

The Field Museum



CEEP Students Remove Invasive
Garlic Mustard from Eggers Woods

Evaluation Report of the Calumet Environmental Education Program 2002 - 2005

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EXECUTIVE SUMMARY

Calumet Environmental Education Program: 2002 - 2005

In April 2002, Carol Fialkowski, Conservation Education Director at The Field Museum, identified the need to embed evaluation into a new environmental education model, the Calumet Environmental Education Program (CEEP). CEEP brings together three existing environmental programs to create a ladder program continuum. Mighty Acorns is for students in grades 4-6, Earth Force for grades 6-8 and UrbanWatch for grades 9-12. CEEP was conducted in three consecutive school years beginning in fall 2002 with increasing participation by schools, teachers and students between fall 2002 and spring 2005. The program was designed so teachers could teach about the environment and integrate environmental content across their curriculum. CEEP is intended to be a useful model that could be applied in a wide variety of ways.

Five Guiding Questions

The following five questions served as *embedded evaluation*, guiding program goals and subsequent evaluation data:

1. What effect has the CEEP had on teachers' knowledge and understanding of biodiversity, environmental issues and the local community?
2. What effect has the CEEP had on teachers' approach to / inclusion of environmental science content in the classroom?
3. How have teachers coordinated their programs, Mighty Acorns, Earth Force and UrbanWatch, with those taught by other teachers, whether in their same school or in other schools?
4. What effect has the program had on students' knowledge and understanding of biodiversity, environmental issues and the local community?
5. When do students begin to assume personal responsibility for taking independent action to address environmental issues in their homes or communities? What actions do they take? Who influences them?

Terrie Nolinske, Ph.D., Principal of TNI Consultants in Professional Development was the external evaluator for the program. John Sparks served as the statistician for this project. Mr. Sparks is an independent statistical consultant and at the time of this writing a Ph.D. candidate in the College of Business Administration at The University of Illinois, Chicago. Dr. Nolinske and John Sparks worked in collaboration with staff in the Environmental and Conservation Programs (ECP) department at The Field Museum. The first two years staff included Carol Fialkowski, Director of Conservation Education and Julie Schultz, Regional Program Manager. In the

third year, the program was led by Laurel Ross, Regional Director for Conservation Implementation, and Kirk Anne Taylor, Conservation Program Manager.

Methods and Instruments

Questionnaires. Questionnaires were designed to 1) assess the existing level of teachers' knowledge of biodiversity and the environment, 2) determine the frequency with which teachers and students took action about the environment and 3) identify the types of activities in which students and teachers engaged to improve their local environment. Questionnaires were used as a pre-test each fall and a post-test each spring. *Note: Field Museum staff conducted a separate analysis of student knowledge gains during the final two years of the CEEP pilot project. The student content analysis is independent of this report and is described in the report [A Model for Science Learning](#).*

Focus Groups. A focus group was conducted using a *convenience sample* of seven teachers in spring 2004, at the end of the second program year. The purpose of the focus group was to identify program strengths, limitations and areas for improvement. In spring 2005, four student focus groups were held at participating schools to determine whether students were taking independent action to care for the environment. A secondary purpose of the student focus groups was to identify how students use the information they learn through CEEP. A convenience sample means that participants were selected because they were available and willing to participate.

Data Analysis

Only students and teachers who participated in all three years of the pilot program are included in this final report. Percent changes between fall 2002 and spring 2005 were calculated for responses that directly related to each question. All responses were entered into a custom database developed using the SPSS data editor; SPSS is the statistical software package that was used to analyze data. *Frequencies and means* (average responses) were calculated using SPSS software. Percent changes between fall 2002 and spring 2005 were calculated and *T-tests* were performed to compare the equality of the means, using a 0.05 alpha level. For data thus analyzed, this indicates a 95% assurance that changes occurred as a result of CEEP and not by random chance.

Participants

Number of Teachers and Schools. In August 2002, the program began in the Calumet region in south Chicago with George Washington High School and five of its elementary feeder schools. 29 teachers participated. By 2005, all eight feeder elementary schools and the high school were involved in CEEP. During this year, the total number of teachers grew to 62, 54 of which participated in this evaluation.

Number of students. In fall 2002, 691 students completed questionnaires. In spring 2005, 980 students completed questionnaires. Although 2,200 students participated in CEEP throughout the three years, only 111 students participated in CEEP for all three years consecutively. These 111 students served as the test bed for this evaluation.

Results

Question 1: “What effect has the Calumet Environmental Education Program had on teachers’ knowledge and understanding of biodiversity, environmental issues and the local community?”

Overall, teachers in Mighty Acorns, Earth Force and UrbanWatch made statistically significant gains in knowledge about biodiversity, the local community and environmental issues – as a direct result from having participated in CEEP. All questions related to content knowledge showed statistically significant increases ranging from 73% to 1,306%.

Question 2: “What effect has the Calumet Environmental Education Program had on teachers’ approach to and inclusion of environmental science content in the classroom?”

Due to their participation in CEEP, teachers wrote teaching objectives specific to the environment to guide their teaching. In addition to persuading students to take action in their community, teaching objectives included “preparing students for further study about the environment.” This objective is particularly noteworthy for two reasons. First, it appears that teachers acknowledge the importance of laddering three discreet programs into the CEEP program continuum. Second, it appears that teachers, therefore, are more aware of how their program (i.e., Mighty Acorns, Earth Force, UrbanWatch) fits into that continuum and how important it is to prepare students for the next program year along that continuum.

Having participated in CEEP, teachers gained the confidence necessary to teach about natural areas and the environment. They took students outside to interact with nature more often than they did before participating in CEEP. Teachers also spent more time discussing the natural environment with other adults, as a result of participating in CEEP.

Questions 3: “How have teachers coordinated their programs, Mighty Acorns, Earth Force and UrbanWatch, with those taught by other teachers, whether in their same school or in other schools?”

Analyses showed that a change in the pattern of responses is significant, although no one pair of data drives the significance. In 2005, more teachers spent 30 minutes or less talking about content and teaching methods than in 2002. From informal conversations among four teachers and the evaluator after the teacher focus group in 2004, they stated having a heightened awareness that content in Earth Force builds on that of Mighty Acorns and the content in UrbanWatch builds on that of Earth Force and Mighty Acorns.

Interestingly, teachers continue to rely on CEEP staff to initiate and orchestrate communication among them. Teachers continue to ask CEEP staff for additional information. CEEP staff has instituted additional workshops on curriculum integration models, instructing teachers in how to integrate CEEP across grade levels and curricular content.

Question 4: “What effect has CEEP had on students’ knowledge and understanding of biodiversity, environmental issues and the local community?”

Student content data gathered in the final two years of the pilot project showed that students made statistically significant gains in knowledge about biodiversity, environmental issues and the local community as a direct result of having participated in CEEP. The student content evaluation was conducted by The Field Museum independently of this evaluation. However, results from evaluation included herein indicate that while student content knowledge increased, fewer students reported knowing about environmental problems in their neighborhood (*decrease 16%*) and knowing how to make the environment better (*decrease 20%*).

Question 5: “When do students begin to assume personal responsibility for taking independent action to address environmental issues in their homes or communities? What actions do they take? Who influenced them?”

Over a three year period there were statistically significant decreases in desired attitudes and behaviors from fall 2002 to spring 2005. and feeling a personal commitment to making the environment better (*decrease of 28%*).

It is *very* important to remember, that this evaluation covers the CEEP three-year pilot project. To date, there has been little student movement from one level of the program continuum to another. It takes a minimum of six years to fully participate in CEEP – from Mighty Acorns to UrbanWatch.

The number of students who have so far participated in the program evaluation is relatively small. Specifically, of the 110 students who participated in CEEP all three years, 25 students were in Mighty Acorns all three years; 82 students moved from Mighty Acorns to Earth Force; four students were in Earth Force three years; and one student moved from Earth Force into UrbanWatch. The decrease in scores on some attitudinal questions could indicate that students are tired of completing the questionnaire. Another explanation could be that students have become more sophisticated in thinking about biodiversity and environmental issues. Students are more aware of what they do not know and have become more discriminating (i.e., less idealistic, more realistic) when answering the questionnaire.

Students may feel as if they cannot effect a positive change; that any effort they make would be futile. When learning something for the first time, it is not unusual to see a downward trend as new information is taken in, compared and then integrated with existing knowledge. A truer test is what happens over the next four to ten years, as students move through the CEEP continuum.

