

When Policy and Infrastructure Provisions are Exemplary but Still Insufficient: Paradoxes Affecting Education for Sustainability (EfS) in a Custom-Designed Sustainability School

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Abstract

Schools willing to implement Education for Sustainability (EfS) commonly find themselves confronted with curricula, school grounds and buildings, and teaching practices that do not lend themselves easily to best practice EfS. In this paper we present what we learned about some of the challenges confronted daily by the staff of a purpose-built sustainability primary school situated in a 'green' suburb in Western Australia. Over the period of a year we regularly engaged with the staff of the school through semi-structured in-depth interviews and classroom observations as part of an interpretive-ethnographic study. We identified three key themes – policy infrastructure, physical infrastructure and pedagogical infrastructure – that serve as both affordances and counter-affordances to best practice EfS. Given the paradoxical interplay of the affordances and counter-affordances shaping the school's implementation of EfS, we suggest that overcoming these paradoxes requires no less than a transformation of school culture.

Keywords: education for sustainability; policy; curriculum; built infrastructure; affordances of infrastructures; school culture

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The last decade has seen many profound changes in Australia's educational arena including the dropping of outcomes-based education in favour of a national standards- and content based curriculum, the introduction of a nation-wide testing program and teacher performance standards. In the area of Education for Sustainability several exciting new policy documents and initiatives seemed to open the door to widespread acceptance and implementation such as the sustainable school initiative leading to the establishment of a number of schools built around sustainability principles. When researchers interested in Education for Sustainability (EfS) were afforded the opportunity to conduct research at one of these purpose-built sustainability school situated in a 'green' suburb, they may have been forgiven for expecting to witness exemplary implementation of EfS. However, after spending considerable time at this 'ideal' school observing classroom and extra-curricular activities, interviewing teachers and school management, and analysing curriculum documents and policies, a somewhat less than ideal picture emerged, and so we sought to understand why. In order to situate our research within the broader context of education for sustainable development we briefly explore several international and national developments that have affected EfS in Australia.

EDUCATION FOR SUSTAINABILITY

Global developments

EfS emerged as a means of providing a wholesale response to a variety of intractable global environmental, social, economic and political issues. The declaration of the *United Nations Decade of Education for Sustainable Development 2005-2014* signalled the need for a shift from what had been a dominant approach within school curricula of educating 'about' the environment to educating 'for' sustainability (UNESCO 2005: 57; Henderson and Tilbury 2004). 'Sustainability' as a term emerged, some argue, from a long tradition of environmentalism, but latterly the term has been used to denote a wider scope of concerns and has adopted a transformative, critical and reflexive slant (Tilbury and Cooke 2005). The idea of sustainability gained greater prominence through the *1987 United Nations World Commission of Environment and Development (WCED) Brundtland Report*. This report spawned one of the most often cited definitions in the literature of sustainability or sustainable development: '*Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs*' (WCED 1987: 8). It took *Agenda 21*, a pivotal document produced at the 1992 Rio Summit to marshal international support for EfS. The rationale was that if we are to effect change one of the most efficacious ways is to use the widespread reach of the world's teachers.

The UN Decade of Education for Sustainable Development (DESD) solidified the need for governments to strengthen their contribution to sustainability through a central platform of education. As part of the Asia-Pacific region, Australia's response to the United Nations DESD was at this time argued to be stronger than any other region in the world (Tilbury and Janousek 2007). Whilst EfS policies in Australia have been well regarded by others (Kennelly, Taylor and Serow 2011), it is acknowledged that there is a gap between policy and practice.

EfS in the Australian Context

The first serious attempt by an Australian government to determine a national approach to environmental education was titled *Environmental Education for a Sustainable Future: A National Action Plan*. It acknowledged that environmental education was critical in leading to changed behaviours for an ecologically sustainable environment and clearly framed such education as encouraging people to “think broadly and understand systems, connections, patterns and causes”, and to understand that the “challenges...have social, scientific, cultural, economic and ethical aspects, all of which must be considered...a holistic appreciation of the context of environmental problems is essential” (Commonwealth of Australia 2000: 4).

Following the UN launch of the DESD, the Australian government published *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* (Commonwealth of Australia 2005) that provided a set of descriptors of the purpose and nature of environmental education across all school years. This report was followed by *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability* (Commonwealth of Australia 2009) that strongly aligned with the DESD focus of reorienting education systems to sustainability. Principles outlined for EfS stressed the need for education to be not only about providing information but (almost more) importantly to be about transformation, change and development of critical and systems thinking whilst acknowledging the interrelationship of environmental, political, economic and social systems (Commonwealth of Australia 2009: 9). The report provided a clear imprimatur for sustainability to become a formally embedded component of the mooted new national curriculum.

