Sounds of Science

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"*I enjoyed everything*"...at the science fair (Participant)

Introduction

Community science fairs at the Canning River Eco Education Centre provide a feast for the senses. The first fair, in 2009, focused on *A Taste of Science* (Pearson & Lewis, 2009), followed by *A Dance of Science* in 2010 (Lewis & Pearson, 2011) and 'sound' this year.

A Sound of Science was a five-hour science fair held on Sunday 21 August during National Science Week (NSWk). The event engaged the general public in learning about different aspects of 'sound'. The planning, implementation and evaluation of the fair was achieved through a successful partnership between Canning River Eco Education Centre (CREEC), NSWk, the Australian Association for Environmental Education – WA Chapter (AAEE-WA), City of Canning, South East Regional Centre for Urban Landcare (SERCUL), Swan River Trust and Great Gardens.

AAEE-WA was awarded a 2011 NSWk grant to conduct *A Sound of Science*. This funding was supplemented by funds and in-kind support from the other major partners. Numerous smaller sponsors also supported the event.

Project Purpose

Project aims aligned with national *Powering Ideas* and *Inspiring Australia* objectives, which emphasized 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, 2009, 2010).

The overarching aim of the science fair was to showcase modern science and Indigenous knowledge in an innovative, holistic context. This incorporated:

- Providing an opportunity for the general public, especially youth, to participate in an event that showcased science, technology and innovation; highlighting modern science's explorations and concerns as interesting, challenging, important, and of direct relevance to daily life, the well being of society and environmental sustainability.
- Promoting science careers.
- Fostering awareness of Indigenous knowledge.
- Fostering partnerships between the community, education/research organisations, local and state government, business and industry.

A Sound of Science Innovative Model

Planning, implementation and evaluation of *A Sound of Science* was built on the experience and outcomes of the two previous science fairs. Each year improvements are made to this proven, innovative model.

Prior to the event, children were invited to design art works related to the fair theme. Over fifty entries were received. The winning entry, by a 12 year old student, was featured on the fair banner. This competition helped to promote the event as well as focus learning and creativity on the fair theme.

2011 fair banner featuring the winning artwork. Photo courtesy Elaine Lewis.

The fair commenced with 'welcome to country' by a local Indigenous elder. This was followed by numerous performances that invited community participation, such as the seagull dance with the Wadumbah Dance Group and the Rhythm Fix drumming workshop.

There were many opportunities for participants to engage in a wide range of hands-on interactive experiences. These included: animals encounters; exploration of microscopic biological

specimens; physics experiments; bush crafts; clay creations; traditional Indigenous storytelling and rock art to pass on science knowledge.

Sounding out about human hearing. Photo courtesy Elaine Lewis.

Many displays were featured at the fair. University and TAFE course information was available, while organisations such as Birds Australia, the Ear Science Institute Australia, and local conservation groups presented information on topics ranging from bush fire management to frogs of the Perth region.

To complement the activities and displays there were formal talks. Scitech's science careers presentation, *Beyond the Beaker*, was very popular with over 120 participants. Eco Education Officer, Leonard Thorn, engaged his audience through stories and activities that showcased Indigenous science and technology. A Research Fellow from Curtin University's Centre for Marine Science and Technology, Miles Parsons, talked about *"eavesdropping on fish"*. Miles said *"The ocean is never silent if you are on the right wavelength"* and explained that different fish sounds are used to discover more about fish ecology.

Outcomes

Three key outcomes of *A Sound of Science* may be identified:

Enhancement of the innovative science fair model showcasing improved awareness of Indigenous knowledge.

Whole systems thinking especially relating to waste, biodiversity and water.

Growth in community partnerships effectively working to foster science.

A Sound of Science developed from the innovative fair model first implemented in 2009 for conducting engaging science events. This model integrates modern and Indigenous science knowledge and technology.

1. Innovative Model Integrates Indigenous Science Knowledge

Improved community awareness of Indigenous science knowledge and technology was achieved through the variety of Indigenous stories and activities provided. For example, participants made bush 'glue' to attach a model axe head to

Rock art and clay creations. Photo courtesy Elaine Lewis.

Table 1. Results from Participant Feedback Form

Responses	A Taste of Science 2009 N = 42	A Dance of Science 2010 N = 26	A Sound of Science 2011 N = 36
Number of attendees	~300	~1000	~1200
Did you enjoy the event?	Definitely 64% Yes 36 %	Definitely 92% Yes 8%	Definitely 78% Yes:19%
Activities most enjoyed?	Wide range 36% Indigenous 19%	Wide range 38% Live animals 27%	Live animals 27% Indigen. dancing 10%
Activities least enjoyed?	Nothing 71% Rainy weather 12%	Nothing 85% Finished too early 4%	Nothing 81% Crowds 6%
Attend event again?	Definitely: 57% Yes: 41%	Definitely: 85% Yes: 15%	Definitely: 78% Yes: 22%
Attend NSWk event before?	No: 70% Yes: 30%	No: 69% Yes: 31%	No: 53% Yes: 47%

wood. Links between traditional and modern technologies were discussed.

Evaluation of the fair is undertaken every year to determine what worked or needed improving. Various types of evaluation were utilised, from the NSWk feedback form to photographic evidence and anecdotal feedback. Table 1 presents key statistics from attendees who completed the feedback form. These results may be compared with findings from previous fairs.

