, schools had a difficult time finding available time in their spring schedules for the assessment. All schools were eventually accommodated and the last data collection was scheduled for June 12, 2009.

Distribution of Data Collection Materials

The Assessment Coordinator assembled each Data Collector's Kit to reflect the total number of schools and students they would be assessing for the entire project. Kits included: Phase 2 Procedures, Guidelines and Timeline, Data Collector's Script, Teacher Introduction, MSELS

booklets, student scantron (response) forms, pencils, a materials checklist and a return FedEx mailing label (Appendix I). All Data Collector Kits were mailed and arrived prior to the first scheduled assessment date for that particular DC. The first Data Collector Kit was mailed on April 20, 2009 and the last sent on May 21, 2009.

School Kits were prepared according to information supplied by the individual school and mailed to arrive prior to the scheduled student assessment date. School Kits included*:* School, Program, and Teacher Information Forms, Active and/or Passive Parental Consent Forms, Materials Verification Sheet, Principal Guidelines and Procedures, Teacher Consent Forms, Letter to the School Administration and Letter to Teachers (Appendices B, C, D, E).

All parental consent forms were approved through the Florida Institute of Technology. Care was taken to ensure that parental consent forms were available to schools at least one week prior to their scheduled assessment date. Several schools opted to print their own copies for distribution, prior to receiving their School Kit, in order to accommodate their schedules. Several schools, with large multi-lingual populations, requested parental consent forms in Spanish and were sent appropriate translations. The first School Kit was mailed on April 20, 2009 and the last sent on May 21, 2009.

On-Site Data Collection and Verification

The first student survey took place on April 27, 2009 and the last occurred on June 12, 2009. The School Information Form (SIF*)* was generally completed by school administrators or their designees prior to or on the student assessment day. The Program Information Form (PIF) and Teacher Information Form (TIF*)* were also generally completed prior to student assessment by the teachers directly involved in the environmental program instruction. As part of the School Packet, administrators were sent a Materials Verification Form. The intent of this document was to ensure that each school received the necessary materials for completion of the contract deliverables. In addition, the data collector was instructed to use this form to ensure that all forms were completed and collected on the actual student assessment day. Two schools did not complete their SIF, TIF or PIF until September, 2009. This was due to school offices closing for

the summer and failure on the part of the Data Collector to request these documents on the day of the actual student survey.

Surveys were administered to students during their regularly scheduled classes, with many schools opting to survey multiple classes in a large group setting such as the school cafeteria or library. Data collectors were to meet with the participating classroom teachers, collect all active consent forms prior to testing, and confirm that alternative activities had been arranged for uninvolved students.

Several steps for data collectors and teachers were outlined in the guidelines to reduce variability in the testing procedures. Teachers utilized a prepared script for introduction of the data collector. Additionally, teachers were required to remain in the room to help maintain order and student comfort during the assessment. Upon beginning a survey session with students and teachers, the DC also read aloud from a prepared script the instructions for administering the assessment. After distribution of the testing materials, students were given further instructions concerning the completion of identifying information on their response sheets (e.g. teacher name, school name, grade level). As students completed their surveys, the data collector was instructed to collect the testing materials and check each response sheet for the appropriate information.

The Data Collectors reported that, in general, the administration of the surveys proceeded smoothly. The recommended time for administration of the *MSELS* was 50 minutes and most data collectors arranged for a 60-minute time slot. This allowed for the additional time necessary to settle the students, prep them with instructions, and distribute materials.

Two schools experienced difficulty with regard to the parental consent protocols, which resulted in a lower than desirable participation rate. Both schools distributed active parent consent forms, even though their district policies specified the passive consent protocol. For the first school, all other data collection procedures were followed and it was retained in the study sample. The second situation, in an effort to address the low participation rate, elected to require all students to complete the survey, not just those with parental consent. Using surveys from students without parental consent would constitute a clear violation of Human Subjects Protection. Because the

scantron response sheets precluded self-identification, there was no way to distinguish between valid and invalid student surveys and this resulted in the elimination of that school from the study.

Submission of Data

The data collectors were provided a checklist itemizing which documents to collect and return to the Assessment Coordinator. These included the MSELS booklets, all student response sheets (used and unused), School, Program, and Teacher Information Forms. In addition, they had been provided a prepaid FedEx mailing label which allowed them to return the testing materials in the same boxes they had received their original testing kit. The Assessment Coordinator, upon receipt of the materials, checked each school data packet for completeness. Only two of the total 65 data packets were returned incomplete. One was missing the school, program, and teacher information forms and the other was returned without the testing booklets. The Assessment Coordinator acquired the missing forms directly from those schools involved and also verified that the missing booklets had been shredded by the data collector. Complete data sets were received from all 65 schools and then mailed to Dr. Tom Marcinkowski in six batches between June 1, 2009 and July 21, 2009.

School and Nominator Reports

Each school was furnished with an individualized *School Report* (see Appendix K) following the initial data analyses. These reports included: a table that identified the sixth- and eighth-grade environmental literacy raw scores and composite scores from the baseline environmental literacy results from Phase One; a table that identified the environmental literacy raw scores and composite scores for each grade in that school participating in Phase Two; and a graph that compared composite scores from the respective grades in that school to sixth- and eighth-grade composite scores from the Phase One Baseline Study. School Reports were generated and sent to schools on March 9, 2010.

When the school was one of several nominated by an individual program, network, or approach, the results were also sent to the head of the program, or to the individual who nominated that school in the form of a Nominator Report (see Appendix K). The Nominator Report combined information from all the schools that represented a specific program. In no case were the names

of schools matched to those results. Rather, each school was identified with a letter (e.g., School A, School B, etc.), as a means to guarantee anonymity to the school. Reports were not sent to individuals or programs that had nominated fewer than two schools. These reports were sent on April 12, 2010.

Appendix I
Materials Prepared for Data Collectors

Recruitment FAQs
Data Collector Application
Letter to Data Collector
Data Collector Purchase of Service Agreement
Data Collector Guidelines and Procedures
Data Collector Script
Survey Administration Materials
Study Materials Verification Form

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

1. **What is NELA?** NELA is a multi-year research project. Year one explored the level of environmental literacy among 6th and 8th grade students in public and private schools across the U.S. This survey gathered information on these students' environmental knowledge, skills, affective characteristics (feelings), and participation, as well as their grade level, age, gender, and ethnic background. It also gathered information on the curriculum and teachers in participating schools. This phase, 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, and the University of the Americas at Kosovo. 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, Data Collection Recruiter, Meyers@RonMeyersAndAssociates.com. In March 2009, the cities/states where schools have been selected to participate in the assessment will be posted on a website. The location of this site will be provided to Data Collectors. Interested Data Collectors should inform Dr. Meyers of the cities/schools they want to collect data in as soon as possible. Data Collectors will be selected in March through April, and will be asked to sign a personal service agreement. Selected Data Collectors should then learn the assessment protocols, and schedule school assessment dates. All literacy assessment surveys should be conducted by the end of May 2009.

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 forms:
   - 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. The Data Collection Recruiter 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 Contact, confirm the number of classes and students taking the MSELS, and establish a date for administration of the four surveys. A pre-assessment visit to the school may be necessary to establish the location(s) within the school where the student survey will be given. The data collector goes to the school on the scheduled assessment day, meets with the principal to confirm procedures, administers the surveys, and meets with the principal immediately after administration of the MSELS to confirm that everything has been completed. Then the data collector sends all materials back to Ms Karen Cifranick, Assessment Coordinator, 1915 Kingston Ave, Norfolk VA 23503.

9. **How many schools, classes, teachers and students will participate in the Assessment?** Seventy schools representing four categories of environmental education will be selected from across the United States and its territories.

10. **Who is responsible for generating the sample of schools?** The sample for this survey will be developed by the NELA Research Team. Using an expert nomination process (schools are nominated from outside the NELA Research Team based on their excellence in aspects of Environmental Education), they will select 70 schools from across the country representing four categories (programs, networks, magnets, and independents) that have 6th, 7th and 8th grade classes. Once nominated, the principal or contact person is asked to complete an electronic pre-selection survey. The NELA Research Team will use these surveys to finalize the selection of schools into categories. Once selected, the school will be notified and placed in the data base as a choice for the Data Collector.

