

Getting down and dirty: Values in education for sustainability

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Values education and environmental education for sustainability are both spheres of education research that have manifested rapid and overlapping development in recent years. An independent primary school located in the Perth metropolitan area of Western Australia participated in research on both values education and environmental education for sustainability. The school contributed to a *Values Education Good Practice Schools* (Stage 2) project that involved a tri-state school cluster. Six schools worked together to explore an explicit values education agenda from an environmental education for sustainability perspective. Three values education and environmental education mini-projects at the school are examined: planting native reeds at the local lake, creating a community permaculture garden and conducting a trial for a turtle nesting site. The values embedded in these environmental projects were: social and civic responsibility and environmental responsibility. The school also participated in research in the field of education for sustainability, with a focus on the 'whole systems thinking' approach applied to the three mini-projects. Preliminary evidence suggested that conducting environmental education projects, with an education for sustainability perspective was an effective, meaningful approach to the teaching of values and enhancing awareness of whole systems thinking. The relationship between values education and environmental education for sustainability was illustrated in potent, hands-on, real-life contexts.

Introduction

Values education and environmental education for sustainability are spheres of interest and research that have manifested rapid development in recent years. The research issue that is the focus of this paper examines this development in the context of the growing, overlapping relationship between values education and environmental education for sustainability. Preliminary evidence linking these two fields in potent, hands-on, real-life contexts will be presented. This research is significant as it links current understandings in values education research, such as those arising from the *Values Education Good Practice Schools* (VEGPS) projects, with the increasing focus on 'whole systems thinking' in the field of sustainability research. Furthermore, the research is timely because both of these spheres of investigation have been highlighted in recent national and international research literature.

Values

Defining values, as for defining environmental education for sustainability, provides the opportunity for considerable debate. However, for present purposes the following definition will be adopted. Values are "... the principles and fundamental convictions which act as general guides to behaviour, the standards by which particular actions are judged as good or desirable" (Halstead, Taylor, & Taylor, 2000). This approach to values is in accordance with the position taken in the national framework of *Values for Australian*

Schooling (Australian Government Department of Education Science and Training, 2005). This document has led to considerable dialogue across Australian school communities about values. Values education is increasingly viewed in Australia, and internationally, as the core business of schools (Lovat, 2005; Lovat & Toomey, 2007). Furthermore, recent developments in values education research suggest important changes are occurring in this field (Hill, 2008; Shaw, 2007). For instance, research involving six case studies examined the symbiotic relationship between values education and quality teaching, a relationship known as the 'double helix effect' (Lovat et al., 2007). The cases showed that values education can make a very important contribution to fostering strong positive relationships, positive dispositions to learning, producing a calm teaching and learning environment and providing emotional and spiritual space. The research also identified ways that values education nurtured in students the various dimensions of quality teaching: intellectual depth, communicative competence, capacity for reflection, self-management and self-knowledge. This relationship between values education and quality teaching, a relationship somewhat like a double helix, refers to good practice values education also being quality teaching practice (Lovat et al., 2007).

The VEGPS Project - Stages 1 and 2, was part of the Australian Government's values education program (Curriculum Corporation, 2006b; Department of Education Employment and Workplace Relations, 2008). It aimed to devise successful ways of implementing the *National Framework for Values Education in Australian Schools* and conduct research to identify, substantiate and describe good practices in values education (Curriculum Corporation, 2006b). The VEGPS Project has contributed new understandings in this field, with a program designed to foster and support improved values education practice in Australian schools (Curriculum Corporation, 2006a; Sparvell, 2007, 2008).

An innovative VEGPS project (Stage 2) involved a tri-state school cluster. Six schools in diverse sites, state and independent, primary and secondary, rural and urban, in South Australia, the Northern Territory and Western Australia co-operated to explore an explicit values education agenda from an environmental education for sustainability perspective. This project aimed to contribute to the growing focus on values education research in Australia. Undertaken over a twenty month period, September 2006 – April 2008, the project incorporated a range of learning activities for students; those in which all the project schools participated and those relevant only to the individual schools. One of the common activities involved students participating in on-line Centra link-ups with other schools across the three states (Sparvell, 2007, 2008). During these on-line sessions the students discussed various topics in values education, such as, exploring the values embedded in local environmental projects. Each of the schools involved in the project conducted their own mini-projects that were relevant to their local needs and student interests. The specific question overarching the schools involved in this tri-state VEGPS cluster was: How can we pursue an explicit values education agenda with an environmental education for sustainability perspective? This question was investigated by analysing the processes and products of both the common and mini-projects in the cluster schools (Sparvell, 2008).

