THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Graduate Handbook

Centre for Science & Technology Education Research

Pokapu Rangahau Pūtaiao me te Mātauranga Hangarau

2012

WELCOME TO WAIKATO

Welcome to the University of Waikato. I hope you make the most of your time here and the opportunities that will present themselves during the course of your study.

You have come to an excellent university that is ranked top in 10 subjects under the Government's Performance Based Research Fund. We are also internationally connected; we have research connections and student exchanges with some of the world's top universities. I urge you to consider taking part in these while you are with us.

Here at the University of Waikato, you will be taught by lecturers who are leaders in their fields of research and who win national teaching awards. We are proud of our academic quality and the fact that we turn out sought-after graduates who go on to take up important roles in all parts of the world.

You will already have noticed our beautiful campus which is set in 68 hectares of gardens, green space and lakes. At the heart of it all is the new Student Centre, which was completed in 2011. With its accessible areas, Library services and multitude of facilities, it is a place for students to study or just gather together and we are very proud of this building.

In 2011 we celebrated 10 years of another important building, the Gallagher Academy of Performing Arts. This world-class facility was the vision of a group of driven Waikato people. It quickly became a focal point in the campus and continues to be an important venue for the performing arts community.

I encourage you to experience all our facilities during your study at Waikato. We are heading towards our 50th anniversary in 2014; you are benefitting from many years of planning, hard work and vision.

I sincerely hope you enjoy your time at the University of Waikato; I urge you to make the most of the excellent education, the beautiful setting and the top facilities and then head out into the world as alumni and ambassadors for us.

Roy Crawford

VICE-CHANCELLOR
UNIVERSITY OF WAIKATO

WELCOME TO THE CENTRE FOR SCIENCE & TECHNOLOGY EDUCATION RESEARCH

Pokapu Rangahau Pūtaiao me te Mātauranga Hangarau

We extend an invitation to students and teachers who have an interest in science, technology and environmental education to read this booklet to find out about the opportunities we offer at the Centre for research and professional development. If you require any additional information about the Centre and its work, please feel free to contact us.

The CSTER Team

Mission

The mission of the Centre is to provide national and international leadership, and to conduct research in science, technology and environmental education, and information technology applied to these areas.

The goals of the Centre are to:

» Conduct excellent research,

» Provide research-informed teaching and supervision, and

» Provide national and international professional leadership.

Further Information

Further information about the University and Schools can be obtained from the Faculty of Science & Engineering and the Faculty of Education *Graduate Handbooks* and the current *University Calendar*.

Centre for Science & Technology Education Research
University of Waikato
Private Bag 3105
Hamilton 3240, New Zealand
Phone: +64 7 838 4035
Fax: +64 7 838 4272
Email: cster@waikato.ac.nz
Website: **http://cster.waikato.ac.nz**

FOREWORD

This handbook provides information about the work and programmes of the Centre for Science and Technology Education Research at The University of Waikato. The Centre is uniquely situated both within the Faculty of Science & Engineering and the Faculty of Education.

The Centre is known throughout New Zealand and internationally for its research and scholarships, and for the use of its research in the development of policy, practice, curriculum, resources, assessment and professional development.

The Centre offers opportunities for professional growth for people working in:

» Science education,

» Technology education,

» Environmental education, and

» ICT education.

Our students include practicing teachers, teacher educators, curriculum developers and community educators in New Zealand and from a range of countries in the Pacific Islands, Africa and Asia. Most are graduates seeking mid-career professional development through advanced study for higher qualifications. Staff and students work together as colleagues in a co-operative and friendly way.

The academic programmes we offer are flexible. Full-time and part-time options are available. Our programmes allow students to specialise in their particular area of interest, to undertake interdisciplinary study, and to learn how to conduct research. Excellent facilities are available in the Centre and at the University. Many courses are available online, so that students can complete a qualification from their own location.

The Centre is keen to host New Zealand Science, Mathematics and Technology Teacher Fellows. Any practicing teacher interested in this option that provides up to one year of study leave on a project of their choice, and of interest to the Centre, would be welcome to discuss this with Centre staff.

We extend a warm welcome to you to come and join our exciting, vibrant community and make the most of all we offer.

The CSTER Team

CONTENTS

INTRODUCTION	4
CENTRE STAFF DIRECTORY	6
TEACHING	7
PAPERS AND QUALIFICATIONS	9
CENTRE RESEARCH ACTIVITIES	16
CSTER STAFF PROFILES	18
ASSOCIATE STAFF PROFILES	22
CURRENT GRADUATE RESEARCH	31
RECENT GRADUATE RESEARCH	32
JOINT PUBLICATIONS	33
PROFESSIONAL DEVELOPMENT	34
CONSULTANCY AND PROFESSIONAL ACTIVITIES	36

Note: *We have endeavoured to ensure that the information in this publication is accurate at the time of printing. It is subject to a continuous process of review and improvement. Readers should be aware that the* ***University of Waikato Calendar*** *takes precedence.*

INTRODUCTION

The Centre for Science & Technology Education Research was formed in 1989. It has grown from the Science Education Research Unit, which was started in 1981 by Dr Roger Osborne and Professor Peter Freyberg. The Centre is interdisciplinary in nature and is jointly administered by the Faculty of Science & Engineering and the Faculty of Education.

Research in science, technology and environmental education is multi-disciplinary in nature and this is reflected in the diverse range of teaching, research and professional activities conducted within the Centre. The Centre has eight inter-related activities.

Research

The major activity of the Centre is to promote and undertake research into science, technology, environmental and ICT education. The Centre has an international reputation for conducting research of the highest standard. This is reflected in the publication of research in many major internationally refereed journals such as *Research in Science Education, Studies in Science Education,* the *International Journal of Science Education, Environmental Education Research,* the *Journal of Technology Studies,* the *International Journal of Technology and Design Education,* and the *Journal of Co-operative Education and Internships*. In addition, Centre staff serve as referees and editorial board members for the above journals.

The staff collectively have research expertise that spans the spectrum from primary to tertiary teaching, learning and assessment, and that represents a range of methodological approaches to research, experience in classroom practice, graduate supervision and contract research. A strength of the Centre is its ability to form teams of staff, students and visitors to conduct research in a wide range of science, technology, environmental and ICT education areas. Within these teams Centre staff, graduate and postgraduate students, carry out research for:

» Masters and doctoral degrees,

» Contract research for government ministries and other education stakeholders, and

» The pursuit of staff members' research interests.

The Centre focuses on research which is characterised by:

» Engagement with the community,

» Social construction of learning, and

» A school classroom basis.

Teaching

The Centre offers postgraduate diplomas and masters papers in science, technology, and environmental education, and in doing educational research. Papers are run in a variety of ways including group seminars for Hamilton-based papers, and online forums for distance students, allowing for active discussion between participants. In addition, supervision is provided for independent study in small research projects or theses.

Student Support

The Centre offers strong support for students in a number of ways. Student support meetings are held regularly and provide guidance and information on topics of general interest. Significant support is provided across the University for new international students and for research students. The Centre ensures that all students are aware of the support opportunities that are available. An online environment provides for easy access to resources and discussions that flow across all members of the Centre, regardless of their location. Students are also included as an integral part of the Centre's social activities.

Educational Development

The Centre undertakes development in science, technology and environmental education, based where appropriate, on the research findings of the Centre. This includes curriculum development, teacher development, resource development and assessment development.

Professional Development

The Centre promotes and supports the professional development of science, technology, environmental and ICT teachers. It provides a forum for discussions, critiques, seminars, and workshops, as well as opportunities to gain postgraduate qualifications. Staff are also involved with international, national and regional subject associations, and professional bodies, and with contract development activities.

Formulation of National Education Policy

The Centre contributes to the formulation of national policy in science, technology, environmental and ICT education. The expertise and experience of the staff and students in research and development enable them to make contributions to the national policy of groups such as the Ministry of Education, through contracts and submissions.

Critical and Constructive Analysis

The work of the Centre staff and students provides a critique of science, technology, environmental and ICT education at the local, national and international levels, and suggests ways to improve science, technology, environmental and ICT education.

Consultancy and Liaison

The Centre works on a networking or consultancy basis with other local, national and international science, technology, environmental and ICT education and research groups.

CENTRE STAFF DIRECTORY

Centre Director

John Williams	BA *Pacific Union College*, DipT *Adelaide*, MA, PhD *Andrews*

Centre Staff

Chris Eames	BSc, MSc, PhD *Waikato*
Mike Forret	BSc *Aberdeen*, DipT, PhD *Waikato*
Kathrin Otrel-Cass	Mag.rer.nat. *Salzburg*, PhD *Waikato*
John Williams	BA *Pacific Union College*, DipT *Adelaide*, MA, PhD *Andrews*

Centre Administration and Secretarial Services

Raewyn Oulton

Associate Staff

Richard Coll	BSc *Canterbury*, MSc, PhD *Canterbury*
Beverley Cooper	BSc MSc *Waikato* DipT *Waikato*
Bronwen Cowie	BSc MSc PhD *Waikato* DipT *Waikato*
Garry Falloon	AdDipT *Christchurch College of Ed*, MEd Massey, EdD *Curtin*
Anne Hume	BSc *Auckland* DipT, MEd *Waikato*
Alister Jones	MSc(Hons) DPhil *Waikato* DipT *Waikato*
Elaine Khoo	BEd(Hons), MA *Vanderbilt*, PhD *Waikato*
John Lockley	BSc MSc, *Waikato* DipT *Hamilton Teachers College*
Kathy Saunders	BSc, DipT *Auckland*, MSc *Curtin,* Sci EdD *Curtin*
Karsten Zegward	BSc, MSc (Tech)(Hons), PhD *Waikato*

TEACHING

Degrees and Diplomas

The Centre offers postgraduate programmes in science, technology, environmental and ICT education, and in research methodologies for the following degrees and diplomas:

» PhD
» Master of Science
» Master of Education
» Master of Social Science
» Master of Arts
» Postgraduate Diploma (Science Education)
» Postgraduate Diploma (Technology Education)
» Postgraduate Diploma (Education)
» Postgraduate Diploma (Environmental Education)
» Diploma of Applied Science

Masters degrees are usually completed in two years of full-time or three to four years part-time study, while the diplomas and postgraduate diplomas usually take one year full-time or two years part-time.

