A Technology Supported Visitation Program to the Sydney Olympic Park: 
Learner Challenges and Teacher Support

Gwyn Brickell, Lori Lockyer, Jan Herrington, Gordon Brown & Barry Harper
University of Wollongong
Wollongong, Australia
gwyn_brickell@uow.edu.au

Abstract: This paper outlines the development and initial implementation of a technology-supported visitation program for the site of the 2000 Olympic Games in Sydney Australia – the Sydney Olympic Park. The site is embedded with rich content and offers a broad range of extended studies and investigations for school children. The context provides learning activities before students visit the park site, specific tasks during their visit and follow up tasks to resolve the challenge post-visit. The program is developed within the content and process parameters of local curriculum specifications and uses the latest technology and research in such contexts. The project has numerous features to be investigated through multiple research agendas such as learning object repositories; supporting teachers in developing effective technology-supported pedagogical designs through an electronic performance support system; and, the use of cognitive tools to scaffold learners through the learning process.

Introduction

The Parklands at Sydney Olympic Park cover over 400 hectares and consist of a unique mix of natural and made environments including: pristine woodlands, salt marshes and mangroves that play host to a diversity of flora and fauna in close proximity to reclaimed industrial sites, a modern sorting complex and housing and industrial estates. They are a place of Aboriginal significance and historic importance. The Sydney Olympic Park Authority (SOPA) is responsible for promoting the historic, scientific, cultural, and educational value of the Parklands. In promoting the educational value of the Parklands, the School Excursion Education Project (SEEP) is a unique and innovative program that sets new standards in the use of information and communication technologies in learning. The Project implements the vision of Parklands 2020 through a partnership between SOPA; the New South Wales (NSW) Department of Education and Training; the Sydney metropolitan Catholic Education Offices; the University of Wollongong, and Sun Microsystems.

Through this partnership, the program aims to create a range of educational experiences that embrace technology-supported learning and teaching. It is proposed that the program will continue to evolve and develop new approaches through applied research on education, technology and Sydney Olympic Park.

A Unique Project

The Project establishes links between classroom-based and non-classroom based learning and information and communication technologies. It is also the first time that a large-scale learning project has been designed around a unique content rich site such as the Sydney Olympic Park.

The uniqueness of the Parklands invites innovative approaches to an education program that is expected to stimulate strong interest from teachers, students and the school education sector generally. The distribution of ‘pods’ (clusters of smart card enabled computer terminals) around the Parklands will enable students to integrate direct observation and experience in this unique physical world with resources held electronically. This combination of ‘place’ and technology provides the potential for Sydney Olympic Park to become one of the key cross-curriculum learning resources in Australia, allowing users of all ages to experience unique environments supported by technologies with the latest views of learning driving the design of the learning experiences.

The project adopts a constructivist approach to learning design with problem solving through resolution of learner tasks. Authentic tasks and scaffolding of learners are key features of the design.
**Student Participation**

Students participating in the excursion program will explore and interrogate targeted databases of learning activities that will support a range of syllabus requirements. The students will retain their own work through related activities in the class, at home, and/or through visits to Sydney Olympic Park. They will engage in work on the web, in class, in the field and in technology pods with an emphasis on student-centred, task driven activities that will require them to explore data and information, construct and test hypotheses where appropriate, and present conclusions and solutions in the form of a range of artefacts. As a result, teachers will be able to source innovative learning material and use technology to construct learning experiences relevant to syllabus requirements. They will have the flexibility to construct lessons to meet individual student needs, while having the necessary support to meet the demands of developing learning experiences for many students. They will be supported through professional development programs and educational resources to ensure they remain at the forefront of educational development in teaching and learning.

**Continued Development and Opportunities to Innovate**

The project focuses on establishing a framework for continued development to consistently take advantage of the rich resources and history of the park to learners of all ages, making use of the latest technology in innovative ways and researching the design and outcomes of the work. The project structure allows new learning experiences and opportunities to be continually added to the site by teachers, site instructors and pre-service teacher education students.