11. **What kinds of schools are being selected?** Schools are being selected for their outstanding work in aspects of Environmental Education. Selected schools represent four categories (programs, networks, magnets, and independents) and contain 6th, 7th and/or 8th grade classes.

12. **How many classes per school will be participating?** The number of classes will vary from school to school. The classes are identified in the pre-selection survey and verified by the Assessment Coordinator, but also need to be confirmed by the data collector.

13. **Does there have to be an equal number of sixth, seventh and eighth grade classes in my school?** No, there does not.

14. **What students will be participating?** Sixth, seventh and eighth grade classes will participate.

15. **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.

16. **What is the project timeline?** We are recruiting people interested in being Data Collectors now, will identify the participating schools in March 2009, and administer all four surveys by end of May 2009.

17. **What do participating schools receive?** Participating schools receive $500 for successfully completing and returning all four surveys.

18. **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@uwplatt.edu
Ms. Karen Cifranick, Assessment Coordinator, (757) 480-1107, or cifranick@yahoo.com.

Research Team Members:
Harold Hungerford, CISDE, cisde@midwest.net
Tom Marcinkowski, Florida Institute of Technology, marcinko@fit.edu
Trudi Volk, CISDE, cisde@midwest.net
Ron Meyers, Rochester Institute of Technology, American University in Kosovo, Meyers@RonMeyersAndAssociates.com

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

National Environmental Literacy Assessment Data Collector Application

The National Environmental Literacy Assessment Project (NELA) is focused on identifying the level of environmental literacy among U.S. 6th, 7th and 8th graders and on determining the effectiveness of environmental education (EE) programs to develop environmental literacy in the U.S. To conduct this year's research, we are seeking to identify individuals to participate in the data collection process.

Role of Data Collector

- Be NELA's local contact to ensure that schools and educators are well informed and participating in a timely and effective manner with the research project.

Responsibilities of Data Collector

- Become well informed on project logistics, purposes, protocols, and keep in contact with Assessment Coordinator.
- Develop relationship with participating school site coordinator and educators.
- Schedule and conduct meetings with school site coordinator and participating educators to review purpose, protocol, explain 4 types of information being collected (Student, Teacher, Program, School) and ensure their questions are answered.
- Contact educators and school site coordinator to schedule and physically collect all 4 types of data, review materials to ensure completeness, mail materials to Assessment Coordinator, and inform Assessment Coordinator and school contacts to certify that school has completed data collection.

Compensation for Data Collector

- Data Collectors will be paid $400 per participating school that successfully completes and returns all 4 types of surveys.

Sign up now to become a NELA Data Collector

For more information contact Ron Meyers, Data Collector Recruiter, at Meyers@RonMeyersAndAssociates.com, or cell: 501-588-1950

National Environmental Literacy Assessment Data Collector Application

Name: _____

Level of education (Check one)

- ☐ High school diploma
- ☐ 2 year technical program
- ☐ Undergraduate student
- ☐ B.S./BA/yr degree
- ☐ Masters student
- ☐ M.A./M.S/ other Masters degree
- ☐ Doctoral student
- ☐ Ph.D.
- ☐ Other _____

How many miles are you willing to drive to help coordinate the involvement/administration of a school? _____

Which cities are you interested in coordinating?_____
_____

Please describe, very briefly, why are you interested in being a data collector?
_____
_____
_____
_____

Any comments or questions? _____
_____
_____
_____

We will contact you shortly to indicate if you have been selected to participate. Thank you for your interest!

Please email application to:

Ron Meyers, NELA Data Collector Recruiter,
Meyers@RonMeyersAndAssociates.com

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

March 29, 2009

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 Purchase of Service Agreement (PSA) and mail to Karen Cifranick at the address provided on the PSA. Please contact me 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. The username for everyone is, "nelauser". The password is WkN458. 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 (Meyers@RonMeyersAndAssociates) 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 different impacts that environmental education programs have on environmental literacy. This will be the first one, a 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 comparison of the differences among different programs in developing 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. Phase I, to collect baseline data on environmental literacy of 6th and 8th grade students, was conducted in 2006. Phase II will explore the differences in developing environmental literacy among different environmental education programs. Both have been funded by U.S. EPA's Office of Environmental Education and the National Oceanic and Atmospheric Administration and administered by the North American 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; Karen Cifranick, Assessment Coordinator, retired; and Dr. Ron Meyers, Rochester Institute of Technology American University in Kosovo.

Research Methods

We are conducting a purposeful sample to identify 70 public and private middle schools who have been nominated for their exceptional attempts to deliver environmental curricula. Depending on the implementation of the school's curriculum, the sample may include 6th, 7th, and/or 8th grade students with

the potential of up to 9,000 students in all. Each school has been nominated by experts in the field or have self-nominated and all have been screened prior to selection.

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, 7th and/or 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 Collector's 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 in these schools and compare this data to the baseline of data generated in Phase 1 (2006-08; view report at <www.oesd.noaa.gov/NAEE_Report>). Through this and 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. However, it is extremely important that students identify their schools and grade level on the scantron forms. With a study of this size, we want no confusion concerning where and at what grade level our data was generated.

Future Surveys

The project team envisions that in Phase 3, researchers across the field of environmental education will be invited to conduct in-depth studies using a diverse range of research methods and methodologies and using the data generated in Phases 1 & 2. Phase 4 is planned to summarize all research.

Please feel free to contact me at 501-588-1950 or Meyers@RonMeyersAndAssociates.com with any questions or comments you have.

Sincerely,
Ron Meyers, Ph.D., NELA Data Collection Recruiter

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

DATE:

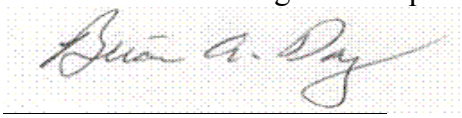
TO: Name
Address SS#
City State Zip Tel: ( ) -

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 , 7th and 8th grade students, _____ has agreed to provide the
First Name Last Name
following services from _____ (Date) :

Description	Rate	Total Schools
Contact Assessment Coordinator as needed with questions; confirm participating classes, and administration date. Coordinate with participating schools to schedule MSELS administration Ensure that the following forms are completed and sent to the Assessment Coordinator: School Information Form; Teacher Form; Program Information Form, and the School Materials Verification Form. Personally administer the MSELS, 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) assigned:		
TOTAL		

_____ (hereafter known as "Contractor") agrees to fulfil this agreement as
First name Last name
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: Karen Cifranick, Assessment Coordinator, 1915 Kingston Ave, Norfolk VA 23503

NELA PROJECT 2009
DATA COLLECTOR GUIDELINES, PROCEDURES AND TIMELINES

A. Data Collector (DC) Selection and School Assignment

1. NELA Research Team selects schools to participate in NELA. (Feb-March)
2. NAAEE posts city and state for schools participating in NELA. (March)
3. 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, Data Recruiter Coordinator (DRC). (Mid March through April)
4. Potential DC regularly checks project website for posting of schools available for data collectors, sends email to Dr. Meyers indicating what schools they wish to coordinate. Dr. Meyers may also contact potential DC's (March-April)
5. Potential DC is emailed her/his school assignment by Dr. Meyers, and confirms her/his acceptance of the assignment to Dr. Meyers. (March-late April)
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 school(s) for which they will collect data. (April-May)
7. Potential DC completes the Data Collector PSA and returns it to Ms. Karen Cifranick, Assessment Coordinator, cifranick@yahoo.com or 1915 Kingston Ave, Norfolk VA 23503. They are then a contracted DC. (April-May)

B. Project Orientation

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

C. Initial Contact with School Principal(s) and/or School Contacts (April-May)

1. DC contacts assigned School(s) by phone to make introductions.
    a. DC confirms that School(s) has received via email their School Letter of Selection, NELA FAQ Sheet, and School Contract.
    b. DC confirms that the 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 each 6th, 7th and/or 8th Grade involved in the study (completed by lead teachers)
iii. Teacher Information Form (completed by teachers of students participating in MSEL Survey)
iv. MSEL Survey (completed by students and administered by Data Collector)

c. Confirms the class periods for administration of the MSELS and the number of students in each class.
d. Asks if the Principal/School Contact has any project-related questions.

