Welcome to Waikato

From modest beginnings in 1964, the University of Waikato is now one of the world’s leading universities, and the university-of-choice for more than 12,000 students annually. Professor Neil Quigley joined the University as its fifth Vice-Chancellor in 2015 and has given fresh impetus to our continued development.

The University campus is undergoing significant enhancement, with construction of the new multi-million dollar Law and Management building well underway. It will provide state-of-the-art facilities for our staff and students.

Research is the University’s lifeblood and we continue to produce research and researchers who are providing genuine answers to some of the key problems being faced by industries, governments and nations. One of New Zealand’s major research organisations, the University of Waikato plays a key role in the regional economy and makes significant contributions to the national innovation system. We have six research institutes which enable our postgraduate students to continually contribute to regional, national and global research. This emphasis on producing meaningful research flows through to our students, who are committed to making a real difference for their employers.

To prepare students for the increasingly competitive job market, we provide work experience while they study, and many courses have components that mirror real-life situations so students are prepared for the challenges they face in the workplace. This creates graduates who are work-ready and attractive to employers.

The University of Waikato continues to provide a dynamic, culturally diverse and inspiring environment for our student population. When you graduate from this university you will be well prepared for the challenges that lie ahead.
Welcome to Te Kura Toi Tangata
Faculty of Education

Kia ora koutou katoa. A very warm welcome to all those who are considering postgraduate research studies in Te Kura Toi Tangata Faculty of Education.

The Faculty is committed to making a difference through its research and we see the research of our students as an integral part of this. Whether you are at the masters or doctoral level, a thesis offers you the opportunity to research an area of interest at an advanced level.

The staff that supervise our thesis students are themselves researchers. They are committed to supporting you to making this is a rewarding experience, but also to ensuring that the research you undertake and the report that it culminates in are of a high standard.

We extend a special welcome to our international students and we value the unique contribution each of you makes to the Faculty’s research activities.

Unlike taught papers, a thesis can at times seem a very solitary endeavour. We recognise this and offer opportunities for our postgraduate students to come together. Some of these sessions are designed to provide specific support to those undertaking theses. At other times, it is simply providing a forum for those on a similar journey to share their experiences. I strongly encourage you to avail yourself of these opportunities.

Professor Roger Moltzen
Dean, Te Kura Toi Tangata Faculty of Education
Welcome to the Technology, Environmental, Mathematics and Science Education Research Centre

This handbook provides information about the work and programmes of the Technology, Environmental, Mathematics and Science Education Research Centre at the University of Waikato. The Centre is situated within Te Kura Toi Tangata Faculty of Education.

The Centre is known throughout New Zealand and internationally for its research and scholarship, 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,
- Mathematics Education, and
- ICT Education in these areas.

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 Centre Team

Mission

The mission of the Centre is to provide national and international leadership, and to conduct research in science, technology, environmental and mathematics 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.
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Note(s): We have endeavoured to ensure that the information in this publication is accurate at the time of printing, 2015. It is subject to a continuous process of review and improvement. Readers should be aware that the 2016 University of Waikato Calendar takes precedence.

The Technology, Environmental, Mathematics and Science Education Research Centre (TEMS Education Research Centre) is the new name for what was previously called the Centre for Science and Technology Education Research (CSTER).
Introduction

The Technology, Environmental, Mathematics and Science Education Research Centre 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 administered within Te Kura Toi Tangata Faculty of Education.

Research in science, technology, environmental and mathematics 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, mathematics 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, Mathematics Education Research Journal and Educational Studies in Mathematics. 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 early childhood to tertiary teaching, learning and assessment, and 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, mathematics 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.

Qualifications

The Centre contributes to postgraduate diplomas and masters papers in science, technology, environmental, and mathematics education, and in educational research. Papers are run in a variety of ways including group seminars and online forums for distance students, allowing for active discussion between participants. In addition, supervision is provided for independent study in small research projects, theses and dissertations.
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 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, environmental and mathematics 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, mathematics 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, mathematics 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, mathematics and ICT education at the local, national and international levels, and suggests ways to improve education in these areas.

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.
Contact details

Further information about the University and Faculties/Schools can be obtained from Te Kura Toi Tangata Faculty of Education Postgraduate Studies in Education Handbook and the 2016 University of Waikato Calendar.

Technology, Environmental, Mathematics and Science Education Research Centre
University of Waikato Private Bag 3105
Hamilton 3240, New Zealand
Phone 07 838 4035
Fax 07 838 4272
Email tems@waikato.ac.nz
Website https://education.waikato.ac.nz/tems

Staff directory

Centre management is comprised of a Director and five research area leaders and an administrator.

