



Cornell University



“Measuring Environmental Education Outcomes”  
Online Professional Development Course  
Cornell University Civic Ecology Lab, NAAEE, EECapacity

# ENVIRONMENTAL EDUCATION OUTCOMES MEASUREMENT TOOLS

Fall 2014

The “Measurement Environmental Education Outcomes” course  
Course facilitator: Alex Kudryavtsev, PhD  
EECapacity PI: Dr. Marianne Krasny

These tools have been developed by environmental educators – participants of the online professional development course “Measuring Environmental Education Outcomes.” The course, which took place in fall 2014, was organized by EECapacity, an EPA-funded professional development project. This document is one outcome of the online course. Other educators can use this document to reflect on the outcomes of their environmental education programs and improve their program evaluation.

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# Verifying Perceptions of Community Outreach among Staff: Word Cloud Protocol

Cheryl M. Calaustra —The Bronx Zoo, Bronx, NY (2014)

## Rationale

The Education Department of the Wildlife Conservation Society (WCS) includes zoos and an aquarium in 5 parks within New York City. The department's vision is to inspire a movement of conservation advocates by providing inspiration, connections to animals and nature, science content, skills, resources, and confidence necessary for our audiences to act individually or collectively on behalf of the environment. Though not a new educational strategy, informal education beyond the walls of the parks is a new priority. Consensus among staff regarding the definition of community outreach is needed to successfully develop, implement and evaluate programs of this type.

## Development

In a study conducted by New York University, cohesion in a groups' identity and defining qualities including similarity in levels of knowledge, attitude and practices resulted in higher levels of cooperation and work effort among group members (Bartel, 2001). This group cohesion is especially advantageous when attempting to develop and implement new programs simultaneously on a large scale through multiple staff members. The WCS Education Department will create a word cloud to qualitatively analyze definitions of "community outreach" among staff to create a single definition that will be discussed, approved and eventually adopted as a baseline for future work.

The proposed tool will quickly and easily provide an initial visual analysis of text to display general themes and frequencies (BetterEvaluation, 2014). This technique can be adapted to analyze interviews, documents, or transcripts and other survey data collected from a variety of stakeholders to inform environmental education practitioners. This concept can be utilized in education for: visualization, brainstorming, and mind mapping. Moreover, word clouds can be created as pre and post program evaluations to monitor changes in textual themes or frequencies to gauge communication techniques and message delivery.

This tool was adapted from a workshop entitled "EE Capacity: Tools for Advancing your Mission" presented by EECapacity at the 2014 North American Association of Environmental Education Conference.

## Word Cloud

While a word cloud can be created using paid applications such as Inspiration, there are a number of free sites that accomplish the same including Wordle (<http://wordle.net>),

Tagxedo (<http://tagxedo.com>) and Text Is Beautiful (<http://textisbeautiful.net/create/>).



Example of a word cloud created from stakeholders' top values regarding environmental education (CAEE, n.d.)

## Implementation and Analysis

Pose the question you want to analyze such as, "Describe what community outreach means to you." Then type or paste the text from stakeholders into the chosen word cloud application and follow application-specific directions to generate the word cloud. Some applications will allow you to easily alter the appearance of a word cloud as well as save and/or print the cloud.

It is recommended to clean up text by removing extraneous words, create uniform capitalization and verbage of similar ideas. Transpose all text in a document (Google Docs or Word) and then copy and paste it into the chosen word cloud application. This provides the ability to save the original document for edits.

It is also helpful to remember that word clouds do have limitations. Specifically, they do not retain the connotation, but reflect the frequency of words used (Harris, 2011).

## References

- Bartel, C. A. (2001). Social comparisons in boundary-spanning work: Effects of community outreach on members' organizational identity and identification. *Administrative Science Quarterly*, 46(3), 379-413.
- BetterEvaluation. (2014, October 8). Word Cloud. Retrieved October 26, 2014, from <http://betterevaluation.org/evaluation-options/wordcloud>
- CAEE. (n.d.). Environment and Education. Retrieved October 26, 2014, from <http://www.caee.org/environment-and-education-top-values-colorado>
- Harris, J. (2011, October 13). Word clouds considered harmful. Retrieved October 26, 2014, from <http://www.niemanlab.org/2011/10/word-clouds-considered-harmful/>

# Evaluating Ocean Conservation Knowledge and Behaviors in Volunteers

Adam Ratner, The Marine Mammal Center

## Introduction

Engaging over 1,000 volunteers and approximately 100,000 visitors a year in marine mammal health and ocean conservation, The Marine Mammal Center needs to evaluate the education volunteer training program to ensure the appropriate conservation information is presented and volunteers are actively sharing their knowledge and actively participating in positive stewardship behaviors in their communities.

## Implementation

A pre-survey will be administered at the beginning of a two-day education volunteer training to identify baseline knowledge and behaviors related to ocean conservation. The survey will be administered 2 months and 6 months following the education training to determine any shift in knowledge and behaviors. Examples of survey questions related to environmental knowledge and behavior:

### 1) What is the primary greenhouse gas responsible for increasing global temperatures?

- a. Methane                      b. Carbon Dioxide                      c. Nitrous Oxide                      d. Ozone

### 2) Which of the following is NOT a current or predicted effect of climate change on marine mammals?

- a. More acidic water causing skin irritation      b. Malnutrition and stress due to shifting fish populations  
c. Increased harmful algae blooms              d. Loss of breeding beaches due to sea level rise

### 3) Please rank from 1 (not very comfortable) to 10 (very comfortable) your willingness to discuss climate change with friends and family:

1      2      3      4      5      6      7      8      9      10

### 4) How often have you incorporated climate change in conversations with friends and family over the past 1 month?

- a. 0-5 times      b. 5-10 times      c. 11-20 times      d. 21-30 times      e. More than 30 times

Please indicate the frequency of the following actions you perform:

	Not in past 4 months	Less than once a month	1-4 times a month	More than once a week
1) Use solar energy to power residence or personal products				
2) Unplug electronics from electrical source when not in use				
3) Compost at home				
4) Buy local, organic products				

# Determining uses for information obtained from conservation education programs

Cindy Fitzwilliams-Heck, Ferris State University – Michigan

## Rationale

Environmental education (EE) program developers and facilitators may not know what participants consider the most valuable aspect of the program or how the information obtained from a workshop will be used. The data gathered from the participants could help improve future workshops by educating others of how the material can be applied.

## Objective

The intent of the mixed methods surveys administered will be to inform EE program developers and facilitators ways to increase the participants' use of the information obtained from a workshop.

## Audience

Educators participating in a conservation education workshop.

## Survey

Participants will complete the following survey in Part A immediately following the workshop. Part B will be completed six months following the workshop as an electronic survey or as a mailed-in response.

