

Learning in 3D: Students' Experiences of Online Projects in NSW Schools

Susan Harriman
University of Technology
Sydney

Abstract

Student participation in online learning activities is a growing priority for Australian government schools. 'Online projects' have emerged as a new learning form, building on non-computer problem-based learning approaches. This paper reports on a study of online learning projects implemented in classes from year 2 to year 11. The purported benefits of online learning were explored through in-depth case studies of the selected projects. Results of the study are presented, providing a window onto the learning events as each project unfolded and highlighting the achievements of students. The study's findings have significant implications for education systems and teachers, in the design and implementation of online projects as part of an effective learning provision for students. The potential and limitations of an online project approach are placed in the context of online learning developments occurring in New South Wales and Australia.

Introduction

In the New South Wales (NSW) government school system (Australia's largest schooling authority), as in many other education systems, the incorporation of computer-based technologies has been a major priority for the last decade, with the familiar expectation that learning enhancements would be achieved. Also familiar are the disappointing outcomes of computer use, in terms of usage levels and evidence of effective learning or in changes to teaching practice (Audit Office, 2000; Hayes, Schuck, Segal, & Dwyer, 2001; Roberts Research Group, 2002).

The emphasis on hardware provision and connection of schools to the Internet needs to be matched with equal emphasis on demonstrating ways that computing technologies, particularly online technologies, can significantly add to teaching programs and student achievement. e-learning or online learning as an alternative to face-to-face lessons in particular school circumstances (small demand for subjects, teacher shortage, distance access) have become established as niche services. Yet when faced with an expectation that online learning will be part of all students' learning, we are still asking the question "What is online good for?" How online learning activities may provide new opportunities, and in what form, constitutes much of the current debate.

Online projects and the Australian online landscape

The Internet's characteristic feature is the ability to be 'connected' – to information, people and products. In NSW schools, currently most frequent use is made of connection to **information** (online encyclopaedia, web searching, WebQuests) and the associated learning activities (Audit Office, 2000; Cooper, Jamieson-Proctor, Crawford, & Nuyen, 2001; Wyld & Eklund, 1997). There is growing interest in educational **products** that will provide teaching and learning activities for direct use by students. The largest proportion of the investment by Australian education systems is going into the development of learning objects, which are expected to provide new opportunities and promote new ways of learning, as well as filling current resource gaps. Success will depend on the ability of objects to model complex concepts and events that are beyond the scope of school resources, and to provide self-paced pathways through sequences of materials (Australian Education Systems Officials Committee (AESOC), 2001). To date there is little product to show for this and even less evidence, worldwide, for significant learning changes.

The ability to connect to **people** provides a third area, with the promise of adding new dimensions to learning activities, particularly in mainstream, class-based environments. Potential activities include direct e-mail contact between students and with others, participation in online discussions or mailing lists, participation in projects with students in other places and contribution to real-world activities. Structured learning uses of online communications often fall into this latter group, presented in the form of 'online projects'.

All Australian education systems contribute to the *OzProjects* directory site administered by EdNA Online (Education Network Australia, 2003). The site provides a central registry of local and international projects, including some created by state education systems, with links to selected overseas collections. It is certainly not the only source of online projects being implemented in Australian schools. It does, however,

represent an endorsement of online projects as e-learning content for school use, although financial support of the site (and of online projects in general) is minimal, and hugely varied across state education systems.

The study on which this paper is based explores how online projects, as one form of class activity, can contribute to the learning outcomes of students and to the effective use of Internet technologies in K-12 school settings.

Activities describing themselves as online projects range from simple information sharing or web publishing activities; to those that bring together problem-based learning approaches and the promise of increased connection to and opportunities for collaboration with people and organisations beyond the school. Descriptions of project types or categories (including simulations) are provided in several contexts (Berenfeld, 1996; Ferrari, Taylor, & Vanlehn, 1999; Global SchoolNet, 2001; Harris, 2002), generally reflecting differences in the amount and nature of the interaction between participants and/or the complexity of the task. Different learning opportunities are promised as students move into a wider learning environment, and as communications facilities change the way activities are framed and undertaken. Online projects are currently implemented in pockets of schools and classes, both in Australia and elsewhere, with little consistent promotion or participation. The benefits of participation are expounded by project providers (Donlan, 1998 - heavily referenced in Education Network Australia, 2003; iEARN, 2003) and yet participation in projects remains relatively invisible in reports of school-based use of ICT in Australia and in the research literature around ICT integration.

Studies of online projects have focused on an 'overview' approach, mapping the occurrence and nature of projects (Harris, 2002) or documenting individual cases, with an emphasis on implementation issues and suggestions for their successful operation (Carr, 2001; Wyld & Eklund, 1997). While teachers recount their positive experiences of participation in online projects and the largely motivational benefits to students (for example, (Brunsden, 2000; Clark, 2002; Roach, 2004; Robertson, 2000), anecdotal evidence of the value of online projects is not yet well supported by research into the experiences of learners or evidence of outcomes achieved. Concerted research is required that investigates and demonstrates how and what students are achieving through their participation in the online activities being advocated (Bennett & Lockyer, 1999; Windschitl, 1998).

The Study

The study reported here was conducted in four classes from Year 2 to Year 11, each participating in a project that moved beyond information gathering and sharing. The selected projects sought to introduce a complex, purposeful task (collaborative design, problem to solve) extending student activity beyond the school. In each case the project was implemented as an integral part of class activities. Use of online technologies was a pivotal part of each project, if not necessarily the aspect where most time was spent.

