The Impact of AuSSI-WA at a Primary School

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Abstract This paper presents the findings of the first stage of research on the impact of the Australian Sustainable Schools Initiative (AuSSI) at an independent primary school in Western Australia. A longitudinal (20 year) case study is being conducted, utilising data related to Education for Sustainability (EfS) at the school from 1990-2009. 2005 was a critical year for the school because it marked the beginning of participation in the Sustainable Schools Initiative pilot in Western Australia (AuSSI-WA). The research investigates elements of EfS in operation at the school pre- and post-AuSSI-WA, as well as student and teacher outcomes after involvement in the Initiative. An analysis of the initial data suggests that participation in AuSSI-WA enabled the school to engage with a growing commitment to EfS in the context of a whole - school approach.

Introduction

The Australian Sustainable Schools Initiative (AuSSI) encourages schools to take a whole-system, whole-school approach to Education for Sustainability (EfS) (DEWHA, 2009a). This paper outlines findings of the first stage of research on the impact of AuSSI at an independent Montessori primary school, located in the Perth metropolitan area of Western Australia.

"Sustainability" involves interrelated systems, environmental, economic and socio-cultural (Jacobs, 1999; Lemonick, 2009; Tilbury & Cooke, 2005), in the context of intergenerational equity (DEWHA, 2009b; UNESCO, 2005). Our era in human history is unique because human survival is under threat due to conditions on our planet (Diamond, 2005; Flannery, 2005). Our era "speaks of the greatest change in human thought and behaviour for 3000 years" (Low, Gleeson, Green, & Radovic, 2005, p. 13). "A profound change in mindset" is needed for the long term survival of our species (Goldie, Douglas, & Furnass, 2005, p. 3). Depending on how we address environmental, economic and social issues in the next few decades, we "could usher in environmental sustainability – or collapse" (Musser, 2005, p. 22). Concern about sustainability consequently becomes global, national, state and local.

The United Nations position on EfS, outlined in their Decade of Education for Sustainable Development (2005-2014) statement, is "Education for sustainable development is a life-wide and lifelong endeavour which challenges individuals, institutions and societies to view tomorrow as a day that belongs to all of us, or it will not belong to anyone" (UNESCO, 2008, p. 1). Furthermore, "educating to deal with complex issues that threaten planetary sustainability is the challenge of Education for

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Sustainable Development" (UNESCO, 2005, p. 7). Clearly, EfS is seen as vital at the global level.

In Australia EfS has sometimes been referred to as Environmental Education (EE) in the context of education in, about and for the environment (Evans & Boyden, 1970; Fien & Gough, 1996; Linke, 1980). However, in practice there was little emphasis on the for component (Heck, 2003). The 1992 Earth Summit (UNCED, 1992) heralded a shift from EE to EfS in Australia (Heck, 2003), with a focus on the for approach (Fien, 2001). In more recent years the emphasis in EfS has involved clarification of understandings related to for the environment, by promoting "critical reflection … lifestyle changes that are more compatible with sustainability ... [and which] build capacity for active participation" (Tilbury, Coleman, & Garlick, 2005, p. 17). Education for the environment empowers people, providing learners with skills to take positive action so that current and future generations have a critical understanding of complex systems: environmental, economic and socio-political systems (Tilbury, Coleman et al., 2005). The most recent National Action Plan for EfS in Australia recognised the need for "individuals and organisations [to] have the knowledge, skills, values, capacity and motivation to respond to the complex sustainability issues they encounter" (DEWHA, 2009b, p. 8). Seven principles of EfS were outlined: transformation and change, education for all and life long learning, systems thinking, envisioning a better future, critical thinking and reflection, participation and partnerships for change (DEWHA, 2009b, p. 9).