Environmental values

There are many formulations of the essential components of 'environmental values' (Gralton, Sinclair & Purnell, 2004; Martin, 2007; Smyth, 1996). Such formulations include, for example, living harmoniously within ecological systems, developing a caring, responsible attitude toward nature, and promoting a sense of continuity and community with other people and all living things. The *Curriculum Framework* (Curriculum Council, 1998), the document guiding education in Western Australia, also explicitly outlines environmental values to be addressed.

The *Curriculum Framework* values of 'social and civic responsibility' and 'environmental responsibility' (Curriculum Council, 1998) are particularly relevant to this discussion. Social and civic responsibility includes the promotion of the value of 'community', specifically, "Interpersonal co-operation and social responsibility are encouraged" (Curriculum Council, 1998, p. 325). Social and civic responsibility also acknowledges the 'benefits of research', that is, "Society should support the advancement of knowledge in all its domains, promote scholarship and research that promise to improve the quality of life and share the benefits as widely as possible" (Curriculum Council, 1998, p. 325). Four aspects of environmental responsibility are identified in the *Curriculum Framework* but only two of these will be referred to in this paper, 'conservation of the environment' and 'diversity of species' (Curriculum Council, 1998). The value promoting the 'conservation of the environment' states "The management of the environment should take into account the need to preserve its diversity and balance for the future" (Curriculum Council, 1998, p. 325). 'Diversity of species' refers to "Each person should recognise a need to preserve native habitats and arrest the extinction of presently-surviving native species" (Curriculum Council, 1998, p. 325). All these environmental values underpin the work presented in this paper.

Environmental education for sustainability

The other sphere of education research that has manifest rapid change in recent years is environmental education. Environmental education has been discussed in the Australian education context since the 1970s (Evans & Boyden, 1970; Fien, 2001; Fien & Gough, 1996), with reference to education *in*, *about* and *for* the environment (Linke, 1980; Lucas, 1979). However, recently the emphasis in environmental education has involved clarification of understandings related to the *for* approach. Education *for* "promotes critical reflection ... lifestyle changes that are more compatible with sustainability. It seeks to build capacity for active participation" (Tilbury, Coleman, & Garlick, 2005a). Education *for* the environment empowers people and provides learners with skills to take positive action so that current and future generations have a critical understanding of how complex systems, such as environments and ecosystems, economic and socio-political systems, work (Tilbury et al., 2005a). The *for* approach also stresses the cultivation of environmental values (Gralton et al., 2004). In theory at least, there is little difference between education *for* the environment and education for sustainability (Efs) (Baudains, 2003, 2006; Tilbury et al., 2005a; Tilbury & Cooke, 2005b).

Relationship between values and sustainability

Exploring the relationship between values and education for sustainability is a sphere of investigation in its own right. Many authors have reported on the various aspects of this relationship (Baudains, 2003, 2006; Mira, Deus, Rodriguez, & Martinez, 2003; Smyth, 1996). However, this paper will only consider the relationship from a '*whole systems thinking*' approach, in line with recent developments in education research (Lewis & Baudains, 2007; Sterling, 2003b). From a theoretical perspective, *whole systems thinking* acknowledges the relationship between EfS and values education. Whole systems thinking is a framework for seeing the whole picture, for establishing interrelationships and understanding phenomena as an integrated whole (Capra, 1996; Clayton, Clayton, & Radcliffe, 1996; Sterling, 2003a; Tilbury et al., 2005a). *Systems thinking* may be contrasted with fragmentary thinking, which is viewing phenomena in their separate parts and focusing only on narrow specialisations. In an EfS context this means emphasising relationships, relationships between all the systems on our planet, and at different systems levels, as they relate to the environment, economics, government, health, and so on. Values and goals are also important aspects of these relationships. Sterling (2003a, p. 2) argues that "... we are educated by and large to 'compete and consume' rather than to 'care and conserve". Furthermore, the same author maintained that because of the imposition of managerial and economic values on education we have lost touch with the social values and real life contexts of authentic education (Sterling, 2003a). With these ideas in mind, one of the understandings that informed the mini-projects included an attempt to engage the students in whole systems thinking.

