Engaging students in science: *Turtle nestwatch*

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Involving students in authentic science work is one way to enhance their interest in science. This paper reports a project in which Year 4–7 students actively participated in a study that involved the provision of a suitable nesting site for local turtles. The students collected data on turtle nests at the site and evidence of turtle hatchlings at it and in the wider wetlands locality. Thirty-one turtle nests were located at the site during the project but all were predated. Teaching and learning outcomes are discussed.

Engaging students in science

Numerous studies show declining student interest in science from the late primary years to high school and tertiary levels of education (Skamp and Logan, 2005; Ramsay, Logan and Skamp, 2005; Tytler, 2007). To engage students in science, one component of curriculum policy in Australia encourages authentic settings, in which school science is linked with community, government and industry organisations to create real-life contexts for science (Tytler, 2007, p16). This development in science teaching may be viewed as one way of 're-imagining science education' in Australia (Tytler, 2007).

The use of authentic settings in science teaching is a characteristic feature of science education at a small independent Montessori primary school, located in the metropolitan area of Perth, Western Australia. The school is also an active member of the Sustainable Schools Initiative (SSI-WA) and has participated in the Initiative since the SSI-WA pilot was conducted in 2005 (Department of Education and Training, 2005). This membership supports the implementation of projects like the one reported here, by providing information and community contacts.

In recent years numerous science projects at the school have been linked with community, government and industry organisations. Two of these projects have been reported on previously, the ChrySOLARis solar power project and a 'living with tiger snakes' community education program (ASTA, 2005). This paper reports on another science project at the school, set in a real-life context. This project involved the provision of a suitable nesting site for Oblong Turtles, *Chelodina oblonga*, in the Herdsman Lake Regional Park.

Student interest in the Oblong Turtle

The Oblong Turtle, *Chelodina oblonga*, is so named because its carapace is an oblong shape. These long-necked turtles are carnivorous, eating water bugs, tadpoles, small fish, crustaceans, ducklings and even carrion (Giles, 2001, 2004; Burbidge et al., 1990). They are at the top of the underwater food chain and provide a meaningful indicator of environmental quality (Giles, 2001). Their wellbeing can be viewed as a means of monitoring changes to the aquatic ecosystem, since all members of this ecosystem are interdependent.

Historically, the students at the school were closely involved in 'science by the lake' investigations (Lewis & Baudains, 2007). Many students had observed adult female turtles searching for suitable nesting sites and subsequent hatchlings heading for the small lakes at the back of the school, known as the Glendalough Open Space (GOS) Lakes. However, during 2005, children at the school, along with members of the local community, expressed concern about the safety of turtles from the GOS Lake and the nearby bigger lake called Herdsman Lake. These concerns related to the long distances the turtles travelled to engage in nesting behaviour. Such distances were traversed because of the dense growth of grass weed species, which sometimes resulted in turtle deaths when the animals attempted to cross Jon Sanders Drive in search of suitable nesting places. The negative impact of grass weed species and roads on turtles has been reported previously (Giles, 2001; Porter, 1987; Porter, Dunlop & Clay, 1986).

Discussions about the life-prospects of egg-laying females and possible hatchlings were held with all the stakeholders: the Department of Environment and Conservation (DEC), the local council, school staff and students, as well as local community members. Furthermore, no published research specifically on the turtles of Herdsman Lake was found. The outcome of these investigations was the submission of a Community Conservation Grant application to fund a trial breeding bank for the local turtles. The grant was approved early in 2006 and the project was undertaken over a two-year period.

Project aim

The aim of the project was to conduct a trial that involved the provision of a suitable, safe nesting site for Oblong Turtles in the Herdsman Lake Regional Park. As an informed trial, it sought to collate and respond to current information about the nesting needs of the turtles, monitor the success of the breeding site in terms of use by female turtles for nesting, and to determine evidence regarding the survival of the eggs and the whether there were any successful hatchings. Four components of this overall aim were identified:

1. Promotion of student engagement in science.
2. Collection of turtle nesting and hatchling data.
3. Collaboration between the school and other community stakeholders.
4. Promotion of connectivity to nature in the local neighbourhood

The Project Leader of the study was a teacher at the school. This paper reports on the outcomes of the project.

Project phases

The project consisted of three phases: site identification, control of weed species at the site, and monitoring the site and surroundings.

