Turtle Watch: Enhancing Science Engagement

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Introduction

Engaging students in authentic science settings and real-life contexts is viewed as one way of 're-imagining science education' in Australia (Tytler, 2007). *Turtle Watch* is an example of such re-imagining. *Turtle Watch* began in 2006 and involves student and community participation in an ongoing conservation project being conducted in the Perth Metropolitan Area of Western Australia. The target species of this project is the oblong turtle, *Chelodina oblonga*, which inhabits the wetlands and rivers of Perth (Figure 1). Oblong turtles are under threat from habitat loss, road deaths, predation and climate change (Bartholomaeus, 2012; Giles, 2001; Sinclair, 2010; Tate, 2009).

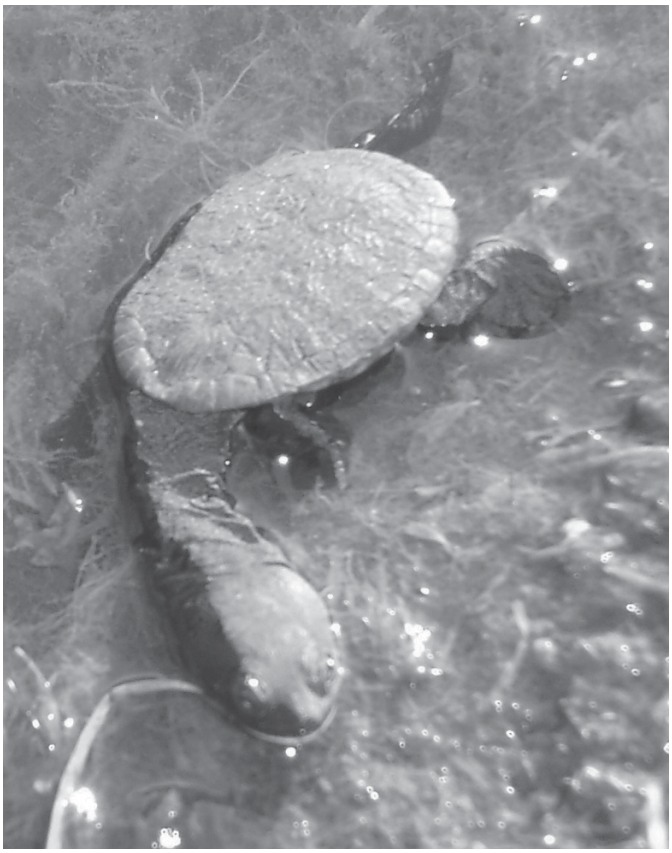

Figure 1. Live turtle hatchling entering Herdsman Lake.

The aims of *Turtle Watch* align with national 'Inspiring Australia' and 'Powering Ideas' objectives, which emphasise the critical need to build a strong relationship between science and society, supported by effective communication about science and its benefits (Department of Innovation, Industry, Science and Research, 2010). Evidence demonstrating this alignment will be highlighted.

There are two phases to the *Turtle Watch* story: 2006-2008, and 2010 to the present. *Turtle Watch 1*, 2006-2008, will be briefly summarised as this phase has been previously reported (Lewis, Baudains, & Mansfield, 2008a, 2008b, 2009; Lewis, Mansfield, & Baudains, 2008, 2010). A discussion of *Turtle Watch 2* (2010-present) is the main focus of this paper.

Turtle Watch 1

During 2005 students and residents near Herdsman Lake expressed concern about the oblong turtle population in relation to road deaths and pollution. To address this issue a Community Conservation Grant was obtained from the Department of Environment and Conservation after consulting stakeholders. The resultant project, known as *Turtle Watch 1*, was conducted from 2006 to 2008.

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. Aspects of this overall aim included:

- promotion of student engagement in science
- collection of turtle nesting and hatchling data
- collaboration between the school and other community stakeholders

promotion of connectivity to nature in the local neighbourhood.