The Australian National Curriculum and Assessment Landscape

In the past decade, education in Australia has become overtly constructed to achieving strategic economic aims in an increasingly competitive global arena. In 2008, a commonly agreed set of aspirations and principles between all the States and Territories in Australia

was codified as the *Melbourne Declaration of Educational Goals* (Ministerial Council on Education, Employment, Training and Youth Affairs [MCEETYA] 2008). This document galvanised the desires of the nation into a succinct set of principles upon which an outward looking, forward thinking, dynamic national curriculum could be based. The new Australian Curriculum was launched in 2011 and echoed the calls for education both to respond to changes and anticipate future conditions. Three cross-curricular priority areas of *Aboriginal and Torres Strait Islander Histories and Cultures*, *Asia and Australia's engagement with Asia* and *Sustainability* were chosen to be woven through the curriculum as they were considered relevant students' lives in light of the contemporary issues they face (Australian Curriculum, Assessment and Reporting Authority [ACARA] 2010). According to the *Shaping Paper for the Australian Curriculum* (ACARA 2012), sustainability in the Australian curriculum is constructed as an ability that should permeate all learning areas with teachers being encouraged to make links between them. The idea behind this was to ensure that sustainability was not understood as a discrete set of skills and knowledge, but rather as a way of thinking and doing that transcends subject boundaries:

Education for sustainability develops the knowledge, skills, values and world views necessary for people to act in ways that contribute to more sustainable patterns of living. It enables individuals and communities to reflect on ways of interpreting and engaging with the world. Sustainability education is futures-oriented, focusing on protecting environments and creating a more ecologically and socially just world through informed action. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems and their interdependence (ACARA n.d.).

EfS as a new educational paradigm

EfS recognises that a change in our current trajectory towards environmental disaster will occur only through an understanding of the interconnectedness of multiple layers of interaction of environmental, social, economic and political issues. Consequently, its proponents hope that EfS will act as a catalyst to precipitate global action, both rapidly and en masse. Educators are being increasingly urged to address sustainability within their everyday lessons. Therefore, schools have assumed increasing importance in fostering the kinds of skills, knowledge and attitudes that may ameliorate our unsustainable actions.

In Western Australia a number of schools claim to promote 'sustainability practice' and thus to be 'sustainability' schools, however, they do not necessarily promote EfS in its broadest sense. Rather, it seems that EfS and sustainability practices, such as recycling and waste reduction, tend to be conflated, as suggested by Pepper (2007) and Lewis, Baudains and

Mansfield (2009) who contend that EfS in Western Australian schools is still in its formative stages. In order to assess a school's 'sustainability orientation', Henderson and Tilbury (2004: 44) identified a number of key features:

- school leadership that places sustainability as central to its planning and decision making;
- whole school involvement;
- reciprocal stakeholder partnerships;
- learning approaches that encourage critical thinking, intercultural perspectives, participation and citizenship;
- integration of environmental education and EfS across the curriculum;
- a hidden curriculum that is congruent with the taught curriculum;
- regular professional development for staff;
- greening of the school environment;
- 'classroom' teaching to be taught within and beyond school grounds;
- reducing the school's ecological footprint;
- the school becomes a reflexive learning organisation and includes the research of practitioners to promote improved performance.

Analysing the above list, it seems that the core-components of EfS, that is, issues related to curriculum and pedagogy, represent only a partial aspect of what makes a sustainability oriented school. Crucially, EfS considers sustainability practices and supportive infrastructures as essential, however, it also places strong emphasis on changes in practices, values and attitudes. The latter can only occur as a result of a re-orientation of the education system as a whole.

SEARCHING FOR AN 'IDEAL' OR RE-SEARCHING A 'REAL' SCHOOL

Amity Primary School (pseudonym) – the site of our research – caters for students from Kindergarten (four year olds) to Year Six (eleven year olds). It is located on the periphery of a natural wetland within an outer suburban development in Perth that was explicitly designed to become a 'sustainability community'. The housing development is situated close to a major local groundwater catchment area that provides much of the metropolitan residential area in Perth, the capital city of Western Australia, with potable water. As such, additional care was taken by the local council to ensure that each household in the community complied with regulations, such as grey-water re-use, recycling, passive-solar building design and orientation to minimise environmental impact. Likewise, the school was designed and built using 'environmentally friendly' materials and design principles. What makes Amity

Primary School special is that it has a clearly identified sustainability ethos and remains the only fully purpose-built sustainability school of its kind in Western Australia.