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

Research area leaders

Science Education
Anne Hume BSc Auckland, Dip Ed Studies, DipT, MEd, PGCertTT, EdD Waikato

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

Environmental Education
Chris Eames BSc, MSc, PhD Waikato

Mathematics Education
Jenny Young-Loveridge BA(Hons) Otago, DipT Wellington, PhD Toronto

Digitally Mediated Education
Mike Forret BSc Aberdeen, DipT, PhD Waikato

Centre administration
Raewyn Oulton
Research teams

Staff in the Centre’s research teams hold substantive positions in other departments within the University. They are involved in supervising postgraduate research students, teaching in Centre papers, have significant roles in Centre research projects and/or are interested in research in this area.

### Science Education

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<tr>
<th>Leader</th>
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<tr>
<td>Anne Hume</td>
<td>Richard Edwards</td>
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<td>Miles Barker</td>
<td>Mike Forret</td>
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<td>Cathy Bunting</td>
<td>Alister Jones</td>
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<td>Bev Cooper</td>
<td>Kathy Saunders</td>
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<td>Bronwen Cowie</td>
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### Technology Education

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<td>John Williams</td>
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<td>Cathy Bunting</td>
<td>John Lockley</td>
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<tr>
<td>Richard Edwards</td>
<td>Louise Milne</td>
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<td>Mike Forret</td>
<td>Judy Moreland</td>
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### Environmental Education

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<td>Chris Eames</td>
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<td>Miles Barker</td>
<td>Lynley Tulloch</td>
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<td>Richard Edwards</td>
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### Mathematics Education

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<tr>
<td>Jenny Young-Loveridge</td>
<td>Ngārewa Hāwera</td>
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<tr>
<td>Judy Bailey</td>
<td>Carol Murphy</td>
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<tr>
<td>Brenda Bicknell</td>
<td>Sashi Sharma</td>
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<td>Nigel Calder</td>
<td>Merilyn Taylor</td>
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<td>Diana Coben</td>
<td>Judith Mills</td>
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### Digitally Mediated Education

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<tr>
<td>Mike Forret (Leader)</td>
<td>Ann Harlow</td>
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<tr>
<td>Nigel Calder</td>
<td>Elaine Khoo</td>
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<td>Garry Falloon</td>
<td>Merilyn Taylor</td>
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<td>Diane Forbes</td>
<td>Noeline Wright</td>
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Qualifications

Degrees and diplomas

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

- Doctor of Philosophy,
- Doctor of Education,
- Master of Science,
- Master of Education,
- Master of Social Science,
- Master of Arts,
- Postgraduate Diploma (Science Education),
- Postgraduate Diploma (Mathematics Education),
- Postgraduate Diploma (Technology Education),
- Postgraduate Diploma (Education),
- Diploma of Applied Science.

The 180-point masters at the University of Waikato means that you can start and finish this internationally recognised postgraduate degree within 18 months.

A masters programme must include an approved research methods paper and a thesis, or dissertation or directed study.

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, mathematics 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, mathematics or ICT education.

Postgraduate diplomas

The Postgraduate Diploma requires completion of four masters-level papers. Candidates select two papers from offerings in science, environmental, mathematics 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, Mathematics 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 1-1.5 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 Te Kura Toi Tangata 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 2016 University of Waikato 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 contributes to the following papers for masters degrees and diplomas:

- MSTE501-16B (NET);16D Mathematics Education
- MSTE502-16A (HAM); 16A (TGA) Acquiring Numeracy: How Thinking Develops
- MSTE503-15C (BLK); 16D (BLK) Numeracy in the Classroom: Issues and Practice
- MSTE504-16C (BLK) Numeracy Difficulties: Issues and Practice
- STER508-16A (NET) Science Education
- STER511-16A (NET) Technology Education
- STER512-16B (NET) Innovations in Science, Technology and Environmental Education
- STER513-16C (HAM) Environmental and Sustainability Education
- DSOE556-16A (HAM) Research Methods for Teachers
- DSOE557-16A (HAM); 16B (NET); 16C (HAM) Educational Research Methods
- STER590-16C (HAM); 16C (NET); 16D (HAM) Directed Study
- STER592-16C (HAM); 16C (NET) Dissertation
- STER593-16C Thesis (three-paper thesis)
- STER594-16C Thesis (four-paper thesis)
- STER600-16C MPhil Thesis
- STER900-16C 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 or Tauranga. Papers taught wholly online are shown as (NET) (ie B/NET indicates taught online in B Semester). 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 (NET) 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 (STER513-16C and DSOE557-16C).

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

DSOE557-16A (HAM), 16B (NET) & 16C (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

*Co-ordinator:* Associate Professor Garry Falloon 07 838 4466 extn 6553
*Email:* fallong@waikato.ac.nz TL.3.13

*Note(s):* DSOE557-16C (HAM) is taught partially online. Enrolment in DSOE557-16C (HAM) should be completed two weeks prior to the paper commencing.

MSTE501-16B (NET) – Mathematics Education

This paper is designed to enable teachers to develop their mathematics teaching with learners of all ages. Teachers will be encouraged to engage critically with theory and research in mathematics education, focusing on issues such as communication, assessment, and catering for diverse learners.

