

# Taking Interactive Technologies to the Next Level

## Report for MAT Sabbatical July 1 – Dec 31, 2000

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### Summary

This report summarizes project work and site visits to three regions, Northern Arizona, New Zealand, and Australia that include by numbers:

#### ❖ visits to 9 educational institutions (19 campus sites)

- Northern Arizona University (Flagstaff, AZ); UNITEC, (Auckland, NZ); Auckland University of Technology (Auckland, NZ); Whanganui Regional Community Polytechnic (Wanganui, NZ); Canberra Institute of Technology (Canberra, NSW, AU); Riverina Institutes of TAFE (Albury, Wagga Wagga, Narrandera, Leeton, Griffith, Lake Corgelligo, West Wyalong, Temora, NSW, AU), Charles Sturt University (Wagga Wagga, Thurgoona, NSW, AU),; TAFE Institutes of South Australia (Adelaide Institute of TAFE, Torrens Valley Institute of TAFE, Onkaparinga Institute of TAFE); Queensland University of Technology (Brisbane, AU)

#### ❖ visits to 2 private education providers

- National College of Multimedia & Technology (Wellington NZ)
- National College of Design & Technology (Wellington NZ)

#### ❖ visits with 10 multimedia developers

- Eli Weir, Native Design (Auckland NZ); Sean Wilson (Auckland NZ); Tony Bray, (Palmerston North, NZ); Che Tamahori, SHIFT (Wellington, NZ); David Wood, PixelPump (Wellington NZ); Mark Martin, Swish Group (Canberra AU); Minty Hunter, Nectarine (Melbourne AU); Dorian Dowse, Xession (Brisbane); Paul Farry (Brisbane, AU); Hans Telford 4tMedia (Robina, AU).

#### ❖ participation in 3 educational conferences

- *NET\*Working 2000* (November 1-14, 2000)- national conference where all events took place on-line
- *Building Momentum, TAFE NSW Learningware Conference*, (November 19-22, 2000, Sydney) - statewide conference on development of on-line learning materials
- *Open Learning 2000* (December 5-8, 2000, Brisbane, AU)- International conference on distance learning

#### ❖ participation in various staff / project meetings

- UNITEC (Auckland, NZ), Whanganui Polytechnical (Wanganui, NZ), Canberra Institute of Technology (Canberra, AU), Riverina Institute of TAFE (NSW, AU)

#### ❖ delivery of 9 presentations / workshops

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- “Quality for Online Courses” workshop, “From .az to .nz” , “Online the MCLI Way” (UNITEC, Auckland NZ)
  - “From .az to .au” (3 times; CIT teacher education course, Flexible Learning Committee, Senior Managers Breakfast), “What a Site!” (Canberra Institute of Technology, AU)
  - “From .az to .au” (Adelaide Institute of TAFE, AU)
  - “Writing Stories on the Web with the Hero's Journey” (Open Learning 2000 conference, Brisbane, AU)

❖ **talks to 3 student groups / classes**

- Whanganui Regional Community Polytechnic (Wanganui , NZ) 2 classes)
- National College of Multimedia & Technology (Wellington NZ))

■ **participation in 1 national professional development initiative**

- ❖ Flexible Learning Leaders project (AU)

The entire experience was documented as a multimedia web-site (more than 70 Mb in images plus notes and presentations) at:

<http://dommy.com/az2nzau/>

I was able to efficiently maintain frequent updates and contacts via a laptop computer, digital camera, and national Internet providers in New Zealand and Australia.

### **Project Goals**

The focus of this experiences was both to develop my skills in an area of interactive multimedia development as well as exploring the support mechanisms which other institutions were using to effectively integrate technology into delivery of learning:

**“My goals are to learn from different approaches of designing instructional technology and information organization, to search for ways to help our less-technical inclined faculty/staff to confidently and successfully deliver, apply, and use deeper, more meaningful uses of technology than just presentation mode.”**

As described in more detail below, I developed two Internet based multi-user interactive activities. From the site visits, I provide examples of strategies used to support insatructor integration of technology.