This paper provides an overview of values education from an environmental education perspective at an independent primary school in the Perth metropolitan area of Western Australia. It draws together investigations arising from the school's involvement in three endeavours: the national VEGPS tri-state cluster project, the application of the *Curriculum Framework* values statements and findings from doctoral research on the education for sustainability program at the school. The doctoral research included an examination of student values, understandings and behaviours, related to education for sustainability. The researcher was a staff member at the school and findings are presented as understood at the initial phase of the research. This paper outlines the educational context of the research, objectives, methodology, preliminary findings, along with preliminary conclusions and future directions of the research.

Educational context

The particular independent school reported in this paper is a Montessori school. The "Montessori Method" (Erskine, 1998; Montessori, 1964, 1965) recognises that young children have *absorbent minds* and *sensitive periods* for learning different values, knowledge and skills, so they are provided with appropriately ordered, stimulating learning environments (Homfray & Child, 1999; Lillard, 1996; O'Donnell, 1996). Montessori's philosophy and educational approach display features overlapping with environmental education, such as encouraging children's respect for the environment, engagement with

different aspects of nature and developing values for peace and the future of humanity (Montessori, 1964, 1965, 1966).

The Montessori approach to education acknowledges that "All is strictly interrelated on this planet" (Montessori, 1973, p. 40) and thus there is an emphasis on the study of ecology: ecosystems, biomes, individual species and species interactions, biodiversity, and so on. Ecology investigates the interaction of living things and relationships between living and non-living forms. From a Montessori perspective understanding ecology develops concern for human impact on Earth, and encourages a value system involving a caring commitment for the environment (Miller, 1974; Montessori, 1966, 1988; Sillick, 1987). Environmental education and values education are therefore viewed as essential components of the Montessori curriculum.

The school was located near a wetlands environment and this had an important influence on the mini-project activities undertaken. Furthermore, the mini-projects were identified as a result of concerns raised, by students and other members of the school and wider community, about the condition of the wetlands. The school's three mini-projects included: planting native reeds at the local lake, creating a community permaculture garden and conducting a trial for a turtle nesting site. The values embedded in these community-driven mini-projects were 'social and civic responsibility' and 'environmental responsibility' (Curriculum Council, 1998). The school leader of the mini-projects was also undertaking the broader doctoral research on EfS, so involvement in the VEGPS project was a component of and informed the doctoral research.

Objective

The research aimed to investigate aspects of the implementation and impact of education for sustainability at the Montessori school. As the study is in progress, this paper only presents preliminary findings with regard to the following question.

What are the outcomes, in terms of student values, understandings and behaviours, after involvement in an education for sustainability program?

This research question was investigated within the context of the school's involvement in VEGPS project, which involved the implementation of the *Curriculum Framework* values statements (Curriculum Council, 1998). Initial findings of student outcomes are reported, as they relate to the three 'getting down and dirty' mini-projects.

Method

The participants of the values education program included the whole school population, sixteen staff members, one hundred and forty students, parents and friends. However, permission to participate in the doctoral research on EfS was received from sixty five students, children from pre-primary to senior primary levels, and seven class teachers. Only data collected from participants who submitted signed permission forms is reported here.

A qualitative approach to gathering information was adopted in order to address the research question. The approach was phenomenological, in that it set out to determine students' perceptions about values in the environmental education for sustainability program and how they influenced them.

Data gathering involved surveys, observation and document searches. It commenced in 2007 and is continuing in the current year. Whole classes of students and individual teachers were surveyed to ascertain values, knowledge and behaviours in relation to the environmental education for sustainability program, in order to determine the outcomes. In addition, whole classes of students were observed, both in class and during outside activities related to environmental education, with randomly selected students interviewed. The document search data is drawn from student work samples, school newsletters, information brochures, minutes from meetings, field notes from workshops, the school website and policy statements.

The *Environmental Learning Outcomes Survey – Student Observation Schedule* and the *Environmental Learning Outcomes Survey – Interview Schedule* (Ballantyne, Packer, & Everett, 2005) were employed to obtain the data. The behaviour assessed by this survey included: sharing learning with peers and experts; making links and transferring ideas and skills; initiating/showing responsibility for their own learning; purposefully manipulating objects and ideas; showing confidence in personal learning abilities; active involvement in learning; responding to new information or evidence; and disengagement. The frequency of engagement in each of these categories was assessed to occur: rarely, sometimes, most of the time or all the time.