This paper draws on doctoral research that examined the policy trajectory of EfS imperatives within Amity Primary School. The study formed part of an Australian Research Council (ARC) Discovery Project (DPS: Taylor, Taylor & Fisher, 2009-2012) that inquired into the role of ethical dilemma pedagogy in supporting EfS in a number of WA schools (for details see: Settellaier 2009; Taylor, Taylor, and Chow 2013). From a methodological perspective, the research was conducted as an ethnographic inquiry within the interpretive research paradigm (Taylor, Taylor, and Luitel 2012; Tedlock 2000), and involved in-depth semi-structured interviews and regular classroom observations for the duration of one school year. The first author (Sonja) conducted the fieldwork and preliminary data analyses. At the school, research participants included the Administration Team - the Principal (Annette) and two Deputy Principals (Margaret and Janine); a Kindergarten teacher (Nancy); a Year 2 teacher (Tarryn); a Year 6 teacher (Robert); two subject specialists for music (Susan) and art (Christine); three Year 4 teachers (Anne, Adam and Mary); and the kitchen chef (Audrey). For ethical purposes, the identities of the school, teachers and other personnel have been protected by the use of pseudonyms.

Data were analysed using a grounded-theory approach (Charmaz 2000) that enabled us to identify three types of infrastructure shaping the implementation of EfS at Amity Primary School: (1) *Policy Infrastructure* - including both mandated and suggestive policies; (2) *Physical Infrastructure* - including the built environment of the school, such as buildings, landscaping, and useable elements (e.g., gardens, chicken coops); and (3) *Pedagogical Infrastructure* - including the ethos, teaching practices, provision of professional development and pedagogical priorities within the school. In order to understand the complex interaction of these infrastructures, how they both facilitated and restricted implementation of EfS at Amity Primary School, we adopted two theoretical perspectives, or interpretive lenses: affordance and paradox.

Affordance

The term 'affordance' refers to passive or latent potential determined by the interaction of humans with non-human elements, and also to the potential of structures and processes to enable desired outcomes. The term has become strongly associated with the definition proposed by Gibson, "...the *affordances* of the environment are what it *offers* the animal, what it *provides or furnishes*, either for good or ill" (1986: 127). Consequently, it can be said that a knife can have 'the affordance of slicing bread' (i.e., feeding a hungry family) or of 'killing someone' (i.e., murder). It is concerned not only with the property of an object but also

with perception, intent and function as determined by the user. Gaver put it succinctly, "...most fundamentally, affordances are properties of the world that make possible some action to an organism equipped to act in certain ways" (Gaver 1991: 79). According to Hammond, "...affordances provide both opportunity and constraint. These are not opposites, rather they are complementary, so, for example, a sledgehammer affords the breaking of rocks but the user is constrained by its weight - the very thing that provides the opportunity for rock breaking" (Hammond 2010: 206).

We have used 'affordance' as an interpretive lens given that the notion of affordance has been broadened to incorporate how different kinds of infrastructure may be acted upon, and with, and has moved away from only being concerned with direct perception. For teachers, the very thing that potentially furnishes opportunity may also serve to curtail achievement. We have chosen to refer to this inherent tension evident in teachers' working lives as *affordances* and *counter affordances*, to better represent the notion of potential that remains unrealised due to influences that pull away from the intended goal.

Paradox

Conventional dualistic logic tends to view counter-affordances as contradictions and thus as obstacles or negative aspects. When analysing the data we used the concept of 'paradox', as suggested by Parker Palmer (2008), as an interpretive lens since it embodies the meaning of living with complexity in a "world of work and politics where values cancel each other out" and interests compete. Interpreting situations through the lens of paradox allowed us to transform apparent contradictions and shortcomings into what Thomas Merton referred to as the 'hidden wholeness' (Palmer 2008: 4-7), thereby avoiding making negative judgements. There are many structures that contribute to the 'hidden wholeness' that teachers are part of and work within, through and sometimes even against.

Next, we examine the policy infrastructure, physical infrastructure, and pedagogical infrastructure of Amity Primary School, and discuss how these infrastructures have affected implementation of EfS at the school. We identify five paradoxes associated with the tension that exists between the affordances and counter-affordances of these policy infrastructures.

POLICY INFRASTRUCTURE

Policy infrastructure, that is, policies that are mandated and those that are suggestive, affect teacher practice. Of direct importance to EfS in schools are policies based on ideas and ideals around sustainability percolating around the time of the development of the *Melbourne Declaration* and the *Australian Curriculum*, especially the cross-curricular priority of

Sustainability. These ideas have been harnessed not only through the national curriculum and the national plans for environmental and sustainability education described earlier, but also through a national sustainability initiative called the *Australian Sustainable Schools Initiative* (AuSSi) of which Amity Primary School is a member.

