Measuring Environmental Education Program Impacts and Learning in the Field: Using an Action Research Cycle to Develop a Tool for Use with Young Students

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Abstract Despite the increasing importance of, and interest in, documenting the impact of environmental education programs on students' learning for sustainability, few tools are currently available to measure young students' environmental learning across all the dimensions of knowledge, skills, attitudes and behaviours. This paper reports on the development of such a tool, using an iterative action research process with 134 students, aged six to eleven, attending programs at an Environmental Education Centre in Queensland, Australia. The resulting instrument, the Environmental Learning Outcomes Survey (ELOS) incorporates observations of students' engagement in learning processes as well as measuring learning outcomes, and allows both of these aspects to be linked to particular components of the environmental education program. Test data using the instrument are reported to illustrate its potential usefulness. It is envisaged that the refined instrument (appended) will enable researchers to measure student environmental learning in the field, investigate environmental education program impacts and identify aspects of programs that are most effective in facilitating student learning.

Introduction

Many studies have investigated learning outcomes that result from environmental education programs. Environmental education aims to extend students' *knowledge* about the environment, challenge the *attitudes* and *behaviours* that form the basis of environmental citizenship and develop *skills* to enable them to take action for the environment. However, reviews of environmental education research (Leeming, Dwyer, Porter & Cobern, 1993; Rickinson, 2001) indicate that a considerable number of studies have only examined changes in learners' knowledge and attitudes. One of the reasons for this is that there are few tools available to measure students' environmental learning across all four dimensions. This is particularly the case with regard to measuring young students' (primary school) environmental learning "in the field". However, because the goal of many "outdoor" or "informal" environmental education programs is to promote environmental sustainability, an increasing number of researchers are interested in

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developing a measurement tool that addresses all four dimensions of environmental learning.

A number of studies have examined learners' knowledge and attitudes, and the relationships among cognitive, affective and behavioural variables (Hart & Nolan, 1999; Leeming et al., 1993; Rickinson, 2001). A majority of these studies have employed some form of quasi-experimental pre-test / post-test design to measure the effects of educational programs on students' environmental learning (Rickinson, 2001). These types of studies typically use a fixed-response questionnaire design comprising multiple choice and/or Likert scale questions as the primary data collection instrument (e.g., Ballantyne, Fien & Packer, 2001c; Bonnett & Williams, 1998; Connell, Fien, Sykes & Yenken, 1998; Cullingford, 1994; Dettmann-Easler & Pease, 1999; Gigliotti, 1994; Kwan & Miles, 1998). For example, Volk and Cheak (2003) used two multiple choice instruments to measure environmental literacy and critical thinking. Connell et al. (1998) employed multiple choice instruments to measure high school students' environmental knowledge and attitudes, and personal commitment to environmental action. Culen and Volk (2000) used five scales to measure the effects of an educational intervention on ecological knowledge, attitudes, perceptions of action skills and environmental behaviour. Many of these instruments are difficult to use with young learners as they depend on the ability to reflect "abstractly" on their learning experiences.

Measuring learning outcomes in informal learning settings is notoriously difficult for a number of reasons. There are usually no formal curricula or assessment procedures; learning involves affective as well as cognitive and behavioural outcomes; and the learning experience often varies widely from student to student. As a partial solution to this problem, Griffin (1999) suggests that in informal settings, it may be appropriate to observe *how* students are learning (the learning process) as well as measuring *what* they have learned (the product). After an extensive review of relevant literature, she has formulated a set of "indicators of engagement in learning processes" which can be used in conjunction with other measures of learning outcomes, such as students' views of their own learning and their understanding of the main messages of the experience (Griffin, 2002). This approach, which combines observation of learning processes with measurement of learning outcomes, lends itself to the investigation of the ways in which an informal learning program impacts on student learning.