The commencement of AuSSI in 2003 placed increased emphasis on a whole-school approach to EfS for Australian schools (DEWHA, 2009a). Pilot AuSSI schools started in New South Wales and Victoria with other Australian States and Territories joining in 2004. The AuSSI-WA pilot began in 2005 (DET, 2009a). AuSSI promotes a deeper understanding and heightened curriculum focus on the active, for the environment, component of sustainability (Tilbury & Cooke, 2005). At a state level, the Australian Sustainable Schools Initiative in Western Australian (AuSSI-WA) conceptualised sustainability in terms of social, economic and environmental systems, viewed from a holistic, integrated perspective, relevant across the curriculum (DET, 2009a). This study investigates the impact of AuSSI-WA at the local school level.

Educational and Historical Context of the Study

A longitudinal (20 year) case study is being undertaken at a small Montessori K-7 school, utilising data related to EfS programs at the school from its commencement (1990) through to 2009. The school joined AuSSI-WA in 2005.

Montessori settings aspire to be student-centred, with hands-on involvement in the real world (Gausman, 2001a; Montessori, 1967, 1992). Maria Montessori believed "nature ought to constitute the child's primary interest" up to the age of twelve (Montessori, 1973, p. 96). Montessori understandings about ecological interdependence and related values indicate close links between Montessori curriculum and EfS (Lewis & Baudains, 2007a; Montessori, 1967). The Montessori approach recognises that "all is strictly interrelated on this planet" (Montessori, 1973, p. 40) and explores the notion of "supernatura" (Hayes, 2005; Montessori, 1992), or "the suggestion that we humans can no longer survive on our own – that we are interdependent" (Gausman, 2001b, p. 2). Thus, biology and ecology are important foci and student learning covers ecosystems, biomes, individual species, species interactions, and biodiversity. From a Montessori perspective, an understanding of ecology develops concern for human impact on Earth and encourages a value system involving active caring and commitment for the environment (Montessori, 1967). Furthermore, Montessori maintained that "we

serve the future by protecting the present" (1966, p. x). This is aligned with EfS understandings.

Objectives of the Study

This study aims to investigate the following:

1. What elements of EfS were in operation in the school prior to and following involvement in AuSSI-WA? and
2. What were the outcomes, in terms of student understandings and teacher perceptions related to EfS, since involvement in AuSSI-WA?

Design, Data Collection and Analysis of the Study

The longitudinal research project from which this paper emerges employs a qualitative, phenomenological approach (Cohen, Manion, & Morrison, 2007), allowing for in-depth exploration of student and teacher perceptions of EfS prior to and after the school's involvement in AuSSI-WA. This research is being conducted by a teacher/researcher at the school. Data gathering involved surveys of former and current students and teachers, document searches and observation of student engagement in EfS lessons. Eight teachers and sixty-five students were surveyed and observed to ascertain attitudes, knowledge and behaviours in relation to EfS, in order to determine program outcomes. Three former teachers and ten Year 7 graduates (from 1999-2005) were surveyed to provide historical information about the school's approach to EfS. Document search data included historical promotional and administration records, school newsletters, information brochures, minutes of meetings, field notes from workshops, school website, policy statements and student work samples.

All sources of data were analysed by discourse analysis, using specialised computer software, QSR NUD*IST, Non-numeric, Unstructured Data - Indexing Searching Theorising (Bazeley, 2007; Richards, 2005). Data analysis also included semantic network analysis (Kleinnijenhuis, 2008; Krippendorff, 2004) of student mind maps and drawings. An independent judge (Volet, Summers, & Thurman, 2009) assisted in the coding of surveys. The judge shared expertise in EfS with the researcher, but came from an adult research focus rather than the school context. Using a coding system designed by the researcher, the judge independently coded survey data and then met with the researcher to reach agreement. The coding process was verified with final interjudge reliability of 93%. Differences occurred due to coder context and knowledge about the characteristics of young children's drawings and were resolved after discussion. Reliability was broadly achieved, however, from triangulation of the wide range of data sources employed.

Initial Findings

EfS at the School Pre-2005

Elements

Prior to 2005 no documentation from the case study school referred to a sustainability vision, policy or most other elements (Table 3) of EfS identified by AuSSI-WA (DET, 2009b). However, an examination of historical records and former student/teacher survey findings revealed a wide range of EfS-type projects were conducted prior to 2005, including a solar power project, vegetable gardening and keeping hens, water quality monitoring and various social projects.