Australian Sustainable Schools Initiative [AuSSi] – A Whole-School Initiative

Amity Primary School is one of over 2000 Australian schools participating in a voluntary program called the Australian Sustainable Schools Initiative (AuSSi) established in 2002 (Commonwealth of Australia 2005: 10). AuSSi's work actively promotes the *Melbourne Declaration on Educational Goals for Young Australians* (MCEETYA 2008). The original intent of the initiative was for sustainability to be supported at both community and whole-school levels through provision of teaching materials, tools for planning and reporting on sustainability outcomes, and staff training. There are nine major aims of AuSSi - the critical outcome they claim to achieve is to improve students' understanding of the world in which they live by developing their knowledge, thinking skills, values and capacity to participate in decision-making about environmental, social and economic development issues (Australian Government – Department of the Environment, n.d). The view presented is that EfS is much more than just environmental management. Amity Primary School was provided with the necessary built infrastructure, as we discuss later, but how, we ask, have the various policy infrastructures put in place over the past decade supported the implementation of EfS? What effect has policy infrastructure had on practice at this school?

Paradox 1: The affordance of sustainability as a cross-curricular priority in the Australian Curriculum versus lack of a policy mandate to teach EfS

The goals of the *Melbourne Declaration* and the intent of the *Australian Curriculum* in regards to sustainability provide a guide to action. Schools are neither measured nor judged on their alignment or lack thereof to such goals. Examining closely the *Australian Curriculum* reveals a concerted lack of emphasis on a requirement for teachers to teach 'about' or 'for' sustainability. Kennelly, Taylor and Serow (2011) critiqued the document saying that it is insufficient to merely identify elements within the four learning areas (Science, Mathematics, English, History) by tagging statements with icons indicating links to sustainability. Only oblique suggestions exist for how to develop the topic of sustainability further.

Thus it could be argued that the *Australian Curriculum* provides an affordance for EfS through its cross-curricular priority of sustainability, however, lack of explicitness within the document makes it difficult for teachers to know what and how to teach about sustainability. According to our analysis of policy documents and interviews with teachers, there appears to

be wide latitude in how sustainability may be interpreted within formal documents and appropriated within the classroom. Tarryn, a Year Two teacher at Amity Primary School, explained that she found the guidance provided by the *Australian Curriculum* and the *Western Australian Department of Education Syllabus*, "...not very explicit at the moment for me" and "...very airy fairy". Furthermore, when teachers decide what to concentrate on and implement within a school setting, priority is likely given to those aspects of the curriculum that have the greatest consequences, that is, those that are mandated. Adam, the Sustainability Coordinator of Amity Primary School, raised a concern that the (education) system did not make it easy to teach sustainability, "*it is not...an assessed strand...you are fighting to get teachers ...and justifying to them why they should be spending some of their precious time that we get little of as it is, on sustainability.*" Consequently, teachers are forced to prioritise competing requirements and those that are not assessable are given less, if any, attention. Thus, whilst acknowledging that Amity Primary School was probably ahead of most other schools inasmuch as sustainability is part of the established school ethos, Adam knew that in other schools this was much harder to achieve, and cautioned that, "...it can fall by the wayside too easily!"

Although the *Australian Curriculum* provides an affordance for EfS, paradoxically it also provides a matching counter-affordance: if teachers are unfamiliar with the intent and purpose of EfS and find it too difficult to identify EfS elements in the curriculum documents there is a risk that teachers may choose to ignore EfS, especially if other mandated and assessed priorities compete with EfS. Consequently, the lofty intent of the new *Australian Curriculum* cross-curricular priority of *Sustainability* may remain largely unrealised.

Paradox 2: The affordance of EfS in the Australian Curriculum versus national teacher standards and national numeracy and literacy testing

At the same time as introducing the promising initiative of a cross-curricular priority that has the potential to promote EfS in schools, the Australian Government yielded to growing calls for improvement of teacher and student outcomes and performance. This led to the development of *National Teacher Standards (NTS)* and national standardised tests designed to measure students' literacy and numeracy skills in the form of the *National Assessment Program – Literacy and Numeracy (NAPLAN)* which is administered annually to all students in every school across Australia in Years Three, Five, Seven and Nine. Neither the NTS nor NAPLAN are concerned with sustainability. They serve, however, as a powerful means of teacher accountability. The NTS prescribe professional attainments that teachers must demonstrate in order for renewal of their teacher registration licence. These standards are also increasingly used as criteria for promotion. NAPLAN results determine how schools

are ranked on league tables which may impact upon rewards and consequences for both individual teachers and schools. Thus, given a choice between achieving highly in the mandated NTS and NAPLAN or trying to work out how to fit EfS into one's curriculum, many teachers are likely to choose only that which is mandated.