2. Innovative Model Demonstrates Whole Systems Thinking

The *Australian National Action Plan for Education for Sustainability* (Department of the Environment Water Heritage and the Arts, 2009) outlined seven principles: transformation and change, education for all and life long learning, systems thinking, envisioning a better future, critical thinking and reflection, participation and partnerships for change. These principles were embedded into fair planning, implementation and assessment, utilizing a whole systems thinking approach.

Wastewise Actions

Being wastewise was an important component of the innovative model, as waste management is a critical issue for science and society. Numerous strategies were adopted to minimize waste at the fair. Feedback forms were printed on the back of the program so that only one page was used. Keep Australia Beautiful bins were supplied for the event. Additional bin labelling and reminder signs were provided. Tea and coffee mugs were washed instead of using disposable cups. Bulk meat and bread were purchased for the BBQ. Eco Faerie Cara, 'Welcome' desk and 'bin monitor' volunteers encouraged patrons to be wastewise. A survey was also conducted to determine participants' understandings about waste.

The waste survey consisted of twelve questions, for example:

- Did you know the Science Fair is a Wastewise event?
- What does a Wastewise event mean to you?
- Do you have any suggestions on how we can improve it?

Interviewees were also invited to respond to statements, such as:

- Recycling helps to reduce impact of climate change.
- Rules for what goes in your household bins are the same for everyone in the Perth Metropolitan region.

Twenty six attendees were interviewed during the fair. In summary, the survey found:

- The relationship between climate change and waste management was recognised;
- Confusion about differences between Keep Australia Beautiful and Fair signage; and
- Confusion about waste separation behaviours in different parts of Perth.

The main recommendations were:

- More and different forms of signage required; and
- Conduct a Wastewise stall to promote waste education.

The results of the survey will inform the planning phase of the next fair.

At the end of the fair all waste was weighed. Tables 2 presents waste results for the last three fairs. Waste management strategies were clearly effective given increasing attendance; however, further interventions are required to achieve zero landfill.

Biodiversity and Waterwise Actions

Biodiversity and waterwise initiatives at the fair reflect enactment of whole systems thinking in relation to the *National Action Plan*. Biodiversity issues were addressed when participants visited the various animal encounters and 'forest room'. The *Great Gardens* presenter, Chris Ferriara discussed waterwise behaviours in his gardening workshop and fair attendees received plant give-aways suitable for our changing climate and soils around Perth. On the day, participants also had the opportunity to bring together biodiversity and waterwise understandings by planting native reeds and sedges along the Canning River. This planting action reflected commitment to the *National Action Plan* which recognises sustainability is not just about providing information, but also equipping people with the skills and motivation to actively work towards a sustainable future.

Critical Thinking and Reflection

The organising team attended a debrief session following the fair. This included evaluation of the event in terms of the *National Action Plan*. Likewise, volunteers and presenters had the opportunity to critically reflect on the fair at their debrief/'thank you' afternoon tea. Table 3 shows the results of these sessions,

Table 2. Waste Outcomes at CREEC Science Fairs .

Year	Number of Attendees	Compostable kg	Recyclable kg	Landfill kg
2009	~ 300	2.8	4.3	2.8
2010	~ 1000	11.6	3.9	1.0
2011	~ 1200	6.8	4.8	3.6

Table 3. Results of Assessments in terms of the National Action Plan for EfS

Principles of Education for Sustainability	Starting	Establishing	Achieving	Excelling
Transformation & change		4 **5**	1 **8**	**1**
Education for all & life long learning		4 **4**	1 **6**	**3**
Systems thinking		4 **6**	1 **8**	
Envisioning a better future		1 **9**	4 **1**	**1**
Critical thinking & reflection	1	1 **5**	3 **5**	**2**
Participation		1 **4**	4 **10**	**1**
Partnerships for change		1	4 **13**	

Key:
Organising Team (BOLD GREY TYPE) N=5; highlighted principle identified for 2012 action
Volunteers/Presenter (BOLD TYPE) N=15; participants did not respond to all items; highlighted principle identified for 2012 action.

which are being employed to guide the planning process for the 2012 fair. Information on the development and application of this assessment is available from the authors.

3. Innovative Model Facilitated Enhanced Partnerships

The third main outcome of the science fair was enhanced partnerships - of existing partnerships and the establishment of new partnerships for the promotion of science. Partnerships not only deepened between the main organising bodies – NSWk, AAEE-WA, City of Canning, CREEC and SERCUL – but with many other groups as well, such as Perth Mint, Bush Rangers WA, Birds Australia and the Canning River Regional Park Volunteers.

Conclusion

A Sound of Science was highly effective in promoting science to all age groups in the community. As one feedback survey respondent stated, *"It was all very good. A good range of activities".* Evidence obtained indicated the model for incorporating modern and Indigenous science knowledge was successful. Findings also revealed enthusiastic engagement in science activities and enhanced community partnerships for the promotion of science. In conclusion, *A Sound of Science* provided engaging hands-on activities together with opportunities for environmental action. This resulted in a rich and enjoyable learning experience that enhanced science appreciation and understandings, while addressing national science and sustainability goals in a whole systems thinking context.

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