

ISDDE Conference 2009

Principles for Design

Cairns, Australia
28 September - 1st October, 2009

Draft Programme

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ISDDE Conference 2009

Principles for Design

The 5th Annual Conference of the International Society for Design and Development in Education will take place on **Monday 28 September 2009 – Thursday 1st October, 2009** at the Cairns Colonial Club Resort in Queensland, Australia.

This conference will bring together outstanding designers, design project leaders and curriculum innovators from around the world, including the US, the UK, Australia, Japan and the Netherlands, together with a few people from the agencies which commission or support such work. We wish to include designers from developing countries and welcome help in identifying such people.

The conference is intended for all designers, researchers and curriculum leaders who feel affinity with the goals of the society. Since places are limited, attendance at the conference by non-ISDDE members is by invitation only. **However**, we would encourage designers, researchers and curriculum leaders who feel affinity with the goals of the society to submit a short (150 word) account of how their work relates to the focus of one of the working groups. Invitations will be issued on the basis of these. See the [Invitations, Registration and Presentations](#) section for details.

Cairns (latitude 17° south) is the major city in far north Queensland and a gateway to many tourist attractions including the Great Barrier Reef and tropical rainforests. The Cairns Colonial Club Resort is set within 4.5 hectares of tropical gardens, with 3 lagoon swimming pools and 2 resort restaurants, and combines the tranquility of a tropical resort with the advantages of a mainstream hotel. June to September is an excellent time for visiting the tropics.

Key Dates

| | |
|--------------------------|---|
| 30 June 2009 | Early bird registration closes (Save AU\$100!) |
| 15 July 2009 | Submit proposals for presentation in a working group |
| 31 July 2009 | Accepted proposals for presentation announced |
| 31 August 2009 | Final papers for conference website submitted |
| 14 September 2009 | Closing date for registration |
| 28 September 2009 | Conference starts at 5pm |
| 1 October 2009 | Conference concludes at 3 pm |

Working Sessions & Themes

Working groups

The main activities of the conference will be conducted in working groups, each of which focuses on a part of the educational process. The working groups are

- Design of classroom materials
- Design of curriculum documents
- Design of educational software
- Design of assessment
- Designing for system change (including teacher development).

Each person will be a member of one working group. Designers with a major interest in software may choose the software group, or be part of any other group, since all will attend to these possibilities.

Themes

Each of the working groups will explore four themes across the days of the conference.

- Design features that promote inclusion, equity and social justice
- Design features that promote use-ability and uptake
- Design features that promote conceptual development
- Design features that promote intellectual engagement

Invitations, Registration and Presentations

Since places are limited, attendance at the conference by non-ISDDE members is by invitation only. **However**, we would encourage designers, researchers and curriculum leaders who feel affinity with the goals of the society to submit a short (about 150 words) account of how their work relates to the focus of one of the working groups. Invitations will be issued on the basis of these. Please email your submission to Melinda Pearson (admin@aamt.edu.au) with the subject line "Request for ISDDE09 invitation". We can not promise to consider requests received after the 14th August.

All existing fellows of ISDDE should receive their invitations shortly.

Registration

- When you receive your invitation, you will be sent a link to the automated online registration site.
- The "early bird" registration fee is AU\$550 - *this will rise to AU\$650 for registrations after 30 June*; partners can attend the social events for AU\$170. Payment options are by credit card, purchase order, EFT etc. Payment must be completed within 21 days of initial registration, or the registration will be cancelled.
- Before visiting the registration site, decide which working group you wish to join and have your 150 word description (see above) ready to paste in to the site. You can re-enter the site at any time to edit these and add proposals for presentations or demonstrations.

Note: please book your own accommodation.

Presentations

- Participants wishing to make a presentation in a working group should submit a full proposal (3-8 pages) by **15 July 2009** addressing one of the 4 focus themes as it applies to that working group (for example, designing assessment that promotes inclusion and social justice). Proposals should explicitly identify the selected theme. Proposals that are accepted will be published on the conference website so that they are available for pre-reading and will be discussed in the relevant session of the working group.
- As part of the submission process, authors will be requested to give written permission to reproduce their full proposal on a publicly-accessible website.
- Participants are encouraged to submit products for the demonstration sessions. A proposal of approximately 150 words describing the product is required by 15 July 2009.
- Proposals are submitted by re-entering the registration web-site and uploading the file. This can be done at any time.

Participants are also encouraged to submit papers at any time directly to the refereed journal "[Educational Designer](http://www.educationaldesigner.org/ed/contribute.htm)" (please read www.educationaldesigner.org/ed/contribute.htm and look at the style and content of existing papers before starting work). This process is separate to making conference proposals.

Accommodation

Please book your own accommodation.

On-site accommodation can be booked directly with the conference venue, the Cairns Colonial Club resort. Current prices start at AU\$140 per night including breakfast. Contact the Groups Department groups@cairnscolonialclub.com.au OR telephone +617 4053 8849. Use “ISDDE Conference” as the reference to make the bookings at the special conference rate. The contact person is Veronica.

The resort's website is: www.cairnscolonialclub.com.au.

Cairns also has a wide variety of other accommodation.

Transport

Participants staying at Cairns Colonial Club can arrange complimentary airport transfers when booking accommodation.

Private car or taxi is the best option for daily transport from the city centre to the conference venue

Tours

We expect that most participants will see the beautiful areas surrounding Cairns prior to or after the conference. The Cairns Colonial Club can assist with arrangements, if desired: TEL: +61 7 4053 8856; email: tours@cairnscolonialclub.com.au

► [Click here for further details](#) of tours bookable via the Colonial Club.

ISDDE 2009 Timetable

Key Dates

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September 28, 2009

| | |
|----------------------|--|
| 15:30 – 17:00 | ISDDE Executive Meeting |
| 17.00 - 18.00 | Registration |
| | Welcome reception: welcome from conference chair |
| Evening | Conference Dinner: to include ISDDE Presidential Address Presentation of 2009 Design awards |

September 29, 2009

| | |
|----------------------|--------------|
| 09.00 - 09.15 | Introduction |
| 09.15 – 10:30 | Plenary 1 |

| | |
|----------------------|--|
| 10:30 - 11.00 | Coffee break |
| 11.00 – 13:00 | Parallel working groups Designing for intellectual engagement |
| 13:00 - 14.00 | Lunch |
| 14.00 - 16.30 | Parallel working groups Designing for conceptual change Afternoon tea taken at convenience of groups |
| 16.30 - 17.30 | Parallel Demo sessions |
| 18.00 - ... | BBQ at CCC |

September 30 2009

| | |
|----------------------|---|
| 08:45 - 10.00 | Plenary session 2 |
| 10.00 - 10.30 | Coffee break |
| 10.30 - 12.00 | Parallel – working groups Designing for useability and uptake |
| 12.00 - 13.00 | Lunch |
| 13.00 - 14.00 | Parallel Demo sessions |
| 14.00 - 17.00 | Designing for Inclusion, Equity and Social Justice Afternoon tea taken at convenience of groups |
| 18.30 - late | Choice of dinner at CCC or in Cairns restaurants |

October 1st 2009

08:45 - 10.00

Plenary session 3

10.00 – 11:30

Working groups finalise presentations
Coffee break taken when convenient during this session

11.30 - 13.00

Working groups presentations to whole group
1 or 2 design principles for each focus theme

13:00 – 14:00

Lunch

14.00 - 15.00

Closing session: evaluation, future plans

15.00

End conference

Plenary Lecture 1:

Challenges and Issues in Designing and Developing a School Mathematics Curriculum over Contiguous Grade Levels - The Case of Connected Mathematics

Glenda Lappan,
University Distinguished Professor, Department of Mathematics, and

Elizabeth Phillips,
Senior Academic Specialist, Division of Mathematics and Science Education,
Michigan State University.