The purported benefits of online learning were explored through in-depth case studies, allowing the researcher to be part of the class for the duration of each project. A multi-method approach was taken to gain insights into the learning occurring through a variety of views, especially those of students. Data were collected through interviews with students and teachers, triangulated with extensive observations of class activities over the duration of each project.¹ Analysis of student products provides evidence of outcomes achieved, particularly related to syllabus requirements.

A significant feature of the study is the value placed on students' perspectives of the experience and learning achieved. Students' reflections on activities as they occurred, and in interviews at different stages of the project, are used as a primary focus of analysis; foregrounding students' perceptions of the project experience and the (sometimes less obvious) learning achieved. Class teachers described how they selected and implemented the projects. However, it is their knowledge of students, revealed through interviews and informal reflections, that contributes most to an understanding of the project learning experience: providing insights into what was occurring in the class and what was achieved as a result.

Online projects in action

In this paper I present two stories from the intensive case studies, one located in a primary (elementary) setting and one in a secondary setting. A detailed description of each project is provided, particularly highlighting the activities and responses of students, followed by analysis of some significant issues. The exploration of the particular contributes to a broader picture of online projects and their place in class-based learning.

Murder Under the Microscope: an eco-mystery for years 5-8

The tension is palpable. A final, collective decision needs to be made about the identity of the ecological criminal, drawing on the research, interpretation of clues and sometimes agonisingly difficult reasoning that has taken place over the last few weeks. A pair of students checks the latitude and longitude of the suspected crime site. Another group is arranging the issues summaries for the class' consideration, while the bulk of the class double-checks the reasons why most villains have been eliminated from suspicion. They are competing against some 2000 other teams from schools across Australia and beyond, and the deadline for making an accusation is looming.

All the ingredients of a murder mystery are here: a victim, dead in suspicious circumstances; a forensic scientist providing a complexity of test results; an array of suspects each with a possible 'modus operandi'; witnesses and bystanders ready to give contradictory accounts of events; all presented by a world-weary investigator in the field. The detective work was done by students in Class 4/5/6 (team name *Ecostars*), in their role as 'eco-detectives', struggling to piece together the information and clues to lead them to the solution: identifying the victim, the crime site, the villain and probable cause of the fatality. Information was revealed through weekly television broadcasts (also available online) and regular updates provided on the project web site. The second phase of the project involved students in the development of a rectification plan for the affected site, with the intention of preventing similar 'crimes' from occurring.

The project was implemented over a nine week period with three to five hours of class time spent each week. Outcomes in Science and Technology, English and Environmental Education were anticipated.

Capitalising on early enthusiasm for the project, the class spent the first weeks working in groups to explore the ten possible crime sites, two per group. They identified the information needed for each site, negotiating the fields of the database that became the enduring shared resource and reference point throughout the investigation. A similar process of distributed investigation was used a few weeks later, to develop understandings about the catchment issues that might be related to the crime. Each group selected and completed structured activities provided by the project.

The whole class eagerly awaited the first broadcast from Catchment HQ that revealed the crime scenario and the 20 potential victims and villains, and began the stream of information and clues to be sifted, interpreted and related to the background information they had compiled. Immediately, students were able to eliminate a number of victims, villains and sites. They debated the impact of the new information, providing evidence from their group investigations, with minimal intervention from the teacher. Subsequent broadcasts were characterised by absolute quiet in anticipation, followed by extraordinary levels of attention, even when frustration was expressed about other aspects of the investigation.

Interaction with the project web site was a defining feature of this project. Accumulated information was stored in various areas, games and activities were provided for enjoyment as well as providing additional clues, and the site provided direct access to reference materials, one-to-one communication with the scientist experts, and links to outside information sources. Information is deliberately delivered progressively throughout the investigation, allowing students time to gather ideas and build understanding, before each new set of data and clues arrived. New data acted as a learning reward, sustaining interest as predictions and decisions made by students were confirmed or refuted. The project itself guided the investigation, steering students' deductive efforts. Additional input was delivered via the Crime Scene Reports and daily Newsflashes, which were impatiently downloaded each morning. Disappointment was strong when they did not reveal something obviously useful.

Whole class discussion was used to share ideas across the groups. On some days this worked better than others, as children found it hard to make the connections between disparate sources and bites of information – a major difficulty identified by the teacher. By the middle of the investigative phase the class hit a trough in enthusiasm. A growing concern for the class teacher was the feeling that many students were not productively involved, in the group activities or in open discussions. Ongoing technical difficulties with the class computers, though relatively minor, caused added tensions as groups were delayed in pursuing their research or had to use computers located in other areas of the school.

The momentum picked up again with each broadcast, particularly as the deadline for accusations drew nearer. Gaps in understanding were being filled and more was revealed through the drama, enabling the class to make more confident assertions and narrow the scope of the follow up questions to be investigated. By this stage the difficulties of group operation had largely been resolved and the time spent on scaffolding group organisation was paying off. The class teacher, Hannah felt happy to leave the investigative work to the students, spending more of her time assisting the groups to keep functioning and structuring activities to

maintain involvement of individual children.