For example, the solar power project was initiated by a Year 4 student in 2002 and facilitated by the EfS champion (teacher/researcher). Under the guidance of

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this champion students started thinking holistically, aiming to install a solar power system at the school connected to the metropolitan electricity grid - an energysmart project that could deliver environmental, economic, social and educational benefits. Such "whole-systems thinking" involved seeing the whole picture, that is, establishing interrelationships and understanding phenomena as an integrated whole (Sterling, 2003; Tilbury, Coleman et al., 2005). In 2004 the whole school engaged in this project, with pre-primary students cleaning the second-hand solar panels, lower primary students creating artistic promotional materials, and upper primary students making solar models including a model of their "solar" school, assisting with installation and measuring solar panel performance.

The former student survey indicated that students recalled "helping to clean solar panels", "making the frog pond" and "picking up rubbish". Furthermore, they remembered why they engaged in these activities, such as, "planting trees to prevent soil erosion". They described the impact of these lessons, such as enjoyment of learning and enhanced environmental awareness: "Fun and enjoyment. Didn't know all that stuff – like water quality testing … making it fun means you learn a lot more". Another student stated that lessons "made me more aware of renewable resources and awakened an interest in our environment. Gave me a broader view on how I was impacting the school/home environment and the world and now have become more conscious of my actions". This is evidence that the school engaged in EfS before joining AuSSI-WA.

The former teacher survey indicated that teachers recalled a range of EfS projects such as "science by the lake", "keeping animals", "growing a kitchen garden" and "using Children's Activities Time Society" (recycled rubbish for art/craft). Teachers also recalled innovative school camps with a "Council of All Beings", and creative community celebrations with concerts about sustainability which "blew people away". As one teacher noted, founding members of the school were conscious of living sustainably, viewing the school as "a place where enough people got together to share the dream … the ultimate empowerment". However, former teachers also mentioned weaknesses and threats that impacted on the school's approach to EfS including "increased governmental reporting requirements", "mixed backgrounds and educational understandings of school management members" and "wildly varying parent expectations". Clearly, former teacher feedback confirmed the school's awareness and commitment to a sustainability agenda prior to AuSSI-WA.

Reflections

Although the school engaged in various EfS-type projects before 2005, there were gaps. Most projects were discrete, disconnected environmental lessons, related mainly to education in and about the environment. For example, evidence revealed lake investigations were presented in the context of interesting science lessons about water quality and life in the lake. Students did not take positive action to improve the polluted lake environment. Prior to AuSSI-WA there was thus an ad hoc and uncoordinated approach to EfS, a reliance on individuals or "champions", a lack of project indicators and evaluation tools, and a lack of a whole school EfS vision or policy.

EfS at the School Post-2005

In 2005 the school joined the AuSSI-WA pilot (DET, 2009a). This proved to be a key development for the place of EfS at the school. AuSSI-WA supported the "use of sustainability as a key context for teaching and learning as part of a *whole-school approach* [author emphasis]", with the overarching goal being to embed "sustainability within the culture of the school community" (DET, 2009c, p. 2). Other guiding principles of AuSSI-WA included: "real-life", meaningful learning tasks for students and teachers;

achievement of measurable educational, environmental, social and economic outcomes; curriculum development; building community partnerships; and "active, global citizenship - a chance to empower, and feel empowered, within your local community, taking action for a cleaner, inclusive, bio-diverse world" (DET, 2009c, p. 2). In comparing issues raised in previous sections with these principles it appeared only some of the pre-2005 EfS projects, such as the solar power project, could be viewed as action for the environment. So what changes occurred at the school during and after 2005? Did subsequent projects invoke a more integrated and whole-school approach to EfS?

Elements

AuSSI-WA identified twelve key elements (Table 3) considered to be critical to the development of a successful whole-school approach to sustainability (DET, 2009b). This paper focuses on two elements only: vision and EfS activity.