### Part A

1. How many years have you been an educator?
2. What type of educator are you? (formal, grade: \_\_\_\_; nonformal, describe: \_\_\_\_ other, describe: \_\_\_\_)
3. How would you rate your knowledge of the natural resources in your watershed? (Likert scale 1-5; 1=very little, 5=very well)
4. What is the likelihood you will use the information from the workshop? (1=not likely; 5=definitely)
5. Describe what you will use from the workshop.
6. How will you use the information obtained from the workshop?
7. In what ways can the program improve to increase level of usability for your purposes?
8. What are your environmental or ecological interests or concerns that exist near where you work or reside?
9. Provide your level of interest in participating in an ongoing conservation project in your region. (1=no interest; 5=definitely)

### Part B

1. How many years have you been an educator?
2. What type of educator are you? (formal, grade: \_\_\_\_; nonformal, describe: \_\_\_\_ other, describe: \_\_\_\_)
3. To what extent have you used the information obtained from the conservation education workshop? (1=not at all; 3=occasionally; 5=frequently)
4. Describe how you have used the information from the workshop.
5. What types of educational services can the organization offer you to help you teach about natural resources and ecology?
6. What is your interest in participating in future educational workshops offered from our organization? (1=not interested; 5=very interested)



## Segments of Society: A WEEB Grant Applicant Demographic Survey

Ginny Carlton — Wisconsin Environmental Education Board, Stevens Point WI (2014)

### Introduction

The *Wisconsin Environmental Education Board (WEEB)* was created by state statute in 1989. The Board is charged with promoting environmental education in all segments of society. It does this through the creation of policy setting documents such as *Wisconsin's Plan to Advance Education for Environmental Literacy and Sustainability in PK-12 Schools* and *Wisconsin's Plan for Environmentally Literate and Sustainable Communities*. The WEEB also administers an annual competitive grant program through which much of the actual work is carried out. This tool was designed to **assess whether grant applicants represent all segments of society.**

### Survey Development

The WEEB was transferred from the Department of Public Instruction to the University of Wisconsin System in 1997. Since this time an online database (<http://cnrapps.uwsp.edu/weeb>) has been maintained. The database is searchable and can provide information regarding geographic location of applicant (e.g., city, county, senate district, assembly district, and zip code), administering organization type and target audience composition.

The last extensive review of the WEEB's grant program was reported in *An Evaluation of the Wisconsin Environmental Education Board's Grants Program* (Sivek and Ciffone, 1999). The report suggested the WEEB was not meeting its stated goal of promoting environmental education in all segments of society but rather resources were primarily invested in PK-12 schools and non-profit initiatives.

The "Segments of Society: A WEEB Grant Applicant Demographic Survey" tool is designed to investigate the segments of society the grant writers represent. Podsakoff et al., (2003) identified common method biases in research. Four that are applicable to self-reported surveys are:

- Item context effects refer to any influence or interpretation that a respondent might ascribe to an item solely because of its relation to the other items making up an instrument.
- Context-induced mood refers to when the first question (or set of questions) encountered on the questionnaire induces a mood for responding to the remainder of the questionnaire.
- Predictor and criterion variables measured in the same location refers to the fact that measures of different constructs measured in the same location may produce artifactual covariance independent of the content of the constructs themselves.
- Item complexity and/or ambiguity.

Thus the order of survey items, and the number of possible responses available for each item was carefully considered in an attempt to avoid these biases.

### Segments of Society: A WEEB Grant Applicant Demographic Self-Reported Survey Tool

Despite the potential for errors due to the identified common method biases, a self-reported survey tool is a cost-effective way to gather data from diverse respondents, especially when the respondents are spread across a large geographic area such as the state of Wisconsin. Depending on the item, respondents are asked to either check one response or check all that apply. Questions include:

1. My gender is...
2. My age is...
3. The highest level of education I have completed is...
4. I am (or have previously been) employed by or volunteered at/for...
5. Since 1990, when the WEEB grant program began, how many grant proposal have you
  - a. written to the WEEB
  - b. received WEEB funding for
  - c. written to funding sources other than the WEEB
  - d. received funding for from sources other than WEEB
6. I have independently led programming related to...
7. I have received training in the following...

### Implementation and Analysis

If approved by the WEEB Grant Committee the "Segments of Society: A WEEB Grant Applicant Demographic Survey" tool will become a part of the 2016-2017 WEEB Grant Program request for proposal documents. Analysis will rely on descriptive statistics.

### References

- Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y. & Podsakoff, N. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Applied Psychology*, 88(5), 879-903.
- Sivek, D. & Ciffone, E. (1999). *An Evaluation of the Wisconsin Environmental Education Board's Grants Program*, Retrieved on October 16, 2014 from: <http://www.uwsp.edu/cnr-ap/weeb/Documents/publications/evaluationcompletept.pdf>
- Wisconsin Department of Public Instruction, Wisconsin Center for Environmental Education, Wisconsin Environmental Education Foundation. (2011) *Wisconsin's Plan to Advance Education for Environmental Literacy and Sustainability in PK-12 Schools*. Retrieved on October 16, 2014 from: [http://www.uwsp.edu/cnr-ap/weeb/Documents/publications/strategic\\_plans/env-literacy-plan.pdf](http://www.uwsp.edu/cnr-ap/weeb/Documents/publications/strategic_plans/env-literacy-plan.pdf)
- Wisconsin Environmental Education Board, Wisconsin Environmental Education Foundation, Wisconsin Association for Environmental Education. (2011). *Wisconsin's Plan for Environmentally Literate and Sustainable Communities*. Retrieved on October 16, 2014 from: [http://www.uwsp.edu/cnr-ap/weeb/Documents/publications/strategic\\_plans/WisconsinPlan.pdf](http://www.uwsp.edu/cnr-ap/weeb/Documents/publications/strategic_plans/WisconsinPlan.pdf)

# Attitudes Towards Aquatic Environment: Survey

Joe Harber, National Aquarium

**Introduction:** The National Aquarium runs seven different aquatic education camps each summer. Summer nature camps have been shown to impact campers' lives through increased self-esteem, ability to work with others, and connection to nature. (Collado, et. al., 2013, Dresner and Gill, 1994). Each camp targets Baltimore City Public School children in grades 6 to 12. About 130 children attend in total. The camps include a learning component at the Aquarium, field trips to a variety of aquatic habitats, and interactions with scientists and other experts.

**Development:** This tool is based on an earlier survey we used for a school-based environmental education program. The problem with the earlier version was that the survey tried to measure too many constructs (see DeVellis, 2003 for more information on Likert-scale survey development).

**Constructs:** The survey will measure two constructs: 1) Attitudes towards the aquatic environment, and 2) Campers' willingness to protect the aquatic environment.

**Name of the Instrument:** Henry Hall Summer Camp Survey.

**Implementation Protocol:** This is a tri-phasic survey. The pre-test is administered at the start of camp and the post-test administered on the last day of camp. A far-post test is mailed to each participant approximately 5 months after camp. A postage-paid post card is included.

## Survey Questions

### (1). Attitude towards aquatic environment.

**Indicate the level of agreement (from "strongly agree" to "strongly disagree") with the following statements:**

1. I enjoy studying the aquatic environment.
2. I enjoy outdoor activities in the aquatic environment.
3. I feel comfortable spending time outdoors in an aquatic environment.
4. Learning about the aquatic environment is interesting to me.

### 2). Willingness to protect the aquatic environment.

**Indicate the level of agreement (from "strongly agree" to "strongly disagree") with the following statements:**

5. It is my responsibility to help protect the aquatic environment.
6. I want to participate in a trash clean-up at a beach, stream, or local waterway.
7. I want to take part in activities to protect the aquatic environment.
8. I am willing to make a difference in protecting the aquatic environment.

**Analysis:** The data collected (calculated mean scores for each group at each time) can be used to inform program managers as to the program's effectiveness as well as included in grant reports. At its simplest, the data could give you relative change in percent. But a paired t-test would give more powerful analytical results. We will compare each group's mean scores from before camp to after camp, and from after camp to far post. Results could also be broken down by ethnicity, time in the program, and age/grade.

### References:

- Collado, S., Staats, H., and Corraliza, J.A. (2013). Experiencing nature in children's summer camps: Affective, cognitive and behavioural consequences. *Journal of Environmental Psychology*. Elsevier
- DeVellis, R.F. (2003). *Scale development: theory and applications* (2nd ed.). Thousand Oaks: Sage Publications
- Dresner, M., and Gill, M. (1994), Environmental education at summer nature camp. *Journal of Environmental Education*. Spring94, Vol. 25 Issue 3, p35.
- EECapacity. (2012). *EE Outcomes Measurement Tools*. Ithaca, NY: Cornell University Civic Ecology Lab.
- Garst, B.A., Browne, L.P., Bialeschki, M.D. (2011). Youth development and the camp experience. *New Directions for Youth Development*, No. 130. Wiley Periodicals, Inc.

