

## Whole Systems Thinking: Education for sustainability at a Montessori school

By Elaine Lewis and Catherine Baudains

Whole systems thinking is a framework for seeing the whole picture, for establishing interrelationships and understanding phenomena as an integrated whole (Capra, 1996; Clayton, Clayton et al., 1996; Sterling, 2003b; Tilbury, Coleman et al., 2005). Systems thinking may be contrasted with fragmentary thinking, which is viewing phenomena in their separate parts and focusing only on narrow specializations. In an education for sustainability (EfS) context this means emphasizing relationships, relationships between all the systems on our planet, and at different systems levels, as they relate to the environment, economics, government, health, and so on. Values and goals are also important aspects of these relationships. Sterling (2003a, p. 2) argues that "... we are educated by and large to 'compete and consume' rather than to 'care and conserve'". Furthermore, the same author maintains that because of the imposition of managerial and economic values on education we have lost touch with the social values and real life contexts of authentic education (Sterling, 2003a, p. 2). With these ideas in mind this paper briefly examines the application of whole systems thinking on an EfS program at a small Montessori primary school in the metropolitan area of Perth, Western Australia.

### Montessori Educational Approach and EfS

The Montessori educational approach has much in common with whole systems thinking, in that relationships between living and non-living things, values and actions are emphasised. Maria Montessori stated "All is strictly interrelated on this planet" (Montessori, 1973, p. 40). Montessori students study ecology:

*"The ultimate goal is an ecological view of life and a feeling of responsibility for [the] environment. The child will see that each individual life on earth is seemingly selfish (fighting for its own survival) but in reality each serves the good of the whole" (Miller, 1974, p. 60).*

Ecology examines the interaction of living things and the link between living and non-living forms. From a Montessori perspective an understanding of ecology develops concern for what humans are doing to our planet and creates a value system where children absorb a caring commitment for the environment (Sillick, 1987, p. 18).

In brief, EfS refers to more than education in and about the environment, by addressing the vital aspect of education for the environment. Education for the environment provides learners with the skills to take positive action so that we and future generations have a critical understanding of how complex systems, such as environments and ecosystems, economic and socio-political systems, work (Tilbury, Coleman et al., 2005; p. 87). These EfS understandings have been progressively developed in the Montessori educational context as a

result of the basic philosophy described. The vital role of nature in education and the interdependence of all life has long been recognized as an important component of the curriculum (Montessori, 1967) but the key aspect about education for the environment will be shown to be a growing feature of the Montessori educational experience at the school under consideration.

In the past systems thinking was not the norm at the Montessori school involved in the study. Many projects were undertaken that may have contributed to sustainability but they were not explicitly linked to the bigger picture. They were just discrete activities and students did not necessarily make the connection to the broader and more complex context of sustainability. Two EfS projects at the school are now discussed, showing this developing understanding of EfS in a whole systems thinking context.

### Lake Science

Since the early 1990s the school has been located near a lake. One of the environmental projects in operation during that decade was 'science by the lake' investigations. The students studied macro-invertebrates, the lake ecosystem and tested the water quality. Were these lessons EfS or just environmental science explorations related to education *in* and *about* the environment? Were the investigations presented in the context of sustainability or as interesting science lessons about water quality and life in the lake? It appears that the key feature of education *for* the environment, in which students take positive action to improve the environment was not a major focus of these early investigations. Commencing in 2005 a long term biological survey started at the school, which included similar water quality testing components to those mentioned above. However, the new feature of this project was a focus on education



▲ Students recording their results after conducting water quality tests.



for the environment. The school obtained a conservation grant to remove exotic weed species from the edge of the lake and replace with native reeds and sedges. The students were involved in the whole project and observed any water quality and other environmental changes arising from their actions. These lessons explicitly link the environmental, economic and socio-political systems.

### Solar Power

In 2002 a student project to install a solar power system at the school was started. Two interested students prepared a detailed report and presented it to the school's Management Committee in 2003. Approval to proceed with the planning was granted, so the students started the long process of fundraising, learning about solar panels and promoting solar power. Due to increased interest in the project, all the upper primary students became involved in solar energy studies. To learn more about solar energy they made various models. Some students attended the solar car challenge at Murdoch University to find out what was involved in making a model solar car, then constructed and tested their own cars. Students also constructed model solar fans and a model of the school, as a solar school. In addition, the upper primary students researched different solar oven designs, and then constructed and tested them, culminating in a solar lunch cook-up.

The two students who were initially involved in the project obtained community support through partnerships with various businesses, organisations and government departments. Silcar, the Sustainable Energy Development Office, the Alternative Technology Association and Midland Brick were some of the partners involved. The project was able to grow to involve all the upper primary students but other students in the school wanted to be part of it too, so it became a whole school endeavour. For example, the pre-primary



▲ Students searching for macroinvertebrates in a sample of lake water.

students washed and cleaned the second hand solar panels that were obtained for the project, and then the upper primary students tested them to check they were in working order. The junior primary students were involved in solar art activities to be used for promotion of the project.



▲ Students installing the frames for the solar panels on the roof of the school.

Publicity about the project was seen as an important part of the project for two main reasons: to promote solar energy and to support the students' fundraising activities. Various forms of publicity

were adopted: speaking on live radio, displays in shopping centres, interviews for newspaper articles, and participating in the annual Perth Sun Fair at the University of Western Australia. The official 'flicking the switch' to turn on the school's solar power system was conducted in 2006 by the two students who started the project.

The solar power project is an example of whole systems thinking. Different aspects of sustainability were integrated into this project. Some of the environmental aspects include reduced air pollution and the promotion of clean, green energy. The project featured a comprehensive education component, including elements such as education about atmospheric pollution, the operation of solar panels and the different uses of solar power. The project obtained governance input through the school's Management Committee processes and the required state government approvals. From a social systems perspective the project brought the whole community together working toward a common goal, in a spirit of co-operation. Student agency in developing the project and working on the project for five years is also noteworthy. The economic system was integrated through student fundraising activities and a successful federal government grant application. This degree of whole systems thinking in a single project is an important development for EfS at the school.

### Reflection

It appears that the Montessori philosophy has facilitated the school's openness to adopt a systems approach to EfS. This is a vital development because EfS in other

schools is not generally being demonstrated in this way, but rather in a series of separate projects which the students may not automatically connect to the bigger picture.

The major challenge for EfS at the school relates to achieving deeper EfS understandings where all projects reflect whole systems thinking. To achieve this it is vital to ask who participates in whole systems thinking at the school? ... some staff, all staff, some students, all students, the school Management Committee, the whole school community? This question is important because many EfS projects at the school are still 'silo' projects involving only one system. At present it appears that only the key people driving the EfS initiative at the school have some understanding of the complex whole systems thinking required. Further education about and commitment to whole systems thinking is essential for EfS to become sustaining, tenable, healthy and durable (Sterling, 2003a).



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#### Acknowledgements

Special thanks to the teachers and Principal who participated in these projects. Permission to publish this paper was obtained from the Principal.