Water Quality Issues as Locally Relevant School Curriculum In Far North Queensland

Introduction

A considerable body of research indicates there are many lifelong benefits to be gained from childhood environmental learning that takes place through non-formal experiences children have in ecological settings and formal educational experiences. Non-formal experiences may be, for example, playing in the bush, going fishing or visiting places with ecological diversity such as national parks. Formal educational experiences are school-based and focus on meeting curriculum outcomes and include action projects work such as creating school gardens, rehabilitating local environments and setting up recycling schemes.

The catchphrase "think global, act local" takes a systems view of the world where a biophysical earth is understood to be an interconnected web of systems, therefore, change in one part of the system affects all other parts. Local scale sustainability work such as habitat rehabilitation to increase local biodiversity will have positive impacts on global scale ecological issues. The case for locally embedded sustainability education is made by Fien and Tilbury (2002) who argue we can only effectively change things in our local communities. Tomashow (2002) and Stewart (2006) propose local natural history education is the foundation for development of more sophisticated global understandings such as global environmental change. Weilbacher (1993) stresses local ecological knowledge is necessary to detect change. Research also links locally relevant sustainability education with increased childhood mental health and wellbeing (Maller, 2005), and increased social capital (Dale & Carlisle, 2008).

Water quality education as a researchable issue in Far North Queensland

In Far North Queensland water quality changes in waterways leading to the Great Barrier Reef is a locally relevant issue that has global meaning. Reef organisms are highly susceptible to any decline of water quality caused by increased sediment runoff, pesticides and herbicides, and general urban wastes.

Over the past 150-200 years, runoff from land based agricultural activities and urban development has caused a fourfold increase in the levels of anthropogenic pollutants entering Great Barrier Reef (GBR) waters via catchments (Haynes, 2001). The result is changes in water quality, which affect the health and sustainability of the GBR as well as social communities dependant on the GBR for their economic, social and cultural wellbeing. It is projected that by 2020 the GBR will suffer further significant biodiversity loss partly due to anthropogenic activities (Intergovernmental Panel on Climate Change (IPCC), 2007). In an attempt to mitigate these adverse affects, the Australian Government has supported the Reef Water Quality Protection Plan (RWQPP), the Douglas Shire Water Quality Improvement Plan (Douglas WQIP) and the Marine and Tropical Sciences Research Facility (MTSRF). The RWQPP and Douglas WQIP aim to halt and reverse the decline in water quality while MTSRF is undertaking research aimed to protect North Queensland's public environmental assets.

Managing natural resources such as water can only be successfully accomplished by incorporating knowledge and practices from all sectors of the community (Olsson, Folke and Berkes (2004), including the formal school sector. It is important to note that almost twenty percent of the population of Far North Queensland attend school everyday as students and paid employees (Australian Bureau of Statistics, 2005). Therefore, it makes sense to include school communities in co-management of water quality resources. School curriculum studies to connect students with local water quality issues enable students to develop and apply real life problem solving skills in a meaningful context. Our research project is funded by MTSRF to investigate school education and water quality issues. We discovered most primary schools in the region rarely undertake education programs that focus on water quality and that there are many barriers to doing this work, that exist across multiple scales of our social systems. We use the literature on sustainability education as a point of reference in this paper because no published research has been carried out on water quality focused sustainability education in schools.

Context and methodology

In this paper, we present a preliminary report on a case study conducted at Wonga Beach State School in 2007 and 2008. The school is situated on the northern end of the Cairns Regional Council area, about 50 kilometres north of Port Douglas, in a township called Wonga Beach that sits between the Great Barrier Reef Marine Park and the Wet Tropics World Heritage Area. The school itself is 300m from the beach and has an enrolment of 120 students from a low socio-economic, rural farming community.

Case study methodology is an effective approach to inquiries into environmental education practice (Kyburz-Graber, Hofer, & Wolfensberger, 2006). As Wonga Beach State School began their sustainability journey in 2004, spurred by a vision to improve a dilapidated wetlands system adjoining the school grounds, this site seemed the logical place to learn about what is and is not possible when it comes to water quality education and action in school settings. In four years, school staff and students have rehabilitated a wetlands area adjacent to the school with the permission and support of the farmer who owns the land; planted 6000 trees on school grounds (land owned by Education Queensland); built vegetable gardens; put in a frog habitat; cut their electrical power consumption by 30%; and established a waste management program. Teaching and learning about sustainability is integral to the school philosophy and environmental education for sustainability is integrated across all Key Learning Areas from Prep to Year Seven. The school has won an impressive number of local and state awards in recognition of their sustainability work and students and staff regularly feature in local newspapers. The school is at the centre of its community and their initiatives have engaged a section of the local community who may not ordinarily be involved with the school. Sustainability education and action has lifted the profile of the school significantly