The analysis of data reported in this paper involved the collection of data from different sources, with a view to determining possible overarching themes. The data is being examined using discourse analysis, word counts and semantic network analysis of student mind maps and drawings. To conceptualise the data and tease out relevant themes and results, the data is being coded and analysed using specialised computer software, QSR NUD*IST (Non-numeric, Unstructured Data - Indexing Searching Theorising) (Qualitative Solutions and Research, 2007). Since the doctoral research is ongoing, only preliminary findings are reported in the present paper.

Preliminary findings

Preliminary findings from the three mini-projects are presented in the following sections: planting native reeds, the community permaculture garden and turtle nestwatch.

Planting native reeds

For many years students at the school have participated in water quality monitoring activities at the nearby lake. A detailed water quality study, conducted throughout 2006, revealed concerns about pollution in the lake. For example, students' findings for macroinvertebrate counts showed a predominance of species that were very tolerant or moderately tolerant to polluted water conditions. Students also learned that the presence

of weed species at the edge of the lake contributed to poor water quality and this finding led to student generated questions about how to improve the situation.

To improve water quality of the lake the school applied for and was awarded a conservation grant. During 2007, implementation of this grant project involved removal of weed species, re-planting with native reeds and sedges and ongoing site assessments and water quality monitoring. Values were embedded, and made explicit, in this environmental education for sustainability project. The specific 'social and civic responsibility' value embedded in the project was 'community', while the 'environmental responsibility' values were 'conservation of the environment' and 'diversity of species' (Curriculum Council, 1998).

During the Planting Native Reeds project, students were encouraged to think about interrelated issues in the project from a whole systems thinking approach. Thus they were engaged in hands-on environmental action, observations of pollution and its origins at the site, consideration of implications of the project findings for the health of the ecosystem and people, educating others about findings, as well as participating in discussions about values related to environmental responsibility.

The 'community' values embedded in the project were illustrated by productive collaboration between various stakeholders and active participation of the school community. The project involved close collaboration between the school, government, conservation and industry representatives. Also, students, staff and community members contributed hands-on support to project activities by making observations at the site, documenting developments and planting native reeds.

Students were engaged in 'conservation of the environment' by making observations, conducting re-planting work and monitoring the site. For example, after school on the re-planting day, one student reported to the project teacher that birds had pulled up some of the newly planted reeds and that she had also spent time re-planting disturbed reeds and sedges.

In 2008, students were invited to create a mind map "showing everything you know about sustainability". A typical junior primary mind map is shown in Figure 1. The mind map, drawn by a boy in Year 3, identified four aspects to 'sustainability'. Three aspects referred to projects that operated in the school during the previous two years: lake testing/reed planting, the permaculture garden/worm farming and the biological survey/pit traps; and one aspect referred to a current project: sustaining a healthy body. This mind map showed the student had been sufficiently engaged in the lessons to remember past projects and made clear links between them and the concept of 'sustainability'. A comprehensive analysis of the mind map data will be reported in a later paper.