The Diploma of Applied Science is designed for graduates who wish to broaden their qualifications at the undergraduate level, while the three postgraduate diplomas include papers at the graduate or masters level.

Masters Degrees

Students studying towards a masters degree taught in science, technology, environmental or ICT education would normally complete four masters-level papers, followed by a four-paper thesis. Guidelines for the papers are described below under Postgraduate Diplomas. The thesis component is undertaken in science, technology, environmental or ICT education.

Postgraduate Diplomas

The Postgraduate Diploma requires completion of four masters-level papers. Candidates select two papers from offerings in science, environmental or technology education, together with a small research project, and our research methods paper. A typical programme consists of:

» One of Science education, Technology education or Environmental education,
» Research Methods (compulsory),
» A Directed Study, and
» One other paper (eg Innovations in Science, Technology or Environmental Education).

Alternatively one or two masters papers from the Faculties of Education or Science & Engineering can be selected in place of the Centre's papers.

Research Degrees (MPhil, PhD and EdD)

The MPhil and PhD are research degrees, designed to recognise original contributions to knowledge made while extending one's research skills under university supervision. The usual level of entry is masters or a good honours degree with an adequate background in the field in which the research is proposed. Both degrees may be pursued full-time or part-time: the MPhil requires the equivalent of 1-1½ years of full-time research (2-3 years part-time), the PhD requires the equivalent of 3-4 years full-time (5-8 years part-time) and both culminate in the presentation of a thesis embodying the results of the research. The EdD degree is offered through the Faculty of Education and comprises course work and a doctoral thesis. Students must complete two compulsory papers in education and two elective papers from a list provided in the *University Calendar*. To qualify to enrol for the EdD, students must have a bachelors or masters degree with honours, have qualified for the award of a recognised teaching or allied professional qualification, and must produce evidence of competent service as an educational practitioner.

Bachelor Honours Level Courses

The Centre's masters courses can be credited towards some honours level bachelor degrees. The Centre Director will be happy to advise interested students which papers may be suited to their needs.

Paper Details

The Centre offers the following papers for masters degrees and diplomas in 2012:

DSOE557-12A (HAM)	Educational Research Methods
DSOE557-12B (NET)	Educational Research Methods
DSOE557-12C (HAM)	Educational Research Methods
STER508-12A (NET)	Science Education
STER511-12A (NET)	Technology Education
STER512-12B (NET)	Innovations in Science, Technology and Environmental Education
STER513-12C	Environmental and Sustainability Education
STER590-12C or D	Directed Study
STER593-12C	Thesis (three paper thesis)
STER594-12C	Thesis (four paper thesis, the normal requirement for a masters degree in the Centre)
STER600-12C	MPhil Thesis
STER900-12C	PhD Thesis

Papers designated (Y) are Mar-Nov, (A) are first semester Mar-Jun, (B) are second semester Jul-Nov, and (C) are variable (but fixed at date of enrolment). All courses designated this way are based in Hamilton. Papers taught wholly online are shown as (NET) (ie B/NET indicates taught online in Semester B). Papers with more than one designation (ie A or C) are offered more than once during the year.

Summer School, Distance Education, Web-supported and Web-based Courses

The summer school and web-based programmes are particularly suitable for students who are unable to attend on-campus classes during the academic year. The Centre currently offers two papers during the University of Waikato Summer School programme (STER513-12C and DSOE557-12C).

The summer school classes are held over one or two weeks in January and involve further study in the first half of the year. Course assessment is usually during or by the end of the first semester. More details about each paper can be found on the following pages.

PAPERS AND QUALIFICATIONS

Paper Prescriptions

DSOE557-12A (HAM), 12B (NET) & 12C (HAM) Educational Research Methods

This paper introduces students to the major educational research paradigms, methodologies appropriate to collecting data in schools (including interviews, observations, surveys, case studies), action research, literature reviews, critiquing research, and report writing. It includes consideration of ethical issues in research.

Paper assessment:	*Internal assessment*
Required texts:	*C. Mutch. Doing Educational Research: A Practitioner's Guide to Getting Started (NZCER Press)*
	L. Cohen, L. Manion and K. Morrison Research Methods in Education (6th Ed) (Routledge/Falmer)
Course Co-ordinator:	*Associate Professor Lise Claiborne*
Time:	*12A (HAM), 12B online, 12C (HAM) – Various times of the year*

Note: *DSOE557-12C (HAM) is taught partially online. Enrolment in DSOE557-12C (HAM) should be completed two weeks prior to the paper commencing.*

STER508-12A (NET) Science Education

This paper aims to provide an overview of current research and development in learning, teaching and assessment in science education in New Zealand and internationally. The synthesis of research findings with classroom practice is a goal of the paper and so it is expected that students will participate in debate and discussion. The modules within the course examine current purposes and aims for science education, views of the nature of science, views of learning in science education, the nature of effective pedagogies for science education and current issues in science education. Topics include:

Purposes of science education

The paper will begin by considering past and present purposes for science education in New Zealand and internationally.

The nature of science and science education

This module focuses on debates about the nature of science itself through an introduction to the work of past and current philosophers of science, such as, Bacon, Popper, Kuhn and Feyerabend with a view to considering how their perspectives are reflected in science education. The use of material from the history of science for teaching will be discussed.

Views of learning informing science education

This module builds from the notion that students come to class with their own ideas about the natural world to explore current theories about how they might go about learning science.

Effective pedagogies in science education

This module examines the ways in which students may be helped to more effectively learn science, to learn about the nature of science and to develop scientific skills and attitudes. It also examines the merits of a variety of ways in which that learning can be assessed.

Current issues in science education

This module focuses on current issues in science education. Examples include the use of ICT, informal science education, culture and gender in science and science education.

Course assessment:	*The course is fully internally assessed by means of three assignments*
Required text:	*Students will be provided with references and extensive course material*
Course co-ordinator:	*Dr Kathrin Otrel-Cass (Room: KP.G.25; Phone: +64 7 838 4512)*
Time:	*Online in Semester A*

STER511-12A (NET) Technology Education

This paper aims to provide an understanding of the current issues in technology education research and development. The course consists of three modules:

Module 1: The nature of technology and technology education. The history and philosophy of technology will be considered in relation to technology education. Different views of technology and technology education will be examined, including teacher and student perceptions. The aims and goals of technology education will also be considered.

Module 2: Learning and curriculum in technology education. Learning theories and their implications for learning in technology education will be considered. The interaction of knowledge, processes and skills will be explored related to research on technological awareness and knowledge, and problem solving in technology education. The social construction of knowledge and its relationship with learning in technology will be emphasised. Current curriculum discussions about technology education in New Zealand and internationally will be related to a historical perspective of curriculum development, as well as recent technology curriculum innovations.

Module 3: Issues in technology education. The implications of technology education will be considered in terms of implementation, management at department and school level educational settings, inclusiveness, and teacher development. Included in this will be issues related to subcultures and innovation. Issues related to assessment in technology education are considered.

Course assessment:	*The course is fully internally assessed by means of three assignments.*
Required text:	*Students will be provided with references and extensive course material.*
Course co-ordinator:	*Associate Professor John Williams (Room: KP.G.28; Phone: +64 7 838 4769)*
Time:	*Online in Semester A*

STER512-12B (NET) Innovations in Science, Technology or Environmental Education

This paper aims to help teachers of science, technology or environmental education to develop their knowledge of science, technology or the environment and to consider how this knowledge might be integrated into educational activities. Students will develop an understanding of the wider issues of curriculum and assessment innovation.

The paper is taught online by a combination of set readings, online discussions and assignment completions. This paper consists of three parts:

» Whole class exploration of current ideas about educational innovation, particularly in regard to curriculum and assessment. This will involve reading set texts and participating in online discussion with the tutors and classmates,

» Individual independent research on a topic of your choice in a knowledge area in science, technology or environment/sustainability. You will be assigned a tutor to work one on one with through this part, and

» Individual work to design an educational innovation using your new found knowledge in your topic area. This part will again be mentored by your individual tutor.

Course assessment:	*The course is fully internally assessed by means of assignments.*
Required texts:	*Students will be provided with references and extensive course material.*
Course co-ordinator:	*Associate Professor John Williams (Room: KP.G.28; Phone: +64 7 838 4769)*
Time:	*Online in Semester B*

STER513-12C Environmental and Sustainability Education

This paper aims to provide an opportunity for in-service and pre-service teachers, and community educators to enhance their knowledge and skills in environmental/sustainability education. During this paper students will have an opportunity to:

- Develop an understanding of the links of environmental education/education for sustainability with other bodies of knowledge (eg indigenous knowledges, gender ideas, philosophy/values etc),
- Develop a critical understanding of the *Guidelines for Environmental Education in NZ Schools,*
- Develop knowledge of national and international research, policy and practice in environmental education/education for sustainability,
- Develop an awareness of the principles and theoretical ideas which underpin environmental education/education for sustainability practice in schools and/or the community, and
- Develop an understanding of the teaching and learning approaches that are appropriate to environmental education/education for sustainability practice.

Paper assessment:	*The course is fully internally assessed by means of assignments.*
Required texts:	*Students will be provided with references and extensive course material at the beginning of the paper.*
Course co-ordinator:	*Dr Chris Eames (Room: KP.G.26; Phone: +64 7 838 4357)*
Time:	*9-13 January 2012, 9am – 3pm followed by online supported learning at your place until early June 2012.*

STER541 Research Methods in Science, Mathematics and Technology Education

This paper will not be offered in 2012.

STER543 Development Project

This paper will not be offered in 2012.

STER590-12C or D Directed Study

This paper aims to provide students with an opportunity to work one-to-one with a supervisor to undertake a research study in an area of interest to them, within the areas of science, technology, environmental or ICT education or a closely related area. This study will normally take the form of a small-scale research project involving data collection, but could take the form of an extensive review of the research literature on a particular topic, or the trial and evaluation of an aspect of education.