Despite Amity Primary School's EfS ethos, it is difficult for teachers to engage with sustainability in their teaching when they need to respond to other pressures such as yearly NAPLAN testing which, according to Adam, has become all pervasive. He summarised NAPLAN's impact on EfS at Amity Primary School: "...unless you can justify sustainability [as] teaching literacy and numeracy [teachers] don't want a bar of it because they know they are getting assessed on the quality of their job based on their NAPLAN results!" Whilst there is a great deal of goodwill within the school toward incorporating sustainability into the curriculum, a number of teachers talked about the priority need for 'results' in literacy and numeracy. Christine felt that the main driver in the school was literacy - not sustainability. She noted that many teachers "*actually feel miserable. [...] It's against most of their philosophies. [...] the role of the classroom teacher is becoming tunnel-visioned.*" Tarryn, who like many other teachers at the school was concerned and connected to sustainability on a personal level, expressed the frustration she felt: "*You can't neglect any sort of sustainability teaching because it's the way forward really*".

PHYSICAL INFRASTRUCTURE

At Amity Primary School many physical aspects of the school environment have been purposely created to support EfS. In many respects this school is not untypical of other primary schools in Western Australia in that it has a vegetable garden, a recycling program, a grey-water scheme and a kitchen program to illustrate the 'seed to table' cycle. But it also has additional environmentally-friendly features based on sustainability design principles embedded in the architectural plan and construction of the school buildings. As well as incorporating recycled building materials, the school has an advanced computerised Building Management System that measures humidity, wind direction and wind speed, and monitors and manages the temperature of the buildings through automatic adjustment of specially placed louvres, and also controls room lighting. Special thermal bricks that capture the winter sun are one of the key features of the school building. None of these features has been replicated in other Western Australian government schools, providing a unique opportunity to observe EfS in action in a school designed to epitomise sustainability principles and practices. The Principal, Annette, seemed proud of the unique status of the school and how it complements its local community, "*...the building was tendered on sustainability principles, which was the first time for the Department [of Education]. That came about with an*

agreement with the developers of Prairie Lakes which is a green smart suburb...where residents have to meet...criteria of sustainability features...so the school was built on those sustainability principles...there is no other school like this.” Given the school’s unique purpose-built infrastructure, we were curious to learn how the facilities supported EfS in practice.

Paradox 3: The affordance of sustainability infrastructure versus unsustainable maintenance paired with ignorance of key sustainability features

Amity Primary School has a permaculture garden and participates in the ‘Stephanie Alexander Kitchen Garden’ program that comes complete with chickens and worm farms, and requires an extensive application process. An aquaponics fish farm has been developed on-site. Schools voluntarily sign up to be part of the not-for-profit Stephanie Alexander Kitchen Garden Foundation program, thereby accessing start-up funding for physical infrastructure (e.g., kitchens, chicken pens, gardens). At the time of our study, this program was operating in 574 schools Australia-wide, involving 60,000 children learning about how to grow, harvest, prepare and serve fresh seasonal food. The program is aimed at eight- to twelve-year old children and its intent is to develop skills that can be incorporated across the curriculum. However, when we visited Amity Primary School we only witnessed Year 3 and 4 children participating in the kitchen garden and corresponding kitchen program. It was explained to us that this restriction was due to limited funding that provides for only four classes of each of these year level groups, a total of eight classes.

We learned that the ‘Stephanie Alexander Kitchen Garden Program’ provides only initial start-up funding: once the program is established each school is left to pay for the staff to maintain and run the kitchen and garden and to supply all the materials and consumables. The kitchen chef, Audrey, does her best to produce goods to sell such as soup and bread rolls for staff lunches as she says the principal has *“allocated money to the kitchen garden program (from the Finance Committee) and the students pay \$10 a term for it as well. So that’s where we get our money for the consumables and then we try and use the market trolley and sell things off”*. Difficulty with funding and maintenance of the garden is one of the issues that restricts the school’s EfS program. Another lies with the buildings themselves.