By week 5 the enthusiasm was tangible. The crimes site and victim lists were each narrowed down to two possibilities, with specific research questions being allocated to pairs of children to follow up. Questions were posted to the project scientists and while the answers were of limited value in resolving the issue, some of the questions posted by other teams provided useful additional ideas. Sifting through the hundreds of questions, however reduced this to a matter of luck rather than systematic analysis. Several students took the unexpected step of contacting the Department of Water Conservation by phone, and succeeded in getting an answer to their question.

Deadlines for individual tasks were used to keep groups on track and maintain the urgency. In a frenzy of activity on the day of the accusation, the class arrived at a tentative solution to the mystery. There was still uncertainty about the cause or 'issue' involved. The competitive aspect kicked in at this point and the class was divided about whether to submit their accusation immediately (only one accusation was allowed per team, and the first correct solution would 'win') or wait for the final broadcast to provide any final clues and confirmations.

The solution, and 'correct answer', was posted on the web site the next day. The *Ecostars* did not get all four elements correct, having made an error in locating the crime site latitude and longitude and in incorrectly identifying the environmental issue. Given the level of involvement throughout the project, it was surprising how rapidly the immediate let down of not getting the answer right, gave way to further thinking about the solution. There could have been recriminations over the error made by the pair who checked the grid references. While the teachers' distress was obvious as she felt responsible for not having made a final check, the children were surprisingly understanding. Attention quickly moved to the other error in their solution: the wrong issue. Rather than accept they'd 'just got it wrong', a lively debate ensued about the relative merits of the 'correct answer' in comparison to the class' decision. While this may be interpreted as justification (or just plain sour grapes) the insights and arguments put forward demonstrated a significant level of understanding of the both the issue that was suggested and the others that had been considered along the way. Several groups of children were able to outline and substantiate how their preferred solution reflected the clues they had been provided. A similar debate was played out on the teachers' forum of the project, with a number of dissenting arguments put forward. The outcome for both teachers and students was an acknowledgement of the interplay of influences and the cumulative effect of multiple environmental pressures – a sound learning outcome in itself.

Bring Modern History to life: the Middle East simulation

The room is full of variously dressed 'conference delegates'; passionately arguing their points, leaping out of seats; or slumped, resignedly feeling the frustration of impasse. A quickly scribbled note passes between delegates, framing up a response to an accusation or proposal. Microphone in hand, the press asks questions that make Arafat squirm, al-Assad leap to her(his) feet and George Bush defer to his co-delegates for support.

The Middle East simulation immerses Year 11 Modern History students in the issues and personalities of Arab-Israeli politics. Originally developed by the Macquarie University Centre for Middle East and North African Studies, for use by tertiary students studying the politics of the wider Middle East region (Macquarie University Centre for Middle East and North African Studies, 2003), the simulation has been adapted to meet the needs of high school participants focusing specifically on the Arab-Israeli conflict.

In groups of three, students take on roles of significant characters in contemporary Middle East affairs, using Internet technologies to interact and play out the action in a likely, if not real, political scenario. The participants were 60 students in three classes, across two Sydney high schools. Several 'control' roles were created to allow monitoring and assessment of activities by class teachers and 'controllers' from the Centre for Middle East and North African Studies. The controllers provided support and guidance to students, as required, allowing them to draw on the expertise of the participating university faculty members.

Following the release of a scenario which sets the scene for the simulation to follow, the action and reaction was driven by the ideas and decisions of students, unfolding over a three week period. The culmination of the project was a Conference Day where players came together, face-to-face, to negotiate around key issues in the conflict. All the lead up action took place online: messages were sent by e-mail, players used chat sessions to negotiate in real time and the simulation web site provided information and facilities to help students explore issues and plan their participation.

The overall response of students to this very different learning environment was unexpectedly varied. Problems with groups and difficulty feeling 'in role' made it less productive for some students, and the timing

of the project was the subject of frequent complaints. Yet in only a very few cases were these barriers sufficient to dampen enthusiasm or outweigh the benefits described by students.

Levels of involvement were extremely high, evidenced in all sorts of ways - from heated arguments on the school bus, or reassurances between friends after impassioned conference debates, to numbers of players who continued to log on to the site well after the simulation was finished. This is not to suggest that participation was easy. At times the challenge to existing ideas was difficult to deal with, particularly for those students who held strong views prior to the simulation.

Because I'm Jewish and I was playing Syria... when you went inside their views it gives a different perspective on the whole situation... I had never seen or even thought about other countries and what they are thinking..., another perspective, never thought about it before...

Overwhelmingly, interviewed students appreciated being able to direct the action themselves; having to weigh up ideas, think strategically and develop careful negotiating skills.

...it was great – not being checked all the time – do what you want in your character – you're in control of the character.

The project was time consuming, and the 'every night' commitment was problematic when other priorities were neglected. Several students described it as engrossing, addictive and themselves as 'becoming obsessed'. Strategies had to be developed by students to manage participation. Working to a team schedule, setting time limits and flexibly sharing the workload to accommodate other demands on team-members' time, were all used to deal with time pressures.

'Being the character' exerted a pressure to do the research and develop a deep understanding of the role being played. In order to take strategically consistent actions, students developed understandings of the range of characters, not just their own. The project shifted the emphasis from learning about events and consequences, to experiencing the processes of policy making, tactics and making difficult decisions at different levels of politics.

...there is like internal and external results of things – all the people who die, poor conditions and then the political side... thinking as the nation.... It's really hard to know which to do, because if you just go from the side of the civilians it's like giving up your nation's rights – like your beliefs ...