2. DC and the Principal/School Contact confirm the type of parental consent (active or passive) is required for students to participate in the survey and finalize/review procedures for obtaining this consent.

D. Identification of Date for On-Site Administration of MSELS (April-May)

1. DC and the Principal/School Contact identify the week(s) in April and/or May for on-site data collection. If no dates in April or May are available, DC works with the school to identify possible dates for data collection prior to the end of the school year, but preferably not within the last week prior to closing.
2. DC and the Principal/School Contact mutually agree on a date (one day for all administration) for on-site data collection.
3. DC and the School Principal and participating teachers agree on how the student survey will be administered (e.g., one-time administration in an assembly/cafeteria (preferred), separate administrations to participating grades, or separate administrations to each class period), and the scheduling of the administration(s).
4. DC confirms with the School Principal and participating teachers that alternative activities for students, who do not have Parental Consent, have been arranged. Teachers are expected to remain present during the administration of the MSELS and complete the Program Information and Teacher Information surveys during this time (if they haven't already). These teachers will not be available to supervise students in alternative activities. Each school will need to determine who will supervise nonparticipating students in alternate activities prior to the administration date.
5. DC informs Karen Cifranick, Assessment Coordinator, of the date selected for data collection and manner of administration.

E. Preparations for Data Collection (April-May)

DC receives Data Collectors Kit, including: Data Collector Administration Materials (Script for Administering MSELS, Customized sets of Scantron sheets, Survey booklets, and Pencils), Return Package: postage/ mailing label and Materials Checklist).

1. DC confirms with the Principal/School Contact that parental consent has been obtained and requests the total number of 6th, 7th, and/or 8th grade students who will participate in the survey.
2. DC verifies with Karen Cifranick the appropriate number of MSEL Survey booklets, Scantron forms, and pencils that will be needed for each school.
3. DC receives Data Collectors Kit from Karen Cifranick and sends confirmation of receipt to her.
4. DC sends e-mail reminder to the Principal/School Contact about the date and administration plan/schedule for the upcoming on-site data collection within 2-3 days of that date.

F. On-Site Data Collection (April-May)

1. DC arrives early, signs in, greets the Principal/School Contact and discusses plans for the day.
2. DC should visit location(s) 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:

3. Shortly before administration, DC talks with the classroom teacher:
    a. DC collects "Parental Consent Forms" from the teacher and asks that any students without Parental Consent leave the testing location for their alternate activity.
    b. DC asks teacher how they prefer any potential problems during administration (e.g., student misbehavior) be handled.
    c. DC asks teacher to stay in the room, but remain seated during the survey. Additionally, the teacher should not respond to any student questions. These will be handled by the DC. These protocols ensure consistent administration of surveys across the country.
    d. DC asks teacher to complete the Program Information Form and Teacher Information Form while students complete the MSEL Survey (if they haven't already).

4. 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 MSELS 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 45-50 minutes, and
    e. DC asks students to raise her/his hand if they have questions during the survey.
5. 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 their school, 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
6. 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)
7. At the end of each administration:
    a. DC thanks the students and teacher for their participation and cooperation with this survey

8. After all administrations:
    a. DC meets with Principal/School Contact 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. When all materials are completed and collected, the DC should thank the Principal/School Contact for her/his cooperation.

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

1. DC sends e-mail to Karen Cifranick on the status of on-site administration and completion/submission of materials, with cc to the Principal/School Contact.
2. Karen Cifranick responds to DC and Principal/School Contact either: (a) thanking them for their efforts, and authorizing the mailing of materials for that school to Karen Cifranick; or (b) seeking information about any missing or incomplete materials, and what steps will be taken to complete and provide those materials
3. When Karen Cifranick has received all completed materials for that school, she 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 booklet (the Middle School Environmental Literacy Instrument)**. 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 are no correct answers – 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 answer sheets (Scantron Forms) will be put together, so when we get them back, we won't ever know whose is whose.

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 the MSELS booklets and Scantron Forms)

On the Scantron Forms there is a place marked NAMES, have the students' write their school's name here. There is also a place marked SUBJECT, have the students' write their grade level and teacher's name in this spot. Finally, have students write the date of administration in the spot marked DATE. Write this on the board for students prior to handing out the MSELS and Scantron Form. Check that this was completed as students return their Scantron Forms and MSELS booklets.

Survey Administration Materials included in your mailing:

_____ MSELS (student booklets)
_____ Scantron (response) forms
_____ Pencils
1 copy of the Data Collector's Script
1 copy of the Teacher Introduction
1 FedEx *return label and plastic pouch (Drop off your box at the nearest FedEx location and they will automatically charge my account.)
Please verify your receipt of these materials by emailing me at cifranick@yahoo.com.
If you are missing anything or require additional materials, please contact me immediately (home) 757-480-1107 or (cell) 443-243-9411. Thanks, Karen

***Q. What materials should you mail back?**
A. All documents received by the school that are printed in BLUE and all testing materials (except pencils…students may keep them).

- School Information Form
- Program Information Form(s)
- Teacher Information Form(s)
- Consent Forms (Active Only)
- Materials Verification Form
- MSELS student booklets
- Scantron forms (used and unused)

NELA Study 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. If upon receipt any materials are missing, please contact the Assessment Coordinator, Ms. Karen Cifranick, (757) 480-1107 or cifranick@yahoo.com.; and
(b) to encourage the School Principal and the Regional 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
☐	Cover Letter to Principal	
☐	Principal General Guidelines & Procedures	
☐	School Contract & Request for Payment	☐
☐	Principal Packet: School Information Form	☐
☐	Packet for Each 6th Grade Teacher:	
	A: Cover Letter & Teacher Consent Form	
	B: Program Information Form	☐
	C: Teacher Information Forms (min. 1 per class)	☐
	D. Teacher Guidelines & Procedures	☐
☐	Packet for Each 7th Grade Teacher:	
	A: Cover Letter & Teacher Consent Form	☐
	B: Program Information Form	☐
	C: Teacher Information Forms (min. 1 per class)	☐
	D. Teacher Guidelines & Procedures	☐
☐	Packet for Each 8th Grade Teacher:	☐
	A: Cover Letter & Teacher Consent Form	☐
	B: Program Information Form	
	C: Teacher Information Forms (min. 1 per class)	☐
	D. Teacher Guidelines & Procedures	☐
☐	Parental Consent Forms:	
	* for Each 6th Grade Class	☐
	* for Each 7th Grade Class	☐
	* for Each 8th Grade Class	☐
To be distributed by the Data Collector:		
	Copies of the student survey (MSELS)	☐
	Response/Scantron Forms	☐

_____ _____

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

Appendix J
Report by Dr. Ron Meyers, Data Collector Recruiter

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

Prepared by:
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June 9, 2009

SUMMARY

In April, May and June of 2009, the National Middle School Student Environmental Literacy Assessment Project, also referred to as NELA Phase 2, administered four sets of surveys at sixty-five schools across the United States. This report documents the efforts to recruit and train the team of data collection coordinators who coordinated and administered the surveys at the schools.

For each of the schools, four surveys were administered. These included: one to document school demographics; one to document the environmental, science, and outdoor education programming for each grade (sixth and/or seventh and/or eight grade) that participated in the study; and, one for each of the teachers of those classes that ascertained their demographics, teaching styles, and attitudes towards environmental education, and; one to assess the environmental literacy of each student in those sixth, seventh, and/or eight grade classes chosen to participate in the study. The documents used to recruit and directly train the data collectors are in Appendix I.

Data Collectors Recruitment

The sixty-five schools were located throughout the U.S., from Hawaii, to Washington State, southern California, southern Florida, to Maine. Building upon the recruitment and training process

used in Phase I of the National Environmental Literacy Assessment (NELA), a cyber-recruiting strategy was used. Each data collector was provided $400 stipend for each school they surveyed to compensate their time and other expenses related to the project.