*Lecturer:* Dr Brenda Bicknell 07 838 4466 extn 6971
*Email:* bicknell@waikato.ac.nz

*Lecturer:* Dr Sashi Sharma 07 838 4466 extn 6298
*Email:* sashi@waikato.ac.nz

*Note(s):* This paper is an approved course for the fee subsidy offered by the Ministry of Education to practising primary and intermediary teachers.

MSTE502-16A (HAM) & 16A (TGA) – Acquiring Numeracy: How Thinking Develops

This paper looks at how students’ thinking becomes increasingly sophisticated as their mathematical understanding grows. A particular focus of the paper is in the Numeracy Development Projects and the use of diagnostic interviews to explore various aspects of students’ mathematical thinking and understanding.

*Lecturer:* Associate Professor Jenny Young-Loveridge 07 838 4466 extn 4353 (Hamilton)
*Email:* educ2233@waikato.ac.nz

*Lecturer:* Dr Nigel Calder 07 377 512 (Tauranga)
*Email:* ncalder@waikato.ac.nz

*Note(s):* This paper is an approved course for the fee subsidy offered by the Ministry of Education to practising primary and intermediary teachers.
MSTE503-16C (BLK) & 16D (BLK) – Numeracy in the Classroom: Issues and Practice
This paper complements the Numeracy Development Project (NDP) professional development programme. The paper provides an in-depth focus on: understanding students’ learning and thinking strategies in mathematics; the number framework for developing students’ number knowledge and strategies; formative assessment tools to enhance quality mathematics teaching; and national and international developments in mathematics education. There will be an emphasis on personal mathematics content knowledge and pedagogical content knowledge in mathematics. The paper is an approved course for the fee subsidy offered by the Ministry of Education to practising teachers.

Lecturer: Associate Professor Jenny Young-Loveridge 07 838 4466 extn 4353 (Hamilton)
Email: educ2233@waikato.ac.nz

Lecturer: Judith Mills 07 838 4466 extn 7872
Email: judith@waikato.ac.nz

Note(s): The 16C(BLK) occurrence is for practising teachers or students who have completed the TEMS324 paper. Students who are not practising teachers or have not completed the TEMS324 paper would be required to enrol in the 16D(BLK) occurrence.

MSTE504-16C (BLK) – Numeracy Difficulties: Issues and Practice
This paper is for numeracy educators and those working with learners of all ages experiencing difficulties in numeracy/mathematics. The paper critically examines research and theory on the causes of these difficulties, as well as focusing on the assessment, diagnosis and remediation. The paper considers broader contextual issues within which the practice of diagnosing and remediating numeracy difficulties sit.

Lecturer: Associate Professor Jenny Young-Loveridge 07 838 4466 extn 4353 (Hamilton)
Email: educ2233@waikato.ac.nz

Note(s): This paper is an approved course for the fee subsidy offered by the Ministry of Education to practising primary and intermediary teachers.

MSTE590-16A (HAM), 16B (TGA), 16C (HAM), 16C (NET) & 16S (NET) – Directed Study 30 points

MSTE592-16A (HAM), 16B (TGA), 16C (NET), 16C (HAM), 16C (NET) & 16Y (BLK) – Dissertation 60 points
STER508-16A (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*

*Co-ordinator: Dr Kathy Saunders TL.4.13 07 838 4466 extn 7733*

*Email: kathy@waikato.ac.nz*
STER511-16A (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:

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.

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.

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.

Co-ordinator: Professor John Williams  K.P.G.28  07 838 4769
Email: pj.williams@waikato.ac.nz

STER512-16B (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.

Co-ordinator: Dr Chris Eames  K.P.G.26  07 838 4357
Email: c.eames@waikato.ac.nz
STER513-16C (HAM) 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 knowledge of national and international research, policy and practice in environmental and sustainability education,

• Develop an awareness of the principles and theoretical ideas which underpin environmental and sustainability education practice in schools and/or the community,

• Develop an understanding of the links of environmental and sustainability education with other bodies of knowledge (eg indigenous knowledges, gender ideas, philosophy/values etc),

• Develop a critical understanding of policies for environmental and sustainability education in New Zealand, and

• Develop an understanding of the teaching and learning approaches that are appropriate to environmental and sustainability education 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.
Co-ordinator: Dr Chris Eames KP.G.26  07 838 4357
Dates/times: 4-8 January 2016, 9am – 3pm followed by online supported learning at your place until April 2016.

STER541 Research Methods in Science, Mathematics and Technology Education
This paper will not be offered in 2016.

STER543 Development Project
This paper will not be offered in 2016.
STER590-16C (NET) & 16D (NET) 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 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 8,000-10,000 words.

Date: Times may be negotiated.

All Centre staff are available for the supervision of projects. Initial contact should be made with:

Co-ordinator: Dr Chris Eames
Email: c.eames@waikato.ac.nz
STER593-16C and STER594-16C 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.