The conference day was characterised by strongly expressed positions, impassioned responses and heart-felt attempts to find solutions. The depth of knowledge and empathy with their character's position and outlook, developed through the online activities, allowed students to confidently argue their points and respond 'in character'. Students developed a strong sense of the complexity of the situation and reasons behind it, all the while maintaining a remarkable optimism.

Discussion of findings from the two cases

Variations on a theme

I have chosen to present accounts of these two online projects because they are so very different: in learning area, in nature of project approach, in technologies used and in age of participants. This selection of cases is not proposed as representative in any way nor do I want to suggest that they represent polar opposites or even points on a continuum. They do demonstrate the variation that exists in the range of projects that can conceivably be developed. There is value in exploring different settings, ages and learning area contexts as well as the different types of project on offer. Multiple cases assist in building a more extensive view of the attributes, value and difficulties that online projects offer.

What unites them (and the others in the study) is their existence as constructed learning environments. They are 'packaged' as complete units of work, offering complex, problem-solving challenges. They each do more than simply 'connecting' students in order to communicate per se. They reflect commonly described characteristics of project-based learning approaches (Katz, 2000; Moursund, 2002; Stepien & Gallagher, 1993; Thomas, 2000): being implemented as a central part of the class curriculum, promoting increased student autonomy, engaging students in constructive investigation around concepts of significance through realistic, non

school-like topics, tasks or challenges.

The experience of being part of these vibrant learning spaces is highly seductive - even second hand as I observed online the daily performances in the Middle East simulation and recorded the student's accounts of their experience. It would be easy to take away a glorified view of the project experience. The purpose of this paper is to make a more critical examination of the nature of the learning achieved and the role played by online presentation of the projects.

Reflecting on the learning experience

At the heart of each project is the expectation that students will develop disciplinary knowledge. In both cases the teachers' decisions to take part was dependent on the project providing a learning challenge that fitted their existing intentions, directly related to the required learning outcomes. Analysis of activities and work products provided substantial evidence for attainment of subject-based knowledge that clearly met the required course or syllabus outcomes. Teachers in both projects highlighted that the students did much more than simply reach these outcomes.

The history students themselves were keen to talk about their wider learning, highlighting an appreciation of both sides of the conflict as perhaps the most valuable outcome of their involvement. New depths of understanding of the complexity of issues were described, with an awareness of motivations and the different points of view that are inevitably present in any conflict. Building empathy with the ordinary, as well as not-so-ordinary people on both sides of the conflict was a surprising result for some. One girl described her realisation that "this isn't about countries - they were people" in terms of it being a revelation.

So it's like learning in 3D – because it's not just like this is this and this is that, it's like 'maybe' - and there is also this side – different ways of looking at it! (Student interview, Middle East simulation)

The most significant feature of both projects was the change in the way the learning was achieved. The projects set up learning spaces, physical and conceptual, that differed markedly from those usually encountered by the classes. Activity shifted from 'finding out' about events and consequences in a more traditional content driven approach, to one that required students to participate in the processes of investigating, making decisions and developing solutions. The range of outcomes was extended, providing a greater emphasis than usual on the learning processes of the respective disciplines.

... obviously we learnt about the conflict - but more. You know it's so easy to stand back and criticise the way that politics work. Everyone is so stubborn... it's so much harder to be so neat about it now – to criticise when you've been there... so I think it made us realise it's not that easy – these feelings have been held for years. You can't just change it

It was an experience, not just a lesson, or an essay... (Student interviews, Middle East simulation)

A major aim of the Middle East simulation (subsequently referred to as ME simulation) was to connect students' experiences to real events in the outside world; engaging them in the processes of international politics as well as historical inquiry. The simulation necessarily required students to 'find out' but with an increased depth of inquiry because they need to take action – they need to do something meaningful with the information.

In solving the *Murder* mystery, students engaged in an investigative process that required them to gather and share information, think carefully about relationships between pieces of data, make links and see casual relationships, and substantiate ideas through reference to data provided or information gathered. This represented a significant challenge to the students' usual ways of demonstrating learning and produced some of the greatest tensions in the project. Outside the project context, the students were (and are) most commonly required to locate and select information relevant to a question or topic, with repackaging of the information sufficing as a demonstration of learning. The messy process of looking for evidence and then testing it against established understandings and other information sources, was new and difficult for many students. The contribution, however, to achievement of learning processes outcomes of Science and Technology², particularly investigation, was a major benefit of the project.

Really useful learning problems are not easy to solve. Significance relies on the problem reflecting real world conditions: in these cases, being contentious, complicated by multiple viewpoints and vested interests. Both projects created learning environments, one online the other in the classroom, conducive to knowledge building: problematising the topics, relying on students to do the intellectual work, while supporting them in

learning how to do this (Engle & Conant, 2002).

Much more was demanded of students; they could not rely on information retrieval or simple, literal readings of reference materials. They were compelled to identify what they needed to know and the questions they needed to ask in order to be able make the next move toward the solution. The project structures supported the teachers in shifting cognitive responsibility to students (Scardamalia, 2002), changing their own roles and those of students. The ME simulation places all responsibility of the collective learning on the students. Teachers provided support only when specifically sought out by students, or in extreme, and rare instances where they need to intervene (although this was not required during the 2003 implementation). Such enhanced agency is particularly rare in senior secondary classes, where examination pressure often causes teachers to revert to highly transmissive pedagogies in order to 'cover the content', but where it might be most urgently required (Heath, 2003).

