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Advance

THE UNITEC MAGAZINE OF INNOVATION AND RESEARCH **SPRING 04**



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Knowledge, innovation, research, teaching, advancing practice, technology transfer – these are components of development for students, communities, professions, industry and, eventually, the economy. Education and new knowledge are the key factors behind development; tertiary education is the key driver for participation in what is termed the 'knowledge economy'.

The defining characteristic of a country's most advanced educator, the university, is research - research that enthuses staff and students alike, by underpinning teaching and creating a culture of enquiry. For a dual sector institution such as Unitec that teaches many of the non-traditional disciplines, advanced practice has equal importance.

Advanced practice describes the engagement of Unitec staff in the activities of industry and/or professions at the leading edge of practice. Staff at Unitec apply their unique expertise to engage in work that industry or professions cannot do. In this way, Unitec is able to influence industry and professional development and enhance its reputation with industry and the professions. By operating at the leading edge of practice, new knowledge can be gained, through case studies, experimentation, or exhibition, which may then be suitable for publication. Quality assurance is provided through such avenues as peer-reviewed publication, industry demand and or recognition from the appropriate profession through invitations and awards.

It was extremely pleasing to find that the Performance Based Research Fund (PBRF) evaluation, in which Unitec participated last year, recognised advanced practice, as it did the more traditional areas of research. It is the



'development of new knowledge' that was the key to inclusion, and it is that which enthuses and inspires. At Unitec, we teach within a culture of pedagogy and enquiry and were delighted that a quarter of our degree-teaching staff were included in the PBRF research-active category. Many more of our staff are active in research, as the research publication database and annual report indicates. Activities from all our staff will be included in issues of Advance to come.

This first issue of Advance, Unitec's magazine for innovation and research, contains a range of stories illustrating how research and advanced practice can serve the needs of communities, professions and industries. This issue presents work in osteopathy, information technology, natural science, design and construction, where Unitec staff and students are active. Each article has contact details of the staff involved, so that you can follow up in more detail and depth if desired.

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KEN NICOLL
HORTICULTURE GRADUATE

experience
REAL WORLD LEARNING

Copper low risk to human health

As the first known pesticide, copper has been used in many production systems, particularly in vineyards, and is accepted as an organic method of control. However, it is also a 'transition metal', seen as having potentially detrimental effects on human health, leading some city councils to become concerned about copper contamination in soils in areas of residential use.

A review undertaken by staff of the Natural Sciences School, requested by VEGFED, has suggested that while caution is sensible, the guidelines proposed by planning authorities are too restrictive.

Although excess copper is poisonous to animals, including humans, eating plants grown in copper-rich soil does not present a risk because the large concentration of iron in most soils prevents copper from being absorbed in the gut. This conclusion is supported by the fact that there have been very few examples of sheep being poisoned when grazing in vineyards.

Staff involved: Professor Ian Cornforth, Dr Bill Bussell and Reg Lewthwaite.

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Formation of the self in higher education

Understanding how students' characters may be shaped in the context of student assessment in tertiary education has been the concern of a doctoral thesis by Mark Barrow, Dean of Teaching and Learning.

His study, *Assessment in Higher Education and the Formation of the Self*, used an interpretive framework informed by the work of Foucault to explore the various effects of different assessment regimes. Mark found that the nature of the assessment regime – either norm-referenced or criterion-referenced – has a powerful effect on students. In an unequal power relation, assessment can be both disciplinary and pastoral in nature but only a criterion-referenced assessment draws students into power relations that are significantly pastoral. In opening themselves to the gaze of their assessors, students expose links between their intellect and character, allowing lecturers to interpret and guide the student's personal as well as professional development.

Mark completed his thesis at the University of Auckland.

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Blackboard can deliver without the chalk

How can lecturers increase their use of web-based learning systems such as Blackboard? Pam Malcolm of the School of Accountancy, Law and Finance explored, through her Masters thesis, ways of improving users' experiences of this web-enhanced learning management system.