The purpose of this study was to develop and pilot a measurement tool which (a) assesses students' environmental learning during, and as a consequence of their involvement in an environmental education program; (b) identifies aspects of the program that are most effective in facilitating students' environmental learning; and (c) can be used across a range of year levels and programs. The study builds on the previous work of Ballantyne and Packer (2002) and Ballantyne, Fien & Packer (2001a; 2001b; 2001c) regarding the impact of school environmental education programs on student learning, and incorporates Griffin's approach to observing indicators of engagement in learning. Ballantyne et al.'s previous work, which used a variety of measures of learning outcomes, including multiple choice, Likert scales and open response items, suggested that the latter held the most potential for measuring young students' environmental learning in the field.

Method

An action research design was adopted for this study using an iterative cycle of developing, trialling and refining the measurement tool. A total of five different versions of the Environmental Learning Outcomes Survey were developed and trialled. After each trial, the instrument was revised on the basis of the outcomes obtained.

Participants and Programs

The research was conducted at an Environmental Education Centre (EEC) located in an urban forest setting in Brisbane, Australia. The Centre aims to provide students with knowledge, skills and concepts about forests, encourage them to clarify their values regarding environmental issues, and facilitate the adoption of environmentally responsible actions. Participating classes were selected by EEC staff from among those whose teachers had arranged a visit to the EEC during the period of the research (July – November 2003). Classes from a range of primary school year levels, whose teachers were willing to be involved in the research, were selected. A total of ten classes (two Year 2, four Year 5 and four Year 6 classes) participated in the study. Data were collected from 134 of the 255 students who participated in the on-site environmental education programs.

Each class took part in a day long excursion to the EEC, during which they participated in one of the environmental education programs offered by the Centre. All of the programs are designed to provide students with cognitive and affective experiences that encourage environmental learning in real-life contexts, and many include action strategies.

- Year 2 students (aged 6-7) participated in the Possum Bangles program. Students were involved in helping a (puppet) possum save his forest home. They learned how they can be a "friend of the forest forever" (foffe – pronounced "foffie") and were presented with foffe badges at the end of the program;
- Year 5 (aged 9-10) students took part in the Among the Gum Trees program. Students explored forest or pond environments through guided and self-discovery experiences. They then participated in a small group activity in which they discussed local environmental issues and proposed solutions to those problems. A problem-solving simulation was introduced in which it was proposed to cut down a 370 year old tree in order to increase the size of the EEC's parking lot; and
- Year 6 students (aged 10-11) participated in the Earthwalk program. Students explored forest and pond environments and participated in a tree identification activity. As for the Year 5 program, a problem-solving simulation was introduced in which it was proposed to cut down a 370 year old tree in order to increase the size of the EEC's parking lot.

Pedagogical approaches used in the delivery of the programs included hands on activities, immersion (in the forest), storytelling, investigative studies and performance presentations. Activities ranged from physically active to quiet and reflective. During the activities, students worked in friendship groups, as a whole class, or on their own.

Procedure

An iterative process of development was followed to test and refine the instruments and procedures for measuring and investigating environmental learning outcomes. The procedure involved the three-part strategy recommended by Griffin (1999; 2002): observing students' engagement in learning; obtaining students' personal declarations of learning; and their understanding of the main messages. Using different strategies in this way allowed some degree of triangulation and cross-validation of data in relation to learning outcomes. An attempt was also made to incorporate cognitive, affective and behavioural components of environmental learning, and to document the learning events associated with different outcomes.

Observing Engagement in Learning Processes

An Observation Record Sheet was designed to record student behaviours indicative of engagement in learning during various components of each program. These are categorised by Griffin (1999) as follows:

1. Showing responsibility for and initiating their own learning (examples: knowing what they want to look for; making choices; deciding where and when to move; initiating engagement in learning);
2. Actively involved in learning (examples: standing and looking/reading; persevering with a task; exhibiting curiosity & interest; absorbed, close, concentrated examination);
3. Purposefully manipulating and playing with objects and ideas (examples: handling objects or specimens with care, interest, purpose; using hands-on activities as intended);
4. Making links and transferring ideas and skills (examples: comparing objects and ideas; comparing/referring to previous experiences);
5. Sharing learning with peers and experts (examples: talking & pointing; asking each other questions; pulling others to show them something or be pulled; talking & listening; talking to adults or experts);
6. Showing confidence in personal learning abilities (examples: seeking out information; explaining to peers; reading to peers); and
7. Responding to new information or evidence (examples: evidence of changing views; evidence of discovering new ideas).