*All Centre staff are available for the supervision of projects. Initial contact should be made with:*

Co-ordinator: Dr Chris Eames  
KP.G.26  
07 838 4357

Email: c.eames@waikato.ac.nz

STER600-16C 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.

*All Centre staff are available for the supervision of projects. Initial contact should be made with:*

Co-ordinator: Dr Chris Eames  
KP.G.26  
07 838 4357

Email: c.eames@waikato.ac.nz

STER900-16C PhD Thesis
The Centre offers a PhD thesis option over three years (full-time) or 5-6 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.

*All Centre staff are available for the supervision of projects. Initial contact should be made with:*

Co-ordinator: Dr Chris Eames  
KP.G.26  
07 838 4357

Email: c.eames@waikato.ac.nz
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
- STER511 Technology Education
- STER513 Innovations in Science, Technology and Environmental Education
- STER590 Directed Study

Jo has a BEd and is a teacher of Year 2 children in a primary school. She has completed a Postgraduate Diploma in Mathematics Education part-time and received a 50% fee subsidy from the Ministry of Education for all three of her mathematics education courses, as follows:

- MSTE503 Numeracy in the Classroom: Issues and Practice
- MSTE502 Acquiring Numeracy: How Thinking Develops
- MSTE504 Numeracy Difficulties: Issues and Practice
- STER590 Directed Study (Her topic was: Multiplicative and Division Problem-Solving of Six and Seven Year-Olds)

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 Education is:

- BIOL572/573 Animal Behaviour and Conservation
- DSOE557 Educational Research Methods
- STER513 Environmental and Sustainability Education
- STER593 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 GradDipT 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
- STER508 Science Education
- STER511 Technology Education
- STER590 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 Master of Education is:

- DSOE557 Educational Research Methods
- STER508 Science Education
- STER594 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 part-time programme for a two-year Postgraduate Diploma is:

- BIOL584/585 Genetics
- STER511 Technology Education
- DSOE557 Educational Research Methods
- STER543 Development Project for a New Biotechnology Unit

David has a BSocSc in Sociology and Education Studies. He has been working as a tutor in adult literacy and numeracy. He completed a Postgraduate Diploma in Education, with a specialisation in Adult Literacy and Numeracy Education as follows:

- DSOE557 Educational Research Methods
- MSTE502 Acquiring Numeracy: How Thinking Develops
- MSTE504 Numeracy Difficulties: Issues and Practice
- ALED525 The Context of Adult Literacy and Numeracy

Meri has a BTchg(Hons) and is a teacher of mathematics in a secondary school. She has completed a Master of Education part-time, as follows:

- MSTE501 Mathematics Education
- MSTE503 Numeracy in the Classroom: Issues and Practice
- DSOE592 Dissertation (Her topic was: Exploring the Mental Strategies of Year 9 Students)

Tui completed her Bachelor of 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 three years is:

- PCSS510 Gender, Race and Education
- STER513 Environmental and Sustainability Education
- STER590 Directed Study on Student Learning Through Recycling
- DSOE557 Educational Research Methods
- STER593 Thesis on Māori Values in Environmental Education

**MPhil**

Jane is an experienced biology teacher. She has a BSc(Hons) and GradDipT and five years of classroom experience. She is interested in improving her classroom practice. Jane enrolls 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 enrolls 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 enrolls for three years of full-time PhD 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.
Research activities

The Centre has been recently involved in the following research:

The Science Learning Hub

The Science Learning Hub is a joint Centre 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.

**Research Team:** Bronwen Cowie, Chris Eames and Mike Forret.

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.

**Research Team:** 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.

**Research Team:** John Williams, Elaine Khoo, Bronwen Cowie, Kathy Saunders and Simon Taylor.

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 and 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.

**Research Team:** 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.

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

Digital Representations of Authentic Student Performance for Assessment

This research will investigate the representation in digital forms of secondary student practical performance in order to deliver authentic formative and summative assessment. The authenticity of the assessment will lie in the extent to which it develops as a natural part of the learning process. The forms of assessment will be structured to align with pedagogies that support performance based learning, and so will enhance both teacher planning for learning, and student reflection and action on their own learning.

Research Team: John Williams, Mike Forret and Richard Edwards.

Using Multiplication and Division Contexts to Enhance Young Children’s Part-Whole Thinking in Mathematics

This study aims to provide young children from diverse cultures with learning opportunities and challenges within the context of multiplication and division. The goal is to help children develop greater understanding of part-whole relationships in mathematics.

The project challenges teachers and children to work with mathematics problems that are not usually given to five and six year-olds. The purpose is to expose children to situations and problems where they work with ‘groups of’ quantities such as pairs of socks (groups of two) and fingers on a hand (groups of five).

Research Team: Brenda Bicknell and Jenny Young-Loveridge.