# Quality of Environmental Learning Stations for Students

Julie Graham, Lady Bird Johnson Wildflower Center, Austin, Texas (2014)

## Introduction

This survey was developed to measure the quality of the revised Mr. Smarty Plants Stations. The survey will allow programs to determine if their activities are a quality product. This measurement tool will be beneficial for programs having stations with different topics that students rotate through.

## Development

This evaluation survey was developed by the education staff at the Lady Bird Johnson Wildflower Center in Austin, Texas.

## Survey

This post survey is a quantitative approach that consists of statements measured with a Likert-scale with the answer choices being: Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. Teachers will be asked to rate each statement for the stations with these choices. Each station will have the same statements. The survey also includes two yes/no questions. If the majority of the statements are answered with "Strongly Agree" or "Agree" – then the revised stations are still a quality field trip destination. If "Undecided," "Disagree" or "Strongly Disagree" are the main answers to the statements – then the revised stations are not a quality field trip destination and changes will need to be made accordingly.

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Clear instructions were given					
Clear learning objectives were given					
Curriculum goals were met					
Students were engaged					
Learning station design and manipulatives were engaging					
Station facilitator was knowledgeable					
If no facilitator, still able to do activity successfully					

	Yes	No
Was subject matter introduced at station new to students?		
Did you find having a station for a snack/bathroom break beneficial?		

## Implementation and Analysis

The Learning Stations are offered in the fall and spring. We normally have a very low turnout in the fall. The spring gives a much better turnout with more surveys returned. This tool will be sent out to teachers via a "thank you for visiting" email after students have gone through the stations. There is a link in the email asking teachers to fill out a Survey Monkey evaluation and send it back to us. We hope to receive enough surveys to determine if our revisions to the stations are a quality product to the teachers and their students.

## References

- Thomson, G., Hoffman, J., & Staniforth, S. (2005). Measuring the success of environmental education programs (pp. 72): Canadian Parks and Wilderness Society.
- Russ A. (Ed.). (2014). Measuring environmental education outcomes (an e-book). Ithaca, NY and Washington, DC: Cornell University Civic Ecology Lab, NAAEE, and EECapacity.

Wildflower Center Learning Stations Evaluation  
<https://www.surveymonkey.com/s/FYZWWRS>

# Preconceptions and Beliefs about Environmental Issues, Stewardship and Climate Change

Karena M. Ruggiero — Science and Environmental Education, University of Tennessee, Knoxville (2014)

## Rationale

With the growing concern of climate change related crisis from scientists around the world and the explicit topic reference to climate change in Next Generation Science Standards (NRC, 2012), it is crucial that educators teach students about the human impacts on the planet and natural resources. In addition, understanding the political, economic, social and environmental issues that our country and the world faces is crucial to being an informed citizen, and will also allow students to be well-informed voters.

This tool measures student’s preconceptions and beliefs about three separate but overlapping topics: *environmental issues*, *environmental stewardship* and *global climate change*. The purpose of this tool is to allow educators to gain a sense of student’s beliefs prior to starting a lesson or unit plan. “Students’ pre-instructional beliefs about the natural world conflict sharply with many of the accepted scientific theories taught in school” (Chinn & Brewer, 1993, p. 1); therefore it is important for the educator to understand his or her students’ beliefs and preconceptions prior to a lesson in order for students to understand new or contradictory ideas.

## Development

The development of this tool is part of an ongoing research study to determine the ways in which global climate change education is being explicitly included or excluded from environmental and science courses in middle and high school classrooms.

The tool can be adapted for a variety of courses that teach lessons on environmental issues and/or climate change to gain an understanding of students’ beliefs and preconceptions.

## Open-Ended Survey Questions Implementation

The tool provided is intended to be a survey given prior to any environmental education lessons to gauge student’s preconceptions and beliefs.

It is designed to be two sets of 3 parallel questions. The first and fourth questions pertain to students’ ideas about what environmental issues are. The second and fifth questions gauge students’ beliefs about environmental stewardship. Finally, the third and sixth questions examine students’ preconceptions and ideas about how global climate change fits into or is different from environmental issues.

Examining student’s preconceptions and beliefs of how the terms environmental issues and global climate change are connected can guide teacher education or lesson planning on teaching climate change models. The tool also allows for teachers to understand students’ beliefs about environmental stewardship.

## Analysis

While the tool provided can be used to gain a general sense of students’ beliefs and misconceptions, it can also be analyzed more formally with a scale. A scale or rubric for this tool should measure student’s ideas on a scale of *naïve* to *sophisticated*. A practitioner or researcher looking to use the tool for these purposes should develop a scale for each question based on their knowledge of the students being assessed.

- 1) An example of a scale for **Question “3) What is ‘climate change’ and what is it caused by?”** might look as follows:

Naive				Sophisticated
1	2	3	4	5
Climate change does not exist	Scientists are unsure about whether or not climate change is happening	Climate change is happening, but it’s entirely natural	Climate change is happening, but it’s all or mostly natural	Climate change is happening, much of it is thought to be anthropogenic (by the scientific community)

## Key Terms

**Environmental education; global climate change; environmental issues; student beliefs; student preconceptions; explicit connections**

## References

Chinn, C. A., & Brewer, W. F. (1993). The role of anomalous data in knowledge acquisition: A theoretical framework and implications for science instruction. *Review of educational research*, 63(1), 1-49.

National Research Council (NRC). (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. National Academies Press.

Name \_\_\_\_\_  
Course \_\_\_\_\_

Answer the following questions in complete sentences.

- 1) What is an ‘environmental issue’ to you?
- 2) Is it important to take care of the environment? Why?
- 3) What is ‘climate change’ and what is it caused by?
- 4) Give examples of things that you consider environmental issues.
- 5) Give examples of ways you can care for the environment.
- 6) Compare and contrast the terms ‘climate change’ and ‘environmental issues.’

# Pre-Post Survey: Change in Environmental Attitudes

Lesley Bensinger, Education Coordinator, Delaware Nature Society

## Rationale

The Delaware Nature Society's Summer Marsh Field Experience goal is to impact students' environmental attitudes through hands-on activities in a freshwater tidal marsh. This survey uses both quantitative methods in the Likert Scale pre/post questions, and qualitative methods in the form of student interviews. Both work toward the same goal – understanding if and how the experience impacts students' feelings for nature and the environment.

## Program Background

Twenty-five rising high school freshman participate in a summer marsh field experience with Delaware Nature Society annually. Students complete a marsh restoration project, participate in activities that expose them to careers in science, and learn about environmental ethics. At the end of the week students present their work to a group of staff and family and receive a stipend of \$100 to be put toward the cost of college applications. These students are from low-income families and are typically 'new-to-nature'. The goal of the program is that in addition to knowledge gained, students leave feeling more comfortable and connected to the natural environment. The goal of this pre/post survey is to investigate the construct: how interested are students in the environment. The following interview questions look into this construct as well.

## Tool

Students are asked to fill out the pre-survey immediately after arrival on the first day of the program. On the fifth and final day of the program students complete the post-survey. Students answer the questions listed in Table 1 by circling a number ranging from 1 "Strongly Disagree" through 5 "Strongly Agree". The surveys are not anonymous and students' pre surveys are matched to their post-survey by name. In addition to the survey students complete video interviews. These videos are shared with an audience during the final day's presentation.

Table 1: Environmental Attitude Survey
1. I enjoy spending time outside.
2. I am interested in wildlife
3. I like plants.
4. I am interested in the environment
5. I would like a career in an environmental field
6. I am an environmentalist
7. Nothing that I do has an effect on the environment
8. I am excited to work in the marsh

Table 2: Student Video Interview Questions
1. Describe one component of your work this week that you enjoyed. What you did/did not like about it?
2. What was your biggest challenge this week and how did you address it?
3. Why does this project matter?



