Raising the Bar on VC:
Using Video Conferencing and NACCQ modules in Secondary Schools

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Abstract

This paper looks at some of the issues confronting the delivery of high school computing courses and proposes a model where Polytechnics teach modules from the NACCQ "blue book" at a distance using the Telecom SchoolZone video conferencing system. A two year pilot, now into its second year, reveals some interesting solutions to old problems as well as presenting some novel challenges. We propose that this model should be extended into a fully funded scheme for New Zealand senior high school students by using an extension to the current STAR structure.

Keywords: Computing education, rural education, distance learning, video conference, high schools, secondary-tertiary relationship.

1 Introduction

The New Zealand Government continues to target Information Technology as an area for potential growth and development. "Export sales of electronic devices and equipment increased $97 million to $523 million in 2006. This remains the highest-value exported commodity category, with 32.5 percent of the total export value" (Statistics New Zealand, 2007). In the Government's Digital Strategy plan, universal advantage is claimed if all sectors cooperate. "Since the full benefits of ICT can only be realised when everyone is able to participate, we have emphasised the importance of partnership and collaboration" (Ministry of Economic Development, 2005). As a tertiary education provider, we are always looking at ways to meet the needs of our community. "Already there is a significant gap between the number of ICT jobs available and the number of suitably qualified applicants" (Ministry of Economic Development, 2005). This encourages the polytechnic to look at ways to provide our educational expertise in ICT to a broader audience.

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In high schools, there is an acceptance that Information Technology needs to be used by all students across all curriculum areas (Ministry of Economic Development, 2005). However the explicit teaching of Information Technology as an academic area, in terms of Computer Science, has been recognised by only a small number of schools.

A number of factors, we assert, have led to this situation:

- Information Technology is a relatively new academic area and lacks the historical context and standing of other curriculum areas.
- Information Technology has suffered from the lack of a cohesive national curriculum (Clear & Bidois, 2005). While Technology in the New Zealand Curriculum provided an approach to learning, many teachers expected a more prescriptive and documented set of course outlines.
- Few schools have teachers who have either the qualifications or the experience of the Information Technology industry necessary to provide a stimulating course for senior high school students.
- Few students recognise the potential Information Technology has as a career path. This is a shown by the decreasing number of enrolments in tertiary IT courses.

High schools, especially rural ones, have not had the resources to engage with computer science to the extent envisaged by the Digital Strategy (Ministry of Economic Development, 2005). Rural schools have additional challenges in overcoming the economic problems of size and resources. (Lai and Pratt, 2004, 2005; Lai, Pratt and Trewern, 2002). Many rural schools, in the last decade, have been on the verge of closing their secondary departments because of low student numbers. In Otago, this has been exacerbated by the small population base and large geographical area. The lack of broadband technologies meant that "country children were disadvantaged in comparison to Otago's city-dwelling school students" (OtagoNet, 2007).