The project provided a suitable nesting site for oblong turtles at Herdsman Lake that did not require turtles to cross the road. The site was a 50 m x 25 m rectangular, weed-free, sandy area about 30 m from the water. Students, interested community members and/or staff from the local school visited the site weekly to observe and record developments. To the amazement of all involved, turtles actually nested in the area during the following nesting season. However, the results showed the site was not safe due to predation. Thirty one predated turtle nests were found at the trial site (Figure 2), with no live hatchlings observed (Lewis, Baudains, & Mansfield, 2008a, 2008b; Lewis, Baudains, & Mansfield, 2009).

Figure 2. Predated turtle nest showing blood on an egg.

Turtle Watch 2

Students and community members continued to lobby for action to be taken on the outcomes of the initial project after the completion of the *Turtle Watch 1*. Predation findings in *Turtle Watch 1* were subsequently addressed by a project undertaken by the Australian Association for Environmental Education – WA Chapter (AAEE-WA). This *Turtle Watch 2* project, funded by Lotterywest and AAEE-WA, aimed to:

identify predator/s involved in the destruction of oblong turtle nests at three sites – Herdsman Lake, Bibra Lake and Canning River

foster partnerships between the community, research organisations, educational institutions and industry to promote conservation action for oblong turtles.

The project involved four eco centres spread across Perth: Cockburn Wetlands Education Centre (CWEC), Canning River Eco Education Centre (CREEC), Herdsman Lake Wildlife Centre (HLWC) and the South East Regional Centre for Urban Landcare (SERCUL). The project program included:

- camera surveillance of nesting sites located by community members and eco centre staff
- promotion of Turtle Hotline phone numbers to enable students and community members to inform eco centres of turtle sightings
- promotion of ClimateWatch website for community members to record turtle sightings: http://www.climatewatch.org.au/
- project promotion through print media and online: http://www.aaeewa.org.au/partnerships.html
- meetings with stakeholder groups, such as the Oblong Turtle Collaborative Research Group based at Murdoch University
- community education forums to promote awareness of the plight of oblong turtles
- development of a Turtle Education Kit for use by schools and eco centres
- monthly e-bulletins to interested stakeholders
- enhancement of existing partnerships and establishment of new community partnerships to expand conservation efforts
- review findings, make and implement recommendations to improve turtle outcomes.

Results

Key outcomes from *Turtle Watch 2* include:

- camera surveillance at HLWC and CWEC provided evidence of fox predation. Students viewed some of the footage and created mind maps about the impact on turtles. See Figure 3 and view: http://youtube/syxWgssIKL0 and www.wildlifesurveillance.wordpress.com
- students and community members employed the Turtle Hotline (30+ messages) and the ClimateWatch website (85 recordings) to document turtle sightings over the last twelve months
- existing partnerships for the conservation of the oblong turtle were enhanced, for example, CREEC and CWEC volunteer groups
- new partnerships were established, for example, between AAEE-WA, CimateWatch, schools, Murdoch University, University of Western Australia, Turtle Oblonga Rescue and Rehabilitation Network, and Friends groups
- excellent attendance (over 50 per session) at six community turtle education forums held at CWEC, CREEC and HLWC during 2011; school-based sessions were conducted this year, for example at Coolbinia Primary School
- numerous successful initiatives to promote awareness about the plight of oblong turtles, including the Turtle Education Kit: http://www.aaeewa.org.au,
- student displays, bookmarks, posters, journals/professional newsletters, websites and newspaper articles.

Figure 3. Camera surveillance evidence of fox predation.

Student Involvement

Turtle Watch is innovative because it is not solely a student project; it is a community science endeavour. Students were, and continue to be an integral part of the community participating in an authentic science issue in a real-life context. Key aspects of student involvement included:

- learning about turtle biology through inquiry-based learning
- participating in excursions to Herdsman Lake and incursions involving a visiting PhD candidate conducting research on turtles
- actions to enhance wider community awareness through presentations and displays.