Researching Teacher Pedagogical Content Knowledge in Environmental Education

This research project is exploring teacher pedagogical content knowledge (PCK) and its manifestation in environmental education (EE) settings. In this project, we trialled the use of a tool known as a Content Representation (CoRE) to see if it was effective in enhancing PCK development for EE teachers. The CoRE represents key concepts to be taught for a particular topic and the pedagogical considerations for this teaching. The research design incorporated a partnership between experienced environmental educators and two classroom teachers to co-design a CoRE for a unit on action-taking for Year 12 students taking Achievement Standard 2.1. The classroom teachers then used the CoRE as a guide to plan and facilitate implementation of the unit in their classrooms. An evaluation of the trial was conducted.

Research Team: Chris Eames, Sally Birdsall, Bridget Glasgow, Robert Forster and Kathryn Jenkin.
Technology Education CoREs

The project aims to investigate the appropriateness and possible redesign of the currently accepted structure of CoREs (Content Representations) in support of the development of technology teachers’ Pedagogical Content Knowledge (PCK). CoREs are a way of articulating what a teacher considers when planning for teaching an area of content to a particular group of students at a particular year level. CoREs represent an holistic overview of a teacher’s PCK. PCK is theorised as being the knowledge that makes expert teachers expert, and acts upon Subject Matter Knowledge (SMK). The concept of CoREs, developed in Science Education, has been shown to be effective in identifying and developing teachers PCK. In previous research by the applicants a significant difference was found in the way CoREs were used by science teachers and technology teachers, raising doubt as to the direct transferability of the structure of CoREs designed for science education to technology education. The nature of knowledge, as well as classroom practice, in technology are significantly different to science thereby providing a theoretical framework and rationale for the research.

Research team: John Williams and John Lockley

Pre-service teachers’ perceptions of technology and technology education

Technology teachers’ perceptions and understanding of the nature of technology heavily influences their perceptions of technology education and consequently shapes their teaching practice. Understanding the nature of technology is also recognised as an important component of technology education and in 2007 the New Zealand technology curriculum introduced a new strand called the Nature of Technology. An important part of initial teacher education programmes is therefore to help student teachers develop their concepts and philosophies of technology and technology education, a goal that is recognised in the Pre-service Technology Teacher Education Resource (PTTER) framework developed by a community of initial teacher education providers within New Zealand and aimed at supporting a coherence of understanding and purpose across institutions. Based on the goals of the technology curriculum and the PTTER framework, this paper reports findings from a survey of New Zealand student teachers’ perceptions of technology and technology education before and after their involvement in a compulsory course in technology education. The findings reported are some of the initial results from one institution but are part of a larger project aimed at bringing together similar data from across the country to inform development of pre-service technology education programmes.

Research team: Mike Forret, Richard Edwards, John Williams and John Lockley.
Staff Profiles

Professor John Williams is the Director of the Technology, Environmental, Mathematics and Science Education Research Centre at the University of Waikato in New Zealand, where he teaches and supervises research students in technology education. Apart from New Zealand, he has worked and studied in a number of African and Indian Ocean countries and in Australia and 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, PCK and electronic assessment of performance. He regularly presents at international and national conferences, consults on Technology Education in a number of countries, and is a longstanding member of eight professional associations. He is the editor of the *Australasian Journal of Technology Education*, advisory editor of the *International Journal of Technology and Design Education*, series editor of the *Springer Contemporary Issues in Technology Education* and is on the editorial board of five other professional journals. He has authored or contributed to over 230 publications, and in 2011 he was elected to the International Technology and Engineering Education Association’s Academy of Fellows for prominence in the profession.

Selected recent publications


Room KP.G.28 Email: pj.williams@waikato.ac.nz
Fax 07 838 4272 Phone 07 838 4769
Anne Hume has been in her current position as senior lecturer in science education since early 2005. She was Chairperson of the MSTE Department from 2013-2014 and Assistant Director TEMS (Science Education) since 2013.

Her research involvement has included membership of the Science Learning Hub (SLH) development team, the Curriculum Implementation Exploratory Studies (CIES) project and a Teaching and Learning Research Initiative (TLRI) project entitled “CoRe: A way to build pedagogical content knowledge for beginning teachers”. She was also Principal Investigator for an FEDU research grant from 2010-2011 entitled CoRe Follow Up with First Year Chemistry Teachers and for a second FEDU funded project entitled Getting to the CoRe of the Matter in 2014 which investigated the review, development and evaluation of a whole-school primary science programme featuring inquiry teaching and learning. Action research into her own tertiary teaching practice has focused on strategies such as reflective writing, role play and Content Representation (CoRe) design to promote student teachers' learning through development of their pedagogical content knowledge (PCK).

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 mental models in chemistry education. Anne serves as an Associate Editor on the Research in Science Education (RISE) journal and on the Editorial Boards of the International Journal of Science Education and NZ Science Teacher journal. She also regularly reviews science education articles for the Journal of Research in Science Education (JRST), Science Education, the Canadian Journal for Science, Mathematics and Technology Education, Asia Pacific Journal of Teacher Education and the Waikato Journal of Education.