Figure 1: Students build a small tidal pool complete with a retaining wall, July 2014.

## References

- Thomson, G., Hoffman, J., & Staniforth, S. (2005). Measuring the success of environmental education programs. Canadian Parks and Wilderness Society.
- Siedman, I. (2006). Interviewing as qualitative research: a guide for researchers in education and the social sciences (3rd ed.). New York: Teachers College, Columbia University.
- Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. Journal of mixed methods research, 1(2), 112-133



## Going deeper? :: EcoSchools “by-products” captured in student drawings

Lindsay Bunce — Toronto and Region Conservation (TRCA), Toronto, Ontario (October 2014)

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### Rationale

The Ontario EcoSchools program provides school communities with guidelines that support pro-environmental behavior that is within a student’s sphere of influence. It seeks to align environmental education initiatives in the classroom with operational practices throughout the school. To date, TRCA’s evaluation of the program’s impact has been exclusively quantitative (i.e., number of schools participating, number of waste audits conducted, number of waste-free lunch programs in place, etc.). The proposed measurement tool explores the more qualitative “by-products” of participating in the EcoSchools program and how school communities might be enriching and enhancing community knowledge, spirit and connectedness. It hopes to capture what falls beyond the prescriptive behaviors and routines that form the basis of the program guidelines. This type of tool might be interesting for EE practitioners that deliver programs that encourage specific actions and unambiguous behaviors (i.e., recycling education programs – in most municipalities, there is only one correct way to effectively recycle...) but are keen to explore how their program might be influencing broader community knowledge and attitudes on a deeper level.

### Development

This evaluation tool was inspired by “Natural Curiosity: A Resource for Teachers”, a guide that focuses on fostering and promoting environmental inquiry in the classroom. I have always been intrigued and motivated by the growth and transformation that can be demonstrated through student drawings over time. As students become more aware of the complexity of the systems in their lives, this attentiveness is often reflected in their art. By asking students to “draw what they know about X” over several sessions, there is an invitation to include a spectrum of ideas and attitudes that can relate concretely or abstractly to the idea at hand. In this way, a student’s “deeper understanding” can be visually represented.

### Evaluation of community knowledge through student drawings

To remain mindful of the scope of this evaluation process, only one aspect of the Ontario EcoSchools program will be highlighted – waste minimization. With regards to design, the tool is quite simple. At a sample of schools participating in the Ontario EcoSchools program, student EcoTeams will be invited to *draw “what you know about waste at school”*. Over time, possibly every six months, students will be asked to participate in the drawing exercise again. Drawings will be collected over several years of program delivery and kept in a series. Community knowledge will be documented through drawings that are coded based on a series of markers.

### Implementation and analysis

To be effective, this tool would need to be utilized multiple times over the course of several years of Ontario EcoSchools program participation. It would require annual parental consent and approval from the school board’s Research Ethics Committee. Whether implemented by the EE practitioner, classroom teacher or EcoTeam leader, there will be a substantial relationship-building component involved and experience in developing Knowledge Building Circles with students would be required.

Drawings will be collected over several years of program delivery and kept in a series. Community knowledge will be documented through drawings that are coded based on a series of markers. The presence of certain markers might indicate that various “by-products” of the EcoSchools program (such as increased sense of community within the school, increased problem solving skills, new appreciation for custodial staff, etc.) may be emerging.

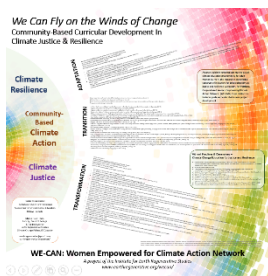
### References

Chiarotto, Lorraine (2011). *Natural Curiosity: A Resource for Teachers*. Oshawa: Maracle Press Ltd.  
Ontario EcoSchools. (2014). Retrieved from: [www.ontarioecoschool.org](http://www.ontarioecoschool.org)

# Spectrum of Climate Justice Education - Evaluation Protocol

Marna Hauk — Institute for Earth Regenerative Studies – WE-CAN Program, Portland, Oregon (2014)

## Rationale & Introduction



This instrument offers a three-tier spectrum to assess depth of implementation of climate justice and transformation approaches in curricula and projects. It can help programs avoid “greenwashing” and instead move more deeply towards social transformation, community-based action, justice, and adaptation.

## Development

This tool was developed through focused meta-synthesis of thirty sources in environmental justice, climate justice education, climate resilience theory, and climate change ethics. It was vetted at the NAAEE Conference 2014.

## Usage

Affiliated artifact includes detailed statements for each node on the spectrum. *Suggested usage includes multiple reviewers selecting statements that characterize the curriculum or project to develop an overall assessment and placement on the spectrum to ensure inter-rater reliability.* The spectrum can also be used proactively by program and project designers to include more transformational elements within their climate change projects and curricula.

## References

- Saldaña, Johnny. (2013). *The coding manual for qualitative researchers* (2nd ed.). Thousand Oaks, CA: Sage Publications.
- Thorne, S., Jensen, L., Kearney, M. H., Noblit, G, & Sandelowski, M. (2004). Qualitative metasynthesis: Reflections on methodological orientation and ideological agenda. *Qualitative Health Research*, 13 (X), pp. 1-24.
- Spectrum synthesis quoted and adapted from Adger (2006), Agyeman, Bullard, & Evans (2003), Bahadur, Ibrahim, & Tanner (2010), Brown, Dyal, & Del Rio (2012), Burkett (2008), Clugston, Calder, & Corcoran (2002), Crowell (2013), Downey et al/EE Capacity (2013), Earth Charter (EC, 2000), Environmental Justice Principles (EJP, 1991), Gardiner et al (2010), Holifield, Porter, & Walker (2009), Krasny & Dillon (2013), Krasny & Tidball (2009), Lotz-Sisitka (2009), Pelling (2011), Price, Simmons, & Krasny (2014), Schlosberg & Collins (2014), Selby & Kagawa (2009), Shue (2014), Slaby et al (2007), Taylor (2000), Tidball & Krasny (2011), and others. See detailed citation list with references for items used in meta-synthesis.

## Contact

Marna Hauk, Ph.D. Faculty, Prescott College & The Institute for Earth Regenerative Studies  
earthregenerative@gmail.com  
www.earthregenerative.org/wecan/

## SPECTRUM, NODE 1: MITIGATION

- ✓ *Focused on transforming current power structures or changing paradigms.*
- ✓ *Strives to maintain or return to status quo or “business as usual” and sees current state as normative.*
- ✓ *Focus on ameliorative technologies and mitigation.*
- ✓ *Single dimensional, linear, analytic, classifying, and mechanistic ways of knowing.*
- ✓ *Tends to be more static, deterministic, and hierarchical pedagogically.*
- ✓ *Oriented to risk, control, management, & rights.*
- ✓ *Sees oppressed (and learners) as something to be managed or a problem to be solved or dealt with.*

## SPECTRUM, NODE 2: TRANSITION

- ✓ *Moves towards transformation, still oriented around structures of domination & control.*
- ✓ *Might not focus on multiple scales (personal, social, structural, etc.).*
- ✓ *Begins to connect ecological and social dimensions, with nascent movement towards interrelation and transformation of systems.*
- ✓ *Pedagogical methods begin to diversify.*
- ✓ *Begins to honor indigenous and community-based ways of knowing and acting.*

## SPECTRUM, NODE 3: TRANSFORMATION

- ✓ *Justice orientation.*
- ✓ *Systems thinking deeply integrated, including accepting change.*
- ✓ *Embeds Environmental Justice Principles and Earth Charter.*
- ✓ *Radical transformation of current structures, power, and paradigms.*
- ✓ *Oriented towards change and action.*
- ✓ *Nurtures community and learner strengths and meaning.*

“Climate change education can be emancipatory and deepen critical engagement: Cultural-historical approaches, reflexive engagement with contradictions and tensions have more to offer ... because they are agency-centered with the potential to enhance capabilities and social change, value engagement with conflict and contradictions, and are more pluralist and open-ended, with material benefits for those living in poverty, assisting with the emergence of innovative adaptation practices.” (Lotz-Sisitka, 2009, p. 73)



# Teaching with Monarchs: Surveying Perceived Capacity and Intention

Nancy McGee — Toronto and Region Conservation, ON, Canada (2014)

## Introduction

This PRE/POST/SUPER-POST survey-type evaluation is to be used to determine shift and degree of shift in confidence levels and intentions for attendees of the two-day workshop, *Teaching and Learning with Monarch Butterflies*. This type of evaluation would be useful to environmental educators who are trying to determine the impact of their adult education programs, specifically in determining “how far the bar has moved” not only regarding intention but also behaviors.