Vision

The creation of the school's sustainability vision involved consultation with the whole school community (students, staff and parents) through activities such as communal mind-mapping and strategic planning sessions. This vision emerged by incorporating understandings from AuSSI, the Montessori "peace flower" (Gausman, 2001a; McFarland, 1999; Montessori, 1992) and Findhorn Foundation's (2005) model of sustainability. The school's vision of sustainability (Figure 1) incorporated eight fields: education (yellow), governance (orange), environment (red), culture (brown), spirit (purple), economics (blue), communication (aqua) and health (green). These fields overlapped, representing interrelationships between the fields and the whole system.

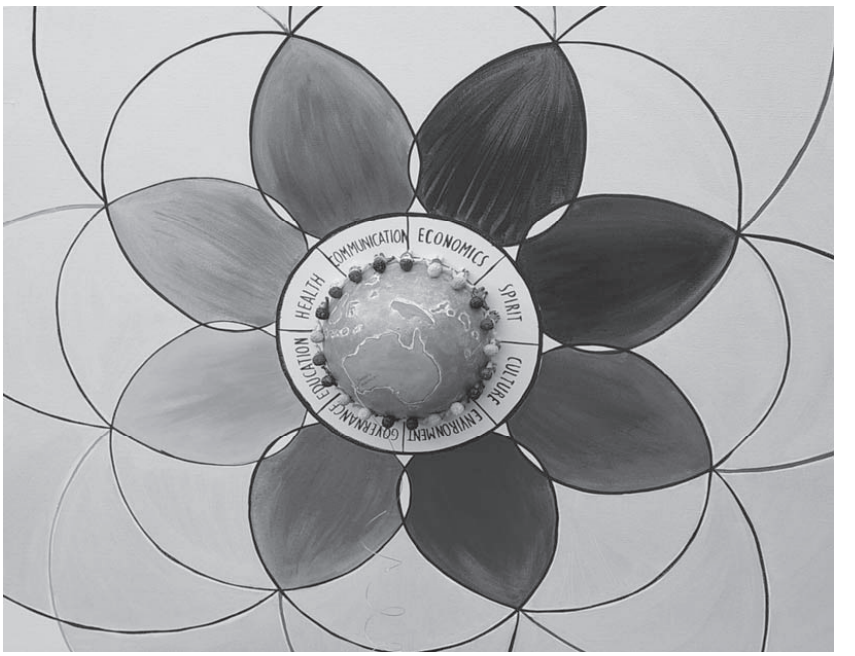

FIGURE 1: The school's vision and model of sustainability

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EfS Activities

The school engaged in many EfS projects (*Wastewise*, *Waterwise*, *Airwatch*, *Travelsmart*) during 2005-2007. Biodiversity and energysmart studies provide good examples of how EfS was understood and enacted during this time. Biodiversity studies focused strongly on the active contribution component of EfS. For example, one project involved the nearby wetland ecosystem and focused on *Living with Tiger Snakes* (ASTA, 2005a; Harris & Lewis, 2005; Rennie, Evans, & Koul, 2005, 2006). In partnership with a local wildlife centre, students studied the life cycle and habitat of tiger snakes and conducted a community education seminar. Biodiversity was also evidenced through the creation of a community permaculture garden (Ribbons of Blue, 2006) and planting over 5000 trees, shrubs and reeds in local wetlands during 2005-2007 (Lewis, Mansfield, & Baudains, 2008).

Another biodiversity project involved a longitudinal biological survey, initiated by students in 2005 to determine flora and fauna present in the school environs. Students considered the survey from a systems thinking perspective by examining environmental, economic, social and health interrelationships involved in habitat conservation (Lewis & Baudains, 2007a, 2007b). Following analysis of 2006 survey data, students implemented hands-on actions to improve local habitat for native species and displayed enhanced understandings of their local ecosystem (Lewis & Baudains, 2007b).

