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Contact Dr. Jennifer Pearson on j.pearson@ecu.edu.au if you require further information
Introduction

The AAEE National Conference at Australian National University Canberra, September 26 30th chose the title of Leading Change: Living for One Planet to provide an opportunity to focus the work on leadership at this critical mid way stage of the Decade of Education for Sustainable Development. This was achieved by engaging a broad range of community members and visitors in experiences that showcased how change is being implemented across all sectors. A significant feature of the conference was the engagement and involvement of youth within the structure of the conference. This bought a sense of energy and passion for the tasks ahead with connections to mentor ‘mature’ delegates to establish a support network.

The collection of articles in the peer reviewed journal represent some of the many presentation that occurred over the conference. The editorial team is listed and I would like to thank them most sincerely for their volunteer time in helping prepare this work.

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## Contents

<table>
<thead>
<tr>
<th>Articles</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Converting the bubble wrap generation into eco warriors”: Results on the effectiveness of a co-signed protocol.</td>
<td>1-7</td>
</tr>
<tr>
<td>Peter Andersen</td>
<td></td>
</tr>
<tr>
<td>2  Underwater photoelicitation: A new experiential marine education technique</td>
<td>8-22</td>
</tr>
<tr>
<td>Steven Andrews and Dr. Laura Stocker</td>
<td></td>
</tr>
<tr>
<td>3  Measuring and addressing the ecological impact of household food waste in Australia</td>
<td>23-30</td>
</tr>
<tr>
<td>David Baker</td>
<td></td>
</tr>
<tr>
<td>4  Place-based environmental education: Sustaining social outcomes</td>
<td>31-40</td>
</tr>
<tr>
<td>Mike Bartlett and Marianne Sheumack</td>
<td></td>
</tr>
<tr>
<td>5  Deforestation and land degradation in Queensland - The culprit</td>
<td>41-51</td>
</tr>
<tr>
<td>Gerard Bisshop and Lefkothea Pavlidis</td>
<td></td>
</tr>
<tr>
<td>6  Education for sustainability in schools: The flow on effects to health and well-being</td>
<td>52-57</td>
</tr>
<tr>
<td>Louise Cooke &amp; Simon Leonard</td>
<td></td>
</tr>
<tr>
<td>7  Preservice teachers’ perceptions of sustainability as ‘professional practice’</td>
<td>58-67</td>
</tr>
<tr>
<td>Dr. Ruth Hickey, Dr. Hilary Whitehouse and Ms Snowy Evans</td>
<td></td>
</tr>
<tr>
<td>8  Weaving an eco-friendly web: Korean NGO reflections on the impact of a school education programme</td>
<td>68-80</td>
</tr>
<tr>
<td>Nicole Doeyon Kim</td>
<td></td>
</tr>
<tr>
<td>9  Environmental understandings of The Sea to Snow Crossing: Facilitating reflection for sustainable design, place-based learning and land care action</td>
<td>81-90</td>
</tr>
<tr>
<td>Dean Turner, David Curtis, Ian Reeve and Chris Allen</td>
<td></td>
</tr>
</tbody>
</table>
“Converting the bubble wrap generation into eco warriors”: 
Results on the effectiveness of a co-signed protocol.

Peter Andersen
Faculty of Education, University of Wollongong

Abstract

In the face of a global environmental crisis, schools are at the forefront of the campaign to influence the young on how to live more sustainably. However, paradoxically, the very children that they are attempting to convert into eco warriors are being bubble wrapped by their parents and the institutions that are attempting to convert them. This paper will analyse the evolution of environmental education in Australia, and the dilemma that it faces in trying to equip the bubble wrap generation with action competence. One means of empowering the young to become eco warriors is through positioning them as change agents, influencing their families on ways to live more sustainably. This paper will explore a research project that tests the effectiveness of a Protocol, co-signed by a group of fourteen-year-old students and their families. The findings of this research shed light on the ability of a Protocol to bring about intergenerational influence between students and their families; the reception that such a tool has on the students and family members; and the implications for further research and practices.

The rise of environmental education: giving kids a voice

Recently, I was driving with my eleven-year-old son near our home in the Southern Highlands of New South Wales, when our conversation turned to the drought-gnarled countryside outside our car windows. I attempted to broach the topic of global warming and in response he uttered the words, ‘Dad, you can replant flowers, but you can’t replant the earth’. The insightfulness of the statement struck me on two levels: firstly because it captured so clearly the essence of the problem that humanity faces. Quite simply, when all of the resources on the planet are gone, many are gone forever; and secondly, it came from a person so young. If I was still unsure of how the youth felt about the earth’s predicament, I was left in no doubt after hearing Caitlin Sherrey-Dadd, a seventeen-year-old student from northern New South Wales.

“I, as a young person in this world have every right
to address anyone on these issues, as they so concern my future.
I, as a young person have the right
to be heard by the people in power over the kind of conditions
they are creating for my future”
(Sherrey-Dadd, 2009)

These emotive and poignant words were meant as a challenge to the environmental educators gathered at the conference at which she was speaking. The crux of Caitlin’s speech was a plea to adults to listen to the voices of the young, as they have as much right as anyone else to be heard on the issues surrounding global warming. Twenty years earlier, Caitlin’s sentiment was being echoed on a far grander stage, at the United Nations General Assembly, New York. The leaders of the world agreed that it was time that the social, economic, civic, cultural and political rights of children were legally protected ("Convention on the rights of the child," 1989). Despite the rhetoric, the history of environmental education in Australia has indeed been long, winding and rocky (Gough, 2006). Greenhall (cited in Robottom, 1987) describes it as a game of snakes and ladders in which every positive move by the government and education fraternity in regards to the field of environmental education was possibly – and usually – met with a problem which brings it back to its original status.
Within Australia there have been many environmental education programs introduced into the schools and there is overwhelming evidence to support the fact that these programs have created positive changes in not only the attitudes of the students but also in the general wellbeing of the schools (Armstrong, Sharpley, & Malcolm, 2004). Primary schools are beginning to embrace whole-school approaches to environmental education in which they include emotional and enjoyment factors into their programs (Skamp, 2009). In response to what Louv (2005) describes as nature deficit disorder in modern children, schools are looking for real life experiences for their children to enhance learning and foster closer relationships with nature.

Creating eco warriors

Educators have an obligation to create students who are able to identify that the environment needs their care, be willing to do something about it and finally, have the skills to do something about it. Bertolini (2007, p. 9) believes that the ‘students of tomorrow need to be flexible, adaptable, self-generative, confident, responsible and skilled in learning how to learn’. Malone and Marr (2007) challenge teachers to treat students as equals in their educational journey, while Rogovin (1998) espouses the immersion approach, in which the students are positioned as researchers in their own right, able to identify issues and solutions, enabling change in their local communities. The ultimate gauge of success of any environmental education program is how effective it is in being able to enable its students to transfer their enthusiasm and skills beyond the walls of the school into their homes and communities. This is the frontier on which environmental educators need to focus. Children do have a right to be change agents and leaders in the fight to save the planet, and schools can provide the launching pads for these young eco-warriors. Jensen and Schnack (2006) argue that it is the role of the schools to create ‘action competent’ students who are capable of taking action on behalf of the environment. Jensen concludes that it is the responsibility of educators to not only influence the behaviour of children but more importantly to empower them to become critical individuals, competent to take action to preserve their natural environments and improve their communities (2004).

There have been several studies done on the effectiveness of environmental education programs in prompting intergenerational influence from children to their parents and other family members. Armstrong, Sharpley and Malcolm (2004) carried out a study on an environmental education program which had been installed at two schools (primary and secondary) in rural Victoria. The program on which the researchers based their results was the Waste Wise Schools Program, funded by Eco Recycle Victoria. The primary purpose of the study was to measure the intergenerational impact of the programs and to identify the factors that influenced their results. The programs allowed students to become involved in practical, hands-on activities such as waste quality monitoring and conducting waste and letter surveys. The results were very encouraging, showing that between 50% and 60% of the parents reported that they had changed their thinking as a result of their children being involved in the Waste Wise program (Armstrong et al., 2004, p. 5). Ballantyne, Fien and Packer (2001a) conducted an extensive study of the intergenerational impact of six environmental education programs in nine metropolitan primary and secondary schools in Queensland. The data revealed that 44% of the of the students interviewed spoke to their parents ‘quite a lot’ or ‘a lot’ about what they had learnt in the environmental education program. The extent to which students enjoyed the program influenced the frequency of the discussions, however, the researchers emphasise that these discussions were often limited to the program itself rather than a discussion of an environmental issue and consequential environmental action.

The two aforementioned research projects show that it is possible to promote intergenerational influence if the environmental education program involves co-learning between the students and
their parents, includes activities that the children enjoy (Armstrong et al., 2004), has an action component in the project, and shows that the children can make a difference in their local environment (Ballantyne, Fien and Packer, 2001b). However, to create eco warriors, schools not only need to have in place sound environmental education programs, but more importantly, tools to enable these children to take their knowledge and enthusiasm into their homes and communities, influencing the attitudes and behaviour of their families.

When two worlds collide

While environmental educators may have a lofty vision for the students of Australia, there remains a complex, complicating factor that clouds their path to success. Most children currently in Australian schools were born between 1995 and 2009 and are members of Generation Z (GENERATION.Z, 2010). Unfortunately, research has shown that the children of this generation are ill prepared to become eco warriors.

Palmer (2006) argues that the children currently in primary and secondary schools in the western world are being poisoned by ‘toxic childhood syndrome’, through which they are being deprived of opportunities for play and firsthand experience. Malone (2007) has conducted extensive research on and with the children who make up Generation Z in Australia and overseas and she argues that many parents are restricting their children’s movements to such an extent that they will not have the social, psychological, cultural or environmental knowledge and skills to be able to negotiate freely in their environment. 92% of these children live in urban environments and the majority of them lead highly adult-organised and controlled lives. O’leary (1998, cited in Malone, 2007, p. 516) adds that for these members of Generation Z the world is depicted as a dark, dangerous and high risk place. As a consequence of this fear, parents are restricting their children’s movement, particularly as pedestrians and cyclists and as a result the children are becoming less independent and resilient. The very reaction to the perceived dangers that these children face could be placing them at an even greater risk of losing a sense of independence and autonomy; key attributes needed for survival in a fast changing world. The image of an eco warrior is a young person who bravely fights for the rights of the earth, yet Gould (cited in Gaylie, 2009) questions how children will have the desire to save nature if they do not love nature. Sir David Attenborough (cited in Gray, 2010) laments the health and safety culture that discourages children from roaming the countryside and discovering nature. This is an alarming development given that one of the common hallmarks of environmental activism is a prolonged exposure to nature as a child (Chawla, 1999).

Coupled with this is a tension that exists in Australian education. Australia has determined that schools form the front line of the offensive to educate children about how to protect the planet, however, Miriam (2007) emphasises that while there is a movement towards giving students a greater voice in their learning, there remains a school structure that is based on traditional adult assumptions. Also, at the same time that schools are attempting to enable students to enjoy more time out of the classroom, they are being forced to comply with strict Occupational, Health and Safety guidelines which is not always supported by appropriate release time and resources to enable the schools to meet the goals of these guidelines (Esler, 2006). While Gualano (2005) insists that it is the school principal’s basic, even moral responsibility to ensure the safety of his or her students and staff, Potts (2006) reports that there is a difference between the realistic dangers faced every day in the school grounds and the sensationalised versions of these dangers offered by the media. He suggests that the popular press is keen to report schools as dangerous places and claims that schools are in fact seen by the public as more dangerous than any other time in history. For those teachers attempting to manage the sustainability initiatives in their schools, on top of their other mandated duties, there is also a risk of burnout (Whitehouse, 2008). At a time when educators should be
exploring ways to enhance their students’ levels of action competence and sense of citizenship, they are instead being bogged down by governmental regulations.

While there is no doubt that educators are teaching children about environmental issues, Murdoch (2006) describes the ability of children to transfer generalisations as being at a higher level of the learning process. Educators need to focus more earnestly and explicitly on how best to position their students to transfer generalisations learnt in the classrooms into their homes and communities. Most research in the field of environmental education has concentrated on the effectiveness of environmental education programs in changing the students’ attitude and behaviour. More research is needed which scrutinises the interaction between the students and their families, when generalisation has been achieved and how best to link the students to their families so that what they are learning in the schools can be transferred into the home environment. This would indeed provide students with the opportunity to become eco warriors.

**Using a co-signed protocol to encourage and support young change agents**

**Title and nature of the project**

The doctoral project is titled ‘Children as environmental change agents: using a negotiated protocol to bring about or support environmentally responsible behaviour in the family home’. The Protocol is a document on which the students, parents and siblings write a list of actions that they will undertake over a period of three months in order to live more sustainably. It is a qualitative case study involving six fourteen-year-old students and their families, and involved four interviews with the students and three interviews with the members of their families over a period of five months.

**Purpose and significance of the study**

The purpose of this study was to ascertain the ability of a co-signed Protocol to assist students to influence their families’ environmental behaviour. The Protocol was designed to provide a conduit between the students and their families, shedding light on how best to foster intergenerational interactions; the resultant attitudinal and behavioural changes that took place; the depth and longevity of the changes and the factors that influenced the interactions and success or failure of the protocol. Its significance lies in that this study positions children as leading stakeholders in the design of the project and the data generation, and examines the challenges of being a change agent from the perspective of a child in his or her own home.

**Data and implications**

While in its infancy, the analysis of the data has revealed some enlightening themes worthy of closer analysis. What stood above everything else is the willingness of the students to be leaders in attempting to change their families’ environmental practices. They saw this as an important cause, worthy of their efforts. As one of the students said, ‘You are never going to say no to something that is going to help. You want to do it’. If educators want to assist the young to become eco warriors they must give those interested an opportunity to make a difference outside of their classrooms. The participants in this project – 25% of the outdoor education class from which they volunteered–embraced the chance to make a difference for the sake of the earth.

The initial part of the project saw the students designing a protocol to take home. Two key issues that arose from the meetings with the participants in these early stages of the projects were their willingness to take ownership of the Protocol and their sense of appreciation at having been given
the opportunity to design the Protocol and take it into their households. Part of the reason for their enthusiasm—given that they had only recently been introduced to the research project and they had not had an opportunity to participate in any of the environmental education program that had been designed for them—was perhaps that the group work was not attached to any formal assessment task. Galton and Hargreaves (2009) argue that students will often feel more comfortable and therefore commit more to a group discussion if they are not weighed down by the prospect of the session being part of the teacher’s assessment schedule. The students had been assured that their participation in the research would have no bearing what so ever on their school report and this certainly would play a role in creating a relaxed atmosphere in the sessions. What stood out here was their willingness and insightfulness in carrying out this task. They analysed the prototype of the Protocol that had been given to them and made significant alterations to the design so that it would best suit their needs in their homes. All of the students revealed that they appreciated being given an opportunity to design something for an important cause.

Mackenzie (2005) asserts that children are on the whole ‘familialised’, being seen as no more than dependents of adult family members, and I was interested to gauge the reaction of the parents to their children bringing home the Protocol for them to sign. Every parent interviewed responded positively, with one parent’s words capturing the essence of their feelings, ‘…I thought that it was fantastic. It is not often that things at school grab a child’s attention enough to bring it home, and this certainly did. He was quite keen and excited about the whole project’. Another parent had been initially resistant to the idea of participating in the project, changed his attitude when he realised that it was important to his son that he be involved. He said, ‘If he grabs the ball and starts running with it, I will have to follow’. The project highlights the importance of breaking the traditional model in which children have been perceived as invisible and subsumed under institutions such as families and education. Parents are willing to embrace child-driven initiatives such as the protocol, offering educators a means of providing students authentic opportunities to become eco warriors.

The first series of interviews demonstrated that both the students and their families were willing to work together to institute the protocol in their homes. The question remained as to how successful they would be in negotiating the terms of the Protocol within their complex family environments. Most of the families overcame this hurdle seamlessly, with only one of the families struggling to find the time to have a formal meeting to discuss the Protocol. Interestingly, the student in this family had forewarned me of the possibility of this occurring, as his father was very rarely home from work in time for the evening meal. All of the participants reported that the process of setting up the Protocol was a good thing to do as a family, with one parent saying that he would probably convert the household over to a green electricity supplier because he ‘…was going to have to front up to the kids saying “Dad, why haven’t you done this?”’. Most of the families held formal meetings to negotiate the terms of the Protocol, giving all members of the family a say in the design, while five out of the six families planned to share the responsibility of driving the Protocol. Sprey (1975, cited in Flurry & Burns, 2005) describes this as a reciprocal exchange process. Each member of the family came to the negotiating table with similar but not identical perceptions (French & Raven, 1959, cited in Flurry & Burns, 2005), and appreciated the opportunity to have their voices heard in the negotiation phase. This is an important finding, as it confirms my belief that in order to support young eco warriors we need to provide interventions such as the Protocol. This will not only raise their profile in matters to do with sustainable behaviour within their home environments, but will also raise the expectation that they will take an active part in the process of achieving the goals set by them and their families.

After the negotiation and signing of the Protocol, I left the students and their families for a period of three months before interviewing them again to ascertain how successful it had been in supporting
and improving the level of their pro-environmental behaviour. The Protocol was highly successful in changing the attitudes of the participants and in the short term had significant impact on the behaviour of all of the families. As time went on four of the families reported that they struggled to maintain their motivation, identifying busy life styles as a major contributing factor. All participants, however, felt that the protocol had assisted them to do something practical to help the environment, and that for the first time they had been speaking openly about environmental issues as a family. Interestingly, the two families that claimed the highest success rate in achieving their goals over a period of three months were those in which the students had remained actively involved in the process. The adults from the other four families reported that they had taken on the leadership roles, as their children lost motivation, causing them considerable frustration.

Conclusion

Despite the desire by Governments, schools and teachers to give children a voice in such important matters as sustainability, the very students that they are targeting are being bubble wrapped into a state of helplessness by these same institutions and parents (Malone, 2007). Converting the bubble wrap generation into eco warriors would appear to be a mission impossible unless researchers and educators begin to focus their attention on how to transfer the learning that is taking place in the schools into the family homes. By creating such tools as the Protocol, children will be given an authentic chance to influence their parents and siblings on such crucial issues as how to look after the world and its resources. My research findings corroborate this theory, with the students helping to change the attitudes and behaviour in their homes. Wider research is needed to build on the knowledge gained from this case study, however, the data from this project shows that interventions such as the Protocol will assist educators greatly in converting the bubble wrap generation into eco warriors.

References


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Underwater photoelicitation: A new experiential marine education technique

Steven Andrews and Dr. Laura Stocker

Curtin University Sustainability Policy Institute, Curtin University of Technology

Abstract

This preliminary paper assesses the efficacy of underwater photoelicitation, a new experiential environmental education technique, on participant learning about marine sustainability. Humanity’s dependence and increasing impact on our ocean ecosystems demonstrate the need for greater protection of the coast and seas. We suggest here that innovative marine educational tools designed to connect humans meaningfully to the ocean world may be a useful way to support its protection. Although marine education has been popular for many years, research has not focused on fostering direct experiential connections between participants and the ocean through visual learning. Photoelicitation is a research technique using photographs (often taken by the participant) as a focus in an interview. Photoelicitation and other visual learning methods have been used successfully in education about the terrestrial environment; the combination of experiential and visual learning can create a powerful educational tool.

During the summer and autumn of 2010, groups of volunteers were given digital underwater cameras to use while they snorkelled in the waters around Dunsborough, Western Australia. They took photos of features that were significant to them and the effectiveness of underwater photoelicitation as an educational tool was assessed. Participants critically reflected on the significance to sustainability and environmental education of their own photos and those of others during the photoelicitation process. Based on the Cognitive-Affective-Behavioural framework, the research questions of primary relevance were: Did the photoelicitation process alter their cognitive and/or affective domains, and did the participants change their intended behaviour toward the ocean? We found that participants developed a better understanding of underwater photography and now intend to snorkel and take underwater photographs more often. We also found that participants’ views of the ocean shifted through the sharing of multiple perspectives through sharing their underwater photography in a group.

Introduction

Environmental Education for Sustainability

In 2002 UNESCO launched the Decade of Education for Sustainable Development with the founding principles of “respect for others and respect for the planet and what it provides us with (resources, fauna and flora).” This approach challenges conventional educational practices and promotes:
- ‘Interdisciplinary and holistic learning rather than subject-based learning
- Values-based learning
- Critical thinking rather than memorizing
- Multi-method approaches: word, art, drama, debate, etc.
- Participatory decision-making
- Locally relevant information (http://www.unesco.org/en/ewsd/decade-of-esd/)

In response to the Decade of Education for Sustainable Development, Australia has also launched
sustainability education initiatives for schools and communities that have culminated recently in the release of the national sustainability curriculum framework [http://www.environment.gov.au/education/publications/curriculum-framework.html]. In line with the UNESCO DESD approach, researchers for the Australian approach suggest that Education for Sustainability motivates, equips and involves individuals and groups in moving towards a more sustainable world. Education for Sustainability consists of active participation in learning and engaging people in change. 1

Researchers have also reviewed the effectiveness of coastal and marine education programs (Wortman et al, 2006). The key findings of this review are that while most educational programs focussed on the provision of information about our coast, a more effective way of teaching is to give participants the opportunity to discuss and reflect on issues. Integrating more coastal and marine education programs, which takes these recommendations into account, will be critical for progressing towards marine sustainability.