For each activity, students' verbal and non-verbal responses were recorded. Teaching and learning approaches and activities used during each experience were also documented in an attempt to identify the strategies associated with different learning outcomes.

Measuring Learning Outcomes

Five different versions of an Environmental Learning Outcomes Survey (ELOS) were trialled, using four different administration methods (see Table 1). After each trial, the success and challenges inherent in the procedure were considered, and refinements made to improve the effectiveness of the tool in achieving its aims, viz., to assess environmental learning and identify program effectiveness across a range of year levels and programs.

TABLE 1: Five Iterations of the Instrument for Measuring Learning Outcomes

Version	Year Level	Number of Participants	Administration Method
1	Year 2	33	Orally administered questionnaire
2	Year 5	48	Self administered questionnaire
3	Year 6	25	Self administered questionnaire
4		5	Open-ended interview
5		23	Structured interview
	Total	134	

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Results

Observations of Engagement in Learning

The observational procedure appeared to be quite successful in identifying the extent to which students were engaged in learning during various aspects of the programs. Episodes involving story-telling, seeing animals in their natural habitats, self-discovery experiences, and physically active, challenging activities in which children worked in friendship groups all resulted in high levels of engagement. For example, the following indicators of learning engagement were observed during these activities:

Actively involved in learning

- exhibiting curiosity & interest. When one of the Year 5 groups came across a dead bird on their walk through the forest, students responded by saying *"Oh yuck", "Oh, poor little birdie"* and, *"Cool isn't it?";* and
- absorbed, close, concentrated examination. During the story portion of the *Possum Bangles* program, Year 2 students were very excited—smiling, laughing, clapping and pointing. They demonstrated high levels of interest and motivation in this component of the program.

Making links and transferring ideas and skills

- comparing/referring to previous experiences. During the story of the 370 year old tree that was going to be cut down, Year 6 students referred to prior knowledge and experiences in searching for solutions to the problem, e.g., *"We should get Greenpeace in here"; "Tie yourself to the tree"; "Have a protest"; "I could deliver letters, I deliver papers".*

Sharing learning with peers and experts

- talking and pointing. Students were highly engaged when they were participating in physically active, challenging activities in which they worked in friendship groups such as scooping for animals at the pond, identifying trees, and solving the foffe riddle. During these activities students were observed laughing, running and chatting with one another.

Responding to new information or evidence

- evidence of discovering new ideas. High levels of engagement were observed when students made discoveries while exploring the forest using their "third eye" (a magnifying glass). *"Wow", "that's awesome"* and *"look at this"* were typical comments made by students during this activity.

This information provided a valuable context for evaluating and improving the effectiveness of different versions of the ELOS.

Version 1. Orally-Administered Questionnaire Used with Year 2 Students

Because of the children's age and limited writing ability, an orally administered questionnaire was used with the Year 2 students. The questionnaire was completed with students during an interview at their school two days after the visit. Students were asked how much they thought they had learned at the EEC and to name specific items learned; they were asked to identify the feelings they experienced during their visit; whether they thought their experience at the EEC would change what they do to help the environment; and if their behaviour would change, to name the actions they would take in the future to care for the environment.

The Year 2 students reported learning *"lots of new things"*, and most of their learning statements related to finding answers to questions and riddles presented in the Possum Bangles story. Year 2 students could readily identify feelings they had experienced

during the visit, and most reported feeling *"amazed"*, *"excited"* and *"happy"* while at the EEC. In response to the question concerning behavioural intent, many children stated that what they learned at the EEC would change what they do for the environment *"a lot"*. Children named a variety of actions for how they would care for the environment in the future, for example:

- Pick up rubbish;
- Put out BBQ fires;
- Look after animals;
- Plant trees and flowers;
- Collecting seeds;
- Turn off tap;
- Not (to) feed animals people food;
- Leave things in the forest;
- Not to cut down trees;
- Look after plants – walk on the path to protect little plants;
- Use your eyes to look first – (don't) step on it or smack it; and
- Look after the forest by not driving over the bush.