Not knowing 'the answer' was also particularly significant. It was critical to present an open-ended scenario, allowing students to work through the processes of decision making, negotiation and compromise without a predetermined solution available. To truly engage in the processes of diplomacy, the characters had to have options, make choices and take risks - and deal with the uncertainty of how others might respond.

In *Murder* the teacher remained a necessary part of the learning collective, taking a shared role, assisting regularly as needed. The difference in teacher role was again assisted by not knowing the answer. She was unable to shape the direction of the investigation, even inadvertently. Groups were held accountable for contributing to the success of the investigation and were required to make the knowledge generated available and accessible to the rest of the class. Hannah was more than a just a co-learner, being responsive to students cognitive and social learning needs. The more challenging nature of the task revealed skill gaps that had previously been hidden, exposing assumptions the teacher had made about individual and group competence.

...[needed to] plan lessons for the kids, for those that need them. The others can sort through but some need more directed activities to get them to be able to deal with it - some are suffering from info overload and are opting out. (Teacher comment during lesson observation)

In addition to scaffolding group operation Hannah realised she needed to provide targeted lessons, such as guided deconstructions of texts, modelling of question generation and even basic information skills.

The importance of group activity and the difficulties it presented strongly influenced the experiences of individuals in both projects. Worthwhile skills and strategies for working in groups were developed by many in the ME simulation, to manage workload and organise collective contributions. Where the groups worked well, they added to the building of understanding and confidence in the subject matter. The group helped individuals to work through challenging new ideas, to utilise or develop different strengths and specialised knowledge areas, and to collaborate in the construction of responses. These effects were reliant on the effective functioning of the group. Students were quick to point out when others 'could hide behind the group'. While the variation in contribution to the shared task was noted and reflected in the final assessments, there was little way of alleviating the added burden felt by those whose groups did not function well.

The amount of research required and the complexity of the information to be digested throughout the *Murder* investigation necessitated a division of labour and the pooling of ideas and knowledge acquired or created. It was clear that the class was not used to working in this way. Early on, some students openly discussed how hard it was, but equally how enjoyable they found it. Others were less enthusiastic, and because of the group work structure, they found it relatively easy to hang back, providing minimal input to group tasks and avoiding contribution to broader discussions. Over time a balancing effect was noticed. Students had to trust that information being provided by other groups was accurate, with the reciprocal effect of creating an imperative for groups to produce worthwhile contributions to the shared information pool. As the project progressed this process was taken more seriously. The pressure to make a contribution, in the knowledge that it might be the pivotal piece of information, resulted in a greater willingness to complete activities and share findings. Improved learning relationships involving trust in, and respect for other class members, developed during the project. For Hannah, the nagging doubt persisted, however, about how much had been achieved by a (small) number of class members.

Scardamalia and Bereiter (1991) remind us not to romanticise the idea of students as independent learners, acknowledging the role of authoritative sources of various types. The role that the projects played in supporting students in this way is also linked to ideas about authenticity.

Enhancing authenticity is a claim often made by advocates of ICT in learning, particularly online projects (Bransford, Brown, & Cocking, 2000; Donlan, 1998; GLOBE, 2004; Stepien & Gallagher, 1993).

While there is considerable diversity in the ways that authenticity is conceptualised in educational research, there was an underlying assumption on the part of teachers in the study that the projects themselves were 'authentic' or true to the situation they purport to represent, providing students with valid insights and understanding of the wider world.

As occurs in many online projects (Childnet International, 2002; CIESE, 1998-2001; Global SchoolNet, 2001) the ME simulation and *Murder* both offered students access to experts. Expert involvement, however, was not limited to answering individual questions. The projects gained authority by their very design, being developed by specialists in the field who ensured that 'the science was right' or that the 'likely if not real' scenario of the ME simulation was authentic to contemporary events. As one designer involved in *Murder* commented, "it may be fiction but it can never be fictional".

Students' construction of knowledge was guided throughout the *Murder* investigation via the progressive revelation of information, all of which was subsequently available on-demand on the web site. The questions posed by all participating teams were available to all as a further resource.

The university-based controllers in the ME simulation performed a dual function: providing direct responses to student-initiated questions, and endorsing proposed 'major' actions before they happened (offensive strikes, dismantling of a refugee camp). Their advice assisted students in understanding and interpreting their character's actions and reactions and helped them to think through alternative types of action they may take, without diminishing students' decision making ability.

Control's reply to a request from the CIA to leak a false report regarding the death of Sheikh Nasrallah, in the hope of driving people to the negotiating table:

George,

Put down the matches and the petrol... Attacks tend to move parties away from the negotiating table rather than towards it (thus the I-P peace process is constantly derailed by attacks) - you'll find that talks are most likely when both sides are exhausted by violence.

If you like, you can still mail Fox News and make up a false report, but it may be counter-productive... As Director of the CIA, you have vast resources and experience in force management so get out there and start managing these parties by improving security on all sides.

Teachers were enormously appreciative of the addition to their resource repertoire and valued highly the opportunity for their students to learn from external specialists. Students not only benefited from the direct input provided, but saw the involvement of real scientists and real academics as validating the work they were doing. They knew their learning mattered.