The Role of Experiential Learning

Experiential learning is an educational methodology that posits learning as a process in which understanding is created through the transformative power of participatory experience (Kolb, 1984; Down, 2006; Davis and Stocker, 2006; Netherwood et al, 2006; Wooltorton, 2006). Experiential learning includes an action that creates an experience, reflection on the action and experience, abstractions drawn from the reflection, and application of the abstraction to a new experience or action (Stehno, 1986). Experiential education has been used extensively for environmental education (Adkins, 2002; Bogner, 1998; Brody, 2005; Davis & Stocker, 2006; Netherwood et al, 2006; Stepath, 2004, 2006, 2007; Wooltorton, 2006; Zeppel, 1998). “[B]y deepening our understanding of what makes outdoor experiences meaningful to participants, we may be able to design programs that can foster spiritual connections, connections to others, and connections to self…” (Loeffler, 2004)

Marine experiential education involves getting people to interact with the ocean. Stepath (2006) provides an excellent summary of the state of marine experiential education, and demonstrates how people learn and change after interacting with the ocean. Marine experiential education may have the potential to transform the way people feel, think and behave in relation to the ocean. In the present paper we explore this possibility.

Research Aims

We introduce a new technique for marine education: underwater photoelicitation. We report the preliminary findings of a community experiential marine education program, Show Us Your Ocean!, created to assess underwater photoelicitation as a technique to stimulate people’s connection to the ocean. Using the cognitive, affective and behavioural model (Ajzen & Fishbein, 1980; Eagly & Chaiken, 1993; Kaiser, et al., 1999) we investigate whether program participants change their values about the ocean and whether underwater photoelicitation changes their cognitive, affective, or behavioural states.

Methodology

Cognitive-Affective-Behavioural Model

The cognitive-affective-behavioural model is used in this research to frame the methodology (Ajzen & Fishbein, 1980; Eagly & Chaiken, 1993; Kaiser, et al., 1999). This model allows for people’s cognitive, affective, and behavioural domains to be qualitatively analysed. Using this model, the researcher can assess whether people’s knowledge levels and feelings have shifted and whether their behaviour is likely to change (Clayton & Myers, 2009, pp. 189-197). In the context of this research, ‘behaviour change’ includes, for example, intended changes in participants’ recreational interactions with the sea, practices of care or political action.

Photoelicitation

Photoelicitation, first described by Collier (1967), includes an interview with a participant about photographic material that is often collected by the participant and used as a qualitative methodology for research (Collier, 1967; Collier & Collier, 1986; Harper, 2002; Clark-Ibanez, 2004). Photoelicitation can be very beneficial in evoking deeper emotions from a participant than can a words-alone interview (Harper, 2002). Outdoor photoelicitation studies (Loeffler, 2004) have shown that photos taken in non-human nature elicit spiritual connections, connections between people, and self-discovery. In the context of marine education, underwater photoelicitation is the concept of using waterproof cameras to capture the marine environment. Underwater photoelicitation is a new technique and undocumented in the academic literature. However this technique was expected to elicit the same kinds of responses in the participants as terrestrial photoelicitation because in both they are interacting intimately with non-human nature. Because our society is increasingly image and media based, photoelicitation may enable and enhance ecologically sustainable thinking (Bergmann, 2000).

Bergmann (2000) utilized photoelicitation to study how people develop their cognitive perceptions towards environmental issues. He stated that “the photographic aesthetic involvement makes it possible for the participants to develop a qualitatively new relationship with their topic, which is built on the final work as a participatory and uniting event.” While participants broaden their initial view, multiple perspectives can be constructed, and their own positions and feelings clarified (Bergmann, 2000).

Show Us Your Ocean!

Show Us Your Ocean! is a community experiential marine education program created for the purposes of this research project to assess underwater photoelicitation as a way to connect people with the ocean. Data have been collected through semi-structured in-depth interviews, workshops, and questionnaires. Data are primarily qualitative rather than quantitative, although some frequency data are presented for summary purposes.

After receiving the highest level of ethics approval from Curtin University, a pilot study with eight participants was completed on Rottnest Island. These were mostly colleagues and friends of the researcher. Through this pilot study, the methodology and research questions were refined.
Two Show Us Your Ocean! programs were then run in Dunsborough, WA made up of a total of 17 adult community members between the ages of 18-35 and mostly female. They were recruited through flyers, emails, the project website, and word-of-mouth in the Dunsborough, Yallingup, and Margaret River communities. All people who applied were accepted.

At the beginning of each program, a training lecture was held at Saumdra (a yoga studio and café in Dunsborough) to explain the basics of compositional photography and some technical aspects of underwater photography. Participants filled out a questionnaire that was designed to assess affective domains/behaviour towards and experiences with the ocean. Cameras were handed out at the end of the lecture, and participants were given two weeks in which to take their photographs and a date for interviews were chosen for each participant.

After the participant took their photos, in-depth semi-structured interviews were conducted. Questions were asked about their experience, about how taking these photos represented their coastal/marine values, and about how taking the photos may have changed their affective domain, behaviour, or knowledge towards the marine environment. At the conclusion of each interview, participants chose three to five of their favourite photos. Participants were deliberatively given no guidance or criteria for the choice of their favourite photographs. Many participants chose these photos either because of their aesthetic value, or the story or subject of the photograph. These favourite photos formed the basis of discussion for the final workshop held after the interviews were concluded.

This workshop brought all the participants together again. Each participant had his or her favourite photos projected onto a large screen, and a group analysis of these photos followed. Each photograph was described/assessed for its subject, emotions/feelings, artistic elements, and new learning. The workshop was facilitated by Steve Andrews, who ensured a free-flow dialogue in which each member of the group had an equal opportunity to respond to each of the photos. While he helped the dialogue along at times, he never defined the direction of the conversation and only occasionally prompted the group.

Responses were recorded and subsequently entered into Excel for further analysis. At the end of the workshop, participants were asked to fill out a final questionnaire. This final workshop evaluation form provides data on the effectiveness of underwater photoelicitation as an educational technique. Through this questionnaire, participants are given the opportunity to reflect on their entire experience. The questionnaire also allows an assessment of whether the participants’ cognitive, affective, or behavioural domains had been affected by participating in the study.

Results presented in this paper represent preliminary findings in the project and include data from two workshops and a final questionnaire. Further domain analysis (Miles & Huberman, 1994) and additional workshop findings will be presented in a later paper.

Results

Sample Participant Pictures and Interview Quotes

These pictures are examples of a few participant photographs. The quotes are extracts from the in-depth individual interviews.
“Its connecting on the highest level, getting your feet down there amongst the algae. The subject is Annie’s feet, just finished my snorkel and saw something really clear to take a picture of. I really like the contrast of her toenails to the algae and how you can see the reflection. It shows to me connection between us and the environment and you don’t usually see feet underwater do you?”

“I took this one because there were so many fish everywhere and because of the light that was coming through on the sand. These two things would be a good contrast. The artistic bit was the fish with the dapples of light.”
“This is such a unique thing to see [mating sea slugs], two of them together. Obviously my interaction didn’t quell any desires they had for each other [laughter]. I find it really amusing, it’s just such a funny thing. It’s such a really cool thing to see happening, whenever you see two creatures you don’t normally see.”

“It just looks like metal, like a big creature coming out of the water. I love the texture and deepness of the grey but it’s just wild. I think it captures the way water can be, so versatile and amazing. It’s got its own energy. Its just throwing a rock in the water. Just wild.”
“I’m stoked I got that. I saw these fish and they were big and fast. I was a reasonable distance off the shore. I felt humbled and fortunate because they are large animals and there was a big school of them. See the way the sunlight catches their body? There is a little bit of dappling on their skin.”

**Workshop Group Discussion**

The following data are taken from the first two *Show Us Your Ocean!* programs run in Dunsborough, Western Australia (a total of 17 participants).

The figures below are the tallied totals of the most common elements that people identified and discussed when looking at each other’s favourite photos during the final workshop. Results are ranked from most common to least common. The data show the variability between workshops, for example seaweed was the most common subject in the first workshop and the least common in the second. An in-depth analysis of this data is in development but significant trends will not be able to be analysed until this analytical methodology is complete and more workshops have been run and more data generated.

<table>
<thead>
<tr>
<th>First Workshop</th>
<th>Second Workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjects</strong></td>
<td><strong># Photos</strong></td>
</tr>
<tr>
<td>Seaweed</td>
<td>8</td>
</tr>
<tr>
<td>Fish</td>
<td>7</td>
</tr>
<tr>
<td>Surface</td>
<td>5</td>
</tr>
<tr>
<td>Rock/landscape</td>
<td>5</td>
</tr>
<tr>
<td>Bubbles/air</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 1. The most common subjects in people’s favourite photos
Figure 1 shows that there was a difference in what kind of subjects people found to photograph. The weather had gotten colder for the second workshop, and it was interesting that people seemed to take more pictures out of the water when it was cold.

<table>
<thead>
<tr>
<th>Feelings/Emotions</th>
<th># Photos</th>
<th>Feelings/Emotions</th>
<th># Photos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>3</td>
<td>Playful</td>
<td>6</td>
</tr>
<tr>
<td>Claustrophobic</td>
<td>2</td>
<td>Calm</td>
<td>5</td>
</tr>
<tr>
<td>Nauseous/seasick</td>
<td>2</td>
<td>Peaceful</td>
<td>4</td>
</tr>
<tr>
<td>Chaos</td>
<td>2</td>
<td>Alluring</td>
<td>4</td>
</tr>
<tr>
<td>Energy/movement</td>
<td>2</td>
<td>Threatening</td>
<td>3</td>
</tr>
<tr>
<td>Peaceful</td>
<td>2</td>
<td>Moody</td>
<td>2</td>
</tr>
<tr>
<td>Dramatic</td>
<td>2</td>
<td>Ominous</td>
<td>2</td>
</tr>
<tr>
<td>Joyful</td>
<td>2</td>
<td>Nausea</td>
<td>2</td>
</tr>
<tr>
<td>Humour</td>
<td>2</td>
<td>Fun</td>
<td>2</td>
</tr>
<tr>
<td>Explosion</td>
<td>2</td>
<td>Eerie</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 2. The most common feelings/emotions in people’s favourite photos

Figure 2 shows the variability of feelings and emotions that people feel from looking at each other’s pictures. No trends have been identified from the data from these two workshops.

<table>
<thead>
<tr>
<th>Artistic Elements</th>
<th># Photos</th>
<th>Artistic Elements</th>
<th># Photos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>19</td>
<td>Light</td>
<td>18</td>
</tr>
<tr>
<td>Colors</td>
<td>18</td>
<td>Texture</td>
<td>15</td>
</tr>
<tr>
<td>Flow/movement</td>
<td>10</td>
<td>Color</td>
<td>11</td>
</tr>
<tr>
<td>Composition</td>
<td>10</td>
<td>Movement</td>
<td>10</td>
</tr>
<tr>
<td>Contrast</td>
<td>7</td>
<td>Composition</td>
<td>8</td>
</tr>
<tr>
<td>Landscape</td>
<td>4</td>
<td>Perspective</td>
<td>6</td>
</tr>
<tr>
<td>Reflection</td>
<td>3</td>
<td>Contrast</td>
<td>5</td>
</tr>
<tr>
<td>Depth</td>
<td>3</td>
<td>Dark</td>
<td>5</td>
</tr>
<tr>
<td>Painting</td>
<td>3</td>
<td>Painting quality</td>
<td>4</td>
</tr>
<tr>
<td>Camouflage</td>
<td>3</td>
<td>Explosion</td>
<td>4</td>
</tr>
<tr>
<td>Shapes</td>
<td>3</td>
<td>Focus</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 3. The most common artistic elements in people’s favourite photos

Figure 3 shows that light and colour were the some of the most common artistic elements participants saw from looking at each other’s pictures. Composition and movement were also common elements that people discussed.

Results from Final Questionnaire

Participants were given a final questionnaire after completing the Show Us Your Ocean! program at the end of the workshop. The purpose of the questions was to ascertain whether any of the participants’ cognitive, affective, or behavioural domains had shifted as a result of the underwater photoelicitation
process. Quotes from participants’ written comments on the questionnaire are used to answer our research questions. These quotes are presented below.

**Cognitive Domain**

**Underwater environment**

When asked to reflect on what they had learned from the experience (cognitive domain), participants both discussed their new knowledge about the underwater environment and reflected on the artistic elements that they experienced during the process.

“Learned to look at sea vistas with more analysis”

“How much life there is under the water around here”

“Sea slugs can be quite pretty”

“I learnt to look in places I don’t normally go and find the beauty everywhere. One day I went somewhere looking for starfish and was annoyed I didn’t find any, but then saw so much other cool stuff and got some good photos.”

“Re-learning beauty of the ocean.”

**Photographic technique**

Participants also learned about the process of taking photography:

“Learnt about the underwater seascape, love-making habits of sea slugs and the learning of using the camera”

“Learned about movement and light plus how many forms the ocean can take.”

“Learning about composition and experimentation with the cameras and the limitations.”

“Learnt I enjoy taking photos.”

**Reactions to Others’ Photos - Intersubjective cognition and collaborative learning**

The most common theme that people discussed was the reaction when they looked at each other’s favourite photos projected during the final workshop. The experience of examining others photos and seeing how people had different views of the ocean was very enjoyable for them. The process of intersubjective comparisons in the workshop enabled whole levels of new awareness to occur. Recognizing the perspectives of others is an important step in the process of consciousness-raising.

“It’s made me realize how different we are all and how people’s perceptions of the same thing can be so different.”
“Yes, realizing other perspectives. New appreciation.”

“Very good to share the experience and the efforts of others. Quite interesting to see other’s results and different styles.”

“Looking at others photos gives a different perspective on the ocean- a different way of looking at it.”

“Enjoyed looking at other people’s perspectives of the ocean.”

“Wow the photos blown up were really awesome and just the difference in people’s photos and the way they saw it in their eyes was cool, each beautiful in their own way.”

“It was a very creative visual experience and amazing to look at others photos. Good to see different angles.”

“Good to see what others saw in my photos. Loved seeing others photos- so many different ways to photograph the ocean and so many different perspectives was very cool.”

“Good photos all around. Enjoyed everyone’s different perspectives. Didn’t change my view of my photos.”

**Affective Domain**

When asked if any of their affective domains towards the ocean had changed or if they had an emotional reaction to the ocean (affective domain), people had varied responses. In several cases (shown below) more sympathy for the marine environment was recorded but generally affective shifts were not apparent from these workshops.

“I feel an emotional connection because it can give so much in return - my attitude is protect!”

“I’m not sure if my attitudes to the ocean have changed.”

“Not really.”

“Not extremely.”

“Yes, just to look after it more and save it.”

“Kept seeing it as an even changing entity.”

“More sympathetic to the natural environment.”

**Behavioural Domain**

Participants were asked to comment on whether participating in the study would change their behaviour/interactions toward the ocean (behavioural domain). Intended behavioural change in terms of
active stewardship or political activity was not reported by participants. However, the intention of viewing and interacting with the ocean more often or more deeply was reported by participants.

“It will make me look at the ocean with detail”

“I will make an effort to be under the water more often- not just on top of it!”

“Maybe even that I’d rather take photos than go fishing?”

“Seeing other people’s photos made me want to explore more”

“I think it made me want to do a lot more photography and exploring above and below water. This has always been a passion of mine- but unfortunately sometimes you need a reason like this to actually do it.”

**Overall Experience**

When asked to reflect on the overall experience, people’s responses were very positive. This question allowed as assessment of the process of underwater photoelicitation and of their participation in the workshop.

“Reminded me how much I love snorkelling and being under water”

“Very enjoyable. Gave a purposeful addition to enjoying the snorkelling”

“Very much so, very valuable.”

“Thank you so much I would love to share all these photos with friends. Everyone should be so proud of getting out there and making some beautiful memories.”

“It was fun and each time different elements came through. Good to see what would happen next time!”

**Discussion**

The present paper reports on research in progress. It is primarily focused on the novel methodology of underwater photoelicitation with some preliminary findings. The data and findings for this paper are drawn mostly from the final questionnaire participants filled out after the final workshop. Because data from the interviews and workshops have not been fully transcribed at the time of writing this paper, more in-depth analysis of the interviews, individual photographs, and the recorded workshops will be presented at a later date. The initial findings from the interview process and the workshop are discussed below.

**Interviews**

The semi-structured photoelicitation interview process involving the participant and the researcher, allowed the participant to examine his or her own photos in a relaxed and supportive environment. The
researcher did not offer value judgments about the photos. This technique was highly effective at getting the participant comfortable with both the researcher and their own photos (Loeffler, 2004).

The interview also helped the participant begin to analyse his or her photographs from multiple perspectives. Because many people had not thought of examining their photographs as artistic works, the artistic analysis provided them with new insights.

Many participants told a story of how and why he or she had taken a particular photograph. As these participants discussed each photograph, the narrative surrounding the experience unfolded, often revealing new details or perspectives that had not been seen or noticed before. One participant took a photograph of mating sea slugs, capturing an interesting animal behaviour. This underwater photoelicitation study supports similar research showing that photography can act as a memory anchor, enabling the participants to relate clearer narratives of their experiences (Stringer & McAvoy, 1992; Carlsson, 2001; Loeffler, 2004).

Photo Workshop

After participating in the final workshop, participants’ perspectives of the ocean shifted. Because of the workshop’s participatory nature, dialogue between participants flowed freely. This exchange allowed for new ideas to be shared. This behaviour, which has been studied extensively in both the collaborative learning and action-research fields, is useful in discussing environmentally based issues (Parkes and Panelli, 2001; Savan and Sider, 2003; Lennie and Hearn, 2003). Looking at other people’s favourite photos showed the participants how everyone had different perspectives of the ocean. The process of intersubjective comparisons in a fully participatory framework lead to collaborative learning and was thus very broadening for participants. The ability and willingness to see others’ perspectives is also a metacognitive process that can lead to a shift in consciousness.

One interesting finding was that group discussions took emphasis off the photographer’s perceived quality of the photo. During the discussion, it was the photographers themselves who were inclined to be the harshest judges of their own photos, especially those that were blurry. However, people’s perceptions of what constituted quality changed once group discussion initiated. In fact ultimately blurry photos were some of people’s favourites because they were considered more artsy. Some people said they had painting-like qualities. Once the perspective shifted from a negative interpretation to a positive, people were much more likely to examine their own photos in more detail with a more generous eye and from different artistic angles. This shift in perception has been documented previously in the photoelicitation literature (Bergmann, 2000).

Conclusion

The research findings highlight that much of the value to the workshop to participants was the process of collaborative learning, dialogue, and discussion, not the just photographic ‘product’ nor even the initial process of taking the photograph. People’s relationship with the ocean was strengthened by seeing and discussing other people’s perspectives of the ocean through the photoelicitation process. Through examining others views, their own views were clarified.
Participants were more engaged with the ocean and had witnessed and adopted new perspectives about the ocean after completing the Show Us Your Ocean! process. Underwater photoelicitation was successful at both facilitating people’s interaction with the ocean and giving them the opportunity to reflect on their experiences within the ocean. Using these cameras gave participants the impetus to go out and snorkel and to find new things. Participating in a fun activity, such as taking underwater photos, while snorkelling was a strong motivational factor for many people in this study.

Participants learned about both the process of taking underwater photography and photography in general. Most people had never taken underwater photos and were excited to learn a new technique. A few participants in the first workshop participated in the second because they wanted to improve their underwater photographic skills. Common feedback from the workshop was that this was the first time they had looked at their photography and the ocean this way. People were surprised with how much there was to see underwater.

The fact that these first workshops did not result in certain kinds of cognitive, affective, or behavioural change may reflect the self-selecting nature of the participants: they already had a connection to and respect for the ocean. In the future, emphasis will be placed on broadening the participants to include those with little underwater experience and less knowledge and experience in the fragile ocean habitat. Obtaining participation of individuals with little empathy for the environmental plight and importance of the ocean will be difficult. However, it is this population who is most important to educate as I continue to run the Show Us Your Ocean! photoelicitation study for another year and a half. The comparative results with new and different geographic and demographic groupings should test the robustness and general utility of the approach outlined here.

We conclude that underwater photoelicitation may be one way to help humans re-connect with the ocean that provides so much for all of us, and to build a culture of marine sustainability.

Further Research

In addition to more community-based workshops, underwater photoelicitation will be introduced into local high schools (Society and Environment Year 10) in 2011 and tested for its effectiveness for that age group. The process will be embedded within a larger, weeklong ocean curriculum. This next phase of this research will explore to what extent and in what ways a process like this can be integrated into high school curriculum and whether underwater photoelicitation can be effective as an environmental educational tool with school students.

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Measuring and addressing the ecological impact of household food waste in Australia

David Baker

The Australia Institute.

Abstract

Australian households are throwing out more than $5 billion worth of food each year. In addition to the personal financial costs of this behaviour is the environmental impact of food waste – through wasted production and disposal of waste. This paper examines who is wasting food and the associated behaviour to promote policy development that would address the hitherto largely ignored environmental impact of household food waste. The production, processing and transport of food generates greenhouse gas emissions. This resource depletion is compounded when food is thrown out instead of being eaten. The collection and decomposition of this food waste produces further greenhouse gases. Food waste is a significant contributor to the ecological footprint of Australian households, but one that could be readily reduced. The potential to reduce food waste and its environmental impact exists in the generally high levels of concern (and feelings of guilt) people reported in a survey on food waste. Survey respondents identified how they could reduce food waste they do not always practice these behaviours. The environmental benefits of reducing food waste a focus of this conference is a secondary motivator for households who report that the money they could be saved is the primary motivator by a factor of two to one. The findings presented in this paper provide important insights and avenues for further research for policy developers charged with the task of reducing levels of food waste.

Introduction

Food waste is a significant, but, largely ignored environmental issue in Australia. Uneaten food thrown out by Australian households has environmental consequences starting at the farm all continuing in landfill. To draw attention to the issue and the potential to mitigate its environmental impact a survey of Australian household behaviour around food waste was conducted. While behavioural change is needed to reduce the impact of food waste on the environment survey findings suggest that apparently paradoxical behaviour presents a challenge for policy makers.