2008 Joint Winners of 2008 ISDDE Prize for Connected Mathematics.

Designing curriculum materials that engage students in thinking and reasoning about “big” ideas in mathematics is challenging. However, “connecting” related “big” ideas to build materials for a grade level or multiple grade levels raises additional challenges. Effective multi-grade curricula have coherence: they build and connect from problem to problem, investigation to investigation, unit to unit, and grade to grade to grade. Such non-traditional materials require more supportive pedagogies to help teachers engage students. We will articulate key stances on learning and engagement that were played out in the CMP materials and examine the challenges, expected and unexpected, raised in such development work.

Biographical Notes

Glenda Lappan's research and development interests are in the connected areas of students' learning of mathematics and mathematics teacher professional development. She has served as Program Director for Teacher Preparation at the National Science Foundation; President of the National Council of Teachers of Mathematics; Co-Director of Connected Mathematics Project; Chair of the grades 5–8 development of NCTM Curriculum and Evaluation Standards for School Mathematics; Chair of NCTM Professional Standards for Teaching Mathematics; on the National Education Research Policy and Priorities Board; Advisory Board for Education and Human Resources at NSF; Vice Chair of the Mathematical Science Education Board of the NRC; and Chair of the Conference Board of the Mathematical Sciences. She has received a University Distinguished Faculty Award from Michigan State University, the Michigan Council of Teachers of Mathematics Lifetime Achievement Award, the Association of Women in Mathematics Louise Hay Award in Mathematics Education, the Meritorious Faculty award from the MSU College of Natural Sciences at MSU, the George Eastman Medal for Excellence from the University of Rochester, the Glenn Gilbert Award from the National Council of Supervisors of Mathematics, the Outstanding Alumni Award from the University of Georgia, and, with her colleague Elizabeth Phillips, received the Outstanding Curriculum Design Award from the International Society for Design and Development in Education.

Elizabeth Difanis (Betty) Phillips' on-going interests are in the teaching and learning

of mathematics with a special interest in teaching and learning algebra. She conducts numerous workshops for teachers, gives speeches, and is a consultant on mathematics-education at the local, state, and national levels. She is the author of numerous papers and books. Most recently she is a co-author of The Connected Mathematics Project (CMP 1), a five-year NSF-funded project to write, test, and implement a complete mathematics curriculum for the middle grades (1991–1997) and CMP 2 which was also funded by NSF (2000-2006) to revise the CMP curriculum and to develop professional development materials to support the CMP curriculum. She is also a principal investigator for a NSF funded project, the Center to Study Mathematics Curriculum (CSMC 2004-2009). This is a partnership consisting of Michigan State University, The University of Missouri, and Western Michigan to promote leadership and research on all aspects of curriculum, in particular, as curriculum relates to student and teacher knowledge. She is a co- editor of an upcoming NCTM publication “The Best of the Middle School Addenda Series”. Her current work is developing professional development materials using classroom videos to support the implementation of CMP.

Plenary Lecture 2:

Can we make a difference in primary science?

Shelley Peers,
Primary Connections Project, Australian Academy of Science

With less than 3% of teaching time in Australian primary schools being used for science, the *Primary Connections: linking science with literacy* project has been welcomed by Australian teachers. This presentation explores the design principles for the development of the professional learning materials and curriculum resources.

Primary Connections is an inquiry-based approach which embeds the teaching and learning of 'literacies of science'. Units and the professional learning DVD have won the Australian Award for Excellence in Educational Publishing in the Teaching and Learning category. Research on the impact of the program will also be explored.

Primary Connections is an initiative of the Australian Academy of Science and is currently funded by the Australian Government Department of Education with grants totalling AU \$9.7 million from 2005 to 2010. More information is at www.science.org.au/primaryconnections.

Biographical Notes

Shelley Peers is Education Manager at the Australian Academy of Science and Managing Director of their *Primary Connections* Project. She holds a degree in Science and Master of Education (Research) focussing on teacher professional learning. She was a medical biochemist before becoming a primary school teacher. Shelley has also held roles as a syllabus writer, curriculum developer, and manager of science education programs in state and catholic education systems from Preschool to Year 12. She was then Senior Project Officer to the Director of the Queensland Studies Authority before becoming A/Deputy Director of the Strategy Branch. In 2007 Shelley was awarded the Nancy Fairfax Churchill Fellowship to study inquiry-based primary science education programs in France, the UK and the USA.

Plenary Lecture 3:

Values, Principles and Design in Mathematics Education

Malcolm Swan,

Professor of Mathematics Education, Shell Centre, The University of Nottingham, UK. 2008 Joint Winner of ISDDE Prize for The Language of Functions and Graphs

The social, personal and intrinsic values of learning mathematics are widely recognised and are clearly evident in most government reports, national curricula, and examination specifications. There is also substantial agreement, supported by research, as to the principles that should underpin effective teaching and assessment. Often these values and principles remain 'aspirational' and are simply ignored in textbook, lesson and assessment design. In this presentation, I will exemplify some of these values and principles, and show how they can be 'designed into' tasks and teaching materials in ways that resist corruption.

Biographical Notes

Malcolm Swan is Professor of Mathematics Education at the University of Nottingham. He leads the Shell Centre design team, playing the principal role in the design and development of many of its products, including the “boxes” that pioneered the integration of assessment, curriculum and professional development. His research is mainly into the theory, development and evaluation of teaching situations in mathematics education. This includes: the design of situations which foster reflection, discussion and metacognitive activity; the design of situations in which children construct mathematical concepts and develop problem solving strategies; and the design of formative and evaluative assessment. Malcolm has recently led the design of curriculum and professional development resources that have been sent to all mathematics teachers in Further and Secondary Education in England. In 2008 he was awarded one of the first “Eddie’s”, the ISDDE Prize in Educational Design, for *The Language of Functions and Graphs*, also known as “The Red Box”.

Working Group: *Curriculum Documents and Assessment*

Chair: Phil Daro

The following papers provide the background for the work of this group. Please bear in mind that some of these papers are informal, or represent work-in-progress. To enable the working group sessions to focus on discussing these and other issues in relation to the conference themes, we suggest that delegates familiarize themselves with the papers before the session.

The papers described in these abstracts can be downloaded from
<http://www.isdde.org/cairns/wg1.htm>

Designing Assessment of Performance in Mathematics

Hugh Burkhardt and Malcom Swan - Mathematics Assessment Resource Service/Shell Centre

The effective implementation of intended curricula that emphasise problem solving processes requires high-stakes tests that will recognize and reward these aspects of performance across a range of contexts and content. In this paper we discuss the challenge of designing such tests, a set of principles for doing so well, and strategies and tactics for turning those principles into tasks and tests that will work well in practice. While the context is England, the issues raised have wider relevance.