The project not only requires an initial design and implementation processes, it also requires procedures and methodologies to be explicitly developed to ensure appropriate ongoing development of a high quality nature. Figure 1 presents, in schematic form, the initial design process and how the necessary procedures for continued development will be put in place in order to implement the Education program.

![Figure 1: Initial Design and Development and Continuation Model](image-url)

The Learning Framework describes the educational philosophy and practice to be used in developing and evaluating the program, including tools for reviewing the learning designs. The Education Program Design represents the design process in developing the learner interactions, viewed through the lens of the Learning Framework. The Monitoring and Evaluation Program provides continuous review of the nature, perceptions and outcomes of teaching and learning resources and activities to allow for ongoing improvement and enhancement. The New Technologies represents the integration of technology into the educational program. The Education Program represents the end learning environment in web form, which can be continually added to through development of new concepts.

**Scaffolding Learning in Problem Solving**

Technology-supported learning environments, such as those being designed for this program, provide enriched learning opportunities by presenting information in a variety of forms usually incorporating high quality visual materials in the form of text, images, sound, graphics and video. A variety of pathways to access the information provides a different perspective on not only the information being presented but also on the interrelationships developed through the
different metaphors used. Using technology-supported learning environments can promote effective learning through reducing the cognitive load on the user, thus increasing the opportunity for more effective engagement and learning. In attempting ill-structured problems within such an environment many learners need guidance to reach a satisfactory solution. Such guidance may be in the form of cognitive tools such as scaffolds that support and direct learners to manage the learning environment, provide a stimulus for an ongoing action or thought, or further develop the learner’s cognitive processes.

Hannafin and colleagues (2001) suggest that scaffolding is a process where learners are supported while engaged in a learning or performance task. Traditionally teachers have scaffolded learning tasks to develop enhanced cognitive structures that assist them to solve problems. By building on the learner’s experiences, providing challenging authentic activities requiring reflective thinking and working in collaborative groups, teachers can provide the scaffolding needed to bridge the ‘zone of proximal development’ (Vygotsky, 1978). Scaffolding is generally regarded as support for learners while they are engaged in activities just beyond their capabilities. It ranges from assisting with an entire task to providing occasional support. As the learners’ capabilities improve, the teacher gradually reduces the support until the learner becomes self-sufficient with the assigned problem.

Depending on the degree and type of scaffolding offered within computer-based learning environments, the learner might use the support system to assist with the planning process or as part of their ongoing development of higher-order thinking skills. Guzdial (1993) suggests the goal of scaffolding is twofold. Initially, scaffolding enables learners to achieve a level of success that would not be possible without the support. Secondly, as the learner's ability level increases the level of scaffolding required decreases until learning is facilitated without the supporting framework. For different problem-solving scenarios the type and level of scaffold available should vary to cater for not only the different activities but also for the variation in the learner's knowledge.

In this on-line environment learners are supported through tasks that scaffold in part the behaviour of teachers when they lead students to reflect upon the learning process. Students may view and listen to alternative perspectives on aspects of the ‘challenge’ under investigation, seek assistance when required, record their reflections on-line, save their data records and reflections while in the ‘challenge’ environment and retrieve the information on returning to their individual schools for analysis. This process allows students to individually manage their learning in a self-directed process aimed at developing appropriate solutions to the selected task.

**Learner Interactions**

Contemporary views of learning contend that we learn through a continual process of constructing, interpreting, and modifying our own representations of reality based on our experiences with reality (Jonassen, 1994). Learning environments, if well designed, can support learner construction of knowledge through structured problem solving experiences and/or through creative expression. The assumption is that within these environments the learner is supported by visual metaphors constructed to represent the information structure supplied and how the “world” operates. Designers construct these environments assuming the resource base included has the argumentation elements and data needed to resolve the learner challenge posed. The unique nature of this program, which incorporates access to the real environment that is the basis of investigations, allows learners to access content and data beyond that included in the virtual environment represented by the web site.