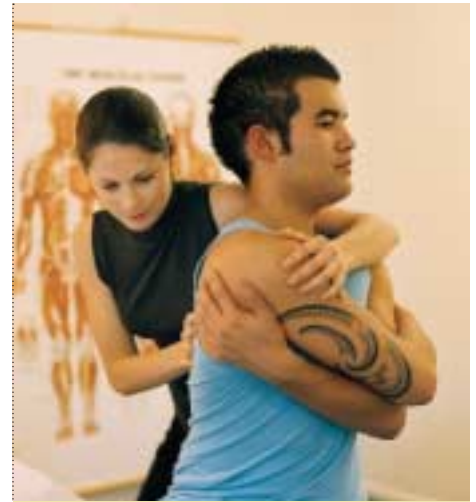
The primary motivating factor for most lecturers, independent of the amount of time they have used Blackboard, is that it offers a service to students. Providing material and moderating discussion boards is time consuming, but this drawback is outweighed by the flexibility that Blackboard offers for students and for lecturers to work off campus.

Senior academic managers also believe that use of Blackboard allows students to participate more actively in their learning, and increases communication, support and consistency of information.

Blackboard is part of Unitec's commitment to excellence, relevance and access in education.

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Hands up for new osteopathy graduates

The first Master of Osteopathy students graduated in April this year. Their degree has strong clinical practice and research components, both of which extend throughout the two years of the programme and result in skilled, capable osteopathic practitioners.

Research undertaken by the first intake of students has ranged from examining the 'Breath of Life', to considering the implications of unequal geographic distribution of osteopaths for the osteopathic profession, to issues involved in psychosocial stress in patients, and osteopathic treatment for computer users.

The latter project involved giving volunteers who were already suffering from forearm pain osteopathic treatment once a week for six weeks, following a two-to-three-week baseline period. Rebecca Walker took weekly measurements of pain levels, disability, sensitivity and muscle power. Her results suggested that most sufferers of computer-related forearm pain will benefit from osteopathic treatment. More recruits are needed to establish the true benefits of this holistic treatment.

Ben Adam's research on geographic distribution of osteopaths clearly showed that they are concentrated in larger, North Island cities, with more sparsely populated regions being poorly served.

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Progress on Peruvian terms

Peasants in many parts of the remote South American Andes pay a day's wages for a one-minute phone call. The nearest airport can be an 18-hour bus journey. Logan Muller from Unitec's Centre for IT Research and Development (CITRUS) has been working in Peru for the past two years to bring the wired and wireless world to the mountains in pursuit of small, sustainable business models.

A FINE BALANCE OF TRADITION AND TECHNOLOGY

For 700 years, the entire fabric of society in the region of Antabamba, Apurimac in Peru has been built around farming alpacas. The animals provided food, clothing, and income. Farming practices have clearly been sustainable as the alpacas have endured the harsh environment and high altitudes where, above 4000 metres, vegetation growing higher than six centimetres is rare. Pastoral management, animal care and husbandry have needed to be very finely tuned to provide continuing sustenance in such conditions.

The population of Antabamba is about 35,000. The predominant language is Quechua, although 90 per cent of inhabitants have a good command of Spanish. All but 10 per cent of the population live above 3000 metres and less than three per cent of the houses have running water or bathrooms. The region of Antabamba is isolated in all senses. There is one telephone to 3000 inhabitants and calls cost one day's average salary per minute. The nearest airport is an 18-hour bus ride from the main town of the region, however 60 per cent of the population live in the highland areas that are, on average, one day's walking distance to the main town of Antabamba. A bus ride from Antabamba to the nearest town costs one month's wages.

The Centre for IT Research and Development at Unitec was approached by the Peruvian ambassador to New Zealand to lend its expertise in internet technologies to developing small, sustainable business systems in the Andes, a project generated by the

Ministry of Agriculture in Peru.

The challenge was to distribute the centralised knowledge and information in the cities to the remote areas in order to improve farming practices.

LEARNING ABOUT SUSTAINABILITY

Research into a design model that would enhance, rather than undermine, the values on which Antabamba had survived for centuries was twofold: firstly, a needs and situational analysis of the communities involved and secondly, an environmental impact analysis.