### **Multi-User Interactive Project**

I developed two new applications of collaborative multimedia environments, “multi-user” applications, where students participate in a shared multimedia space via the Internet. This work was done in collaboration with the **Center for Research and Evaluation of Advanced Technologies in Education (CREATE)** at Northern Arizona University.

For this project, I learned advanced programming techniques in Macromedia Director software that work in conjunction with the Shockwave Multiuser Server. The server software can turn a desktop Macintosh or Wiindows computer into a communications hub that manages the transmission of messages and data between designated groups of users in

a shared virtual. While powerful, the software is poorly documented and we could find few examples of this technology used in education (the most common use is on-line games).

Creation of these multiuser applications requires intermediate to advanced programming skills, but once developed, such skills are not necessary to run them on a free version of the server (up to 50 connections at a time), or with a licensed copy of Macromedia Director, up to 1000 users at a time. In my project, the goal was to master the core programming knowledge to create an architecture that could be used for a series of different educational simulations, with tools that would allow instructors to manage and modify the simulations. It would be possible for individual instructors to turn their desktop computer into such a server for an in-class laboratory exercise. Or, with institutional resources, a college could deploy a larger scale server for distance learning students.

The two applications were based on ideas of NAU Chemistry Professor Paul Smolenyak, now the chair of Chemistry Department at Yavapai Community College (Prescott, AZ). The original thought was for group activities for in-class students, but could easily be extended to out of class or distance learning modes. An impetus for the idea came from considering ways to use a new multimedia lecture hall in a way more profound than just providing presentations to students.

To make the work extensible, all of the applications utilize a common login application that creates the data structures any application would need for the multi-user communication. It provides built in functionality to provide any application with a chat capability. In addition, both of the applications have separate instructor interfaces that allow them to modify the configurations and to monitor students work in near real time.

### **(1) Ideal Gas Law Game**

Groups of students will be able to manipulate a simulated system that models the Ideal gas Law ( $PV=nRT$ , where  $P$ =pressure,  $V$ =volume,  $n$ =number of moles of gas,  $R$ =gas constant,  $T$ =temperature) taught in Introductory Chemistry. The ideal gas law is a foundation for understanding gas mechanics and the dependent relationships of a multivariate system.

Depending on which "group" they log in to the server, students try to achieve an assigned target pressure by changing the simulation's volume (the chamber size), temperature, and number of moles of gas. Every change made by a member of the group is seen by all other students who are logged in to that same group. A valuable part of the multiuser server is that each group created runs as a separate instance of the same application, making it possible to have numerous groups operate simultaneously.

In this "game", students can also use a chat window to discuss what they are doing. A second version was created where competing groups view the same environment but each group is trying to reach a different target pressure.

A web application was created for the instructor create new groups, modify the initial starting conditions for the groups, to send chat messages to all students or just one group, and to monitor progress as the simulation is used.

The Ideal Gas Law game was tested by small groups at NAU (2-4 people), among a group of other multimedia developers across the US via a programmers forum (8-10 people), and with Paul Smolenyak's students at Yavapai Community College. On October 12, Paul

provided a presentation to the Yavapai Community College Governing Board in which I remotely participated from Wellington, NZ.

## **(2) Chemical Equation Balancing**

This multi-simulation provides a place for students to practice balancing stoichiometric equations, a key to understanding how chemical processes operate. They will see an unbalanced chemical equation and then use the on-screen controls to increase and decrease the coefficient for each reactant and product. Again, the chat features will provide a means for the students to discuss their attempts. They will all have to agree that they have reached the correct answer before it is posted for other students to see.

This application features a tool for instructors to use to create new equation problems by uploading a Word document, and setting the correct final answers. The tool can also be used to monitor progress while students use the simulation. An instructor could develop an entire library of equations for students to practice their balancing skills.

As an outcome of this work, I plan to further develop projects in this area with possible collaborations with colleagues at Yavapai Community College, Northern Arizona University, and faculty at Maricopa. I also authored two articles on the programming techniques that are available from Director-Online Users Group. This work will be demonstrated at a Technology Dialogue Day in February, 2001, to be held at Chandler-Gilbert Community College.