The good intentions imbued in the school’s sustainability design are yet to be fully realised. The difficulties stem from the end users (i.e., teachers, students, community) not having been part of the original design process; only the initial cohort of teachers received an introduction to the physical infrastructure when the school was first constructed in 2003. Not many of the current staff has an adequate understanding of the function of the sustainability design elements. Teachers expressed concern that although they recognised potential

technological benefits of the school's sustainability design, they were not able to fully realise this potential within their own teaching as they did not have adequate knowledge about these features. Disappointingly, some of the key features had a history of malfunction and were either defunct or remained unused.

School staff reported the breakdown of the grey-water recycling system which could not be repaired because the cost of this important feature had to be off-set against other pressing financial school needs. Janine, the Deputy Principal, explained some of the issues: *"The recycling of the grey-water never worked and has now been decommissioned."* She added, *"We had difficulty with the Building Management System...[there is] a designated computer that lives in the library...there are sensors in the classrooms and it manages those."* These sensors help to control louvres along the bottom of the buildings' walls that are designed to cool the rooms in summer. In theory, the position of the louvres helps create a chimney-effect by drawing in cool air from the bottom of the building with hot air leaving through vents in the roof. But sometimes the system 'went haywire', as Janine observed, *"Sometimes the louvres open and close ten times an hour. Sometimes they're open and you're thinking, "Wow! It's freezing now! ... We have little temperature monitors inside the buildings... and we know they just aren't correct. That's not 19 degrees all year round!"* Robert, another teacher, commented on lack of consultation or forethought of the building designers in considering the needs of the teachers and students saying, *"Children should have been considered as little light bulbs. The heat generated by 30 plus bodies is not compensated by the natural airflow."*

Initially the school was designed without air-conditioning powered from the state's electricity grid because it was believed that these sustainability building features would cool the centre of the buildings during long, hot, dry Perth summers (with daytime temperatures regularly in excess of 30°C). However, the Principal, Annette, noted that what actually happens is that the natural heat in summer is exacerbated by the special thermal walls that were designed to attract winter heat but that have been shown to heat the classrooms all year round. The resulting classroom climate was having a negative impact on the children, *"I think we are disadvantaged [in comparison] to the school down the road that has air-conditioning...when we're preparing for NAPLAN and things like that"*. Consequently, the impact of having no adequate air-conditioning had wider ramifications than just immediate student discomfort. Subsequent to this study, the Federal Government overrode the original environmentally friendly intent of the school and installed grid powered air-conditioning as part of an economic stimulus measure during the Global Financial Crisis (GFC). Thus, the GFC indirectly resolved the school's dilemma of wishing to provide a comfortable learning and teaching environment but also having to remain true to the school's sustainability

principles. Annette stressed that this form of air-conditioning can be consistent to some extent with 'being sustainable' if it is used only when necessary. The leadership team showed resolve in overcoming these issues and the Principal affirmed that, *"...it was all a trial thing in this school and because it has been problematic they are not going to put it into any other schools. But we're quite passionate about it because we are a sustainable school...so we'll continue to drive it."*

Thus, we conclude that the affordances of the physical infrastructure of Amity Primary School are counteracted by having to secure ongoing funding for the ongoing operation of key sustainability features. The school was initially funded for its special sustainability design but ongoing maintenance is now the school's responsibility. Although there is strong desire to maintain sustainability practices within the school, economic pressures serve as counter affordances. Not having enough school funding directed at repairing key malfunctioning sustainability systems sends a message to staff and students that these are not essential features of the educational experience for their students. None of the teachers interviewed commented on their students using any aspect of the physical infrastructure in their learning – apart from the kitchen and garden. Consequently, the school community is left with the paradox that they have access to erstwhile state-of-the-art physical infrastructure yet the use of that physical space as a 'third teacher' (Malaguzzi 1998) remains largely an ideal.

PEDAGOGICAL INFRASTRUCTURE

Pedagogical infrastructure comprises a school's ethos and teaching practices and priorities. Of particular importance with a view to sustainability is the way a school plans for EfS and ensures that teacher knowledge about sustainability concepts is up-to-date through ongoing professional development. The affordances and counter affordances of the pedagogical infrastructure of Amity Primary School are explored in this section.