Data collection involved extensive, in-depth, on-site, semi-structured interviews with the principal and sustainability education coordinator, taking photographs, examination of school documents such as the school environmental management plan, and the writing of researcher reflections. Semi-structured interviews allowed the research agenda to be covered and give the two interviewees the freedom to define and expand on matters on their own terms. Interview data were subject to qualitative categorical analysis (Lankshear & Knobel, 2004), which relies on the systematic organisation of data into homogenous groups. We initially coded the data according to pre-set categories (generated from a reading of recent research literature) and then carefully examined

uncoded data, which led to construction of emergent codes and then, preset and emergent codes were used to analyse all interview transcripts. In this paper we present a portion of the analysis

Barriers to and opportunities for water quality work

> *It was just a pity to see such a beautiful waterways system being destroyed in a sense that it had just become a dumping ground for people to dump their rubbish out the back yard. Council were concreting all the creeks so they would get better drainage. I had a look around me – gee these little patches have brought so much life, it would be nice to do something better ... So then we started looking around here [the school] and we thought, Oh well, we can do a lot more with the school. We were only looking at the wetland originally. But then as things moved on, why just look at a bit of water quality and a bit of habitat when we can look at so much more maybe. So I started thinking, if we can get the things they do all the time, like the rubbish they produce, and all those sort of things, then we'll have a real effect on them.* (SEC, WBSS)

Barriers and opportunities emerged for Wonga Beach State School whilst implementing their highly regarded water quality sustainability work. Barriers can be both practical and systemic. Practical barriers primarily concern teachers on a day-to-day basis such as lack of time and perceived lack of space in curriculum. Systemic barriers are those imposed by policy, funding, laws and regulations and normative practices that marginalize environmental perspectives, by education departments and other government agencies. For example, Australian governments are heavily focused on improving literacy and numeracy skills, however, studies which link sustainability education with improved literacy, critical and social skills (Ernst & Monroe, 2006; Larri, 2004; Volk & Cheak, 2003) are disregarded. Schools are placed under pressure to meet very narrowly defined quantitative literacy and numeracy benchmarks, one effect of which is to push sustainability education off a centralised education agenda (it is very difficult to quantify local sustainability education efforts). And while the Queensland Department of Education, Training and the Arts has a carefully developed statement on sustainability for all Queensland schools titled *"enough for all forever"* (2008), the lack of significant sums of direct funding to schools presently undermines the effectiveness of these policies. These situations may change in the future, of course. However, most sustainability work can still be regarded as fragile in North Queensland schools, and the reliance on one or two key staff to initiate, develop and maintain education programs means sustainability education is, itself, unsustainable, particularly in smaller rural schools, where continuing staff turnover can affect sustainability initiatives.

Barriers to water quality focused sustainability work

Documented barriers to teacher uptake of sustainability education are lack of time, poor content knowledge (Ham & Sewing, 1987), overcrowded curriculum (Cutter, 2002), insufficient training (Cutter, 2002; Spiropoulou, Antonakaki, Kontaxaki, & Bouras, 2007; Spork, 1992), and lingering adverse teacher attitudes to the environment and/or sustainability education (Cutter, 2002; Ham & Sewing, 1987).

> *It's time always, money, it's whether they want to do it, it's their commitment. The teachers that aren't committed, we still have to battle along with them here and that was hard (Principal, WBSS).*

Wonga Beach staff have been very determined and innovative in overcoming these barriers and have creatively used administrative time and curriculum coordinator time to embed sustainability education throughout the curriculum.

Perhaps the most significant barrier identified through our research is a shortage of meaningful funding. For teachers, lack of money is intricately connected to lack of time to spend on planning and action, lack of opportunities for training and lack of the materials and resources needed to effect change – which can include simple things like money to purchase local plants for re-vegetation efforts. Wonga Beach State School sourced funds for implementation of sustainability education from grants available from several organizations. However, successful grant applications require applicants to spend large amounts of time to first, research the grant and secondly, apply the relevant genre. Teachers, who already have full time jobs, have to do this work in other time. Grant writing is neither part of a teacher's job description, nor is it time effective, and every organization expects a slightly different "genre" and focus. If, on top of their normal workload, teachers need to invest a minimum of 20 hours to secure one grant, it seems reasonable then teachers become discouraged, so the grant system is not sustainable because it exhausts teachers rather than sustains them. If schools were allocated block funding for sustainability education it may allow teachers time to actually enact change.

> *Writing grants – Oh, very time consuming, it takes me weeks to write a good grant, because they want all sorts of stuff - weeks to write these grants usually …having a scientific background, it's easy for me to write in the language that they want [but] if you're getting one out of ten [grants], you're doing really well.* (SEC Coordinator, WBSS)

The water quality focused sustainability work required time for organization and grant applications, and money to purchase tools and hire machinery with operators to carry out the work. Additionally, the school also had to purchase materials such as trees, dirt, mulch, stones and pebbles. Wonga Beach State School's sustainability education coordinator (SEC) was required to dedicate a large amount of personal time to plan and coordinate the water quality work. This included designing suitable curriculum learning as well as consultation and negotiation with local business and community members who were able to contribute to the project. Also, the sustainability coordinator's position is part-time meaning this staff member spent time outside normal teaching duties on designing and implementing the swamp rehabilitation.