During the paper, students will have opportunities for some or all of the following:

» Develop an understanding of an area of educational research,
» Frame a research question to be investigated,
» Develop skills in reviewing and critiquing educational research literature,
» Develop skills in the use of one data generation method,
» Analyse data,
» Construct an argument based on data that has been collected and analysed, and
» Discuss research findings or the problem of interest in relation to relevant literature.

This paper can be taken completely online, completely face-to-face or through a mix of these modes. Students at a distance to the University will typically work with a supervisor through email and phone calls, with possible, but not essential, occasional face-to-face sessions.

Paper assessment:	*The directed study report will normally comprise a document in report format. The exact nature of the product of the directed study should be negotiated and agreed with the CSTER supervisor of the study. Typically, the study will be a small-scale research project or an in-depth literature review. The word limit for the report is between 8-10,000 words.*
Course co-ordinator:	*First contact should be with Associate Professor John Williams (Room: KP.G.28; Phone: +64 7 838 4769; Email: pj.williams@waikato.ac.nz). All Centre staff are available for the supervision of projects.*
Time:	*Times may be negotiated*

STER593-12C and STER594-12C Masterate Theses

The Centre offers theses equivalent to three (eg STER593) or four (STER594) papers at the masterate level, in accordance with the calendar regulations. In exceptional circumstances, smaller dissertations equivalent to one paper (STER591) or two papers (STER592) may be offered.

Thesis work involves study over one year (full-time) or two years (part-time) on a research topic of interest. The topic is negotiated with, and supervised by, at least one member of the Centre staff.

Initial contact should be made with Associate Professor John Williams (Room: KP.G.28; Phone: +64 7 838 4769; Email: pj.williams@waikato.ac.nz). All Centre staff are available for the supervision of projects.

STER600-12C MPhil Thesis

The Centre offers an MPhil thesis option over one year (full-time) or two years (part-time) for study on a research topic. This option is suitable to those students who already hold an honours degree (masters or bachelors degree with honours) who wish to undertake a short research study, rather than a PhD. Students may be encouraged to enrol in the MPhil option and subject to satisfactory performance upgrade to a PhD. Approval to undertake this programme is required from Centre staff. The research topic is negotiated with, and supervised by, at least one member of the Centre staff.

Initial contact should be made with Associate Professor John Williams (Room: KP.G.28; Phone: +64 7 838 4769; Email: pj.williams@waikato.ac.nz). All Centre staff are available for the supervision of projects.

STER792 Diploma in Scientific Investigation

This paper will not be offered in 2012.

STER900-12C PhD Thesis

The Centre offers a PhD thesis option over three years (full-time) or five-six years (part-time) for study on a research topic. This option is open to those students who already hold an honours degree (masters or bachelors degree with honours) who wish to undertake an original research study. Approval to undertake this programme is required from Centre staff and the University Postgraduate Studies Committee. The research topic is negotiated with, and supervised by, at least two members of the Centre staff.

Initial contact should be made with Associate Professor John Williams (Room: KP.G.28; Phone: +64 7 838 4769; Email: pj.williams@waikato.ac.nz). All Centre staff are available for the supervision of projects.

Examples of Possible Programmes for Students

The Centre has a strong desire to provide flexible learning, tailored to the individual needs of students. The variety of papers and options open to you for research and study towards a higher degree or diploma are many and varied. Outlined below are some options chosen by teachers and students to further their qualifications. Some programmes combine papers from the Centre with papers from other faculties of study.

Allan is a graphics and technology teacher at a secondary school. He successfully applied for a PPTA study award to complete a full-time **Postgraduate Diploma in Technology Education**, as follows:

DSOE557	Educational Research Methods
STER511A	Technology Education
STER512B	Innovations in Science, Technology and Environmental Education
STER590C	Directed Study

Diana has a BSc in biology and is interested in gaining further qualifications in conservation science and environmental education. She has been working for the Department of Conservation for 10 years. Her proposed programme for a full-time **Master of Science** is:

BIOL572/573	Animal Behaviour and Conservation
DSOE557	Educational Research Methods
STER513C	Environmental and Sustainability Education
STER590C	Directed Study
STER594C	Thesis on the educational impact of displays on visitors to National Park Centres

Harry is an experienced secondary science teacher who has a BSc in physics and a DipTchg and is interested in gaining further professional qualifications. Currently he is unsure about committing himself to a full masterate programme because of family commitments. He undertakes the following programme for a **Postgraduate Diploma** part-time over two years:

DSOE557	Educational Research Methods
STER508A	Science Education
STER511A	Technology Education
STER590C	Directed Study on the introduction of electronics in schools

Hone is a primary teacher with a BEd and is working with bilingual students. He is interested in gaining qualifications in science education and Māori education. His proposed programme for a two-year **Master of Education** is:

DSOE557	Educational Research Methods
PCSS503B	Indigenous and Post-colonial perspectives in education
PCSS510C	Gender, Race and Education
STER508A	Science Education
STER594C	Thesis on the learning of science in a Kura Kaupapa programme

Carolyn is a fourth year secondary science teacher with a BSc who is interested in learning more about biotechnology education. Her proposed programme for a two-year **Postgraduate Diploma** is:

BIOL584/585	Genetics
STER511A (NET)	Technology Education
DSOE557	Educational Research Methods
STER543C	Development project for a new biotechnology unit

Tui completed her teaching online through a Mixed Media Programme. She really misses her online learning connections and is keen to continue to learn from her rural base while teaching full-time. Her proposed programme for a Master of Education part-time over four years is:

PCSS510C (NET)	Gender, Race and Education
STER513C	Environmental and Sustainability Education
STER590C	Directed Study on student learning through recycling
DSOE557	Educational Research Methods
STER594C	Thesis on Māori values in environmental education

MPhil

Jane is an experienced biology teacher. She has a BSc(Hons) and DipT and five years of classroom experience. She is interested in improving her classroom practice. Jane enrols in a part-time **MPhil** over two years and her thesis project consists of a comparative study investigating the implementation of a novel teaching style including extensive use of analogies.

PhD

Michael is an experienced chemistry teacher. He has a BSc and MEd and many years of classroom experience. He is interested in a major research project to improve the teaching of abstract chemical concepts in atomic structure and bonding. He also wishes to improve his future prospects by obtaining an internationally-recognised higher degree. He feels this will open up overseas career opportunities. He enrols in a part-time **PhD** over five years; his thesis project consists of a qualitative inquiry investigating students' understanding of atomic structure.

Li has recently completed her masters degree and is lecturing at a university in her country. She is interested in improving her pedagogy in teaching technology, and believes there is a gap in the research in this area. She gains a scholarship to study at Waikato, and enrols for three years of full-time study. Shortly after successfully defending her proposal, she returns to her country to conduct an intervention and collect her data, which is relevant to the position she will return to upon completion of her studies.

CENTRE RESEARCH ACTIVITIES

The Centre was involved in the following research in 2011:

The Science Learning Hub

The Science Learning Hub is a joint CSTER and WMIER project funded by the Ministry of Research, Science and Technology. The Hub provides web-based resources for secondary teachers to use with their students. The Hub is structured around contexts of interest to students such as the Sporting Edge which looks at the science of sport and the See Through Body which examines medical imaging. The Hub highlights the research of New Zealand scientists, it includes video resources, teaching and learning materials, articles and news stories.

Bronwen Cowie, Kathrin Otrel-Cass, Chris Eames and Mike Forret.

Have Their Environmental Experiences Turned Them Green: Reflections of Some Young New Zealanders

This project is bringing together researchers and teachers to explore the impact of environmental experiences on some young New Zealanders. Students who have been identified as being highly engaged in environmental education at primary school are being interviewed to explore the long-term impact of these and other environmental experiences.

Chris Eames, Miles Barker, Carol Scarff, Marianne Robertson and two primary teachers.

Investigating the Feasibility of Using Digital Representations of Work for Authentic and Reliable Performance Assessment in Senior Secondary School Courses

The focus of this three year study, funded by the Australian Research Council, is on the use of digital technologies to 'capture' performance on practical tasks for the purpose of high stakes summative assessment. The purpose is to explore this potential so that such performances could be included to a greater extent in the assessment of senior secondary courses, to increase the authenticity of the assessment in these courses. The study involves 40 case studies for the four courses involved.

For each case a variety of quantitative and qualitative data was collected from the students and teachers involved, including digital representations of the students' work on the assessment tasks, surveys and interviews. This data was analysed and used to address the research questions within a feasibility framework consisting of four dimensions: Manageability, Technical, Functional and Pedagogic.

John Williams and researchers from Edith Cowan University, Perth.

Scratch Project

In the Scratch Project we aim to gain insights into what the computer program, Scratch, has to offer learners and teachers. Scratch has been designed with young users in mind, is simple and easy for young learners to use, and provides a context within which children can enjoy exploring and being creative with programming. The research team are working with teachers and pupils in a local primary school to explore the teaching and learning potential of Scratch.

Mike Forret, Ann Harlow and Merilyn Taylor.

NILSS Networked Inquiry in Secondary Science Classrooms

This TLRI funded research project aims to explore and theorise how inquiry teaching and learning in junior secondary science can be supported through e-networked environments such as blogs or email and how online resources accessed through the Internet can afford individual and group exploration of content, skills and resources.

The focus is on using this approach to address how science education can be made more relevant to and responsive to the needs and interests of students from diverse backgrounds

Overall, the project goals are to:

» Describe the social construction of knowledge when diverse students are involved in individual or group science inquiries, that are both face to face and supported through networked online environments, and

» Put forward a framework for understanding inquiry learning in science classrooms underpinned by activity theory.

Kathrin Otrel-Cass, Elaine Khoo, Bronwen Cowie and Alison Basel.

Promoting Pedagogical Content Knowledge (PCK) Development for Early Career Secondary Teachers in Science and Technology Using CoRes (Content Representations)

This project will bring together science and technology content and pedagogy experts, early career teachers and researchers to design a CoRe (Loughran, Berry & Mulhall, 2006) to assist development of teacher pedagogical content knowledge (PCK). The study will then research the teacher's use of the CoRe in their planning and delivery of a unit in their classrooms to examine the impact of the CoRe on teaching and learning.