It is unrealistic to expect significant results for this fifth question until students have had an opportunity to move through the entire CEEP continuum, from Mighty Acorns through UrbanWatch, in another three years. That there have already been statistically significant changes in response to other questions is quite encouraging. The CEEP evaluation was a three-year pilot project, one in which The Field Museum has gathered a strong baseline of information from which they or others might base subsequent observations.

Summary

Executive Summary

Benefits of CEEP for teachers and students. CEEP enhances and supplements the way in which teachers teach (i.e. it gives teachers content and activities to supplement and apply across their curriculum). CEEP staff members are knowledgeable and well-prepared, responsive to teacher requests for additional materials. CEEP prompted one teacher to collaborate with another teacher at her school to create dedicated time for science. CEEP stimulates student interest in science through experiential activities and field trips. CEEP stimulates some students to take action in their communities, often as extensions of activities experienced in CEEP. It promotes additional student learning beyond that which is normally attained in the classroom and promotes teamwork, leadership and socialization skills in students. More time and further study is necessary to determine the point at which students take independent action and to see the full effects of the ladderred CEEP continuum.

What teachers need to become more independent with CEEP. Teachers would like additional field guides on trees, plants, seeds, animals tracks and insects. They would like microscopes and water testing equipment. They would be willing to check equipment or materials out from The Field Museum. Teachers offered to create a list of resources available in that school, which could become another way in which to network with other teachers about the CEEP continuum.

Teachers admitted they needed to become better acquainted with their own curricula before participating in CEEP. They want to learn

how other teachers teach subjects and how those teachers integrated CEEP material into their teaching. Teachers requested an in-service on what CEEP staff does on Mighty Acorns fieldtrips. Teachers admitted feeling pressure to cover CEEP material by certain deadlines and requested help from CEEP staff to assist them in establishing priorities and sequences about what to cover. Teachers want help from CEEP staff to identify how activities they select for Earth Force and UrbanWatch align with academic standards. CEEP staff could provide a model for aligning teacher's ideas with standards in the summer institute / CEEP workshop.

Finally, teachers expressed concern that not all of them taught at the same pace or covered material in the same way. Students, therefore, may not be equally prepared in meeting grade level benchmarks. This poses problems as students progress through the CEEP continuum, in that teachers find themselves with students whose knowledge level varies considerably on certain content. This means that teachers may have to back up to catch students up on foundation concepts before moving on to grade appropriate content. This can directly influence what they can or cannot do within CEEP.

Three Year Summary and Analysis

Calumet Environmental Education Program: 2002 - 2005

In April 2002, Carol Fialkowski, Conservation Education Director at The Field Museum, identified the need to embed evaluation into a new environmental education model, the Calumet Environmental Education Program (CEEP). CEEP brings together three existing environmental programs to create a ladder program continuum. Mighty Acorns is for students in grades 4-6, Earth Force for grades 6-8 and UrbanWatch for grades 9-12. CEEP was conducted in three consecutive school years beginning in fall 2002 with increasing participation by schools, teachers and students between fall 2002 and spring 2005. The program was designed so teachers could teach content about the environment and connect environmental content across their curriculum. CEEP is intended to be a useful model that could be applied in a wide variety of ways.

Five Guiding Questions

1. What effect has the CEEP had on teachers' knowledge and understanding of biodiversity, environmental issues and the local community?
2. What effect has the CEEP had on teachers' approach to / inclusion of environmental science content in the classroom?
3. How have teachers coordinated their programs, Mighty Acorns, Earth Force and UrbanWatch, with those taught by other teachers, whether in their same school or in other schools?
4. What effect has the program had on students' knowledge and understanding of biodiversity, environmental issues and the local community?
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Methods and Instruments

Questionnaires were designed to gather existing level of knowledge of teachers and students about biodiversity and the environment, the frequency with which teachers and students took action for the environment and the types of activities in which students and teachers engaged to improve their local environment. Questionnaires were used as a pre-test in the fall and post-test in the spring.

In **Teacher Content**, teachers were asked to define terms such as biodiversity and interdependence, give examples of stewardship, list habitats in the Calumet area, identify an animal and plant species that threatens the Calumet region, describe the importance of interdependent relationships between plants and animals in an ecosystem, identify natural resources near their schools and describe why conservation of natural resources is important to the Calumet area.

In **Teaching Preferences**, teachers were asked about their preferred teaching methods, things that limited their ability to include environmental content when they teach, the frequency with which they talked with other teachers about teaching methods or content and the degree to which they felt comfortable with various aspects of teaching about the environment and natural resources in the Calumet area.

In **Teachers and the Environment** as well as **Students and the Environment**, teachers and students were asked to what extent they agreed with statements like "Preserving local biodiversity is important" and "I believe the actions of one person can make a difference." They were asked how frequently they do things like talk about environmental issues, meet with a group that does something about environmental issues or restore natural areas. They were also asked whether they had done anything in the past six to eight months to make the local environment better and, if so, what they had done and who influenced them to take action.

In August of each program year, a three-day workshop was held for teachers participating in CEEP. The purpose of these workshops was to assess teacher knowledge about environmental issues and to train teachers in content for Mighty Acorns, Earth Force and UrbanWatch. Each year, the three teacher questionnaires were administered as a pre-test at the beginning of the summer workshop, conducted by CEEP staff. The students completed questionnaires in September, before participating in their respective programs. Students and teachers repeated the questionnaires as a post-test at the end of each academic year.

Focus Groups. A focus group was conducted using a convenience sample of seven teachers in spring 2004 to identify program strengths, limitations and areas for improvement. In spring 2005, four student focus groups were conducted using a convenience sample of students. One group consisted of 10 students who had participated in Mighty Acorns for two years. A second group was six students in Earth Force (for one year). There were two focus groups for a total of 25 students in UrbanWatch. These were all held at participating schools to determine ways in which students have taken independent action to care for the environment.

Data Analysis

Each year, responses were entered into a custom database developed using the SPSS data editor; SPSS is the statistical software package that was used to analyze data. Frequencies and means (average responses) were calculated using SPSS software. **Only students and teachers who participated in all three years of the pilot program are included in this final report. Percent changes between fall 2002 and spring 2005 were calculated for items that directly related to each question.** Data are only reported for participants in Mighty Acorns and in Earth Force. The low number of students participating in the UrbanWatch program made it difficult to draw any conclusions or to identify statistically significant findings. In fact, the change in the pattern of responses was not statistically significant due to the small “N” or number of responses or participants overall.

Given that some teachers dropped out of the program and others failed to respond to the questionnaires each year, an assumption is being made in the data analysis that teachers who dropped out of the program would have been similar to those teachers who remained in the program. Again, the numbers of participants overall are too small to generalize results to any population.

T-tests were performed to compare the equality of the means, using a 0.05 alpha level. The resulting value shows the probability that one would see a difference in the observed increase or decrease at least as large as the one observed when there is no difference in the population. For data thus analyzed, this indicates a 95% assurance that changes occurred as a result of the Calumet Environmental Education Program and not by random chance. Those items that were statistically significant are highlighted in light gray on tables within this report.

Demographics

Teachers and Schools. In August 2002, 29 teachers participated in CEEP. Teachers represented five elementary schools and one high school in the Calumet region of Chicago. Participating schools and corresponding number of teachers included seven teachers from George Washington Elementary School, seven teachers from Jane Addams Elementary School, five teachers from Virgil Grissom Elementary School, two teachers from Henry Clay Elementary School and five teachers from John Marsh Elementary School. Three teachers participated from Washington High School, the school that these elementary schools feed into.

By 2005, the following three schools and 21 teachers were added: Douglas Taylor Elementary (nine teachers), Orville Bright (two teachers) and Gallistel Academy (ten teachers). At the end of the three-year pilot, CEEP participants included eight elementary schools and one high school with a total of 54 teachers.

Demographics (cont'd)

Number (%) of teachers by program. In fall 2002, of the 29 teachers in who participated in CEEP, 16 (55%) of them were in Mighty Acorns, 10 (35%) in Earth Force and three (10%) in UrbanWatch. In spring 2005, of the 48 teachers who participated in CEEP, 31 (65%) were in Mighty Acorns, 113 (27%) in Earth Force and four (8%) in UrbanWatch.

Subjects taught. In fall 2002, 38% of CEEP teachers taught math, 41% reading, 38% science and 26% all subjects. In spring 2005, 6% of CEEP teachers taught math, 18% reading, 25% science and 1% social studies. Fifty percent taught all subjects. The total percentage may not add up to 100% because teachers often taught more than one subject.