To recruit data collectors, a database was developed that included lists of Phase I (NELA) data collector applicants, all NAAEE members, and membership lists of past and present members of the NAAEE Research Commission. To this list was added the list of schools selected for the study. The combined list was sorted by zip code first, and then by state. Those persons living within the same state as the school, and all those residing within a reasonable distance from each school's zip code were emailed a request to assist with the study. The request stated the city, but not the name, of the school. This was done in order to prevent applicants with a special attachment to the school from applying, as well as to provide anonymity for the school. A recruitment flyer and application were electronically sent to each person in the group. Table 1 lists the participating schools in each state.

Table 1: Participating schools in each state

Arkansas - 1	Maine – 2
Arizona - 4	Missouri - 1
California - 2	New Jersey - 2
Colorado - 3	New Mexico - 1
Florida - 5	New York - 1
Georgia - 1	Oregon - 1
Hawaii - 1	Pennsylvania - 1
Iowa - 4	South Carolina - 6
Illinois - 2	Tennessee - 2
Indiana - 1	Virginia - 1
Kentucky - 2	Vermont - 1
Louisiana - 1	Washington - 4
Massachusetts - 1	Wisconsin - 4
Maryland – 9	West Virginia – 1

Data Collector Selection

All data collectors' applications indicated some experience in environmental education and interest in supporting the study. From this pool, data collectors were selected based upon that experience, interest, proximity to the selected counties and/or schools, and in order of application. Qualification criteria included level of education, with preference given to advanced degrees, preferably a masters

or doctorate in education, professional affiliation with an environmental education organization, and membership in NAAEE. However, no persons who were affiliated with or nominated the schools were permitted to administer the surveys to student participants in order to reduce external threats to validity. Where no potential data collectors applied after the initial emailing, follow-up emails were sent to the lists, and in a few cases, the chairs of the state affiliate were asked to assist with recruitment.

Data collectors were prepared by emailing them two sets of documents (ten total documents) designed to familiarize them with the overall study process, to give them broad context to use in making discretionary judgments, and to provide them with very specific guidelines on how to administer the surveys (to ensure consistency in administration of the survey). These guidelines included instructions to: become familiar with the study and all materials sent to the schools; contact the schools to schedule a meeting prior to administering the survey and schedule the administration of the survey; meet with the school contact prior to administration of the study to confirm all arrangements for having the survey forms completed, the procedures for administering the survey, and to check the site to ensure that it was suitable for administration of the surveys; and to become familiar with the detailed instructions on how to administer the survey to students. The attention to consistency in administration of the survey was done to reduce variability in the administration of the survey and reduce potential threats to validity.

When data collectors were selected, they were sent the first packet, "Initial Contact Packet for Data Collectors", which contained five documents, including: Data Collector Introductory Letter; Data Collector Guidelines, Procedures, and Timeline; Data Collector Recruitment FAQ; NELA Website Materials, Documents and Supplies List; and the Data Collector Purchase of Service Agreement.

The Data Collector Introductory Letter gave data collectors a login to a project website and directed them to become familiar with the site and review all project documents on it. The site contained, in addition to all the materials that Data Collectors were sent via regular mail, another thirteen documents that were used to recruit, inform school administrators and teachers of their responsibilities, as well as the School, Program, and Teacher survey forms. The project website was hosted by the North American Association for Environmental Education.

When the data collectors confirmed that they had read and understood the materials in the packets and become familiar with the website, they were sent the contact information for their school(s) and given permission to make arrangements to administer surveys at the school. At this point, the Data Collector Recruitment Coordinator certified that the data collectors were ready to proceed with their duties to work with the schools to administer the surveys. Karen Cifranick, the Assessment Coordinator, was the primary point of contact to work with the data collectors from that point forward.

Appendix K
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 and Ms. Jennifer Engelhardt, Florida Institute of Technology

August 3, 2010

Step 1: Reading Scantron Responses into Text Files

This first step involved a number of related activities. Dr. Marcinkowski oriented Ms. Jennifer Engelhardt, Research Assistant, and Dr. Elvan Sahin, Research Associate, to the tasks associated with the preparation of Scantron forms for data entry and with data entry (e.g., organizing forms into class or grade-level sets, numbering forms, removing partial erasures and stray marks). With assistance from technicians in Florida Tech's Technology Support Center, and with the files for each school provided by Ms. Cifranick, we conducted several practice sessions so as to become familiar with the creation of text files for each class, entering forms and working with forms that were not read on the first pass by the Scantron reader (e.g., re-entering forms, preparing notes so as to remove blanks and duplicates, preparing to manually enter responses), partitioning data in text files, importing text files into MS Excel, formatting those MS Excel files, and labeling each data file (e.g., by school and by grade). During practice sessions, we rotated roles and responsibilities (i.e., one to work with data files, one to manually enter Scantron forms, and the third as a supporter/observer), until everyone understood the data entry process and until that process ran smoothly.

For MSELS Section VII., Items 68-75 pertaining to Action Strategies, a slightly different approach was used than was used in Year 1 (Phase 1). Rather than using a script to remove responses other than "a" during data entry, all Scantron responses were read into text files. Following data entry, Ms. Engelhardt and Dr. Sahin deleted all responses other than "a" from MS Excel files manually so as to maintain consistency with the preparation of Year 1 data files.

Initially, Scantron forms were entered and data files were created for each participating class. However, following discussions with members of the Research Team as to how data would be analyzed, a decision was made to read all classes within the same school and grade level into a single data file. These procedures resulted in the creation of 175 text files and 175 corresponding MicroSoft Excel files. Data folders were created for each grade level within each school (i.e., separate data folders for all 6^{th}, all 7^{th}, and all 8^{th} grade data files from the same school). In turn, these grade-level folders were placed in one folder for each school.

Step 2: Formatting and Editing MS Excel Files

Once all MS Excel files had been created and properly labeled, Dr. Marcinkowski, Ms. Engelhard, and Dr. Sahin began to ready these MS Excel files for scoring and analysis. In the first step, each of the 175 MS Excel files was formatted. This involved copying and pasting the data set in each file to (a) create 11 blank columns in Columns A-K; and (b) to create two blank rows in Rows 1 and 2. Columns A-K were filled with information used to code each data set, as follows:

- Col. A: School ID number;
- Col. B: State abbreviation (e.g., AR for Arkansas);
- Col. C: Type of school (public, private independent, private religious);
- Col. D: Range of grades in the school (K-8 = 1; 6-8 = 2; 7-9 = 3, 6-12 = 4; etc.);
- Col. E: Primary sampling category (1 = Program; 2 = Approach; 3 = Network; 4 = Magnet/Charter; 5 = Independent);
- Col. F: Secondary sampling category (e.g., magnet and charter schools in the sample but not in Category 4);
- Col. G: Specific EE program/approach represented;
- Col. H: Grade level;
- Col. I: Teacher ID number (i.e., from 1 to n in each data file);
- Col. J: Class Period; and
- Col. K: 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 labeled with the correct answer or point value, for scoring purposes.

Once item numbers (columns) and Student ID numbers (rows) had been added to each MS Excel file, Ms. Engelhardt and Dr. Sahin compared each Scantron form to each data record, matching Student ID number in the MS Excel file to the Student ID number on each Scantron form. They 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 (e.g., splitting one data file into two on the basis of this grade level responses). Once this was accomplished, they were able to review data records to ensure that Scantron responses had been properly read into each data file. They 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 reading student responses (e.g., those lightly penciled in, responses missed by the Scantron reader), these were typed into the data file. At the same time, they 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 a response partially erased by the student as a second response, the corresponding "?" symbols in each data file was replaced with the marked Scantron response. Once this had been completed for each of the 175 data files, these data files very closely matched the sets of Scantron forms sent by Ms. Cifranick.

A second round of formatting was undertaken on these MS Excel files in preparation for scoring and analysis. The same answer and scoring key used to score student responses to the MSELS in the Year 1 Baseline Study was used to scores student responses in the Phase 2 study. 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 (in Row 1), and the range of possible scores was entered (in 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).

