

Knowledge building research in New Zealand: The journey begins

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Abstract

This paper describes two Knowledge Building research projects that are currently undertaken in New Zealand. The first is a two-year project (2012-2013) investigating the design and implementation of computer-supported knowledge building communities in 9 senior secondary classes, in a variety of school subjects, both in on-site and distance classes. The second project (2011-2012) is an investigation of using Knowledge Forum to support potentially high achieving Year 13 students from rural/provincial or low decile (in socio-economic terms) New Zealand schools to cultivate an interest in science and enhance their ability to excel in the university entrance (NCEA) examinations. There are two major challenge of these projects: (1) all the participants are senior secondary students and the teaching units in these projects have to align closely with external exam standards; and (2) most of the participants are distance students teaching in these classes are primarily conducted by videoconferencing.

Introduction

While Knowledge Building research (Scardamalia & Bereiter, 2006) has been undertaken in a number of countries in the last 30 years, very little Knowledge Building research has been conducted in New Zealand. The only two projects that the authors are aware of are an unpublished project undertaken by one of the authors (Pullar) about 10 years ago as part of his postgraduate studies, and a project in higher education undertaken by Lai & Trewern (2012). The authors of this paper are excited to be able to gain funding in the last two years to begin researching knowledge building in New Zealand schools. As our journey has just begun, this paper is largely a description of two Knowledge Building research projects that we are currently conducting. At this stage we are in the process of collecting data and undertaking preliminary analyses. We anticipate that findings of these two projects would be presented and published in the next couple of years.

Designing knowledge building communities in secondary schools (KBC) project, 2012-2013

This project is a two-year TLRI (Teaching and Learning Research Initiative) project funded by the New Zealand Ministry of Education. The aim of the project is to investigate the design and implementation of computer-supported knowledge building communities in senior secondary classes using the Knowledge Building pedagogy, to support students to become knowledge creators. Nine classes (four on-site and five distance) from schools located in different parts of New Zealand are participating in this project. Participating teachers will use the knowledge building approach and *Knowledge Forum* to teach a topic for at least one school term (10 weeks) per year. Table 1 summarises the subjects and classes included in this project.

We understand Knowledge Building research has been so far primarily conducted with one-site classes, with face-to-face knowledge building constituting an important component of the knowledge building process. One significant challenge of this project is that the majority of the classes are distance classes, and the participants are distance students. Researching knowledge building with distance students is important in the New Zealand context, as New Zealand is a sparsely populated country, with an average of only 15 people per square kilometre (Lai & Pratt, 2009). Due to small school size and the limited availability of specialist teachers, many rural secondary schools are formed into clusters to deliver a wide range of subjects to their students using videoconferencing as the primary delivery tool. There are now over 200 schools, formed into 15 Virtual Learning Network (VLN) clusters (<http://www.vitualearning.school.nz>), with the Virtual Learning Network Community being its national organisation. Teachers participated in this project are associated with the VLN, and are experienced distance teachers.

Table 1: Summary of participating teachers and classes

Subject/Class	Year	Classroom based	Video-conferencing	Number of students
Biology	11		1	9
Art History	13		1	11
Economics (Class 1)	12		1	8
Economics (Class 2)	12	1		9
Economics	13	1		13
Physics	13	1		13
Accounting	12		1	17
Classics	13		1	24
English	11	1		24
Total		4	5	128

Another challenge of this project is that all the participating classes are at the senior secondary level, and the units that students are studying are all part of the National Certificate of Educational Assessment (NCEA) curriculum, which are subject to internal and external examinations. The NCEA is the qualification that New Zealand students aim to achieve in order to gain admission to universities. Teachers are thus under tremendous pressure to cover the subject contents and support their students to achieve the NCEA standards. How knowledge building can be successfully integrated into the NCEA curriculum is a huge challenge in this project.

Research design

As a design-based project, it is essential that the researchers collaborate with the practitioners on a longer-term basis to refine the design of the study. This study thus

includes a two-year cycle. There are three phases in each of cycle: (1) design/re-design; (2) implementation; and (3) evaluation. In the design/re-design phase of the project, the researchers work with the teachers to identify the teaching topics, and develop ideas and strategies for their teaching. Each teaching unit in this study is aligned with a set of NCEA assessment standards. In the implementation phase, activities are organised to develop a collaborative knowledge building culture in each participating class. The knowledge building pedagogy is discussed, and in-class and online workshops are organised for students to learn how to use *Knowledge Forum*. The teaching units are implemented in this phase. Students are engaged in individual and group research activities, and are encouraged to contribute ideas to the online *Knowledge Forum* discussion. At the end of the study, some of the students will produce individual electronic portfolios to document and reflect on the ideas developed by the community. The classroom-based classes will involve research and discussions both in-class and online. The distance classes will conduct research and knowledge building primarily through videoconferencing and online discussions. The teaching units will be evaluated in the last phase.