Mapping children's mathematical development in the early years

Brian Doig - Deakin University, Australia

The tasks described here, and those still under development, are in a highly structured format but the look and feel of the tasks, from the children's perspective, is that of games. These games cover a range of aspects of mathematics, including number, chance, measurement, and mathematical structure. All games use simple equipment. An overarching feature that these games have is that they should begin play with concrete materials, and then move on to playing mentally. To date several children have been interviewed and issues with the games revealed. Two examples of games are detailed, and interested parties are invited to comment or participate in further development.

Supporting Targeted Connections: A Call for Cross-Curricular Design

Dr. Cheryl Malm, Northwest Missouri State University;
Dr. Patricia Lucido, Rockhurst University

Current efforts by the National Governor's Association's Common Core Standards Initiative seek to articulate expectations for what students should know and be able to do grade-level by grade-level within a content area (NGS, 2009). There is no indication, however, that any

attempt is being made to correlate topic placement between content areas. Close examination of mathematics and science concepts to identify supporting ideas, processes, and skills would allow the design of parallel curricula that would take advantage of “targeted connections” that arise naturally within the study of a unit. Such parallel programs expand the definitions of integrated curricula and correlated lessons to include the idea of correlated conceptual explorations. (Berlin & White, 1994; Offer & Vasquez-Mireles, 2009). The supporting connections that exist between mathematics and science would be made explicit through the process of aligning the sequence of topics for each grade level across the content areas. This paper will look at the differences between integrated curricula and correlated lessons and the challenges each face. Targeted connections and parallel curricula will be defined and an example of the type of connections that could be exploited to enhance student exploration and understanding of each content area will be given.

SMART Assessment for Learning

***Kaye Stacey, Beth Price, Vicki Steinle,
Helen Chick, Eugene Gvozdenko - University of Melbourne, Australia***

“Specific Mathematics Assessments that Reveal Thinking,” which we abbreviate to “smart tests,” provide teachers with a quick and easy way to conduct assessment for learning. Using the internet, students in Years 7, 8, and 9 undertake a short test that is focused strongly on a topic selected by their teacher. Students’ stages of development are diagnosed, and sent to the teacher immediately. Where available, on-line teaching resources are linked to each diagnosis, to guide teachers in moving students to the next stage. Many smart tests are now being trialled in schools and their impact on students’ and teachers’ learning is being evaluated. Design issues are discussed.

Working Group: *Classroom Materials*

Chair: Susan McKenney

The following papers provide the background for the work of this group. Please bear in mind that some of these papers are informal, or represent work-in-progress. To enable the working group sessions to focus on discussing these and other issues in relation to the conference themes, we suggest that delegates familiarize themselves with the papers before the session.

The papers described in these abstracts can be downloaded from <http://www.isdde.org/cairns/wg2.htm>

A Curriculum Developer Lens on Challenges in US Mathematics Education

Glenda Lappan and Elizabeth Phillips - Michigan State University

The need to improve the teaching and learning of mathematics has been a focus of attention in the US over our entire careers. There have been waves of National interest in mathematics education that have attracted mathematicians and mathematics educators to the work of improving K-12 mathematics education. Today we will focus our remarks in two areas, our own curriculum development work including the story of how we came to engage in and accomplish the work and our comments on the challenges we face in future work to improve mathematics teaching and learning. We expect that many of the challenges we see are also challenges for mathematics education worldwide. First we will share relevant aspects of the work in which our research and development group have engaged for over 35 years. Many of these remarks are based on other papers that we have published about our work. But for this special audience we would like to tell you a bit of our personal stories.

This is a draft of a paper from the forthcoming third issue of [Educational Designer](#).

How to Practice It? An integrated approach to algebraic skills

Alex Friedlander and Abraham Arcavi - Weizmann Institute of Science, Israel

Recently, an increasing number of mathematics educators consider that procedural/transformational and conceptual/sense making activities are intrinsically complementary and should be thoroughly integrated. What kinds of tasks, exercises and problems would engage student learning in such a way that such complementarity is enacted? We propose to answer this question from the perspective of instructional design.

Educative curriculum materials for the integration of writing and science in elementary schools

***Susan Mckenney & Joke Voogt - University of Twente, Netherlands
Willem Bustraan & Mieke Smits - National Institute for Curriculum Development, the Netherlands***

This paper describes how five teachers perceived and operationalized the curriculum embodied in one set of educative materials, with limited additional professional development. All 25 class sessions were observed during the enactment of a five-lesson curricular module on clouds and precipitation, which was designed to facilitate pupils writing about science. All teachers showed less of the suggested teaching practices. Nevertheless all teachers focused most on those practices that were considered most important by the designers, viz. student collaboration and student thinking processes. Teachers were very positive about the possibilities of learning more about integrating writing and science through educative curriculum materials. Further study is necessary to understand what teachers learned from the experience and how this may have affected their practice for the longer term.

Working Group: *Educational Software*

Chair: Peter Boon

The following papers and other resources provide the background for the work of this group. Please bear in mind that some of these papers are informal, or represent work-in-progress. To enable the working group sessions to focus on discussing these and other issues in relation to the conference themes, we suggest that delegates familiarize themselves with the papers before the session.

The papers described in these abstracts can be downloaded from <http://www.isdde.org/cairns/wg3.htm>

Designing Digital Activities

Peter Boon - Freudenthal Institute for Science and Mathematics Education, University of Utrecht The Netherlands

Over the last decade I have designed numerous java applets - English versions of some of these can be found on the [WisWeb](#) website. The background to this work is discussed in my article "[Designing Didactical Tools And Microworlds For Mathematics Education](#)". A recent article on [software design within educational design processes](#) can be found in the May 2009 issue of *Educational Designer*.

In the last few years I have been working on the integration of these digital activities (applets) in longer learning trajectories that are embedded in a digital learning environment. In close cooperation with schools and teachers we have built the DME ([Digital Math Environment](#)). This is an internet based learning environment that is now used by more than 100 Dutch schools. Embedding the applets in the DME offers several new possibilities that improve the usability of applets in educational practices. For example, students' work is stored and can be made accessible for teachers. Also the activities can be arranged and customized by teachers. A recent development within the DME-project is the design of a (mathematical) authoring tool for making new digital activities for students without the need for programming. Applets can now be used (in a flexible way) as interactive components within learning trajectories. I think that the development and use of this kind of authoring facility is necessary in the design of rich and versatile digital curriculum materials.

- ▶ [Designing Didactical Tools And Microworlds For Mathematics Education](#)
- ▶ [Article in Educational Designer](#)
- ▶ [WisWeb website \(English\)](#)
- ▶ [Digital Learning Environment Example](#)
- ▶ [Digital Math Environment](#)

Sophisticated Numeracy Learning Materials

Kees Hoogland APS - National Center for School Improvement, Utrecht, the Netherlands

Connecting mathematics to the real world is often seen as a motivational tool to make mathematics more meaningful and mathematics education more enjoyable. In other cases connecting to the real world is seen as an explicit goal of mathematics education. Not for motivational reasons, not to learn the mathematics from it, but to learn to use the mathematics in real life situations or to cope with quantitative aspects of the world around us. If this explicitly is the case one speaks of numeracy or mathematical literacy. Concepts of numeracy (education) can be arranged along a continuum of increasing levels of sophistication. According to a review of AIR (2006) all of the most recent influential approaches to defining numeracy fall into the so called integrative phase of this continuum. In this phase numeracy is viewed as a complex multifaceted and sophisticated construct, incorporating the mathematics, communications, cultural, social, emotional and personal aspects of each individual in context.