In both cases the projects were developed for school use through partnerships between the disciplinary experts (government departments and university academics) and educationalists. This also works as quality assurance for teachers considering embarking on a project-based activity. The ongoing partnerships have worked to make the projects more than one-off events, being open to an ever-expanding number of schools and classes and elevating them to a level beyond many of the information-sharing projects that dominate the online project landscape.

The two projects discussed here had particular strengths in adding authenticity in terms of processes and content. In the other cases in my study, those not elaborated in this paper, the tasks were not as reflective of real-world activities. However they provided a greater level of authenticity and value to students because of the audience for whom they were completed.

The audience for activity in both *Murder* and ME simulation was also extended beyond the class teacher. Participation in ME was assessed by the project controllers, as well as the class teachers, based on how 'true to character' students were in their interpretation of the scenario and the actions proposed. Working with another school added to the effectiveness of the simulation. Submitting the solution to the *Murder* mystery to 'Catchment Headquarters' provided an acute motivating effect and significant value to the learning. In both projects, students talked of connections made to their own interaction with and enhanced understanding of current events.

However, in neither of these situations did the activities and products of the projects have a real impact on events or people outside the class. This is the obvious limitation of simulations, which by definition are imitations of real events. But it may help to explain the disappointing participation on the second phase of *Murder*. For the majority of teams, including my case study class, the solution to the crime is the culminating

event of the project. The second phase involves the development of the catchment plan, that brings together the understanding students have developed through the investigation and asks that they put their knowledge into practice. Consistently, only around 10-15% of teams continue to phase two (Interview with project designer) despite the promotion of this as the most important aspect, deserving of the “highest honour” (Teachers’ Handbook, p.4).

How much of these effects were the result of the projects being presented online?

Examination of the impact of online presentation of the projects yielded some expected benefits, consistent with the experience in other web-based activities. Working in the online space created in the ME simulation increased participation of all students (Sherry & Bilig, 2002), access to expertise beyond the school and extended audience for student activity.

The motivating effects, so frequently attributed to online activities was of less intrinsic value than the other aspects of the project environments already discussed. For most students in the study computer use is not a novelty to be valued for its own sake. On the contrary, Hannah encountered continuing resistance by a few class members to the computer-based activities, that was barely altered by participation in the project. Once again the group work focus enabled students to opt out of this aspect of the tasks.

Even in the ME simulation, where most of the action took place online, the learning was not primarily about using the computers. For some it was the first time they’d really used e-mail, but this was rare. The online environment of the simulation was significant for several students who for the first time saw some purpose in computer use for school. Others were critical of the interface because of their extensive personal experiences.

While the projects certainly put the technologies to use in meaningful ways, they were not identified as significantly improving students’ computing skills, except in a few isolated cases. Rather, they shifted the role of the technology, making it secondary or ancillary to the purpose and intention of the learning. Presenting the projects online not only adds to the realism of the experience but extends students’ technology activities to higher order uses.

A strong message came from the teachers. Several were tentative computers users prior to implementing the project. The experience has demonstrated a more meaningful use of ICT in their classes and provided suggestions for new ways of working. While this doesn’t mean they are instant converts, they are now looking for other times, places and ways of creating similar learning spaces.

... it gave me another view on how to do it and how to use the Internet... I wouldn’t have done it that way, it wouldn’t have occurred to me. (Teacher interview – Murder Under the Microscope)

Unexpected effects also emerged, related to the unfolding of events, the learning supports provided through the project infrastructure, and the positioning of students that enhanced the authenticity of the task.

The murder-mystery metaphor of *Murder Under the Microscope* creates the drama and excitement of the project. The importance of the unknown result has already been discussed. The progressive unfolding of events was only possible through the delivery of the materials online and through the broadcasts. Daily and weekly inputs not only maintained the momentum of the investigation over several weeks, but also helped students cope with the amount and complexity of the information being provided. The ongoing availability of the accumulated materials allowed students to retrieve and review them as required. Even so, it seemed a little overwhelming at times.

...the fact that they added [ideas] as they learnt them means you’ve got to ask ‘Well where does that fit into this?’ So that forces them to make those links. (Teacher interview – Murder Under the Microscope)

It is in this way that online projects also differ significantly from other online activities. A partnership developed between the online component of the project and the necessary activities that took place in other spheres of the class’ work - both on and off computer. Student activities take centre stage; the construction of ideas takes place between students. The technologies themselves (the computer and the network) recede into the background of complex learning tasks, perhaps more so than in other styles of online activity.

The *Murder* project provided a wealth of support materials: appropriately pitched reference materials, formats for organising and presenting information and lists of web resources for students; planning and scheduling advice, suggested sequences of lessons, assessment formats for teachers. Support materials are intended to assist where and when needed. They are neither prescriptive nor exhaustive. They do however, provide much needed supports for teachers, elaborating possible implementation strategies and ways to manage

the knowledge building processes.

While the online interaction was the dominant function of the ME simulation, the final face-to-face meeting was highly valued by all involved. Again, the balance of virtual and real interaction was a major benefit of the experience. The depth of learning that occurred during the three weeks of online interaction prepared students for the often confronting task of arguing the points face-to-face.

I learnt it so well. I found when I finished - I don't know why that stuck.... you've had all this lead up to it . You actually believe what you are saying. (Student interview, Middle East simulation)

It is certainly conceivable to suggest that the activity could have taken place entirely in a face-to-face classroom environment. However, being online added several significant dimensions. Shifting the major activity away from a face-to-face interaction increased students' ability to construct arguments in considered ways, working collaboratively to explore ideas, plan actions and respond to the initiatives of other characters, without being interrupted (Wills & Ip, 2002). An immediate comparison was possible.