During Term 1, 2012, students at Coolbinia Primary School (K-7) studied turtles within the context of the new Australian Curriculum:

- science: Biological Sciences sub-strand (Science Understanding) and Use and Influence of Science (Science as a Human Endeavour)
- cross curriculum priorities of Sustainability, Aboriginal and Torres Strait Islander Histories and Cultures, and Asia and Australia's Engagement with Asia
- General Capabilities of Literacy and Critical and Creative Thinking.

The Turtle Education Kit, a resource developed for *Turtle Watch*, was trialed during the term. Student work samples (Figures 5-10) and extracts from assessment rubrics (Figures 11 and 12) illustrate student learning. These and more resources are included in the Kit.

Figure 4. Murdoch University PhD candidate explains to students how a turtle trap works.

Using turtles as a context, students were able to examine key biological concepts of structure and function, life cycle, adaptations that support survival, classification, habitats, endangered species, biodiversity and conservation. *Turtle Watch* provided the rationale and why for the science understandings. Students' critical thinking was developed through use of concept maps as diagnostic and formative assessment tools.

Extract from Year 4/5 Rubric, Concept Map Assessment
Biological Science, Science Understanding, Australian Curriculum
Student Version: Turtle Concept Map

Performance Indicators	Developing	Satisfactory	Good	Excellent
Key understandings of science • Life cycles of turtles includes all stages from egg to adult • Relationships such as feeding, predation and competition described • Roles in ecosystem such as producer, consumer, decomposer in relation to turtles • Adaptations of turtles that help with their survival such as carapace • Factors that impact on survival of turtles	Limited number of concepts selected relating to turtles Arrangement of concepts illustrates limited understanding of conceptual relationships	Concept map demonstrates some of the key ideas content. Eg life cycles Headings such as diet, habitat, lifecycles and features included but no detail May include irrelevant facts not specifically linked to turtles Arrangement of concepts demonstrates simple understanding of how the ideas relate to each other. For eg feeding relationships and role as consumer	Most concepts relating to turtles are covered (see section in grey) Cause and effect relationships evident from selection of concepts. For eg illustrates how turtle is part of an ecosystem Each major heading is unpacked further with more specific detail eg diet is described for turtles	Arrangement of concepts demonstrates an understanding of structure and function For eg detail about how carapace reduces predation Evidence that student has considered what could happen to survival of turtle if key survival aspect such as habitat or diet changes or is missing Relationships include more abstract and multi faceted Eg links survival to reproduction rates, biodiversity, balance of nature in ecosystems

Table 1. Extract from Year 4-5 student assessment rubric.

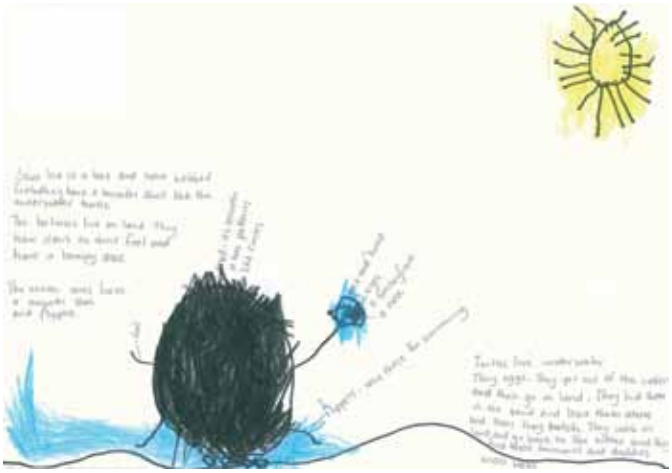

Figure 5. Pre-primary student's drawing of 'everything I know about turtles' (scribed).

Figure 6. Year 1 students shaped and labeled clay models of turtles.

Figure 7. Year 5 student's paper mache carapace.