A closer look however at lesson or test materials used in many different countries reveals that most materials consist of word problems or of exercises with formal arithmetic skills. One could say that the sophistication of the concepts runs way ahead of the sophistication of the learning and testing materials. In this era of technological and multimedia possibilities a next step can and should be made to bring real quantitative problems – problems as individuals face them - into learning materials. The new developed web based multimedia learning materials, presented at this conference, use real life situations in a multimedia environment to close as much as possible the gap between the educational setting and the real life use of numeracy.

Designing educational mini-games

***Frans van Galen, Vincent Jonker and Monica Wijers
Freudenthal Institute for Science and Mathematics Education
University of Utrecht, the Netherlands***

Children like playing online mini-games, even if these are about a school topic like mathematics, but do they learn from these games? This paper is about mini-games that aim at problem solving. We shall argue that there is a difference between designing software that will be part of the curriculum, and mini-games that will be played by children unsupervised. One of the difficulties is that the computer stimulates children to experiment, but experimenting may also keep children from thinking through a problem.

Computers in Mathematics Assessment

*Daniel Pead - Mathematics Assessment Resource Service/Shell Centre team
University of Nottingham, UK.*

This paper details recent research and development undertaken at the Mathematics Assessment Resource Service, University of Nottingham, and focusses on three different computer-based assessment projects: The development of problem-solving tests for the World Class Arena project, an evaluation of a new digital version of an existing paper assessment, and a small-scale design research project looking at issues which might arise from computerising an established high-stakes assessment.

The computer is, ultimately, a delivery medium and not tied to any pedagogical theory: these case studies show that solutions can be found to support – and hopefully enhance - very different assessment cultures. They also highlight many technical, practical and organisational issues and how these could, in some cases, unintentionally subvert the educational aspirations of a project.

Working Group: *System Change (including Teacher Development)*

Chair: Chris Schunn

The following papers provide the background for the work of this group. Please bear in mind that some of these papers are informal, or represent work-in-progress. To enable the working group sessions to focus on discussing these and other issues in relation to the conference themes, we suggest that delegates familiarize themselves with the papers before the session.

The papers described in these abstracts can be downloaded from <http://www.isdde.org/cairns/wg3.htm>

The role of key teachers in PMRI dissemination

Sutarto Hadi, Maarten Dolk, Ellen Zonneveld

The demand for PMRI (Indonesian adaptation of realistic mathematics education) implementation in primary schools is high. The capacity of TEC (Teacher Education College) to support the implementation is limited. How to cope with the limited number of faculties staff is an important issue in the PMRI movement. This is the small history of how the role of key teachers was born. A key teacher is a highly motivated teacher who is a role model in the school if it comes to PMRI. A key teacher helps his/her colleagues in designing PMRI lessons, a key teacher is supportive, is teaching together with his/her colleagues, can observe lessons and give feedback.

Teachers have a forum where they can meet regularly, that is called KKG: *Kelompok Kerja Guru* (literally translated: teacher working group). This paper describes how teachers developed into the role of key teachers, what their role in the movement means, how key teachers work together with their KKG forum as a vehicle to disseminate PMRI in their own school.

Creating a Post-Colonial Elementary Education Program

Lisa Blank, PhD, Matthew Schertz, PhD, Georgia Cobbs, PhD
College of Education and Human Sciences, The University of Montana

In 1999, the Montana legislature passed House Bill 528 into law - MCA 20-1-501 - that has become known as Indian Education for All. The IEFA act is the most significant curricular policy decision ever made by the Montana legislature. It has helped to ensure that Native American Studies (NAS) becomes a focal point of our Office of Public Instruction. Tribal Colleges throughout the state, via an initiative entitled the "Montana Tribal History Project," have seen an increase in funding to build

departments that focus on their respective traditions, grants have been distributed to help implement culturally response curricula for K-12 settings both on and off reservations, and multipronged efforts have been initiated to support the growth of NAS throughout Montana's university system. This paper will focus on the how the elementary education program in the College of Education and Human Sciences (COEHS) at the University of Montana prepares future teachers to implement post-colonial curricula enriched by NAS.

System change: Engineering a lever for changing the teaching of science

Christian Schunn
Learning Research and Development Center University of Pittsburgh,
USA

The elementary and secondary science instructional systems in the US are fundamentally broken: most teachers of elementary science and many teachers of secondary science have a weak mastery of the content they are teaching and do not use effective reform pedagogy; US students spend less classroom time on science than students in many other countries; most US textbooks used for science instruction bore the students or confuse the teachers; most US students (and parents) do not value science as an epistemology or career; and most US school districts have low quality and ineffectual professional development communities in science.

There is hope for the designer to instrument long-lasting and meaningful change by using a systems perspective to the design task and incrementally building change from that perspective. This paper outlines this methodology and presents an example from secondary science, based on my work with a wide variety of large urban school districts in the US, trying to produce significant improvements in student learning across the large districts.

Demonstrations

29th September 16.30-17.30; 30th September 13.00-1400 (details TBA).

Engineering is Elementary

Christine Cunningham - Museum of Science, Boston, USA

The Engineering is Elementary: Engineering and Technology Lessons for Children (EiE) project aims to foster engineering and technological literacy among children. EiE is creating a research-based, standards-driven, and classroom-tested curriculum that integrates engineering and technology concepts and skills with elementary science topics. The EiE team is creating 20 units; each unit reinforces an elementary school science topic while focusing on a specific field of engineering. EiE lessons also connect with mathematics, language arts, and social studies.

A unit, composed of four lessons, includes teacher lesson plans, student worksheets, assessments, and background resources. Units begin with storybooks featuring children from a variety of cultures and backgrounds introduce students to an engineering problem. Students are then challenged to solve a problem similar to that faced by the storybook character. Development of a unit is intensive and includes pilot and field testing. Curricular materials that will occupy 7-9 hours of instruction take about 3000 hours of staff time to create. Collection of research and assessment data from both student and teachers is extensive. Statistical analysis of these data indicates that children who engage with EiE learn engineering, technology, and related science concepts better than a control group. This demonstration will begin by familiarizing the group with the curricular materials, their structure and some findings. Participants will then discuss current design attributes and brainstorm other possibilities that help make the materials inviting to a wide range of students, particularly those who are underserved in science and mathematics.

Mathematical Action/Consequence Documents on TI-Nspire (Texas Instruments)

Tom Dick - Oregon State University, USA

Mathematical 'Action-Consequence' interactive documents are essentially learning environments where students interact at the level of the device screen. The design principle guiding the authoring of these documents is the requirement that students be able to immediately take some mathematically meaningful action on an object with an immediately visual (and mathematically meaningful) consequence. There are many Java applets that fit this definition, as well as particular documents authored with software platforms. Our demonstration will be of the TI-Nspire platform, which crosses both computer software as well as a handheld device. TI-Nspire can be used as a mathematical 'toolkit' like a graphing calculator or computer algebra system, but it can also serve as an authoring platform for action-consequence documents. We will

demonstrate several examples, including those that could be used in algebra, geometry, or calculus instruction.