The learning activities and interactions designed for this site will be set within the framework of the New South Wales school curriculum, and the educational philosophy and pedagogical description of the educational setting at Sydney Olympic Park. Within this context, the learning environment will:

- provide learners with control over their actions by placing them into ‘worlds’ that can be manipulated and interrogated;
- support learner construction of knowledge through scaffolded problem solving experiences;
- offer learners the tools and resources to produce artefacts which represent their construction of knowledge.

This view of learner interaction is based upon arguments that learners should be placed in authentic environments that incorporate sophisticated representations of context through such constructs as “virtual worlds”. Within these modern constructions, learners are often given a rich set of resources to construct artefacts that reflect their challenge solutions. It is envisaged that, as the project grows and evolves, new tools can be added to support learners in their investigations. The activities are being designed to include:

- identification of problems and refining of the problem space and question;
• interrogation of content both in the real space of the Park and within the web-based learning environment;
• analysis of information and data using tools and procedures suitable for the data;
• construction of learner representations of knowledge;
• reflection on the knowledge constructed;
• reflection on the knowledge construction process.

The mode of activities will also reflect the social nature of learning, with collaborative processes as key features of the activities, but also offering opportunities for individual work.

The Education Program design offers early engagement through interaction with a selection of learner challenges before visiting the Sydney Olympic Park, continuation with the interaction at the site and then completion of the learner challenges following the site visit. This Program has been designed so that there are multiple options for the visitation program.

Learner Challenges and Tasks

The concept of a learner challenge as representing the large-scale task for learners has been developed to link student-centred problem based activities to accessing the site and pre and post activities. The characteristics of a learner challenge could be thought of as a large-scale activity, while contributing activities could be thought of as the tasks that learners engage in to meet the challenge. The challenges are being designed to:

• be problem based;
• connect to the real world beyond the classroom;
• represent an educational outcome and substantive intellectual activity of educational value which can be demonstrated;
• incorporate the production of learner artefacts which require demonstration of a variety of communication skills;
• link to NSW syllabus outcomes;
• engage knowledge and skills from multiple knowledge domains;
• enable flexibility for schools to address local contexts;
• require analysis that goes beyond merely reporting content;
• involve topics of interest to learners of the age group targeted; and
• require concerted learner effort over a period of 5-8 weeks and can be thought of as a Unit of Work or Study in terms of learner effort.

The learner challenges are being developed within this framework. A challenge is set, learners are scaffolded using the project web site that will incorporate an educational performance support system to explore their challenge and develop a research plan as well as a rich set of resources, structured through a digital repository (Wiley, 2002). This process is being explored as a key component of the project (c.f. Cotton, Lockyer, Brickell & Harper. In Press). The pre-visit tasks to Sydney Olympic Park are designed to support students in developing their research plan and collecting data that will support a solution. The activities at the site are designed for learners to explore their challenge further in the site setting, collect data in the field and analysing that data at the Pods located at the site. The pods consist of small technology labs on the Sydney Olympic Park site making use of Sun Microsystems SunRay technology. The pod activities are based on the notion that learners should be able to enter their collected site data, in the form of measurements, photographs, video, audio and diagrams, and then analyse that data through a scaffolded process, linking their analysis back to the central concept of the challenge.

All data and learner interaction at the Pods can be saved off to a learner’s individual space and then accessed through the project web site when the students return to their schools and continue with post-visit web based activities.

A Geography Challenge

A prototype challenge has been developed for high school students in geography, and initial implementation and testing has been trailed. The challenge involves initially setting a context for the learners, where a realistic scenario is described:
Sydney Olympic Park Authority (SOPA) has invested a great deal of thought and effort into the land and water management at Sydney Olympic Park. Most of the time, areas like the Narawang Wetlands need little attention, as there is a balance within the land and water ecology. However, every now and again there is a major weather event that throws things right out of balance. Last year, it was an unusually long drought. While subsequent rains have returned the wetlands to more normal levels, SOPA is worried about the longer term effects.