Food waste exacerbates the existing environmental effects of food production and processing. Put simply, if less food were wasted, less land and water would be needed and lower greenhouse gas emissions would be generated. Additional to the direct emissions from agriculture are the emissions associated with transporting food to the shop shelf and then to the consumer’s home and finally emissions generated from decomposing waste. Food waste is an unnecessary and easily avoidable contributor to Australia’s greenhouse gas emissions and reducing such waste would provide a low cost means of reducing Australia’s emissions.

Tristram Stuart begins his book Waste: Uncovering the global food scandal by making the connection between rising public awareness of the environmental impact of greenhouse gas emissions and the need to recognise the role food consumption plays in this.

In Australia, the Australian Bureau of Statistics (2007) reported that in the year to March 2006, just over half of Australian households had not eaten left-overs or composted food waste. Householders indicated that the primary reason for throwing out food was insufficient levels of waste to warrant re-use. The implication is that a majority of Australians do not perceive their level of food waste to be a problem. This paper reports the findings of an Australia Institute survey of food waste by Australian households. Food waste was reported in dollar terms from which an estimate for national household waste was calculated. A calculation of greenhouse gas emissions was also made by combining survey results with
data compiled by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and University of Sydney.

The survey also examined householder awareness, concern and motivation around food waste to determine possible policy options to reduce the amount of food being thrown out. The findings provide an insight into the challenge of reducing food waste for policy makers and others working in the field of waste and consumption as it relates to the environment. The paper concludes that the complexity of human behaviour and motivation needs to be addressed if the environmental impact of food waste is to be reduced.

**How much food is being wasted?**

Australians are throwing away food worth $5.2 billion a year. This waste includes food thrown out at home and unfinished food and drinks consumed at cafes, restaurants and so forth. This is more than the $5 billion Australians spent on digital equipment such as flat screen TVs and mobile phones in 2007. While household food waste is a private phenomenon the environmental impact is a public policy problem. An understanding of who is throwing away how much and the reasons why is necessary if food waste is to be addressed and reductions achieved.

An online survey of a representative sample (n=1,603) based on location and household size was completed in 2009. The use of self-reporting and the personal nature of food waste may have led to an indeterminate degree of under-reporting. Potentially exacerbating this effect was an economic climate influenced by the global financial crisis at the time of the survey, which may have tempered people’s readiness to acknowledge actual levels of food waste. Possible shortcomings as a result of the methodological approach, however, is likely to have had less impact on the data pertaining to behaviour around food consumption compared to reported levels of waste.

Through an analysis of survey data it has been estimated that Australian households throw out $616 worth of food a year, which equates to $239 per person. Research undertaken in the United Kingdom (Ventour 2008) found that a third of the food householders bought in the UK is thrown out. Householders in the UK were found to be throwing out the equivalent of Aus$700 worth of edible food, almost half of which was fresh food.

In Australia more than $1.1 billion worth of fruit and vegetables is being thrown out annually, more than any other food type, followed by another $1 billion in restaurant and take-away food that goes uneaten. Australian households are also throwing out: $873 million worth of fresh meat and fish; $571 million in bread and cereal products; and $512 million in dairy products every year.

Survey findings indicate that household income is a strong influence on the amount of food thrown out and in all but one state, higher household incomes are associated with higher levels of food waste. This finding provides indicative evidence missing from a previous report (Productivity Commission 2006) that found while waste increases with economic prosperity this relationship had not been quantified. Analysis of survey data found that across Australia, households with an income of $40,000 or less reported wasting food worth $518 a year. This compares with $635 a year for households with an income between $40,000 and $80,000 and $803 by households earning more than $80,000 a year.

Fresh food accounts for the majority of wasted food in Australia, which is also the case in the United Kingdom. A correlation between household wealth and food waste is identifiable and fills a gap in previous research.
The environmental impact of greenhouse gas emissions and food waste

The amount of food being thrown out by householders contributes to Australia’s greenhouse gas emissions – already the largest amongst countries in the Organisation for Economic Co-operation and Development when measured against Gross Domestic Product (GDP). (OECD 2008) Greenhouse gas emissions from the agriculture sector are more than one fifth of total emissions worldwide and in Australia the sector contributes more than 15 per cent of total emissions. (Department of Climate Change 2010) These emissions are released whether or not food ends up being eaten, but, when food is not eaten and thrown out any value from these emissions is also thrown out. Unfortunately for Australia there is a connection between increased GDP and increased levels of municipal waste which has a high organic component. (Adhikari and Barrington 2006)

The production of meat products has with the largest embodiment of greenhouse gas emissions of any food category. Embodied emissions include additional inputs such as transport, processing and refrigeration of food production. On a dollar basis emissions from meat products are nearly 12 times that of fruit and vegetables. So while Australian householders throw out more fruit and vegetables than meat and fish the environmental impact of the latter is greater. The calculated dollar value of food waste from gathered survey data and the greenhouse gas emissions embodied in selected food categories is plotted in Figure 1.

**Figure 1 Wasted greenhouse gas emissions from the production of food which is thrown out**

![Figure 1](image_url)

Figure 1 shows that the environmental impact of throwing out uneaten meat products is considerably greater than the other three categories. An estimate of the embodied emissions wasted through food waste has been calculated by dividing the dollar value of food waste by a ratio of emissions per dollar (GHG/$) of final private consumption calculated by the CSIRO and University of Sydney. Greenhouse gas emissions are measured as a weight of carbon dioxide. Because a range of gases have a greenhouse effect each gas is given a carbon dioxide equivalent measurement. The calculated emissions from food thrown out by Australian households is equivalent to 12.9 million tonnes of carbon dioxide or 12.9 Mt CO₂-e.
The embodied emissions of wasted food production are further compounded at the other end of the ‘food chain’ where decomposing food waste in landfills emits methane. Methane has a global warming potential equivalent to 21 times the same amount of carbon dioxide.

Almost half of all municipal waste in Australia is comprised of organic material, most of which is household rubbish. Previous research had found that 70 per cent of municipal waste in Australia went to landfill in 2002–03. (Productivity Commission 2006) While reported figures varied between states they correlated with the comparable rates of household food waste across Australia identified in the survey data.

The decomposition of organic waste is the main source of greenhouse gas emissions from landfill. In 2004 Australian landfills emitted 15 Mt CO₂-e which accounted for 2.7 per cent of Australia’s total emissions. (Productivity Commission 2006) This excludes methane that is captured and burned to produce carbon dioxide and water and reduces the effective quantity of emissions. Between 1990 and 2003 capture of methane went from zero to approximately a quarter of total emissions. (Productivity Commission 2006) The benefit of burning gas is extended further if used to generate electricity.

Using these figures it can be estimated that approximately 5.2 Mt CO₂-e or almost 1 per cent of greenhouse gas emissions are generated from household food waste disposed in landfill. While in terms of total emissions this amount may be small it is still more than the embodied emissions from reported waste of fruit and vegetable and cereal products combined.

It has been estimated that where gas is captured the cost of landfill is ‘likely to be no more than $5 per tonne of waste’ while without gas capture this may increase ‘up to $24 per tonne for wastes with high levels of organic content’. (Productivity Commission 2006: xxix) The cost argument for abatement of greenhouse gas emissions through landfill capture has been questioned by the Productivity Commission though, as it argues there are cheaper options for emissions abatement. Reducing the amount of food going to landfill in the first instance would be one option.

The cradle-to-grave emissions of household food waste can be estimated by combining wasted production emissions and those generated from decomposition. The sum is 18.1 Mt CO₂-e. This is equivalent to the annual emissions of 4.2 million passenger cars or a third of all passenger cars in Australia. Reducing food waste, therefore, has the potential to make an important contribution to reducing Australia’s greenhouse gas emissions. But to reduce food waste will require behavioural change by Australian households.

**Behavioural change and reported contradictions between attitudes and behaviour**

Food waste has shared environmental consequences and personal consequences for household finances. Yet, despite stated concerns about the issue of food waste and a reported awareness of how to prevent wasting food, cognitive dissonance means that households continue to throw away large amounts of food.

The survey of Australian households found that most (83 per cent) were either ‘very concerned’ or ‘somewhat concerned’ about household food waste. A similar finding was made in relation to the level of guilt felt by households when throwing out food. Eighty-four per cent of respondents reported feeling guilty whereas only 15 per cent reported not feeling guilty. While guilt is not a sound basis for generating sustained motivation to change behaviour, coinciding levels of concern and guilt indicates that awareness of food waste is not the issue. Interestingly however, there is a corollary between household income and
reported concern. Figure 2 compares reported levels of concern about household food waste with household income.

**Figure 2**  Relationship between concern about household waste and income

![Graph showing the relationship between concern about household waste and income.](image)

Figure 2 shows that the degree of concern expressed about food waste trends away from ‘very concerned’ to ‘somewhat concerned’ as household income increases. This finding is consistent with the correlation, discussed earlier, between amounts of reported food waste and household wealth. Yet, while householders report being greatly concerned about food waste their behaviour around buying and using food reveals evidence of a confliction between attitudes and behaviour.

Around half the households (53 per cent) surveyed favoured focusing on food brought into the house as the best way to reduce food waste. Whereas 42 per cent said that planning meals around the food already in the household is the most efficient method to reduce the amount of food that is wasted.

Yet the potential to reduce food waste by only buying food that is needed or planning meals around the food in the fridge and pantry is being undermined by cognitive dissonance amongst householders. For example:

- Householders who believe that buying only food that will be eaten is the best way to reduce food waste report that they usually take a list when they go shopping. However, many of these respondents also agreed that they often buy things on the spur of the moment.
- Householders who believe that reducing food waste is best achieved by planning meals around the food they already have were also likely to think about how they might incorporate leftovers into a meal. However, many of these respondents said that they often plan meals based on what they want to eat rather than around the food that they already have.

It is not expected that people act as purely rational beings. The theory of behavioural economics points to the reason why there is a paradoxical relationship evident in people’s behaviour. Pertinent to the observed behavioural contradictions reported here is the motivation to ‘do the right thing’ which is undermined by the influence of habit. Importantly, the principles of behavioural economics holds that people need to feel involved in any change and that incentives and information alone is insufficient to achieve behavioural change. (Dawney and Shah 2005) Habits pertaining to household attitudes and behaviour around waste...
management have been previously examined. Tucker and Spiers (2003) found that once a new approach to managing waste has been trialled attitudes readily adjusted to the new behaviour and are sustained, except where a negative experience is encountered. These observations about behaviour emphasise the need to engage people in processes of behavioural change.

In an attempt to determine how the apparent paradox between attitudes and behaviour might be reconciled survey respondents were asked to prioritise the reasons that might motivate them to reduce their food waste, if they were to try. The options presented were: environmental; financial savings; concern about poverty and hunger; or other reasons. Respondents were able to select more than one motivating factor.

Financial savings that could be made was identified as the primary motivator (85 per cent) for householders to reduce the amount of food they waste. This motivation was twice as prevalent as protecting the environment (41 per cent) or humanitarian concerns (27 per cent).

Respondents who said that financial savings were a motivator for reducing food waste spent $601 on food they ended up throwing out compared to the national average of $616 per household and $100 less than households who did not identify financial savings as a motivating factor. This compares positively with those who cited environmental or humanitarian reasons as motivation to avoid food waste, but, actually reported wasting more food than households who did not share those motivations. Financial motivation was the only motivating factor associated with lower levels of food waste.

So while people are not expected to act rationally at all times and will therefore continue to exhibit paradoxical behaviour the finding that financial motivation results in lower food waste suggests that there is some corollary between intention and behaviour when supported by a related motivation.

**Policy direction**

A majority of Australians report being concerned about food waste yet households continue to consume food in ways that promote wastage. While reducing household food waste will reduce greenhouse gas emissions and the ecological footprint of households reported behaviour suggests food waste will continue to be a problem unless government takes steps to address it. Research findings reported in this paper have policy implications for the development of future government strategies to affect reductions in household food waste. To be successful though, future strategies will have to engage householders.

Simply informing people about the nature and extent of the problem and providing strategies to reduce waste is unlikely to be successful. Most people are already aware that food waste is an issue and that they themselves could reduce the amount of food wasted. Despite this they continue to waste large amounts of food. The problem is not a lack of awareness but of translating reported concern into behavioural change.

If government policy is to be effective in reducing food waste, it will also need to include food retailers in any strategy. Food retailers are concerned with profits not waste; it is irrelevant whether or not the food a customer buys is eaten. For example, the provision of plastic shopping bags helps to ensure that customers do not need to plan their purchases in advance. While the direct link between plastic bags, litter and landfill is well understood in Australia, the role of plastic bags in helping to promote wasteful shopping practices seems to be less well understood. Combine this with discounts for bulk purchases and two for one specials encouraging people to buy more food and the integral role of food retailers in any government policy or strategy to reduce food waste is clear.
Reducing food waste also provides a low cost step toward reducing greenhouse gas emissions. In contrast, the Government’s postponed Carbon Pollution Reduction Scheme which proposed a cost penalty to drive change in behaviour by ‘rational’ polluters and consumers. The premise of a ‘rational’ response to achieve behavioural change, however, has been shown to be partly flawed and an inadequate basis for policy development.

The politics of ‘reduce, reuse, recycle’ appears to favour recycle over reduce, but, government is going to have to make the hard choice if food waste is to be reduced. To this end, evidence that financial motivation is a factor in reducing food waste, some form of cost incentive linked with waste disposal may need to be considered. In addition to the direct financial benefits to households, which they have identified as a primary motivator, reducing food waste has the capacity to deliver significant environmental benefits and a reduction in Australia’s ecological footprint.

**Summary**

Australian households are throwing away $5.2 billion worth of food annually. This waste contributes to Australia’s greenhouse gas emissions twice; firstly through wasted emissions from producing food which is not eaten and secondly through emissions from decomposing food waste. Achieving reductions in food waste requires changes in behaviour around food which Australians are aware of but this is not always reflected in their actual behaviour. This paper identifies this behavioural disconnect as the starting point for the development of effective policy to reduce food waste.

A majority of survey respondents expressed concern about the amount of food thrown out by their household, and most also reported feeling guilty about it. Reflecting this level of awareness and feeling about the issue, survey respondents were able to identify ways to reduce food waste. Yet, respondents also reported contradictory behaviour that results in food waste rather than a reduction.

Motivation to reduce food waste is primarily the financial savings that could be had rather than altruistic concerns including concern for the environment. The evidence shows that this motivation is effectual with reported food waste $100 less per household than those who were not motivated by money. While most Australians are subject to tight water restrictions and encouraged to take measures such as buying energy efficient appliances to reduce greenhouse gas emissions the ecological impact of food waste continues to be largely ignored.

In order to reduce food waste Australians need to be reminded about the cost of food waste and shown how small behavioural changes can potentially save them money while also effecting reductions in their ecological footprint. Financial benefits that encourage changes in behaviour are likely to have some effect. However, if any policy is to be successful householders and food retailers will both have to be engaged by government in designing policy to reduce food waste.

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Place-based environmental education: Sustaining social outcomes

Mike Bartlett and Marianne Sheumack
Sydney Olympic Park Authority, NSW

Abstract

Sydney Olympic Park is a 640 hectare site with complex and sometimes competing uses. The 430 hectares of remediated parklands within the precinct have been described as Sydney’s backyard and are an outstanding legacy of the ‘green games’. The Sydney Olympic Park Authority (SOPA) is briefed through legislation and policy to deliver increasing community benefit in its management and ongoing development of the Park. Included in this responsibility is the mandate for provision of educational activities which leverage the Park’s natural and built assets whilst reducing the net cost to government. Like most other public agencies and NGOs, SOPA’s budget is annually contracting. The recent global financial crisis has compounded already strong direct and indirect competition for program funding and participation. In this environment, education program administration across all sectors increasingly requires sound business strategies and effective market positioning. The core business of SOPA Education is the delivery of environmental education onsite and through outreach & events to over 30,000 school students per year. This paper uses the recent story of multi-sectoral environmental education at Sydney Olympic Park to unpack strategies for sustainable program provision. Successes and challenges of a triple bottom line approach are illustrated.

Introduction

Environmentally themed education has been delivered at Sydney Olympic Park since the late 1980’s, largely through curriculum-based school excursion programs. Opportunities for learning at the Park have been dramatically enhanced by the large-scale remediation of the site and development of world-class facilities fast-tracked by the Sydney 2000 Olympic Games (Sheumack, 2010; Nash and Sheumack, 2008). These developments have attracted a broad range of programs and providers across all education sectors in additional areas of sport, arts, physical activity, place management and corporate conferencing (http://www.sydneyolympicpark.com.au). However the built environment and ‘living legacy’ created from Olympics-related investment has not automatically delivered participation growth or program viability.

Sydney is actually one of the very few Summer Games host cities to deliver accessible, functional, financially viable post-Olympics assets and activities for its public, the result of some pre-games strategic planning and considerable post games strategic management (Cashman, 2008; Olympic Coordination Authority, 1995). Education services have been considered core business and a key outcome in the purposeful achievement of net social benefit from place making and place management activities. Field-based school programs, delivered in key learning areas such as Science, Geography and Technology, continue to be the core education offering of the site’s managing Authority. Participation in these programs has grown significantly (Sydney Olympic Park Authority, 2005-2009) despite ever-constricting budgets and increasing market challenges. This paper aims to share lessons learnt from the strategic evolution and rationalisation of education activities towards social, financial and environmental sustainability.

The Mandate of Place

Sydney Olympic Park (‘the Park’) is a 640 hectare site including some 430 hectares of remediated parklands. With the largest stand of mangroves on the Parramatta River, the natural environment lends itself to a broad range of field research activities and opportunities for learning. The more familiar urban core of the Park boasts major sporting, entertainment and function venues which
attract in excess of 500,000 school students a year for sport, carnivals and events. A total of 9.2 million people visited the Park as a whole in 2009 (Sydney Olympic Park Authority Annual Report, 2009).

Since 2001, Sydney Olympic Park’s diverse set of natural and built assets have been managed by the Sydney Olympic Park Authority (SOPA) - a statutory State government Authority. Formal impetus for the Authority’s education activities is found in the Sydney Olympic Park Authority Act, 2001. A principal function under this legislation is: ‘to promote, co-ordinate, organise, manage, undertake, secure, provide and conduct cultural, sporting, educational, commercial, tourist, recreational, entertainment and transport activities and facilities’ (Part 4, 13.1b). Overarching priorities and actions within the NSW Government State Plan help to shape this mandate and interpret what particular social outcomes are sought.

Provision and facilitation of education programs directly support the Authority’s mission:

'...To manage the evolution of the Park from its Olympic state to a vibrant town incorporating one of the largest, most diverse urban parklands in Australia…'


The Sydney Olympic Park Master Plan received government approval in 2010 and sets the vision for long-term sustainable development at the Park. The aim is to create a township showcasing best practice in sustainable urban development while enhancing the Park’s status as the home of major sporting and entertainment events. The Park’s rapidly growing business, education and hospitality activities will be complemented by new urban activities including residential uses intended to activate Sydney Olympic Park on a 24/7 basis.

**Bottom-Line Considerations**

Environmental education at Sydney Olympic Park is primarily funded on the basis of positive social outcomes. This is drawn from state legislation (Sydney Olympic Park Authority Act 2001) and political priorities (NSW State Plan, 2006). School education programs are endorsed as core business by the SOPA Board insofar as they contribute to goals supporting community engagement and providing community benefit. At a functional level, education is driven by central values of social inclusion and sustainability. These values are increasingly articulated in local business planning and activated through specific performance targets. Social benefit and inclusiveness are actively considered in the development of marketing and communications, customisation of content, scheduling of programs, determination of pricing models, subsidisation and in brokering external funding.

In terms of direct social benefits:

- Environmental education drives visitation and increases usage of public parklands and facilities. More than 30,000 students per annum visit Bicentennial Park or Newington Armory to participate in education programs. Many are visiting these parklands for the first time (Sydney Olympic Park Authority, 2010a).
- Curriculum-based school excursions provide opportunities for students (K-12) from government and non-government school systems to achieve field-based learning outcomes.
- Professional development workshops enhance the subject knowledge and field-work skills of school teachers.
- School outreach services assist teachers and students to appreciate and utilise their local natural environment as a site for learning.
• Subsidised and customised programs enable participation by individuals and groups with a variety of special needs.
• Some school-aged education events are underpinned by an objective to encourage participation in higher education and/or to promote interest in science.
• Physical Education programs for primary schools are designed to encourage broad participation in sport and align with policies addressing childhood obesity.

Net social benefit of education at the Park is dependent on additional measures. A legitimate equation considers costs and benefits for the environment as well as the net financial investment of the community. Environmentally themed school education programs at the Park meet NSW curriculum outcomes in the key learning areas of Geography, Science and Technology for high school students and Science and Technology and Human Society and its Environment for primary school students. The fact that most of the Park’s programs are field-based means that teachers can fulfil syllabus requirements for field work that often cannot be achieved within the local school environment. By experiencing the natural environment first hand through activities such as gathering environmental data and using observation skills to study the intertidal wetlands, students gain an understanding of how and why protected environmental areas are managed. These experiences enrich students’ understanding of the importance of biodiversity and help engender environmental stewardship (Ballantyne & Packer, 2002; 2005; 2009; Brody, 2005).

Other environmental outcomes include the capacity building achieved through Wetlands Education and Training workshops, internships, guided research, Technical Tour programs and coordination of a range of third party provided education programs across sectors. All education programs must operate within the constraints of the Parklands Plan of Management, which means that the impacts of participant numbers on sensitive ecological areas need to be carefully monitored and managed.