Specific Mathematics Assessments that Reveal Thinking: Making Formative Assessment Practical.

Kaye Stacey - University of Melbourne, Australia

Graph Maker (Grafiekenmaker)

Frans van Galen - Freudenthal Institute, Netherlands

In the project *Mathematics education for the information society* we are developing a computer tool that is meant to help students to go from an elementary understanding of measurement to understanding sophisticated representations such as line graphs.

At ISDDE 2008 I presented a [paper describing the design of this tool](#). Since then new features have been added and new student activities have been developed."

Delegate list

Judy Anderson - University of Sydney

► [Working group: System Change](#)

While currently employed as a senior lecturer in mathematics education at the University of Sydney, I previously worked at the NSW Board of Studies as a senior mathematics curriculum officer with responsibility for developing the current Kindergarten to Year 10 mathematics curriculum. I am particularly interested in the way curriculum presents and encompasses the process strands and teachers' implementation of processes including problem solving. Problem solving is a key component of the school mathematics curriculum throughout the world. However, problem solving is difficult to teach since students need to develop a range of knowledge, skills and attributes. As Australia continues to develop a national curriculum, it is important to learn from other countries about the best approach to including problem solving in the curriculum and supporting teachers to implement recommendations. International approaches to supporting teachers are varied with some countries developing realistic tasks (e.g. Holland), and others reducing the content and providing ongoing professional development (e.g. Singapore). While providing valuable resources and more time are important steps, it is possible that problem solving in the mathematics curriculum will only become valued when it is included in high-stakes assessment. Examining the efforts of other countries and considering the constraints and affordances to teaching problem solving will inform the efforts required for successful national curriculum implementation in Australia.

Peter Boon - Freudenthal Institute, Netherlands

► [Working group: Educational Software](#)

Over the last decade I have designed numerous java applets - English versions of some of these can be found on the [WisWeb](#) website. The background to this work is discussed in my article "[Designing Didactical Tools And Microworlds For Mathematics Education](#)". A recent article on [software design within educational design processes](#) can be found in the May 2009 issue of *Educational Designer*.

In the last few years I have been working on the integration of these digital activities (applets) in longer learning trajectories that are embedded in a digital learning environment. In close cooperation with schools and teachers we have built the DME ([Digital Math Environment](#)). This is an internet based learning environment that is now used by more than 100 Dutch schools. Embedding the applets in the DME offers several new possibilities that improve the usability of applets in educational practices. For example, students' work is stored and can be made accessible for teachers. Also the activities can be arranged and customized by teachers. A recent development within the DME-project is the design of a (mathematical) authoring tool for making new digital activities for students without the need for programming. Applets can now be used (in a flexible way) as interactive components within learning trajectories. I think that the development and use of this kind of authoring facility is necessary in the design of rich and versatile digital curriculum materials.

Hugh Burkhardt - Shell Centre for Mathematical Education, University of Nottingham, UK

► [Working group: Curriculum & Assessment](#)

Hugh Burkhardt takes an 'engineering' view of educational research and development - that it is about systematic design and development to make a complex system work better,

with theory as a guide and empirical evidence the ultimate arbiter. His core interest is in the dynamics of curriculum change. He sees assessment as one important 'tool for change' among the many that are needed to help achieve some resemblance between goals of policy and outcomes in practice. This has been reflected in a series of projects and products that integrate high-stakes assessment, teaching materials, and curriculum development support. www.toolkitforchange.org complements such specific tools by directly addressing the barriers that change agents face in making improvement programmes work in their school systems. This work is ongoing in both the UK and the US. His other interests include making mathematics more functional for everyone through teaching real problem solving and mathematical modeling, computer-aided math education, software interface design and human-computer interaction.

Georgia Cobbs - College of Education and Human Sciences, The University of Montana ► [Working group: System Change](#)

It is the intent of the legislature . . . that every Montanan, whether Indian or non-Indian, be encouraged to learn about the distinct and unique heritage of American Indians in a culturally responsive manner . . . all school personnel should have an understanding and awareness of Indian tribes to help them relate effectively with Indian students and parents . . . Every educational agency and all educational personnel will work cooperatively with Montana tribes . . . when providing instruction and implementing an educational goal (MCA 20-1-501). Challenges with this legislation is how to model curricula and pedagogical frameworks for our students that appropriately incorporates tribal knowledge, diversity, and ways of knowing. Students complete a capstone experience of an integrated block of methods courses: math, social studies, science and reading. Faculty that teach these courses collaborate to ensure that the fundamental values of IEFA are addressed in a systematic, authentic, and intellectually rigorous manner.

Mark Coleman - Melbourne Grammar School, Australia ► [Working group: System Change](#)

For the past 9 years I have taught Science exclusively with Y7 & 8 boys. Under the umbrella of the Ithaka Project, this time has allowed me to develop a clear view of what junior science is in terms of its content, responsibilities and how it relates to other disciplines. In particular I have endeavoured to find and develop authentic classroom activities and assessments that reflect my values and which have a clear purpose to my students. This search has forced me to overhaul the area of the school for which I am responsible. Having to bring other staff along required system change and, most importantly, clear justifications for that change and obvious benefits for the other staff involved. This has involved clarification of the meaning of language we commonly used, establishment of a reputation within our organisation as agents of change, consistent encouragement of cross-campus communication and a clear willingness to bridge the perceived gap between theory and practice.

Rita Crust - Shell Centre for Mathematical Education, University of Nottingham, UK ► [Working group: Curriculum & Assessment](#)

I am the lead designer in the Mathematics Assessment Resource Service, MARS, Shell Centre team with particular responsibility for assessment design. I am an experienced teacher, teacher educator, chief examiner and designer of curriculum and assessment. I lead the design of MARS US tests and classroom assessment tasks and co-ordinate the design work of MARS for several projects. For many years I have been a Principal Examiner in Mathematics for various UK examination boards. Since 1982 the MARS team has designed and developed assessment tasks and support materials specifically to

stimulate systemic improvement, funded by Government agencies, large-scale assessment providers, foundation and school systems in the UK and the US (including NSF, CTB, Noyce Foundation, and various school systems) The MARS materials are developed and refined through an iterative process of testing in classrooms, using feedback to guide revision until they work well with the target groups of users. The initial trials are qualitative: for assessment tasks the later stages provide psychometric data and robust scoring schemes reinforced by specimen responses.

Christine Cunningham - Museum of Science, Boston, USA

► [Working group: Classroom Materialst](#)

I am the founder and director of the Engineering is Elementary: Engineering and Technology Lessons for Children (EiE) project. EiE is creating a research-based, standards-driven, and classroom-tested curriculum that integrates engineering and technology concepts and skills with elementary science topics. The EiE team is creating 20 units; each unit reinforces an elementary school science topic while focusing on a specific field of engineering. EiE lessons also connect with mathematics, language arts, and social studies. In addition to curriculum and resource development, the project also engages in professional development, and research and assessment. One of my areas of interest focuses on how to design materials that work for all children. I am especially interested in design that will invite and engage students who have traditionally been underrepresented in science and engineering, and underserved by the educational system. Such "at risk" populations include girls, minorities, people with disabilities, children on Individualized Education Plans, English Language Learners, and children from low socioeconomic backgrounds. Understanding how to foster and scaffold all students' conceptual understanding, inquiry, and problem solving skills has been a central theme of our work. Another area of interest is the interplay between research and curriculum development, particularly when you are exploring a relatively new domain like elementary engineering about which little is known. How can we best structure research projects so they both inform and are informed by development and testing? What constraints and opportunities do such opportunities present?