...it let everyone get a say. In the conference you don't have time to search for that perfect word that would just fit in - it's hard to be articulate – in e-mails you can think about it... (Student interview, Middle East simulation)

Events unfolded on a daily basis, sustaining the momentum while maintaining the depth of responses. As for *Murder*, the online environment contributed to the pace of the action and interaction.

Working electronically, interactions between group members did not have to occur synchronously. The workload was frequently divided, with group members taking the load on different days, while maintaining shared responsibility through systems of individual drafting and group review, amendment or endorsement. The simulation environment provided a 'diary' area where character group members could privately communicate with each other. Not all groups made use of this, preferring to use instant messaging or the telephone, or even discussing and planning at school. The intensity of the project often led to combinations of these being used simultaneously. The project made it imperative that students plan and manage their participation, at the same time as providing support structures to do so.

In the ME simulation, involvement of another school was only made possible by working online. Students commented that this enhanced the realness of the situation, adding new perspectives and a greater range of ideas and unpredictable responses. As they did not know the others, they communicated entirely in role. Wills and Ip, (2002) suggest such anonymity makes participation more comfortable, especially for adult learners. For the school students being online also meant that existing relationships were minimised; the action was 'unable to be influenced' by existing friendships. Most importantly it added to the authenticity of the action; communication occurred between the 'characters' rather than friends and classmates.

It didn't feel like just talking to kids!

Conclusions

There is no revolution happening here and perhaps we should stop expecting one. I have learnt, as have the teachers in my study, that online projects have a deal to offer in creating authentic, problem-based learning experiences for students and in making effective use of online technologies, although not without sizeable concerns to be addressed.

Students were asked if they would recommend the project to others. An overwhelmingly positive response was tempered by similar issues identified by students in both projects: the amount of time it took away from other set tasks and the difficulty found by some in working in their allocated groups.

More experienced computer users in both age groups were most vocally critical of any online aspects that didn't measure up to their (outside school) experiences: the relatively limited 'flashiness' of the *Murder* graphics, 'cripplingly' slow speed of the simulation chat facility. This sets immediate challenges for schools, 'to be in the game' both in terms of quality of functionality and interface design that supports the purposes of the sites. This is not easy. We know that graphics, functions and interface design of recreational software are the result of a multi-billion dollar, cut-throat industry built on rapid updating and expanding repertoires of effects and features. It is impossible for the resource-poor education sector to keep up technically. Students' further comments were somewhat reassuring. They suggested that 'bells and whistles' are not critical, but reliable,

efficient function is, with a style of presentation that supports the purpose without attempting to be more than it is. The greatest criticism was of 'try hard' failures.

The teachers would all do it again, too... "but not all the time!" They acknowledged that the projects created a style of learning that is rewarding and adds tangible benefits to children: realism, purpose, authentic process and valuable content, emphasis on student knowledge building. But it requires a balance. Projects are time consuming (if not all-consuming) and have more than just the potential to take time away from other, equally important learning activities of the class.

Ways of resolving the tension between the time taken and the value gained, requires further investigation. Can we accept that the time it takes, is the time it takes and therefore is worth it? Or should the projects be scaled back so they more manageably become an 'ordinary' part of class activities. At what point in scaling is the value lost? Is it sufficient to implement projects only periodically, particularly if the models of changed pedagogy can be incorporated in teachers' design of other learning activities?

Teachers certainly did not want to have to create projects themselves. They have neither the time or expertise. Definite value lay in the projects being available for teachers to participate in, as convenient.

The continued existence (individually and collectively) of online projects relies on teachers and students finding the experiences useful, both in delivering learning benefits and providing support for changed pedagogy. The evidence from these two cases suggests that, with support, this can be achieved.

The study has significant implications for education systems in the design and implementation of online projects as part an effective online learning provision for schools. While they are enthusiastically implemented by teachers who value the student learning achieved and the support provided within the project environments, wider implementation remains sporadic, at best. Complex problem-solving projects require time and expertise to develop and maintain, far beyond the capacity of individuals or even groups of teachers to sustain. Both these issues suggest the increased need for systemic development and support for projects, particularly in partnership with other organisations. Yet in NSW and most other states of Australia, they remain the 'poor relation' of online activities: underfunded and outside priority e-learning development areas.

In this highly conflicted area of investment in ICT and the search for purposeful learning uses of the Internet, online projects present a teaching and learning approach that can deliver on some of the much-acclaimed potential – primarily because they promote changes in practice that are concerned with much more than just the technology.

¹The Middle East simulation, described later in this paper, was conducted predominantly in the virtual project environment. Student activity took place outside class time and locations included students' homes, the school library and other venues where Internet access was available. In place of direct observations, descriptions of the learning activity and students' perceptions were obtained through interviews with six groups of students (two from each of the three participating classes) at three points during the project, and diaries of participation completed by four volunteers, two from each school.

²The NSW primary curriculum brings science and technology subjects together in a single syllabus, *Science & Technology K-6*. The three learning processes of Investigating, Designing and making and Using technology underpin all learning in the area.