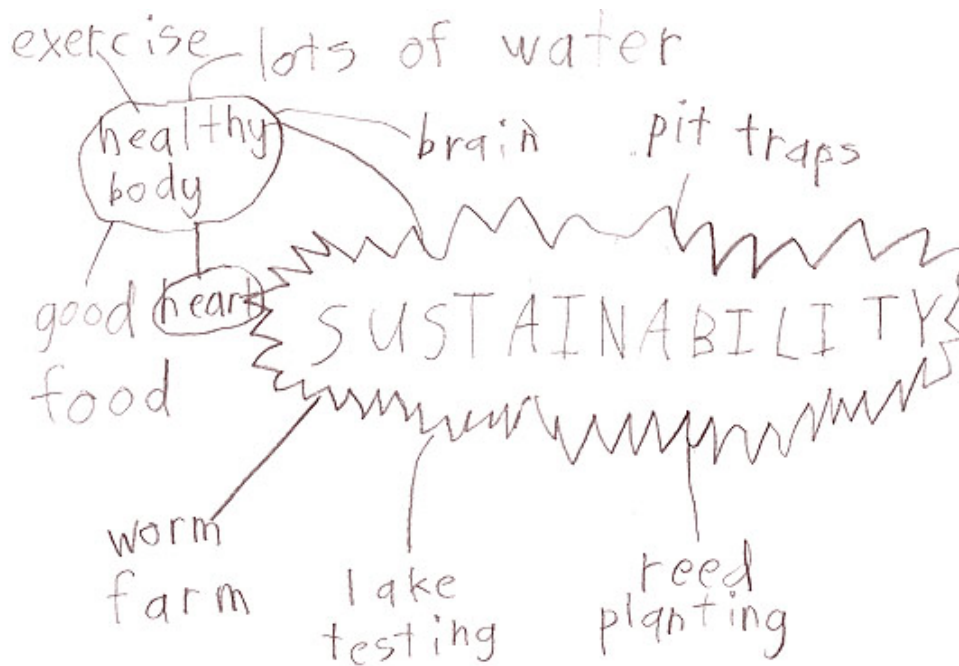


Figure 1: Mind map of 'sustainability' by year 3 boy

The value of 'diversity of species' relates to the need to preserve native habitats. This value was recognised as an important component of the project. Students were able to explain that planting native reeds and sedges would improve lake water quality and this would positively impact on the diversity of species found in the lake. For example, during an interview about attitudes to the environment, using the *Environmental Learning Outcomes Survey - Interview Schedule* (Ballantyne et al., 2005), students were asked what was the particular part of their recent visit to the project site that made them change how they felt. One Year 3 girl replied "... remembering how dirty the water was last year and how clean it is this year ... I found more creatures in the lake and saw the water was cleaner".

An initial analysis of data from the 2007 *Environmental Learning Outcomes Survey - Student Observation Schedule* (Ballantyne et al., 2005) has been conducted. The pre-primary (PP) and lower primary (LP) classes were observed participating in the reed planting project. Observations were undertaken during lessons incorporating whole class and small group discussions, walking to and from the lake site, observing surroundings and conducting water quality assessments. Overall, students displayed positive engagement in learning behaviours during these lessons. See Table 1. A comprehensive analysis of survey data will be reported in a later paper.

In brief, the Planting Native Reeds project engaged the children in practical, hands-on activities that made explicit the values they were learning. The students were able to discuss relevant values, actively engage in water quality assessments and take action to care

for reeds they planted. However, early data suggests most students need further experiences to enhance the development of their whole systems thinking skills. Another planting project, the Community Permaculture Garden, complemented the reeds project by reinforcing the same values. This garden project is discussed in the following section.

Table 1: Student engagement in learning behaviours for the reed planting project

Behaviour	Frequency of engagement	
	PP 2007	LP 2007
Sharing learning with peers and experts	4	4
Making links and transferring ideas and skills	1	2
Initiating /showing responsibility for their own learning	2	1
Purposefully manipulating objects and ideas	4	3
Showing confidence in personal learning abilities	2	2
Actively involved in learning	4	4
Responding to new information or evidence	2	1
Disengagement	1	1

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

Community permaculture garden

Planning for a community permaculture garden at the school began in 2005, with the installation of the garden completed the following year. Students were involved in planning, installing, harvesting and cooking activities related to the garden project. In 2007 the children regularly cooked with fresh, organic produce from the garden. Again, values were embedded in the garden program; the same values identified for the 'planting native reeds' project: 'community', 'conservation of the environment' and 'diversity of species'.

The 'community' values were made explicit through support provided by the school community for the project. Students, parents and staff got 'down and dirty' in the garden. Collaboration with wider community organisations, such as government authorities, local businesses and garden experts, also contributed to living the 'community' value. For example, to assist with the cost of installing the garden, the school applied for a landcare grant which enabled the purchase of compost, plants and garden edging. Students actively participated in the garden, throughout all phases of its development. As part of an Environmental Learning Outcomes Survey (Ballantyne et al., 2005) interview, one student stated that "... gardening is a lot of fun ... doing the planting, digging the hole and covering over the seed with dirt ... I like doing it with my friends". Two other students regularly attended garden committee meetings after school because they were very committed to the development of the garden, even though the meetings were "boring at times". These examples reflect student engagement with the value of 'community'.

Another example illustrating how the school manifests the value of 'community' was installation of the compost bin. The school applied for and was awarded a grant that provided for the building of a three-bay compost bin. A parent from the school

community worked with a group of students to design and construct the compost bin. Interested students continued to construct the bin after school hours, until it was completed. Another parent in the community worked with students, showing the process of making compost. These examples reflect commitment to the 'community' value and show it in-action.

Students also participated in 'conservation of the environment' activities through worm farming. The installation of a large worm farm, with associated worm-handling experiences for the students, was facilitated by worm farm experts. These lessons enabled the students to understand in a concrete, physical manner the processes and environmental benefits of worm farming and how it linked to creating a healthy, organic, productive garden eco-system. The mind map shown in Figure 2 illustrates a Year 3 girl's awareness of worm farming as a component of 'sustainability' and is particularly interesting because physical, hands-on projects, like, gardening/worm farming, keeping guinea pigs and recycling, are just as much a part of sustainability as the values of 'caring' and 'respect'. Explicit evidence of student awareness of the overlap between VE and EfS is demonstrated here.