Years of teaching. In fall 2002, 24% of teachers have taught from 0-3 years, 17% have taught 4-6 years, 14% have taught from 7-10 years and 45% have taught over 10 years. In spring 2005, 26 % of teachers taught from 0-3 years, 11% 4-6 years, 20% 7-10 years and 43% have taught over 10 years.

Number of students. In fall 2002, 691 students completed evaluations. In spring 2005, 980 students completed evaluations; only 111 students have been in CEEP three years and have been included in the final, three-year analysis.

% students by program. In fall 2002, 59% of students participated in Mighty Acorns, 38% Earth Force and 3% in UrbanWatch. In spring 2005, 46% of students participated in Mighty Acorns, 51% in Earth Force and 3% in UrbanWatch.

Student gender. Throughout the three-year pilot, approximately 50% of the students were male and 50% female.

Student shift along the CEEP continuum. 25 students remained in Mighty Acorns all three years; 82 students moved from Mighty Acorns into Earth Force; 4 students remained in Earth Force all three years; and 1 student moved form Earth Force into UrbanWatch.

Results

NOTE: These data are drawn from the four questionnaires as well as from teachers and student focus groups. Only students and teachers who participated in all three years of the pilot program are included in this final report. Because the focus of CEEP is on the laddered program, results will be reported using total numbers and percentages of teachers and students in CEEP rather than by individual program (i.e., Mighty Acorns, Earth Force and UrbanWatch).

The first question is “What effect has the Calumet Environmental Education Program had on teachers’ knowledge and understanding of biodiversity, environmental issues and the local community?”

To answer this question, results from the questionnaires entitled Teacher Content, Teaching Preferences and Teachers and the Environment were used. **Overall, teachers in Mighty Acorns and Earth Force made statistically significant gains in knowledge about biodiversity, the local community and environmental issues – as a direct result from having participated in CEEP.**

Teachers across programs made statistically significant gains in content knowledge from fall 2002 to spring 2005 (Table 1):

- ♦ Identify a plant threat to the Calumet area. (*increase of 1,306%*)
- ♦ Give two examples of stewardship in natural areas. (*increase of 509%*)
- ♦ Importance of conservation in Calumet area (*increase of 400%*)
- ♦ Describe the importance of interdependent relationships between plants and animals. (*increase of 195%*)
- ♦ Identify an animal threat to the Calumet area. (*increase of 150%*)
- ♦ Why is the conservation of natural resources in the Calumet area so important? (*increase of 131%*)
- ♦ What does it mean to restore a native community? (*increase of 88%*)
- ♦ Define interdependence. (*increase of 76%*)
- ♦ Think of the Calumet Community as it was before being settled by Europeans and as it is today. List one way the Calumet area might be the same and one way in which it might be different. (*increase of 73%*)

Table 1: Teacher Content 2002 - 2005

	Mighty Acorns			Earth Force			Total		
	N=12		N=13	N=3		N=3	N=15		N=16
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
Define biodiversity	42%	62%	48%	67%	100%	50%	47%	69%	47%
Define interdependence	42%	92%	122%	100%	100%	0%	53%	94%	76%
Describe 'restore a native community'	42%	92%	122%	67%	67%	0%	47%	88%	88%
Two examples of stewardship	17%	77%	362%	0%	100%	NA	13%	81%	509%
Animal species threatening Calumet	25%	83%	233%	33%	33%	0%	27%	67%	150%
Plant species threatening Calumet	8%	100%	1100%	0%	67%	NA	7%	94%	1306%
Interdependent relationship of plants/animals	17%	75%	350%	67%	100%	50%	27%	79%	195%
Natural resources near school	33%	90%	170%	67%	100%	50%	40%	92%	131%
Importance of conservation in Calumet area	8%	100%	1100%	67%	100%	50%	20%	100%	400%

Note: Shading indicates statistically significant increase at alpha 0.05

From fall 2002 to spring 2005, there was a 79% increase in the number of teachers who gained knowledge from CEEP, making it easier for them to include environmental content in their teaching (Table 2). This was statistically significant at the 0.05 level. In fall 2002, 69% of teachers reported, “lack of knowledge makes it difficult to include environmental content in my teaching”. In spring 2005, only 14% of teachers agreed with that statement.

Table 2: Teaching Preferences 2002 - 2005

	Mighty Acorns			Earth Force			Total		
	N=12		N=11	N=4		N=3	N=16		N=14
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
Lack of knowledge makes it difficult to include content about nature / environment in my teaching	67%	18%	-73%	75%	0%	-100%	69%	14%	-79%

During teacher focus groups in spring 2004, teachers shared ways in which CEEP increased their knowledge about the environment and their community: Yanina (MA2, grades 4 and 5): “Even those of us who are from here don’t know Calumet. I didn’t know there was a Wolf Lake or Eggers Woods.”

The second question is “What effect has the Calumet Environmental Education Program had on teachers’ approach to and inclusion of environmental science content in the classroom?”

To answer this question, items from Teaching Preferences and Teachers and the Environment were used. Due to their participation in CEEP, teachers in Mighty Acorns and Earth Force made statistically significant gains in becoming more confident and comfortable in teaching about the environment and natural areas. Participation in CEEP influenced the way in which teachers taught, including taking students out into nature to make observations and participate in environmental projects.

Due to their participation in CEEP, teachers wrote teaching objectives specific to the environment to guide their teaching. In addition to persuading students to take action in their community, teaching objectives included “preparing students for further study about the environment.” This objective is particularly noteworthy for two reasons. First, it appears that teachers acknowledge the importance of laddering three discreet programs into the CEEP program continuum.

Second, it appears that teachers, therefore, are more aware of how their program (i.e., Mighty Acorns, Earth Force, UrbanWatch) fits into that continuum and how important it is to prepare students for the next program year along that continuum.

In the Teaching Preferences questionnaire, teachers were asked to indicate their level of comfort or confidence with 12 statements, where 1=no comfort, 2=slight comfort, 3=moderate comfort and 4=considerable comfort. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there were statistically significant increases in the frequency with which teachers did the following (Table 3):

- ♦ have students observe out in nature (*increase of 42%*)
- ♦ teach about natural areas and the environment (*increase of 23%*)

Table 3: Teaching Preferences 2002 - 2005

	Mighty Acorns			Earth Force			Total		
	N=11	N=13		N=4	N=3		N=15	N=16	
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
(Q4) How often do you teach using (or have students do) the following?									
Take students on fieldtrips or do things outside the classroom	2.0	2.2	12%	2.3	2.7	19%	2.1	2.3	12%
Teach about natural areas and the environment	2.6	3.0	17%	2.5	3.7	47%	2.5	3.1	23%
Have students observe out in									

From fall 2002 to spring 2005, there were statistically significant increases in the degree to which teachers felt confident about the following (Table 4):

- ♦ comfort about my current knowledge of restoration projects in the Calumet area (*increase of 125%, 233% in Earth Force*)
- ♦ comfort in answering student questions about environmental issues in Calumet (*increase of 96%; 150% in Earth Force*)
- ♦ comfort in my current knowledge of natural resources in the Calumet area (*increase of 80%; 233% in Earth Force*)
- ♦ comfort in discussing issues with adults about the natural environment (*increase of 46%*)
- ♦ comfort with their current level of knowledge about environmental issues (*increase of 42%; 100% in Earth Force*)

Table 4: Teaching Preferences 2002 - 2005

	Mighty Acorns			Earth Force			Total		
	N=11	N=13		N=4	N=3		N=15	N=16	
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
(Q6) Indicate the degree to which you feel confident about each of the following statements:									
Comfort with my current level of knowledge about environmental issues	2.4	3.1	30%	2.0	4.0	100%	2.3	3.3	42%
Comfort about my current knowledge of restoration projects in Calumet area	1.4	2.9	106%	1.0	3.3	233%	1.3	3.0	125%
Comfort in discussing issues with adults about the natural environment	2.1	2.9	40%	2.3	4.0	71%	2.1	3.1	46%
Comfort in answering student questions about environmental issues in Calumet	1.6	2.9	85%	1.3	3.3	150%	1.5	3.0	96%
Comfort in my current knowledge of natural resources in the Calumet area	1.8	2.9	59%	1.0	3.3	233%	1.7	3.0	80%

In fall of 2003, teachers reported having “no comfort or confidence” in their knowledge of restoration projects or natural resources in the Calumet area and being able to answer student questions about the environment. In spring 2005, teachers reported having “moderate comfort or confidence” in these three areas. This large shift in teacher confidence is directly related to participation in CEEP.