Recently Anne was appointed to an adjunct senior lecturer position at the University of Fiji.

Selected recent publications


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 an executive member of the New Zealand Association for Environmental Education (NZAEE) and committee member for the Waikato branch. He is Associate Editor of the Australian Journal of Environmental Education, on the editorial board of the Journal of Environmental Education and acts as a reviewer for Environmental Education Research. Chris also has extensive experience 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). His other research interests are in secondary and tertiary science/biology.

Selected recent publications


Room KP.G.26
Phone 07 838 4357
Email c.eames@waikato.ac.nz
Jenny Young-Loveridge is an Associate Professor with a BA(Hons) from the University of Otago and a PhD from the University of Toronto. She teaches at the undergraduate level in human development and mathematics education, and at the postgraduate level in mathematics education and research methods. She supervises research students in mathematics education. She developed Checkout/Rapua, a supermarket shopping game to assess numeracy on entry to school, distributed to all primary schools in New Zealand (English and te reo Māori versions). Her current research interests include the use of multiplication and division contexts to enhance young children's part-whole thinking. She has published many articles and has authored and co-authored four books. She also regularly presents at international and national conferences, is a longstanding member of six professional associations and is on the editorial board of two professional journals.

Selected recent publications


Young-Loveridge, J. & Mills, J. (2010). "Without maths we wouldn't be alive": Children's motivation towards learning mathematics in the primary years. In B. Maj, E. Swoboda, & K. Tatsis (Eds.), Motivation via Natural Differentiation in Mathematics (pp. 80-90). Wydawnictwo Uniwersytetu Rzeszowskiego, Poland.

Room TL 4.11
Phone 07 838 4353
Email educ2233@waikato.ac.nz
Mike Forret is a senior lecturer in Te Kura Toi Tangata Faculty of Education and 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


Raewyn Oulton joined the Science Education Research Unit in 1987 and works part-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.

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<td>Email</td>
<td><a href="mailto:r.oulton@waikato.ac.nz">r.oulton@waikato.ac.nz</a></td>
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Research area teams

Staff in the Centre's research area teams hold substantive positions in other departments within the University. They are involved in supervising postgraduate research students, teaching in Centre papers, have significant roles in Centre research projects and/or are interested in research in this area. The URL for the profile of each researcher is listed beside their names below.

Science Education

Anne Hume (Leader)  https://education.waikato.ac.nz/about/faculty-staff/?user=annehume
Miles Barker  https://education.waikato.ac.nz/about/faculty-staff/?user=mbarker
Cathy Buntting  https://education.waikato.ac.nz/about/faculty-staff/?user=buntting
Bev Cooper  https://education.waikato.ac.nz/about/faculty-staff/?user=bcooper
Bronwen Cowie  https://education.waikato.ac.nz/about/faculty-staff/?user=bcowie
Richard Edwards  https://education.waikato.ac.nz/about/faculty-staff/?user=richarde
Mike Forret  https://education.waikato.ac.nz/about/faculty-staff/?user=mforret
Alister Jones  www.waikato.ac.nz/research/expertise/staff/AlisterJones.shtml
Kathy Saunders  https://education.waikato.ac.nz/about/faculty-staff/?user=kathy

Technology Education

John Williams (Leader)  http://sci.waikato.ac.nz/about-us/people/jwilliam
Cathy Buntting  https://education.waikato.ac.nz/about/faculty-staff/?user=buntting
Richard Edwards  https://education.waikato.ac.nz/about/faculty-staff/?user=richarde
Mike Forret  https://education.waikato.ac.nz/about/faculty-staff/?user=mforret
Alister Jones  www.waikato.ac.nz/research/expertise/staff/AlisterJones.shtml
John Lockley  https://education.waikato.ac.nz/about/faculty-staff/?user=johnl
Louise Milne  https://education.waikato.ac.nz/about/faculty-staff/?user=louisem
Judy Moreland  https://education.waikato.ac.nz/about/faculty-staff/?user=moreland
Environmental Education
Chris Eames (Leader)  http://sci.waikato.ac.nz/about-us/people/biol2120
Miles Barker  https://education.waikato.ac.nz/about/faculty-staff/?user=mbarker
Richard Edwards  https://education.waikato.ac.nz/about/faculty-staff/?user=richarde
John Lockley  https://education.waikato.ac.nz/about/faculty-staff/?user=johnl
Lynley Tulloch  https://education.waikato.ac.nz/about/faculty-staff/?user=lynleyt