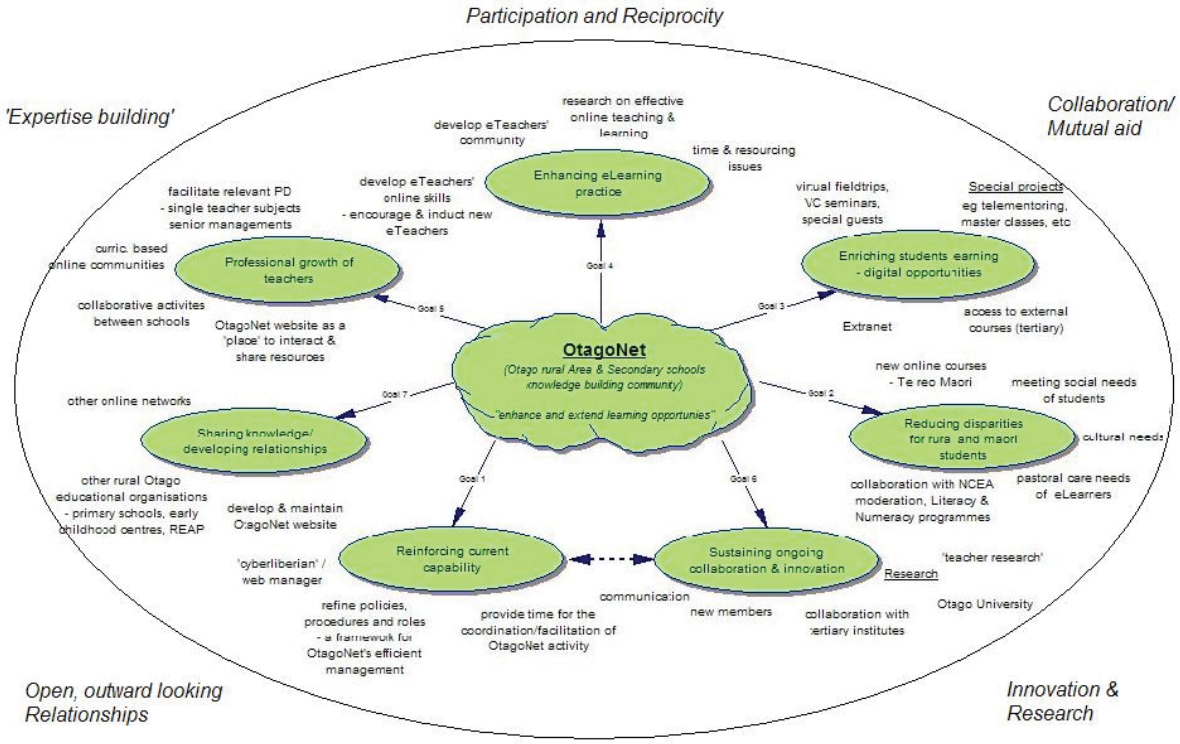

Figure 1: The Holistic Approach of OtagoNet (Walsh-Pasco, 2004).

A local solution was proposed in 2001 where Otago area schools and rural high schools share teaching resources and teachers over a dedicated network called OtagoNet. "Its aim is to widen and enrich the educational opportunities for Otago rural area and secondary school students and enhance teaching and learning…This community of schools was established to overcome rural isolation and the difficulties of small roll sizes by strengthening existing interaction and collaboration between these rural, geographically dispersed schools and their communities." (Walsh-Pasco, 2004). "With video conferencing, a data link and a cluster-wide intranet, distance and size need no longer be barriers for these schools. Video conferencing over broadband allows students and teachers to work with each other as though they are in the same room. This means OtagoNet schools can offer students a wider range of subjects than they would be able to on their own. This means OtagoNet schools can offer students a wider range of subjects than they would be able to on their own" (Ministry of Economic Development, 2005).

2 The First Year of the Pilot

The Otago Polytechnic worked with OtagoNet students in 2005 and 2006 implementing the ICT Ambassadors' course, a six-day residential holiday course to develop the skills of Year 11 and 12. This experience provided a platform from which to consider other possible courses and collaborative ventures.

In 2006, the Otago Polytechnic was invited by Howard Baldwin, ePrincipal OtagoNet, to deliver a Year 13 Computing course to rural Otago students. This allowed the Polytechnic to work within the established and successful Telecom SchoolZone network, where the emphasis is in creating an excellent learning experience for the student.

When considering the possible course content and curriculum, we considered our first year tertiary students. Many are familiar with microprocessors, Linux, PC construction and languages, but their knowledge is patchy, self taught and within a narrow domain. As a partial amelioration of this issue, Otago Polytechnic presented a full year course called Level Four Computing to five rural schools via one hour per week video conference. Students can interact with the lecturer and can also see the PC screen and documents via a document camera where appropriate.

The schools supported the students in an additional three hours per week, some in specially designed distance education rooms. The system worked well with all students but one passing over 80% of the unit standard credits. Five of the eleven students indicated a commitment to enrol at the Polytechnic in the following year.

Some lessons learned from the first year of pilot:

Utilising existing channels. It is expedient for tertiary providers to link into an existing framework of collaborative schools through which tertiary lessons can be delivered. OtagoNet was such a structure; it has built up "experience, mentoring, administration and resources appropriate for 195 students in 11 schools taking 26 subjects" (OtagoNet, 2005).

Equipment. While the video conference systems have existed for over 10 years, delivering through this medium was a new experience for us on many levels. It was necessary to become expert with the equipment at a technical level but also required considerable reflection as to how to maximise the learning experience in the video conference context.

We did not have the appropriate video conference gear at the start of 2006 and so made use of the Otago Community Trust's video conference room in central Dunedin. This generous help was appreciated but took the lesson delivery right out of the campus milieu and made ad hoc connections for tutorial functions more difficult as well as increased the stress of small technical mishaps and transport issues. For year two of the pilot a suite of modern Polycom equipment has been purchased which resides in a semi-dedicated room.

Fees. Within OtagoNet schools, teachers and students are traded in an agreed manner. For a tertiary institution, it is necessary to formally charge course fees. No polytechnic is immune from strict financial analysis and at some levels this pilot is not financially worthwhile. Marketing and strategic issues will be discussed later in the paper. On a straight cost recovery model we would have to charge each student more than a school could bear. The fee agreed to, approximately $400, did not seem to drive away many prospective students and fulfilled internal financial guidelines. Our fee for 2007 has increased to $996.This topic will be analysed later in our proposal for a national extension to the pilot.