In the Teachers and the Environment questionnaire, teachers were asked to indicate the extent to which they agree with 11 statements, where 1=do not agree, 2=agree a little, 3=agree more than a little and 4=agree a lot. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there were statistically significant increases as teachers agreed with the following items (Table 5):

- ♦ I know about local environmental issues (*increase of 30%; 67% in Earth Force*)
- ♦ bees and mosquitoes are good for the environment (*increase of 20%, significant only for Mighty Acorns*)

Table 5: Teachers and the Environment 2002 – 2005

	Mighty Acorns			Earth Force			Total		
	N=12	N=13		N=4	N=3		N=16	N=16	
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
(Q1) To what extent do you agree with the statements below?									
Bees and mosquitoes are good for the environment	3.3	3.8	18%	3.0	3.7	22%	3.2	3.8	20%
I know about local environmental issues	2.4	2.9	21%	2.0	3.3	67%	2.3	3.0	30%

In the Teaching Preferences questionnaire, teachers were asked to circle all of the items that made it difficult for them to include content about the environment or natural areas of Calumet when they teach.

From fall 2002 to spring 2005, there were statistically significant changes in what made it difficult for teachers to include content about the environment or natural areas of Calumet in their teaching (Table 6):

- ♦ lack of knowledge (*decrease of 79%*)
- ♦ lack of resources (*decrease of 65%*)
- ♦ lack of time (*increase of 71%*)

Table 6: Teaching Preferences 2002 - 2005

	Mighty Acorns			Earth Force			Total		
	N=12	N=11		N=4	N=3		N=16	N=14	
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
(Q3a, Q3b) Indicate whether the following things make it difficult for you to include content about the environment or natural areas of Calumet where you teach.									
Lack of knowledge	67%	18%	-73%	75%	0%	-100%	69%	14%	-79%
Lack of confidence	25%	27%	9%	50%	0%	-100%	31%	21%	-31%
Lack of resources	83%	27%	-67%	75%	33%	-56%	81%	29%	-65%
Lack of time	50%	82%	64%	50%	100%	100%	50%	86%	71%

In the Teaching Preferences questionnaire, teachers were asked to indicate their level of comfort or confidence with 12 statements, where 1=no comfort, 2=slight comfort, 3=moderate comfort and 4=considerable comfort. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there were statistically significant increases in the degree to which teachers felt confident about the following (Table 7):

- ♦ comfort about knowledge of restoration projects in Calumet area (*overall increase of 125%; 106% Mighty Acorns in 233 % in Earth Force*)
- ♦ comfort in my current knowledge of natural resources in the Calumet area (*overall increase of 80%; 233% in Earth Force*)
- ♦ comfort in giving student ideas about how they can take action in Calumet area projects (*increase of 61%; 100% in Earth Force*)
- ♦ comfort in developing classroom activities about natural areas in Calumet (*increase of 52%; 100% in Earth Force*)
- ♦ comfort in discussing issues with my class about natural environment (*increase of 46%*)
- ♦ comfort with their current level of knowledge about environmental issues (*increase of 42%; 100% in Earth Force*)
- ♦ comfort with leading class on fieldtrips to learn about natural resources in Calumet (*increase of 41%*)
- ♦ comfort integrating environmental content across the curriculum (*increase of 27%*)
- ♦ comfort teaching about nature (*increase of 25%*), 83% in Earth Force)

**Table 7: Teaching Preferences
2002 - 2005**

	Mighty Acorns			Earth Force			Total		
	N=12	N=13		N=3	N=3		N=15	N=16	
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
(Q6) Indicate the degree to which you feel comfortable with (confident about) each of the following:									
comfort with my current level of knowledge about environmental issues	2.4	3.1	30%	2.0	4.0	100%	2.3	3.3	42%
comfort with teaching about nature	2.8	3.2	15%	2.0	3.7	83%	2.6	3.3	25%
comfort about my current knowledge of restoration projects in Calumet area	1.4	2.9	106%	1.0	3.3	233%	1.3	3.0	125%
comfort in developing classroom activities about natural areas in Calumet	2.0	2.8	42%	1.7	3.3	100%	1.9	2.9	52%
comfort with leading class on fieldtrips to learn about natural resources in Calumet	2.2	2.9	35%	2.0	3.3	67%	2.1	3.0	41%
comfort in discussing issues with my class about natural environment	2.7	3.2	18%	2.7	4.0	50%	2.7	3.3	24%
comfort in discussing issues with adults about the natural environment	2.1	2.9	40%	2.3	4.0	71%	2.1	3.1	46%
Comfort in giving students ideas about how they can take action in Calumet area projects	1.9	2.9	53%	1.7	3.3	100%	1.9	3.0	61%
comfort in my current knowledge of natural resources in the Calumet area	1.8	2.9	59%	1.0	3.3	233%	1.7	3.0	80%
comfort integrating environmental content across the curriculum	2.3	3.1	37%	2.7	3.7	38%	2.3	3.2	37%

In the Teaching Preferences questionnaire, teachers indicated the frequency with which they did any of 11 activities, where 1=hardly ever, 2=1-2x/semester, 3=1-2x/month and 4=1-2x/week and 5=almost daily. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there were statistically significant increases in the frequency with which teachers did the following (Table 8):

- ♦ have students observe out in nature (*increase of 42%*)
- ♦ teach about natural areas and the environment (*increase of 23%*)

Table 8: Teaching Preferences 2002 - 2005

	Mighty Acorns			Earth Force			Total		
	N=12	N=13		N=4	N=3		N=15	N=16	
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
Teachers and the Environment: (Q2) How often do teachers do the following?									
teach about natural areas and the environment	2.6	3.0	17%	2.5	3.7	47%	2.5	3.1	23%
have students observe out in nature	1.8	2.5	45%	2.5	3.7	47%	1.9	2.8	42%
have students discuss current events about the environment	2.9	3.2	11%	3.3	4.0	23%	3.0	3.4	13%

In the Teaching Preferences questionnaire, teachers were asked to indicate whether they've used a specified teaching objective in their classroom (and to write in any other objectives they use to guide their teaching about the environment).

From fall 2002 to spring 2005, there were statistically significant increases in the number of teachers who use the following teaching objective to guide their teaching (Table 9):

- ♦ prepare students for further study about the environment (*increase of 267%; 733% increase in Mighty Acorns*)
- ♦ persuade students to take action in the community (*increase of 175%*)
- ♦ integrate teaching about environment across the curriculum (*increase of 125%*)
- ♦ foster caring attitude about the environment (*increase of 50%*)
- ♦ instill in students the notion that one person can make a difference (*increase of 33%*)

By spring 2005, teachers used the teaching objective “prepare students for further study about the environment” 267% more often than they did in fall 2002. The largest percent increase by program occurred with Mighty Acorn teachers, who had an increase using this teaching objective of 731%. *Note that the initial figure in fall 2002 for this comparison was 8% -- quite a bit lower!* These teachers appear to understand the laddering concept of CEEP programs – how teaching students in Mighty Acorns prepares those students to participate in Earth Force (which, in turn, prepares students to participate in UrbanWatch).

There is also a positive correlation between this item and the amount of time teachers spend talking with each other about teaching strategies and course content. Are teachers talking with each other more often to determine what other teachers are doing in their respective CEEP programs? Possibly. A more detailed data analysis could be done to gather additional information.

Table 9: Teaching Preferences 2002 – 2005

	Mighty Acorns			Earth Force			Total		
	N=12		N=13	N=4		N=3	N=16		N=16
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
(Q5) Which of the following teaching objectives have you used?									
fostered caring attitude about environment	67%	92%	38%	50%	100%	100%	63%	94%	50%
prepare students for further study about environment	8%	69%	731%	50%	67%	33%	19%	69%	267%
instill in students that one person makes a difference	75%	100%	33%	75%	100%	33%	75%	100%	33%
integrate teaching about environment across curriculum	25%	54%	115%	25%	67%	167%	25%	56%	125%
persuade students to take action in community	25%	69%	177%	25%	67%	167%	25%	69%	175%

During teacher focus groups in spring 2004, teachers shared ways in which CEEP influenced their approach to and inclusion of environmental science content in the classroom (also included in this section are relevant comments made by students during student focus groups in spring 2005):

CEEP enhances the way in which teachers teach about the environment; CEEP activities are extensions to content already taught; gives teachers content and activities that apply across their curriculum;

(Yanina, Mighty Acorns2, 4th and 5th) remembers, “In grade school, I thought that science was boring and dull. I hated it. All I remember from science is reading the lesson and answering questions and then studying for a test; I was never a science person. But, when I went to the [CEEP] summer training and fieldtrips, science was enhanced -- more hands on. I look forward to teaching it to students.”