A business sustainability cluster recruited and facilitated by SOPA as part of the Sustainability Advantage Program strengthens local corporate networks and promotes environmental collaboration. Sustainability Advantage is delivered in partnership with NSW Department of Environment and Climate Change and Water (DECCW) and includes modules on resource efficiency, climate change and staff engagement (http://www.environment.nsw.gov.au/sustainbus/sustainabilityadvantage.htm). Resulting energy, water and waste saving initiatives are currently being rolled out across the precinct.

The financial balance of education at Sydney Olympic Park reflects an agreed level of government funding, partially offset by revenue from user fees. The major costs of SOPA Education are in staff salaries, marketing and materials. Historically, income has come almost entirely from school student excursion fees. As with many public agencies, the Authority has a brief to incrementally reduce net expenditure and increase return on investment whilst maintaining and improving core services. For the Education business unit, this has translated into targets for annually reducing net expenditure whilst maintaining levels of program participation and continuously improving program content and delivery. This challenge is ongoing and equally familiar to many non-government and private sector education providers. School excursion business is further complicated by market factors including education system policies, the scope and sequence of evolving curricula, class time constraints, transport costs, competing learning opportunities/destinations and customer willingness/ability to pay.

Whilst operational efficiencies can, and in the Authority’s case have improved the ratio between delivery costs and fee-revenue, the remaining gap cannot usually be closed by generic price increases. The average market won’t accept it and efforts towards social inclusion would be
compromised. Differentiated pricing, premium niche products and external funding mechanisms provide some alternatives. Even so, the gap may never fully close and for many government programs this is acceptable. Transparent public investment in efficient public services is usually readily justifiable. However in terms of recurrently funded programs, ‘acceptable’ and ‘justifiable’ aren’t always enough.

*Could the same money be invested elsewhere for a better net benefit? Who would the winners and losers be if this service was wrapped up or wound back?*

Regardless of intended social benefit or perceived mandate, recurrently funded education programs are particularly vulnerable to these sorts of questions. The answers in the minds of funding decision makers can largely determine whether or not a program is ultimately sustainable. Sustainability requires the management of the messages, perceptions and politics which give shape to reality.

**A Strategic Approach**

In 2006, the Authority commissioned development of a four-year Strategic Plan (2007-10) for education at the Park. At the time, education related functions were spread across the organisation in separate delivery, business development and marketing units. The plan was intended to distil vision, define mission, guide resource allocation and prioritise objectives.

The following steps were undertaken over four months:

- Scope of enquiry and process steps agreed with senior management. Access to key personnel and records approved
- Desktop audit of annual reports, corporate and related government priorities
- Internal surveys administered to education-related staff and practitioners
- Structured interviews held with on and off-site stakeholders
- Informal interviews held with education-related staff and practitioners (ongoing)
- Audit conducted of existing education programs and budgets
- Review of previous market research
- Focus group held with education-related staff and middle management (defining values, barriers and opportunities)
- Interim consultation paper drafted and distributed for comment
- Planning workshop held with senior management and key education stakeholders (clarifying vision and positioning)
- Comparative case studies of agency programs (including education) compiled
- Second planning workshop held with senior management and key education stakeholders (clarifying mission and key result areas)
- Draft Strategic Plan disseminated to all process stakeholders for review and comment.

The resulting strategy incorporated a charter of principles and values for both the team and the function, firstly:

‘As facilitators of quality learning opportunities we will leverage the diversity of our settings and offerings, the expertise of our staff, our history and our knowledge reserves. In pursuing a local and international reputation as a world-class education precinct, we will emphasise *accessibility* of Sydney Olympic Park assets, *collaboration* with education providers and systems and *responsiveness* to learner needs’
And secondly,

‘As a social enterprise contributing to the Authority’s mission, we will maintain a strategic focus and implement economically sound models of program provision which demonstrate: **innovation** in program development and service delivery, **sustainability** in developing products and entering new markets; **social responsibility** through continuing support of key programs; and **collaboration** with strategic partners and sponsors’.

**Local Lessons in Sustainability**

After four years of strategic implementation, total school student and community participation in environmental education at Sydney Olympic Park has increased by more than fifty per cent whilst net government investment in the delivery of these programs has decreased by a similar proportion. Partnerships now underpin a range of delivery models. Commercial products across sectors are successfully emerging and beginning to cross-subsidise social benefit programs. The program suite has been rationalised, a staffing restructure has occurred, marketing priorities and methods have significantly shifted. A major sponsor has renewed support for a further three years. Recent capital investment in our Education Centres has confirmed a corporate commitment to the value of education at the Park.

To say that the strategic plan itself delivered these outcomes would be false. After year one of the plan’s implementation cycle, a number of strategic actions were seemingly made redundant by changes in government and executive priorities. Decisions around resource allocation and agency staffing altered both the strategic and operating environment. Seed funding for certain initiatives was absorbed elsewhere. New commercial education programs modelled on medium term returns became higher risk.

Even with significant executive input and formal Board endorsement, the strategic plan did not provide a constant green light to run programs. It has not removed the need for comprehensive business submissions, negotiations around staff roles or justification of expenditure. It certainly has not magically transformed the bottom line. Despite hopes for a revered document that staff might proudly affix to their workstation, in hindsight it is now more obvious that the value of strategic planning was - and is - in the process.

The process provided a focus for cultural conversations and structural decisions which altered the course of SOPA Education’s evolution. It facilitated recognition for past achievements and room for acknowledging underperformance. A general destination of sustainability was set. The process established an ethos, or at the very least reinforced the expectation of accountability. It has fostered an agility and resilience that has accommodated fluctuations in corporate direction and market trends. The document itself has provided ongoing terms of reference for annual business planning, workload allocation, individual/team performance management and outcomes reporting.

There are some key areas in which the strategic journey of education planning and implementation at Sydney Olympic Park may offer some general insights:

**Program rationalisation**

When it comes to innovations in environmental education programming, there is usually no shortage of ideas. A functioning multi-disciplinary team will usually have solid industry networks and high levels of motivation and creativity. Sustainability requires a structured sifting through of the myriad
of excellent program proposals which inevitably arise within such a group. If individual and team motivation is to be maintained, there is a need to do this openly, consistently and in collaboration with program proponents without stunting ideas generation.

On the back of the strategic plan, SOPA Education developed a procedural framework for education business cases to support the development of sustainable programs and services. A flexible template guides staff through forecasting of material and human resource requirements, targets for participation and revenue (and/or capped expenditure). A basic cost-benefit analysis encourages consideration of different funding scenarios and alternative models of program provision. Working through the framework provides coaching and professional development opportunities amongst the team. This continues the conversation about program sustainability and teases out issues which enhance the perspective of program proponents and reviewers. The resulting document provides an evidence-based submission for executive management. This process has been applied retrospectively to existing programs where appropriate.

**Models of provision**

Traditionally, SOPA Education has directly delivered site-based environmental excursion programs through a local pool of qualified teachers. Consultation in the strategic planning process confirmed this approach as core business but indicated that alternative models of provision would be necessary to lower the risk of program growth and diversification.

Strategic partnerships with major education systems and third-party providers have proven effective in offsetting the development and delivery costs for programs whilst increasing participation. This has been particularly effective in the case of partnered education events. An example is ‘Science in the Suburbs’, which is an annual Australian Museum event for school students. Within this model, SOPA is both event host and one of many program providers. The event serves to activate lesser known parklands within the site. It provides exposure for sponsors and opportunities for other onsite partners. SOPA and the Australian Museum collaborate on marketing and leverage each other’s networks and branding to maximise participation. This extends the reach of SOPA’s environmental education profile whilst minimising the risks and costs inherent in being a sole provider.

With a casual pool of up to 20 delivery staff, SOPA’s delivery capacity offers various benefits and challenges. The size and transience of the team mixed with the broad Kindergarten to Year 12 program offering, relative staff availability and the spread of individual skills and abilities provides enormous complexity in rostering. Other management issues involve ensuring the currency of individual skills, assuring the quality of delivery, assessing and meeting training and development needs and providing adequate amounts and variety of work to aid staff retention.

The delivery capacity, collective experience and expertise of the team comprise an immense asset. This is more a strategic opportunity than a competitive advantage. Proven capacity and ability has led to invitations to deliver a variety of externally funded programs. In 2008-09, SOPA environmental educators resourced NSW Department of Education and Training’s *Kids Design Challenge*. This was an outreach program to schools where field techniques were modelled for teachers and feedback was provided to students on environmental projects. In 2009, the SOPA team delivered *Go for Green* a student ambassadorial program funded by Strathfield Council and designed to support their school education brief. In 2010, SOPA assisted Birds Australia in the development of a curriculum-based module, teacher professional development workshop and excursion program packaged around their *Birds as Indicators* program.
Pricing

SOPA environmental education programs are usually provided on a fee for service basis, with pricing based on benchmarking and other market research. In a thorough analysis of net social benefit, taxpayer investment through government subsidisation and user fees for public participation would be regarded as ‘costs’ (Commonwealth of Australia, 2006). Given the overall budget size, this depth of analysis is not applied, nor would it be cost effective in itself. Financial sustainability is here considered a measure of social benefit in so far as government investment is reduced and user fees are maintained as generally affordable. Where ability to pay is an issue, arrangements are made to enable full participation. Of course, the impact of pricing is not obvious when participation trends are static or increasing. Market research incorporating non-user surveying is needed to capture this. The concept of generally differentiated pricing for education systems is a controversial model that has not been adopted. Instead, higher priced and customised niche programs have been made available.

Marketing

In environmental education partnerships, there are often loosely justified concerns over the use and protection of intellectual property. SOPA Education has taken the position that whilst respecting laws of copyright and license agreements, as far as practical we will treat our body of knowledge as a public asset. This is a value-based position which is in line with our legislative mandate and our agency’s strategic intent to provide social benefit. In this sense, our materials are shared relatively freely amongst teachers and school systems. Sharing of information helps to embed our place and programs in teacher planning, system initiatives and the minds of would-be user groups. We primarily rely on the point of difference provided by the unique and diverse assets of the place itself to solicit visitation and participation. This focuses the marketing effort towards place awareness over program offering. The general ethos of open-handed information sharing will be better tested as we increase our teacher professional development activities and venture into the territory of connected classrooms and virtual excursions.

The closest physical market for SOPA environmental education is approximately 730,000 students from around 1700 schools within the Greater Sydney Metropolitan Area (Suzanne Moore Consultancy, 2004). There is roughly a 50:50 split in participation from government and non-government school systems. Annual booking analysis and user surveying between 2005 and 2010 consistently indicates that more than eighty percent of SOPA school education throughput is repeat business. Details supplied by new subscribers to our quarterly electronic newsletter (SOPA, 2009/10) indicate that our strongest form of promotion continues to be word of mouth between teachers. This has implications for both the nature of advertising and importance of a visiting teacher’s excursion experience. In recent years, the position descriptions and professional development activities of SOPA delivery staff have shown an increasing emphasis on customer service and the soft skills required of front-line ambassadors.

Direct marketing through print advertising and hard copy collateral has been significantly wound back in preference for electronic promotions, one-to-one contact at events and relationship marketing through industry networks. Whilst driving direct advertising costs right down, this shift also demonstrates credibility in the sustainable use of resources. With marketing in mind, program design and delivery takes account of transport arrangements, the constraints of normal school-day hours, the desire for hands-on outdoor activities, the value of immersion experiences in the natural environment and above all, curriculum relevance. A new frontier now exists for environmental excursion programs to assist teachers in meeting the learning outcomes of a national curriculum as this is introduced.
Since 2008-09, SOPA has offered low-cost teacher professional development workshops in the areas of Science and Geography. These programs centre on field-study techniques, biodiversity, use of geographical information software and wetlands management. These workshops contribute to the sector by building teaching capacity whilst at the same time exposing teachers to the site and its program offerings. It appears these programs will require formal endorsement and accreditation if they are to retain an audience in the longer term (Australian Science Teacher’s Association, 2010; Leonard and Watson, 2009; NSW Institute of Teachers, 2008). Another effective promotional approach has been to integrate SOPA programs with existing global program initiatives. An example is the provision of teacher workshops and school excursion options aligned with National Geographic’s Jason Project (2010).

**Continuous improvement**

Fairly standard metrics of school program evaluation are used at the Park including curriculum relevance, satisfaction with facilities and general experiences of delivery. Education staff assesses lessons and discuss issues of delivery on a daily basis. In order to better inform the continuous improvement of both staff and programs, SOPA is in the process of developing a professional development framework for field-based teachers entitled SEEED: Sustaining Excellence in Environmental Education Delivery. While this was originally conceived as a system of peer review, it has morphed into a local evidence-based adaptation of classroom teaching standards, developed under the supervision of Macquarie University, Department of Education, Faculty of Human Sciences. Initial results from related research indicate a pedagogical link between student experiences of place and the development of positive attitudes toward the environment (Nash, 2010). This reinforces the need to better capture and integrate participant (student) feedback into our continuous improvement cycles.

Systems for content review of individual programs contribute to sustainability by ensuring ongoing curriculum relevance and therefore supply that continues to meet the central demand. A longer term contribution to overall program sustainability is made through systems of performance recognition and management which lead to staff development, retention and customer satisfaction.

**Sponsorships**

Corporate investment provides about fifteen percent of SOPA Education’s annual revenue and almost double that value again through in-kind (non-cash) contributions. For most corporate partnerships, responsibilities to deliver on a variety of agreed outcomes are usually involved. This typically involves opportunities for the sponsoring organisation to demonstrate corporate social responsibility broadly by virtue of a financial contribution and/or specifically through activities such as staff tree planting days.

In SOPA’s instance, tremendous sponsorship opportunities are provided by the environmental credibility of the precinct, a strong tradition of environmental education and a globally iconic brand. However, for these to be realised, SOPA Education has needed to address a certain level of cultural opposition to the sponsorship model. Integrity has been protected through internal policy governing sponsor attributes and the nature of sponsorship agreements. It remains important that sponsorship agreements and related reporting obligations do not distract from core business or unduly divert human resources.

In recent years SOPA has seen striking examples of effective corporate investment. ‘Roads to Sustainability’ sponsored by Transurban was a two year program that saw 3000 students from 50
DET Priority Schools participate in fully subsidised environmental excursion programs. Nestle funded the development of technical tours in water management and catchment models for use in school excursions. The EnergyAustralia Education Centre is a solar powered classroom now home to education programs focussing on renewable energy (SOPA, 2010b).

SOPA’s Education sponsorship strategy has been a key action in closing the gap between fee revenue and actual delivery costs. Corporate partnerships have been scoped and driven proactively by a dedicated commercial business manager. Keys to success in this area have included development of a prospectus outlining customised scenarios for corporate involvement, clear agreements on expectations, a workable reporting regime, active scheduling and delivery of positive media coverage, promotion of the partnership to a Ministerial level and a mutual commitment to leveraging the relationship as fully as possible. Delivery of sponsorship outcomes is now a standing item for team meetings, embedded in staff work plans and specifically addressed in performance feedback.

Conclusion

During a four year phase of strategic activity, SOPA Education has developed an understanding of program sustainability shared by management, staff and stakeholders. This was precipitated by a consultative strategic planning process which focussed internal and external stakeholder attention on social, environmental and financial outcomes. An ongoing conversation about what comprises net social benefit has since permeated business submissions, program development, partnership development, performance management, outcomes reporting, quality assurance, staff development, marketing approaches and general business planning from the ground-up. The strategic journey has been one of developing awareness, facilitating cultural and structural change, managing internal perceptions and establishing new accountabilities. Now entering a new phase of forward planning, the key result areas for SOPA Education are: delivering community value, leveraging the legacy (of Sydney Olympic Park) and sustaining our social contribution. It is a testament to the resilience and commitment of the education team that these strategic goals are now considered business as usual.

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Deforestation and land degradation in Queensland - The culprit

Gerard Bisshop and Lefkothea Pavlidis
University of Melbourne

Abstract

Satellite remote sensing has provided resources managers a unique tool to map and monitor land and water resources over large areas. An outstanding example of this is the recent Statewide Landcover and Trees Study 2007-2008, a landmark report that traces deforestation in Queensland for the previous 20 years, accurately mapped by satellite. This report shows the tree clearing resulting from agricultural expansion progressively from the eastern Brigalow Belt, northward to the Desert Uplands, and westward to the western Brigalow and the Mulga lands. It catalogues the immense impact we have had on the natural environment, even though it excludes the previous 200 years of human settlement. Deforestation has been shown to have a major impact in exacerbating the regional impact of climate change, biodiversity loss, causing land degradation, soil loss and water pollution, and adding considerably to Australia's carbon emissions, directly when the forests are cleared, and through foregone sequestration. Tree clearing rates for the last 20 years have averaged 430,000 hectares per year, equivalent to a forested area of 65 x 65 km cleared each year. Fully 91% of this tree clearing was to grow pasture for livestock. This paper addresses the impact of livestock grazing on land and soil degradation, biodiversity loss and climate change impact.

Our ecological footprint

In one generation, our attitudes towards the ecosphere that supports us have changed dramatically. We once believed that the land was ours to conquer, to tame and to turn into productive agricultural land, and to use for mining, cities and transport. We now know there are limits. We now know that we have exploited our natural resources beyond their limits, using more resources than the world can regenerate (UNEP, 2010). We are like a wild child, spending up on our credit card with no way of paying.

The Living Planet report (WWF, 2008) chillingly describes an "ecological credit crunch", due to our over-use of resources (Figure 1). Their Living Planet Index reflects human impact on our planet, showing how vertebrate species have declined by nearly 30% over the past 35 years, and how overfishing has pushed 60% of fisheries to collapse (WWF, 2008). At this rate, we will be consuming twice the world's sustainable capacity by 2030.
Australians have the dubious honour to have one of the highest ecological footprints per capita in the world, just behind the USA (WWF, 2008), and the highest per capita greenhouse emission rate in the OECD (Organisation for Economic Co-operation and Development) along with Luxembourg (OCDE, 2010). The 2006 Australian State of the Environment (SoE) report (Beeton et al., 2006) found that biodiversity continues to be in serious decline in many parts of Australia, and that loss of native vegetation continues to be one of the greatest threats to Australia’s biodiversity. It also found the condition of native vegetation to be highly variable, with some ecological communities occupy less than 1 per cent of their original extent as a result of clearing for agriculture, and many others to be highly fragmented. In addition, the components of many ecosystems, especially the understorey in forests and woodlands, have been severely disrupted. (p.69)

SoE 2006 shows a bleak picture of soil loss, dust storms, soil carbon loss, and increasing soil salinity and acidity. In fact, Australia has seen the greatest loss in biodiversity (extinctions and endangered species) of any continent in the last 200 years (NRM, 2010).

We now know that the impact of European settlement in Australia has resulted in more droughts (Nicholls, 2006; McAlpine et al., 2009A), more extreme wildfires (Connor, 2009; Lucas et al., 2007), greater floods, regional climate change (McAlpine et al., 2007, 2009A), soil loss, land degradation (McKeon et al., 2004), water pollution, extinctions, endangered species and biodiversity loss (NRM, 2010). Surprisingly, we find a common cause for much of our ecological crisis - the loss of native vegetation. Not surprisingly, there is a common driver for this loss - agriculture, predominantly livestock grazing. The following exploration of land use and tree clearing provides us with a clear picture of how and why our native vegetation has been lost.

How we use our land

The Australian Land Use Mapping Program shows that urban settlement and mining combined take up less than one percent of our land area, livestock grazing uses 64%, and all cropping and horticulture uses 5% (ACLUMP, 2009). Clearly, pasture for livestock is responsible for most native vegetation clearing (hence the greatest ecological impact) since European settlement.
The full extent of native vegetation clearing across Australia can be seen in Figure 3 (DEWHA, 2009). It's no wonder we have pushed our supporting biosphere out of balance.

Figure 3: Cleared native vegetation and protected areas (DEWHA, 2009)

Tree clearing in Queensland

A landmark report on tree clearing in Queensland documents 20 years of change as seen by the Landsat satellites from 1988 to 2008 (DERM, 2009). This Statewide Landcover and Trees Study (SLATS) provides us with a highly detailed history of how expansion of agriculture, settlement, mining, forestry and infrastructure have impacted the landscape. During this period, about 80% of all Australian clearing occurred in Queensland, however the sheer scale of tree clearing is staggering, with a cumulative total of 8.6 million hectares cleared in the 20 year period. This equates to an area of 293km x 293km, as shown diagrammatically in figure 4. Approximately 40% of this amount is re-clearing. In some cases, regrowth is cleared as regularly as every 3-6 years.

Building on the SLATS data, the Environmental Protection Agency publish Remnant Vegetation in Queensland (Accad et al., 2008) and associated Regional Ecosystem maps detailing the state of Queensland ecosystems, and categorising their conservation status. Clearing of endangered ecosystems and broadscale clearing of remnant (pre-European) vegetation is now unlawful under new laws, with certain exceptions, most notably clearing for livestock fodder.
Over this 20 year period, major clearing activity occurred in the Brigalow Belt, then moved north to the Desert Uplands, then west into the Mulga biogeographical region, reflecting expansion of grazing into less productive pastures more susceptible to soil degradation and biodiversity loss (McKeon et al., 2004). What is most notable in this report is the purpose for clearing: fully 91% of this tree clearing was to grow pasture for livestock. These trees are mostly "pulled" by chain drawn between large bulldozers, and left on the ground or pushed into large piles and burnt. Less than 2% of trees cleared were used for timber (DERM, 2009).

New vegetation laws that came into effect in late 2006 have substantially reduced this clearing, however in 2007-2008, under the full protection of these laws, the clearing rate was still 123,000 ha/year, or an area of 35km x 35km each year (DERM, 2009).