References

- Audit Office. (2000). *Computers in schools: providing and using computers for teaching and learning in NSW public schools*: The Audit Office of New South Wales.
- Australian Education Systems Officials Committee (AESOC). (2001). *The Le@rning Federation*. Retrieved Oct, 2004, from <http://socci.edna.edu.au/>
- Bennett, S., & Lockyer, L. (1999). *The Impact of Digital Technologies on Teaching and Learning in K-12 Education: Research and Literature review Final Report*. Wollongong: University of Wollongong.
- Berenfeld, B. (1996). Linking Students to the Infosphere. *T.H.E. Journal Online*, 23(9).
- Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How people learn : brain, mind, experience, and school* (Expanded ed.). Washington, D.C.: National Academy Press.
- Brunsdon, A. (2000). *Online Projects - Making the Links*. Paper presented at the 16th Australasian Computers in Education Conference: Learning Technologies, Teaching and the Future of Schools, Melbourne.
- Carr, J. (2001). *Project pillars: Foundations for success in online curriculum projects* (A research paper funded by the Commonwealth Department of Education, Training and Youth Affairs): EdNA schools project.

- Childnet International. (2002). *Net-Detectives*. Retrieved Oct, 2004, from <http://www.net-detectives.org/index.html>
- CIESE - Center for Innovation In Engineering & Science Education. (1998-2001). *Ask An Expert Sites*. Retrieved Oct, 2004, from <http://www.k12science.org/askanexpert.html>
- Clark, M. (2002). *Linking Learners Through Project-Based Adventures*. Paper presented at the Linking learners: ACEC 2002 - Australian Computers in Education Conference, Hobart.
- Cooper, T., Jamieson-Proctor, R., Crawford, J., & Nuyen, A. (2001). *SOCCE Market Research Report*. Brisbane: Schools Online Curriculum Content Initiative (SOCCE).
- Donlan, L. (1998). *Visions of Online Projects Dance in My Head*. Retrieved Feb, 2004, from <http://www.infotoday.com/MMSchools/jan98/story.htm>
- Education Network Australia. (2003). *OzProjects*. Retrieved Oct, 2004, from <http://ozprojects.edna.edu.au>
- Engle, R. A., & Conant, F. R. (2002). Guiding Principles for Fostering Productive Disciplinary Engagement: Explaining an Emergent Argument in a Community of Learners Classroom. *Cognition & Instruction*, 20(4), 399.
- Ferrari, M., Taylor, R., & Vanlehn, K. (1999). Adapting work simulations for schools. *Journal of Computing Research*, 21(1), 25-53.
- Global SchoolNet. (2001). *Global School House Project Registry*. Retrieved Oct, 2004, from <http://www.globalschoolnet.org/GSH/index.html>
- GLOBE. (2004). *The Globe Program*. Retrieved Oct, 2004, from <http://www.globe.gov/fsl/welcome.html>
- Harris, J. (2002). Wherefore Art Thou, Telecollaboration? *Learning & Leading with Technology*, 29(6), 54-59.
- Hayes, D. N., Schuck, S., Segal, G., & Dwyer, J. (2001). *Net Gain? The integration of computer-based learning in six NSW government schools*. Sydney: University of Technology, Sydney.
- Heath, S. B. (2003). Making Learning Work. *After School Matters*, 1(1).
- iEARN. (2003). *Collaborative projects*. Retrieved Oct, 2004, from <http://www.iearn.org.au/collab.htm>
- Katz, L. G. (2000). *Engaging Children's Minds: The Project Approach* (2nd ed.). Stamford, Co: Ablex.
- Moursund, D. (2002). The case for PBL. In *Project-Based Learning Using Information Technology* (2nd ed). Eugene, OR: International Society for Technology in Education.
- Roach, M. (2004). *Integrating curriculum in the middle years using online problem based collaborative learning*. Paper presented at the Australian Computers in Education Conference 2004, Adelaide.
- Roberts Research Group. (2002). *Teachers' Use of ICT in Teaching and Learning: Pilot Program Research Results*. Sydney: New South Wales Department of Education & Training.
- Robertson, E. (2000). *Integrating Learning Technologies and Collaborative Internet Projects into the Curriculum*. Paper presented at the 16th Australasian Computers in Education Conference: Learning Technologies, Teaching and the Future of Schools, Melbourne.
- Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. In B. Smith (Ed.), *Liberal education in a knowledge society* (pp. 67-98). Chicago: Open Court.
- Scardamalia, M., & Bereiter, C. (1991). Higher Levels of Agency for Children in Knowledge Building: A Challenge for the Design of New Knowledge Media. *Journal of the Learning Sciences*, 1(1), 37-68.
- Sherry, L., & Bilig, S. H. (2002). Redefining a "virtual community of learners". *TechTrends*, 46(1), 48.
- Stepien, W., & Gallagher, S. (1993). Problem-based learning: As authentic as it gets. *Educational Leadership*, 50(7), 25-28.
- Thomas, J. W. (2000). *A Review Of Research On Project-Based Learning*. San Rafael. C.A.: The Autodesk Foundation.
- Wills, S., & Ip, A. (2002). *Online Role Play as a Complementary Learning Design for the First Fleet Database*. Paper presented at the Australian Computers in Education Conference, Adelaide.
- Windschitl, M. (1998). The WWW and Classroom Research: What path should we take? *Educational Researcher*, 27(1).
- Wyld, S., & Eklund, J. (1997). A case study of communication technology within the elementary school. *Australian Journal of Educational Technology*, 13(2), 144-164.