(Rosalee, Mighty Acorns2, 3rd) said, “CEEP gets students more excited and motivated because we have field trips and activities. In the past it was, ‘open your science books to page’ and now students and I are excited to learn more and explore.”

(Holly, Mighty Acorns2, 4th) said, “CEEP didn’t change the way I teach science, but Mighty Acorns plugs into the units I always teach; the extra field trips are great! CEEP enhances the way I teach.”

(Angela, Earth Force, 6th) said, “I found it easy [to use]; the binders and materials. CEEP made it easier to go into two binders and not have to search far for information.”

CEEP provides outdoor, real world application of concepts.

(Nancy, Mighty Acorns1, 3rd) said her students “love the word ‘scat’”. Nancy told the group that she had “a little problem with parents who didn’t want their kids to go on fieldtrips. She stressed to them that “the fieldtrip was a part of their learning and not recreation.”

(Collective student responses) “You can spend time outside. We play cool games and we learn at the same time...we learn about plants and animals, you get to explore things...”

CEEP makes connections across the curriculum.

(LaMeatrice, Mighty Acorns2, 4th) commented, “CEEP changed my teaching in the sense that I applied something that happens to be about nature to other things that I teach. I go through other lessons and say ‘Now what does this remind you of?’”, referring to an aspect of Mighty Acorns. I also tie it [Mighty Acorns] into reading.” (Angela, EF, 6th, acknowledged doing this as well)

CEEP is taught using hands-on, experiential activities; CEEP does not lecture or use textbooks.

(Student comment from student focus groups) “Being outside in nature is not as boring as reading a textbook...You get to learn more about the environment...It’s awesomely fun.”

(Melina, Earth Force, 7th) “When it [Earth Force] started, I wasn’t into it, but when we did the activities then I got interested. They were fun and taught us in a non-lecturing way...”

CEEP provides comprehensive resources and materials.

(Yanina, Mighty Acorns2, 4th and 5th) shared, and others agreed, that the “Rubbermaid® storage containers filled with the complete activity saved time copying and finding materials.” She added that “a lot of the activities go with the 5th grade curriculum and I don’t even have to introduce it.”

(Rosalee, Mighty Acorns2, 3rd) agreed, stating “the flower book and transparency are helpful and correlate with the food chain /food web in the 4th grade curriculum. Also very useful were the backpacks with the guides inside.”

(Nancy, Mighty Acorns1, 3rd) “That is what is so great about CEEP, they have *all* the materials that you need.”

CEEP turns teacher from 'the expert' to a facilitator; a 'do with' person rather than a 'do to'.

(UrbanWatch student) “Other teachers were just pushing us, but she helped us research, even though she pushed us.”

Students are often ill-prepared for grade appropriate content; Teachers spend time bringing students up to grade appropriate level, which cuts down on amount of CEEP content and activities they fit into curriculum.

(Angela, Earth Force, 6th) “Students aren't going to understand the benchmarks [in 6th grade] because they don't have the 4th and 5th benchmarks down. I had to do more with lower level benchmarks so there were some things [in CEEP] that didn't fit.

The third question is “How have teachers coordinated their programs, Mighty Acorns, Earth Force and UrbanWatch, with those taught by other teachers, whether in their same school or in other schools?”

To answer this question, items from the Teaching Preferences questionnaire were used as were several comments shared during the teacher focus groups in spring 2004. In the Teaching Preferences questionnaire, teachers were asked to indicate the frequency with which they did any of eleven activities, where 1=hardly ever, 2=1-2x/semester, 3=1-2x/month and 4=1-2x/week and 5=almost daily. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there was one statistically significant decrease in the amount of time in which teachers did the following (Table 10):

- ♦ coordinate lessons taught with another teacher or class (*decrease of 26%*)

In fall 2002, teachers reported coordinating lessons taught with another teacher or class “1-2x a month.” In spring 2005, teachers reported coordinating lessons taught with another teacher or class “1-2x a semester.” As before, this may be a problem of item validity. In fall, at the beginning of the academic year, teachers may do more coordination with other teachers and classes than they do at the end of the year.

The fall questionnaire is administered during the summer institute, when teachers are just getting back to school and preparing for the year, thus communicating with more people to prepare for the upcoming school year; the spring questionnaire is administered just

before school is out, when teachers are winding down, wrapping up and focusing more on their own class. CEEP staff should monitor this item and further mine the data to search for any individual (teacher or student), class or school implications for this decrease.

Table 10: Teacher Preferences 2002 - 2005

	Mighty Acorns N=12			Earth Force N=3			Total N=15		
	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng	Fall 2002	Spring 2005	% Chng
(Q4) How often do you teach using (or have students do) the following?									
coordinate lessons taught with another teacher or class	3.1	2.4	-23%	4.0	2.7	-33%	3.3	2.4	-26%

The overall pattern of teachers talking with other teachers is different in spring 2005 than in fall 2002. In 2005, more teachers spent 30 minutes talking about content and teaching methods than occurred in 2002. From informal conversations between four teachers and the evaluator after the teacher focus group in 2004, they stated having a heightened awareness that content in Earth Force builds on that of Mighty Acorns and the content in Urban Watch builds on that of Earth Force and Mighty Acorns. One teacher stated that she tried to coordinate teaching of CEEP content with another teacher but the plans fell through when that teacher resigned.

Interestingly, teachers continue to rely on CEEP staff to initiate and orchestrate communication amongst them. Teachers continue to ask CEEP staff for additional information. CEEP staff have instituted additional workshops on curriculum integration models, instructing teachers in how to integrate CEEP across grade levels and curricular content.

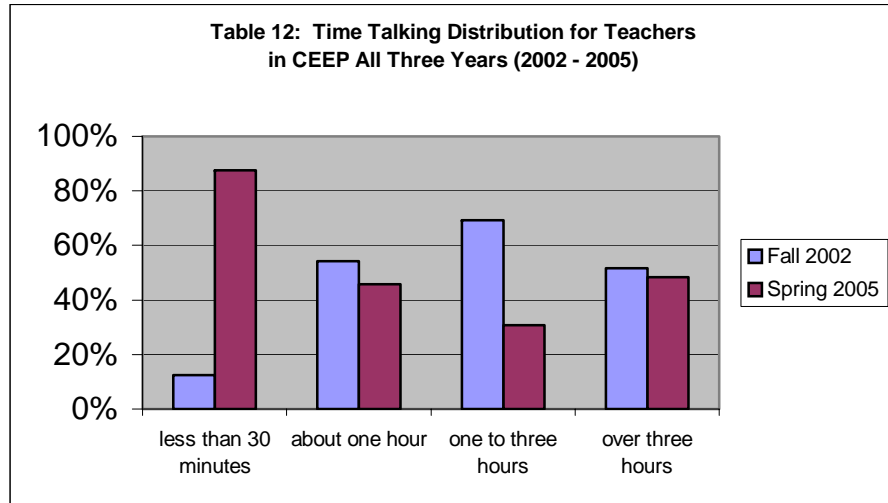
CEEP staff may find that they can facilitate communication across the ladder CEEP curriculum through use of an online listserv or asynchronous discussion thread or chat rooms. In this way, teachers can access information and each other in a way that encourages both independent use of resources and the fostering of collegial relationships.

To further assess this issue, CEEP staff could send postcards out to teachers, as a formative type of assessment, asking them to indicate whether they are talking with teachers at their school or at another school about science or the ladder CEEP curriculum.

Table 11: Teacher Preferences 2002 - 2005

	Total		% Chng
	N=35	N=31	
	Fall 2002	Spring 2005	
(Q3) In an average month, how much time do you spend meeting or talking with teachers at your school or another school about teaching methods or content?			
less than 30 minutes	2	14	600%
about one hour	26	22	-15%
one to three hours	18	8	-56%
over three hours	32	30	-6%

Table 12: Time Talking Distribution for Teachers in CEEP All Three Years (2002 - 2005)



During teacher focus groups in spring 2004, teachers addressed time spent meeting or talking with teachers at their school or another school about teaching methods or content:

(Erin, Earth Force, 6th and 7th; Angela, Earth Force, 6th; Yanina, Mighty Acorns 2, 4th and 5th; Rosalee, Mighty Acorns 2, 3rd and Nancy, Mighty Acorns 1, 3rd) “No, I have not coordinated my CEEP program with other teachers due to constraints on their time.”

During teacher focus groups in spring 2004, teachers addressed time spent meeting or talking with teachers at their school or another school about teaching methods or content (cont’d):

(Holly, Mighty Acorns 2, 4th) “I coordinate or talk about Mighty Acorns only in the meetings here [with CEEP staff].”