While government efforts to control tree clearing are laudable, to continue to allow tree clearing on this scale is disastrous, knowing its impact on loss of plant and animal species, climate change and soil degradation and loss, as described below. Of course, knowing that the driver for this clearing is predominantly livestock grazing, this gives consumers strong leverage to halt the destruction simply by their food choices.

Accompanying the SLATS report was the first Queensland government report on potentially illegal clearing (DERM, 2010). It found that of the 123,000ha/year cleared in 2007-2008, an amount of 12,500ha/year was unexplained clearing of remnant (old growth) vegetation. This was not cleared...
under permit, and is potentially illegal. Although this figure is small when compared to past clearing, it is still about two and a half times greater than all the tree planting in Australia, as described below.

**Tree planting in Australia**

A study by the Australian Conservation Foundation (ACF, 2010) into the extent of tree planting programs noted the lack of information on large government funded programs such as the National Heritage Trust and Caring for our Country and complexities with agencies reporting numbers of trees planted rather than areas of plantings. Despite this, ACF found that a best estimate of all tree planting programs amounted to 5,000ha/year.

It is nonsensical that combined tree planting for land restoration, for soil stability, for riparian revegetation, for nature refuges, and offsets for carbon sequestration (such as Greenfleet planting), add up to just 4% of the recently reduced tree clearing in Queensland! In other words, people who pay for trees planted to offset flight emissions, but who continue to support the industry responsible for tree clearing (livestock production), are cancelling any benefit. Likewise, those willing volunteers who plant trees but still consume meat are (perhaps unknowingly) participating in a cruel irony.

**Biodiversity loss, extinctions and endangered species**

Recognising the critical importance of biodiversity to our way of life, the Caring for our Country Business Plan (NRM, 2010 p. 4) states that:

> Australia’s natural environment — the life in our rivers, lands and seas — is fundamental to our economy, well-being and national identity. Our natural environment provides the basis for our ability to support human life.

The Plan then goes on to deliver a stern warning:

> Australia’s natural environment is in decline. We have suffered the largest decline in biodiversity of any continent over the past 200 years and our rate of decline remains one of the highest in the world. (p. 4)

In the government’s 2008 Assessment of Australia’s Terrestrial Biodiversity report among the biggest threats to biodiversity identified were land use change and grazing pressures. The report established a clear correlation between threatened ecosystems and cleared land. Aquatic biodiversity such as catchments and riverines are also affected by land clearing creating unhealthy wetland ecosystems through the substantial reduction or absence of native flora and fauna. In Queensland pressures from animal grazing and land use change are a great threat to biodiversity.

Indeed grazing pressures are a major hazard to biodiversity across the entire Australian landscape. Over 60% of Australia’s landmass is used for livestock and pastures. Animal grazing is responsible for:

> the direct removal of some species; changes in the relative proportions and mixtures of species in ecosystems such as grasslands, shrublands and woodlands; alteration to habitat in mid and lower storeys of forests and grasslands; altered fire regimes; and impacts on soil structure and water infiltration. (DEWHA, 2009, p. 186)

Heavy and prolonged grazing further causes biodiversity loss through land degradation exposing the topsoil. This is further exacerbated by rains or windstorms causing severe soil and watercourse erosion, removing important nutrients from the soil’s upper layers.
In a special report by the Cooperative Research Centre for Tropical Rainforest Ecology and Management (CRCTREM) (2004) the authors stated, “clearing of natural vegetation exacerbates greenhouse gas build-up and reduces the resilience of the landscape to effects of climate change” (p. 11). They advised putting an end to widespread clearing of vegetation in order to minimise the impacts of climate change on biodiversity. In fact the clearing of native vegetation has impacted the variability of rainfall. There has been an obvious decline in average summer rainfall in coastal Queensland as well as New South Wales and southwest West Australia since the 1950s due to clearing (Deo et al., 2009B). Rainfall variability is another threat to biodiversity conservation.

Intensive factory farms are clearly not a solution to reduce grazing land as they only exacerbate the environmental problems. And of course there are the obvious animal welfare issues associated with factory farming. The FAO (2006) considers the agriculture sector in all its forms as one of top most substantial contributors to the most serious environmental problems, from local to global levels.

While the Australian government encourages the various land-holder tenures to establish and conserve biodiversity through a range of incentives (DEWHA, 2009), as most of these properties are for land grazing, the most effective way to enable land-holders to promote biodiversity is to reduce the demand for livestock, thus freeing up over 60% of our country to replenish and regrow its natural vegetation.

**Soil salinity**

Another environmentally detrimental effect arising from large-scale clearing of native vegetation is soil salinity. Through the broadscale clearing of trees less water can be removed from the ground thus building up and eventually making its way to the surface bringing with it salts from the soil (Brough, 2007).

The Australian and New Zealand Environment and Conservation Council (ANZECC) (2001) examined the effects of salinity on biodiversity and found that not only agricultural lands have been affected but wetlands, riparian zones and other natural ecosystems have also become victims of salinity. The consequences of this is devastating to our natural environment because as more vegetation declines or dies from salinity effects, the more the salts from ground water tables will rise causing further problems to our ecosystems. One of ANZECCs (2001) major conclusions was that “salinity problems confronting vast areas of Australia are directly linked with the extensive clearance of native vegetation, past and present” (p. 6).

In Queensland, land affected by salinity was in the vicinity of 48 000 hectares in 2000. In 2002 the area of saline land rose to 107 000 Ha (Brough, 2007). Brough (2007) predicts that if immediate action is not taken to reverse the rising water table about 3.1 million hectares of land in Queensland will be devastated by salinity by 2050. He recommends the planting of deep-rooted native trees as one of the urgent actions to address the salinity problem.

**Climate change impact**

McAlpine et al. (2007), Syktus et al. (2007) and Deo et al. (2009A) showed that deforestation in Queensland and other parts of our nation has changed the regional climate, making droughts longer, hotter and drier. Their climate modelling found that land clearing may be having a similar impact on the drought as greenhouse gases.
Agricultural expansion through deforestation has led to practically bare landscapes with less than 10% of the original native vegetation gravely impacting biodiversity and severely altering geophysical processes (McAlpine et al., 2009B). In Western Australia, Pitman et al. (2004) found that land cover change has made the south west significantly hotter and drier, having a greater influence than global climate change patterns.

Changes to the earth’s land cover have significant impact on the climate. They alter land surface properties like albedo, leaf area index, vegetation fraction and stomatal resistance all of which are vital in climatic processes between ecosystems and the biosphere such as evaporation and transpiration (Deo et al., 2009B) also referred to as biogeoophysical reactions. Land use and land cover changes also have biogeochemical impacts namely through the release of the trace gases carbon dioxide (CO2) and methane (CH4) into the atmosphere.

Cattle and sheep in particular also contribute greatly to greenhouse gases through enteric fermentation releasing large amounts of methane, due to their vast population sizes, and release nitrous oxide (N2O) through manure production. Russell (2009) calculated that the methane emissions from enteric fermentation far exceed the carbon dioxide emissions from all our coal-fired power stations combined. (Livestock 216 Mt CO2-e > Coal Stations 180 Mt CO2).

Furthermore, a 2009 study by World Bank environmental specialists revealed that the global amount of greenhouse gases emitted from the livestock sector has been severely underestimated. Goodland and Anhang (2009) calculated that livestock and their by-products account for at least 32.6 billion tons of carbon dioxide equivalent each year, or 51 percent of annual worldwide greenhouse gas emissions. Based on their analysis, the authors recommend an essential and immediate decrease in meat consumption in order to help slow climate change.

**Land degradation**

Another consequential impact of tree clearing and continuous farming on global warming is the loss of topsoil, which has been accelerating. Erosion and loss of topsoil means the removal of organic matter and that not only means depletion of soil nutrients vital for growing healthy plants but also signifies it’s losing its ability to capture carbon (Adams, 2009). Soils are the world’s greatest carbon store, and Australian soils have seen long term decline in soil carbon, largely due to grazing pressure (McKeon et al., 2004).

Many people are still not aware of the enormous impact meat consumption is having on the environment. In 1950 world meat consumption was 47 million tonnes; in 2005 meat consumption rose to an incredible 260 million tonnes (Brown, 2006). That’s more than five-fold the amount consumed since 1950, in a time where the human population merely doubled.

In the notable paper by McAlpine et al. (2009B), the authors proposed four vital policies to mitigate the environmental and climate impacts of animal agriculture:

1. halt subsidies on meat production and stop promoting meat consumption
2. control soybean crops and grazing
3. protect and restore regrowth forests in grazing lands
4. allocate resources to less environmentally damaging alternative land uses
**Population pressure - not human, but livestock**

For every person in Australia, there are 1.4 cattle, 5 sheep, 25 chickens and various other livestock (DAFF, 2009). This huge population of livestock is largely hidden from urban dwellers, but a comical and frightening picture is painted if every person on a busy city street was accompanied by their share of cattle, sheep, chickens, pigs etc. Now that would be traffic chaos!

Those of us who believe that human overpopulation is responsible for our global environmental crisis would be astounded by the 56 billion livestock that we breed and slaughter annually for our consumption (FAO, 2008). Of course, the food value of these animals could easily be replaced by plant foods, given the very inefficient process whereby 15-20 kg of grain feed produces 1 kg of meat (Gold, 2004). Indeed, 33% of the world’s arable land is used for producing feed for livestock and 90% of the global soybean crops serve as animal fodder, not food for humans (FAO, 2006).

Additionally, the World Health Organisation (WHO) (2002) reported that one third of the world’s people place an “undue demand on land, water, and other resources required for intensive food production, which makes the typical Western diet not only undesirable from the standpoint of health but also environmentally unsustainable” (p. 14). Thus, WHO (2002) recommend that people eat mostly plant-based foods rich in fruits, vegetables, pulses and legumes, and minimally processed starchy foods.

**Learning from history**

Our impact on the Australian ecosphere is all too clear. Although we initially cleared this land with the best intentions, we know now that this clearing is responsible for massive species loss, climate change, more severe droughts, floods and bushfires, land degradation, soil loss and water pollution (Deo et al., 2009B; ACF, 2010; ACLUMP, 2009; McAlpine et al., 2009B).

Since 2007 the Queensland Vegetation Management and Other Legislation Amendment Act has reduced tree clearing significantly, but rates of clearing remain far too high and replanting programs too little to stop the environmental debt we are creating (ACF, 2010). Thankfully, we do not need to rely on governments to solve this problem, because each of us has the power to reduce the ecological debt simply by our food choices (McAlpine et al., 2009B).

What this means for livestock farmers is that a decrease in consumer demand for animal food products will generate higher demand and consumption for vegetable foods, creating jobs in other sectors of the production cycle, providing opportunities to move into different areas of agriculture (Goodland et al., 2009). Furthermore, if government reduces its subsidies on livestock farming this would not only help bring down the demand for animal products, because consumers will have to pay an amount closer to the *real* cost of livestock products, but the remaining funds could be used to assist farmers with transitioning into more sustainable, greener practices.

At present, 70% of Australian beef is exported, making Australia one of the top beef exporters. If domestic demand were to fall without corresponding international demand falling, this would not have the desired ecological impact. Although we are a small nation, we punch above our weight internationally, and our lead in this would give a strong example to other nations. As in all global issues, there must be a global solution, but we must start by clearing up our own backyard, in line with the axiom "Think Globally, Act Locally".
This solution may appear simplistic, but it would have far-reaching effects. Ceasing livestock consumption and production in Australia would:

- stop 200,000 ha of tree clearing each year (DERM, 2009; DCC, 2009);
- encourage native vegetation re-growth over 64% of Australia (ACLUMP, 2009);
- slow, and ultimately reverse, species and biodiversity loss (DEWHA, 2009; McKeon et al., 2004);
- reverse regional climate change (McAlpine et al., 2007);
- reduce Australia's greenhouse emissions by at least 30% (Foran et al., 2005);
- halt soil degradation and loss (FAO, 2006); and
- make us all healthier too! (Russell, 2009).

References


Education for Sustainability in Schools: The flow on effects to health and well-being

Louise Cooke & Simon Leonard

Faculty of Education, University of Canberra

Abstract

Sustainability is an important issue for 21st century society but Education for Sustainability remains a peripheral activity in schools dealing with a heavily crowded curriculum. Indications from schools where Education for Sustainability has been successfully implemented through the Australian Sustainable Schools Initiative (AuSSI) are that Education for Sustainability programs also make a significant contribution to the health and well being of the students, staff and general community of the schools. The evidence reported here suggests that greater analysis of a connection between Education for Sustainability and the indicators of strong social capital may give Education for Sustainability a greater priority in the crowded curriculum.

Introduction

Education for Sustainability (EFS), evolving from environmental education, has been part of Australian primary school education for the past three decades, although typically in an ad hoc and often isolated manner. More recently, sustainability education in many schools has become more organised and more holistic through participation in the Australian Sustainable Schools Initiative (AuSSI). AuSSI is a partnership between the Commonwealth and State/Territory governments that seeks to support schools and their communities to become sustainable. The initiative takes a whole-of-school approach to explore, through real-life learning experiences, the improvements that can be made in a school’s management of resources and facilities including energy, waste, water, biodiversity, landscape design, and use of products and materials. In the Australian Capital Territory (ACT), the program is run from the Department of Environment, Climate Change, Energy and Water with officers providing consultation, assessment, training and mentoring to participating schools. The AuSSI encourages schools to incorporate EFS themes into school operations, curricula teaching and learning, the surrounding landscape, and relationships internally and with the broader community. (Davis, 2009; Department of Territories and Municipal Services, 2007; Department of Environment and Heritage, 2005).

AuSSI schools engage in a process of continual improvement around a set of indicators focusing on whole school participation, partnerships, reduced consumption of resources and embedding sustainable actions into the schools’ curriculum and overall ways of working (Department of Territories and Municipal Services, 2007). Being an AuSSI school requires long term commitment and consequently schools are encouraged to move through areas of change over time. Integrated into this process is a certification system which provides schools with a framework for working through each action area.

The AuSSI program has been quite successful in the ACT, both from a learning perspective and in terms of improvements to school resource management. In addition, participants in the program have reported an apparent improvement in the health and well-being of the school community. The analysis presented here explores this possibility through comparing observations of and reports on the AuSSI program with relevant literature in health development.
Methodology

While participating in AuSSI activities, the first author realised that when teachers were talking informally about the AuSSI process, they were not talking about resource management, they were talking about improvements in student connectedness, in community participation and in student participation in decision making. In short, they were describing health and well-being development practices in action, so she started making notes of these conversations in her diary. This paper presents a comparison of these observations with the available literature on health and well-being in order to draw conclusions on how a program based in resource management may also be contributing to health and well-being outcomes within participating schools. The analysis is intended to be descriptive and is supported by information from the ACT AuSSI evaluation reports (Sustainable Schools ACT, 2007a, 2007b).

Discussion

Health and well-being can be broadly defined, but the Australian Indigenous perspective that sees it as the ‘integrity and harmony of the inter-relation of all those things that constitute Aboriginal peoples' life ways’ (NACCHO, 1993) is instructive:

> Health is holistic, encompassing mental health and physical, cultural, and spiritual health. Land is central to well-being. This holistic concept does not merely refer to the ‘whole body’ but in fact is steeped in the harmonised interrelations which constitute cultural well-being. These inter-relating factors can be categorised largely as spiritual, environmental, ideological, political, social, economic, mental and physical (Swan and Raphael, 1995).

A holistic approach to health highlights the importance of elements such as social capital, self-determination, empowerment and connectedness.

Schools have a great capacity to promote this holistic idea of health within their communities. Schools are built environments that promote social interaction and participation and provide space for the development of social networks, social support, a sense of community, community cohesion and competence, and senses of place. Through this, schools offer a rich opportunity to develop social capital, a ‘focus on networks between people that trust and then lead to cooperation and beneficial outcomes’ (Baum, 2008 pg. 500). Social networks, social support and social capital are all important determinants of community mental well-being (Butterworth, 2000) and schools seem an obvious place to develop them all.

The AuSSI appears to offer an opportunity to better realise the social capital potential of schools with its focus on partnerships and networks. Indeed, the signs of strong social capital such as robust social networks, strong community based resources and a commitment to respectful and reciprocal relationships with both nature and each other (Putland et al, 2009) are all regularly reported in evaluations of EFS programs nationally and internationally (Cutter-Mackenzie, 2010; Jackson, 2008; Ozer, 2007; Gough 2004). Evaluations have also found that successful sustainable schools typically show a shared or distributed leadership with collective responsibility for sustainability activities shared between teachers, students and the broader school community (Cutter-Mackenzie, 2010; Jackson, 2008; Ozer, 2007; Larri 2006). In conversations with the authors, ACT teachers have reported that schools that have engaged with and have developed close links with their local community have achieved greater success in EFS program development. As an example of this, Baker Garden Pre-School in the ACT reported:
In 2007, children, families, and staff at Baker Gardens Preschool discussed becoming a sustainable early childhood environment. We were determined for it to be a whole-of-school approach, so the school community was actively involved from the start (Sustainable Schools ACT, 2007a).

As such, EFS programs including AuSSI have proved successful in providing a focus for social capital building by rallying the community to identify, mobilise and address issues of sustainability and to cultivate the transfer of knowledge, skills, systems and resources that affect and benefit the community. EFS appears to turn the potential of schools to form community networks into actual and active communities of practice and action.

Another indicator of well-being being enlisted by AuSSI is that of self-determination, a central idea in social justice and closely connected to community health (Ifé and Tesoriero, 2006). Anecdotal evidence in conversations between staff from schools in the AuSSI program and the first author while involved in a project with the ACT Sustainable Schools indicates observance of high levels of confidence and pride in, as well as ownership of, school sustainability activities. At Hawker Primary School, for example, they have learned:

A Leadership Program is an ideal way to undertake environmental education programs. Not only are students becoming advocates for the environment but also supporting the Values for Australian Schooling (Sustainable Schools ACT, 2007b).

School staff also reported an awareness of increased participation from parents/carers and extended family and talk of increased cohesion and harmony within the school. Teachers’ described a growing culture which values all relationships with and between all living things: plants, animals, and people. They were also highly aware of the extension of school based activities into the home environment, including the uptake in home vegetable gardens, greater awareness of the need to recycle, and using energy and water more efficiently by such things as turning appliances and lights off when not in use, and taking shorter showers. Teachers’ commented on seeing students exhibiting a greater level of self-regulation and leadership in sustainable living, and felt this led to greater levels of social connection between the students. While anecdotal, these reports provide a strong indication of the potential of sustainability programs within schools and are evidence that they are at least having an impact on teachers’ perceptions. They are certainly worthy of further investigation.

There are other sustainability concepts that will logically support the growth, development and empowerment of students and the broader school community. Affirmative action, participatory democracy and genuine partnering are established sustainability practices (Verrinder, 2005) that compliment other growing school approaches such as restorative justice programs. The embedding of these values can be seen in their incorporation into significant drivers of policy and practice. For example, schools that have been in the AuSSI program for some years are now incorporating sustainability indicators into staff professional pathways and development opportunities. They are also actively workshopping the curriculum with their community to adapt it to suit their local environment. In doing so, they are both building on the skills, knowledges and values of the staff and the wider school community, and asking the extended school community to have a stake in, and a responsibility for, the activities and curriculum of the school.

Greater levels of student connectedness to both the natural and social environment were also highlighted by ACT teachers. This is consistent with research showing that students engaged in the natural world tend to demonstrate a better understanding of the life cycle and through that understanding are more considerate of living things (West-Burnham & Huws Jones 2007). EFS activities were also seen to encourage partnerships with other groups, organisations and communities beyond the school to share and learn about sustainable ways of living. This approach was seen by
teachers as fostering a sense of communal learning where everyone is both a teacher and a learner. Similar findings are being reported in the international literature:

> Caring for oneself, for each other and for the environment are some of the values at the heart of sustainable development and provide a meaningful context for young peoples’ social and emotional development. Many young people are enthusiastic and imaginative in their responses to global and local environmental challenges, and can contribute to the solutions through volunteering opportunities and community based activities like food growing, environmental regeneration, provision of green space and tackling climate change (SDC, 2007 pg. 32).

The fundamental respect of peoples' different knowledges that is embedded in sustainability principles should support a sense of connectedness. In schools this is realised within the curriculum by providing alternative opportunities for success not always recognised in traditional pedagogies. This seems to be benefiting students through increased sense of self, trust, connectedness and responsibility. Students are experiencing an increased sense of belonging in these places they spend so much time, potentially replacing or excluding feelings of alienation and unhappiness (Moore & Wong 1997). Goodman and Jelmberg (2008) found that experiential, action based learning in meaningful contexts helped many students grasp concepts and facts that can be lost through other forms of learning, and that outdoor learning has a tendency to remain embedded in the student's memory. These pedagogies also lead to improved self-efficacy which Goodman and Jelmberg (2008) explain in this context as giving students multiple opportunities for success or failure in a non-competitive environment; developing experience based scaffolding for student knowledge and skill acquisition (Vygotsky, 1978); and believing that the only failure is non-attempt or non-participation.

In conversation, ACT teachers reported that the AuSSI provides opportunities for students to work with other students who they would ordinarily not have the opportunity to get to know, giving rise to extended networks of friendships, some transcending age barriers. The feeling of belonging, and having a valued place in the school community and knowing that one has friendships and supportive networks are important factors influencing mental health and wellbeing. Given all this, it is not surprising that the same teachers are also reporting that student absences have declined, behaviour has improved, vandalism rates have reduced, there is a positive work ethic, and homework quality has improved with a growing sense of purpose and enthusiasm for supplementary learning. Again it is recognised that this is just anecdotal evidence worthy of more robust analysis. Even as anecdotal reports, however, it is a strong indicator that teachers are feeling less stressed in their work environment. These anecdotes are also consistent with EFS school based literature which identifies that EFS has the potential for significant health and well-being benefits in the school setting (Jackson 2008; Ozer 2007; Larri, 2006; Maller 2005; Dyment 2005, Gould League).