It is noted that teachers need to gain knowledge and first-hand experience in knowledge building in order to fully understand and be committed in using this pedagogy in their teaching (Chai & Tan, 2009). While face-to-face research and professional development meetings are organised in each cycle of the study, an online knowledge building teacher community has been established as a means to engage teachers in collaborative inquiry and to provide social support during the research process. The research team (both the researchers and practitioners) also meet once a month via videoconferencing.

Research questions

New Zealand is fast advancing into a knowledge-based society, and as such there is an urgent need to develop young people's competency to work creatively and innovatively with knowledge. Very little is known in New Zealand as to how knowledge building competencies can be effectively facilitated in schools. To contribute to knowledge building theory and practice, this project will address the following research questions:

1. How can a knowledge building community be designed and effectively integrated into the New Zealand senior secondary classes, both in the classroom-based and distance learning contexts? What factors will affect the roles of the teachers and what teaching strategies and design principles do teachers use to support students' advancement of knowledge?
2. What are the effects of a knowledge building community mediated by *Knowledge Forum* on students' learning and knowledge building outcomes? Have students' domain knowledge, skills of learning how to learn, collaborative learning skills, as well as dispositions as an epistemic agent changed over time?
3. What are the factors affecting the development of a knowledge building community and culture in New Zealand secondary schools?

Data collection methods

In order to collect valid and reliable data to answer the research questions, a number of quantitative and qualitative data collection methods are employed in this study to allow triangulation:

- Questionnaire survey – a questionnaire with forced-choice and open-ended items is administered to all participating students at the beginning and the end of each teaching unit to collect demographic information, as well as information on computing and Internet experience, epistemic beliefs, social networking skills, and attitudes towards collaborative learning. The SPOCK questionnaire developed by Shell et al. (2005) is adapted for this survey.
- Class observations – Each on-site class is observed at least once during each implementation phase and field notes will be taken to provide a broad picture of how the on-site class knowledge building activities have been implemented.
- Online observations – The online *Knowledge Forum* discussion of each class will be observed at least once a week during each implementation phase. Field notes will be taken to provide a broad picture of how the *Knowledge Forum* discussions have been run.
- Teacher interviews – Semi-structured interviews will be conducted with all the participating teachers to collect data on epistemic and pedagogical beliefs, their roles in the knowledge building communities, as well as the knowledge building strategies they use. Data on issues related to implementation will also be gathered. Each participating teacher will be interviewed twice each year to assess change over time. Interview questions are adapted from Chai & Merry (2006) and Chai & Tan (2009).
- Student interviews – One semi-structured focus group interview of at least six students for each class is conducted in each year to understand how students feel about their knowledge building communities, the extent that the *Knowledge Forum* discussions can support their learning and the extent that they consider knowledge building as a cultural practice.
- Content analysis – All the online discussion notes are archived and analysed to understand students' depth of understanding of domain knowledge, as well as their development as an epistemic agent. All the online discussion notes contributed by the teachers in the knowledge building teacher community are also collected to assess pedagogic and epistemic beliefs. A coding scheme developed from the literature review will be used.
- Document analysis – Plans and materials developed for the teaching units will be reviewed to evaluate strategies used in the knowledge building communities, and the extent that they have been integrated into the school curriculum. NCEA achievement of the participating students related to the teaching units will also be collected.
- Student online portfolio – Students are asked to produce a portfolio to reflect on the ideas that they have developed in the knowledge building community.
- Participation data – User data generated by *Knowledge Forum* at the system level, such as login and contribution frequencies, patterns of communication, etc. will be collected to assess the development of the knowledge building community and culture.

As a two-year project, this study is also conceptualised as a multisite case study. While teachers in this study will collaborate as co-designers within a knowledge building community, they will implement their individual teaching units in specific school contexts

that have characteristics that are unique to each class. The sites included in the study were selected to allow comparisons in several important dimensions such as location of the school (urban versus rural), subject content (7 school subjects), and delivery method (classroom-based and at a distance). The heterogeneity of classes chosen for this study will allow cross-case comparisons that can generate more robust findings and increase practical generalisability (Schofield, 1990).

A one-day symposium is scheduled on November 19, 2012, in Wanaka, New Zealand for the participating teachers to share some of the initial findings to a wider audience.

The Otago University Advanced School Sciences Academy (OUASSA) Project, 2011-2012

This is a two-year (2011-2012) pilot project funded by the New Zealand Ministry of Education and the University of Otago to support potentially high achieving Year 13 students from rural/provincial or low decile schools (in socio-economic terms) to cultivate an interest in science and enhance their ability to excel in the NCEA examinations. In each year of this pilot project, a cohort of about 50 students from across New Zealand come to the University of Otago for two five-day residential science camps, in January and July. Throughout the year a virtual academy is set up using the Knowledge Building approach and *Knowledge Forum* to study a number of topics in science.

In the first year of study, from February to October, the topic of study primarily focused on climate change. In the second year of study, from February to June, the topics of study are related to the science projects that students did during the January residential camp, in a number of science subjects.