Paradox 4: EfS requires deep teacher knowledge of sustainability concepts versus reduced professional learning favouring literacy and numeracy

A key factor determining the extent to which teachers implement EfS is their level of knowledge, skill and confidence. The fact that there is a regular turnover of staff at Amity Primary School means that there is also a new influx of teachers who, on arrival, are likely to have varying levels of familiarity with sustainability concepts. Rather than providing teachers with intensive professional development focused on sustainability, the professional development focus for the school has recently moved to literacy and numeracy because of the need to improve the school's NAPLAN performance, as outlined earlier. The Principal acknowledged this discrepancy and claimed that professional learning for sustainability is not

as prominent as it used to be, but that it has not been forgotten. If teachers now undertake professional learning on sustainability issues it is usually of the kind where teacher-relief is paid for by an external provider (e.g., the 'Water Wise Program'). Regardless, the goal of face-to-face professional learning for staff, according to the principal, is to upskill one or two individuals at a time. The expectation is for these teachers to share their newfound knowledge with colleagues. Annette stated that there were now many more professional learning opportunities available 'online'. A number of teachers mentioned that the internet was where they turned to for information and ideas about sustainability, rather than approach colleagues or Adam, the designated Sustainability Coordinator. Anne, a Year 4 Teacher and the school's Science Coordinator, admitted her lack of knowledge in this area yet professed her commitment to sustainability saying, *"I don't really have any ownership of my sustainability teaching right now but I have recognised that as a gap for me."*

Adam stated that as the school's Sustainability Coordinator he aims to enable all teachers to show students how to look at 'the whole picture' using curriculum integration which he identified as a key to EfS. As he was knowledgeable about sustainability he was better able to integrate curriculum areas and link them to sustainability ideas. He reported, however, that most teachers at the school taught each subject area separately, and noted that teachers were *au fait* with everyday sustainability practices but still needed to develop deeper knowledge and understanding of sustainability: *"They're very good at the surface, turn the tap off, use solar power, the ones everyone knows."* Yet, he stressed, they need to develop *"...deeper underlying skills...how by turning the tap off... does that improve dams? They still need that."*

According to Adam, content knowledge of Amity Primary School teachers is supplemented by commercial 'black-line masters', that is, books full of worksheets on sustainability. He rejected their usefulness, arguing that *"...sustainability is a very personal thing and it requires not only content knowledge but a change in your beliefs, essentially. You don't get that from a worksheet!"* He did, however, understand the appeal of these worksheets, *"...you have to understand your teacher doesn't necessarily have the time to do it all when they are also having to go home at night and learn the background content themselves."* Furthermore, Adam pointed out that sustainability is not yet seen as a legitimate part of pre-service teacher education curricula at universities, *"...maybe [as] a footnote in your Society and Environment or Science curriculum unit"*.

For Christine, who had taught at the school since its inception, teachers' attempts at integrating sustainability into their teaching practice were not much more than a token effort, *"It kind of...looks good on the surface but when you scratch deep, there's not very much*

there. It's a bit like an IKEA school: it's quite good for that short time and it looks good and shiny...but the point is it doesn't last long."

Paradox 5: A school culture driven by change agents and professional sharing promoting EfS versus lack of ownership and understanding by teachers

When Adam was offered the position of Sustainability Coordinator at Amity Primary School he was aware that, as a change agent, knowing what other teachers are doing in regards to sustainability was a priority. He was also aware that whilst teachers may be doing 'amazing things' much of this information is not shared across the whole school. Tarryn, the Year Two teacher, confirmed Adam's assertion by saying that in her first year at the school she felt that she was not doing enough about sustainability, "...because I didn't know what was really expected." She had heard a Year Three teacher talking about using 'dilemma stories' for sustainability in the classroom but was not familiar with them nor aware of what other teachers were doing about EfS in their classrooms. Tarryn explained that she was conscious that being a teacher at a sustainability school entails the tacit expectation to engage in EfS, yet she felt that she was still finding out what that actually means.

On a positive note, some of the teachers reported having joined the school's new Triple S Committee - Science, Social Studies and Sustainability [SSS]. Through this committee they were feeling increasingly connected to what was going on in the school in terms of EfS. Nancy and Tarryn confirmed that Adam had been working hard to integrate sustainability, history and geography, and science. At the time of this study, the SSS Committee was aiming to create an integrated planning document.

When asked how the school was helping teachers engage with EfS, Annette, the Principal, pointed out that all change is incremental. She stated that the previous Sustainability Coordinator had done good work but had not engaged teachers across the school in the thinking and practice of EfS. That person has since left the school and the role was now Adam's. Annette expected the next stage would see a greater emphasis on sustainability across the whole school, especially through Adam's work as a key change agent. The affordances provided by the pedagogical infrastructure allow for EfS to be integrated across the school, however, the school has been confronted with the paradox that the main change agent in the past had preferred to work largely alone and thus professional sharing had been on the backburner and was only now starting to develop.