**Conclusion**

The discussion above gives a clear indication that when EFS frameworks such as the AuSSI are implemented in a real and substantial manner, is likely to lead to improvements in social capital, self-determination, empowerment and connectedness, and that these improvements are being seen by teachers and those evaluating the program even though they are not explicitly part of the program objectives.

The connections and observations reported here are largely anecdotal and more robust research is required. One fruitful area for investigation will be to explore how leading schools have managed to embed sustainability principles in the policies, procedures, curriculum, signage, shared vision and values of their school, as opposed to simply implementing ‘another policy’. Another will be assessing measures of social capital and social ties in relation to available school data on well being
including playground incidences (fights, bullying, accidents etc), levels of absenteeism, staff sick leave rates, suspensions, community events, community networks, and fund raising activities.

EFS should be a hugely important priority for our society but can easily become just another one of many competing priorities in school curriculum and practice. With further research, the indications found in the ACT AuSSI that EFS actively enhances student and staff well-being may assist in highlighting its importance and lead to a greater investment in EFS programs both in the ACT and in other jurisdictions.

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Preservice teachers’ perceptions of sustainability as ‘professional practice’

Dr. Ruth Hickey, Dr. Hilary Whitehouse and Ms Snowy Evans

School of Education, James Cook University, Queensland

Abstract

Preservice teachers in the School of Education, James Cook University are provided with productive opportunities to develop beliefs, values and practices about sustainability at different points in their education program. Education for sustainability is core practice within the recently refreshed teacher education program at the university. Preservice teachers were asked about their conceptions of sustainability, and familiarity with a range of approaches to teach sustainability education. Data were collected through focus groups, in each year of a four-year (Bachelor of Education) and a one-year program (Graduate Diploma of Education). This paper reports on preservice teachers’ familiarity with, and exposure to, a range of approaches that characterize sustainability education, during both on-campus studies and practicum. Their views on the importance of learning how to ‘teach sustainability’ within these approaches are described. Results from this study provide information on preservice teachers’ perceptions of what sustainability means; and the gap between seeing it as important and the extent of opportunities they recognize as contributing to their professional practice as sustainability educators. The paper also explores the confounding effect of preservice teachers’ limited views of what constitutes sustainability education, which can result in the rejection of experiences, which program planners saw as explicitly developing environmentally attentive learning.

Introduction

Australia is in the fortunate position of having a strong suite of national and state educational policy supporting the inclusion of education for sustainability (EfS) in preservice teacher education. The Australian Government’s Department of the Environment and Heritage (2005) publication Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools promotes education for sustainability as “a concept encompassing a vision of education that seeks to empower people of all ages to assume responsibility for creating a sustainable future” (p. 3) and explicitly promotes the inclusion of environmental education in all school curriculum. The Australian Government’s Department of the Environment, Water, Heritage and the Arts (2009) Living Sustainably: National Action Plan for Education for Sustainability specifically identifies teacher education as a “key profession” for sustainability (p. 23) and that, ideally, EfS be “integrated into all university courses/subjects areas” (p. 21). In Australia, all teacher education takes place at universities, and what happens within schools and faculties of education strongly influences teacher professional practices. Teacher education can be seen as a systemic leverage point for promotion and implementation of sustainability (see Ferreira, Ryan & Tilbury, 2006; Steele, 2010).

EfS in teacher education at James Cook University

The value of including EfS in teacher preparation has been recognised at James Cook University’s (JCU) School of Education. Since 2001, an elective subject covering contemporary approaches to environmental education with an emphasis on the Australian tropics has been run as a fourth year elective. There are other opportunities for preservice teachers to engage with EfS in the Science, Studies of Society and the Environment, and Technology curriculum; in pedagogical subjects where the lecturer has knowledge and interest (Gooch, Rigano, Hickey & Fien, 2008; Hickey & Whitehouse, 2010); and in a cross-faculty Masters of Education for Sustainability. The one-year Graduate Diploma of Education offers rich engagement with EfS in second semester through a local
wetland restoration project that combines information communication technologies with community wetland education (Hickey, 2009).

In 2008, School of Education staff on the Cairns campus participated in the Australian Research Institute in Education for Sustainability (ARIES) and Commonwealth Government supported pilot project (Ferreira, et al., 2009, p. 27) called Investigating Queensland Educating for Sustainability in Teacher Education (IQuEST). Ferreira et al. (2009) argue that moving EfS from the margins to the centre in schools will “not be achieved without the preparation of teachers for this task” and report that, “in seeking to mainstream sustainability into preservice teacher education in Queensland it becomes clear that one needs to build capacity for change” particularly in terms of developing “knowledge of education for sustainability, conceptual skills in systemic thinking … and organizational change and leadership skills” (p.1). Involvement in IQuEST refined our understanding of how teacher educators in Australian universities can do more to effectively support environmentally attentive learning across educational systems.

Coincident with our participation in IQuEST, a curriculum refresh process was instigated by the Vice Chancellor, and academics were asked to find ways of re-engaging with tropically focused teaching and learning. In the School of Education, a decision was made to engage with EfS and Indigenous perspectives as foci for our teacher education program. A core subject Foundations of Sustainability in Education will be introduced for first-year students in 2010. The subject explores topics related to climate change, energy, water, biodiversity, agriculture, and population health with the intention of engaging intending teachers in aspects of systemic and critical thinking, problem solving, active citizenship and community educational partnerships. Consolidating this foundation, a final-year subject Service Learning for Sustainable Futures will have preservice teachers participate in learning partnerships projects within schools and classrooms and with local and state community agencies, industry and business. Such curriculum innovations pay attention to the nation-wide education sector’s need for education graduates with sustainability knowledges and skills. The Australian Curriculum’s (ACARA, 2009) selection of “sustainability” as a “unifying idea” (p. 9) with “ecological sustainability” as part of “contemporary science” (p. 5) indicates that sustainability can no longer be ignored by the school education sector, and therefore, needs much greater attention in the university education sector.

Preservice teacher professional practice

One effect of our participation in both IQuEST and the concurrent curriculum refresh was the realisation we had little knowledge of how education students, as preservice teachers, actually experienced EfS in terms of their professional development as future teachers. We didn’t know whether preservice teachers recognised the EfS learning opportunities presented in our programs. And we were also concerned that, in Shephard’s (2010, p.14) words, “graduates may know much about sustainability and possess many of the skills needed … but, unless they choose to put this knowledge and these skills to sustainable ends, their education (for sustainability) will have in some sense failed.”

Our paper reports on an exploratory research project conducted with preservice teachers in 2009. The findings provide insights into professional practice in EfS, and suggest directions for further research and strategic change in our program offerings. We are fortunate in that we researched preservice teachers’ perceptions of EfS not from a position of curriculum deficit, but within a context of increasing curriculum and pedagogical emphasis on EfS.
Given the emerging need for graduate teachers with knowledge of, and skills in, EfS our analysis specifically looks for indicators of preservice teachers’ professional practice. Our use of the term professional practice refers educators’ intentions, actions and curriculum delivery. It includes planning lesson sequences, assessing student learning, maintaining productive collegial relationships, and enacting education policy. This last point is important. In Queensland there is a raft of national, state and organisational policy supporting the implementation of EfS in schools. Therefore, we argue, EfS can be included as part of professional practice. Preservice teachers’ professional practice develops though a combination of both on-campus and practicum experiences. We see professional practice as an expression of professional identity (Hickey & Taylor, 2010). Once preservice teachers graduate, they will refine their existing professional practice into a full professional identity. Ideally, graduate teachers’ professional identity will include an understanding of, and a willingness to engage in, EfS.

Research questions and method

The research purpose was to describe preservice teachers’ understandings and experiences of EfS in their on-campus program and (off-campus) practicum. The scope of the project is within Bachelor of Education (BEd) and the Graduate Diploma of Education (GradDipEd) at the School of Education at JCU’s campuses in Cairns and Townsville.

There were three research questions:

1. What opportunities do preservice teachers recognise, from their on-campus and practicum, to learn about environmental matters, to take action for an environmental matter, or to experience education in natural environments, such as rainforests, reefs, mangroves and urban conservation zones?

2. What beliefs and values are held by preservice teachers about EfS, and what do they see as the impact of these on their professional practice?

3. How important do preservice teachers regard learning how to “teach sustainability”?

Data were participants’ responses, based on self-reported experiences, observations or reflections, which were categorised to reflect the extent to which they recognised EfS during on-campus or practicum placements. Extracts from responses are used as qualitative data to illustrate the range of responses.

The research method used focus groups, each of 1-6 members, of 30 volunteer preservice teachers who were recruited through invitation at lectures and follow-up emailed invitation. Richer data were obtained through groups, when participants could comment, clarify, inter-act, and reflect at length, than could be obtained by a larger sample, using written surveys. Volunteers were organised into groups within their year of study (e.g., all first year). Groups represented each year of the four-year BEd at both campuses, and the Cairns’ one-year GradDipEd. Groups met during mid-year 2009 with a researcher, who conducted the sessions. Higher rates of participation for Cairns were due to recruitment difficulties in Townsville. Groups represented between 2% and 7% of the internal enrolment for each cohort.
Participant welfare dictated that focus groups were voluntary, not linked to assessment, were confidential, and all responses de-identified. Sessions were audio-taped and transcribed. At the start of each 30 minute session, participants wrote notes about their experiences in sustainability education. The researcher then encouraged discussion on these notes, and of the terms *sustainability* and *environmental education for sustainability* as an orientation activity. Participants then engaged in a group discussion about their experiences. Further questions stimulated critical reflection of preservice teachers’ experiences to identify their recollection of opportunities to engage with sustainability education, during on-campus and during practicum. A set of posters showing images of three approaches to teaching EFS was used as stimulus material:

- *About* environmental matters (e.g., images of students listening to a teacher, a school bulletin board) focusing on building knowledge, awareness, and understanding of sustainability issues.
- Experiential activities *in* natural environments or outside *in* school grounds (e.g., images of water quality testing and local creek studies) was taken to mean having experiences outside the classroom. We reproduce the category *in* for consistency with established literature which holds that outdoor learning experiences constitute being *in* an ecological environment.
- *For* environmental matters (e.g., images of students planting trees, using recycling bins) means taking action at school. This includes promotion and participation of recycling, reduction and reuse regimes, gardening and biodiversity conservation, and community outreach, where there is evidence of systemic thinking about the complexity of socio-environmental matters beyond the school fence.

We understand these three approaches, *about*, *in* and *for* (Lucas, 1979; Linke, 1980; Gough, 1997; Australian Government, 2005) are now seen as somewhat mechanistic, but they do provide a relatively clear way of describing approaches to EFS delivered across complex programs on two campuses, and we saw these categories as serviceable for our reflections on program quality.

**Results**

Results are presented in three sections. The first identifies participants’ perceptions of opportunities to develop EFS as professional practice. The second focuses on participants’ views of EFS and how these views impact on professional practices; the third reports on their sense of the importance of EFS for their professional practice. To assist interpretation, categories are ordered by similarity, as well as magnitude, shown in a series of tables.

**Opportunity to develop professional practice in EFS**

Participants were asked to recall their exposure EFS and whether they were provided with opportunities to develop EFS as professional practice. Exposure was differentiated into the contributory elements of on-campus lectures/tutorials, or (off-campus) practicum. Analysis of transcripts resulted in nine categories (see Table 2) reflecting the three *about*, *in* and *for* approaches.
When reflecting on university experiences, 57% of participants could not recall an opportunity, were unsure of their exposure to EfS, or their response was unclear. Thirty percent of participants reported opportunities to learn about environmental matters, with fewer (13%) reporting combinations of about, in and for approaches.

When considering practicum, 40% provided no recognised experiences (26%) or no experiences (14%). The balance of 60% of participants, recognised EfS experiences as sole or combinations of about, in and for; however, this was typically limited to about environmental matters.

Table 2
Reported opportunity to develop EfS as professional practice

<table>
<thead>
<tr>
<th>Category</th>
<th>On-campus Number (30)</th>
<th>On-campus Percent</th>
<th>Practicum Number (30)</th>
<th>Practicum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unclear/unsure</td>
<td>8</td>
<td>27</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>None</td>
<td>9</td>
<td>30</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>About</td>
<td>9</td>
<td>30</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>In</td>
<td>3</td>
<td>10</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>For</td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>About &amp; In</td>
<td>4</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>About &amp; For</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For &amp; In</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>About, For, In</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note. An empty cell denotes no responses.*

Overall, results (Table 2) suggest a strong sense of participants’ unfamiliarity with EfS as professional practice. Typically, preservice teachers appeared unsure, or unable to identify whether they had experienced EfS either on-campus or during practicum, or recalled no exposure at all. When participants did recognise opportunities, they reported consistently higher levels of exposure to EfS which was limited to the about approach. Opportunities to develop a broader understanding and appreciation of EfS through combinations of the three approaches (i.e., about, in and for) were located to practicum, with fewer occasions identified during on-campus education studies.

**Opportunity to change professional practice in EfS**

Participants were asked to consider whether any of their experiences (on-campus or during practicum) had changed their professional practice about EfS. This was analysed as two aspects: a focus on the way they are *thinking* about EfS (i.e., perceived changes in views and/or beliefs) and the way they are *teaching* (i.e., perceived changes in their inclusion of content or learning activities when planning lessons and units of work).

Analysis of transcripts resulted in six categories (see Table 3) for the thinking aspect. Less than half (43%) reported that they were unsure, or recognised no change in their thinking about EfS. Over half the participants (57%) reported changes in their way of thinking. Some changes related mostly to personal views about sustainability. For example, one student remarked, “It’s changed my perceptions because it’s making me consider what I’m wasting at home. It’s making me think ‘don’t put that in the bin because it should really be recycled’ whereas before I used to think ‘whatever’.” Other students identified changes in ways of thinking about social responsibility, for example,
“There is more social awareness of [sustainability] therefore we have to be more socially responsible in our choices.”

One participant explained a change in thinking, that related more to her professional practice as she could more clearly see how EfS “could be integrated” across the whole curriculum. There was evidence of a realisation of the potential impact teachers and education can have. As one participant explained, “I never realised how much impact teaching has on our whole society. It’s all filtered through the education system”. A fellow participant extended, “You are filtering everything they [governments] want you to, to the future society.”

Table 3

<table>
<thead>
<tr>
<th>Category</th>
<th>Thinking</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
<td>Percent</td>
<td></td>
</tr>
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<td>---------------------------------</td>
<td>----------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Unclear/unsure</td>
<td>7</td>
<td>23</td>
<td>6</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>No change</td>
<td>6</td>
<td>20</td>
<td>6</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Raised awareness</td>
<td>6</td>
<td>20</td>
<td>11</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Changed profess. views</td>
<td>5</td>
<td>17</td>
<td>11</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Changed personal views</td>
<td>3</td>
<td>10</td>
<td>7</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Changed profess. &amp; personal views</td>
<td>3</td>
<td>10</td>
<td>7</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Changed profess. practice</td>
<td>n/a</td>
<td>n/a</td>
<td>7</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

*Note. An empty cell denotes no responses. n/a indicates responses did not relate to ‘thinking’ changes.*

Participants also reported on changes for the teaching aspect, as a result of exposure to EfS. Analysis of transcripts resulted in four categories (see Table 3).

Forty-percent of participants reported that exposure to EfS has not changed their teaching (i.e., professional practices), or were uncertain. For some, this was due to a perceived lack of impact from on-campus and/or practicum; however, one reported a history of involvement in community-based EfS activities prior to entry to JCU, was an ardent supporter of EfS, so it was more a case of already being one-hundred percent committed.

Some (37%) reported that exposure to EfS had raised their awareness about the possibilities and potential benefits of integrating EfS. Their reflections were forward-looking, taking into consideration that they may only have had limited practicum opportunities (e.g., first-years at the time, had only one week in one school). One expressed eagerness to integrate EfS in her future teaching practices, saying, “I think I would like to do a whole term focusing on sustainability.” Another commented that, “I think I’d also try to model being a good environmental citizen. Make sure I’m recycling in the classroom and use pencils right up–until they are tiny.”

A smaller number (23%) reported they had changed their professional practice as a result of experiences of EfS. One captured the essence of this: “Once you have [EfS] brought to your attention and you start looking into it and start thinking, then I saw it as being really important part of my role [as a teacher].” A few participants connected EfS with the importance of teaching students to be critical thinkers.
Importance of EfS for professional practice

Participants were asked how important it is for preservice teachers to learn how to teach for sustainability. This question relates to preservice teachers’ perceptions of the value and place of EfS in curriculum. Analysis of transcripts resulted in three categories (see Table 4).

Table 4
Perceived importance to ‘teach for sustainability’

<table>
<thead>
<tr>
<th>Category</th>
<th>Number (30)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unclear/unsure</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Important</td>
<td>23</td>
<td>76</td>
</tr>
<tr>
<td>Integral</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

The majority of participants (76%) viewed EfS as an important component of being a teacher. For some, EfS was rationalised as valuable in terms of employability. For example, one participant commented that learning how to teach sustainability is “especially [important] if the school you’re planning to teach in is really big on that [sustainability] issue – if you are not up to their standard, then that’s a problem for you. Similarly, Education Queensland [a major employer] are pushing it so if we turn up to our interview and they ask ‘What is something you have taught on sustainability?’ and we go ‘I have no idea …!’”

For two participants (7%) the value of EfS was integral and pre-existing, as something that preservice teachers should know how to teach. As one explained, “It’s a natural thing. As a teacher, they are the values you have anyway. So you would teach those values because you wouldn’t have your kids throw rubbish all over the floor.”

Discussion

Our research describes the recollections of a sample of volunteer preservice teachers, about their views of the importance of EfS, the extent to which they recognised teaching for sustainability as part of their experiences, and how EfS related to their professional practice. All points raised in our discussion should be tempered by consideration that views and experiences of volunteer participants may not represent those of the cohort, and are indicative of recollected experiences rather than observations of practice. Our small study supports our institution’s organisational “capacity for change” through reflection on practice (Ferreira, et al, 2009, p. 57).

The need to establish clarity of understanding of EfS

Preservice teachers’ lack of clarity about EfS was a consistent finding. Too many were unsure if they had been exposed to EfS, and too many were not aware of any changes in their professional practice (of thought or action). This indicates that what constitutes education for sustainability may be conceptually diffuse and was not clearly identified in preservice teacher programs at JCU prior to 2010. In the absence of a systematic approach to EfS learning–at university, in schools and between the two–preservice teachers cannot be expected to be clear about EfS in their professional practice.

Problematic too is that when preservice teachers affirmed engagement with EfS, they reflected very limited views of what constitutes EfS. Only low-impact, social actions such as “using the whole pencil”, “picking up rubbish” or “recycling the toner” were mentioned by study participants indicating our teacher education program needs to address the prevalence of simplistic perceptions of EfS. A richer, more informed socio-ecological conception of EfS is likely to be necessary to support...
productive professional practices over the long term. As teacher educators we need to ensure exposure to EfS reflects a systemic approach to teaching and learning which explicitly links ecological and social system understandings. The explicit naming of key subjects in first and fourth year will indicate what can and does constitute EfS in our version of teacher education (though this will differ from other tertiary institutions given JCU’s emphasis on learning for living in tropical environments, which the Vice Chancellor calls living in the torrid zone).

**EfS as a shared experiential partnership between on-campus and practicum**

As shown in this study, preservice teachers more often experienced worthwhile combinations of the three EfS approaches (i.e., about, in and for) during practicum. This suggests that university-based teacher educators should recognise these rich opportunities for preservice teachers to experience EfS, and value these through strategic partnerships.

Since on-campus experiences were typically limited to about environmental matters, these should continue to contribute content knowledge and conceptual growth in this approach. However, enriched on-campus experiences will allow preservice teachers to develop professional practice about, in and for EfS. These guaranteed opportunities could include: organised site-visits to environmental education centres and exemplar EfS schools; active citizenship by involvement in university-based sustainability initiatives that require student participation; citizen science (Jenkins, 1999) through site restoration or on-campus species listing with recognised organisations; and through involvement in decision making in school environmental management planning through formal fourth-year internships (Queensland Government, 2010; Government of NSW, 2010).

When exploring ways to develop learning linkages between schools and university, teacher educators should also recognise the non-linear nature of opportunities preservice teachers have to develop professional practice in EfS. During data analysis, it became apparent there was little evidence of a gradual, developmental increase from first-year through final-year in engagement with EfS. This was partly due to wide variations in preservice teachers’ entry-level, for example, one first-year was already very active in community-based EfS; compared to a fourth-year who was unsure of what EfS even entailed. A second contributing factor was the wide range of experiences during practicum: some second-years reported EfS during school placements, while others in final-year could not report any exposure during 100 days of placements.

**Acknowledging cynicism**

Program planners should not underestimate the stringent expectations of preservice teachers as high-demand clients. University experiences have led some to be critical about sustainability and skeptical about teaching sustainability-related issues. A few students rejected as superficial, those same experiences which we saw as explicitly developing environmentally attentive learning. One student, blended personal and professional views, which are likely to result in a negative impact on professional practice:

“Sustainability hasn’t really been explained … I don’t feel like I have done anything towards education for sustainability … at university … I think sustainability is political hypocrisy of western countries, of wealthy people who really don’t understand the implications of what they’re doing. I think the economic and social issues haven’t been thought through and I’m not agreeing with the sustainability approach we’re undertaking. I think it’s misguided and wrong. It has made me not want to have anything to do with [it].”
Building on hopefulness

As a final comment, the majority (83%) of preservice teachers’ in this study demonstrate a high regard of EfS as an important or integral component of their teacher education program. Preservice teachers evidenced a high hope factor—that they can make a difference—through their professional practice. Unfortunately, results indicate a paucity of opportunities for them to develop a rich understanding of EfS as multi-faceted, complementary components of knowledge about EfS, doing EfS in outside the classroom, and undertaking actions for change.