Step 3: Identification and Designation of Unusable Responses

As was found in the Year 1 Baseline Study, 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 could adversely affect the calculation of scores and analysis of data. As a result, during the preparation of the Year 1 data set, members of the research team determined the number of blanks in each scale that would be deemed acceptable and unacceptable. The same decision rules used in the Year 1 study were used in the Phase 2 study 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, as in Year 1, some student responses reflected what is commonly referred to as a "response set." Two common forms of response sets are: (a) selecting the same lettered response for all items in a given scale (e.g., all "a" or "e"); and (b) sequencing responses in a visible pattern such as a Christmas tree (e.g., 1st item = A, 2nd Item = B, 3rd Item = C, 4th Item = D, and so on). In all instances within the Phase 2 data set, response patterns that had a clear visible pattern on one or more scales were deemed invalid and therefore unusable. However, this same rule was not 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.

Further, 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, discuss, 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.

Step 4: Treatment of Missing Responses

Even after the data records with 25% or more missing responses had been identified and deemed unusable in Step 3, there were still a rather large number of data records in which there was a smaller number of missing responses. 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 use a form of multiple imputation commonly referred to as "hot deck imputation" (HDI) during the preparation of Year 1 data files. Members of the research team reviewed material on this, and agreed to support its use. Consequently, this same form of imputation was used to prepare the Phase 2 data set.

As in Year 1, HDI involved three steps. First, the researcher(s) identify student records containing blanks, and search for one or 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 the matching record(s) are compared and, when appropriate, used to "fill in" missing responses. When no matching record(s) are found, the missing response remains blank and is marked (e.g., filled in with yellow). When one matching record is found, the corresponding value from the matching record is used to fill in each missing response. In instances where more than one matching record is found, the best matching records are compared. If there is 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 is left blank and marked. 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 procedures described above, Ms. Engelhardt and Dr. Sahin used HDI to search for and, when appropriate fill in, missing responses in each data file. Ms. Engelhardt did so for Schools whose names began with A-M, and Dr. Sahin did so for Schools whose names began with N-W. Each maintained a detailed record of all missing responses (blanks) encountered and of all imputation decisions in MS Excel spreadsheets. In all cases, within the data files, imputed values used to fill in blanks were highlighted in red font.

Step 5: Conversion of Alpha to Numeric Responses

All of the activities undertaken in Steps 1 through 4 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. Ms. Englehardt and Dr. Sahin used the "find" and "replace" tools in MS Excel to convert alpha to numeric data for all items (i.e., A=1, B=2, C=3, D=4, E=5). However, as noted under Step 4, there were six negatively worded items that required reverse scoring. Consequently, they completed the reserve scoring for these six items in all files (i.e., A=5, B=4, C=3, D=2, E=1).

Finally, 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, Ms. Engelhardt and Dr. Sahin followed the scoring directions from the Year 1 study provided by Dr. Marcinkowski. 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 for 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.

Step 6: Final Preparation of Data Sets

Data files were prepared to permit analyses of data set pertinent to Research Question One (i.e., results from Phase 2) and Research Question Two (i.e., how results from Phase 2 compared to results from the Year 1 Baseline Study). Data files also were prepared to support analyses that would yield results that paralleled those presented in the Final Report for the Year 1 Baseline Study (e.g., Tables 1, 24, and 34). Finally, data files were prepared to permit analyses that reflected different units of analysis (e.g., analysis of data for each grade level within each school needed for *School Reports* and *Nominator Reports*, as well as for each grade level across all schools). In addition to the creation of the MS Excel data files described earlier in this report, data files created to support these analyses included the following:

- when data files for each class had been created, it was necessary to merge data from all classes at the same grade level within the same school into a single file; and
- copying student records from 6th grade classes in all participating schools into a single data file, and then doing the same for all 7th and all 8th grade classes.

Finally, results of descriptive statistical analyses of data for each grade in each school were summarized in tables and charts, as these were needed to support inferential statistical analyses (e.g., Z tests), and the calculation of component and composite scores. Subsequently, the latter were summarized in tables and charts and used to conduct additional inferential statistical analyses (e.g., t-tests).

Appendix L
Sample School and Nominator Reports

Sample School Report
- Letter from Coordinator of NELA Project
- Results from 2007 NELA Phase 1 – Baseline Study
- Results for Each Participating Grade at the School
- Comparison Between Phase One Composite Results and the School

Sample Nominator Report
- Letter from Coordinator of NELA Project
- Results for Program-related Schools on Specific Literacy Variables
- Results for Program-related Schools on Specific Literacy Composite Scores

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

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2/9/2010

Dear School Administrator and NELA Contact:

On behalf of the research team, I would like to express our appreciation for your efforts in Phase II of the National Environmental Literacy Assessment (NELA).

Your selection or nomination to participate in NELA Phase II expressed a vote of confidence that your school is one of the best in the country at environmental education programming. You should take great pride in this alone! The professionalism with which all of the participants (students, parents, teachers, and administrators) at your school acted allowed us to make a very difficult task manageable. We especially appreciate your communication with Ms. Karen Cifranick and the Data Collectors who visited your school. From our prior experience, this was critical to a study such as this.

Sixty-four schools across the U.S., representing over 8,000 students participated in this study. Our data collection was completed toward the end of the spring semester of 2009 and we are now at the point in our data analysis where we can provide each school in the study with individualized results. Your school's data are valuable to the research team as we compare them to the data generated during NELA Phase I, a national random sample of 6th and 8th graders from schools across the United States. Unlike the random sample used in Phase I, Phase II included schools that were nominated specifically for their efforts in environmental education.

The data included in this school report were gathered using the Middle School Environmental Literacy Survey (MSELS). Similar data collection and analysis methods were used for both Phase I and II, allowing the research team to make valid comparisons across these two studies.

In this report you will find:

A. a table that identifies the 6th and 8th grade environmental literacy raw scores and composite scores from the baseline environmental literacy results during Phase I of NELA,
B. a table (with similar information to A) for each grade from your school that participated in Phase II, and

C. a graph that compares composite scores from the respective grades in your school to 6th and 8th grade composite scores from the Baseline Study.

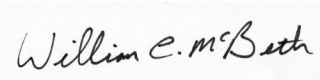
If your school was one of several nominated by an individual program, network, or approach, we may be sending these results on to the head of the program, or to the individual who nominated your school. In no case will the name of your school be matched to the results they receive. Rather, we will identify your school with only a letter (e.g., School A), to protect your confidentiality. If you are contacted by your nominator, you can decide whether or not to identify your school to them.

In providing you with these data, it is not our intent to judge the success of your environmental programming. However, we hope that these data prove useful to you as you evaluate your efforts and make decisions concerning your programming.

The research team anticipates the completion of our final report by the end of the summer, 2010. Upon the acceptance and publication of the report, we will provide you with a URL where you can access the report so that you might examine it in its entirety. In the final report your school will be identified by number or letter only, again protecting your anonymity.

On behalf of the research team, I want to thank you for your efforts in environmental education and the work that you do with our youth.

Sincerely,



William C. McBeth, Ph.D.

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608-342-1284

Table 1. Results from 2007 National Environmental Literacy Assessment (NELA) Phase 1 – Baseline Study

1	2	3		4		5	
Major Components of Environmental Literacy	**Environmental Literacy Variables Measured in the Baseline Study**	**Raw Mean Scores on Literacy Variables**		**Adjusted Mean Scores for Environmental Literacy Components (60 possible points per component)**		**Total Environmental Literacy Composite Scores (240 possible points)**	
		6th	**8th**	**6th**	**8th**	**6th**	**8th**
Ecological Knowledge	Ecological Knowledge	11.24	11.62	39.67	41.01	143.99	140.19
Environmental Affect	Verbal Commitment	43.89	41.10	40.73	38.06		
	Environmental Sensitivity	32.54	30.11				
	Environmental Feeling	8.14	7.82				
Cognitive Skills	Issue Identification	1.31	1.29	25.15	25.98		
	Issue Analysis	2.75	2.86				
	Action Planning	7.25	7.86				
Behavior	Actual Commitment	38.44	35.14	38.44	35.14		

The table above presents the results from Phase 1 of the National Environmental Literacy Assessment (NELA), a study undertaken to provide baseline information on environmental literacy among middle school students in the United States. In Phase 1, data were collected from 2,004 middle school students (1,042 6th graders and 962 8th graders) in a national random sample of public and private schools across the U.S. The research team used a survey to gather information on student levels of environmental knowledge, skills, affective characteristics (feelings), and participation, as well as grade level, age, gender, and ethnic background information. The complete final report on that study is available at http://www.oesd.noaa.gov/NAEE_Report/. These results presented above are intended to serve as a guide in interpreting the results for your school, and to provide you with a basis for comparing environmental literacy levels among your students to the national baseline (NELA Phase1).