Chris Eames, John Williams, Anne Hume and John Lockley.

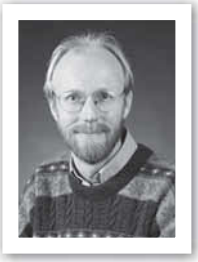
Technology Education Teachers' Pedagogical Content Knowledge: A Collaborative Research Study Between New Zealand and South Africa

The purpose of this study is to research technology teachers' pedagogical and content knowledge (PCK). This is a collaborative and comparative study between South Africa and New Zealand, with a view that an examination of PCK in the context of technology curriculum revisions happening in both countries will enhance the understanding of technology teaching.

Four teachers in each country will be observed during their teaching, support documentation will be analysed and the teachers will be interviewed. This data will be combined to form a picture of the teacher's PCK. The researchers will work together in all aspects of the project.

John Williams and Mishack Gumbo (University of South Africa).

CSTER STAFF PROFILES



CHRIS EAMES is a Senior Lecturer in the Centre. He teaches and supervises research students in environmental education/education for sustainability, and science education. He has conducted research and evaluation projects for the Ministry of Education, the Teaching and Learning Research Initiative and WWF New Zealand in the past few years. His current research interests focus on whole school approaches and action learning in sustainability. He is a member of the national executive of the New Zealand Association for Environmental Education (NZAEE) and a committee member for the Waikato branch. He acts as a reviewer for Environmental Education Research and the Australian Journal of Environmental Education. Chris also has extensive experience in teaching biochemistry and microbiology at the tertiary level, and in liaison with science and technology companies and biology secondary teachers. He is an Honorary Life member of the New Zealand Association for Co-operative Education (NZACE), is on the editorial boards for the Journal of Co-operative Education and Internships and the Asia-Pacific Journal for Co-operative Education. His other research interests are in secondary and tertiary science/biology, and learning through co-operative education.

Selected Recent Publications

Eames, C., Roberts, J., Cooper, G., & Hipkins, R. (2010). Education for sustainability in New Zealand schools: An evaluation of three professional development programmes. (Report to Ministry of Education) *Ministry of Education*, 2010, 1-302.

Eames, C., & Coll, R. K. (2010). Cooperative education: Integrating classroom and workplace learning. In S. Billett (Ed.), *Learning through practice: Models, traditions, orientations and approaches* (pp. 180-196). Springer.

Taylor, N., Littledyke, M., Eames, C., & Coll, R.K. (Eds), (2009). *Environmental Education in Context: An international perspective on the development of environmental education*. Sense Publishers.

Littledyke, M., Taylor, N., & Eames, C. (Eds), (2009). *Education for sustainability in the primary curriculum: A guide for teachers*. Palgrave MacMillan.

Eames, C., Barker, M., Wilson-Hill, F., & Law, B. (2009). *Investigating the relationship between whole-school approaches to education for sustainability and student learning*. Wellington, New Zealand: New Zealand Council of Educational Research.

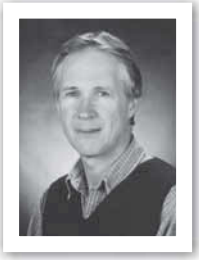
Eames, C., & Stewart, K. (2008). Personal and relationship dimensions of higher education science and engineering learning communities. *Research in Science and Technological Education, 26*(3), 311-321.

Eames, C., Cowie, B., & Bolstad, R. (2008). An evaluation of characteristics of environmental education practice in New Zealand schools. *Environmental Education Research, 14*(1), 35-51.

Eames, C., Law, B., Barker, M., Iles, H., McKenzie, J., Williams, P., et al. (2006). *Investigating teachers' pedagogical approaches in environmental education that promote students' action competence*. Wellington, New Zealand: New Zealand Council of Educational Research.

Contact Details

Room: KP.G.26; Phone: +64 7 838 4357; Email: c.eames@waikato.ac.nz



MIKE FORRET holds a joint position as a senior lecturer in the Faculty of Education and the Centre for Science and Technology Education Research. He holds a BSc(Hons) from Aberdeen and a DipT and a PhD from Waikato. Mike has a background in teaching secondary science and physics and is currently teaching undergraduate papers in curriculum science and technology and a masters paper in technology education. His research interests lie in developing effective learning environments through a clearer understanding of learning and the ways in which learners engage with learning situations. He is involved in supervising masters and PhD students engaged in a range of research projects in technology education, web-based learning and science education. Mike has a particular interest in computer-based and supported learning and is currently exploring the use of Scratch (software) to support classroom learning and teaching.

Selected Recent Publications

Harlow, A., Taylor M., & Forret M. (2011). Using an interactive whiteboard and a computer-programming tool to support the development of the key competencies in the New Zealand curriculum. *Computers in New Zealand Schools: Learning, Teaching, Technology, 23*(1).

Khoo, E., & Forret, M. (2011). Investigating Online Student Roles as a Basis for Understanding Learning and Development in a Learning Community. In S. Barton et al. (Eds.), *Proceedings of Global Learn Asia Pacific 2011* (pp. 1257-1265). AACE. Retrieved from www.editlib.org/p/37328.

Khoo, E., Forret, M., & Cowie, B. (2010). Lecturer-student views on successful online learning environments. *Waikato Journal of Education*, *15*(3), 17-34.

Contact Details

Room: TC4.04; Phone: +64 7 838 4481; Email: m.forret@waikato.ac.nz

RAEWYN OULTON joined the Science Education Research Unit in 1987 on a part-time basis and is now full-time with responsibility for the Centre's administrative and secretarial services, and the provision of student support. Raewyn may be contacted for any general or administrative enquiries about the Centre.

Contact Details

Room: KP.G.29; Phone: +64 7 838 4035; Email: r.oulton@waikato.ac.nz

KATHRIN OTREL-CASS has a masters degree (Mag.rer.nat.) from the University of Salzburg, Austria and a PhD from the University of Waikato. Her degree includes biology and earth science with a teaching degree for secondary science. Her PhD investigated the use of simulations to teach earth science concepts in a New Zealand science centre. She joined the Centre in 2006.

Kathrin was involved in include co-authoring the 'evolution for teaching' website **www.sci.waikato.ac.nz/evolution**, the InSiTe project that investigates teachers' and students' interactions around science and technology teaching, and the Quality Teaching and Research Development (science) project, that examined culturally responsive teaching strategies. Kathrin is also involved in the development and quality assurance of the national MoRST funded project, 'The New Zealand Science Learning Hub' **www.sciencelearn.org.nz** – a web-based science teaching and learning resource. Kathrin is hosting Cafe Scientifique in Tauranga and Junior Café Scientifique, a discussion forum based on young peoples' interests and questions in science. Kathrin is involved in a range of research projects with a particular interest in classroom based research in schools as well as the tertiary environment. Research projects in 2011 include students' and teachers' uses of ICT in science classrooms and culturally responsive science education.

Selected Recent Publications

Cowie, B., Otrel-Cass, K., Glynn, T., & Kara, H. (2011). *Fostering parent and whānau engagement with children's learning: A strategy to enhance children's science learning*. Paper presented at the 2011 NARST Annual International Conference, April 3-6, 2011. Caribe Royale Orlando, Orlando, Florida.

Unterbruner, U., & Otrel-Cass, K. (2010). Wie sich Jugendlicher Technik und neue Medien in einer Welt in 20 Jahren vorstellen: Ergebnisse der Studie Jugend-Zukunft-2008/09 mit Jugendlichen aus Osterreich, Deutschland und Neuseeland. In J. Zumbach & G. Maresch (Eds.), *Aktuelle Entwicklungen in der Didaktik der Naturwissenschaften* (pp. 37-53). Innsbruck, StudienVerlag,

Otrel-Cass, K., Cowie, B., & Maguire, M. (in press, July 2010). Taking video cameras into the classroom. *Waikato Journal of Education*.

Campbell, A., & Otrel-Cass, K. (2010). Teaching evolution in New Zealand's Schools – Reviewing changes in the New Zealand science curriculum. *Research in Science Education*. v-online, 1-11. DOI 10.1007/s11165-010-9173-6, Springer.

Campbell, A., & Otrel-Cass, K. (2010). Teaching Evolution in New Zealand's Schools – Reviewing Changes in the New Zealand Science Curriculum. *Research in Science Education*. doi:10.1007/s11165-010-9173-6 http://dx.doi.org/10.1007/s11165-010-9173-6

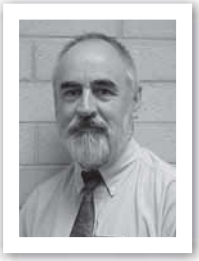
Otrel-Cass, K., Cowie, B., & Campbell, A. (2009). What determines perseverance in studying science? *Journal of Institutional Research*. 14(2), 30-44. November. Australasian Association for Institutional Research.

Otrel-Cass, K., Cowie, B., & Glynn, T. (2009). Connecting science teachers with their Māori students: Linking one school's tuata with forest ecology. *Set: Research Information for Teachers*. v2, 35-41. New Zealand Council for Educational Research.

Otrel-Cass, K., Cowie, B., Moreland, J., & Jones, A. (2009). Teachers and researchers working together: A subject specific planning framework as a boundary object. In P. Masson and M. Pilo (Eds.), *Partnerships in Education. Theoretical approach and case studies? Le partenariat en Éducation. Approche theorétiqueat étude de cas* (bilingual publishing), (pp.127-153). Lille: Book Edition, Collection savoir faire.

Contact Details

Room: KP.G.25; Phone: +64 7 838 4512; Email: kathrino@waikato.ac.nz



DR P JOHN WILLIAMS is Associate Professor and Director of the Centre. He teaches and supervises research students in technology education. In addition to New Zealand, he has worked and studied in a number of African countries, in Australia and in the United States. He directed the nationally funded Investigation into the Status of Technology Education in Australian Schools. His current research interests include mentoring beginning teachers and electronic assessment of performance. He has published over 40 articles and has authored and co-authored eight books. He also regularly presents at international and national conferences, consults on Technology Education in a number of countries, is a longstanding member of eight professional associations and is on the editorial board of four professional journals. He is an Examiner for The International Baccalaureate Design Technology and External Examiner for the Mauritius and Hong Kong Institutes of Education.