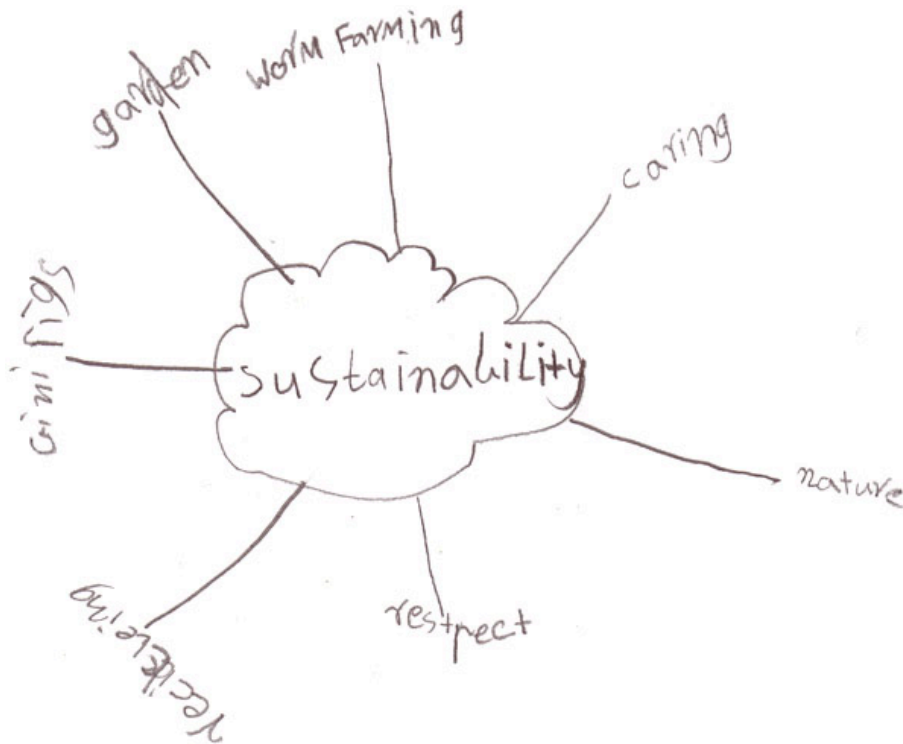


Figure 2: Mind Map of 'Sustainability' by Year 3 Girl

The value of enhancing 'diversity of species' was made explicit in the garden. Students planted many different species of vegetables and herbs, including heritage species. They

also discovered many different insects; even removing garden edging to find them! This new diversity of insects was contrasted with the narrow range of insects that were in the grassed area prior to the installation of the garden. Furthermore, findings from the *Environmental Learning Outcomes Survey - Interview Schedule* (Ballantyne et al., 2005) indicate a change in student behaviour. For instance, when asked if what he had learnt will change what he will do for the environment, one Year 2 boy said "Gardening at home – I'll do more of it".

A preliminary analysis of the garden project data from the 2007 and 2008 *Environmental Learning Outcomes Survey - Student Observation Schedule* (Ballantyne et al., 2005) has been conducted. The observation of the lower primary (LP) class was undertaken during lessons that incorporated whole class and small group discussions, walking to and from the garden, observing the surroundings and conducting planting activities. Overall, as shown in Table 2, the students displayed positive engagement in learning behaviours during these lessons.

Table 2: Student engagement in learning behaviours for the permaculture garden project

Behaviour	Frequency of engagement	
	LP 2007	LP 2008
Sharing learning with peers and experts	4	4
Making links and transferring ideas and skills	2	1
Initiating /showing responsibility for their own learning	2	3
Purposefully manipulating objects and ideas	4	4
Showing confidence in personal learning abilities	2	3
Actively involved in learning	4	4
Responding to new information or evidence	2	2
Disengagement	1	1

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

All the values identified in the permaculture garden project were also considered in relation to whole systems thinking. During the garden project, students were encouraged to think about interrelated issues in the project from a whole systems thinking approach. Thus, students were engaged in hands-on environmental action, discussions about soil and water quality, possible soil and bore water pollution and the need for testing, a review of the project findings in terms of the health of the ecosystem and people, educating others about findings, as well as participating in discussions about values related to the project.