As primary researcher and project manager, I took two trips to the area, over three months, as well as engaging in an ongoing process of consultation and community group participation. Antabamba was like a time capsule, providing an opportunity to learn the values and philosophies of a people that achieved social, economic and environmental sustainability for nearly a thousand years. Whilst the CITRUS project began to assist the area curb the negative impacts of westernisation it was also providing a unique research experience - an opportunity for us to learn some valuable lessons about the values and philosophies that underpin sustainability.

FROM INDEPENDENCE TO WESTERN DEPENDENCY

Prior to the 1990s, the economy was totally based on a barter system. Products were traded between families and communities both inside and out of the region.

Television arrived in the early 1990s and

very soon the combination of marketing and improved physical access resulted in a surge in the availability and sale of products from multinational companies. With these products came packaging materials and non-biodegradable products, such as plastic wrapping and bottles.

Advertising and the introduction of convenience products created a burgeoning cash society, as pressure from sellers of these goods grew for locals to purchase them with cash. Marketing and branding strategies began having an even more pronounced and dramatic effect on these remote communities than in the west.

The demand for alpaca fibre was high in the late eighties, and buyers from the cities soon began to source this profitable product in the Antabamba region. Alpaca fibre became the major source of income for the region.

The world demand for alpaca fibre continued to grow and commercial entities, knowing that they had a virgin market and commercially naive producers, began to exploit this unique opportunity. By 2002, alpaca farmers were receiving only 15 per cent of the mid 1990s price for their fibre. The population had become totally dependent on this external cash flow to maintain their increasingly westernised lifestyles.

THE IMPACT OF WESTERNISATION

Farmers were forced to run more animals per square kilometre, resulting in erosion and the need to take children out of school in order to help graze and maintain the increased herd numbers. The farmers sought

advice from the buyers who started recommending farming techniques used in more developed areas, such as mechanisation and the use of fertilisers to increase grass production. This further compounded the need for cash and the dependence on outside entities.

The result was that the power and control were being shifted from the hands of the community to outside entities, creating dependency on those whose priorities were not the well-being of the dependant society. Given the isolation of the community, the ability of the residents to have any control over the external inputs into their community had become very limited.

Antabamban society has never been worse off than today in terms of economic stability, environmental issues and public health. A generation of children has rotting teeth due to the increased sugar-based commercial products in their diet. Sales of soft drinks, cigarettes and alcohol continue to increase. External companies are increasingly extracting resources from the area and reinvesting nothing. The additional pressure on families to run more alpacas has caused erosion and a decline in the quality of the product they are now producing, leading to a further decrease in market prices and in-cropping areas for other food sources such as maize, quinoa, kiwicha and potatoes.

These factors have caused an imbalance in available nutrition, and schools now have to provide lunches to curb malnutrition. Additionally, there is no infrastructure to collect and dispose of rubbish. The streets, paddocks and streams are left with non-biodegradable litter.

THE CITRUS PROJECT

Over the past 12 months, Unitec's research team has spent more than seven months with the locals. Understanding the context and the experience of these people has assisted in the development of tools they can use to empower themselves; to take more control of their own resources, education and direction. Activities

during this time have involved an inclusive approach, using community meetings and input from every community organisation. Over 500 individuals have participated, through mothers' groups, producer groups, medical, church, government and cultural groups. Nine local coordinators worked full time supporting their constituents.

It was apparent that there was a range of needs and priorities in Antabamba, and that education, input and help from a diverse array of providers was needed. Yet, the crucial factor influencing the success of this help was self-determination, ensuring that the criteria, content, delivery and philosophy of the education was decided and determined by the recipients themselves, and not by the institutions or entities providing it. The project provided the tools to empower the residents to access and determine their own solutions.

Antabamba was linked via satellite to the internet. The CITRUS project provided training and capacity building programmes that enabled institutions and organisations within the region to transfer that training to every sector of the community. Centres of information and capacity building were established in each town's community centre and computers installed in each centre. These have been linked via satellite or wireless to the internet, allowing local residents to access information. The power and locus of control is now very much in the hands of the people themselves, as it was some decades ago.