Selected Recent Publications

Williams, P.J. (2011). STEM Education: Proceed with Caution. *Design and Technology Education: an International Journal*, *16*(1), 26-35.

Williams, P.J. (2011). Research in Technology Education: looking back to move forward. *International Journal of Technology and Design Education*. DOI: 10.1007/s10798-011-9170-8

Williams, P.J. (2010). Technology Education to Engineering: a Good Move? *Journal of Technology Studies*, *36*(2), 10-19. Retrieved from http://scholar.lib.vt.edu/ejournals/JOTS/v36/v36n2/pdf/williams.pdf

Williams, P.J. (2010). The role of the 't' in STEM: Technology and the school curriculum. *STEM in Education Conference*. Queensland University of Technology, Australia, November.

Williams, P.J. (2010). Portfolio-based performance assessment in Engineering. *International Conference on Technological Learning and Thinking: Design, Sustainability, Human Ingenuity*. University of British Columbia, Vancouver, June.

Williams, P.J. (2010). Authentic assessment of student performance. *6th Biennial International Conference On Technology Education Research: Knowledge in Technology Education*. Gold Coast, Queensland, December.

Williams, P.J., & Gumbo, M. (2010). Technology education teachers' pedagogical content knowledge: a collaborative research study between New Zealand and South Africa. *6th Biennial International Conference On Technology Education Research: Knowledge in Technology Education*. Gold Coast, Queensland, December.

Williams, P.J. (2009). Teacher Education. In A. Jones and M. de Vries (Eds.), *International Handbook of Research and Development in Technology Education, (*pp.93-104). Rotterdam, Sense Publishers.

Williams, P.J. (2009). Technological literacy: a multiliteracies approach for democracy. *International Journal of Technology and Design Education, 19*(3), 237.

Williams, P.J. (2009). Authentic Assessment of Student Performance. *International Conference on Technology Education in the Asia-Pacific Region ICTE 2009*. National Taiwan Normal University, Taiwan, November.

Contact Details

Room: KP.G.28; Phone: +64 7 838 4769; Fax +64 7 838 4272; Email: pj.williams@waikato.ac.nz

ASSOCIATE STAFF PROFILES

The Centre's Associate Staff hold substantive positions in other faculties within the University. They are involved in supervising postgraduate research students, teaching in Centre papers and/or have significant roles in Centre research projects.

RICHARD K. COLL holds a BSc and PhD in chemistry from the University of Canterbury, Christchurch, New Zealand and a Doctor of Science Education from Curtin University of Technology, Perth, Australia.

Richard worked as an industrial chemist for five years between his chemistry degrees, before teaching chemistry at the University of the South Pacific and University of the West Indies. He returned to New Zealand to take up a joint position at Waikato in 1995, teaching chemistry and liaising with the industrial sector. Richard is Professor of Cooperative Education, and a member of a number of professional bodies including the New Zealand and World Association for Cooperative Education (WACE). His research interests include learners' mental models for scientific conceptions along with aspects of cooperative education including assessment, improving learning for students on work placements.

Selected Recent Publications

Coll, R.K., Dahsah, C., & Faikhamta, C. (2010). The influence of educational context on science learning: A cross-national analysis of PISA. *Research in Science & Technological Education*, *28*(1), 3-24.

Hume, A., & Coll, R.K. (2010). Authentic student inquiry: The mismatch between the intended curriculum and the student-experienced curriculum. *Research in Science & Technological Education*, *28*(1), 43-62.

Çalik, M., Alipaşa A., & Coll, R.K. (2009). Investigating the effectiveness of an analogy activity in improving students' conceptual change for solution chemistry concepts. *International Journal of Science and Mathematics Education*, *7*, 651-676.

Hume, A., & Coll, R.K. (2009). Assessment of learning, for learning, and as learning: New Zealand case studies. *Assessment in Education: Principles, Policy & Practice*, *16*(3), 283-304.

Coll, R.K., Taylor, N., & Lay, M.C. (2009). Scientists' habits of mind as evidenced by the interaction between their scientific training and religious beliefs. *International Journal of Science Education*, *31*(6), 725-755.

Contact Details

Room: KP.G.19; Phone: +64 7 838 4100; Email: rcoll@waikato.ac.nz

BEVERLEY COOPER is Director of the Centre for Teacher Education responsible for secondary, primary and early childhood teaching programmes. She holds a BSc, and MSc and DipT from Waikato University. She taught in secondary schools for 18 years before moving to the University of Waikato to be responsible for teaching practicum and lecture in science and chemistry education. Bev has been involved in the development and facilitating of the implementation of NCEA at level 1, 2, 3 and 4 and the development of the New Zealand curriculum. She also writes and edits books for science and chemistry teaching years 11-13.

Bev is immediate past president of the New Zealand Association of Science Educators (NZASE) and is the Secretary for the International Council of Associations for Science Education (ICASE). She has been involved in several large-scale research and development projects, including the NZ Curriculum Stocktake, TELA laptops in schools research, NZ Curriculum exploration research, the Solomon Islands Teacher Education Project and the development of the NZ Science Hub. Bev's recent research has been involved with assessment for learning and is a member of a national TLRI project "Learning to be assessment capable teachers".

Selected Recent Publications

Cooper, B., & Abbott, G. (2011). Year 11 Science. NCEA Level 1. Achievement Standard Science 1.5: Demonstrate understanding of acids and bases. *Student Workbook and Teachers Guide* (pp. 1-78). ABA Books Limited.

Cooper, B., Cowie, B., & Jones, A. (2010). Connecting teachers and students with science and scientists: The Science Learning Hub. Science Education International. 21(2), 92-101. International Council of Associations for Science Education (ICASE).

McGee, C., Cowie, B., & Cooper, B. (2010). Initial teacher education and the New Zealand curriculum. *Waikato Journal of Education.* 15(1), 9-27. Hamilton, New Zealand, Faculty of Education, The University of Waikato.

Hipkins, R., Cowie, B., Cooper, B., & Boyd, S. (2010). *Curriculum implementation exploratory studies 2: Milestone report* June 2010. (Report to Ministry of Education) New Zealand Council for Educational Research, 1-75.

Cooper, B., & Cowie, B. (2009). Collaborative research for assessment for learning. *Teaching and Teacher Education*. v-online, Elsevier, 1-8.

Cowie, B., Jones, A., Harlow, A., McGee, C., Cooper, B., Forret, M., Miller, T., & Gardiner, B. (2008). *TELA: Laptops for teachers evaluation: Final Report Years 9-13.* (Report to Ministry of Education) Hamilton, New Zealand, Wilf Malcolm Institute of Educational Research, 1-90.

Cooper, B., & Abbott, G. (2007). Year 13 Chemistry (NCEA level 3) *Theory Workbook* Hamilton: ABA Resources.

Contact Details

Room: TC2.75; Phone: +64 7 838 4382; Email: bcooper@waikato.ac.nz

BRONWEN COWIE holds an MSc, a PhD and a DipT from the University of Waikato. Bronwen is director of the Wilf Malcolm Institute of Educational Research. She has a background in secondary mathematics, science and physics teaching and in pre-service teacher education. Recent research projects include the New Zealand Curriculum Exploratory Case Studies Project, the National School Sampling Study Curriculum Stocktake, the Environmental Education in New Zealand Schools Research Study, the Laptops for Teachers Evaluation Study and the Classroom InSiTE project. She is currently working on two classroom-based projects. One is investigating the use of culturally responsive pedagogy in primary science classrooms with a high proportion of Māori students and the other concerns the use of ICT in the teaching and learning of science. Her research interests include assessment, particularly formative assessment/assessment for learning, student perspectives, the nature of effective interactions in science lessons, curriculum implementation and the role of ICT in science teaching and learning.

Selected Recent Publications

Cowie, B., Jones, A., & Harlow, A. (2011). The distribution of leadership as an influence on the implementation of a national policy initiative: the example of the Laptops for Teachers scheme. *School Leadership and Management*, 31, 47-63.

Glynn, T., Cowie, B., Otrel-Cass, K., & Macfarlane, A. (2010). Culturally responsive pedagogy: Connecting New Zealand teachers of science with their Māori students. *Australian Journal of Indigenous Education*, *39*, 118-127.

Cowie, B., Jones, A., & Otrel-Cass, K. (2010). Re-engaging students in science issues of assessment, funds of knowledge and sites for learning. *International Journal of Science and Mathematics Education*, *9*, 347-366.

Contact Details

Room: TW.1.10; Phone: +64 7 838 4987; Email: bcowie@waikato.ac.nz

GARRY FALLOON is a Senior Lecturer in the Department of Professional Studies in Education. Garry was previously project leader for the New Zealand Ministry of Education's e-Learning research initiative – the Digital Opportunities Projects, and is presently involved in initial teacher education, postgraduate teaching, supervision, and research in e-learning and Science Education at Waikato University. In association with Scion Research Ltd, he is currently exploring technology-supported school-scientist partnerships as part of the Ministry of Innovation's Science-for-Life programme. Other research interests include the use of synchronous virtual classrooms in supporting postgraduate students, online learning environment design, and the design and use of digital learning objects in schools.

Selected Recent Publications

Falloon, G. (2011). Making the connection: Moore's theory of transactional distance and its relevance to the use of a virtual classroom in postgraduate online teacher education. *Journal of Research on Technology in Education, 43*(3), 187-209. International Society for Technology in Education.

Falloon, G. (2011). Pursuing possibilities through digital opportunities. In V. Ham and D. Wenmoth (Eds.), *eLearnings: Implementing a National Strategy for ICT in Education, 1998-2010* (pp. 107-115). Christchurch: CORE Education Ltd.

Falloon, G. W. (2010). Learning Objects and the Development of Students' Key Competencies: A New Zealand School Experience. *Australasian Journal of Educational Technology 26*(5). ISSN1449-3098.