Column 1 – lists the four major components (domains) of environmental literacy that were included in the study.
Column 2 – lists the variables measured in the study, grouped into the four major components.
Column 3 - presents the raw means of each measured variable for the 6th graders and 8th graders in the national sample.
Column 4 – presents the adjusted mean scores for the 6th graders and 8th graders in the national sample. In order to look at student characteristics across the four major components, we used multipliers to derive adjusted scores with a maximum of 60 points possible for each component. For example, were applied to the raw mean scores for verbal commitment, environmental sensitivity, and environmental feeling in order to derive an adjusted mean score for Environmental Affect.
Column 5 - presents composite scores for the total survey for the 6th graders and 8th graders in the national sample. These scores are the sums of the four adjusted mean scores found in the previous column.

The following table or tables represent the grade levels from your school that participated in Phase 2 of NELA. There is one table for each grade level. You can use the information below Table 1 to guide you in understanding environmental literacy in your school and in comparing environmental literacy levels among your students to those in the national baseline study.

Table 2a. Environmental Literacy Results –XXXXX School 6th grade

Major Components of Environmental Literacy	Environmental Literacy Variables Measured In This Study	Raw Mean Scores on Literacy Variables	Adjusted Mean Scores for Environmental Literacy Components	Total Environmental Literacy Composite score (240 possible points)
Ecological Knowledge (60 possible points)	Ecological Knowledge	11.75	41.47	159.71
Environmental Affect (60 possible points)	Verbal Commitment	50.12	45.31	
	Environmental Sensitivity	34.72		
	Environmental Feeling	9.16		
Cognitive Skills (60 possible points)	Issue Identification	1.24	28.33	
	Issue Analysis	3.45		
	Action Planning	8.57		
Behavior (60 possible points)	Actual Commitment	44.60	44.60	

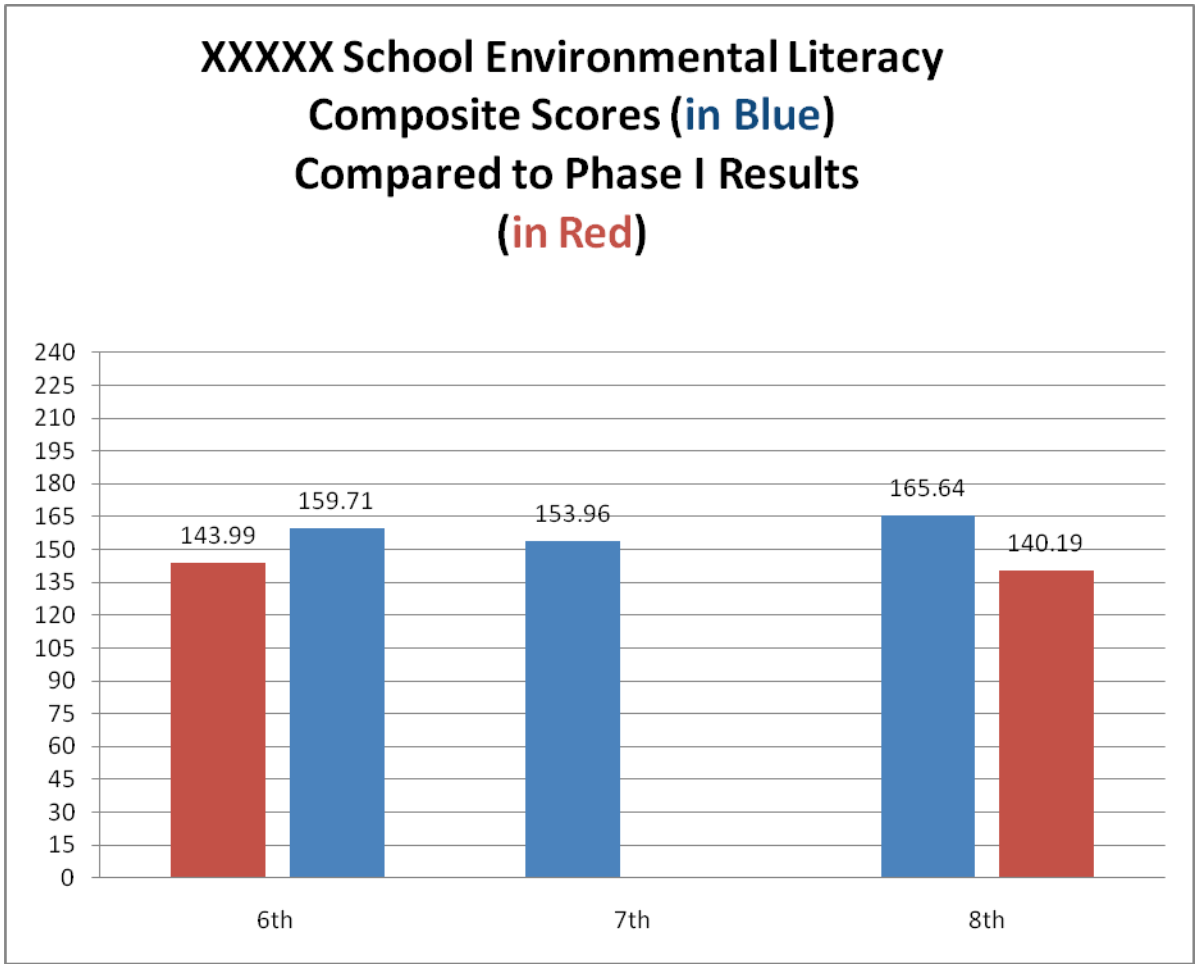
Table 2b. Environmental Literacy Results – XXXXX School 7th Grade

Major Components of Environmental Literacy	Environmental Literacy Variables Measured In This Study	Raw Mean Scores on Literacy Variables	Adjusted Mean Scores for Environmental Literacy Components	Total Environmental Literacy Composite score (240 possible points)
Ecological Knowledge (60 possible points)	Ecological Knowledge	12.12	42.77	153.96
Environmental Affect (60 possible points)	Verbal Commitment	46.31	42.85	
	Environmental Sensitivity	34.04		
	Environmental Feeling	8.63		
Cognitive Skills (60 possible points)	Issue Identification	1.26	25.51	
	Issue Analysis	2.99		
	Action Planning	7.15		
Behavior (60 possible points)	Actual Commitment	42.83	42.83	

Table 2c. Environmental Literacy Results – XXXXX School 8th Grade

Major Components of Environmental Literacy	Environmental Literacy Variables Measured In This Study	Raw Mean Scores on Literacy Variables	Adjusted Mean Scores for Environmental Literacy Components	Total Environmental Literacy Composite score (240 possible points)
Ecological Knowledge (60 possible points)	Ecological Knowledge	12.79	45.14	165.64
Environmental Affect (60 possible points)	Verbal Commitment	47.82		
	Environmental Sensitivity	32.14		
	Environmental Feeling	9.11	42.94	
Cognitive Skills (60 possible points)	Issue Identification	1.67		
	Issue Analysis	3.93		
	Action Planning	10.56	34.79	
Behavior (60 possible points)	Actual Commitment	42.77	42.77	

Table 3. Environmental Literacy Composites Scores – A Comparison between NELA 1 and Your School



This graph presents your school's data alongside data collected from the 2007 National Environmental Literacy Assessment (NELA Phase I) baseline data. The outer red bars represent the environmental literacy composite means for the 6th and 8th grades from the 2007 baseline study. You will notice that there is no data for the 7th grade baseline, since 7th grade data were not collected in the Phase I research. Blue bars represent composite means from the grades in which data were collected in your school. Each of these composite data sets were generated using the scores for the four major environmental literacy components measured by the student survey (the Middle School Environmental Literacy Survey). The scores were adjusted to allow for comparison across the four major components. The maximum possible score for the composite is 240.