In summary, the Community Permaculture Garden project provided students with another opportunity to actively engage in tasks that made real, made physical, the values being promoted. Another environmental project that similarly embedded the values was the Turtle Nestwatch project discussed in the next section.

Turtle Nestwatch

Students of the school and local community members expressed concern about the turtles in the nearby lakes. Specifically, road deaths and a lack of suitable nesting sites were identified as key issues that impacted on the turtles. To address these issues the school applied for and was awarded a conservation grant. Values education was an important component of the turtle nestwatch project. The specific 'social and civic responsibility' values embedded in the project were 'community' and 'benefits of research', while the 'environmental responsibility' values were again 'conservation of the environment' and 'diversity of species'.

The purpose of the turtle nestwatch project was to conduct a trial involving provision of a suitable, safe nesting site in the Herdsman Lake Regional Park for the Oblong Turtle, *Chelodina oblonga*. This project was undertaken over a two year period, March 2006 – February 2008. Three stages of the project were identified: the selection of the trial site, the control of weed species at the site and monitoring and reporting outcomes.

'Community' values were manifest in the project by effective collaboration between various stakeholders and active participation of local community members. The project involved close collaboration between the school and the government conservation authority, the local council and other bodies. Also, students, staff and community members contributed hands-on, getting 'down and dirty' support for the project by making observations at the site, collecting litter and documenting developments.

The value relating to the 'benefits of research' was highlighted by the turtle nestwatch data. The students found that turtles used the provided site for nesting, but it was not safe, as thirty one nests were predated. This new finding was reported to all stakeholders for follow-up action.

Students showed 'environmental responsibility', specifically 'conservation of the environment' by making observations and monitoring the site. They observed rubbish at the site and evidence of water pollution. Students volunteered to collect litter each time they visited the site. During an interview on the project, using the *Environmental Learning Outcomes Survey - Interview Schedule* (Ballantyne et al., 2005), a Year 7 girl reported "My attitude to this environment has changed seeing the impact of predation, of rubbish, and weeds, at the site ... It is sad to see how much rubbish is about; I'm more conscientious about walking to the bin". Furthermore, the mind map shown in Figure 3 illustrates a Year 5 girl's awareness of the importance of 'looking after [the] environment' as a component of 'sustainability'. The student elaborated on this point by mentioning 'looking after sick wild animals', and 'turtles' in particular.

The value about 'diversity of species' emphasises the need to preserve native habitats and was integral to the project. Students recognised that although the turtles weren't endangered, they were at the top of the under-water food chain and therefore provided a meaningful indicator of environmental quality (Giles, 2001). Students came to appreciate that the well-being of the turtles could be viewed as a means of monitoring changes to the aquatic ecosystem since all members of this ecosystem are interdependent.



Figure 3: Mind Map of 'Sustainability' by Year 5 Girl

In the Nestwatch project, the students were again encouraged to reflect from a whole systems thinking perspective about interrelated issues impacting on the project. Students observed pollution at the site and considered its origins. They discussed implications of the project findings for the health of the turtles, the ecosystem and people. Students participated in hands-on environmental action with associated discussion of the related values. However, initial evidence suggests that students need more experience in seeing the big picture, establishing interrelationships and understanding phenomena as an integrated whole.

An initial analysis of the data from the 2007 *Environmental Learning Outcomes Survey - Student Observation Schedule* (Ballantyne et al., 2005) has been conducted. Middle (MP) and upper primary (UP) classes were observed participating in the nestwatch project. Observations

were undertaken during lessons incorporating whole class and small group discussions, walking to and from the turtle nesting site, observing surroundings and conducting a 'turtle egg hunt'. Again it was found that overall, students displayed positive engagement in learning behaviours during these lessons. See Table 3.

Table 3: Student engagement in learning behaviours for the nestwatch project

Behaviour	Frequency of engagement	
	MP 2007	UP 2007
Sharing learning with peers and experts	4	4
Making links and transferring ideas and skills	1	2
Initiating /showing responsibility for their own learning	2	2
Purposefully manipulating objects and ideas	3	3
Showing confidence in personal learning abilities	2	2
Actively involved in learning	4	4
Responding to new information or evidence	1	2
Disengagement	1	1

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

In brief, the review of the outcomes of the Turtle Nestwatch project suggested participation provided opportunities for students to actively engage in numerous learning behaviours. The learning environment also provided an effective means of promoting values in an education for sustainability context, as well as enhancing awareness of whole systems thinking.