RESULTS PROVE POWER POSITIVE

With one more year of the three-year project still to go, producer groups are already identifying new markets for their products and accessing the resources they need to participate in these markets. The schools are accessing up-to-date educational resources over the internet and the use of IT has been incorporated into the educational curriculum. The hospital and its staff are linked to up-to-date medical information and assistance, which is providing much-needed support to these

professionals.

Mothers' groups and organisations for displaced families are also able to participate in activities and use resources available to them. The alpaca farmers have linked with other providers, farmers and processors, and are forming clusters that give them more leverage, resulting in higher prices and more stability in the marketplace. Residents are now considering value-added activities within the region, activities that they determine are appropriate.

WHERE TO NEXT

CITRUS has now been invited to collaborate with San Ignacio University, the University of Huamanga, Cusco University in Peru, the Catholic University of San Paulo, University SENAC, University FUMEC and the Federal University of Minas Gerias in projects using the model developed for Antabamba. The model has a range of applications from poverty alleviation to the development of e-tourism.

The desire to adopt alternative business and economic development practices in these developing countries is strong, and Unitec New Zealand's approach has been well received. It backs theory with real practice and results.

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= CITRUS BREAKTHROUGH

Since writing this article Logan Muller has returned to Peru, taking emergency aid supplies to Antabamba. Over the past four years, Antabamba has been hit by a series of earthquakes, floods and freezes that have caused loss of life. Until this year, the Antabambians received no outside help. Now, for the first time, thanks to the CITRUS IT project, they have been able to use technology to call for emergency aid.



Artweb: an eco model for urban development

Can non-linear models of organisation be used to guide and inform urban planning and design? The Arts Regional Trust, established to promote the development of arts infrastructure in the cities of Auckland and Manukau, is working with the School of Architecture and Landscape Architecture at Unitec to find out.

An urban landscape architecture project for the Auckland region is providing the physical structure to research an implied link between urban systems and ecosystems.

The project, known as Artweb, is a physical network of site-specific events and projects in the cities Manukau and Auckland, designed not only to improve cultural knowledge but also to facilitate easy access by visitors to Auckland.

Artweb draws on ideas from non-linear dynamical theory, such as self-organisation, feedback loops, unpredictability and bifurcation, linking to systems theory in general. It is also linked to the related discourse of field theory, since it begins with the conception of the city as a network of interactive fields. Finally, the project draws on network theory to understand the behaviour of web-like systems. Taken together, these are the theoretical connections that imply an underlying conception of urban systems similar in their organisational characteristics to ecosystems.

DESIGNING ARTWEB

Sites for Artweb are selected in collaboration with the GIS departments of both Auckland and Manukau city, along with arts and planning personnel from both cities. GIS social and physical data sets of information about the Auckland region are sorted into normative classification systems, such as infrastructure, vegetation, hydrological, industrial and so on. Further data sets are acquired from TerraLink, NIWA, TranzMetro and Statistics New Zealand. Other, non-GIS types of data are also gathered, and non-normative classification systems (or taxonomies) are developed. For instance, one set of sites has been selected on the basis of its entropic qualities, and another according to its degrees of environmental turbulence.



Many different taxonomies can be developed from social and cultural data, such as crime sites, taniwha locations, local anecdotes and histories, and sub-culture populations. These data have to be spatialised before they can be used.

OVERLAPPING UNDER-USED SITES

The sites are connected by pathways that can be travelled on foot and by bicycle. Throughout the network established artists and scientists can develop solo and collaborative

projects, which work with the local qualities of the sites and the 'vectors' that connect them. Site-specific qualities are actualised, contested, re-arranged, destabilised, celebrated and investigated by means of installations, performances and experiments. The project has focused on sites with low real-estate values in order to avoid the high costs often associated with public arts projects.