There are a number of frameworks, policies and resources we identified that exist to support schools wishing to engage with water quality work. For example, Department of Education, Training and the Arts' (DETA) cross sectorial policy (independent, catholic and state) - Statement on Sustainability for All Queensland Schools *"enough for all forever"* (2008) and the Ministerial Advisory Committee for Educational Renewal's (MACER) "*Education for sustainable futures: Schooling for the smart state*" (2006), encourages an environmental focus in schools. There are eight units that focus on water quality on Education Queensland's website - Curriculum Exchange. There are four Senior Science Officers in Queensland employed by DETA to support teachers, and the SSO in cairns has run professional development workshops on water quality. Education officers employed by Terrain Natural Resource Management to support teachers implement sustainability

education and then local Environmental Education Centres (EECs) include water in the programs. Education officers employed by the Great Barrier Reef Marine Park Authority (GBRMPA) will work with teachers to implement programs related to conservation and appreciation of Great Barrier Reef.

Systemic barriers specific to water quality in the northern end of the Cairns Regional Council also include the water quality improvement plans, (initiatives of the federal government in concert with state and local governments) - surprising as this may seem. The plans state they focus on the importance of partnerships between all stakeholders including government agencies, industry, landholders, local community and indigenous people. We discovered the plans omitted mention of the formal education sector. Although the RWQPP has a strategy for education, it focuses on landholders and the larger community but excludes schools. We question how these plans to mitigate declining water quality can be effective and sustainable when they omit nearly 20% of the local population who spend three quarters of the year at school.

School-based sustainability education is successful due to the hard work of a few very dedicated teachers who devote much of their personal time (Cutter, 2002; Robottom, Malone, & Walker, 2000). Hjorth and Bagheri (2005) state it is often possible to find 'leverage points' of a system. These are places within a complex system where a *small shift in one thing can produce big changes in everything*. We propose the water quality initiatives are not using schools and teachers as their leverage points. If we consider intergenerational influences the inefficiency of not using leverage points may be substantial because students, teachers, administration and other school based workers go home to their families, neighbours and friends who work in other industries.

Opportunities for and from implementing water quality work

Socially critical sustainability education engages students in locally relevant social issues. The learning is meaningful because it arises from a local need and is based on "critical understanding of, and an informed commitment to, the improvement of society" (Greenall Gough & Robottom, 1993, p. 301). The water quality work that Wonga Beach State School has engaged in over the last four years has these characteristics. Figures 1 and 2 show photos of the wetlands area before and after rehabilitation. The students at Wonga Beach SS planned, designed and physically created the wetlands. Staff reported sustainability education engages the students because it is "hands on" learning and, significantly in a social sense, creates pathways for forming positive relationships with students:

> *Boys like to see something for their labour. It is like doing an assignment is not all that exciting for them because probably they don't see much for it. But if they have dug a hole and put rocks around it and all that sort of stuff, they look back and say "gee it's really coming along". They're always commenting on how things are going ... It gives me an opportunity to build a relationship with some of the boys. It's like they respect you because you're not always being a teacher. You have other interactions with them. And you build nice positive relationships, whereas if you're just always just picking on them "stop doing that" or "pick up the papers" "do this, do that". They just see you as somebody else hassling the day lights out of them.* (SEC WBSS)

Figure 1. Wetlands area before rehabilitation

*Figure 2.*Wetlands area after rehabilitation

In summary

Although water quality in Far North Queensland is on the scientific, political and local agenda in some areas, our research indicates the wider community does not seem to be aware of problems associated with the quality of water. When we first contacted schools and teachers to participate in our research we received mixed reactions with most people commenting they did not know anything about water quality and felt it was not relevant to them. It very quickly became evident to us that if we were to carry on with the research we needed to find an approach that schools and teachers could identify with. Systems theory provided a way forward. Systems theory is based on investigating and understanding links between elements rather than the elements themselves. Applying a systems framework we can assume that learning activities that impact positively on school environments will eventually impact on water quality. We have reported our (very) preliminary research findings here on the one school identified in the study that has made an effort to improve local water quality through a swamp improvement project. This led on to a number of sustainability initiatives in the school

Carrying out research in schools is laden with complications. Schools are very busy places. Water quality is not high on school agendas. Yet, if the Great Barrier Reef is to be resilient to climate change, reef organisms cannot be further disabled by the effects of poor water quality. Every person living along the coast in Far North Queensland has a socio-ecological interest in the reef, whether they recognize this or not. Schools do have a significant role to play, but so far, we have only identified one primary school where staff and students have actively included water quality improvement into the curriculum and pedagogy in the catchments in which we are conducting research. The possibilities for change to this situation remain wide open.

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