Mathematics Education
Jenny Young-Loveridge https://education.waikato.ac.nz/about/faculty-staff/?user=educ2233 (Leader)
Judy Bailey  https://education.waikato.ac.nz/about/faculty-staff/?user=jlbailley
Brenda Bicknell  https://education.waikato.ac.nz/about/faculty-staff/?user=bicknell
Nigel Calder  https://education.waikato.ac.nz/about/faculty-staff/?user=ncalder
Diana Coben  https://education.waikato.ac.nz/about/faculty-staff/?user=dccoben
Ngārewa Hāwera  https://education.waikato.ac.nz/about/faculty-staff/?user=ngarewa
Carol Murphy  https://education.waikato.ac.nz/about/faculty-staff/?user=carolmm
Sashi Sharma  https://education.waikato.ac.nz/about/faculty-staff/?user=sashi
Merilyn Taylor  https://education.waikato.ac.nz/about/faculty-staff/?user=meta
Judith Mills  https://education.waikato.ac.nz/about/faculty-staff/?user=judith

Digitally Mediated Education
Mike Forret (Leader)  https://education.waikato.ac.nz/about/faculty-staff/?user=mforret
Nigel Calder  https://education.waikato.ac.nz/about/faculty-staff/?user=ncalder
Garry Falloon  https://education.waikato.ac.nz/about/faculty-staff/?user=falloong
Diane Forbes  https://education.waikato.ac.nz/about/faculty-staff/?user=diforbes
Ann Harlow  https://education.waikato.ac.nz/about/faculty-staff/?user=aharlow
Elaine Khoo  https://education.waikato.ac.nz/about/faculty-staff/?user=ekhoo
Merilyn Taylor  https://education.waikato.ac.nz/about/faculty-staff/?user=meta
Noeline Wright  https://education.waikato.ac.nz/about/faculty-staff/?user=noelinew
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:

- **Agnes Akinnuoye (Phd)**
  Secondary students understandings, attitudes and motivations to act towards environmental issues.

- **Debby Bandele (Phd)**
  Environmental literacy of pre-service teachers.

- **Jared Carpendale (Phd)**
  Addressing Senior Physics students' misconceptions by enhancing the PCK around Physics Education of Junior Science Teachers' using CoRE Design.

- **Nelson Cyril (PhD)**
  Models of acid-based reactions.

- **Lorraine Evening (PhD)**
  Enhancing success of Māori and Pacific Island students in science at university.

- **Farshad Hashemzadeh (PhD)**
  Environmental education in secondary schools in Iran.

- **Tatiana Kalnins (PhD)**
  Whole school approaches to EFS.

- **John Lockley (PhD)**
  Teacher professional development and curriculum development in education for sustainability.

- **Judith Mills (PhD)**
  Improving the pedagogical content knowledge of teachers to enable confidence in providing quality classroom mathematics programmes.

- **Kelvin Mills (EdD)**
  The use of numeracy in the workplace by toolmakers.

- **Bruce Moody (PhD)**
  Students’ learning about proportional thinking.

- **Fariba Mostafa (Phd)**
  Use of social media in teacher professional learning in environmental education.

- **Nhung Nguyen (PhD)**
  Enhancing flexible and constructivist learning by integrating information and communication technology.

- **Susan Pudin (PhD)**
  Community-based sustainability education in Sabah.

- **Sela Tapa’atautai**
  Faikoa Ma’a Tonga: Conceptions of professional attitude development and implications for teacher education in Tonga.

- **Mathew TijuThomas (PhD)**
  Implementation of STEM in schools.

- **Sangion Tiu (PhD)**
  Environmental policy in Papua New Guinea.

- **Lynley Tulloch (PhD)**
  Ideologies of nature and education for sustainability.

- **Damon Whitten (PhD)**
  Understanding the role of adult learners' beliefs about mathematics: The impact of an intervention designed to challenge negative beliefs.
**Current masters students in the Centre are**

<table>
<thead>
<tr>
<th>Name</th>
<th>Research Focus</th>
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<tbody>
<tr>
<td>Steven Awape</td>
<td>Exploring quality of mathematics teaching and learning in secondary schools in Papua New Guinea.</td>
</tr>
<tr>
<td>Valerie Bianchi</td>
<td>Conservation Education.</td>
</tr>
<tr>
<td>Kathy Broadhead</td>
<td>Public perceptions of sharks.</td>
</tr>
<tr>
<td>Anita Croft</td>
<td>Environmental education in early childhood.</td>
</tr>
<tr>
<td>Thea de Petris</td>
<td>EE in Taupo</td>
</tr>
<tr>
<td>Surette du Plessis</td>
<td>Assessing secondary school students' beliefs and attitudes towards statistical literacy.</td>
</tr>
<tr>
<td>Sharyn Gee</td>
<td>Views on the effects of digital technologies on teaching and learning in food and textiles education.</td>
</tr>
<tr>
<td>Kisan Hussain</td>
<td>Mobile learning in the Maldives.</td>
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<tr>
<td>Helena Kara</td>
<td>Mathematics for Māori students in mainstream settings.</td>
</tr>
<tr>
<td>Jay Mackenzie</td>
<td>Secondary mathematics teachers’ perspectives on the use of visual representations including manipulatives to teach multiplicative strategies.</td>
</tr>
<tr>
<td>Jo Matthews</td>
<td>The mathematics thinking of Year 3 students in relation to National Standards.</td>
</tr>
<tr>
<td>Christine Murphy</td>
<td>Perceptions and challenges of modern learning practice.</td>
</tr>
<tr>
<td>Helen Twentyman</td>
<td>The impact of integrating mathematics and technology on students’ attitudes towards mathematics.</td>
</tr>
</tbody>
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Recent graduate research

Recent PhD theses

Claudio Aguayo (PhD)  
Environmental education using ICT in Chilean communities.