The project has also worked with marginalised, left-over, under-used sites such as railway corridors, urban stream ways, motorway medians, and wetland areas, as well as private and public property like school grounds and golf courses. The arts and science projects that animate the web are funded by grants and sponsorship. In many cases, specific artweb interventions are interdisciplinary, with artists and scientists collaborating on projects, all of which have some kind of environmental dimension.

During and after implementation, each aspect of the project is monitored against a set of performance criteria in order to evaluate its ability to deliver on its aims and objectives.

This network of overlapping cultural and scientific events and projects is navigable by Aucklanders and visitors to the city. Information about it can be accessed from the artweb website, where a map of the Auckland region depicts the network of sites and explains how they can be accessed and used to explore the region.

The research is funded by the Arts Regional Trust (ART) and Unitec New Zealand.

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Building on Dynaproject synergy

The construction industry is internationally recognised as inefficient and under-productive, and enormous efforts are being devoted to reforming the sector. A programme of research by PhD students collided with fate at a conference in Virginia on lean construction in 2003, serendipitously giving birth to an empowering technology called DYNAPROJECT™.

Unitec's School of the Built Environment has played a key role in recognising and accessing new, advanced-practice technologies to introduce into New Zealand construction. It is now working with Professor Jouko Kainkainen of the University of Technology, Helsinki, and with the spin-off technology firm Dynamic System Solutions (DSS) to access and adapt the software programme DYNAPROJECT™.

A RADICAL REVISION OF CPM

The software was born of a fusion between seemingly disparate cultural methods of organising construction. In this country, the planning and scheduling of construction projects involves organising activities of work into logical units, which are then connected into a sequence of work in a relational network. This information is then analysed mathematically to create a model of the construction project. The most frequently used method for this is the Critical Path Method (CPM), one that is complex but well understood in the local industry. Its most common representation is a Gantt (bar) chart of the activities showing on a time scale when the work is to be done.

In Finland, where the construction industry does not have a critical path culture, a method known variously as Line-of-Balance, Repetitive Scheduling Method, Time-Distance method or a preferred term Flow-line is employed. This technique was essentially a graphical tool until Olli Seppänen, of DSS, recognised that it was possible to combine the principles of CPM with the

Flow-line technique. DYNAPROJECT™ was born.

Using its detailed knowledge of the local construction industry, staff at Unitec have been able to harness the power of the software, improving the technology to suit local conditions while taking it to the industry and responding almost daily to queries, requests and demands from developers.

This has led to some interesting results. First, the school's access to industry at a senior level has dramatically improved, before delivering real solutions that add value. Secondly, staff have identified that the New Zealand industry (with its reliance on CPM) works differently to the Finnish industry, and lessons learned were fed back to DSS, improving the system. This has generated a truly collaborative relationship of applied research based on advanced practice and delivering value to industry.

REAL WORLD RESEARCH

The school has gone to Australian firms to trial the techniques because the level of interest there is much greater than in New Zealand. It is hoped, however, that demonstrations from Australia will influence firms in New Zealand to question and change their practices.

There are two main thrusts to this work. Firstly, productivity can be improved in commercial construction before forcing a continuous flow of work teams through locations (by a technique which may be called Location-Based Scheduling). This suits complex projects with readily identifiable locations. The prime example of this is the Victoria Park

project in Sydney by Walter Construction Group, where work is being done to establish and then monitor a plan for completing the current AU\$75 million stage of apartments, consisting of four buildings and a common podium. The plan is complete, and now moving into the phase of cultural change within the organisation and with site teams to alter their dominant work practices, which do not encourage work flow.

The output is not a quicker schedule but rather a cheaper one. It is hoped that, in time, projects running this way could reduce labour cost on finishing trades by 20 to 30 per cent.

Secondly, staff are working with the Civil Engineering discipline to empower the planning and control of large civil works. So far they have explored the application on projects such as the AU\$1.5 billion Lane Cove Tunnel (Theiss-John Holland JV) and on tenders for civil works (John Holland Group). In this area, applications exist in rail, road and civil construction.