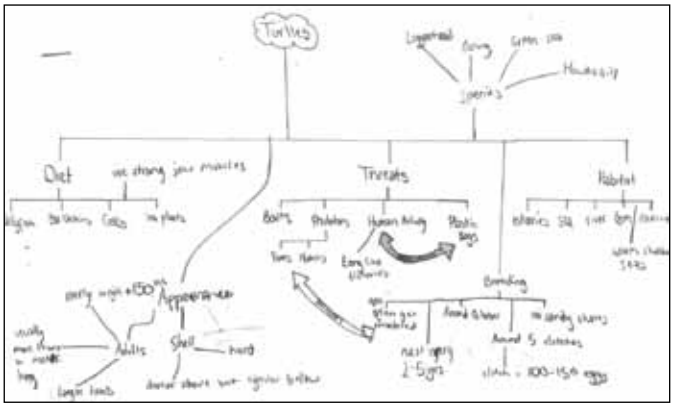

Figure 8. Year 7 concept map.

Figure 9. Year 6 art on display at RSL Care showcasing the Aboriginal cross curriculum priority.

Figure 10. Year 7 student work sample on display at Canning River Eco Education Centre reflecting the Sustainability cross curriculum priority.

The program utilised the extensive resources available from the Turtle Education Kit. For example some of the articles were used to teach an integrated program as students fine tuned their persuasive writing skills in English using science as an engaging context for literacy practices. They also created models of turtles in Art. The accessibility of the program for all students was highlighted by Kindergarten and Pre-primary students confidently describing what endangered meant in relation to turtles and a student with Special Education Needs in Year 2 describing to her teacher what the carapace looked like. Further program and curriculum information can be found in the Turtle Education Kit (http://www.aaeewa.org.au/).

Turtle Watch Continues

The *Turtle Watch* initiative is ongoing and sustainable:

- the camera surveillance consultant committed to providing AAEE-WA access to future video footage showing turtle predation over the next five years
- the AAEE-WA website will provide ongoing access to *Turtle Watch* information and resources, for example, 'Turtle Watch News', initially funded by the *Turtle Watch 2* grant as a monthly e-bulletin, is ongoing and can be accessed at: http://www.aaeewa.org.au/
- the ClimateWatch website will provide ongoing access for students and community members to record turtle sightings: http://www.climatewatch.org.au/
- eco centres involved in the project are committed to continue the Turtle Watch program, thereby ensuring the sustainability of the initiative. Annual community and school education workshops about turtles are scheduled at these eco centres, as well as new centers not previously involved
- partnerships focused on turtle conservation are continuing (Lewis & Hartill, 2012).

Conclusion

Turtle Watch demonstrates the development of a strong relationship between science and society on an issue of concern, with students, wider community members and institutions collaborating effectively. The project produced camera surveillance evidence of fox predation and developed new and enhanced partnerships focused on the conservation of oblong turtles. It provided opportunities for students to engage in authentic science, while showcasing implementation of the Australian Curriculum. Students participated enthusiastically in the project and their work samples illustrate the depth of learning. Continued student involvement in science projects set in real-life contexts is therefore highly recommended.

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Extract from Year 6 Teacher Rubric, Concept Map Assessment
Biological Science, Science Understanding, Australian Curriculum

Performance Indicators	D	C	B	A
Key Concepts: • **Growth** • **Adaptations** • **Living things** • **Non living things** • **Environment**	• Limited number of concepts selected relating to topic • Arrangement of concepts illustrates limited understanding of conceptual relationships	• Concept map demonstrates some of the key ideas content e.g. ... • Headings such as ... • Arrangement of concepts ...	• Most concepts relating to topic were selected • Cause and effect relationships evident from ...	• Arrangement of concepts demonstrates understanding of structure ... • Evidence student has considered ... • Relationships ...
Hierarchical Structure	No sense of hierarchical ...	Concepts are displayed in ...	Some structure used with ...	Headings are appropriate ...
Linkages	No relationships between concepts.	Some basic relationships ...	Relationships indicated with ...	Linking words show variety ...
Cross Links	Cross links not evident or appear ...	Limited cross links ...	Cross links reflect simple ...	Cross links demonstrate in ...
Depth of Coverage	Limited content included ...	Superficial coverage of key ...	Main ideas included and ...	Content shows depth of ...

Table 2. Extract from Year 6 teacher assessment rubric.