(Erin, Earth Force, 6th and 7th) “It would be great to have an in-service and compare how we each cover subjects or see how we implement CEEP material or cover all of our bases.”

One teacher, however, showed initiative in talking with another teacher to attempt to coordinate lessons, as illustrated below:

(LaMeatrice, Mighty Acorns2, 4th) “The learning disabilities teacher and I got together so we can coordinate our schedules. I hope to have science everyday and Fridays could be Mighty Acorn day or something. Then I won’t get behind and it won’t be the day before ‘let’s do the pre-activity’. However, after all of this hopeful scheduling for next year, the learning disabilities teacher was fired! I still hope to do it though.”

The fourth question is “What effect has CEEP had on students’ knowledge and understanding of biodiversity, environmental issues and the local community?”

To answer this question, responses from the Students and the Environment questionnaire were used, as were comments from the four student focus groups, conducted in spring 2005. Additional information directly correlated to this question is available from the content evaluations for each program (i.e., Mighty Acorns, Earth Force, UrbanWatch) -- developed, administered and analyzed by staff at The Field Museum independent of this evaluation.

The analysis of several items on the Students and the Environment questionnaire reported a decrease in doing things to care for and about the environment. To truly understand why this occurred, more detailed data analysis could be done. Identifying and selecting key students and conducting interviews or focus groups would also gather more qualitative, anecdotal information to explain the decrease. Or, the drop in scores on several attitudinal items could indicate that students are tired of completing the questionnaire.

Another explanation could be that the students have become more sophisticated in their thinking about biodiversity and environmental issues. Knowing the bits that they learned, students are more aware of what they do not know and have become more discriminating (i.e., more realistic) in their responses to the questionnaire. After one to three years in CEEP, students have learned about many environmental issues but may feel overwhelmed by how vast or pervasive those issues are. They may feel as if they cannot realistically effect a positive change; that any effort they might make would be futile. Although conjecture, all of these possibilities are plausible.

In the Students and the Environment questionnaire, students were asked to indicate the extent to which they agree with 14 statements, where 1=do not agree, 2=agree a little, 3=agree more than a little and 4=agree a lot. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there were statistically significant changes as students agreed with the following (Table 13):

- ♦ Bees and mosquitoes are good for the environment (*increase of 12%*)
- ♦ Actions of one can make a difference (*decrease of 14%*)
- ♦ I know about environmental problems in my neighborhood (*decrease of 16%*)
- ♦ I know how to make the environment better (*decrease of 20%*)
- ♦ I feel a personal commitment to making the environment better (*decrease of 28%*)

The decrease in scores on attitudinal items may indicate students are tired of completing questionnaire or that students have become more sophisticated in thinking about biodiversity / environmental issues. Students are more aware of what they do not know and have become less idealistic and more realistic in answering the questionnaire. After one to three years in CEEP, students have learned about many environmental issues but could feel overwhelmed by how pervasive those issues are. One UrbanWatch student said he feels “more cautious after being in CEEP”, because he is “more aware of the harmful things in the environment”. When learning something for the first time, it is not unusual to see a downward trend as new information is taken in, compared and integrated with existing knowledge. A truer test is what happens over the next three years, as students move through the continuum.

Table 13: Students and the Environment 2002 - 2005

	Total		% Chng
	N=105	N=110	
	Fall 2002	Spring 2005	
(Q3) How much do you agree with the following statements?			
Bees / mosquitoes are good for environment	1.8	2.1	12%
I know about environmental problems in my neighborhood	2.6	2.2	-16%
Actions of one can make a difference	3.4	2.9	-14%
I feel a personal commitment to make environment better	3.2	2.3	-28%
I know how to make the environment better	2.9	2.4	-20%

In the Students and the Environment questionnaire, students were asked to indicate the extent to which they agree with 14 statements, where 1=do not agree, 2=agree a little, 3=agree more than a little and 4=agree a lot. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there were statistically significant decreases as students agreed with the following (Table 13):

- ♦ I enjoy exploring out in nature (*decrease of 15%*)
- ♦ I care about the natural environment (*decrease of 23%*)

The reason for the dip in both items may be due to the measurement error of social desirability. In fall 2002, students reported “agreeing more than a little” that they enjoyed exploring out in nature. In spring 2005, the mean decreased by 0.5, or 15%, although

students still reported “agreeing more than a little” with the statement, “I enjoy exploring out in nature”. This is just enough of a dip to think that, in fall 2002, students reported that they enjoyed exploring out in nature when, in fact, they may have had no or very little actual experience in nature.

Once they participated in CEEP and spent time exploring nature and the environment, they didn’t like it, hence the slight downward trend in response pattern. *It should be noted, however, that this downward trend was within the same response category – that students still agreed more than a little’ to the item – ‘I enjoyed being out in nature’.*

The downward direction of this response should be monitored and, if it continues to fall, interviews with specific students, teachers or classes should be conducted to determine why --, especially because observations by CEEP staff indicate that students are enjoying time spent in natural areas. Is this because students are ‘out of the classroom’ or is something else going on?

In fall 2002, students reported “agreeing more than a little” (within 0.3 of “agreeing a lot”) with the statement, “I care about the natural environment.” In spring 2005, the score for this item dropped from 3.7 to 2.8 or 23%, indicating that students “agree a little” with the statement “I care about the natural environment.” Why? In fall 2002, students were new to CEEP.

They may have responded to this item in a socially desirable manner, because everyone knows you are supposed to care about the environment. They may have responded idealistically to the thought of speaking out for a cause, admiring those who do so in the media. However, once they spent time out doors and learned more about environmental issues, they may have felt overwhelmed by the issues and ill prepared so early in their education to be able to realistically do much about them.

In the Students and the Environment questionnaire, students were asked how often they did 11 activities, where 1=never, 2=2-4 times a year, 3=1-2 times a month, 4=1-2 times a week and 5=everyday. The mean, or average response, was used to measure a change from fall 2002 to spring 2005.

From fall 2002 to spring 2005, there were statistically significant decreases in the frequency with which students did the following (Table 14):

- ♦ I talk about environmental issues with friends or family (*decrease of 27%*)
- ♦ I help on “cleanup the neighborhood” days (*decrease of 31%*)
- ♦ I take initiative to learn about nature (*decrease of 35%*)
- ♦ I tell others how to make the environment better (*decrease of 36%*)

Table 14: Students and the Environment 2002 - 2005

	Total		% Chng
	N=107 Fall 2002	N=109 Spring 2005	
(Q3) How much do you agree with the following statements?			
I feel comfortable in nature	3.3	3.2	-4%
I enjoy exploring out in nature	3.5	3.0	-15%
I care about the natural environment	3.7	2.8	-23%
(Q4) How often do you do the following things?			
I do things to make my neighborhood look better	2.9	2.5	-15%
I tell others how to make environment better	2.8	1.8	-36%
I talk about environmental issues with friends or family	2.6	1.9	-27%
I help on "clean up neighborhood" days	2.7	1.9	-31%
I take initiative to learn about nature (read, take class, museum program, watch shows on TV)	3.4	2.2	-35%

The reported decrease in action from fall 2002 to spring 2005 requires attention. CEEP staff may want to review raw data to determine if this occurred in any one CEEP program; determine the point at which the infrequency of environmental action began and identify

extenuating circumstances at a school or a class; look at individual student or teacher responses; or to conduct a focus group of identified students to learn why actions to care for the environment decreased over the three years.

One explanation could be that new learning takes time to be applied appropriately. The idealistic notion of saving the environment may have worn off and the reality of what that really means set in. Students might realize they don't have enough knowledge or adequate resources to do what needs to be done. They begin to question themselves, their knowledge and any ultimate ability to do what it is they feel they want to do. (e.g., an UrbanWatch student stated during the spring 2005 focus group -- "It made me angry to know that the government wants to go into Alaska's reserve. It made me upset because I thought that was there to conserve it not to destroy it.")

During four student focus groups in spring 2005, students talked about the following:

Students found CEEP experiences and activities most useful and educational.

(Selenda, Mighty Acorns, 5th) "It was good when the beetles got to eat [purple loosestrife] because it is not native and it grows really fast, so it takes over for the other plants."

(Stephanie, Mighty Acorns, 5th) "We played a game. Five people picked an animal and we were in groups and one group would go to where the woods are protected and the other group would go where the trees were cut down and see how much it would hurt the animals."

(Jacqui, Mighty Acorns, 5th) "We had poker chips and our own little space. White was sun, red was water and blue was soil, and we threw them up and then whoever's space got all three colors is alive; whoever didn't died...I died seven times."