Outcomes and discussion

1. Site identification:

The site was selected by the DEC Regional Parks Officer responsible for the region, after discussions with the Project Leader and other DEC officers. It is located on the north-eastern side of Herdsman Lake, between the lake and Jon Sanders Drive. The site was on land gently rising from the edge of the lake water; a comparatively flat, open, rectangular (50m x 25m) area covering approximately 1250 square metres and about 30 metres from the water. Grassy weed species dominated the site, with dense growth.

Other issues that were considered in relation to the selection of the site were connectivity to the local environment and student engagement in the related science activities. There is evidence that there is 'a widening gap between people and the natural world' (Miller, 2005, p. 430). This estrangement of people from nature, also known as 'environmental generational amnesia', results in a continual ratcheting down of expectations and knowledge about the quality and ecological function of nearby natural areas (Miller, 2005). Thus it was considered vital that members of the school community had the opportunity to be involved in conservation efforts to increase 'attachment to place' in their local natural environment (Evans, Abrams, Reitsma, Roux, Salmonsen & Marra, 2005). Furthermore, evidence suggests that fostering stronger connections to the local environment may be one strategy to modify behaviour in a way that benefits species and habitats (Evans et al., 2005). Thus distance of the site from the school was crucial and the selection of a site that was a ten minute walk from the school and had numerous advantages.

Since the children expressed interest in the turtles, not only did the project provide an opportunity to enhance attachment to place, it was also an important avenue to promote science. One student stated that what helped her to learn was 'seeing, asking questions, doing and hearing about *our* turtles'. The *our* indicates attachment to place.

2. Weed control

The control of weed species at the site was important because the dense weed cover prevented female turtles from readily accessing their preferred nesting ground (Giles, 2001). In addition, dense weed growth can confuse hatchlings, causing disorientation and preventing their safe return to the water (Giles, 2001; E. McCrum, Skills for Nature Conservation, personal communication, May 26, 2007). Thus spraying of grass weed species at the site was a priority. The first spraying of grass weed species at the site was undertaken in October 2006. The spraying was repeated when required, determined by the amount of weed regrowth.

At the start of the project there was no evidence of turtle nests at the trial site. Spraying of weeds exposed the ground, making it suitable for turtle nesting activity.

3. Monitoring site and surrounds

Turtle nests

Throughout the project the DEC Regional Parks Officer and the Project Leader met and collaborated regularly to ensure good communication about developments at the site. Furthermore, students, interested community members and/or staff from the school visited the site weekly to observe and record developments. Sometimes, when whole classes visited the site, the students formed an orderly line across the area and moved carefully over the site like 'forensic scientists on television', searching for evidence of nests. They walked across the site at a guided, slow pace and raised their hands if they saw disturbed soil or holes in the ground surrounded by broken egg shells. Each find was documented and photographed, with no further interference allowed.

At site visits in May 2007 a number of predated nests were found (Figure 1). The existence of these nests was not known prior to the discovery of the first predated nest. By the end of the study period thirty-one predated turtle nests were found in the trial site, with another four predated nests located in the nearby vicinity. Students were astounded ... and disturbed ... to discover so many predated nests. One student stated, 'My attitude to this environment has changed seeing the impact of predation, of rubbish and weeds at the turtle site, how many broken eggs were scattered everywhere.'

Figure 1. ***Predated turtle nest showing blood on an egg shell.***

A characteristic shape to the predated nests was observed: the holes had a steep back and a shallow slope down at the front. This shape suggested they were dug by paws. The students also discussed research evidence about the impact of introduced and native predators on the turtle populations in other wetlands of the Perth metropolitan area (Burbidge et al., 1990; Clay 1981; Environmental Protection Authority, 1994; Giles, 2001, 2004). They conjectured about the likely culprits of their predated nests. No predators were observed at or near the site during the daytime, in a night stalk was undertaken to ascertain if any possible predators could be seen.

Night stalk

Groups of enthusiastic students and adults participated in a night stalk as part of *The Great Australian Marsupial Night Stalk* on two evenings in September 2007. The aim of this *Night Stalk* is to collect information for a national spotlight survey of marsupials

and feral pests to assist with the management of wildlife (Tiwest Night Stalk, 2007). However, the students had the additional interest in the activity of seeking data on the culprits responsible for the predated nests. Thus the *Night Stalk* was conducted along the north-eastern shore of Herdsman Lake but no foxes, feral dogs or cats were observed.