While still in its early days, this project has the capacity to drive Unitec to the forefront of thinking about the planning and control of projects in both commercial and civil construction. At its conclusion, the underlying theory will be published, together with case studies.

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Animal, vegetable or bestseller?

They were around at the same time as the dinosaurs, early explorers thought that they were a new species of animal hybrid, they were all the rage in Victorian England, and there's a good chance you have some growing in your garden.

The tree fern is common in New Zealand's forests and gardens and is the subject of a new book, *Tree Ferns*, which is selling around the country.

Associate Professor Mark Large from the School of Natural Sciences wrote the text. He says early explorers took ferns back to Europe where they were prized for their exotic appearance, and that pattern is being repeated in modern times.

"There are about 600 different species of tree fern found in Central and South America, the Pacific, Australasia, Asia and Africa, and there is now a booming business exporting living plants to Europe."

But the otherworldly appearance that attracts gardeners today led 15th century academics to come to some unusual conclusions.

"The stem of the tree fern *Cibotium* is very hairy and looks like the leg of an animal. When specimens were taken back to Europe, the leaves died and fell off during the trip.

"It was hypothesised that the stems came from an animal they called the vegetable lamb, which they thought grew out of the ground like a plant."

Associate Professor Large spent seven years doing research for the book, which looks at the plant's different species and colourful history, and he says the response since its release in June has been excellent. "Orders from shops around the country are coming in batches of five, which is a pretty good sign."

Early childhood education recognised

Early childhood teaching is starting to get the respect it deserves according to an award-winning educator.

Lesley Pohio is a lecturer on Unitec's early childhood teacher education programme and was a recipient at this year's National Excellence in Teaching Awards.

Twenty teachers were recognised at the ceremony, and this year was the first time early childhood teachers were included in the national awards.

Lesley was recently the head teacher at Akarana Avenue Kindergarten in Auckland and was nominated by parents from the kindergarten. She says, although early childhood teaching is a profession, it hasn't always had the acknowledgement it deserves.

"New Zealand early childhood teaching is held in high esteem around the world and international experts travel here to observe our practice.

"We've had to advocate strongly for childhood education as a profession in the past, but there is a growing awareness of its importance."



Artists impression of Waitakere Central Library

West Auckland campus grows

Unitec's presence in West Auckland is growing with the purchase of the Waitakere City Council's Civic Centre and some of the land on Waipareira Ave.

Plans are already under way to add more teaching space to the existing Ratanui St campus as part of a partnership with the Waitakere City Council, which will also see the construction of the Waitakere Central Library alongside.

Unitec expects to move into the Waipareira Ave complex in 2007. Unitec CEO Dr John Webster said that date would meet the needs of both the Council and Unitec.

"Even with the planned development of our facilities in the Henderson town centre, we will need extra space in order to best serve the local community into the future."



DIY rescue in far North

After its first year of operation, a joint initiative in Northland is starting to pay dividends. Te Runanga O Te Rarawa in Kaitiāia is giving free carpentry training to Te Rarawa whanau using the Certificate in Applied Technology (Carpentry), with Unitec staff also supporting the tutor in Kaitiāia.

The first intake of students recently completed the year-long programme and Te Rarawa Commercial Manager Vance Winiata says its benefits are being felt throughout the region.

With many houses in the far North in a state of disrepair, he says, the graduates are able to use their carpentry skills to upgrade housing in their community.

"We can't offer them all jobs, but all of the graduates can use their skills to help their whanau by doing repairs and carrying out maintenance on their homes."

Of the 24 people who have completed the carpentry certificate, seven are now employed by the Runanga. He says that he has also noticed a huge amount of personal growth. "The graduates we have working for us have really stepped up to the plate and you can see the change. It's the first qualification most of them have gained and they're becoming role models."



Sleeping soldier a photography winner

An opportunistic shot while traveling in Israel made Tilly Blair a winner in the New Zealand Professional Photography Awards. Tilly is in the first year of the Diploma in Contemporary Photography at Unitec and received the top prize in the student/assistant category for her photo of a sleeping Israeli soldier. Her photo will be in the National Print Exhibition touring the country later this year.