(Selena, MA, 5th) "I lived three times." [Note: students across focus groups reported this activity as having taught them the most – the interdependence of life.]

(Ganessa, Mighty Acorns, 6th) said, "When we found insects and looked in books and found out what they were it was interesting."

(Andres. Earth Force, 6th) "It's cool about helicopter plants. They travel by wind...someone from The Field Museum came to school and asked us to guess how many plants and animals we thought there were. We all thought mammals were the biggest number but it wasn't so...it was plants...that surprised me...I was surprised that one type of plant can invade a whole forest."

(Marlen, Earth Force, 6th) “I saw ant holes. Leaves fell from trees. Ants go over old leaves on the ground and ants went in the holes...it was their home...Garlic mustard takes over forest and beats out other plants...once garlic mustard gets bigger, then we have to take care of it...pulling it out is interesting...garlic mustard is an invasive...honeysuckle is not healthy for other plants.”

During four student focus groups in spring 2005, students talked about the following:

Students found CEEP experiences and activities most useful and educational. (cont'd)

(Melina, Earth Force, 7th) “I learn about the environment and I learn new things that I wouldn't learn at school another way.”

(Sofia, Earth Force, 7th) “I like putting the thermometer in soil – didn't know it could change temperature and didn't know that soil could be warm...I like testing water... We did this at Wolf Lake and found little worms and bugs in it (white worms you can barely see that can dig in and eat skin). Testing the water helps me know if what I'm doing is safe and healthy...Beetles that eat bad invasives are good.”

(UrbanWatch student) “We gathered data on species diversity in the test area. We'd square off the areas and every 10 meters we'd count the different types of species. Then we'd use equations to calculate diversity in the area...the whole [CEEP] experience made me want to learn about the environment”

(UrbanWatch student) “We made beetle traps so we could identify types of beetles in area...we cored two trees to determine their age...we used a GPS to mark locations where we worked and mapped them. That way we can locate every species of tree and see how many there are...We learned to identify trees just by looking at the leaf. That was pretty cool.”

Materials from CEEP students found most helpful.

Mighty Acorns had no response to this. Earth Force students found test tubes, thermometers, magnifying glasses, tree guides, plant guides, tree clippers and saws helpful. Materials found most helpful for UrbanWatch students included waders, global positioning systems, corers, tree guides, the UrbanWatch CD and the large poster that helped them identify water species.

Materials students wished they had had access to included petri dishes, additional magnifiers, forceps, clinometers and “space heaters because we had some ‘issues’ with the [cold] weather!”

The fifth question is “When do students begin to assume personal responsibility for taking independent action to address environmental issues in their homes or communities? What actions do they take? Who influenced them?”

To answer this question, items from the Students and the Environment questionnaire were used as were comments from the four student focus groups, conducted in spring 2005.

What do we know? There are no significant findings in this area in this report. It is *very* important to remember, that CEEP is a three-year pilot project. The number of students who have so far participated in the program evaluation is relatively small. Specifically, of the 110 students who participated in CEEP all three years, 25 students were in Mighty Acorns all three years; 82 students moved from Mighty Acorns to Earth Force; four students were in Earth Force three years; and one student moved from Earth Force into UrbanWatch.

Table 15: Students and The Environment 2002 - 2005

	Total		% Chng
	N=110	N=109	
	Fall 2002	Spring 2005	
(Q5) In the past 6-8 months, have done anything that helped make the environment better? If you answer yes, what did you do?			
no	53	47	-11%
yes-- in general	5	6	20%
plant or work in yard	21	12	-43%
work in natural area	1	6	500%
clean up/collect garbage	34	29	-15%
remove invasive species	0	18	NA
recycle	0	4	NA
monitoring (natural resources)	0	0	NA
educate others	0	0	NA
reintroduce insects/animals	0	1	NA
donate/raise money	0	0	NA

To date, there has been little student movement from one level of the program continuum to another. It takes a minimum of six years to fully participate in CEEP – from Mighty Acorns to UrbanWatch. It is unrealistic to expect significant results for this fifth question until students have had an opportunity to move through the entire CEEP continuum, from Mighty Acorns through UrbanWatch, in another three years. That there have already been statistically significant changes in response to other questions is quite encouraging.

In the Students and the Environment questionnaire, students were asked to indicate whether, in the past 6-8 months, they had done anything that helped make the environment better and, if yes, describe what they did (Table 15).

Bottom, line, the majority of what students report having done to help the environment are activities they did in CEEP. In fall 2002, 52 students reported “no,” they did not do anything. In spring 2005, only 47 students reported “no”. This is a 11% drop in the number of students who reported doing nothing to help the environment in the past 6-8 months.

What did the students do? There was a 500% increase in the number of students who worked in natural areas, due to their participation in CEEP. Other students reintroduced insects or animals, or removed invasive species, also through their participation in

CEEP. Still other students recycled. That fewer students did yard work but more worked in natural areas shows increasing sophistication in the level of action students take to care for and about the environment.

A statistical test was run only for categories 'no', 'yes', 'plant or work in yard', 'work in natural areas', 'clean up/collect garbage' and 'remove invasive species' because the small counts for all remaining items threw off the chi-square test.

What proved to be statistically significant at 0.05 level was the change in the pattern of responses, driven by the increase from 0 in fall 2002 to 18 in spring 2005 for the item, "remove invasive species".

What will be most interesting from this point forward is to monitor students to see if they apply what they have learned in CEEP at school to their homes and their communities.

In the Students and the Environment questionnaire, students were asked to indicate who or what made them decide to take action, and become involved, if indeed they had done anything that helped make the environment better in the last 6-8 months, with the following results (Table 16):

A chi-square test was run only on the following items, 'myself', 'family', 'member' and 'educator/school' to avoid small number of participant counts that violate the conditions of the statistical test (i.e., from other items like The Field Museum, church, community center). The change in pattern of responses was statistically significant; the change was driven by 'educator/school', 'family member' and 'myself', in that order.

Table 16: Students and The Environment 2002 - 2005

	Total		% Chng
	N=73 Fall 2002	N=83 Spring 2005	
(Q6) Who or what made you decide to take action and become involved?			
myself	23	18	-22%
family member	30	21	-30%
friend or neighbor	5	2	-60%
educator/school	17	35	106%
TV or radio program	4	2	-50%
The Field Museum	0	11	NA
church	0	0	NA
community group/center	0	1	NA
need to improve area	0	7	NA

This means that for those individuals, who did something in the past 6-8 months to help make the environment better, they were influenced to take action by an educator at school, a family member or it was something they themselves were motivated to do. It is not surprising that students felt influenced by an educator at school, since students are unable to participate in CEEP without a classroom teacher signing up for the program.

Note that 11 students (13%) were influenced by CEEP staff to take action for the environment, again, not surprising.

What *is* surprising is that these students are aware that CEEP is not a school program, but run by The Field Museum. It is interesting to note that seven students (8%) were influenced to take action for the environment because they saw a need to improve an area. It would be very interesting for CEEP staff to identify these seven students, talk with them and learn more about what they've done to help the environment.

During four student focus groups in spring 2005, students made the following comments about how they have applied what they learn in CEEP and how CEEP has influenced their lives:

Students report the effect CEEP has had on their lives.

(Jacqui, Mighty Acorns, 5th) “It [caring for the environment] is important because it’s *our* environment...I pick up more trash and I try not to litter as much because I learned that it’s not good for the plants...We’re used to just sitting and looking at textbooks and being bored, so I like being outside.”

(Marissa, Mighty Acorns, 6th) “[Lisa] from The Field Museum talked to us about how the circle of life effects every animal and plant. We took string and it was all connected. If one dropped theirs, it would affect the others. I learned how everything affects everything else. It was new to me; I didn’t know that before. It’s changed how I think about how trash can affect animals. I’ve learned not to litter and to pick up trash when I see it.”

(Sofia, Earth Force, 7th) “Before I was careless, but since I learned this amazing stuff, I like to learn about the environment now...Before I didn’t care or I ignored it, but now I wouldn’t...the more people who help makes a difference.”

(Andre, Earth Force, 6th) “What you learn can influence what you teach your own kids when married.”

(UrbanWatch student) “It [CEEP] made me feel cautious because the last visitors told us about sampling air for dust particles and how big atoms are in the atmosphere and knowing that we’re breathing it in everyday and so are the animals and it’s made me cautious.”

(UrbanWatch student) “It’s [CEEP’s] made me more conservative – I am not as wasteful of resources.”

(UrbanWatch student) “It made me angry to know that the government wants to go into Alaska’s reserve. It made me upset because I thought that was there to conserve it not to destroy it.”