It appears that all may not be well in the wetlands. Nearby residents have made a few complaints about an increase in the number of mosquitoes in the area. This complaint is always one that sets alarm bells ringing for SOPA, as there are a number of serious illnesses that are carried by mosquitoes, such as Ross River Virus and encephalitis. A number of years ago, an organism called Gambusia was introduced into the wetlands to control the breeding of mosquitoes. Perhaps the Gambusia was also affected by the drought.

SOPA has many questions relating to the land and water management of the wetlands. Are there more mosquitoes breeding in the wetlands than normal? What has happened to the Gambusia population? What is the state of the vegetation in the wetlands? Could this be part of the problem? Are residents really impacted by the mosquitoes, or are these complaints just the perceptions of a vocal minority? Is the situation within a normal range of variation, or is this an unusual and potentially harmful situation?

SOPA needs answers to these questions. It has commissioned you and a team of other expert geographers to investigate land and water management in the Narawang Wetlands. They have asked you to prepare and implement a research plan, and based on the findings, prepare a report and a presentation, such as a PowerPoint presentation or a video. In the report and presentation, you will give an expert opinion of the health and future of the wetlands, and present a list of recommendations on how land and water management should proceed at the wetlands.

The scenario describes a complex task that gives the learner an authentic and collaborative role. It sets the parameters for the scope of the investigation, without specifying step by step how the problem should be resolved. It also provides brief information on the artefact or product that the students will prepare, and the context and nature of the presentation of their findings.

A series of activities have been developed for the learners to explore this challenge, collect and analyse data at the site and then develop solutions to the challenge. Figure 2 shows the interface for learner activities at the site where learners can explore this challenge through three possible themes; Pests, Human interaction or Water management. Learners collect data at the Sydney Olympic Park site, in this case in the form of counts of mosquito larvae and wrigglers. They then explore and analyse the data, relate it to their chosen theme and reflect on their understanding of their data in relation to the learner challenge.

In this analysis, they are given two levels of scaffolding which they can choose to use. At the first level, students are given a space to explore their understanding of their data (and how it relates to the data of other groups at the park and to historical data) under three broad headings: Analysis/comment, Theme focus, and Summary (see Figure 2). Broad questions are provided to prompt their thinking, such as: ‘One solution for reducing mosquitoes in the Narawang Wetlands is to use chemical sprays. How do you think different interest groups would see this approach?’ If they so choose, students can access further prompt questions such as ‘How do you think local residents would react? Do you think they would be pleased that something was being done or do you think they might object to spraying potentially dangerous chemicals near their homes and schools? What about regular visitors to the park? What about ecologists and environmentalists?’ The data entered in this way at the technology Pods is saved out to a server, and is then available to them on return to school to continue with the completion of their research plan and report.
Figure 2: The data entry and analysis interface in a technology pod at the Sydney Olympic Park site.

A Research Agenda

The Project draws on recent research and knowledge of best practice in all aspects of the design and implementation of the learning environment, and will serve as a new model in the use of ICTs in learning. The new knowledge gained from the use of the site will guide future design.

The research agenda for this project should be considered at two levels. At the most basic level, input from published research is an integral part of the design and development process. In some circumstances, this input is well known, in others, the project will be drawing on research outcomes that are just being reported. Secondly, a series of research agendas associated with the project will investigate the learner problem solving process, teacher support and professional development, and evaluation of the site development processes.

Conclusions

This project has the potential to model best practice in use of technology in supported learner resolution of rich tasks or learner challenges—tasks that are long term, ill-structured and require learners to investigate solutions to problems in a planned way. This type of approach has the potential to support the development of higher order thinking skills.

The project has a number of features that are being investigated through multiple research agendas. Firstly, the project is an ideal situation for developing repositories to store electronic resources in the form of learning objects. This
technology has developed from the international movement to reuse learning content in the form of learning objects, and the broader issues of learning design based on drawing on these objects as resources.

Secondly, providing teachers with guidelines on the effective pedagogical design of technology supported learning experiences within this program will be the key to its success, and the model will serve as an example of best practice in the use of technology in education through an electronic performance support system.

References