## Development

The workshop is designed to build knowledge, skills, and capacity of educators to ethically bring monarch butterflies into their classroom for the purpose of student engagement and learning. Teachers become the advocates for change, as defined by Heimlich (2010), and meet their own desires of creating sustained inspiration or the spark (Liddicoat and Krasny, 2013) that goes beyond short-term learning and impact.

## Implementation and Analysis

This is a tri-phasic survey whereby participants complete the survey **PRE-workshops** upon entering the workshop, **POST-workshop** at the end of the workshop but before leaving the physical site, and **SUPER POST-workshop**, approximately 3 months after the workshop has been completed. It is expected that the first two phases would most likely be completed as hardcopies (unless internet/WiFi is widely available) and the third phase would be in an online survey.

It is noteworthy that in order to allow for *the option* of anonymity, only the hardcopy surveys will have the capacity to be analyzed for intra-individual change. These surveys may also be analyzed intra-group and inter-group to determine overall respondent levels. Anonymous super post surveys could be added to the intra- and inter-group data offering a semi-longitudinal study component. The super post-workshop will be analyzed based on percentages as compared to previously collected data.

### Shifting capacity and intention: A survey measuring impact of Teaching and Learning with Monarchs workshop

**INSTRUCTIONS:** For the following workshop content areas, please indicate your confidence/ abilities by rating each of the statements with the scales provided below:

Low	Low/Medium	Medium	Medium/High	High
1	2	3	4	5

- 1) Your knowledge of monarch butterflies
- 2) Your experience handling monarch livestock
- 3) Your familiarity with laws governing wildlife in your area
- 4) Your understanding of international concerns regarding monarchs
- 5) Your ability/skills to rear monarch livestock in the classroom
- 6) Your desire to introduce students to monarch livestock in the classroom
- 7) Your intention to bring monarchs to the classroom within the upcoming school year

Please provide an email address to indicate permission to contact you in the future for a follow-up survey.

Data analysis offers the opportunity to consider the effectiveness of teaching methods in the creation of confident, enabled educators, and speaks to the necessity for adjustments to both content and method to create effective workshops.

## References

- Heimlich, J.E. (2010). Environmental education evaluation: Reinterpreting education as a strategy for meeting mission. *Evaluation and program planning*, 33(2), 180-185.
- Liddicoat, K., & Krasny, M. (2013). Research on the long-term impacts of environmental education. In R. B. Stevenson, M. Brody, Dillon & A. E. J. Wals (Eds.), *International handbook of research on environmental education* (pp. 289-297). New York and London, Routledge.

## Photo-Based Evaluation of Environmental Action Projects

Nicole Hamley — Toronto & Region Conservation Authority, Toronto, ON, Canada (2014)

### Introduction

The *Environmental Leaders of Tomorrow* program utilizes a multi-phase, integrated approach to environmental education, aiming to provide grade six students from high-priority Ontario communities with the knowledge, skills and inspiration needed to become the next generation of environmental leaders. A key component of the program is *action* – students decide on an action project to undertake and then work cooperatively to plan, initiate and complete the project with their class. This tool has been developed to measure [students' pro-environmental behaviors](#) using photo-based evaluations of environmental action projects.

### Development

Since its inception in 2008, the *Environmental Leaders of Tomorrow* program has relied on anecdotal notes as an informal measurement of students' environmental action projects. These notes are made by outdoor centre staff during the third and final phase of the program when staff reconnect with students in the classroom, and often consist of the basics, such as the type and status of the particular action project. Students have not been given a true opportunity to reflect on their action project, nor have their pro-environmental behaviors been measured. Research suggests that many valuable environmental education outcomes, including positive youth development and long-term participation in community transformation, can result from environmental action (Schusler et al., 2009), further signaling the need to examine students' projects more thoroughly.

### Photo-Based Evaluation

Photo-based evaluations are the most logical fit given that each participating class receives a digital camera, and that students consistently report enjoying taking photographs with the camera. Students will select three photographs from the ones they have taken over the course of the *Environmental Leaders of Tomorrow* program (approximately eight weeks), which relate to their environmental action projects.

Pairing participant photographs with interviews is an effective means of ensuring the meaning of the photograph is not misinterpreted (Stedman et al., 2004). During the third and final phase of the program, a small group of 4-8 students (selected by the classroom teacher) will meet with outdoor centre staff during their in-class visit. OC staff will conduct a semi-structured interview with this group of students, where they will be encouraged to use their photographs to tell the story of their environmental action project. Similar to methods employed by Schusler & Krasny (2010), group interviews will be scheduled to last 30 minutes and will be digitally recorded.

OC staff will ask open-ended questions such as:

1. What does the photo illustrate?
2. What is the significance of the photo?
3. Why was this particular photo selected?
4. Were there important parts of the project that were not photographed? If so, why?
5. How did you decide on this project?
6. What was your individual contribution to this project?
7. What skills did you need/use for this project?
8. Given your experience, what other environmental action project might you take on?



### Implementation and Analysis

During the first phase of the *Environmental Leaders of Tomorrow* program, students will be introduced to the concept of an environmental action project and the stages involved in bringing such a project to fruition. Being careful not to prescribe the shots to take, outdoor centre staff will encourage students to use the classroom camera (or their own device) to take photographs relating to their action project. As a starting point for action project brainstorming, students can capture points of interest both inside the school and outside in the schoolyard. They can then continue to take photographs relating to their action project as the planning and initiating stages unfold, as well as during their residential stay at the outdoor centre during phase two of the program. After conducting the group interviews during phase three of the program, digital recordings will be transcribed and then coded for general categories. Anticipated categories include *nature of action project*, *project determinants*, *pro-environmental behaviour*, *skills/knowledge*, and *willingness to repeat*. Naturally, modified and/or new categories will be identified as the analysis proceeds.

Results of this type of photo-based evaluation will aid in the measurement of students' pro-environmental behaviors. A picture is truly worth a thousand words. Incorporating photo-based evaluations may also serve to identify other valuable EE outcomes, inform program improvements and enhancements, and simply encourage kids to get outside with a camera and enjoy nature.

### References

- Schusler, T.M., et al. (2009). Developing citizens and communities through youth environmental action. *Environmental Education Research*, 15(1), 111-127.
- Schusler, T.M., & Krasny, M.E. (2010). Environmental action as context for youth development. *The Journal of Environmental Education*, 41(4), 208-223.
- Stedman, R.C., Beckley, T.M., Wallace, S.M., & Ambard, M. (2004). A picture and 1000 words: using resident-employed photography to understand attachment to high amenity places. *Journal of Leisure Research*, 36(4), 580-606.

# Measuring the Effectiveness of Workshops for Teacher Professional Development: A Qualitative Evaluation Tool

Nikki Julien — University of Arizona, Maricopa County Cooperative Extension, Phoenix, AZ (2014)

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## Introduction

Establishing an atmosphere of support is vital for learning to take place, even for adults. This qualitative survey draws out written responses that give directly relevant and useful feedback regarding presenter effectiveness and workshop effectiveness.