Most of these actions were included in the part of the program where students discover what it means to be a foffe. Observational data confirmed that the students were very engaged during this activity – running from clue to clue to solve the foffe riddle. After the riddle was solved, adults reinforced the learning by engaging students in a discussion about what it means to be a foffe.

Overall, data from this questionnaire assisted in identifying the teaching strategies that appeared to foster attitudinal and behavioural change. However, many Year 2 students' responses regarding what they had learned did not relate specifically to information about the environment. For example, common responses students provided included, *"I learnt the name of the baby"* and *"Learnt about foffes"*. It was considered that asking students to state what they learned specifically about nature would improve the quality of the responses.

Version 2. Self Administered Questionnaire Used with Year 5 Students

A modified self administered questionnaire was trialled with Year 5 students and was distributed to students by their teachers in class after their visit. The questionnaire was similar to Version 1, but in addition to asking students what they learned about the environment, they were also asked to write down what they were doing when they learned it. In addition to identifying the feelings they experienced while at the EEC, they were asked to complete sentences using "feeling words", e.g., "I felt ... when I heard stories about the forest and the catchment". In addition to asking students if what they had learned at the EEC would change what they would do for the environment, they were asked to complete the following sentence, "I wanted to look after the environment when ...".

Students completed the questionnaire with varying degrees of success. One quarter of the students reported learning something about the "old tree" and observation data confirmed that students demonstrated high levels of engagement during this activity. Year 5 students were able to identify feelings they experienced during the visit without difficulty. Although the "complete the sentence" questions yielded additional information about what students were feeling during different experiences, the questions were worded too broadly to assist in identifying links between specific learning events and affective learning outcomes. In relation to behavioural intentions, although some of the actions students provided for how they would care for the environment could be linked

to the experience at the EEC, many comments were too general and did not provide direct evidence of a connection between the experience at the EEC and intent to care for the environment.

The most frequent responses provided by students regarding when they wanted to look after the environment were when they were fishing (scooping for aquatic animals at the pond), or in their "magic spot" (an activity where students sit by themselves in the forest for five minutes). Based on observational data, children demonstrated high levels of engagement during both of these experiences.

Although data from this questionnaire did provide insights into different aspects of environmental learning, issues concerning the administration and design of the self-administered questionnaire reduced its usefulness as a measurement tool. Although many Year 5 students were able to write down something they had learned at the EEC, few were able to write down what they were doing when they learned it.

Version 3. Self Administered Questionnaire Used with Year 6 Students

As for the Year 5 students, self administered questionnaires were distributed by teachers in the classroom the day after the visit. In the revised self administered questionnaire, questions were designed to be more focused and specific. Instead of asking a general question about what they had learned overall, students were asked to write down what they had learned at each of three different areas explored during the visit – pond, forest and tree ID. They were asked to identify the feelings they experienced at each of the three sites. They were also asked to complete the following sentences: "I was amazed when ..."; "I was happy when..."; and, "I wanted to look after the environment when ...". To assess applied knowledge and behavioural intent, students were asked to write responses to scenarios about issues related to their EEC experience. They were also asked to name one thing they could do to help the environment that they learned from their day at the EEC.

The more focused and specific questions in this version of the questionnaire yielded additional information about what students learned during each activity. For example, students reported learning the following during the tree identification session:

> I learnt that there were different kinds of gum trees.
>
> That you can identify trees by their bark.
>
> I learnt that names of trees tell you so much about them.

In response to the sentence completion items, many students identified *"seeing the Channel-billed Cuckoos"* as an experience that prompted them to feel amazed. (During the program, the EEC guide had explained how privileged they were to observe these birds' behaviour in taking over a crow's nest.) *"Hearing the story of the tree"* was the most frequent response provided by students for when they wanted to look after the environment.