In summary, the programming for Multi-Users environment is complex, but it is conceivable that we could create a series of open-ended tools that would allow a wide range of teachers to use such tools. These are powerful techniques because they provide a learning environment where students collaborate to solve problems, where the learning is not step-by-step but evolves out of working together to achieve a goal.

## **Institutional Visits in New Zealand & Australia**

Four months of the sabbatical provided an opportunity to see how other education providers overseas are integrating and supporting instructional technology. In addition, the visits provided a long list of colleagues with whom connections have already been made with peers at Maricopa.

The visits to these institutions provide a common perspective-- the need to use technology to provide not only needed skills for today's students but also as a tool to make institutions more "flexible" as a provider of learning. This need is more obvious in these countries that have much smaller and more geographically dispersed student populations.

No one place, including our own system, has perfected any success formulas for supporting the development of interactive learning materials. The resources, time, and skills are much less available than for most of the commercial developers I met.

All of the institutions visited are faced with shifting changes in student skills and expectations, pressure to catch up with the business world, a crisis of keeping current with evolving technologies, and a strong need for professional development for faculty and staff.

As general comparisons, the Maricopa Community Colleges are fortunate to have relatively abundant resources (capital and human), more so than similar systems in New Zealand and Australia. The high degree of local control on programs and degrees at Maricopa makes it responsive to community and business needs, while the countries I visited are operating under a system of national government directives which are often altered in philosophy by changes in elected governments.

At Maricopa we have a long history of technology usage with a focus in teaching and learning, so that the organizational culture is one that almost assumes technology as a normal tool of communication as well as an environment that encourages and almost expects innovation with technology. While many places I visited do not have such a history, it was apparent that New Zealand and Australia have a history of achieving much with limited resources, and their distributed populations are and will be a continued driver to utilize technology to overcome their geography conditions. They will move and catch up fast, as shown in the rapid evolution in the quality of their national ANTA Toolbox projects, the high quality of multimedia materials developed at places such as the CALS at the Adelaide Institute of TAFE and the interface design by students at Whanganui Polytech in New Zealand, and the wide recognition voiced in the online NET\*Working 2000 conference that looking at on-line learning as all or nothing was not effective.

The type of “interactivity” that I saw is most important is in the area of communication; the use of group communication tools within classes, the use of communication to provide professional and peer support (i.e. the Flexible Learning Leaders project in Australia), the need to develop better skills in not only participating in electronic communications, but facilitating such communications. State-wide educational efforts in New South Wales and South Australia take an appropriate focus on providing professional development opportunities I person and on-line.

Australia and New Zealand have a longer tradition than most US institutions in providing self-directed learning (self-paced course materials in paper format) yet have struggled first with the notion that this could be “converted” to web delivery. Places such as the Canberra Institute of Technology are accustomed to team development a set of learning materials focused on specific outcomes, and have an organizational philosophy built on strategic planning and accountability. The state-wide efforts in New South Wales to develop their own collection of “learningware” was impressive for the diversity of subjects covered (not just information technology but Child Care to Carpentry) as well as the emphasis on development by teams.

Most institutions have recognized the need to have staffed centers responsible for supporting faculty integration of technology, some with more of a technology focussed (development of materials) and others with more of a professional development/training focus. As a generalized summary, the more successful ones have a mixture of technical-skilled staff and staff with expertise in learning theory; report to the administrator in charge of instruction (rather than being within an IT department); have cultivated supportive relationships with faculty; and utilize students in the development of materials.

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From a small survey of eight such centers ranging in staff size from 6 to 65, the top issues in working with faculty are in the areas of project management and planning, followed by an idea that faculty have limited views as to what they might do with technology, and lack of sufficient funding and/or technology resources.

### **Specific Strategies of Interest**

The **Learning Technologies Group** at UNITEC (Auckland NZ) achieves success with a diverse, creative staff, and commitment to working with appropriate persons across the system. They have support and resources for research of new technologies and freedom to develop their own internet-based applications.