The energysmart project, involving the installation of a grid-connected solar power system, continued after 2005 (ASTA, 2005b; Lewis & Baudains, 2007a). The numerous challenges (technical, financial and administrative) which arose during the project were collaboratively solved by students, staff and community members, and community partnerships were developed to assist with funding the project. Student focus on whole systems thinking related to the interacting environmental, economic and social aspects of energy use was maintained throughout the project. The solar power system was officially launched in 2006, at a full day "Switch to Sustainability" celebration focusing on different spheres of sustainability (Figure 1) at the school, concluding with an eco-concert. The celebration promoted an active, hands-on approach to sustainability, and with over two hundred people in attendance it achieved positive community engagement around the issue of sustainability. During 2007 students participated in on-going educational activities related to reducing the school's energy requirements.

Student Outcomes

EfS student outcomes were ascertained from survey responses about their understandings of sustainability, student mind maps, lesson observations and work samples. For example, pre-primary students drew pictures of themselves "doing something good for the environment" and primary students created mind maps showing their understandings of sustainability. Student conceptions of sustainability were investigated and coded according to AuSSI-WA sustainability action learning areas, such as wastewise and wellbeing (DET, 2009d). Table 1 shows the frequency different categories were identified. Wastewise issues predominated, followed by biodiversity and wellbeing.

A typical pre-primary drawing is shown in Figure 2 and a representative upper primary mind map is shown in Figure 3. The mind map included reference to the wastewise, waterwise, biodiversity, energysmart and wellbeing aspects of sustainability. Sustainability values, caring and teamwork (Figure 3), were also highlighted by other students.

TABLE 1: Aspects of sustainability identified by students in their mind maps

Year Level	Cleaning	Wastewise	Waterwise	Biodiversity	Energysmart	Wellbeing
Pre-primary	7	6	5	10		6
Lower primary		42	7	27	7	32
Upper primary		62	13	44	13	16
Total	7	110	25	81	20	54

Student numbers: Pre primary 15; Lower primary 21; Upper primary 18; Total 54.

FIGURE 2: Wastewise drawing showing the student "looking after the worms" (Pre-primary boy)

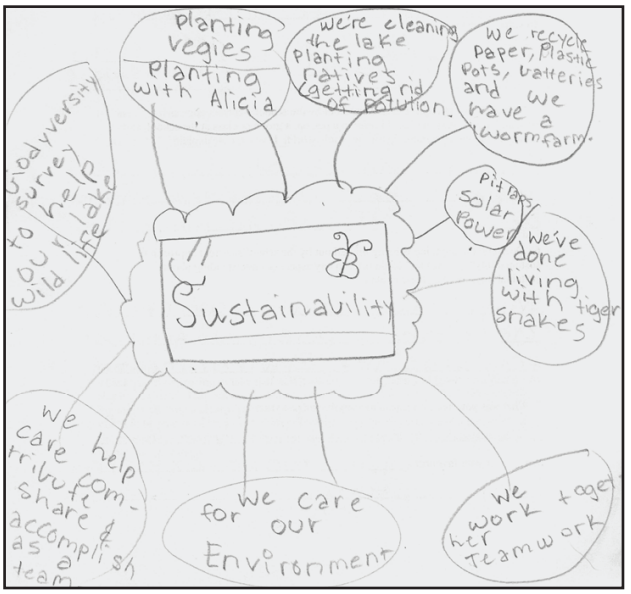

FIGURE 3: Mind map showing a student's conception of sustainability (Year 6 girl)

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Students identified their favourite sustainability lessons in 2006 (Table 2). Biodiversity programs (biological survey and permaculture gardening) clearly provided favourite lessons. Pit trapping (in the biological survey) was specifically mentioned in 18/29 responses in that category: "Pit traps because … I like looking at the frogs and weighing them"; "we could see lots of different animals"; "it was fun and we all worked together"; and "I like saving the Earth". Furthermore, the biodiversity programs were identified by upper primary students as examples of "sustainability in action" (for 11/20 responses spread over the waterwise, wastewise, biodiversity, energysmart and wellbeing categories). Students were thus engaged, enjoyed the lessons and felt empowered by their sustainability experiences.