Phil Daro - University of California, Berkeley, USA ► [Working group: System Change](#)

Phil Daro currently directs the development of a middle school mathematics program inspired by the Japanese curriculum, works on advancing the design and use of leadership tools for change at every level of the educational system, and consults with states and school districts on their accountability systems and mathematics programs. He has served as Executive Director of The Public Forum on School Accountability, directed the New Standards Project (leader in standards and standards based test development) and Research and Development for the National Center for Education and the Economy (NCEE), responsibilities included test development, development of mathematics curriculum, and staff development programs, consulted to the New York City School District, the El Paso Collaborative, Los Angeles School District, Chicago Public Schools, Denver Public Schools, states of Vermont, Georgia, Kentucky, Rhode Island, and California and others. He directed large scale teacher professional development programs for the University of California including the California Mathematics Project and the American Mathematics Project. His sixteen years at the University included six years directing projects to help states develop standards, accountability and testing systems. He has held leadership positions with the California Department of Education. Mr. Daro has served on a number of California and national Boards and committees including: NAEP Validity Committee; RAND Mathematics Education Research Panel; College Board Mathematics Framework Committee; ACHIEVE Technical (Assessment) Advisory Group,

Mathematics Work Group; Technical Advisory Committee to National Goals Panel for World Class Standards, National Governors Association; Title I Commission organized by Council of Chief State School Officers; Mathematical Sciences Education Board of the National Research Council; California Public Broadcasting Commission; and The Accrediting Commission for Senior Colleges and Universities (WASC). He has taught mathematics and is the father of three daughters.

He is Vice-Chair of ISDDE.

Frank Davis - TERC, Cambridge, Mass. USA

► [Working group: System Change](#)

I lead a non-profit research and development group that has as a mission improved mathematics and science learning for diverse communities of learners. This work assumes that system reform and change in both formal and informal learning and teaching environments.

Tom Dick - Oregon State University, USA

► [Working group: Educational Software](#)

Lewis Lum and Tom Dick have been working extensively with the TI-Nspire software platform in designing what have come to be called 'Action-Consequence' interactive documents. These are essentially learning environments where students interact at the level of the device screen. The design principle guiding the authoring of these documents is the requirement that students be able to immediately take some mathematically meaningful action on an object with an immediately visual (and mathematically meaningful) consequence. We have several examples of such environments produced for use with elementary algebra and geometry topics and are currently pursuing a collection for use in calculus instruction.

Brian Doig - Deakin University, Australia

► [Working group: Curriculum & Assessment](#)

Current work involves the design of mathematical tasks to elicit young children, "developing mathematical understandings. The target group of children are those in their prior-to-school years: that is, no formal education in mathematics as yet. The tasks are in a highly structured format but the look and feel of the tasks, from the children's perspective, is that of games. It is the intention that children's responses to these games will be placed on a continuum of mathematical development to allow early childhood educators to gauge and address children's mathematical needs. The games cover a range of aspects of mathematics, including number, chance, measurement, and mathematical structure. All games use simple equipment. An over-arching feature that we wish these games to have is that they should begin with play with concrete materials, and then move on to playing mentally. To date several children have been interviewed and issues with the games revealed. Discussion within the working group is seen as assisting in the development of better tasks (games).

Alex Friedlander - Weizmann Institute of Science, Israel

► [Working group: Classroom Materialist](#)

Working for 35 years in design of activities, comprehensive curriculum projects and research on learning materials at the middle grades and elementary levels.

Frans van Galen - Freudenthal Institute, Netherlands

► [Working group: Educational Software](#)

I am a designer of curriculum materials for mathematics education in primary schools. One of my projects is www.rekenweb.nl, a website with mathematical games. Another project is

on the 'mathematics of change' and the use of the computer to help children understand graphs.

Louis Gomez - University of Pittsburgh, USA

► [Working group: System Change](#)

One definition of scale is successfully catalyzing collective action. Our work on the analysis, design, and implementation of networked improvement communities in education aims to specify principles and workable social arrangements that support diverse groups of people working on shared problems within a common framework. This framework specifies common outcomes and how improvement transpires as a function of collective action. We hypothesize that designing tools that operationalize the common framework in a usable form is important for catalyzing and coordinating system change.

Sutarto Hadi - Lambung Mangkurat University, Indonesia

► [Working group: System Change](#)

The demand for PMRI (Indonesian adaptation of realistic mathematics education) implementation in primary schools is high. The capacity of TEC (Teacher Education College) to support the implementation is limited. How to cope with the limited number of faculties staff is an important issue in the PMRI movement. This is the small history of how the role of key teachers was born. A key teacher is a highly motivated teacher who is a role model in the school if it comes to PMRI. A key teacher helps his/her colleagues in designing PMRI lessons, a key teacher is supportive, is teaching together with his/her colleagues, can observe lessons and give feedback.

Teachers have a forum where they can meet regularly, that is called KKG: *Kelompok Kerja Guru* (literally translated: teacher working group). This paper describes how teachers developed into the role of key teachers, what their role in the movement means, how key teachers work together with their KKG forum as a vehicle to disseminate PMRI in their own school.

Laurence Holt - Wireless Generation, USA

► [Working group: Curriculum & Assessment](#)

Wireless Generation creates innovative tools, systems, and services that help educators teach smarter. With its mobile assessment software, the company invented a better way to give classroom assessments and make data-based instructional decisions. Now Wireless Generation has broken new ground with technology that analyzes student data and customizes curriculum to individual learning needs. Wireless Generation also builds large-scale data systems, such as New York City's ARIS, that centralize student data and give educators and parents unprecedented visibility into learning. A Web 2.0 collaboration and knowledge network for educators propagates proven approaches across schools. Wireless Generation currently serves more than 200,000 educators and 3 million students. More information is available at www.WirelessGeneration.com.

Kees Hoogland - APS - Dutch National Centre for School Improvement

► [Working group: Educational Software](#)

I am an international consultant and researcher in mathematics education and mathematical literacy. During the 1980s and 1990s I was co-author and editor of a successful mathematics textbook series for secondary education in the Netherlands: *Moderne Wiskunde*. From 2001 I have been involved as a project leader in the support project for the Indonesian PMRI movement. One of the focal points of that project is the creation of a bottom up Indonesian text book series on realistic mathematics for primary education. From 2000 I have been a key person in the development of Mathematical Literacy in the Netherlands which resulted in a project to develop web based multimedia

learning materials for vocational and adult mathematics literacy education, which I am leading. Their designing is an attempt to create exemplary materials for a sophisticated numeracy concept. My research supports this design and focuses on how people learn and use numeracy skills in everyday life and working situations.