Vicent Anney (PhD)  
Professional development approaches for science and mathematics teachers in Tanzania.

Wendy Fox-Turnbull (PhD)  
Using autophotography to investigate technology education.

Dilani Gedera (PhD)  
An activity theory analysis of mediational engagement with E-learning activities.

Denis Lajium (PhD)  
Student mental models of chemical reactions.

Nelson Lebo (PhD)  
Permaculture in a redesign of secondary science education.

Joseph Lingawa (PhD)  
An analysis of lessons learned from the outcome-based curriculum: A case study of Madang Province primary schools in Papua New Guinea.

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.

Mohd Nihra Said (PhD)  
Online collaborative learning in Malaysian tertiary education.

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.

Tony Trinick (EdD)  
The Māori medium mathematics register: Challenges for students and teachers.

Recent masters theses

Osamah Almaghlouth  
ICT in Saudia Arabia schools.

Nicholas Bowskill  
Success and failure in technology education.

Jared Carpendale  
Science education in a museum setting.

Ellison Giano  
Science education in the Solomon Islands.

Liz Haines  
Secondary students’ conceptions of sustainability.

Alan Reilly  
Interactive historical sites.

Thomas Smith  
Understanding how an audiovisual introduction engaged GATE students in technology activity.
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:


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 recent seminar series, the following presentations were made:

Chris Eames
Conservation education in New Zealand – research informing practice

John Williams
Research in Technology Education – trends and possibilities

Jonathan Scott, Mira Peter and Elaine Khoo
Swapping is the New Flipping: Preliminary impressions using video lectures in a large, hands-on, class with Threshold Concept emphasis

Jenny Young-Loveridge
Using multiplication and division to enhance young children’s part-whole thinking in Mathematics – Phase 2

Carol Murphy and Nigel Calder
The use of Apps in Maths Education

Mike Forret
Reflections on a career in Science and Technology Research
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:

**Nelson Cyril**
An Investigation of Malaysian Secondary School Students’ Mental Models of Acid-base Chemistry

**Søren Witzel Clausen**
Danish Geography Teachers’ Professional Knowledge and Skills

**Modupe Agnes Akinnuoye**
Understandings, Attitudes and Motivation to act Towards Environmental Issues Among Secondary School Students in New Zealand

**Farshad Hashemzadeh**
Environmental Education in Iranian Secondary Schools

**Jared Carpendale**
Collaborative Core Design and Implementation for Electricity and Magnetism: Enhancing Practising Science Teachers’ PCK

**Chandan Boodhoo**
Assessment for Learning in Design and Technology: A Multi Case Study in Mauritius Secondary Schools

**Tiju Mathew Thomas**
The Application of Mathematics in Design and Technology

**Deborah Bandele**
Evaluation of Environmental Literacy of Pre-service Teachers in New Zealand

**Fariba Mostafa**
Integrating Social Media in Teachers’ Professional Learning in Environmental Education

**Nhung Nguyen**
A Hint of Vietnam’s History and Culture

**Liz Reinsfield**
Technology Teachers’ Perceptions: Who’s in the Driver’s Seat?

**Sharyn Gee**
Participants’ Views on the Effects of Digital Technologies on their Teaching/Learning in Food and Textiles Technology Education

**Richard Edwards**
Assessing Learning in a Collaborative Design Project: A Teacher’s Perspective

**Judith Mills**
The Professional Knowledge Required for Effective Teaching and Learning of Mathematics for Numeracy

**Thea DePetris**
Kids Greening Taupo: Achieving Effective Partnerships between Schools and the Community in Conservation Education

**Sangion Appiee Tiu**
Educating for Sustainability Through Traditional Ecological Knowledge: A Lesson from the Past
Jenny Mangan  
Enhancing Teachers’ Use of Web-based Resources in Technology Education

Monica Peters  
Grassroots Citizen Science in New Zealand: Barriers and Opportunities

Sela Tapa’atoutai Teisina  
An Insider’s Perspectives on Data Collection Experiences

Carrie Swanson  
Expanding Student Perceptions of Scientists Through the Dramatic Technique of ‘Role on the Wall’

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 and 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
Many staff hold leadership positions in relevant professional associations, serve on the editorial boards of journals, review papers for conferences and journals, work with fellow experts on curriculum development and consult on educational projects both in New Zealand and overseas.

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 (www.royalsociety.org.nz) 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
2012    William Van Zyl

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 2011-2015 we were visited by numerous casual education visitors from throughout New Zealand and overseas.

Participating schools 2015
Centre staff 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 2015.