## Development

As manager of a preschool's new Outdoor Classroom, I am tasked with supporting the teachers to use the new space. Evaluating the effectiveness of both the presenter and presentation format of teacher workshops will offer clues to their feelings about the Outdoor Classroom.

## Method:

- Modify these essay questions to solicit information that answers your specific constructs.
- Fewer and simpler questions will steer participants into answering with greater depth. Limit the format to one page with lots of space for comments.
- Print in brightly colored paper, this makes the evaluation easy to find amid other handouts at the end of the program.
- Give evaluation out at beginning of workshop so the teachers can get a sense of what they are responding to and can begin to generate answers.

## Analysis of Qualitative Responses:

Written answers can offer additional perspectives to answer different constructs even within a few open-ended questions. While reading the responses to the survey, look for:

- Vocabulary used in the responses. What words and ideas were presented by the program/presenter that were taken up/reused by the participants when answering these questions? What words and ideas were generated by the social network of the participants themselves?

- Depth of responses. This might indicate a deeper connection (even if the responses are negative or mixed).
- Were the goals, objectives, and outcomes of the workshop restated by the participants? This should indicate that the goals were effective.
- Were your constructs addressed? Was the feedback helpful? Can it be applied to better programs in the future? Can it provide measurable information to the effectiveness of the program content?

## The survey questions:

1. Please comment on effectiveness of the presenter (useful materials, started and ended on time, clear agenda and goals, ability to communicate support).
2. How useful was today's program in introducing you to the Outdoor Classroom?
3. What did you like about today's program?
4. What could have been improved?
5. List at least one thing you will do to connect to the Outdoor Classroom before our next training on Dec 5th.

## References

Usable Knowledge, Inc. (Feb 13, 2014). "Open-ended Questions on Surveys". *Program evaluation and consulting for non-profit organizations*. Retrieved from: <http://www.usablellc.net/open-ended-questions-on-surveys>

Higginbotham, B. and Vaterlaus, M. Utah State University Cooperative Extension. (May 2012). *Writing Survey Questions for Local Program Evaluations*. Retrieved from: [http://extension.usu.edu/files/publications/publication/FC\\_Evaluation\\_2011-02pr.pdf](http://extension.usu.edu/files/publications/publication/FC_Evaluation_2011-02pr.pdf)

# Youth Environmental Leadership Survey: Environmental Impact

Patrick Marti — Wildlands Restoration Volunteers

## Rationale

This tool is part of a larger pre- and post-training survey intended to measure the impact of WRV's High School Crew Leader Training program on its participants. The program aims to empower youth with the technical knowledge and leadership skills necessary to lead crews of volunteers on ecological restoration projects. The more general goal of this program is to empower youth with the skills necessary to be leaders within their community.

The pre- and post-training survey measures four major outcomes: leadership skills, knowledge of environmental impact, participation in pro-environment behavior, and understanding of community. This tool specifically measures knowledge of environmental impact with a focus on recognizing ways to restore damaged ecosystems and make a positive impact on the environment.

## Development

This tool has been adapted from previous surveys implemented by WRV based upon feedback from partner organizations and information obtained from relevant literature. It combines Likert-scale items and open-ended response questions, and compliments qualitative evaluation in the form of informal interviews, feedback surveys, photos, videos. Previous iterations of the survey included more questions on how humans make a negative impact on environments, but the current survey has been modified to emphasize knowledge of positive impacts that can be made to damaged areas.

## Survey of Knowledge of Environmental Impact

### Likert-Scale Items:

How strongly do you feel you know how to:	Very Strongly	Strongly	Somewhat	Not Really	Not At All
<i>Identify ways that ecosystems are impacted by humans</i>					
<i>Identify ways to restore ecosystems</i>					
<i>Talk to others about the importance of ecological restoration</i>					
<i>Make a positive impact on your local environment</i>					

### Example of Open-Ended Response Questions:

List any ecological restoration techniques that you are familiar with.

## Implementation and Analysis

This tool should be administered prior to the beginning of training and at the culmination of training (Note: For WRV's High School Crew Leader Training program the post-training survey is administered following the completion of the two-day training workshop, two mentoring experiences, and one full-time leadership experience). Likert-Scale responses can be coded and translated into quantitative results (e.g., a mean score across the group) and used to compliment informal interviews to judge each participant's knowledge of environmental impact. The Open-Ended Response Questions can be quantified if necessary (e.g., the number of restoration techniques mentioned). A comparison of pre- and post-training results can be used to analyze the effectiveness of the training.

## References

- Bennett, D.B. (1984). Evaluating environmental education in schools: a practical guide for teachers: UNESCO.
- Simmons, B. (2004). Designing evaluation for education projects: NOAA Office of Education and Sustainable Development.
- Thomson, G., Hoffman, J., & Staniforth, S. (2005). Measuring the success of environmental education programs (pp. 72): Canadian Parks and Wilderness Society.

# Garden-Based Learning Assessment: A Survey or Interview Guideline

*Rob Efird, Seattle University*

**Target audience:** 3<sup>rd</sup>-5<sup>th</sup> grade

**Evaluation Type:** Qualitative Pre/Post Survey

**Time required for both pretest and posttest:** 20-30 minutes

**Measurement goals:** Assess changes in 1) enjoyment of outdoor play (physical activity and health), 2) knowledge and enjoyment of gardening, 3) awareness of, and participation in, family food traditions (food and culture).

## Background and Goals

This survey instrument is designed to assess the outcomes of garden-based learning for elementary school-aged students. The prototype is a nine week afterschool program for approximately 10-20 elementary school children meeting twice a week for at least 50 minutes. Due to the small number of students, the focus is on qualitative rather than quantitative assessment.

## Method

In order to ensure consistency of responses and (as much as possible) avoid bias, facilitators should be clear about the survey goals and method and have any questions answered prior to administering the assessment. The assessment should NOT be presented as a “test”; instead, the pretest can be introduced as a way to “get to know you better” and the posttest can be introduced as a way of “learning about how you feel after being in the class,” or something similar. While students are responding to the questions, they should be separated from one another as much as possible so that their answers are not influenced by others. However, the facilitator administering the questionnaire should be readily available to answer questions, help with spelling, etc. The pretest and posttest should consist of one sheet of paper, with the student’s name and/or birthdate and first 5 questions on the front and the sixth question at the top of the back (with room to draw beneath). Student name and/or birthdate or some other identifier is necessary in order to compare pre- and post-test responses.

## Pretest/Posttest Questions

1. Where are your favorite places to play? What do you like to play there?
2. Do you like to grow plants or food? Why or why not?
3. What do you need to grow plants or food?
4. What are the special foods that your family eats at special times (holidays, weekends, family celebrations)? Do you help to make the food?
5. What do you want to know about growing or making food? (Pretest) / What do you remember most about growing and making food during our time together? (Posttest)
6. If YOU had a garden, what would it look like? Draw a picture of your garden and label what is in it!

# One year post event survey: Wabash Sampling Blitz

*Sara Peel, Wabash River Enhancement Corporation, Lafayette, Indiana*

## **Introduction:**

This survey was developed to measure the impact of the Wabash Sampling Blitz on its participants, specifically to identify any changes in behavior they made following participation. All volunteers provide contact email when they register for the event and as part of the event's evaluation effort. These emails will be used to generate contact lists to use to solicit participants to complete an online survey (for example, using the Qualtrics online software).

## **Development:**

This evaluation survey was developed by the Director of Watershed Projects at the Wabash River Enhancement Corporation and our education committee.