Glenda Lappan - Michigan State University, USA ► [Working group: Classroom Materialst](#)

The curriculum materials used to engage students in learning mathematics are one of the central tools available to teachers at a grade level. The CMP design team considers the following kinds of questions to drive the mathematics to be developed: What is the central mathematics theme for a particular grade level? How is it chosen? What is important for students at the grade level to know and be able to do? How does this theme interact with other supporting themes for the grade level? How is the mathematics of a grade level knitted together with the mathematics to be developed in the next grade level? How does the mathematics build on the grade level before the target grade level? How well do the problems selected for development in the materials promote mathematics proficiencies for students including conceptual understanding, procedural fluency, strategic competence (the ability to formulate, represent, and solve mathematical problems), and adaptive reasoning (the capacity to think logically and to informally and formally justify one's reasoning)? (NRC, 2001, p. 131) Interactions around such design 'principles' and goals can push the discussion group to consider alternatives that may lead to more powerful, useful, and engaging mathematics experiences for students.

Editor's note: In 2008 Elizabeth Phillips and Glenda Lappan were awarded one of the first 'Eddies' - the [ISDDE Prize in Educational Design](#) - for *Connected Mathematics*.

Patricia Lucido - Rockhurst University, USA ► [Working group: Curriculum & Assessment](#)

Would connecting the study of appropriate elementary/middle science concepts to the logical sequence of concepts outlined in most elementary/middle mathematics curricula strengthen students' understanding and performance? Would leveraging the science curriculum to provide the context and the mathematics curriculum to provide the skills and critical thinking increase student comprehension and achievement? We believe a restructured sequence coordinating existing elementary/middle math and science curricula incorporating cross-field connections to leverage a transfer of knowledge would strengthen students' understanding. Continuum models developed to characterize the nature of integrated curricula can be modified to provide a theoretical basis for coordinating existing but separate, mathematics and science curriculum, building upon the natural connections between the disciplines. Within a unit of study some concepts are discipline-specific and should be studied as such but some concepts might be enhanced with supporting concepts from the other discipline. Taking advantage of these natural "targeted connections" requires well-coordinated curricula that are closely aligned and taught simultaneously. Research-based mathematics and science curricula with documented evidence of positive impacts on student performance would be examined to create detailed concept maps outlining the concepts and processes found in each unit. A coordinated scope and sequence chart detailing when each concept or skill is taught would facilitate the creation of an instructional timeline coordinating the units across the disciplines. As the curricula examined already have documented evidence related to student success, additional gains would be attributed to the sequence in which the units are presented and the impact of the "targeted connections" lessons incorporated.

Lewis Lum - University of Portland, Oregon, USA. ► [Working group: Educational Software](#)

I am a 'tech resource' for TINspire.

Cheryl Malm - Northwest Missouri State University, USA ► [Working group: Curriculum & Assessment](#)

See [Patricia Lucido](#) for paper synopsis.

Susan McKenney - University of Twente, Netherlands ► [Working group: Classroom Materialist](#)

I have a background in early childhood education, although I have also taught and conducted research in primary as well as junior secondary schools. In recent years, I have grown especially interested in exploring and supporting the interplay between curriculum development and teacher professional development. During the last 10 years, I have been engaged in a variety of design-based research endeavors that strive to maximize the natural synergy between these two processes. Much of my work on "learning by design" relates to designing teacher guides, learner material or other supportive curriculum documents.

Will Morony - Australian Association of Mathematics Teachers ► [Working group: System Change](#)

As Executive Officer of Australia's national association for teachers of mathematics my work has an emphasis on informing and supporting 'change'. The scale for these changes ranges from the individual teacher - through, for example, materials and initiatives to assist teacher professional development - through to the national - in relation to curriculum, policies and programs. The extent to which 'design' principles can guide my work varies with the locus of control for the program funding, but my goal is to increasingly work and argue from a design-based perspective.

Daniel Pead - Shell Centre for Mathematical Education, University of Nottingham, UK ► [Working group: Educational Software](#)

I have been working on the design and development of educational software since 1984 - including small applets for mathematics education (some of the software which used to accompany Malcolm Swan's red book), multimedia products (I made major contributions to the design of the Bowland Maths professional development materials) and computer-based assessment (design of problem solving tasks for the World Class Tests project). A recurring interest is how to produce computer-based materials which support and encourage good teaching and assessment practice, ensuring that the technology is a means to an end, not an end in itself. Technology can greatly enrich teaching and assessment, but over-enthusiastic use may also promote a reductive, over-structured approach which is anathema to many current pedagogical aspirations (such as true formative assessment and promotion of thinking skills and less structured activities). I feel that a key solution to this is to promote a better mix of educational and technological skills amongst software designers, to ensure that the products match the pedagogical objectives.

Shelley Peers - Primary Connections Project, Australian Academy of Science

I am Project Director for 'Primary Connections: linking science with literacy' which combines professional learning with curriculum resources for use in Australian primary schools to improve the teaching and learning of science. Expanding uptake of the inquiry-based approach is our current challenge, hence I would be interested in hearing about work in this area. In particular, the strategies for building relationships with education

departments, principals and teachers; processes for systemic engagement; adoption of scalable models of professional learning for sustainability. We have published a professional learning training manual and DVD, and 19 curriculum units in hard copy, with accompanying web resources such as a unit planner and assessment rubrics. We have trained approx 400 facilitators, 900 curriculum leaders, and 125 university lecturers and tutors in the approach.

Elizabeth Phillips - Michigan State University ► [Working group: Classroom Materialst](#)

My work (with Glenda Lappan, James Fey, and Susan Friel) involves designing, developing, field-testing, and evaluating a problem-centered mathematics curriculum for middle school teachers and students. This work involves identifying the important mathematical ideas relevant to the middle grades, unpacking the understanding of these ideas and then embedding these understandings in a sequence of problems (sometimes called hypothetical learning trajectories) that help students develop the understanding. Furthermore these mathematical sequences must build on each other to form a unit and in turn units must build on and connect to previous units within a grade and across grades to form a complete and coherent curricula - both for students and teachers. The work has been challenging, but promising. We are doing an in depth analysis of the curriculum to find opportunities to strengthen students' mathematical understanding and reasoning and to find ways to talk about curriculum development that might be helpful to future generations of curriculum developers.

Editor's note: In 2008 Elizabeth Phillips and Glenda Lappan were awarded one of the first 'Eddies' - the [ISDDE Prize in Educational Design](#) - for *Connected Mathematics*.

Robyn Pierce - University of Melbourne ► [Working group: Classroom Materialst](#)

I am interested in researching principles for the design of lessons that help teachers access the various potential affordances of technology for teaching mathematics. In the past two years we have studied the design of lessons through a process akin to „lesson study“. This process is usually used to promote teachers' professional development but in our case the focus was on the lesson rather than the teaching per se. Each of three lessons has been developed by the research team in collaboration with teachers. The lesson, as planned, was taught with other teachers and some researchers observing. Feedback was provided by way of a survey of all participants (including students) and a focus group discussion with teachers and researchers. The lesson was revised in the light of this feedback and then introduced to a second school where the process was repeated.

Christian Schunn - Learning Research and Development Center University of Pittsburgh, USA ► [Working group: System Change](#)

Designing for systems change requires taking a systems perspective to the design task, which involves three elements. First, it involves developing a model of the overall system to be changed (i.e., what subsystems are a critical element of the overall functioning system that needs to be changed). This step helps to ensure that the design includes all the critical elements. Second, it involves determining requirements associated with key decision makers (e.g., consistency with existing policies, dimensions of change that are valued by decision makers). Third, it identifying resources available for use (e.g., existing materials, partners, teacher training opportunities). Because the systems change is typically much too large to be accomplished all it once, design for systems change will typically also require a growth model, which often is a capacity-building theory of action. I will present an example in which this approach was taken to reform science teaching at the middle school level in a large US school district. A variety of data was collected and we found that very substantial

change took place over the course of two years, as well as creating capacity for later reform work. But lessons were also learned about how this systems change work could have been even more effective.