Teacher Outcomes

Teacher outcomes were ascertained from survey responses about the EfS program. Teachers identified strengths, weaknesses, opportunities and threats (SWOT analysis) for EfS at the school. Strengths included: "gives children hope about the future"; "teaches children ways to help and contribute"; and being "linked into curriculum". Weaknesses ranged from "time to fit it all in"; "getting across the notion without despair"; and "[need] paid staff to oversee the implementation of the program". Identified opportunities included: "to facilitate children taking their learning home to make a difference there"; "to be a lighthouse"; "to educate the whole community about the wise use of natural and man-made resources"; and "to link with outside agencies". Identified threats related to "lack of funding and resources"; "busy-ness"; "entrenched patterns"; "academic pressure"; and "burn out". In brief, the teachers appeared to have a balanced view of the challenges involved in teaching EfS at the school.

Teachers were asked to explain the impact of AuSSI-WA on EfS at the school and identified improvements in EfS and concerns. One teacher stated AuSSI-WA had a "big impact on the school" and referred to the increase in the number of EfS projects. Other improvements included "creating networks with other schools - helps us to feel connected and supported"; "seeing and hearing lots of good things happening"; and "teachers are now putting into practice what they believe and teaching it in a practical way that is relevant to the school community and the curriculum". Teachers' concerns included "lack of time" and "sometimes feeling removed from what was happening".

The impact of an ongoing sustainability focus was also explored in the teacher survey. Three response types resulted: curriculum action, student engagement and help needed. Overwhelmingly, teachers agreed that EfS "gives guidance and structure" for curriculum action and is "important in building a repertoire of sustainable practices", and commented on the children's enthusiasm "to keep working on projects". Teachers also identified the need for more help, with one referring to the sustainability focus as "making me whip myself" preferring "a major focus once a year; not a conscious focus all the time". In summary, teacher survey results indicated teachers had increased

TABLE 2: Categories of students' favourite sustainability lessons

Year Level	Wastewise	Waterwise	Biodiversity	Energysmart	Wellbeing
Lower primary	4	5	16	5	4
Upper primary	0	5	13	1	0
Total	4	10	29	6	4

Student numbers: Lower primary 21; Upper primary 18; Total 39.

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their level of commitment to EfS, to varying degrees, since the school joined AuSSI-WA and were observing enhanced student engagement.

Whole School Outcomes

Additional outcomes were identified in document searches, particularly staff meeting minutes. At numerous staff meetings teachers assessed EfS outcomes using the AuSSI-WA self-assessment tool, the *Key Elements Assessment, Planning and Evaluation Rubric* (DET, 2009b). Four levels of EfS achievement were identified: starting, establishing, achieving and excelling, with twelve elements for assessment. Three assessments by teachers/sustainability committee members employing this rubric are presented for years 2005-2007 (Table 3). Group assessments concluded that gains were achieved on numerous elements of sustainability at the school. Furthermore, recent EfS projects differed from earlier projects as they were progressively linked to the wider world, rather than being conducted as disconnected, ad-hoc activities within the school. This has resulted in sustainability being more fully addressed in a systemic manner (Lewis & Baudains, 2007a, 2007b).

Teachers identified four main benefits (organisational, policy development, curriculum, financial) emerging from involvement in AuSSI-WA. Organisational benefits related to access to AuSSI colleagues and the toolkit. Procedures were established for a co-ordinated whole-school approach to EfS, including creation of a sustainability committee as part of the school's management structure. A process of reviewing projects and examining indicators was also undertaken, recognising the need for additional staff professional development on EfS, and creative education programs to increase EfS awareness and involvement of the whole school community. These organisational actions resulted in a supportive structure committed to ongoing EfS projects within the school community.