As sustainability educators in the School of Education at JCU, the disparity between preservice teachers’ high hopes and the low reported rate of exposure (3%) to all three approaches (see Table 2) is a salutary starting position from which to consider our hoped-for effects of the curriculum refresh changes. However, with this small study we have set a benchmark that all graduating students can report sufficient exposure to EfS, through on-campus and practicum, so they are confident to convert these hopes into professional practice. We have some work to do yet before future studies will show that EfS responsibility will genuinely be in the repertoire of preservice teachers’ professional practice.

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References


Weaving an eco-friendly web: Korean NGO reflections on the impact of a school education programme

Nicole Doeyon Kim
Griffith University

Abstract

This paper reports on a research study that explored the effects of a community environmental education organisation delivering an education programme within a suburban school in Seoul, South Korea. In this study, three members of the community environmental organisation – who delivered the programme in the school – described their experiences and reflected on their activities for the schools. The study also surveyed primary school students (n=272, from 8 schools) who had experienced the community organisation’s education programme, along with the researcher’s observations. The study examined (1) the instructors’ attitudinal changes and how these affected them, their family, the school and the community organisation, (2) primary school students’ awareness after taking the class and (3) the potential for community organisations to work with schools in building an eco-friendly society. Results indicate a positive outcome for the three instructors and their families, especially their children in terms of pride. Instructors reported that they also improved their knowledge about the environment and gained an increased understanding of their community and the contribution that community environmental organisations can make. Primary school students reported that they now had an increase in environmental knowledge and in future expected to have a better understanding of their community. Findings also suggest that the link between community environmental organisations and schools has the potential to develop eco-friendly behaviours and attitudes in school students and community members to work for an eco-friendly community.

Introduction

The dichotomy between formal and non-formal education is one of the main problems making education incomplete. A strict adherence to this dichotomy especially conflicts with the objectives of environmental education from the point of view of lifelong education as the following stated document.

The resulting artificial boundaries are incompatible with the all-embracing character of education and the optimum utilization of human, material and financial resources. By its nature, environmental education may provide an excellent means of linking formal and non-formal education, as it aims to secure the participation of the various groups in a given community (children, adolescents and adults) in preventing and solving environmental problems, an objective shared by formal and non-formal education entailing pooling their resources. (UNESCO, 1980, p. 47)

In the Korean context, environmental education has been debated in terms of two broad sectors for the past 20 years. The two sectors are formal education and non-formal education. Formal education simply means ‘schooling’. Non-formal education represents all the institutions’ and non-government organisations’ (NGOs) programmes and activities that take place outside of normal school programmes and are not linked to formal curriculum (Kim, 2003). These two educational sectors have not explained in the Korean education system so far even though there was a definition of the different settings with more detailed classification including three sectors such as formal, non-formal and informal education (Fien, Scott and Tilbury, 2001).

In the Korean construction, environmental education issues were dealt with mainly within formal education. The non-formal environmental education sector only worked as an irregular and one-off learning programme for the few youths who participated in environmental NGO events. However, in
the last decade, several studies in Korea (Yang, 2002; Choi, 2003; Jee, 2003; Lee, 2004) have underlined the need to increase the role of NGOs in delivery non-formal environmental education programmes to schools. These studies have played a role in strengthening efforts to link formal and non-formal environmental education.

Environmental education delivered by community environmental organisations is integral to effectively addressing the importance of environmental issues, since the school based environmental education would take many years to impact on society owing to the time lag involved with school children maturing into adults even if it is effective within the schooling (Edmunds, 1997, p. 1). In this respect, it is clear that the link between schools and community environmental organisations will be positively acted to provide learning experiences that develop students’ environmental knowledge, sensitivity and skills, as well as the motivation and capacity (Ballantyne & Packer, 2006, p. 16). This linkage also can be extended to build a foundation towards an eco-friendly society.

This research set out with the following two questions to find a point of conjunction towards an eco-friendly society: (1) How does an NGO-School link effect NGO instructors’ personal change? (2) How does a school class delivered by an environmental NGO affect the environmental conceptions of primary school students?

Specifically to answer to the research questions, the effect of school environmental education supported by a community environmental organisation was investigated through the concepts of primary school students who had attended the three participants’ environment classes and the changes of the three participants in community environmental organisation.

Methods

This study adopted the mixed methods using both qualitative and quantitative data. It contains mix of both ways of collecting and analysing data (Cresswell, 2003, p. 208). The integrating two kinds of methods were used to interpret the results as well.

The field study was carried out in a suburban area of south-eastern Seoul, South Korea from March to May 2004, and May to October 2005. The researcher was resident in the field study region for around three months during the research term. The three methods for data collection were used - observatory participation, semi-structured interviews and questionnaire surveys.

The programme is not based on the regular school curriculum but a special class at schools’ discretion. The community environmental organisation provided several programmes for the schools - Learning Nature, Exploring the Forest, Learning Recycling, Exploring the River, Mapping My School. Most of the content was taught in the classroom or in the small gardens within the schools, but in the case of the programme ‘Exploring the river’, students went to either creeks or rivers to make observations. The instructors taught around 30 to 40 students in each class and students learned the names and the special features of trees and flowers. Students built models applying scientific ideas and using recyclable materials, or drew maps of their schools. During the classes, instructors’ teaching and students’ learning in these programmes were observed.

After the class by the community organisation, the students were surveyed on their reactions and attitudes about the importance of the environment via a questionnaire. The questionnaire comprised 11 questions using the Likert scale and one open-ended question requiring a descriptive answer. (see Appendix 1 and 2) 115 students’ answers were collected from 4 schools in 2004 and 157 students’ were surveyed from 4 schools in 2005. Collected survey data was put into Excel software and
analysed the distributed portion with percentage of the answers. For the descriptive answers, the framework of 5 areas fulfilling the aims of environmental education was applied and words, phrases and sentences in their answers were classified into the appropriate goal areas. The goal areas include awareness, knowledge, attitude, skills and behaviour as mentioned in Tbilisi Declaration (UNESCO, 1978).

In the next, three instructors of the community environmental organisation were interviewed in order to derive their reflections from the descriptions about their experiences of environmental education in the community environmental organisation. As the pattern of semi-structured interview, the same questions in the same order were given to each participant and they individually gave me their own answers. The interview questions are (1)’What kind of motivation did you have for this performance?’ (2)’What do you think of your training term for being qualified as an instructor of community environmental organisation?’ (3)’What is the most important change in your life after you were involved in educational activity of community environmental organisation?’ (4)’How did your family feel and react to your involvement?’ (5)’Do you believe that your educational service for the schools in your community will contribute to solve the environmental problems?’ The interviews were recorded with portable digital recording device after the participants’ agreement.

Results

Participants’ reflections

Positive and negative aspects for teaching in the community organisation

The three participants described their experiences and reflected on their activities in the schools. (Appendix 1) They were much in common, in other words, they had very similar background. First, they were aged from their late forties to their early fifties and they were all housewives with children. Their similarity has both positive and negative aspects. One negative aspect is that they had not taught during their children’s upbringing so they were not confident about teaching students. All the following participants wanted to be compensated for the perceived loss of their identities within their families and communities.

Participant A: “It was so difficult to teach someone...because I have been just a housewife for a long time from marriage. I was never confident at first.”

Participant B: “I have just lived and wasted time at home with my children so far after getting married. I had no experience to present in front of somebody.”

On the other hand, because their children had already grown up, they didn’t have to care for them too much and they had enough time to spend on themselves.

Participant A: “I don’t need to work for the organisation all day long for everyday. That’s good for me. Now I can use my own time to work because I am a housewife and my children grew up enough.”

Participant C: “My husband works everyday and develops his own career, but I am just still here. I am worried what if I will be alone just staying here even after my children become an adult.”

The second similarity is that each participant had considerable experience in rural living in their youth. This positively affected on their teaching ability because they had already acquired much unstructured common knowledge about nature.
Participant A: “I just lived with nature in my childhood. At that time, most people know how to treat nature and environment. I used to plant rice by myself in rural area and work for farm. During working in the countryside I could learn how to identify grasses, flowers and trees.”

Participant B: “We are surrounded by cement at the present time, but I learned through nature in daily life when I was a child. My children and also others can’t learn naturally like what I did. They should make a special time on purpose to learn and feel nature.”

Participant C: “I used to cut the grass after school in my childhood in order to compost. When I started to work for the community environmental organisation, I thought it is quite strange to experience planting rice with paying for that activity.”

However, the participants needed to reorganise their existing knowledge and learn also structured new knowledge about nature and the environment. They had similar difficulty increasing their environmental awareness.

Third, all participants had resided in the town of research for over 6 years and had worked as conservation volunteers in community environmental organisation, which implies that each held a degree of knowledge about the local environment. Further, Participants A and B reported heightened motivation arising from their experience with the NGO while Participant C did not.

Participant A: “I have lived in this region for around 10 years. Actually, I haven’t been interested in environmental issues until I started to work in the community organisation. I thought the environment is something important to us, but I didn’t have enough knowledge and information about it. After participating in the community organisation, I really enjoyed learning something about the environment. I feel this region is not so polluted and I haven’t thought we have any environmental problem in my community because it’s a quite good residential area designed very well. We have about 150 parks around the community, so it’s much green enough. We have separate sewage and tap water systems as well, so it can protect the rivers.”

Participant B: “I have been in this region since 1995. Volunteer activity made me interested in the environment. They say this area is liveable. That’s right. I agree, but the creeks and rivers in this region are not so clean even though we have a good system for separating sewage and tap water. I think it’s because there are many apartments here and most residents do laundry at their veranda connected to tap water pipe. I usually wash the clothes with my hands in bathroom or washing room, not a washing machine as I know what the system is.”

Participant C: “I moved here in 1999. After moving here, my husband really likes to climb the mountain near here with me. I learned many things about this area during climbing and walking with my husband.”

The above interviewees’ responses show sufficient environmental knowledge about their communities.

**Gaining further: Confidence through lifelong learning**

After involvement in community environmental education, the three participants experienced personal changes. One of the positive dimensions was that the participants received training prior to their placement in schools which they reported as a welcome diversion from ordinary household duties. As mentioned above, these instructors tried to overcome their lack of environmental knowledge. As a result of these efforts, they came to be more interested in environmental issues and more confident to teach. Also they could put their increased environmental knowledge into practice in daily life.
Participant A: “During the term of training, I was really happy to study hard and wanted to study more to get confidence to teach students. I was in a full of joy of teaching children and also they were enjoying my class. Now I am confident enough.”

Participant B: “I was totally in a mess at first. I took a lesson from professors or lecturers, but I could understand almost nothing. I could understand if I should learn how to cook with those animals or plants. I tried to study by myself finding materials after the lesson. I don’t think I am a specialist for the environment as well as for the education. I just know a little bit more than other housewives. When teaching students, sometimes I feel that children know much more things than me. I learn more from students. They feel happy and appreciate even if I give a very little thing. I feel I am ready for teaching children.”

Participant C: “I became more active than before as working for community organisation. I can manage my time and control all schedule effectively, in addition, now I feel my health condition is improving mentally and physically.”

In this context, training experiences of three instructors actualised a lifelong learning according to one of the characteristics of environmental education (UNESCO, 1980, p.29; UNESCO, 2009, p. 2). Lifelong learning process by environmental education in this case also brought a sense of self-confidence and opportunity of self-realisation to three participants.

**Gaining further: Pride through self-realisation**

At an instance, the three participants were in common in respect of the positive impact on their family. Their family members recognised that their mother or wife spends the time for the socially and environmentally sound working and this affected positively three participants’ families. Especially for their children, they came to be confident enough to instruct their children about the environment and children also became proud of their mother. In addition, they pulled their husbands’ support and respect through their work for environmental education. In the case of Participant C, her participation to community organisation was even related to her daughter’s future dream.

Participant A: “It was really helpful for my children’s education to work for the community organisation. I think every mother is like a mirror for their children. Children can grow up copying their mom. Now, my children are really proud of me about my social activities more than I am doing. They think my mom is volunteering very actively not like other housewives just at home.”

Participant B: “My husband proudly tells the relatives that my wife gives a lecture and earns money even if it’s a small amount.”

Participant C: “I can answer for my daughter’s questions walking along the river or in the park after the experience of training and teaching in the community environmental organisation.”

However, there must be a few barriers to their changed lives and attitudes. According to Participant B, her son blamed her after she became responsible for much more classes for environmental education in community organisation.

Participant B: “These days my son is full of complaints as I much less concentrate on housework than before. He might feel that I am working for community organisation too much, but it’s just a small part of my family’s life.”

Considering their reflective description in every particular, it is clear that three participants have been achieving the pride and self-realisation as well as the positive effect of their contribution to the community with environmental education is successfully infused into their family in spite of some small barriers.
Starting point towards the future change

The three instructors involved in community environmental education anticipated little change of students’ behaviour for the environment through those activities. They just expected to give students a light motive, an interest and knowledge for the environment rather than a drastic behaviour modification. They recognised that their responsibility for community environmental education is to make children friendly to nature or the creatures in this world.

Participant A: “I scarcely expect a big transformation through this environmental education programme, but anticipate a very little change. They are primary school students, so I think it is successful if they can remind of any small things or thinking even after my class. It will be helpful for the gradual transformation for the environment.”

Participant B: “I don’t agree that environmental education can draw a dramatic change. What I can do for children is making them more interested in the environment and motivated to have more friendly attitude. I hope children can remove their fear or disgusting feeling about the unfamiliar creatures in my class.”

Participant C: “My husband wants to make a small eco-school, a kind of outdoor education centre with me in the future. I am interested in dyeing skills.”

Impact of School Education Programme

The questionnaire was administered for the primary school students who attended the classes provided by community organisation in order to identify their environmental concept. Survey was implemented in three sections: (1) Primary school students’ environmental concerns in daily life (2) Primary school students’ learning experience about the environment in the regular class (3) Primary school students’ conception about the community and demand for environmental education. Appendix 2 shows the responses of these questions.

Students’ environmental concerns

The results show that most students are not familiar to talk about the environment with their family or other acquaintances. In daily life, they rarely do practice the conservation activity. The most frequent ways to get environmental information revealed in order of TV, the books other than textbook, and classes and textbooks. These results reflect the fact that students have more chances to acquire environmental knowledge under the effect of mass media rather than school education or any other ways.

Students’ classroom learning experience about the environment

Over a half of the replied students answered ‘no’ on the previous learning experience in the class about the environment. In contrast, the students of around 70 percent answered they have heard about environmental issues in the regular class. Over 70 percent of replied students thought that the environmental education delivered by community organisation will be helpful for them. These responses imply that it is insufficient for the students to learn and understand the environment only in school even though the primary school curriculum is dealt with environmental content. In regard to this item, students also described with hand writing which aspect of this environmental class is particularly beneficial to them. As the following Appendix 3, students’ descriptions mainly inclined to environmental’ knowledge’ (31.5%) and ‘awareness’(21.6%) The lowest response is about ‘behaviour’ (8%). This is closely related to three instructors’ reflections in the part of their expectation about the effectiveness of community environmental education.
With regard to students’ conception of community, they feel a total lack of environmental knowledge as part of their community. As opposed to this response, students expected that learning activity from community organisation would improve their understandings and affection of their community environment. Besides, they strongly agreed to be involved in the environmental class by community organisation later again and demanded a special place for environmental education and mostly 2~3 times environmental education opportunities in a month.

Discussion

This study summarises the results of the effect on the link of environmental education between the schools and the community organisation in three areas: (1) Diffusion into the community (family, school etc.) of the outcomes from self-confidence and self-realisation through the training for environmental education as a lifelong learning (2) Demand of support for school curricula by community environmental organisation (3) Convergence of the expected level of transformation between the participants and the students through the NGO-school link.

The three participants sought to identify their ‘positions’ in their families and communities. Their efforts resulted in increased self-confidence and a greater sense of self-realisation, and their family became proud of each participant. These results represent a successful example of lifelong learning through the link between formal and non-formal environmental education because the participants all overcome their lack of structured environmental knowledge through training in the community organisation, regardless of their age or experience.

Students responded that they usually get more chances to acquire environmental knowledge through mass media rather than through classroom education or any other means. These responses imply that it is insufficient for students to learn about the environment only within school curricula, particularly given the limited physical space in schools even though the primary school curriculum has well-organised environmental content. In addition, students lacked information about their community. Students expected that the learning activities provided by the community organisation would improve their knowledge and increase their concern for their community environment.

In the view of future transformation, the participants anticipated little modification of students’ behaviour in the environmental class. They consider that environmental education connected to community organisations can provide only a small motive for students to change their attitudes for the environment. Further, environmental education connected to community organisations helps students to increase their awareness and knowledge about the environment rather than effecting a radical behaviour change. There was a convergence between what the instructors intended to transfer to students in the environmental class and the students’ self-reported learning outcomes.

Conclusion

The improved linkage between formal and non-formal education in Korea has been developing gradually during the last two decades. It has been an important change in helping to achieve the essential goals of environmental education stated in the recommendations from the conference report on environmental education (UNESCO, 1978; 1980; 2009).

From these results, two implications were extracted for future study. One is the demand for reflection on the educational direction intended by community environmental organisations. The other is the
demand for a consideration of the transformation of the link between school curricula and community organisations for promoting behaviour change for the environment.

References


Edmunds, K., (1997). *Parts of the solution, not part of the problem’ Adult Learning Experienced in an Environmental Action Group, Brisbane, Australia*, Master of Science in Environmental Change and Management awarded by Hertford College in Oxford University.


Appendix 1: Summary of the three participants’ reflections

<table>
<thead>
<tr>
<th>Q 1 Motivation</th>
<th>Participant A</th>
<th>Participant B</th>
<th>Participant C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Early fifties</td>
<td>Early fifties</td>
<td>Late forties</td>
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<tr>
<td>Status</td>
<td>Housewife with children</td>
<td>Housewife with children</td>
<td>Housewife with children</td>
</tr>
<tr>
<td>Personal Experience</td>
<td>Rural life in youth</td>
<td>Rural life in youth</td>
<td>Rural life in youth</td>
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<tr>
<td>Residential Term</td>
<td>Approx. 10 years</td>
<td>Approx. 10 years</td>
<td>6 years</td>
</tr>
<tr>
<td>• Volunteer for conservation</td>
<td>• Volunteer for conservation</td>
<td>• Introducing from Ministry of Labour</td>
<td></td>
</tr>
<tr>
<td>• Increasing the interest about environment after participation</td>
<td>• Increasing the interest about environment after participation</td>
<td>• Previous work experience as a private instructor</td>
<td></td>
</tr>
<tr>
<td>Q 2 Training</td>
<td>• Struggling to overcome lack of environmental knowledge and confidence</td>
<td>• Struggling to understand and obtain much more environmental knowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Learning more and more through teaching</td>
<td>• Learning more and more through teaching</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Courtesy to students</td>
<td>• Enjoy the learning environment</td>
<td></td>
</tr>
<tr>
<td>• Enjoy the learning environment</td>
<td>• Appreciate colleague’s assist for training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q 3 Personal Changes</td>
<td>• Many positive aspects:</td>
<td>• Practice of environmental knowledge (e.g. environmentally consideration of wasting and consuming habits)</td>
<td>• Sound time management</td>
</tr>
<tr>
<td></td>
<td>• Getting an educational opportunity out of housekeeping</td>
<td>• Practice of environmental knowledge (e.g. environmentally consideration of wasting and consuming habits)</td>
<td>• Improving her health</td>
</tr>
<tr>
<td></td>
<td>• Effort to study all the time</td>
<td>• Practice of environmental knowledge (e.g. environmentally consideration of wasting and consuming habits)</td>
<td>• Increasing environmental knowledge</td>
</tr>
<tr>
<td></td>
<td>• Confidence for teaching</td>
<td>• Practice of environmental knowledge (e.g. environmentally consideration of wasting and consuming habits)</td>
<td>• Teaching her children about the environment in daily life</td>
</tr>
<tr>
<td>Q 4 Self-Realisation</td>
<td>• Involvement after children’s growing up</td>
<td>• Positive response to her involving in NGO activity</td>
<td>• Support from her husband(intellectual and psychological aspects)</td>
</tr>
<tr>
<td></td>
<td>• Spending the spare time</td>
<td>• Raising children’s and husband’s respects for her(pride)</td>
<td>• Relating to her children’s dream(zoologist)</td>
</tr>
<tr>
<td></td>
<td>• Support from family</td>
<td>• Raising income from work, even if it’s a small portion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Positive to her children’s education(as a role of mirror of children)</td>
<td>• Educate her children about environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Raising children’s respect for her(pride)</td>
<td>• Making children more friendly to the creatures</td>
<td></td>
</tr>
<tr>
<td>Q 5 Vision</td>
<td>• Little expectation to change students’ behaviour</td>
<td>• Not drawing a drastic change, but gradual increasing children’s interest and knowledge about environment</td>
<td>• Building a kind of an eco-school in the future</td>
</tr>
<tr>
<td></td>
<td>• Just giving a small motive for the environment to students</td>
<td>• Making children more friendly to the creatures</td>
<td>• Developing a skills of natural Dyeing</td>
</tr>
</tbody>
</table>

Appendix 2: Survey results of the student questionnaire
Appendix 3: Responses for the open-ended descriptive item: What is the benefit of EE class? (Classification into 5 areas of aims of environmental education)