## **Survey questions:**

1. In which Wabash Sampling Blitzes have you participated? Select from list for the two most recent events (survey for one year's participants only).
2. Did you look at the results posted following the Wabash Sampling Blitz? y/n/didn't know where to find them
3. Did participating in the Wabash Sampling Blitz increase your awareness of local water quality issues? y/n
4. How did participating in the Wabash Sampling Blitz increase your awareness of local water quality issues?
5. What aspects of the Wabash Sampling Blitz helped raise your awareness of water quality issues in your community?
  - a. Collecting water samples
  - b. Testing water samples
  - c. Talking to water experts on-site
  - d. Networking with other volunteers
  - e. Looking at results maps online
  - f. Other, please explain
6. After participating in the Wabash Sampling Blitz, did you make changes at home, in your daily routine, or at work to try to help improve water quality in your community? y/n/would like to do / don't know how to start
7. What kinds of changes did you make at home, in your daily routine or at work to improve water quality in your community following participation in the Wabash Sampling Blitz?

## **Implementation:**

This instrument will be emailed to participants one year following the Wabash Sampling Event. The results will be aggregated for each year's participants (spring and fall) and then reviewed to determine how the Wabash Sampling Blitz can be modified to elicit participants to take their experience back to their daily life and make changes to improve water quality in the Wabash River.



# Efficacy of Green Eggs and Sand Workshop Evaluation

Stacy Epperson, Maryland Department of Natural Resources, Aquatic Resource Education, 2014

**INTRODUCTION:** Green Eggs and Sand is a two-part program: 1. a middle/high school science curriculum-based on the horseshoe crab and 2. a three day/two night immersion in all aspects of the horseshoe crab. The curriculum is reviewed and distributed at the end of the workshop. Our objective is to increase to a high level, the knowledge participants have about horseshoe crabs; and to ensure participants have the confidence to bring the curriculum/lessons into the classroom. Both of these outcomes can be applied to most any environmental program for educators. There are many reasons why educators may not be able to bring environmental education lessons into the classroom that are not in the control of the environmental education providers; this tool directly measures those items that the provider can control.

## **DEVELOPMENT:**

The survey separately measures knowledge and teaching confidence about several main aspects of the horseshoe crab. The Likert scale is used. The questions were designed by the author. We (Green Eggs and Sand Team) feel that knowledge will most likely be attained by most if not all participants. The level of confidence of the teacher may have a direct link to whether the curriculum is used in the classroom.

## **SURVEY:** Efficacy of Green Eggs and Sand Workshop Evaluation

*Possible responses: 1 pt "Strongly disagree," 2 pt "Disagree," 3pt "Neither agree nor disagree," 4 pt "Agree," 5 pt "Strongly agree."*

### **Knowledge**

1. I feel I have enough biological information about the horseshoe crab to understand the life cycle.
2. I feel I have a strong understanding of the shorebird's dependency on the horseshoe crab and its effect on the lifecycle of the shorebird.
3. I feel I have a strong understanding of the reason for the commercial harvest of horseshoe crabs.
4. I feel I have a strong understanding of the medical value of horseshoe crab blood.
5. I feel I have a strong understanding about the management of the horseshoe crab.

### **Confidence**

6. I feel I could facilitate a discussion or lesson about horseshoe crab life cycle.
7. I feel I could facilitate a discussion or lesson on the horseshoe crab and its effect on the lifecycle of the shorebird.
8. I feel I could facilitate a discussion or lesson about the lifecycle of the Red Knot or other shorebird that feeds on horseshoe crab eggs.
9. I feel I could facilitate a discussion or lesson about the role of the commercial harvest of horseshoe crabs in the management of the animal.
10. I feel I could facilitate a discussion or lesson about the role of the horseshoe crab blood in human health.
11. I feel I could facilitate a discussion or lesson of the issues in managing the animal.

**IMPLEMENTATION AND RESULTS:** This instrument will be given at the commencement of the workshop and again at the end on the same paper. To maintain anonymity, participants label their form with a number found in their arrival packet. Surveys are collected and then re-distributed at end of workshop. On average, this survey is administered in our program with about 80 participants a year. The results will be tabulated for separate groups (formal educators, non-formal educators, other; *and* upper elem, middle school, high school, adult) and for the separate variables (knowledge, confidence). If the results overall for confidence are less than a TBD specified threshold, a re-evaluation of the program would be needed. Note that there is a separate evaluation form completed by participants that would include suggestions and improvements.



# Assessment of Middle School Students' Systems Thinking Skills: Scoring Guide for a Collection of Evidence

Susan Duncan — Science, Engineering and Environmental Educator, Portland, OR (2014)

## Rationale

This scoring guide measures a middle school student's proficiency for **Oregon's 2013 Environmental Literacy Plan Strand 2** available at <http://goo.gl/kO3dWO>: "Understand and apply systems thinking concepts and tools" (p. 5). To reach the outcome, a student generates a collection of evidence that shows how one "analyzes and applies the properties of systems thinking to Earth's physical, ecological and human systems now and to inform future considerations" (OELP, 2013, p. 5). It is important for environmental education and academic programs because the student learns to determine the scope and context of a possibility, or problem, based on one's own experiences and observations. By modeling interconnections and change over time, a student can propose action with a clear explanation of the information, beliefs and assumptions that underlying it.

## Development of Scoring Guide

This assessment tool was developed using: the *Habits of a Systems Thinker*, published through The Waters Foundation in 2010 at <http://goo.gl/2jTkFD>, and the *AMAT Learning Cycle* by Bernice McCarthy, whose resources are available at <http://goo.gl/8jJi0W>. Its intent is to guide a student in documenting one's thinking. It is intentionally open-ended to allow each student to propose actions appropriate to one's interests, level of concern, culture, age, perspective and means. A proficient collection would include the following items.

**Change over Time Graphs.** The student "connects" with 4-5 different variables from one's ecological and human system (McCarthy, 2014). Graphs show, and captions explain, the pattern for how each changes over time. To learn how to create examples, visit <http://goo.gl/SXrhpe>.

**Connection Circle.** The student "attends" to the connections between the variables (McCarthy, 2014). Each is organized around a circle and arrows point from the cause to its effect. These are called, "causal links" (Waters Foundation, 2010, p. 4). The arrows are labeled + or - to indicate increasing or decreasing relationships. To see example, visit <http://goo.gl/EF6vdQ>.

**Causal Loop.** The student notices which arrows in the Connection Circle create an image that shows "causal loops" (Waters Foundation, 2010, p. 5). The letter R is used to label reinforcing loops, <http://goo.gl/PX8JBQ>, and the letter B is used to indicate balancing loops, <http://goo.gl/9uCnoL> (Waters Foundation, 2010, p. 10).

**Stock/Flow Map.** The student adds information from lectures, books, on-line research, field investigations, field trips, and guest speakers to diagram a model that shows the system's inputs and outputs. For example, visit

<http://goo.gl/IPfPv3>. The diagram shows which variables work together to cause increases and decreases in the system over time (Waters Foundation, 2010, p.5).

**Archetype Diagram.** The student practices comparing one's model to known archetypes such as the Tragedy of the Commons, and overlays one's model to an existing archetype, if possible (Waters Foundation, 2010, p. 10-13). To see archetypes, visit <http://goo.gl/bqHuvA>. The student identifies a variable that acts as constraint on the system as a leverage point and explains how it affects the positive long-term change one wishes to see.

**Ladder of Inference.** The student examines the assumptions and beliefs behind the recommended action. For example see, <http://goo.gl/XWW7S1>.

1. What kinds of assumptions are being made based on your experience, culture and information sources?
2. In your experience, are certain pieces of information more important to attend to than others? Which ones?
3. Which experiences, cultural or personal beliefs will have the most influence on leveraging change?
4. Describe the meaning that your recommended actions will bring to the situation.
5. What specific actions do you recommend based on your current understanding and beliefs associated with this particular ecological and human system? (Questions adapted from the Waters Foundation, 2010, p. 7).

**Iceberg Metaphor.** The student refines one's model using guiding questions to summarize (Waters Foundation, 2010, p. 9). See specifics at <http://goo.gl/ZYAZ9X>. The student presents recommendations for creating long-term positive change in a particular ecological and human system in the form of written work, verbal presentation or display.