Students know their local community better.

Seven students in Mighty Acorns agreed that they definitely know their local community better due to participating in CEEP.

(Sofia, Earth Force, 7th) “I’m more aware of the [resources] around me and if people ask me I can say I know what it is I’m proud of.”

Students share how and where they've applied information they learn from CEEP.

(Jacqui, Mighty Acorns, 5th) "Last year when we did the poison ivy identification, I had a class two months after that and the teacher asked something about poison ivy and I got it right."

(Oscar, Mighty Acorns, 5th) "Me and my dad go bike riding there [Eggers Woods] and I taught him about purple loosestrife and garlic mustard."

(Selena, Mighty Acorns, 5th) "I tell my family about what I learned. We planted purple loosestrife. I took them there at Eggers Woods."

(Matthew, Mighty Acorns, 6th) "What we learned helps answer questions in other classes."

(Andres, Earth Force, 6th) "In Earth Force I learned about plants – how they grow on forest floors and I did a report about it. Earth Force is my favorite thing...Earth Force helps me remember things I learned. It refreshes my memory."

(Cristina, Earth Force, 6th) "We see other kids' science projects, and we see that they don't know as much as we've learned. I did my project on apples coming from plants. You have a different number of seeds and it depends on how you plant them. If you throw some kind of garbage away, it dies things. We did a poster on this for a science fair project."

(Marlen, Earth Force, 6th) "I tell my family everything I did. I can always learn new things and tell my family about animal tracks and animals."

(Melina, Earth Force, 7th) "I tell my sister what I do and what plants are bad and she'll learn, too, after I tell her. And I tell my mom and my family says we never knew that before...I did a report on how would life be like without a specific plant and if more bad plants come in and endanger that plant."

(Sofia, Earth Force, 7th) "Earth Force helped me do a project. I wrote a long report...I did a report on all the things we learned on a fieldtrip to Wolf Lake. People cared about Wolf Lake after my report...we learn about biodiversity in science class."

(UrbanWatch student) "My parents were curious because we had our pictures in the newspaper a few times [from CEEP activity], so they wanted to know what we were doing. They were amazed that all that stuff is in our neighborhood."

Students share how and where they've applied information they learn from CEEP. (cont'd)

(UrbanWatch student) "Over spring break, I took pictures of every single tree on the block – a distance picture for the shape of the tree and a close-up of the bark. Then I had to identify all the trees. I thought I was going to find all the same but there were a lot of different types – 10 or more different types (all winter identification). The way we identified them in class was with leaves; I guess I never really noticed how different trees all look. I saw there was more n it than leaves."

(UrbanWatch student) "Our first lab was three identification with the leaves on. We had to describe the trees a little. Some of my trees when I went online I'd find out that a tree wasn't native to our place but that it's used for urban design. I didn't know that they take trees from different areas."

(UrbanWatch student) "The whole experience [CEEP] has made me want to learn about the environment. For the science fair, I did soil testing. It makes me learn as well as do the assignment."

CEEP has influenced some students to take independent action on behalf of the environment.

(Melina, Earth Force, 7th) "When I see trash on the ground, I throw it away or put it in my pocket and throw it away at home...Earth Force influenced me to help around the world. Me and my family visit my grandparents in Mexico. When I'm there, I pick up garbage to make it look better and so now I can make a lot of other places look better...We know what plants are dangerous to the environment and what ones are not. And, if we see a bad one, we can rip it out."

(Jesus, UrbanWatch) "I attended community meetings. I didn't know there were community meetings to be aware of the community I live in. I've attended two or three without being required to. They talk about the neighborhood, what's going on, crime rates, when they were going to open the east side plaza. At meetings people gave their opinion of what they wanted to change and the alderman listened to them. "

Note: Seven more students in UrbanWatch had also attended community meetings, per the focus group conducted on April 1, 2005 at George Washington High School.

(Raoul, UrbanWatch, president of student council) "One time I brought up the landfill project and we talked about petitions and writing the alderman to stop that. We were supposed to have a rally but they pushed the landfill back to January 2007."

Summary

Overall, CEEP benefits teachers and students. Both teachers and students agree that CEEP is a hands-on, experiential and applied program. In the focus group discussions, teachers and students described the following benefits from CEEP: CEEP enhances and supplements the way in which teachers teach, gives teachers content and activities to supplement and apply across their curriculum. CEEP staff members are knowledgeable and well-prepared, responsive to teacher requests for additional materials. CEEP prompted one teacher to collaborate with another teacher at her school to create dedicated time for science.

CEEP stimulates student interest through experiential, applied activities and fieldtrips, to get them excited about science. CEEP stimulates some students to take action in their communities, often as extensions of activities experienced in CEEP. It promotes additional student learning beyond that which is normally attained in the classroom and promotes teamwork, leadership and socialization skills in students. More time and further study is necessary to determine the point at which students take independent action and to see the full effects of the ladderred CEEP continuum.

What teachers need to become more independent with CEEP. Teachers would like additional field guides on trees, plants, seeds, animals tracks and insects. They would like microscopes and water testing equipment. They would be willing to check equipment or materials out from The Field Museum. Teachers offered to create a list of resources available in that school, which could become another way in which to network with other teachers about the CEEP continuum. Teachers recommend that fewer stewardship day activities be offered so that all students participate in the same opportunities.

Teachers admitted they needed to become better acquainted with their own curricula before participating in CEEP. They want to learn how other teachers teach subjects and how those teachers integrated CEEP material into their teaching. Teachers requested an in-service on what CEEP staff does on Mighty Acorns fieldtrips. Teachers admitted feeling pressure to cover CEEP material by certain deadlines and requested help from CEEP staff to assist them in establishing priorities and sequences about what to cover. Teachers want help from CEEP staff to identify how activities they independently select for Earth Force and UrbanWatch align with academic standards. CEEP staff could provide a model for aligning teacher's ideas with standards in the summer institute / a CEEP workshop.

Finally, teachers expressed concern that not all of them taught at the same pace or covered material in the same way. Students, therefore, may not be equally prepared in meeting grade level benchmarks. This poses problems as students progress through the CEEP continuum, in that teachers find themselves with students whose knowledge level varies considerably on certain content. This means that teachers may have to back up to catch students up on foundation concepts before moving on to grade appropriate content. This can directly influence what they can or cannot do within CEEP.

Suggestions for future study

CEEP staff members at The Field Museum have a strong baseline of data from the four questionnaires and focus groups. To monitor CEEP progress in subsequent years, CEEP staff may want to discontinue all but the content knowledge questionnaires and consider using interviews and focus groups to collect both formative and summative data. In so doing, CEEP staff will collect timely information. They will also be able to clarify questions and probe for more in-depth information to find out when, why and how students are (or are not) taking independent action to care for the environment.

The analyses done in this pilot program were intentionally basic to lay the foundation for future analyses. The data were intentionally analyzed by each program (Mighty Acorns, Earth Force and UrbanWatch). The data could just as easily, however, be analyzed by individual – looking at how each individual who participated in CEEP changed from fall 2002 to spring 2005. The database itself was created with more detailed analyses in mind; there are multiple layers of analysis that one can perform with existing data. There are hundreds of variables that can be analyzed to determine whether significant relationships exist. Examples of such relationships are those between students and teachers, teachers and their schools, students within a class, grade comparisons between schools or even students compared to themselves. One might even take the laddering model itself and explore its application to other programs or scenarios.

One might look at whether teacher knowledge about the environment influences student interest in and subsequent action related to the environment. Does the principal or overall culture within a school influence what a teacher does or does not do with students? One might examine students by grade level to look at changes in knowledge, attitude or behaviors. What factors are responsible for the changes? One might compare 4th grade students from one school to those at another school to see what factors make a difference in the level of environmental action. Is it the teacher who makes the difference or some thing (one) else? How much do programs in which students were involved in the past influence student actions towards the environment now?

One could look at a comparison of each student to him or her self. How has this individual changed from fall 2002 to spring 2005? What is responsible for those changes? What activities related to the environment has the student been involved with in the past? Have those activities influenced current participation in his or her CEEP program? One might look at content knowledge only, attitudinal shifts only or behavior changes only or examine the impact each has on the other. Which of the three have to change first for the others to occur? Does a shift in attitude cause a change in behavior and subsequent knowledge? Or, must knowledge be acquired before attitudes and behaviors can change?

The opportunities for further research are many. It is hoped that this model, with embedded evaluation, stimulates thought and discussion – a new way of thinking about program effectiveness and the use of institutional resources.