In contrast, a web development team at **Auckland University of Technology** operates on a cost-recovery basis, and thus can develop only for departments with appropriate budget, and thus must scale back an idea from what is worth doing to what is economically feasible.

A multimedia development and training company in Auckland, **Native Design**, cross-trains their staff, encouraging their programming staff to learn graphic design, and their graphic designers to learn some basic scripting skills. In addition, they look for employees in rather non-traditional places (one JavaScript programmer was found working the x-ray scanner at the airport).

**Teacher Education and Learning Solutions (TEALS)** at the Canberra Institute of Technology offers a range of free courses for their own faculty to help them become better users of technology. The **Learning Systems and Resources Standing Committee** at the TAFE Institutes of South Australia provide state wide support using professional development activities that are in person as well as on-line. The **TAFE System of New South Wales** is supporting subject-specific curriculum development for on-line “learningware”, to be shared with institutes state-wide. These projects have requirements built in that make them become collaborative in development.

From a national level, Australia National Training Authority (ANTA) offers a number of programs of interest. **Toolbox Central** supports development of online learning materials that are designed to be easily usable and exchanged with institutions across the country. They are creating a searchable database for these products, similar in approach to the Maricopa Learning eXchange. The **Flexible Learning Leaders** program is a fellowship for middle-managers that support on-line learning—the first year group went a long way by developing a formal and informal network of peers, and from my own involvement with the project (meetings, an online forum, individual visits), this network is something that will extend far past the time of their projects. And **LearnScope** projects provide seeds for innovations and encourages national communication via a Virtual Learning Community

Participation in a completely on-line conference, **NET\*Working 2000**, was a challenge technically (more than 2000 participants registered when 800 were expected) that suffered from the overload. What worked effectively was a series of discussion forums, and provided many more professional contacts than would have been possible outside of the conference. This is an example where technology can provide an added value to an event. What did not work was a complex structure of the conference that

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made it confusing to navigate, and an over abundance on “cute” but not important graphics. The most popular areas were old fashioned text-based discussions.

On the other hand, the **Open Learning 2000** conference was set in a traditional forum where the primary communications mode was a lecture to a passive audience, even so that a keynote speaker read verbatim a submitted paper. Like the majority of similar events around the world, more interactivity took place in the halls and the inter-sessions. Any transformation in the field of education calls for a new paradigm for professional gatherings.

From visits to places where students are learning how to design media, the **National College of Design & Technology** in Wellington, NZ, had a very impressive program where students learned graphics and web design by working on real-world projects (marketing of products and services, creation of product prototypes) and emphasized project management skills of documentation, storyboards, client presentations. **Whanganui Polytechnic** in New Zealand has a well-deserved international reputation for their graphics design programs, where students learn in a studio format. The students I met were all actively engaged because they had the chance to work on projects that were relevant and important to them.

Many of the multimedia programs in this field in Australia have required work-place experiences, so that multimedia development departments in places like the **Onkaparinga Institute of TAFE** are able to produce impressive amounts of digital video CD-ROMs and interactive web sites development mainly on the skills of these design students. Students in an Information Technologies program at the **Riverina Institute of TAFE** in Albury have required community-based projects (service learning) taking their class knowledge and applying it by helping network elementary schools or set up database systems for local businesses or health care providers. From student presentations at their graduation, this is an incredible learning experience for the students and a strong community connection for the school.

## Summary

This sabbatical was a valuable experience in terms of focussed time for development of new technology techniques, and the opportunity to develop professional contacts on the opposite side of the world. This sort of opportunity is not available for persons in comparable at many of the places I visited.

Although my initial interest was in uncovering leading edge examples of interactive multimedia, what has come out the most important interactivity are of lesser impressive technology (text!). The ability to reach out and contact with colleagues via an online conference, or a simple email or chat session, is unparalleled in power and potential for professional development or learning in communities beyond where we live. Teachers everywhere are eager for ideas on facilitating and supporting students through communications tools, and hunger for techniques and activity ideas more so than flashy web sites. Students are eager to have the technology in their hands, not presented to them.