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April 8, 2010

Dear School Nominator:

We would like to extend our sincere thank you for nominating schools into Phase II of the National Environmental Literacy Assessment (NELA). Our data collection was completed by the end of the Spring semester of 2009 and we are now at the point in our data analysis where we can provide each school in the study with individualized results, and each nominator with the results from the schools he or she nominated.

The data from the schools you nominated are valuable to the research team as we compare them to the data generated during NELA Phase I, a national random sample of 6th and 8th graders from schools across the United States. The Phase I results presented us with a national baseline for environmental literacy among U.S. middle school students. Phase II included schools that were nominated purposefully for their efforts in environmental education. In many cases, schools were nominated into the Phase II study because they were affiliated with a specific program or approach to environmental education. The results of Phase II will provide us with a profile of middle school students in schools with established environmental programming.

This report is going out to individuals who nominated schools for participation in the Phase II study. The information included in the nominators report was gathered using the Middle School Environmental Literacy Survey (MSELS). Similar data collection and analysis methods were used for both Phase I and II, allowing the research team to make valid comparisons across these two studies. If you would like more information about the data collection and analyses methods, please consult the Final Report for the Phase I National Environmental Literacy Assessment, which can be found at: http://www.oesd.noaa.gov/NAEE_Report/.

In the attached file you will find two tables summarizing results from the schools you nominated:

A. Table 1, which includes results for the grade or grades (6^{th} , 7^{th}, and/or 8^{th}) from each of your schools that participated in Phase II. This table will permit you to observe how students in your program performed on the eight sections of the environmental literacy survey, and to compare their results to the environmental literacy baseline results from the national random sample. Table 1 also lists other curricular sources, in addition to your program, that were reported as used by each school, and

B. Table 2, which presents the environmental literacy mean component scores and composite score from the baseline literacy study and from each of your schools.

We have also contacted individual schools to provide them with similar individualized information. In our letter to the schools, we indicated that we would not disclose identifying information in reports about the project. Therefore, in this report to you we have identified the schools you nominated by letter only (e.g. School A, School B, etc.), thereby protecting each school's anonymity and respecting our assurance of confidentiality.

In providing you with this information, it is not our intent to ascertain the success of any school's environmental programming. Rather, these data indicate how students at a particular school performed on a measure of environmental literacy and how those results look next to the national baseline.

The research team anticipates the completion of our report by the end of the Summer, 2010. Upon the acceptance and publication of the report, we will provide you with the report URL so that you might examine the report in its entirety. In the final report schools will be identified by number or letter only, again protecting their anonymity.

On behalf of the research team, I want to thank you for your efforts in environmental education and for helping us with this important study. We hope that these data prove useful to you as you make decisions concerning your particular efforts.

Sincerely,

William C. McBeth

William C. McBeth, Ph.D.

Coordinator of the NELA Research Team

Table 1. Descriptive Results from Phase 2 of the National Environmental Literacy Assessment for Schools Affiliated with XXXXX Program, by Environmental Literacy Scale
[Format slightly modified to be consistent with that of Final Report.]

Part of *MSELS (Variable Measured)* No of Items: Possible score	National 2008 Baseline Results: Weighted Means and SD by Grade Level		School A * Means and SD by Grade Level			School B * Means and SD by Grade Level			School C * Means and SD by Grade Level		
	6th n=1,042	8th n=963	6th n=5			6th n=83	7th n=62	8th n=75	6th n=180		8th n=238
II. Ecological Foundations (*Knowledge*) 17 items: 0-17	11.24 3.26	11.62 3.32	11.71 2.82			13.52 2.33	13.73 1.86	13.09 4.07	12.17 3.41		8.80 3.43
III. How You Think About the Environment (*Intention*) 12 items: 12-60	43.89 8.88	41.10 9.20	46.21 8.11			45.75 8.30	45.00 9.39	42.91 10.50	44.17 7.61		42.40 5.62
IV. What You Do About the Environment (*Behavior*) 12 items: 12-60	38.44 9.15	35.14 9.39	41.86 7.53			42.15 8.61	42.13 8.67	38.81 10.35	39.33 7.95		38.65 9.08
V. You and Environmental Sensitivity (*Affect*) 11 items: 11-55	32.54 7.47	30.11 7.48	32.71 6.29			30.62 6.33	31.27 7.55	28.88 7.37	31.71 7.85		30.95 8.88
VI. How You Feel About the Environmental (*Affect*) 2 items: 2-10	8.14 2.00	7.82 2.06	8.94 1.59			8.97 1.39	9.02 1.51	8.39 2.14	8.63 1.79		7.16 2.54
VIIa. Issue Identification (*Cognitive Skills*) 3 items: 0-3	1.31 0.93	1.29 0.95	1.24 0.99			1.56 1.10	1.48 0.94	1.81 0.98	0.91 0.90		0.74 0.65
VIIb. Issue Analysis (*Cognitive Skills*) 6 items: 0-6	2.75 1.89	2.86 2.00	2.80 1.88			4.22 1.78	4.34 1.78	4.38 1.59	2.60 1.97		2.10 1.62
VIIc. Action Planning (*Cognitive Skills*) 8 items: 0-20	7.25 5.44	7.86 5.64	7.20 5.06			11.13 4.95	9.84 5.43	9.00 5.39	6.24 4.83		4.81 5.21
Other Major EE Resources Used in This School's Environmental Program:			Earth Day activities; *State* EE Assn; Project WILD; Project WET; Project Learning Tree; Hooked on Fishing Not on Drugs; Outdoor Classroom Education; Jr. Master Gardener Program; Stream Team			Earth Day; Project WET; Project WILD; The Center for Earth & Environmental Education; Wonders of Wetlands; Ecology Club; Summer Ecology Camps			Green and Healthy; Project WILD; Flying WILD; CATS; *Local* 4-H overnight marine science camp; Journey North; Let's Get Wild (*State* DNR); *Local* Nature Center; EPSN – Give Plants a Chance; Science Club		

Note: The *n* (number of students) reported for each school reflects the total number of participating students at each grade from that school. The number of usable responses on each scale varied (e.g., due to incomplete or invalid responses), and is not reported here.

Table 2: Environmental Literacy Composite Scores for Participating Schools Affiliated with Program XXXXX

[Format slightly modified to be consistent with that of Final Report.]

Source of Results	Grade	Ecological* Foundations (Part II)	Environmental* Affect (Parts III, V, and VI)	Cognitive* Skills (Part VIIa, b, c)	Environmental* Behavior (Part IV)	Environmental** Literacy Composite Score
Baseline Results	**6**	**39.67**	**40.73**	**25.15**	**38.44**	**143.99**
	8	**41.04**	**38.06**	**25.98**	**35.14**	**140.19**
School A	**6**	**41.32**	**42.34**	**24.79**	**41.86**	**150.31**
School B	**6**	**47.71**	**41.15**	**35.59**	**42.15**	**166.60**
	7	**48.45**	**41.09**	**34.16**	**42.13**	**165.83**
	8	**46.19**	**38.66**	**35.66**	**38.81**	**159.32**
School C	**6**	**42.95**	**40.70**	**20.97**	**39.33**	**143.95**
	8	**31.06**	**38.78**	**16.74**	**38.65**	**125.32**

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.

*The adjusted mean for each component was 60 possible points:

** The total possible score was 240.

The table above includes information regarding how the students in your schools performed on the bases of major components of environmental literacy and compares those results to those derived from Phase 1 of the National Environmental Literacy Assessment (NELA), a study undertaken to provide baseline information on environmental literacy among a national sample of middle school students in the United States. The four major components of environmental literacy addressed in both studies included Ecological Foundations (addressed by the survey section entitled Ecological Knowledge, Environmental Affect (addressed by How You Think About the Environment, How You Feel About the Environment, and You and Environmental Sensitivity), Cognitive Skills (addressed by Issue Identification, Issue Analysis, and Action Planning), and Environmental Behavior(addressed by What You Do About the Environment). In order to look at student characteristics across the four major components, we used multipliers to derive adjusted scores with a maximum of 60 points possible for each of the four components, and an total maximum composite score of 240.

Row 2 presents the adjusted component mean scores and composite environmental literacy score for the 6th graders and 8th graders in the national sample.