Pohio, K., & Falloon, G. (2010). Deliberate acts of virtual communication: Cellphones as a tool to enhance student learning and engagement. *Set: Research Information for Teachers*, *3*, 2-9. Wellington: NZCER Press.

Contact Details

Room TL3.13; Phone +64 7 8384466 extn 6553; Email: falloong@waikato.ac.nz

ANNE HUME is a senior lecturer in science education at undergraduate, graduate and postgraduate levels. Before taking up her current position in early 2005, Anne was an evaluator with the New Zealand Education Review Office for four years, following 25 years secondary teaching, 16 of those as head of a science department. She has had extensive experience in the wider science education scene in New Zealand, including membership of: the Board of the Royal Society of NZ; the writing team for the 1993 Science in the New Zealand Curriculum, and the science expert panel for the National Certificate of Educational Achievement (NCEA). From 1993-94 she was President of the New Zealand Science Teachers' Association (NZASE), and in 1993 she was awarded a New Zealand Suffrage Medal for contributions to science education, followed by a British Council Travel Award in 1996. Recent awards include a Fulbright Scholarship (2007) to present her doctoral findings at an international conference in the USA, an Excellence in Research award from the University of Waikato in 2009 and the Most Valued Paper (MVP) Award for 2010 from Teaching Science, the Australian Science Teachers' Association journal.

During her teaching career Anne published a range of papers and students' texts in the field of science education for teachers and students. Recent research involvement included membership of the Science Learning Hub development team (STER Centre, University of Waikato) and the Curriculum Implementation Exploratory Studies (CIES) project. For 2011 she is a researcher in the TLRI funded project 'Promoting pedagogical content knowledge (PCK) development for early career secondary teachers in science and technology using Content Representations (CoRes).

Current and past doctoral supervision are in the fields of curriculum implementation, developing the pedagogical content knowledge (PCK) of science and mathematics teachers, didaktiks analysis in physics education and chemistry education.

Selected Recent Publications

Hume, A. (2011). Primary Connections: Simulating the primary science classroom in initial teacher education. *Research in Science Education*, DOI 10.1007/s11165-011-9210-0

Hume, A., & Berry, A. (2010). Constructing CoRes – a strategy for building PCK in pre-service science teacher education. *Research in Science Education*, *41,* 341-355.

Hume, A., & Coll, R. (2010). Authentic Student Inquiry: The Mismatch between the Intended Curriculum and the Student-experienced Curriculum. *Research in Science and Technological Education*, *28*(1), 43-62.

Hume, A. (2010). Investigating content representations (CoRes) as pedagogical tools for science teacher education. *Science Teacher Education (Special Issue), 59*, 29-38.

Hume, A., & Coll, R. (2009). Assessment of learning, for learning, and as learning: New Zealand case studies. *Assessment in Education: Principles, Policy and Practice, 16*(3), 263-268.

Contact Details

Room: TL.4.05; Phone: +64 7 838 4466 extn 7880; Email: annehume@waikato.ac.nz

ALISTER JONES is currently Professor and Deputy Vice-Chancellor at the University of Waikato. He is a former Director of the Wilf Malcolm Institute of Educational Research, and former director of the Centre for Science and Technology Education Research at the University of Waikato. Alister is recognised internationally for his work in science and technology education at the national policy, leadership, research and curriculum level. He has acted as a consultant to governments internationally and his research is innovative in the way it links science and education. He is a director of Australasian Science Education Research Association Ltd and is the past president of International Technology Education Association (Pacific Rim). He has a substantial research record (over 300) publications; has built international research teams and has provided advice on building research infrastructure to international organisations. In 2000 he was awarded the New Zealand Science and Technology Medal for contributions to technology education.

Selected Recent Publications

Jones, A., & de Vries, M. (2009). *International Handbook of Research and Development in Technology Education,* (pp1-708). Rotterdam, The Netherlands, Sense Publishers.

Moreland, J., Jones, A., & Barlex, D. (2008). Design and technology, Inside the black box, Assessment for learning in the design and technology classroom. *Dept of Education & Professional Studies Kings College London.*

Yuengyong, C., Jones, A., & Yutakom, N. (2008.) A comparison of Thailand and New Zealand students' ideas about energy related to technological and societal issues. *International Journal of Science & Mathematics Education* (2008)*6*, 293-311.

Jones, A. (2006). Teacher education in New Zealand. In J. Williams (Ed.), *CTTE International Technology Teacher Education*. New York: McGaw Hill.

Jones, A. (2006). The role and place of technological literacy in science teacher education. In K. Appleton (Ed.), *Elementary Science Teacher Education* (pp.197-218). New Jersey: Lawrence Erlbaum.

Moreland, J., Jones, A., & Cowie B. (2006) Developing Pedagogical Content Knowledge for the New Sciences: The example of biotechnology. *Teaching Education, 17*(2), 143-155.

Jones, A., & Baker, R. (2005). Curriculum, Learning and Effective Pedagogy in Science Education for New Zealand: Introduction to special issue. *International Journal of Science Education, 27*(2), 131-144.

Contact Details

Room: B1.06; Phone: +64 7 838 4245; Email: a.jones@waikato.ac.nz

ELAINE KHOO is currently a Research Fellow at the Wilf Malcolm Institute of Education (WMIER) in the Faculty of Education at Waikato University. She had previously worked in Malaysia for 10 years, lecturing and collaborating on research in effective technology-based and online learning environments. Her research interests include pedagogical strategies in technology-based and technology-supported learning environments. She has been involved with a number of externally funded research projects associated with online learning and information and communication technologies (ICTs) and teaching and learning in classrooms and tertiary level. A current two-year externally funded project is Networked Science Inquiry: An investigation in junior secondary science classrooms (NILLS) (with Dr Kathrin Otrel-Cass, Associate Prof Bronwen Cowie and Alison Basel).

Selected Recent Publications

Khoo, E., & Forret, M. (2011). Investigating online student roles as a basis for understanding learning and development in a learning community. In S. Barton, J. Hedberg, & K. Suzuki (Eds.), *Proceedings of Global Learn Asia Pacific 2011* (pp. 1257-1265). AACE. Retrieved from www.editlib.org/p/37328

Johnson, E. M., Cowie, B., De Lange, W., Falloon, G., Hight, C., & Khoo, E. (2011). Adoption of innovative e-learning support for teaching: A multiple case study at the University of Waikato. *Australasian Journal of Educational Technology*, *27*(3), 499-513. Retrieved from www.ascilite.org.au/ajet/ajet27/johnson.html

Khoo, E., & Cowie, B. (in press). Cycles of negotiation and reflection: A negotiated intervention approach to promote online teacher development and transformations. *Educational Action Research Journal*.

Khoo, E., & Forret, M. (in press). Evaluating an online learning community: Intellectual, social and emotional development and transformations. *Waikato Journal of Education*, *16*(1).

Khoo, E., Johnson, E. M.,Torrens, R., & Fulton, J. (accepted for presentation). It only took 2 clicks and he'd lost me: Dimensions of inclusion and exclusion in ICT supported tertiary engineering education. *2011 Australasian Association for Engineering Education Conference*. Western Australia, 5-7 December 2011.

Khoo, E., Forret, M., & Cowie, B. (2010). Lecturer-student views on successful online learning environments. *Waikato Journal of Education*, *15*(3), 17-34.

Otrel-Cass, K, Cowie, B., & Khoo, E. (2010). ICT in support of science teaching and learning: Teaching landforms and erosion. *SET: Research Information for Teachers*, *3*, 15-21.

Khoo, E., & Cowie, B. (2010). Analysing an online learning community from personal, interpersonal and community planes of development. In Z. W. Abas, I. Jung, and J. Luca (Eds.), *Proceedings of Global Learn Asia Pacific 2010* (pp. 4222-4231). Chesapeake, VA: AACE. Retrieved from www.editlib.org/p/34523

Khoo, E., Forret, M., & Cowie, B. (2009). Developing an online learning community: A model for enhancing lecturer and student learning experiences. In Same places, different spaces. *Proceedings ascilite Auckland 2009*. Retrieved from www.ascilite.org.au/conferences/auckland09/procs/khoo.pdf

Contact Details

Room: TW1.09; Phone: +64 7 838 4466 extn 6260; Email: ekhoo@waikato.ac.nz

JOHN LOCKLEY has a background in science and technology and was a secondary school teacher before entering the Faculty of Education in 2000. John has a research interest in teachers' development of curriculum and pedagogy. His current research projects include investigating secondary teachers' development of curriculum and pedagogy in Education for Sustainability and the use of Content Representations (CoRes) as a tool for developing early career teachers pedagogical content knowledge in Technology Education.

John is involved in a number of research and development projects with schools nationally and internationally including;

» The GLOBE programme (Global Learning and Observations to Benefit the Environment) – National and Asia/Pacific co-ordinator from 2000 – 2006
» The UNESCO Baltic Sea Project
» AGENDA21NOW! Student Internet Conference
» Hamilton Boys High School Gully Restoration Project

Selected Recent Publications

Eames, C., Lockley, J. & Milne, L. (2009). Education for Sustainability in primary technology education. In *Education for Sustainability in the Primary Curriculum: A guide for teachers*. South Yarra: Palgrave MacMillan.

Nicholas, M., & Lockley, J. (2009). The Nature of Technology: Teachers understanding of design and knowledge in empowering technological practice in education. In *Proceedings: Napier War Memorial Conference Centre 6-8 October 2009*. Presented at the TENZ 2009, Napier: Technology Education New Zealand.

Parker, M. & Lockley, J. (2009). Design Education: How design in technology education differs from design in industry. In *Proceedings: Napier War Memorial Conference Centre 6-8 October 2009*. Presented at the TENZ 2009, Napier: Technology Education New Zealand.

Lockley, J.W., Eames, C., & Bell, B. (2008, January). Curriculum and pedagogy development in education for sustainability in New Zealand schools. *New Zealand Association for Environmental Education Conference*. St Margarets College, University of Otago, Dunedin.