## Implementation and Analysis

Score each item in the collection of evidence for proficiency as they are generated if possible. The graphs, connection circles and causal loops need to be created prior to learning new information about ecological and human systems. Provide adequate time for students to practice, extend and refine their models in light of new experiences and information provided by an educator. The results of this measurement can be analyzed and used to determine which thinking skills students need to practice and what specific information and resources educators need to support each student as one considers the future.

## References

- McCarthy, B. (2014) *Learning and Teaching Styles Assessment Instrument*. Wauconda, IL: About Learning. <http://www.aboutlearning.com>
- Systems Thinking in Schools. (2010). *Systems Sampler*. A Waters Foundation Project. <http://www.waterfoundation.org>

# Water Pollution Prevention – Verbal Assessment Tool

Tamar Hurwitz, San Francisco Department of the Environment



We visit classrooms to teach 5<sup>th</sup> grade students about water pollution prevention and must assess whether students are learning six key points. We verbally survey students immediately before and after the presentation, and record their answers on the spot. This method can be adapted to any short classroom presentation and does not require materials to be distributed, does not take much classroom time, and does not require additional time for evaluation. A potential drawback of this method is that we only measure what students remember immediately after the presentation and do not know what they will remember long term. Additionally, there can be issues with reliability of this approach since subtle variables (like the speed or tone of the surveyor’s voice as they ask the questions) can bias the response of the students. While we found this method to be effective for the 5<sup>th</sup> grade classes we’ve surveyed, we have not tested it with other grades.

Some suggestions to remember when implementing this survey:

- You must craft your questions carefully and ask them in a neutral voice that does not bias student answers. You must use this same voice during both the pre and post surveys.
- It is crucial to make sure students cannot observe other students’ responses so they are not influenced by each other. Students must have their eyes closed and also put their heads down on their desk.
- Administer the pre-survey immediately before you teach. Simply introduce yourself and give the survey. Don’t talk too much about what you’re about to teach since it can bias the student response.
- After each question, when you’re done recording how many hands are in the air, say: “Thanks. You may put your hands down.” You must say this after every question *even if no hands were in the air*.
- The following script effectively introduces the survey. It doesn’t give students too much information about the presentation; it reduces “test anxiety” by making the survey sound fun, and by assuring students they won’t be graded on their answers; and it directs them to close their eyes and put their heads on their desk, which is essential.

**Hi students, my name is \_\_\_\_ and I’m here to give you a presentation about water. Before I begin, I’m going to conduct a survey by asking you seven questions. It’s really simple, and it will be fun, because you’re going to answer with your eyes closed! I’ll then ask the same questions at the end of the presentation. No one is going to be graded on this, so don’t worry! Just raise your hand to answer the questions, and I’ll count how many hands are in the air. Okay. Let’s get started. Everybody close your eyes and put your heads down on your desk. Raise your hand when you think the answer is ‘yes.’**

1. Pretend you are helping your neighbor change the motor oil in their car. How many of you think it is okay to pour the used motor oil down the storm drain outside? [Thanks. You may put your hands down.]
2. Pretend it is raining outside and the water in the streets goes down the storm drain. Do you think all that water going down the storm drain gets cleaned at the wastewater treatment plant? [Thanks. You may put your hands down.]
3. Picture litter on the street next to a storm drain. How many of you think that when litter collects on top of the storm drain, that it can cause flooding in the streets during a rain? [Thanks. You may put your hands down.]
4. Pretend you are helping make French fries and there is leftover cooking oil. How many of you think you should pour cooking oil and other types of fats and grease down the kitchen drain? [Thanks. You may put your hands down.]
5. How many of you think it is okay to flush old medicine down the toilet? [Thanks. You may put your hands down.]
6. How many of you think it is okay to flush baby wipes or cleaning wipes down the toilet? [Thanks. You may put your hands down.]
7. How many of you think it is okay to flush baby wipes or cleaning wipes that say “flushable” down the toilet? [Thanks. You may put your hands down.]

# Evaluating Climate Change Response in Sequoia National Park using Facilitated Dialogue

*Tara Hostnik, Sequoia Field Institute Manager  
Sequoia Natural History Association, Three Rivers, CA*

## **Introduction**

The Sequoia Natural History Association engages visitors of Sequoia and Kings Canyon National Parks through free interpretation programs such as constellation tours, historical interpretation, nature walks, wilderness survival talks, crystal cave tours, backpacking trips and wildlife viewing. *Facilitated dialogue* is an interpretation technique that offers multiple points of view, allows the audience to share stories and opinions and encourages discussion (see a PDF file here: <http://goo.gl/IGqaWP>)

## **Outcome**

By the end of their visit to Sequoia or Kings Canyon National Parks, visitors will understand how the Park is affected by climate change and will be inspired to respond, either inside or outside the National Parks.

## **Method**

During an evening campfire program, visitors will see photos taken in the Park (of wildlife, people picnicking or volunteering, a natural disaster such as a fire and a human-caused disaster such as bad air quality or light pollution). In addition to receiving information on climate change and how it affects our Parks, visitors will be asked the following questions on the photos:

1. Raise your hand if you care about [the subject or resource in the photo such as a bear, wilderness, people, etc]. Why do you care?
2. Does anyone want to share a story or past experience about [the subject in the photo]?
3. Scientists tell us that our National Park will experience rising temperatures in the future. What challenges might [the subject] face in the future?
4. How might you, as a park visitor, staff, scientist or manager respond to these challenges?
5. What is one thing you can realistically do to respond to climate change, either inside or outside the Park? How many of you feel inspired to see that through?

## **Analysis**

The facilitator may use visitor responses to communicate to Park managers about what visitors care most about in the Park and how they believe the Park should be managed with respect to challenges such as climate change or bad air quality. Allowing visitors to share stories may also give us insight into whether they have had positive or negative experiences in the outdoors and whether they feel inspired to protect it.

## Out-of-school time EE program – connecting with in-school time EE teachers

*Thomas Huchko, Pennsylvania Statewide Afterschool Youth Development Network*

### Introduction

The purpose of this survey is to see how much the education received in the informal setting (out-of-school time EE program) was connecting with the formal setting (in school education). There is a huge disconnect between what students do during school and what they do in the 80% of their time spent out of school. Although a lot of students do not attend an afterschool program and even less attend one that does EE, this tool should help see ***how well students are learning EE outside of school and if it at all is relating to what they learn in the classroom.***

### Development

This tool is meant to assess whether students can connect what they learn during school to what they learn in an afterschool EE program. The survey will be in a Likert-scale format with answers including (1) “strongly disagree”, (2) “somewhat disagree”, (3) “neither”, (4) “somewhat agree”, (5) “strongly agree”. This will be the only section of the survey and will be 15 questions. This survey will be given out in two forms: a pre and post survey. There will be a time period of three consecutive in-school and in-program weeks. This would need to be done while the students were currently going over an EE topic in their current science class. After these surveys are done we hope to be able to share our results with teachers and other administrators to try and gain awareness of this need.

### Survey – To be given before and after the environmental education program

- 1) I enjoy learning about environmental education.
- 2) I think about environmental education outside of school.
- 3) I like to participate in projects that deal with the environment.
- 4) I would like to have a job that deals with the environment in the future.
- 5) I like reading about the environment.
- 6) I am curious to learn about new technologies that can help preserve the environment.
- 7) I only participated in this program because I had to.
- 8) Before participating in this program, I was interested in the environment.
- 9) I do environmental related activities that are not for my schoolwork.
- 10) I pay attention when people talk about recycling to protect our environment.
- 11) Some of the things I learned in the environmental education program were the same as things I learned in school.
- 12) It would be beneficial to me if my schoolwork connected with my after school program.