School Visits. It was found that visiting the students in their rural schools on a one to one basis was an educationally enhancing aspect of the course. Small problems were cleared up, a relationship with the school was established and morale and motivation maintained. This comes at a cost in time and money and the need for a teacher who is empathetic to the high school context to travel around keeping these rural beacons aflame.

Engagement and the video conference medium. Russell (2001) suggests that teaching by video conferencing is not as effective as normal classroom teaching. On a strict comparison of delivery methods, this may be so, but effective teaching relies on effectively engaging the learner despite the medium. (Claverley and Shephard, 2003.) "The teacher - student relationship is central to effective learning" (Walsh-Pasco, 2004). Engagement is only possible with extra effort on the teacher's part and a certain academic standard and commitment on behalf of the pupils. It is necessary to approach on-line lessons in terms of lesson planning and interaction, presentation skills and technical competency (Allot-McPhee, n.d.).

3 The Second Year of the Pilot

In the second year we extended the reach of the video conference classes into the North Island and currently teach four times a week to 30 pupils in 15 schools from Tapanui in South Otago to Kaikohe in Northland.

Staff Changes

In the first year there was just one polytechnic lecturer presenting the classes, visiting schools and liaising with the OtagoNet ePrincipal. There are now two lecturers, team-teaching with the camera on one or both of us. This counteracts the risk if there should be one teacher involved; like live classroom lessons, emergency relief require a knowledgeable teacher to step in when crises arise.

Figure 2: Students explaining a solution to the authors at the bottom right of the screen.

Local Schools

In 2007, five schools from Dunedin have been included. This is partly a marketing initiative but it also reflects a demand from city schools to be included in an urban version of OtagoNet. Nearly every principal within 10km of Otago Polytechnic was visited at the end of 2006 to ascertain demand. One of our expectations was that a live class would be the preferred option either on site at school or on the Polytechnic campus. Interestingly, the principals consistently wanted video conference lessons. Some said that this was the way education was going to go, while others did not want students to go outside the grounds during the school day in case they got "lost". Accommodating the video conference time of delivery and the need for support in the other designated times also needed to be negotiated with the schools. Not all schools were able to buy or set up their video conference equipment for 2007, and so we have also run a live version for such schools in an after school time slot.

Curriculum issues

The Level 4 Unit Standards used in 2006 were allowed under STAR (Secondary Tertiary Alignment Resource) funding because of an exemption for that year only. (Ministry of Education, n.d.). In 2007, we shifted the curriculum to units from the NACCQ "blue book" (Roberton, 2002). These units have been taught for over a decade in most polytechnics, are educationally robust, and have a sound revision and moderation arrangement. This became possible when NACCQ negotiated in 2006 that the high schools were recently allowed to claim credit inclusion and STAR funding for such units. Students who pass our course (PP510, OS500 and PR530) will be awarded 21 Level Three NCEA credits. They also have passed about one third of Otago Polytechnic's CIT (Certificate in Information Technology) and possibly some BIT (Bachelor in Information Technology) consideration. The gaining of tertiary subjects at high school is an explicit marketing advantage.

4 Proposal for Extension

We recommend that a formalised extension of our two year pilot commence in 2008.

The Hybrid Model of Blended Delivery

There is no methodological or technical silver bullet in this area. Effective education comes about through engagement via the following tools:

- Video conference classes
- Visits to students' schools
- Access to a learning management systems like Blackboard and Mindspring
- Email
- Face to face class meetings
- Phone contact
- One-to-one video conference tutorial

Our Polytechnic insertion into OtagoNet has always made visits to rural students in their own centres. This has proved to be a key contribution to student success.

This hybrid model would have the following characteristics:

All Polytechnics could offer NACCQ modules via video conference to high schools anywhere in New Zealand.

The main point of this proposal is that we should not replicate with parallel structures, systems that are already working well. NACCQ has sound curricula in "real" computing which, as national qualification body, is associated with moderation, interest groups and development processes that seem to be working well. School demand is there as well. The pilots mentioned above demonstrate a demand in the schools for tertiary-level ICT subjects as opposed to some of the current application based unit standards and ad hoc topics that gain little credibility from knowledgeable staff or students. Two vital ingredients high schools look for in any tertiary offering are NCEA credit inclusion and STAR funding. Through the recent good offices of the NACCQ executive we now have both these requirements built into most blue book subjects.

Existing frameworks and systems would be used and enhanced.

Video conferencing networks are already established for rural secondary schools.