Lockley, J. (2006). Recycling and education for sustainable development: From global perspective to individual action. *The Baltic Sea Project Learner's Guide 7: Recycling*. Baltic Sea Project, 2006. (Keynote in a Learners': Guide No. 7).

Lockett, J., & Lockley, J.W. (2004, July). The CloudSat education network: An example of a participatory education and outreach project. *Calipso, CloudSat, Aura, & GLOBE (CCAG) Workshop, (pp. 1-20)*. Colorado.

Contact Details

Room: TL.4.01; Phone: +64 7 838 7785; Email: johnl@waikato.ac.nz

KATHY SAUNDERS is a senior lecturer in science, biology and environmental education with both primary and secondary pre-service teachers and teaches in both graduate and undergraduate papers in science, biology and environmental education.

She holds a BSc and DipTchg from University of Auckland, and MSc (Science Education) and SciEdD from Curtin University of Technology, Perth, Western Australia. She has a background in secondary and middle school science and biology teaching in both rural and city schools, before working for a number of years as a secondary science adviser for School Support Services. She has worked extensively in the professional development of teachers for implementation of science and biology curricula and has also worked on contracts for the Ministry of Education and NZQA, mainly in the areas of curriculum review and development, and assessment in science and biology. She has received a British Council Award for services to science education.

Her current research interests are in the field of teaching and learning about controversial science issues, bioethics, and understandings of the Nature of Science in science education at primary, secondary and initial teacher education levels.

Selected Recent Publications

Saunders, K. J. (2010). Engaging with bioethics. A professional learning programme. In A. Jones, M. Reiss & A. McKim (Eds.), *Ethics in the science and technology classroom: A new approach to teaching and learning*. Rotterdam/Taipei: Sense.

Saunders, K J. (2010, May). A pedagogical model for ethical inquiry into controversial science issues. *American Educational Research Association 2010 Annual Meeting: Understanding Complex Ecologies in a Changing World*, (pp.1-33). Denver, Colorado.

Saunders, K J. (2010, July). Teaching and learning about controversial science issues – a professional learning programme for teachers. *Conference of the European Researchers in Didactics of Biology (ERIDOB)*, (pp.1-33). Braga, Portugal.

Saunders, K. J. (2010). Teaching and learning about controversial science issues. *New Zealand Science Teacher*, *125*, 30-33.

Saunders, K., & Anderson, F. (2009, July). Introducing bioethics in to secondary science classrooms. *BIOLIVE 2009 Biennial Conference*. Dunedin; 6-8 July, 2009. University of Technology, Perth, Western Australia.

Saunders, K, J., & Rennie, L. (2009, April). A model for ethical inquiry into controversial science issues, (pp.1-8). *2009 NARST Annual International Conference*. California.

Buntting, C., Ryan, B., Saunders, K., McKim, A., Conner, L., de Luca, R., & Jones, A. (2008, November). Classroom approaches to teaching and learning ethics. In *Conference papers of the NZARE National Conference: Education in Change*. Palmerston North, NZ: NZARE.

Buntting, C., Saunders, K., & Dinnis, D. (2008, July). *Teaching bioethics – an interactive tool for teachers*. Paper presented at Science to Change our World. SciCon 2008. Wellington, New Zealand.

Jones, A., McKim, A., Reiss, M., Ryan, B., Buntting, C., Saunders, K., De Luca, R., & Conner, L. (2007). Research and development of classroom-based resources for bioethics education in New Zealand. *Report commissioned by Toi te Taiao: The Bioethics Council*. Wilf Malcolm Institute of Educational Research, University of Waikato.

Contact Details

Room: TL 4.13; Phone: +64 7 838 4466 extn 7733; Email: kathy@waikato.ac.nz

KARSTEN ZEGWAARD holds a BSc, MSc(Tech)(Hons) and PhD in science from the University of Waikato. He has been a member of the Cooperative Eduction Unit for 13 years. He is also a council member of the New Zealand Association for Cooperative Education, Editor-in-Chief Journal of Cooperative Education and a member of several editorial boards and professional bodies. Karsten undertakes research in work-integrated learning; graduate competencies; student development of professional self-identity; workplace value systems and ethics; preparation for the professional workplace; and student learning of the nature of science.

Selected Recent Publications

Zegwaard, K., & Campbell, M. (2011). *Development towards a professional values framework: Community and practitioners perspectives*. Proceedings of the New Zealand Association for Cooperative Education.

Campbell, M., & Zegwaard, K. (2011). *Ethical considerations and values development in work-integrated learning programs*. Proceedings of the New Zealand Association for Cooperative Education: Vine to Wine: Maturing Coopera.

Zegwaard, K. (2011). Proceedings of the New Zealand Association for Cooperative Education: Vine to Wine: Maturing Cooperative Education.

McCurdy, S., & Zegwaard, K. (2010) *Exploring interventions to enhance faculty involvement in cooperative education*. Proceedings of the New Zealand Association for Cooperative Education.

Contact Details

Room: KP.G.21; Phone +64 7 838 4892; Email: karsten@waikato.ac.nz

CURRENT GRADUATE RESEARCH

The Centre has a large number of graduate students working on a remarkable variety of interesting research projects either by distance or in residence.

Current doctoral students in the Centre are:

Claudio Aguayo (PhD)	Environmental education using ICT in Chilean communities
Vicent Anney (PhD)	Professional Development Approaches for Science and Mathematics Teachers in Tanzania
Irene Barnett (PhD)	Tertiary Physics Education
Vanwyk Chikasanda (PhD)	Technical education in Malawi
Wendy Fox-Turnbull (PhD)	Using autophotography to investigate technology education
Marshall Gass (PhD)	The evolution of ICT as a School Curriculum Subject
Dilani Gedera (PhD)	An activity theory analysis of mediational engagement with e-learning activities
Tatiana Kalnins (PhD)	Whole School Approaches to EfS
Denis Lajium (PhD)	Student mental models of chemical reactions
Nelson Lebo (PhD)	Permaculture in a redesign of secondary science education
John Lockley (PhD)	Teacher professional development and curriculum development in education for sustainability
Louise Milne(PhD)	The Role of LEOTC in primary school technology education
Alcuin Mwalongo (PhD)	Student teachers' perceptions about learning management systems as tools for promoting critical thinking
Nhung Nguyen (PhD)	Enhancing flexible and constructivist learning by integrating information and communication technology
Asaku Openg (PhD)	Pre-service Teacher Education in Education for Sustainability in Papua New Guinea
Franco Rodie (PhD)	Solomon Islands Year 9 Science Teachers Summative Assessment Practice
Mohd Nihra Said (PhD)	Online collaborative learning in Malaysian tertiary education
Lynley Tulloch (PhD)	Ideologies of nature and education for sustainability

Current masters students in the Centre are:

Nicholas Bowskill	Success and failure in technology education
Jared Carpendale	Science education in a museum setting
Kisan Hussain	Mobile learning in the Maldives
Tracey McAllister	ECE – school transition and EE
Wiki Papa	Māori worldviews in NZ taxonomy
Barbara Ryan	Teaching ethics in the primary science classroom: Planning support for teachers
Todd Sharland	Teaching secondary science through Māori stories
Nicole Stevens	Use of Moodle, ICT in Science Education
Suskia Van der Merwe	An investigation into secondary science teachers' use of research findings to inform their science teaching

RECENT GRADUATE RESEARCH

Christine Fenton (PhD)	Science Teaching in Nursing Education Programmes
David Hodges (PhD)	Assessment of Work Based Learning
Elaine Khoo (PhD)	Online learning communities in tertiary education
Michael Michie (PhD)	Cultural issues in science education
David Sade (PhD)	Professional development for TE teaches in the Solomon Islands
Fauziah Sulaiman (PhD)	Improving Physics Learning in Tertiary Education using Problem Based Learning via Web-based Classrooms
Mohd. Zaki Ishak (PhD)	Teachers' Perceptions of an Introduction to Computer Systems

Recent Masters Theses

Osamah Almaghlouth	ICT in Saudia Arabia Schools
Diana Anderson	Indigenous knowledge and environmental education
Margaret Arthur	Development of action competence using EFS in a New Zealand school
Ellison Giano	Science education in the Solomon Islands
Beatrice Moore	Learning food technology outside the classroom: A study of a secondary class visit to a live historical village
Hani Nusantari	Environmental education in Lombok
Thomas Smith	Understanding how an audiovisual introduction engaged GATE students in technology activity
Sue Wake	The Eco-Classroom Project

JOINT PUBLICATIONS

It is encouraged within the Centre to publish research outcomes and present at conferences during the research process. For students this is most commonly done jointly with supervisors, and resources are provided to students to enable them to achieve these research dissemination goals.

Some recent examples of joint publications and presentations are:

Milne, L. & Eames, C. (2011). Teacher responses to a planning framework for junior technology classes learning outside the classroom. *Design and Technology Education: an International Journal*, 16(2), 33-44.

Bowskill, N., Williams, J. & Forret, M. (2011, July). *Teacher's perspectives on vocational training in NZ secondary schools and the new Technology Curriculum*. Paper presented at the PATT Conference, London.

Chikasanda, V., Williams, J., Otrel-Cass, K., & Jones, A. (2011, July). *Students' perceptions towards technology (PATT): A professional development tool for technology teachers*. Paper presented at the PATT Conference, London.

Nguyen, N., Williams, J., & Forret, M. (2011, June). *A Model of integrating constructivist learning principles and ICT*. Paper presented at the 2011 Science Education Symposium, Khon Kaen University, Thailand.

Nguyen, N., & Williams, J. (2011, June). *Science Education in Vietnam: current state and future directions*. Paper presented at the 2011 Science Education Symposium, Khon Kaen University, Thailand.

Lebo, N., & Eames, C. (2010), *Towards ecological literacy: A permaculture approach for junior secondary science*. Paper presented at the New Zealand Association for Environmental Education Biannual Conference, Hastings, New Zealand.

Aguayo, C., Otrel-Cass, K. & Eames, C. (2010, January). *Education for sustainability and Information and Communication Technology: Use of EfS websites for community education*. Presentation to the 6th New Zealand Association for Environmental Education Conference. Hastings, New Zealand.