Although many children were able to provide comprehensive answers for the scenarios (and demonstrated high levels of understanding), it is difficult to conclude that their responses were directly related to their experience at the EEC. When asked to name something they could do to help the environment that they learned from their day at the EEC, nearly half of the responses focused on *"not littering"*. Approximately one third of the comments pertained to saving trees from being cut down.

Overall, the data from this questionnaire did offer new understandings about the impact of environmental education programs on student learning. For example, the problem-solving simulation based on cutting down the old tree featured prominently

in students' responses regarding the behaviour/action dimension of their learning. However, the need for supplementary observational data and the opportunity to probe students' responses through interviews were apparent.

Version 4. Open-Ended Interview with Year 6 Students

Open-ended interviews were conducted with a limited number of students to determine whether an unstructured conversation would provide additional insights into students' environmental education experience. Individual interviews were conducted by researchers at the school three days after the visit. The interview started by asking students to comment on what they remembered about their visit to the EEC. In most cases, students provided statements such as, *"I had a nice day"* and *"The people were nice"*. After a few interviews it was decided that it would be a more efficient use of time, both in data collection and analysis, to ask questions specifically targeted at student learning through the use of a structured interview.

Version 5. Structured Interview with Year 6 Students

The structured interview was designed to probe environmental learning in-depth by questioning students about each learning event along a number of different dimensions. For example, after a student stated *"I learnt that lots of different creatures live in the pond"*, they were asked to identify: 1) where they were when they learned it; 2) what they were feeling when they learned it; and 3) how they thought they learned it. These questions were designed to enable links to be made between various components of the program and different learning outcomes. It was considered important to record the emotions associated with each learning event because previous research has highlighted the importance of emotional involvement in environmental learning (Ballantyne et al., 2001a; 2001b), and because emotion is an important motivational factor underlying human action (Ford, 1992). Prompt cards were used to assist students with responses to these questions. As well as asking students if they thought their experience at the EEC would change what they would do for the environment, and what actions they might take to care for the environment in the future, they were asked if their intended action was a result of something they did at the EEC. All responses were recorded on an interview recording sheet.

This method of in-depth probing of students' reported learning revealed detailed information about where learning occurred, emotions experienced during specific learning events, students' perceptions of how they had learned, and experiences that impacted most on environmental behaviours and actions. Some sample analyses are presented below as an indicator of how such data might be used in research and evaluation. Because only 23 participants completed this version of the instrument, no firm conclusions can be drawn from these analyses, other than to confirm the success of the final version of the ELOS in producing usable data.

Each different item that a student reported having "learned about nature" during their time at the EEC was considered a "learning event" and was categorised as new knowledge, attitude, action or skill. Associated with each learning event, was information about the component of the program during which it had occurred; the feelings with which it was associated; and the teaching or learning process perceived to have contributed to it. A total of 66 learning events were reported and categorised in this way (see Table 2).

Crosstabulations yield some potentially interesting information on the impact of different aspects of the program on environmental learning. For example, crosstabulating type of learning by program component indicated that while new knowledge was learned throughout all of the program components, attitudes and

TABLE 2: Frequencies of Learning Events

Type of learning	
knowledge	61%
attitude	11%
action or behavioural intention	12%
skill	14%
Program component	
forest exploration	48%
pond exploration	28%
tree identification	20%
tree problem-solving	5%
Level of emotional engagement	
low (bored)	5%
moderate (happy, calm)	32%
high (excited, amazed, challenged)	63%
Teaching/learning process	
(more than one option may have been mentioned)	
listening to an adult	50%
talking with friends	8%
reflecting alone	9%
experiencing the environment	29%
doing something in the environment	41%

behaviours were learned predominantly during the forest exploration, and skills were learnt mainly during the pond exploration. Crosstabulating type of learning and level of emotional engagement indicated that high levels of emotional engagement usually accompanied the learning of attitudes, but not necessarily the learning of actions/behavioural intentions. Crosstabulating type of learning and teaching/learning process indicated that listening to an adult was important in learning knowledge and skills, while experiencing and doing something in the environment were important for learning attitudes and actions/behavioural intentions. Again it should be noted that these analyses are presented to demonstrate the potential uses of the instrument – the conclusions should not be generalised without further testing.