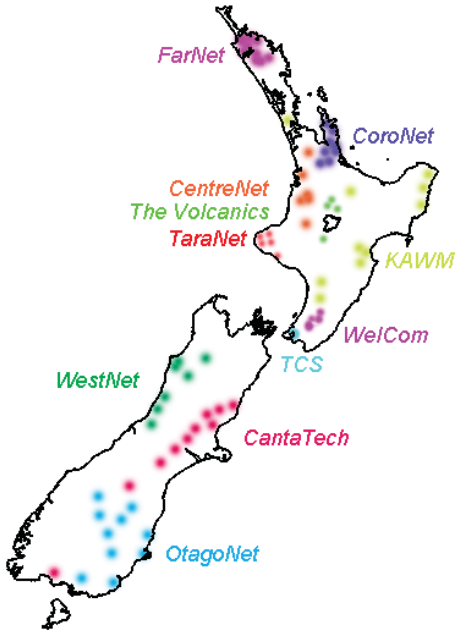

Figure 3: Rural secondary networks (Baldwin, H, personal communication)

The administration of enrolments has been taken care of by the Virtual learning Network (VLN). Schools currently offer subjects to be taught via video conference by entering such descriptions into the Ministry's VLN. Class sizes, outcomes, costs and times are all entered into the VLN by the offering institution. Potential student lists are uploaded by receiving schools to be accepted or otherwise by the deliverers. Polytechnics have started to be included in this system which is working well.

The actual video conferences are carried out on a Virtual Private Network (VPN) called SchoolZone which is run by Telecom as a Quality of Service (QOS) commitment, administered from Mount Aspiring College in Wanaka

and supported by Asnet Technologies Ltd. Lessons have been taking place on SchoolZone since 2002.

Equipment

Many high schools already have video conference gear appropriate for the SchoolZone system. Rural schools especially, in order to gain some extension to the range of subject choices they can offer, have raised funds to purchase Polycom and Tandberg equipment. Students do not have difficulty in mastering the controls and quickly adapt to the video conference room protocols and etiquette (Walsh-Pasco, 2004). The minimum setup to effectively participate in SchoolZone's VPN consists of a small room with a camera, screen and document camera. Most interactions take place via a series of conversations between the teacher and the various school sites in rotation. Class notes and written materials can be displayed on the document camera either by laying the documents directly on the flat bed or by writing on paper in real time to produce a broadcast effect like a television white board. The prices for entry into the SchoolZone VPN have been dropping. Such minimum equipment used to cost about $25 000 in 2003. Now it is close to $10000, and falling, for a better set of technical specifications.

Teaching

The issues related to distance teaching include teacher motivation, teacher suitability and all the usual distance adaptations that have to be made on "live" materials and classroom habits. There is a vast literature on these differences and required adaptations (Greenberg, n.d.; Allot-McPhee, n.d). Again current best practice can be taken from the OtagoNet experience which has had over 700 senior students in virtual classes since 2002. Teachers meet twice per year and swap experiences and anecdotes as well as affirm excellent practices and initiate new eteachers. Administration guidance is given and research is discussed. (Walsh-Pasco, 2004). Not all teachers will wish to be involved nor should pressure be brought to bear on any practitioner to become involved in video conference delivery. Rather, as has happened in the case of the current 26 OtagoNet teachers, enthusiastic volunteers provide the driving power for this form of virtual education.

Funding would come from an extended STAR fund.

We would like to suggest that the current STAR funding model is not sufficient to drive the current school networks towards strong tertiary inclusion. Assuming a polytechnic cost recovery model of gaining three times the teacher's salary as revenue a charge of around $3000 per student per 21 credit class would have to be asked, given usual class sizes and associated expenses. The authors found that some schools baulked at a charge of $996, which their current course required and believe it is unlikely that there would be much high school uptake at $3000 per student. The problem lies in the clash between tertiary funding requirements and the limited STAR funding for high schools. We propose a pilot of 500 national places is funded from Vote Education to approved polytechnic courses, like the NACCQ's "blue book" units, whereby two thirds of the charge is paid for leaving the balance to be picked up the schools out of existing STAR. This would cost the government an additional one million dollars and very little extra infrastructure. A polytechnic appointed National Schools eLearning Coordinator would also be needed to liaise with the existing ePrincipals and current network coordinators.

5 Conclusion

The authors are into the second year of a two year pilot to teach senior high school students IT from the NACCQ curriculum. This now has a national flavour and has quickly grown due to the schools already possessing mature and effective structures like:

- The Telecom SchoolZone VPN
- The regional networks, like OtagoNet, that span the country
- The Ministry's Virtual Learning Network

These are excellent educational treasures that should be leveraged by the polytechnics to the advantage of tertiary and secondary education.

It is timely to talk about a comprehensive range of Polytechnic subjects being injected via video conference into the senior secondary school curriculum. A good start could be sponsored by NACCQ in conjunction with the Ministry of Education and a new funding model.

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