Said, N.M., Forret, M., & Eames, C. (2010, November). *An online group for collaborative learning in Malaysian pre-service teachers programme*. Virtual presentation to International Conference of Education, Research and Innovation, Madrid, Spain.

Aguayo, C., & Eames, C. (2010, January). *Assessing the Environmental Literacy of a community using a wind farm project as a case study*. Presentation to the 6th New Zealand Association for Environmental Education Conference, Hastings, New Zealand.

PROFESSIONAL DEVELOPMENT

The Centre has a strong commitment to professional development. While the Centre's teaching of courses and supervision of research is one form of professional development, and the involvement in development contracts is another, the Centre is also involved with other activities that assist professional development.

The Centre conducts a series of Autumn and Spring Seminar presentations by staff in areas of their current research. A conference is held each year for doctoral and masters students to present their research; and study groups are supported by the Centre.

Autumn and Spring Seminar Series

In the most recent seminar series, the following presentations were made:

Dr Chris Eames
Becoming green? The durable impact of environmental education experiences on young New Zealanders.

Associate Professor Jenny Young-Loveridge
The challenges for teachers of helping students acquire a range of strategies to solve addition and subtraction problems.

Dr Kathy Saunders
Teaching and learning about ethical inquiry into socioscientific issues.

John Lockley
Activity Theory as an analysis tool for investigating local curriculum development in Education for Sustainability.

Dr Kathrin Otrel-Cass
ICT in support of teaching and learning earth science.

Dr Sashi Sharma
Developing Statistical Literacy with Year 9 Students: A Collaborative Research Project.

Graduate Conference

The Centre holds an annual graduate conference to showcase student work and allow students to gain practise in presenting their work. The presenters at the most recent conference included:

Vanwyk Chikasanda
Enhancing teachers' technological pedagogical knowledge and practices: A professional development model for technology teachers in Malawi.

Irene Barnett
A model for categorizing and developing laboratory course teaching purposes.

Mohd Nihra Haruzuan
Malaysian undergraduate pre-service teachers' perceptions of learning online through the implementation of an online collaborative learning environment.

Ellison Giano
Science teachers' perceptions about doing practical science activities in urban and rural secondary schools in the Solomon Islands.

Chhaya Narayan
Students' perceptions of science and scientists.

Asa Openg
Pre-service teachers' perceptions about environmental problems in Papua New Guinea.

Tatiana Kalnins
The evaluation of the development of a whole school approach to education for sustainability.

Wiki Papa
Te Ao Huirhuri: The juxtaposition of Te Reo Māori, Tikanga and scientific naming protocols for naming new species in New Zealand.

Wendy Fox-Turnbull
A framework for the analysis of the nature of conversation in technology education.

Nelson Lebo
Towards ecological literacy: A permaculture approach for junior secondary science.

Denis Lajium
Students' mental models about chemical reactions.

Fauziah Sulaiman
Improving physics students' creativity thinking using problem-based learning approach in the e-learning environment.

Study Groups

The Centre encourages and supports the formation of study groups to debate and discuss recent research. The Centre currently operates a series of reading groups in research related areas conducted from within the three research groups, the Tertiary Science Education Research Group, the Science & Environmental Research Group and the Technology Education Research Group. These groups meet on an informal basis regularly throughout the year. Interested individuals should contact the Centre director if they wish to be a part of a study group.

CONSULTANCY AND PROFESSIONAL ACTIVITIES

Professional Activities

Chris Eames is the past Chairperson of the New Zealand Association for Co-operative Education and is on the editorial board of the *Journal of Co-operative Education and Internships* and the *Asia-Pacific Journal of Co-operative Education*. He is a committee member of the Waikato branch of the New Zealand Association for Environmental Education.

Kathrin Otrel-Cass is on the organising committee of the NZ Association for Research in Education (NZARE), and is involved with the Geological Society of New Zealand and the Royal Society of New Zealand. She is also a reviewer for the journal *Research in Science Education (RISE)*.

John Williams is a Regional Editor for the *International Journal of Technology and Design Education* and is on the editorial board of the *Journal of Technology Education Design and Technology Education: An International Journal*. He is on the International Relations Committee of the International Technology Education Association, the Education Committee of the Australian Academy of Technological Sciences and Engineering, and the Research Committee of the Council on Technology Teacher Education (USA). He has consulted on Technology Curriculum in South Africa, Australia, Botswana, Mauritius and Seychelles and has been a Visiting Scholar at Nanjing Normal University in Nanjing, China.

Liaison

Centre staff liaise both nationally and internationally with a number of groups including the Ministry of Education, the New Zealand Council for Educational Research, the Royal Society, APEID/UNESCO, ICMI, IASE, New Zealand Science Teachers' Association, Technology Education New Zealand, the National Education for Sustainability Team, ITEA and other centres, for example, in Leeds, London, Reading and Melbourne.

Teacher Fellows

The Centre regularly hosts teachers for Royal Society Teacher Fellowships and other scholarships.

New Zealand Science, Mathematics and Technology Royal Society Teacher Fellows

2004 Mary McPherson
2005 Marianne Robertson and Kathy Paterson
2006 Barbara Ryan and Sara Loughnane
2008 John Dudli, Jenny Mangan, Debra Leong and Colin Milne
2010 Alison Basel

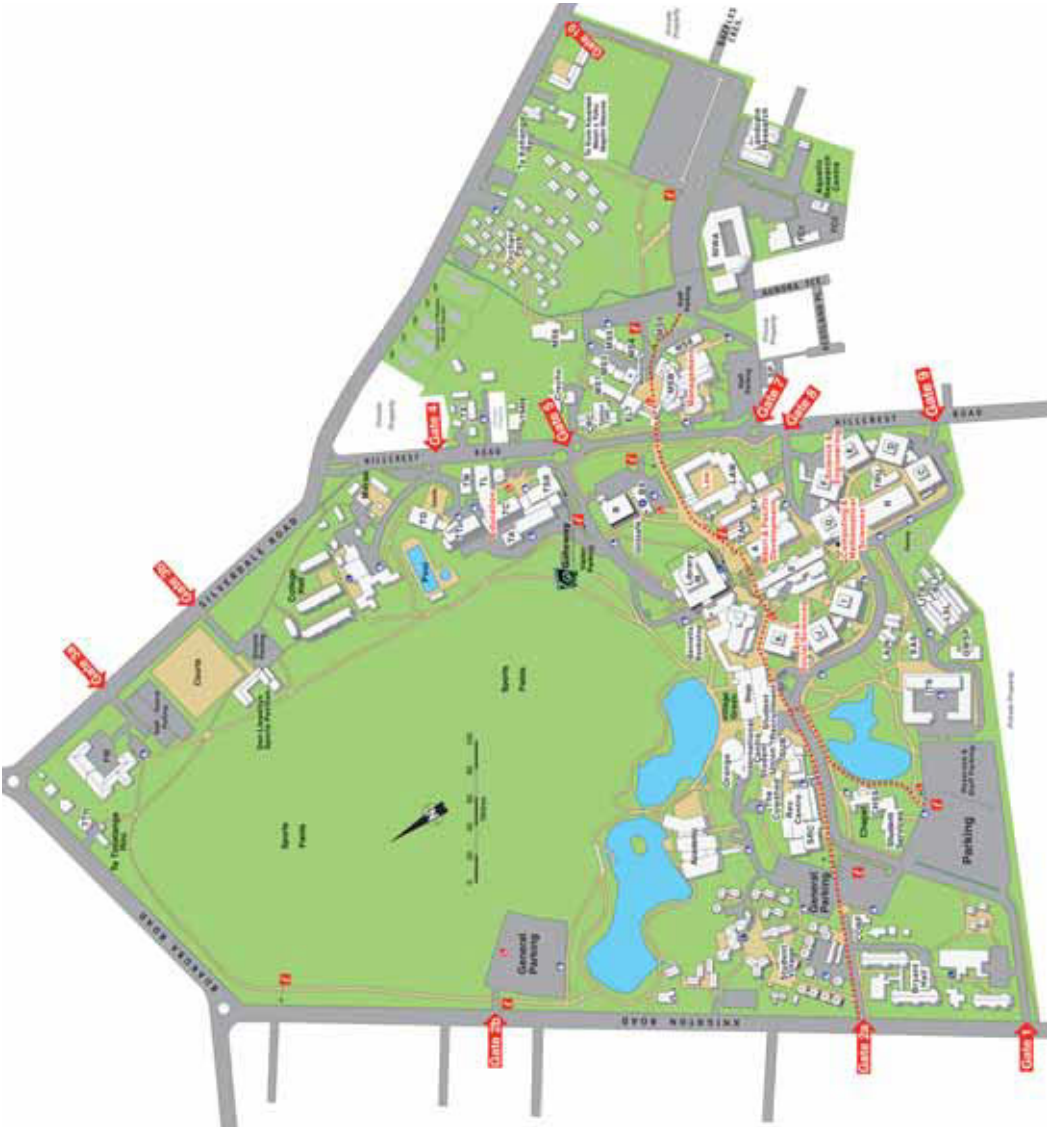
We invite teachers interested in applying for a Fellowship to discuss having the Centre as a host or co-host.

Centre Visitors

The Centre is pleased to host international and national visitors who may be on study leave, or academics who have a research agenda. In 2011 we were visited by numerous casual education visitors from throughout New Zealand and overseas.

Participating Schools 2011

The staff of the Centre are grateful for the help and support of the staff and students from New Zealand schools who were involved in research with the Centre in 2011.



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

BOLD IDEAS. SMART PEOPLE.
UNLIMITED AMBITION.

WHAKAARO PŪKENGA. HINENGARO KOI.
PITO MATA MUTUNGA KORE.

The University of Waikato
Private Bag 3105
Hamilton 3240
New Zealand

Toll Free: 0800 WAIKATO
Website: www.waikato.ac.nz

Centre for Science & Technology Education Research
Phone: +64 7 838 4035
Fax: +64 7 838 4272
Email: cster@waikato.ac.nz
Website: http://cster.waikato.ac.nz