Although there are examples of initiatives in place at Amity Primary School that contribute to a potentially strong pedagogical infrastructure for sustainability that affords EfS at the school, teacher engagement with these initiatives had been low-key and superficial

due to other competing priorities and lack of professional sharing. New change agents in the school are likely to find themselves confronted with the paradoxical situation that although some pedagogical incentives are in place that could promote teacher engagement with key ingredients of EfS, namely curriculum integration and deep sustainability knowledge, teachers' knowledge about sustainability remains somewhat superficial and professional sharing does not appear to be commonplace.

WHAT HAVE WE LEARNED?

In this paper we have examined how policy, physical and pedagogical infrastructures have provided affordances and created counter-affordances for implementation of EfS within Amity Primary School, a purpose-built sustainability school. We have identified five paradoxes that juxtapose the idealised intentions of sustainability policies against the everyday reality of the school.

- Paradox 1: The affordance of sustainability as a cross-curricular priority in the Australian Curriculum versus lack of a policy mandate to teach EfS
- Paradox 2: The affordance of EfS in the *Australian Curriculum* versus national teacher standards and national testing of numeracy and literacy
- Paradox 3: The affordance of sustainability infrastructure versus unsustainable maintenance paired with ignorance of key sustainability features
- Paradox 4: EfS requires deep teacher knowledge of sustainability concepts versus reduced professional learning favouring literacy and numeracy
- Paradox 5: A school culture driven by change agents and professional sharing promoting EfS versus lack of ownership and understanding by teachers

Reporting on issues raised in discussions during the *2009 UNESCO World Conference on Education for Sustainable Development*, Gadotti (2010) confirmed several of our findings when he stated that, in so-called sustainability schools, sustainability can reinforce the key elements of teaching and learning, including the school physical environment, the social environment, and the linkages with the community, however, the rigidity of prescribed curricula and examination processes are likely to serve as impediments to teachers' creativity and innovation in the sustainability space. This echoes our understanding of why Amity Primary School can be so different from other schools in some respects and yet still be like any other primary school in other respects. We were able to witness some aspects of EfS, but then many of these also could be present at 'non sustainability' schools.

Whilst examining the policy infrastructure it became apparent that even with a strong sustainability ethos at Amity Primary School coupled with wider policy support, its teachers

have to walk a tight-rope of responsibilities and desires. Strong counter-affordances in the form of a weakly defined and non-mandated sustainability strand in the *Australian Curriculum* competes with a greater emphasis on teacher accountability and national testing regimes. These regimes do not reflect the purposes and intent of EfS and consequently distract teachers' focus to a narrowly defined set of curriculum outcomes. Although recently some teachers at Amity Primary School are planning together how to integrate sustainability across the curriculum through the so-called 'SSS-plan', a competing set of messages is simultaneously broadcast to teachers that mandate an emphasis on discrete literacy and numeracy skills. This situation appears to be a tacitly accepted and uncontested paradox that requires further research and contestation.

Physical infrastructure in a school that is purpose-designed and built along sustainability principles provides a potentially rich teaching space and set of tools. Amity Primary School has been unable to fully realise this potential since maintenance and related costs of that physical infrastructure paradoxically act as a counter-affordance to EfS.

Examining the school's pedagogical infrastructure has revealed that teacher knowledge and professional learning have a marked impact on how EfS is embedded into the whole school. Although this appears to be an area that on the surface may be easily remedied by providing more sustainability pedagogical content knowledge, competing professional development priorities in literacy and numeracy create a counter-affordance to developing deep teacher knowledge of sustainability. Importantly, whilst improved discipline knowledge is certainly important, by itself it does not constitute the critical element of EfS.

Given that, crucially, EfS places strong emphasis on changes in values, attitudes and practices, we argue that what EfS strives to change can be referred to as 'the school culture' which comprises the meanings, values, and practices that constitute the way of life of the whole school community (Schech and Haggis 2000: 21). Whilst Amity Primary School's existing policy, physical, and pedagogical infrastructures are important and supportive, what seems to be in most need of change is the culture of the school if EfS best practice is to overcome the paradoxes identified in this study. This requires a 'macro shift' in thinking (Laszlo 2001) rather than 'business as usual'. EfS promises a different kind of education than we currently have: one that is premised on a systemic, ecological world view that encourages interdisciplinary, holistic and transformative teaching and learning (UNESCO 2005), rather than the education system within which Amity Primary School's teachers struggle to work and flourish and which presents them with numerous paradoxes to overcome. Education in Australia is currently predicated on a dominant mechanical worldview that treats all aspects of the world, including humans and their relationship to their

world, in isolation. In effect, this means that in addition to changing whole-school culture teachers are required to act as intellectual change agents and work against hundreds of years of a deeply ingrained way of thinking about the intent, purposes and practices of education. This is clearly not an easy task (Stevenson 2007).

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