Numerous policy benefits arose from involvement in AuSSI-WA. A school sustainability policy was developed within the context of a community consultation

TABLE 3: Assessment of the school's approach to sustainability using the AuSSI-WA rubric

Elements	Starting	Establishing	Achieving	Excelling
School governance	☺	□	☼	
School policy	☺	□	☼	
Vision and values	☺	□	☼	
Review EfS activity	☺	□	☼	
Professional learning	☺	□	☼	
Teaching and learning	☺	□ ☼		
Curriculum integration	☺	□ ☼		
Reporting on learning	☺	□ ☼		
Student voice		☺ □ ☼		
School networks	☺		□ ☼	
Community networks and partnerships	☺	□	☼	
Recognition/promotion of successful action		☺ □	☼	

Key: ☺ 2005; □ 2006; ☼2007

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process resulting in a dynamic document that could reflect progressive future growth in EfS understandings within the whole school community. This policy linked with the school's Strategic Plan, as well as with "big picture" (state, national, international) sustainability goals.

Curriculum development was enhanced through whole school staff development days on EfS and this appeared to support positive outcomes for student learning, especially in terms of enhanced awareness of the importance of whole systems thinking (DEWHA, 2009a; Newman, 2005). Involvement in AuSSI-WA also reinforced the Montessori ecology curriculum and values program as a foundation for EfS.

Finally, financial benefits for the school arose from waterwise, wastewise and energysmart behaviours. The school created a co-op for eco-sales. Funds raised from the sale of worm juice fertilizer and organic produce were used to support other sustainability endeavours, like the permaculture garden. Clearly, the school's participation in AuSSI-WA was seen to be advantageous from numerous perspectives.

Reflections

The findings suggest an ongoing and growing commitment to EfS at the school, from the pre-2005 data, to developments in 2005 when the school joined AuSSI-WA, and finally to a range of successful EfS projects during 2006-2007. The pre-2005 data indicated an existing commitment to EfS evidenced through the solar power project which manifested some of the understandings later promoted by AuSSI-WA (including whole systems thinking, student agency, problem solving). The findings suggest this EfS project was a fore-runner of the AuSSI-WA approach in the school.

Since involvement in AuSSI-WA considerable progress has been achieved at the school in a relatively short period of time. AuSSI-WA facilitated major shifts in understanding and growing appreciation of a whole-school approach to EfS which was reflected in development of the sustainability vision and policy, creation of the sustainability committee and growing depth and breadth in EfS projects undertaken. Several examples were outlined of projects involving enhanced understandings of EfS, within a whole school, whole systems thinking context. Other outcomes included enhanced curriculum integration of EfS; organisational, financial and wider environmental benefits; and links with bigger picture sustainability understandings and goals. In brief, participating in AuSSI supported the school to develop a more effective and comprehensive EfS program.

Although the first stage of the research provided evidence for the positive impact of AuSSI-WA, questions remain about how the school will sustain and develop EfS. Studies have shown successful outcomes during formative years of EfS implementation in schools, but with the impact diminishing over time (Pepper, 2007; Tilbury, Coleman et al., 2005). Indeed, it is possible that EfS initiatives may suffer from the "novelty" factor and may fade easily if not deeply embedded into curriculum and the school's vision and strategic plan. In addition, there are external factors that may have a significant impact on the success or otherwise of EfS. As the present study continues, investigation will monitor the development of EfS initiatives, especially in light of potential leadership and staff changes, community and wider educational pressure, and opportunities for professional learning/community education about sustainability.

Future Directions

Despite the gains outlined, the biggest challenge for EfS at the school is achieving deeper EfS understandings, where all projects recognise the different aspects of sustainability (environmental, economic, social) and utilise a whole-school, systems thinking approach. All EfS projects need to be conceptualised as integrated, linked with

different aspects in a systemic whole, not as "silo" projects involving one component of sustainability, one narrow perspective of an issue. In addition, it appears that only EfS champions (including the teacher/researcher) are driving the sustainability initiative at the school and have some understanding of the complex systems thinking required. Further staff and community education and commitment is required for the school to "live" its sustainability vision long term.

During 2008/9 student and teacher surveys, as well as observations of lessons and ongoing document searches will be conducted at the school. What will be the impact of AuSSI-WA and EfS outcomes for students and staff after five years in the Initiative? Analysis of this future evidence will reveal the ongoing story of one school's journey in EfS through AuSSI.

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Keywords: Education for sustainability; sustainable schools; whole systems thinking.

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