Columns 3-6 present the adjusted means for each of the four main environmental literacy components for the national baseline study and for each of your schools. Column 7 presents the environmental literacy composite score for the national baseline study and for each of your schools.

Appendix M
Component and Composite Scores for Phase One Sixth- and Eighth-Grade Cohorts

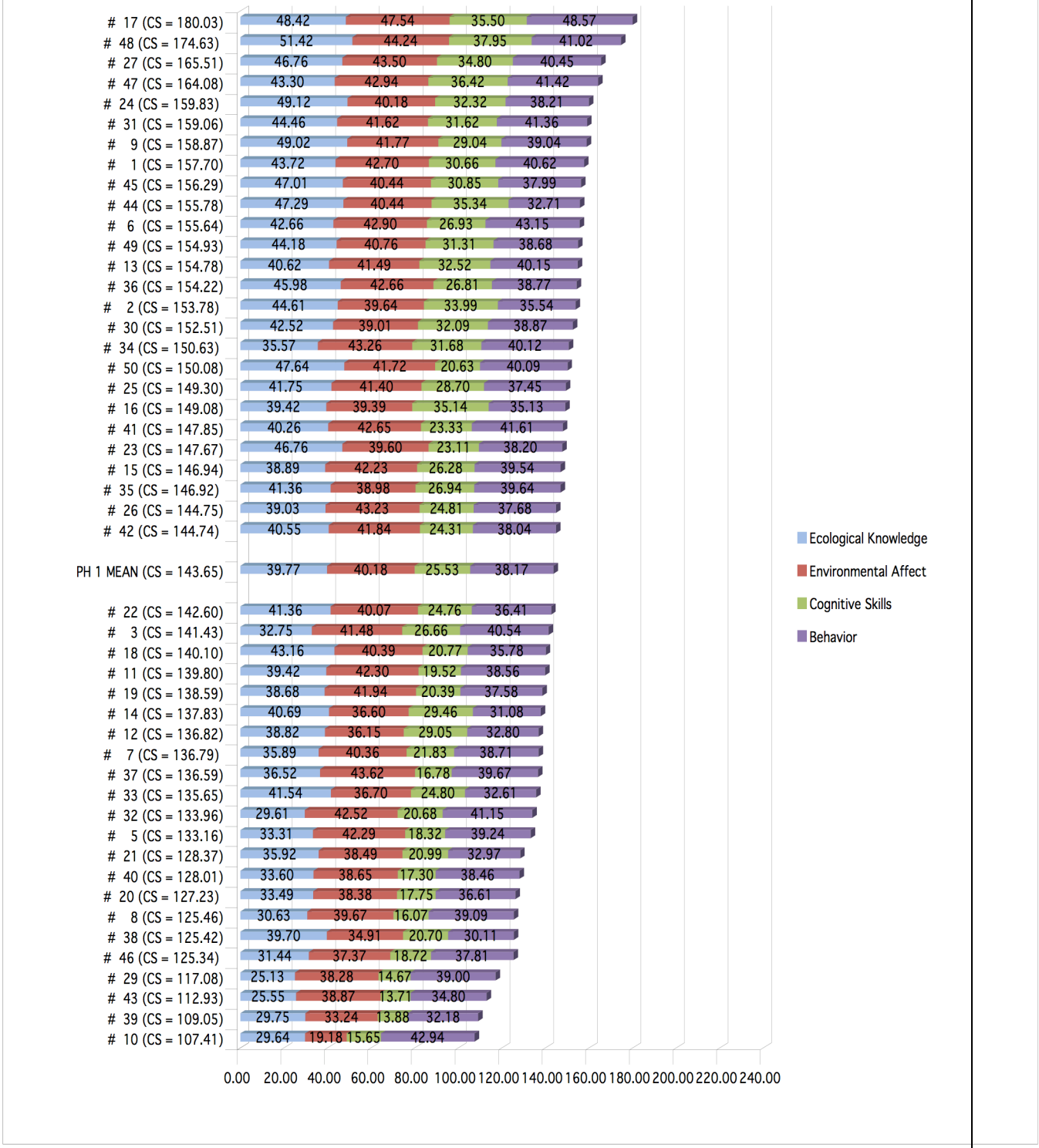

Figure M1. Graphic distribution of Component and Composite scores for Phase One Sixth-Grade cohorts.

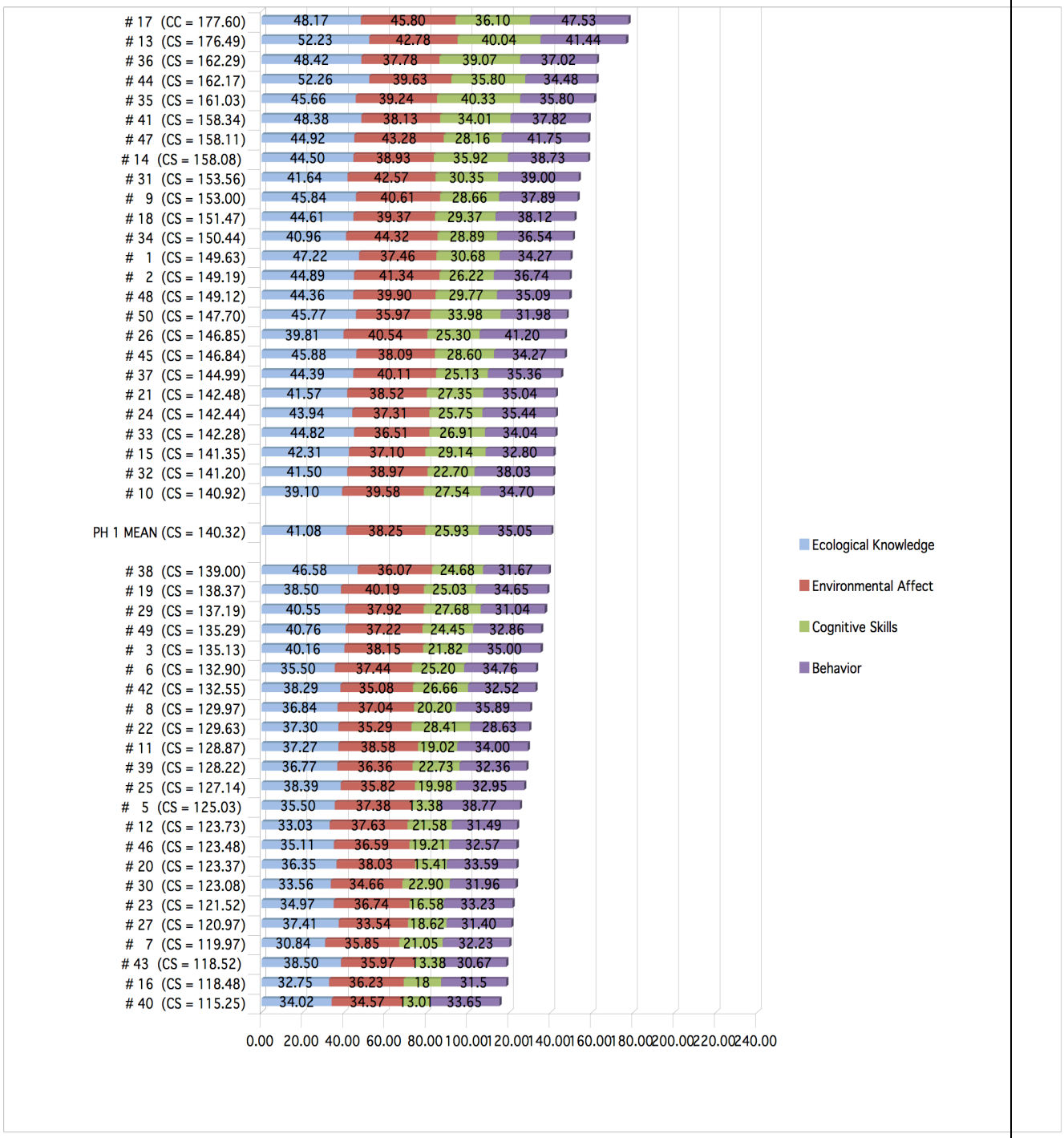

Figure M2. Graphic distribution of Component and Composite scores for Phase One eighth-grade cohorts.