As well as analyzing the data at the level of reported learning events, it is also possible to analyse the data at the student level. For each student, the following measures can be derived: total number of learning events reported; number of learning events of each type (knowledge, attitude, action, skill); level of emotional engagement; and number of environmental actions suggested (see Table 3). Using data such as these, it should be possible to explore for differences in learning outcomes according to gender, age, program type and other independent variables.

Further Iterations

Further improvements to the Version 6 instrument described above have been made in the light of the findings of this study. In the final revised version, the "intended actions" reported by students are explored in a similar way to the "learning events", probing for the program components, emotional engagement and teaching/learning approaches associated with each. The categories used to classify emotional engagement

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TABLE 3: Descriptive Statistics for Year 6 Class (n=23)

	Mean	Mode
Number of learning events	2.8	4
Knowledge	1.7	2
Attitude	0.3	0
Action	0.3	0
Skill	0.4	0
Level of emotional engagement (1=low; 2= moderate; 3=high)	2.6	3
Number of environmental actions	1.5	2

and teaching/learning approaches have been further refined and provided as an aid to interviewers. The observed behaviours indicative of learning have been refined to give a separate measure of program effectiveness and thus provide triangulation data. (This is not an individual measure but can be categorised by program component and by teaching/learning approach.) The final instrument is attached as Appendix A (Environmental Learning Outcomes Survey) and incorporates two components: an Observation Schedule and an Interview Schedule. A mnemonic (SLIMCARD) is employed to facilitate the use of the observation measure (see Appendix A).

Conclusion

This study demonstrates how the impact of environmental education programs on student environmental learning can be measured, even with young students. Although there were strengths and weaknesses associated with all the versions tested, the most effective strategy used in the study comprised a combination of field observations and a structured interview. Observations were useful in identifying experiences that produce high levels of engagement, interpreting connections between teaching/learning approaches and student learning outcomes, and triangulating data collected in the structured interviews. The structured interview, which involved in-depth probing of students' reported learning, was found to be effective in measuring individual student learning outcomes and identifying experiences associated with different types of outcomes. These methods are more labour-intensive than many of the multiple choice, fixed response methods used in the past. They need to be administered by researchers with skills in observing and interviewing young children, and if possible, the use of multiple observers is preferred, in order to enhance reliability. However, the additional effort required is considered necessary in order to collect valid and reliable data regarding young students' environmental learning outcomes.

The instrument described in this paper is currently being used to investigate the impacts of environmental education programs on students' environmental learning in a range of sites throughout Queensland. It is envisaged that the instrument will allow researchers to explore various aspects of environmental learning in greater depth, and to identify those elements of environmental education programs and pedagogies that are most effective in facilitating learning outcomes across the four dimensions of knowledge, attitudes, behaviours and skills. In particular, the larger sample size of this research will allow the links between observations of learning, reported environmental learning outcomes and students' emotions to be explored.

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Keywords: environmental education; learning for sustainability; environmental learning outcomes survey.

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APPENDIX A: ENVIRONMENTAL LEARNING OUTCOMES SURVEY - INTERVIEW SCHEDULE

Centre: _____ Focus of program: _____

Student name: _____ Year level: _____ School: _____ Gender: Male ☐ Female ☐

Teachers/s: _____ Researcher: _____ Date: _____

A: Knowledge

A1. What are some of the things you learned about caring for the environment during your visit?	**A2.Where were you when you learned this? (Program component)**	**A3. What was it that helped you learn? [prompts: something... the teacher said; you did; you saw; a story you heard; talking to friends]**	**A4. Feelings (1-12)**