Turtle hatchlings

No turtle hatchlings or evidence of hatchlings were observed at the trial site. However, nine live hatchlings were found in the surrounding area during the study period (Figures 2 and 3). The students expressed great excitement when hatchlings were discovered and were very engaged in the biology of the turtles. As one student said, 'I learned about the life cycle of the turtle and the difficulty turtles have finding suitable places to breed'. Using the Environmental Learning Outcomes Survey (Ballantyne, Packer, & Everett, 2005), the student was then asked how she was feeling when she was learning. She selected the following 'high intensive, positive' cards: 'interested' and 'surprised' (Ballantyne et al., 2005).

Figure 2. ***Live turtle hatchling found by a student on a footpath.***

Pollution of the site

The students discussed the pollution of wetlands in the Perth metropolitan area. Evidence indicated that water quality impacted on the health and reproductive success of Oblong Turtles (Giles, 2001; Porter, 1987). In the vicinity of the trial site the students observed several forms of pollution. They commented on the foul smell sometimes present, as well as the dense algal growth at the edge of the water and the amount of rubbish sighted in and near the water. Poor water quality of the lake has been reported previously (R. Harris, Herdsman Lake Wildlife Centre, personal communication, May 26, 2007; K. O'Neill, Ribbons of Blue, personal communication, February 16, 2007). In addition, the

Figure 3. ***Live turtle hatchling entering the lake.***

impact of pollutants from the nearby light industrial area and pollutants in the surface water entering the habitat added to the pollution problems at the site (DEC, 2007; D. Rajah, City of Stirling Sustainability Officer, personal communication, July 3, 2007). Other sources of pollution observed at the site were dog droppings and litter. Each time the students visited the site they collected at least two buckets of rubbish.

Collaboration in environmental conservation

Collaborative action involving the local and broader community can support developments in environmental education (Australian Science Teachers Association, 2007; Department of the Environment and Heritage, 2005; Evans et al., 2005; Evans, Koul & Rennie, 2007; Miller, 2005). This principle was adopted as part of the current project. A close working partnership between DEC staff and the Project Leader was an important feature of the turtle project. Other collaborative action involved discussions with relevant personnel in the wider community, such as officers from the Museum of Western Australia and the Herdsman Lake Wildlife Centre. The students and staff at the school, as well as other school community members, actively contributed to the project throughout the study. All these collaborative endeavours supported the progress and outcomes of the project.

Whole systems thinking

Whole systems thinking is a framework for considering the whole picture, in which interrelationships are recognised and phenomena understood in the context of an integrated whole (Lewis & Baudains, 2007; Sterling 2003; Tilbury, Coleman & Garlick, 2005). This means emphasising the interconnectedness of the natural and human environment: the interconnectedness of systems as they relate to the environment, economics, politics, health, and so on.

In the context of the turtle trial, the students were encouraged to think about the interrelated issues in the project from a 'whole systems thinking' approach. Thus the students made observations of the vegetation and pollution at the site, they considered where the pollution came from, and they engaged in hands-on environmental action. They participated in discussions about values: environmental responsibility and community. The students considered the implications of the project findings in terms of the health of the ecosystem and people, and were also involved in educating others about the trial results.

Conclusions and recommendations

The *Turtle Nestwatch* project resulted in numerous positive outcomes, for the turtles, the students, and the school and wider community. For the turtles, there was improved awareness and understanding by the local community and government authorities on the use of the site for nesting and the impact of weeds, predation and pollution. Students were involved in making recommendations on addressing these impacts.

The students participated in the project enthusiastically, enjoying active participation involving hands-on tasks at the site and in the nearby area. Furthermore, they were involved in the discovery of new knowledge about the turtles of Herdsman Lake. They engaged keenly in discussions that incorporated whole systems thinking in the real-life concerns they had identified. Some expressed enhanced connectivity to nature when interviewed using the Environmental Learning Outcomes Survey. Continued student involvement in science projects set in real contexts is therefore recommended.

School and wider community outcomes relate to the implementation of

sustainability projects that involve community partnerships and collaborative action. The partnerships in this project were effective and productive, as indicated by the aforementioned outcomes. However, additional funding for schools is essential to facilitate such partnerships across the whole education sector. The Project Leader in the current study donated considerable time to achieve the successes outlined. This constraint may limit the implementation of such projects in other schools.

Overall, the *Turtle Nestwatch* project received resounding acclamation from all stakeholders involved ... except for the occupants of the predated nests!

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