Research questions

The OUASSA project primarily aims at evaluating the effectiveness of the virtual academy. Specifically, it is designed to investigate whether or not knowledge building can be supported totally online as an extra-curricular activity.

Data collection

In this study a number of quantitative and qualitative data collection methods are employed:

- Questionnaire survey – a questionnaire has been administered to all the participating students twice in 2011. 52 and 29 students have completed the first and second questionnaires, respectively. In January 2012, a questionnaire incorporating some of the questions in the SPOCK questionnaire was administered to the second cohort. 40 students have completed this questionnaire. This questionnaire will be administered again at the end of 2012.
- Interview – 13 students have been interviewed once in 2011. 15 students will be interviewed in July, 2012.

- Content analysis – All the online discussion notes in 2011 and 2012 are archived and will be analysed to understand students' depth of understanding of domain knowledge, as well as their development as an epistemic agent.

While all the participants of this project are Year 13 students, the challenging part is that they come from all over New Zealand, and are doing different school subjects. In other Knowledge Building projects that we have surveyed in the literature, participating students almost always came from the same class, and did the same school subject. The challenge is that there is no real connection between the students and the knowledge building moderators (teachers). The moderators have only met the students twice, and for the rest of the time they only communicate online. The knowledge building process was also done totally online. Understanding of knowledge building principles was achieved during the Jan residential school, and students learned how to use *Knowledge Forum* in a workshop. The authors are interested to see what students can gain from the knowledge building process when minimal support is provided to students face-to-face. Figure 1 is an example of a view of one of the OUASSA projects in 2012

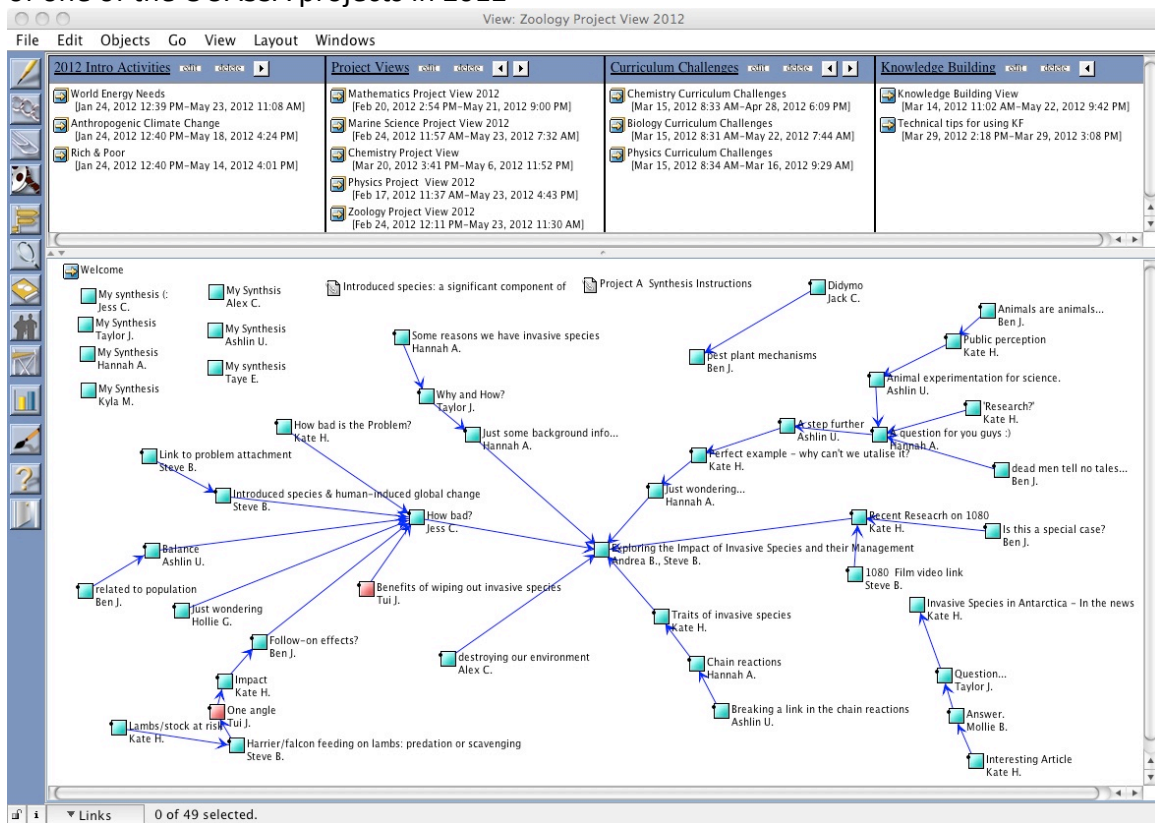


Figure 1: A view of the zoology project view in 2012

Conclusion

This paper has provided a brief description of the two Knowledge Building projects that the authors are currently undertaking in New Zealand, as well as some of the challenges that we have experienced, or are anticipating, in the process of implementing these two projects.

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