A2 codes: 1=pond; 2=forest; 3= story; 4: tree *(these codes vary according to the components of the program)*
A3 codes: 1=listening to a story; 2= listening to an adult or teacher; 3=talking to a friend; 4=discussing with a small group; 5=seeing something in the environment; 6= doing something in the environment; 7=experiencing the environment
A4 Which one of these words best describes how you were feeling when you learned [heard, saw, did, said] this? [show flashcards to students]
A4 codes: LP 1=happy 2= calm 3=relaxed; HP 4=excited 5=interested 6=surprised; LN 7=nothing 8=bored 9=disinterested; HN 10=afraid; 11=angry; 12=sad
LP = Low intensity/Positive; HP = High intensity/Positive; LN = Low intensity/Negative; HN = High intensity/Negative

B. Attitudes

B1 Have you changed the way you feel about the environment as a result of your visit? If so, how have you changed?	B2. Was there a particular part of the visit that made you change how you feel? Where was it?	B3. What was it that made you change? [something...the teacher said; you saw; you did; a story you heard; talking to friends]	B4. Feelings (1-12)

C. Behavioural intentions

C1. Do you think what you learned from your visit will change what you do for the environment? If yes, what do you think you will do?	C2. Where were you when learned this?	C3. What was it that made you think about doing something about the environment? [something...the teacher said; you saw; you did; a story you heard; talking to friends]	C4. Feelings

B2 & C2 codes: 1=pond; 2=forest; 3= story; 4: tree; 5=the overall program
B3 & C3 codes: 1=listening to a story; 2= listening to an adult or teacher; 3=talking to a friend; 4=discussing with a small group; 5=seeing something in the environment; 6= doing something in the environment; 7=experiencing the environment; 8=the overall program
B4. Which one of these words best describes how you were feeling when you learned [heard, saw, did, said] this? [show students flashcards]
C4. Which one of these words best describes how you were feeling when you thought about doing something for the environment? [show students flashcards]
B4 & C4 codes: LP 1=happy 2= calm 3=relaxed; HP 4=excited 5=interested 6=surprised; LN 7=nothing 8=bored 9=disinterested; HN 10=afraid; 11=angry; 12=sad
LP = Low intensity/Positive; HP = High intensity/Positive; LN = Low intensity/Negative; HN = High intensity/Negative

ENVIRONMENTAL LEARNING OUTCOMES SURVEY - STUDENT OBSERVATION SCHEDULE

Centre/Program: ______________ Class: ______________ Researcher: ______________ Date: ______________

Program component	Observed student behaviours (including comments and questions)	Frequency of Engagement code (1-4)
		S : 1 2 3 4 L : 1 2 3 4 I : 1 2 3 4 M : 1 2 3 4 C : 1 2 3 4 A : 1 2 3 4 R : 1 2 3 4 D : 1 2 3 4
		S : 1 2 3 4 L : 1 2 3 4 I : 1 2 3 4 M : 1 2 3 4 C : 1 2 3 4 A : 1 2 3 4 R : 1 2 3 4 D : 1 2 3 4
		S : 1 2 3 4 L : 1 2 3 4 I : 1 2 3 4 M : 1 2 3 4 C : 1 2 3 4 A : 1 2 3 4 R : 1 2 3 4 D : 1 2 3 4

Engagement in Learning Behaviours (adapted from Griffin, 1999)

S Sharing learning with peers and experts (talking & pointing; asking each other questions; pulling others to show them something; talking & listening; talking to adults or experts)
L Making **links** and transferring ideas and skills (comparing objects and ideas; comparing/referring to previous experiences)
I Initiating / showing responsibility for their own learning (knowing what they want to look for; making choices; deciding where and when to move; initiating engagement in learning)
M Purposefully **manipulating** objects and ideas (handling objects or specimens with care, interest, purpose; using hands-on activities as intended)
C Showing **confidence** in personal learning abilities (seeking out information; explaining to peers; reading to peers)
A Actively involved in learning (standing and looking/reading; persevering with a task; exhibiting curiosity & interest; absorbed, close, concentrated examination)
R Responding to new information or evidence (evidence of changing views; evidence of discovering new ideas)
D Disengagement (off-task behaviour; lack of attention; disinterest)

Frequency codes: 1=rarely; 2=sometimes; 3=most of the time; 4=all of the time

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