Preliminary conclusions and future directions

Although further collection and analysis of data is required to fully address the research question directing the research, the current paper presents some initial evidence relating to student outcomes (values, understandings and behaviours) after involvement in the mini-projects. Preliminary evidence supports the proposition that conducting environmental education projects, with an education for sustainability perspective was an effective, meaningful approach to the teaching of values and for enhancing awareness of whole systems thinking. This relationship between values education and environmental education for sustainability was observed in hands-on, real-life contexts, as well as in student mind maps and interviews.

The three mini-projects discussed in this paper illustrate how one school attempted to engage in an explicit values education agenda from an environmental education for sustainability perspective. During and after completion of the mini-projects, students were able to verbalise their environmental knowledge, explain the associated values, express their attitudes toward local environmental issues and outline their behavioural intentions and actions to improve the environment. This evidence suggests that students can learn about values by 'getting down and dirty', through environmental education initiatives. The projects provided students with opportunities to explicitly engage with values in real life environmental contexts and actively participate in tasks that made the values being

promoted both physical and understandable, rather than vague abstract concepts. Indeed these environmental contexts facilitated the demonstration of values, as was illustrated when a student, on her own initiative, re-planted the disturbed reeds after school.

Preliminary findings of this research suggest that values assets can be captured by using a suitable context. However, whether values can effectively be taught out of such a meaningful context remains unanswered and warrants further research. The issue about who created the suitable context was important at the Montessori school. A collaborative approach, where all participants were able to contribute, was adopted for each of the mini-projects. The whole school community had many opportunities for input; indeed it was the students and parents who initially raised concerns and drove the creation of the environmental contexts for the three learning initiatives. The students' participation in the whole learning process, from the conception of a learning context to its fruition, appears a crucial component for achieving powerful values education and environmental education for sustainability experiences.

From the perspective of providing learning experiences that embrace whole systems thinking, it appears further opportunities to engage in this approach to thinking are required. Although the findings suggested that some students displayed increased awareness and were able to identify relationships between phenomena, it appears that ongoing explicit focus on this approach is warranted. Seeing the whole picture and establishing interrelationships between fragmentary pieces of information, such as pollution and the health of an eco-system, is important if students are to understand phenomena in their world as an integrated whole. As discussed early in this paper, values are an important component of these interrelationships and therefore need explicit attention by educators. In particular, thinking about the connections and relevance of the experiences needs to be facilitated, as it may not occur without prompting.

The mini-project findings reported in this paper were presented to the VEGPS tri-state school cluster project and are in general agreement with the findings of the other schools in the cluster (Sparvell, 2008). What could have been stand-alone environmental education projects in each of the schools, were transformed into "significant, deep and sustainable learning" journeys by re-framing their thinking with a strong, explicit, values education foundation (Sparvell, 2007, p. 30).

Although the VEGPS cluster project, the native reed planting and turtle nestwatch mini-projects were completed early in 2008, the community permaculture garden project is continuing. Further data collection during 2008 will assist in determining stability of attitudinal and behavioural changes suggested by the initial data. Another key research issue relates to the facilitation of deeper futures thinking and whole systems thinking in an environmental education for sustainability context. What is the nature of the staff professional development required to achieve this? What do teachers, students and the school community need and want, in order to engage in meaningful, potent experiences with the *Curriculum Framework* values statements? How do you promote such outcomes? How do you assess the outcomes?

In conclusion, values are central to environmental education for sustainability. The mini-projects allowed environmental projects to be viewed with a re-framed perspective, 'seeing' opportunities to develop value assets within them. Indeed, sound pedagogy calls for making clear links between values learning and the real world. The challenge to the participating school now, and to other schools, is to consider ways to deeply embed values and sustainable practices within other site plans and curricula. There has been a move from the notion of 'teaching' values to a focus on providing opportunities that facilitate deep links between values and the real world. This brings us back to the 'double helix effect', the idea of a symbiotic relationship between values education and quality teaching (Lovat et al., 2007). What are the implications of the issues identified in this paper for pre-service and in-service teacher education? Finally, does 'getting down and dirty' necessarily translate into examples of quality teaching? Clearly, there are many research questions about the relationship between values education and environmental education for sustainability, in a quality teaching context, which warrant further study. Only some of these questions will be addressed as part of my ongoing doctoral research, so it is hoped that future researchers will consider the questions raised here as a platform for further discovery.

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