<table>
<thead>
<tr>
<th>No.</th>
<th>Category</th>
<th>Content of Responses</th>
<th>Awareness</th>
<th>Knowledge</th>
<th>Attitude</th>
<th>Skill</th>
<th>Behaviour</th>
<th>R</th>
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<td>Action for the environment</td>
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<tr>
<td>3</td>
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<td>Conservation skills</td>
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<td>●</td>
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<td>●</td>
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<tr>
<td>4</td>
<td></td>
<td>Drawing pictures</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
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<tr>
<td>5</td>
<td></td>
<td>Effort to clean surroundings</td>
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<td>●</td>
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<td>Events related with environment</td>
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<td>7</td>
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<td>For boasting</td>
<td>●</td>
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<td>Help for the environment</td>
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<td>10</td>
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<td>Practice the knowledge about environment</td>
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<tr>
<td>11</td>
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<td>Strong management of school environment</td>
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<tr>
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<td>About the environment</td>
<td>About mountains and water</td>
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<td>38</td>
<td>Being fond of</td>
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<td></td>
<td>nature(such as trees)</td>
<td>Loving environment</td>
<td>Mind of loving nature</td>
<td>Mind to conserve the environment and knowledge about environment</td>
<td>Help for science and morals</td>
<td>Help for the practical course</td>
<td>Science</td>
<td>Science and mathematics</td>
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<td>40</td>
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<td>42</td>
<td>Help for learning subjects and school life</td>
<td>Help for science and morals</td>
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<td>⬤</td>
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<td>Easily making friends</td>
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<td>⬤</td>
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<td>47</td>
<td>No environmental content in school text book</td>
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<tr>
<td>Total (162 responses categorised with 47 patterns)</td>
<td><strong>35</strong> (21.6%)</td>
<td><strong>51</strong> (31.5%)</td>
<td><strong>31</strong> (19.1%)</td>
<td><strong>32</strong> (19.8%)</td>
<td><strong>13</strong> (8.0%)</td>
<td><strong>79</strong></td>
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Environmental Understandings of The Sea to Snow Crossing: Facilitating reflection for sustainable design, place-based learning and land care action

Dean Turner, David Curtis, Ian Reeve and Chris Allen

The Crossing Land Education Trust

Abstract

This paper looks at an Australian learning journey from the Sea at Bermagui in south east NSW to the summit of Mt Jagungal in the Snowy Mountains. The 300km, 12 day Sea to Snow Crossing for 16-18 year olds uses boats, bikes and boots on pathways less-travelled. The Sea to Snow Crossing is recognized at the Gold Level of The Duke of Edinburgh Award. The Sea to Snow Crossing provides a whole of ecosystems approach to understanding the environment, engaging a group of ten young people to investigate sustainability using critical thinking and reflection. Sustainable design, place-based learning, and land care action are all key journey features. An understanding of conservation, feeling of belonging to nature and development of an ethic of contribution are all aims of the journey. Following the two pilot years of 2008 and 2009 the journey has been assessed using visual arts and questioning of the young participants. Using questions from the World Values Survey and the NSW DECCW Who Cares About the Environment survey as well as an attitude survey for 2009 has allowed better assessment of changes to behaviour, attitude and values. Initial results are encouraging and statistically significant changes have been observed at all levels including sustained intention for pro-environmental behaviour. The most significant change was to values, with all participants rating 'having more say in how things get decided and in their communities' as their most important value at the conclusion of the journey. This paper is presented in conjunction with a Sea to Snow Crossing DVD illustrating sustainable design, place-based learning and land care action with comments from journey participants on their learning’s.

Introduction

'Some people walk in the rain, others just get wet' (Miller, 1936-1992) For the Sea to Snow Crossing, the real journey is about awareness.

The annual Sea to Snow Crossing is a project of The Crossing Land Education Trust, a recognised Australian Environmental Organization and not-for-profit, sustainably designed bush camp on the NSW Wilderness Coast. The Crossing is a key wildlife corridor between two major coastal national parks and 93% of The Crossing land is registered as a Conservation Agreement with NSW National Parks and Wildlife Service.

The Sea to Snow Crossing is a canoeing, cycling and walking journey for ten 16-18 year olds who successfully apply before the first training camp in July each year. All secondary schools in SE NSW are invited to make the opportunity available to their students, who can apply at www.thecrossing.thebegavalley.org.au

The 12 day Sea to Snow Crossing from Bermagui, on the coast, to Mt Jagungal in the Snowy Mountains, is held in late November/early December after school exams and is made possible with the help of scholarship support from service clubs, businesses and individuals who donate to The Crossing Land Education Trust Fund for the journey. The NSW Environmental Trust and Natural Resources Advisory Council partially funded the pilot years of the Crossing. Austcom, Far South Coast Landcare
Association, ABC SE radio and Bournda Environment Education Centre are ongoing supporters with Bournda EEC providing a pathway for young people to progress to The Sea to Snow Crossing.

The journey follows trails less-travelled including a number of off-track sections. Young people are guided through the journey training, and on the journey, to meet with land managers, help out with land care and learn more about the natural environment, sustainability and community contribution. At the same time they complete the expedition component for a Gold Duke of Edinburgh Award and in the process progressively take charge of decision making during the journey.

Lao Tzu reflects the leadership philosophy of the journey:

‘The wise leader does not intervene unnecessarily... Trust a person's process and that person will trust you... Facilitate what is happening and if you must take the lead, lead so that the (other) is helped, yet still free and in charge’. (Lao Tzu, 1972)

By presenting at schools and service clubs, before, during and after the journey, the learning the participants reach and inspire a wider audience. 'Adventure is fulfilled not in and of itself, but in knowledge brought back and shared...' (Greenwald, 2000).

**Place-based learning**

The Sea to Snow crew receives a traditional welcome to country by a representative of the Yuin people to begin the story of their Crossing from Sea to Snow. Effective place-based learning results in students becoming part of the story of a place. Story gives order and meaning to nature and engages students in place-based learning (Hayes, Mills, Christie, & Lingard, 2006; Brookes 2002, p.77)

On the side of Gulaga Mountain The Sea to Snow crew visit a sustainable home to learn how conservation is about what you use, as well as what you save. They hear stories of design trials, failures and successes. In the heart of the Wadbilliga wilderness, 'Tralfamadore' provides a welcome rest stop for Sea to Snow participants. Here they paint and reflect, swim and sing as well as express thanks through land care action to remove weeds brought in long ago. The crew listens to stories of intentional communities, environmental advocacy and the drying of the landscape over generations.

The crew experience, observe and comment on changes around them as they climb higher, from temperate forest to rainforest and then through heathland onto dryer tableland and alpine vegetation. Place-based learning expands cultural landscapes to include ecosystems, bioregions and understanding of living interactions (Gruenewald, 2008). Arriving at Tuross Falls, via an off-track section, the crew walks in respect for the traditional culture and stories of the place, literally diving into an understanding of the preciousness of water. Painting the journey into their story becomes a ritual – helping the participants to understand the journey at a deeper level.

At either end of the Monaro tableland, the Sea to Snow crew is invited by landowners onto quite different environments to learn what some farmers are doing to repair their properties. They hear stories of hardship and ignorance, feral species disasters and natural disasters, but they also experience the counterpoints of restoration and sustainable design.

Arriving in the Alps, the last four days of the journey are managed completely by the crew themselves as they strive to complete their Gold Duke of Edinburgh Test Expedition. This means that all navigation,
safety and environmental management decisions are made by them alone with Crossing staff present as advisors if needed.

The crew visits Wallaces, Cesjacks and the new O'Keefes Hut, constructed by National Park workers with the help of the 2008 crew and many other volunteers of the Kosciusko Huts Association. The crew finds and creates their stories of cultural heritage from log books that impart the ethics of the mountains. Sacred mountains feature in discussions among the snowgums, on the roof of Australia. On the summit of Mount Jagungal the 2009 Sea to Snow crew raised flags of hope for sustainability given to them by the school children they talked to during their training and along the journey.

**Sustainable Design**

The importance of sustainable design is emphasised in Sea to Snow training based at The Crossing, a purpose-built environment education centre. An understanding of the elements and actions involved in 'living more sustainably' are demonstrated at The Crossing. A curriculum organised around 'centres of care' will help young people to develop and practice an ethic of care, acknowledging the three-fold goal of living as healthy people within healthy communities in a healthy environment (Fein, 2003)

Exploration of sustainable design principles include:

- Solar passive building design features
- Stand alone solar power (off the grid)
- Solar and wood fired hot water and cooking and associated sustainable timber harvesting and koala tree species conservation
- Development and maintenance of permaculture food forest gardens
- Water saving and grey water reuse through an artificial wetland reed bed system and,
- Conservation Area monitoring with nest box and arboreal education

The crew also see examples of design approaches during the journey at places they visit and they talk about what they have learned and the ideas they really like in rest moments and around the evening campfire as the journey progresses.

**Land Care Action**

Part of The Crossing's mission is to inspire young people to conserve and each Sea to Snow crew contributes to positive environmental care through land care action. 'My dad always says, “You are what you do, not what you say.”' (12 year old Severn Suzuki, Earth Summit, Rio, 1993).

At the training camps and along the journey itself, the Sea to Snow crew, in partnership with the NSW Department of Environment, Climate Change and Water, contribute to what is possibly the largest field-based biodiversity survey in Australia. Loss of biodiversity and habitats is one of the greatest threats to the environment, and education has a critical role to play in addressing this (Gladstone, Stanger & Phelps, 2006). The biodiversity survey has grown from a koala survey, the first phase of which assessed the distribution and abundance of a highly scattered and endangered koala population occupying the coastal forests to the south of The Crossing (Allen et al 2010). The survey took a partnership approach involving government agencies, Aboriginal organisations, educational institutions and volunteers, with Crossing staff, volunteers and young participants playing an important part in the program.
The survey uses a method known as the Regularised Grid-Based Spot Assessment Technique (RGBSAT). A grid is placed over the map of a given study area and the gridline intersections form the “spots”, or sites, that the survey team hikes to, to search and record ecological data. The main search undertaken is for faecal pellets using a standardised and repeatable method searching the forest litter within a meter of 30 live trees whose trunks are larger than 150mm diameter at breast height (dbh). The searches are undertaken carefully. Particularly because koalas are so rare, it is important the search team doesn't miss any evidence they leave behind. Sometimes these grid intersections occur in difficult terrain or dense vegetation and the search for pellets can be quite difficult.

The survey method enables levels of Koala activity to be quantified, determined by the proportion of trees with Koala evidence, and compared with the total number of trees assessed at each site. This is termed 'activity level', expressed as a percentage. Thus a site with 1 tree in 30 with koala pellets has an activity level of 3.33%, and one with 5 trees has an activity level of 16.66%. This approach enables a systematic assessment of the distribution and abundance of koalas. In the coastal forests south from The Crossing the survey established:

- Where the greatest concentration of koalas occur in the study area
- That koalas are breeding in at least some parts of the area
- Genetic analysis of DNA extracted from the pellets found no evidence of inbreeding
- That the koala population is undoubtedly small, probably less than 50 mature animals and thus it will be important to ensure that the population does not experience any further loss, and that provision is made for its expansion into unoccupied but suitable habitat

With most of the recent surveys, extensive data has been gathered on the distribution and abundance of another arboreal marsupial dependent on eucalypt foliage, the greater glider. The survey team searches for all pellets, that are then identified, either immediately on site, or if there is doubt, the pellets are sent away for further analysis. The team also searches for evidence of digging, and it is often relatively easy to identify the species responsible.

In this way the teams are able to identify and record, in addition to the koala and greater glider, the following:

- Many native animals including: eastern grey kangaroo; wallaby; long-nosed bandicoot; long-nosed potoroo; brush tail possum; ringtail possum; yellow-belly glider; and lyrebird.
- The presence/absence of bell minors, identified through their calls; this species is associated with high levels of defoliation and tree death.
- The presence or absence of more recent arrivals such as the rabbit, goat, deer fox and dog.
- The tree species under which we search and the diameter of their trunks, systematically measured at breast height. This can provide a measure of the structural complexity and growth stage of the forest at the location assessed, with capacity to measure growth rates over time.

Because the data has been gathered systematically, it is then possible to map the distribution of all the above species and test for associations. As well as providing the Sea to Snow crew and other students with opportunities of a forest experience, the survey process provides many educational opportunities to learn about plant and animal identification, and about ecology. Sea to Snow participants and other community volunteers know that they are contributing to a big and important project. Since 2007,
survey teams involving more than three hundred people have visited more than 750 sites and searched through the litter under 22,500 trees in two study areas covering more than 30,000 hectares of forest.

The information gathered can inform forest managers in many ways, such as: where to apply fire, improve predation control and alter logging regimes, it can also inform landholders about the biodiversity on their properties and on adjacent lands. Perhaps most importantly, the surveys conducted by the Sea to Snow crew and others in the local community provide key baseline information about our forests as they face great changes, including those associated with climate change. Now we have a record of what’s there. Future Sea to Snow crews and perhaps some past members will go back to exactly the same locations to measure and record the changes that have occurred to monitor what is happening. The Crossing will adopt survey sites and can go back repeatedly to assess, knowing that they are contributing to a bigger monitoring program.

The work done by Crossing young people and other community volunteers is helping to protect these vulnerable species and monitor forest health including the impact of disturbance events and climate change.

'Australian identity is significantly influenced by our flora and fauna. (Right now) ...it is important for Australians to know who their more-than-human neighbours are, understand how they live, and take an interest in their well-being and survival... The loss of native species and the loss of a culture of paying attention to one's surroundings leaves Australian's impoverished in their capacity to imagine and develop a rich sustainable future' (Stewart, 2006)

In the Wadbilliga Wilderness the crew removes weeds that were brought in with hay for animals long ago. A thank you to the owner for accommodation and welcome, their contribution is reducing the spread of the plants. With annual effort the crew may one day fully restore the native grassland on the small river flat.

On the tablelands, the crew investigates wider spaces and a systems approach to revegetation and grazing management that is reversing land degradation and soil loss. Participants hear personal stories of changes to the environments that were created by previous clearing, overgrazing and introduction of feral animals. For example, 'Carlaminda' is an old sheep property on the Numeralla River. Here, farmer Simon Lange talked to the crew about tree planting and river restoration to combat the erosion problems inherited from over-clearing by past generations.

'Soil, in the long run, is what sustains us... (and) unless soil happens to be in a traveling mood, it values tree roots very highly...History tells us what it costs to run out of forests... Man has created deserts with great skill in the past' (Brower, 1995, pp. 49, 72, 76)

Also at 'Merlingbung' in the foothills of the Snowy Mountains, Stuart and Jan Reid discussed and demonstrated the effectiveness of short period rotational grazing to create a rich and biodiverse 'salad' for their pastures. The crew took on the challenge of working out just how many different species were now present in the 'Merlingbung' grasslands and each crew member compared their findings on benches in the woolshed where they had spent the night. Stuart's grandfather had told him about plants that are only now reappearing on the property due to improved management of the land and the crew also witnessed the expansion of remnant treed areas on the hilltops and in many of the gullies.
Results for the Environment

There has been a lack of awareness at the Australian secondary school level about the communal environmental actions that are possible to create a more sustainable society and to respond to climate change (Connell et al., 1998; Jenson, 2002). Feelings of helplessness and pessimism about the environment have been common attitudes for upper high school students in Australia (Hutchinson, 1997) and elsewhere (Rickinson, 2001).

Education 'for' the environment, 'in' the environment, is important to sustain environmental awareness and a readiness to contribute to positive environmental change (Heck, 2003). Seven land care activities were undertaken by participants on the Sea to Snow Journey including habitat survey assessment, tree plantings, contour mulching and drainage to prevent erosion, riparian weeding, pasture composition biodiversity analysis under cell grazing and revegetation and trail maintenance at high country huts which are traditional high use areas.

Knowledge gains are a necessary but not sufficient aspects of learning (Meyers, 2006). Education for sustainability should also be about changing attitudes and behaviours (Kennelly & Taylor, 2007). Emphasis on emotive or affective social engagement through education for sustainability may develop the kinds of values and skills that empower citizens to be part of a more sustainable future (Littledyke, 2008; Australian Department of Environment and Heritage, 2005; Tilbury, 2005; Ballantyne, Fein & Packer, 2001).

For at least 20 years we have known the importance of learning experiences in nature for the development of pro-environmental attitudes and behaviour (Dettmann-Easler & Pease, 1999; Mittelstaedt, Sanker & VanderVeer, 1999). Slowing down to spend time in real environmental contexts and natural places allows kinaesthetic meaning making and development of connections to place and people in place (Payne & Wattchow, 2008). Encouraging reflective responses within the natural environment achieves higher than average learning outcomes (Martin, 2007).

Three surveys were conducted: one before the journey, the second straight after the journey finished and a third three months after the completion of the journey. The first surveys measured values and pro-environmental behaviours. The second measured personal attitudes toward the project and degree to which the project inclined participants to adopt pro-environmental behaviour. The third survey measured values, pro-environmental behaviours, personal attitudes toward the project and degree to which the project inclined participants to adopt pro-environmental behaviour.

Analysis of the 2009 survey results shows that young participants have experienced some statistically significant changes in their attitudes, behaviours and values as a result of the Sea to Snow Crossing:

- At an attitudinal level they have greater confidence to express their feelings for people's relationship with the natural environment,
- At a behavioural level they have tried to get information relating to protecting the environment
- At a values level they all now wish to see that people have more say in how things get decided and in their communities.
Survey analysis also showed that the intention for pro-environmental behaviour was a sustained outcome of the journey.

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Use of the World Values and NSW DECCW *Who Cares About the Environment* surveys allowed comparison with other similar aged young people and no significant differences were seen between the crew and others in the pre-training analysis. Thus a high level of confidence can be placed in the results for providing a good assessment of the positive changes that may be expected in future Crossing journeys with other young people.

We asked participants if they wanted to do anything different for the environment or if there was anything else they got out of The Sea to Snow Crossing that they wanted to mention – here's what they said:

'I loved hearing people's opinions and meeting new people.'

'It made me notice how lucky we are where we live'

'To reduce my impact on the environment and help protect it. It was an amazing experience'

'(There were) different aspects and outlooks on the environment and land I would otherwise not have picked up on...it was a great learning curve'

'To push for sustainable agriculture that is rotational and a stronger push for environmental issues'

'To be more aware of the surrounding environment. I really enjoyed the project, it was good physically and mentally, also the things I learnt'

'To do my best to reduce my impact on the environment meeting interesting people along the way'

'To change the treatment of our native forest'

'To make the most of green energy and use less electricity.'

'To do my best to be a part of education and do more locally and at home.'

'The place to improve the world is first in one's own heart and head and hands, and then work outward from there...Make an art of what you are doing...quality changes you and others because quality is seen, and the person who sees it feels a little better because of it and will pass that feeling on...This is how further improvements of the world will be done' (Persig, 1974)
Conclusion - Environmental Understandings and an Ethic of Contribution

Mt Jagungal and the Australian alps were described by the first Sea to Snow crew as 'an island in the sky' with plants and animals found nowhere else on earth. This deep metaphoric level of understanding was a significant early indication that environmental understandings were resulting from the journey. 'There are two sciences – the science of manipulation and the science of understanding' (Schumacher, 1977). 'Look deep into nature, and then you will understand everything better' (Einstein, 1951).

The simple accumulation of knowledge about ecology and pollution does not necessarily lead to a fondness for nature or an intuitive wisdom about how to live in harmony with nature. Experiencing a sense of wonder is key (Swan, 1995) Wonder is evident in some of the film footage and in excerpts from interviews with participants after the journey. Wonder was also observed by the journey leaders in moments when crew members were up-close with nature or when nature seemed to be rubbing up closer: rest times, twilight times and eventful times when new rains were arriving over the land, or when major natural landmarks such as wild rivers were reached, or when cloud displays were drawing closer, when the trees were growing bigger and it seemed that the koalas must be living close by, these were often the times of wonder for the crew.

Most primary and secondary young people in NSW see the environment as 'out there' while only one in every eight students see the environment relationally - 'as something which supports and enhances their living, and which in turn requires their care and support' (Loughland, et al., 2003, p.14). To develop relationships and an ethic of contribution, people need to spend time getting to know nature through personal contact. This breaks down the separation between nature and self and changes an instrumental relationship into a close and caring one. Sustaining a close relationship with nature depends on learners perceiving that nature is responding to their efforts through emotional feeling and/or observation of change. An ethic of care or contribution is sustained when students work at getting to know nature like they would a new friend. (Martin, 2007)

Further thought is being put into creating more opportune moments for Sea to Snow crew members to get closer to nature through the Sea to Snow journey and to see and feel nature responding. Some minor survey changes will take place to hone-in more closely on attitudes to this aspect for 2010. For instance, crew members will this year camp close to where they conduct habitat survey work so that they are able to more fully immerse in this experience. There will also be more effort to share observations from past crew members so that discovery of change becomes more enticing. Recording the discoveries will be done through a focus on film making by crew members who will have true freedom to develop their own films. This year's Sea to Snow school newsletter ad included the line 'budding film-makers, photographers, artists and explorers encouraged'.

Longer term surveys of past Sea to Snow crew members will look at changes over time, after all we want to see nature as a mentor and source of ideas and as a community to which we belong, rather than a supermarket of resources. We want our youth to design products to reabsorb and restore the earth rather than depleting it. (Butler, 2002; Benyus, 2002)

'The clearest way into the Universe is through a forest wilderness...God has cared for these trees, saved them from drought, disease, avalanches, and a thousand straining, levelling tempests and floods; but he cannot save them from fools' (Muir, 1973, p.191)
We hope to report over many years on the contributions made by members of The Crossing's Sea to Snow Crew in their ongoing journey of awareness.

**References**