Matt Skoss - NT DET/Possum Educational Services, Australia

► [Working group: System Change](#)

Involved in the provision of professional learning experiences (Mathematics with integration of ICT) to classroom teachers (EC to 12), as well as supporting leading teachers in their role of providing strategic support to teachers at a school/regional level. Classroom teachers supported included those in remote Indigenous settings. Interested in exploring the application of Web 2.0 tools (eg. wikis, nings, twitter, etc) as well as hardware enabling collaboration (eg. iPod Touch).

Kaye Stacey - University of Melbourne, Australia

► [Working group: Curriculum & Assessment](#)

I am currently conducting, with my colleagues, a research and development project on the design of formative assessment. The main research question is how to make formative assessment 'educationally tractible'. We are writing 'specific mathematics assessments that reveal thinking', which we call smart-tests. These provide teachers with almost immediate computer-based diagnostic assessment on students' conceptual understanding on a wide range of topics.

Elizabeth Stage - Michigan State University, Australia

► [Working group: System Change](#)

I've worked on standards, assessments, professional development, curriculum materials, and policy. I'm still trying to figure out how to improve math and science teaching and learning. Why is it so hard to overcome the status quo, at least in the U.S., at least in California?

Max Stephens - University of Melbourne, Australia

► [Working group: Curriculum & Assessment](#)

My current research uses number sentences involving two unknown numbers to identify some key junctures between relational thinking on number sentences and an ability to deal with sentences involving literal symbols. I have developed a questionnaire which focusses on how students are able to make generalisations on sentences involving two unknown numbers, and how these influenced their performance on sentences involving literal symbols. The questionnaire has now been translated and used with success in China, Brazil and Indonesia as well as in Australia. It aims to identify some key linkages as students make a transition from arithmetic to algebra.

Malcolm Swan - Shell Centre for Mathematical Education, University of Nottingham, UK

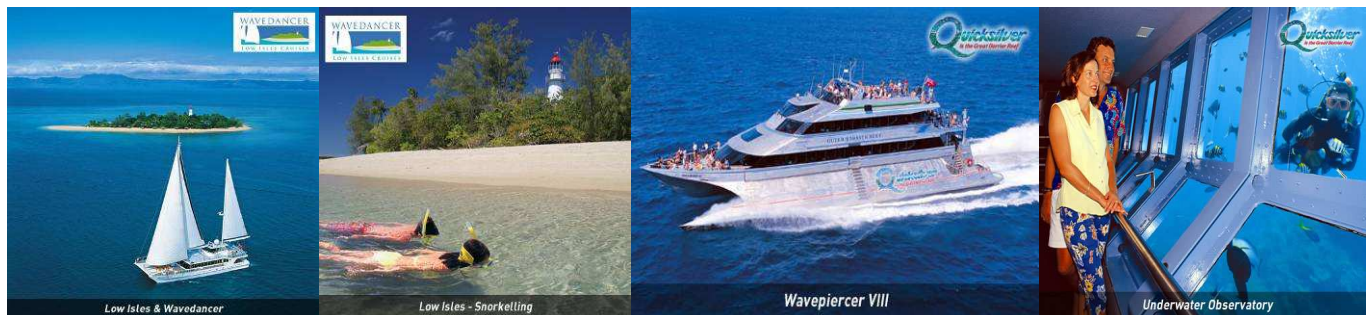
► [Working group: Curriculum & Assessment](#)

Malcolm Swan is Professor of Mathematics Education at the University of Nottingham. He leads the Shell Centre design team, playing the principal role in the design and development of many of its products, including the 'boxes' that pioneered the integration of assessment, curriculum and professional development. His research is mainly into the theory, development and evaluation of teaching situations in mathematics education. This includes: the design of situations which foster reflection, discussion and metacognitive activity; the design of situations in which children construct mathematical concepts and develop problem solving strategies; and the design of formative and evaluative assessment.

Malcolm has recently led the design of curriculum and professional development resources that have been sent to all mathematics teachers in Further and Secondary Education in England.

Editor's note: In 2008, Malcolm was awarded one of the first 'Eddies' the ISDDE Prize in Educational Design, for *The Language of Functions and Graphs*, also known as 'The Red Box'.

CAIRNS TOUR OPTIONS – 2009



GREAT BARRIER REEF

The Great Barrier Reef has a range of different options to allow you to experience its unique beauty.

BOAT - Diving and snorkeling from a boat is a great way to see the Outer Great Barrier Reef and is a fantastic experience.

- **Silverswift** (departing from Cairns) – Visit 3 sites at the Outer Barrier Reef and spend a leisurely 5 hours at play.
<http://www.silverseries.com.au/swift.htm>
- **Silversonic** (departing from Port Douglas) - At Agincourt Ribbon Reef, you'll have access to 3 different exclusive dive and snorkel sites
<http://www.silverseries.com.au/sonic.htm>

PONTOON - Going out to one of the platforms on the outer reef is a great trip for those that don't want to spend all day in the water but want to experience as much of the reef as they can.

- **Quicksilver** – Outer Barrier Reef Pontoon located on Agincourt Reef. Choose to dive, snorkel, or stay dry and explore the stunning reef from the comfort of a Quicksilver semi-sub, just one metre underwater.
<http://www.quicksilver-cruises.com/wavepiercer.htm>

ISLAND - Spend a day exploring one of the various islands near Cairns and the inner reef.

- **Green Island (Great Adventures)** - Stroll through magical rainforest, laze on the white coral sands, swim, dive or snorkel amongst an amazing display of tropical fish and coral gardens, or enjoy the well appointed day visitor facilities
<http://www.greatadventures.com.au/tours/green-island.html>
- **Low Isles (Quicksilver Wavedancer)** - Set like a jewel in a Great Barrier Reef lagoon, Low Isles is an idyllic, unspoilt coral island that appeals to everyone. The wide, sandy beach and clear, calm lagoon waters are ideal for swimming and snorkeling.
<http://www.quicksilver-cruises.com/wavedancer.htm>
- **Frankland Islands** - Visitors share the immaculate reef with green sea turtles, tropical fish and giant clams, while leisurely guided island walks take you through rainforests, rock pools and along secluded sandy beaches.
<http://www.franklandislands.com/>

To book or enquire further about any of the tour options, please contact
the Cairns Colonial Club Resort Tour Desk:
TEL: +61 7 4053 8856 EMAIL: tours@cairnscolonialclub.com.au



KURANDA / SKYRAIL / SCENIC RAIL

One of the most popular trips to the Rainforest is on the Scenic Rail and Skyrail to Kuranda. Known as the 'Village in the Rainforest', Kuranda has something for everyone, from its famous markets with a wide range of arts and crafts stalls, to its roadside cafés and restaurants.

- **Tropic Wings** - Tropic Wings offers a variety of tours with different inclusions, depending on how you'd like to spend your time there.

<http://www.tropicwings.com.au/kuranda-tours/kuranda-tours.htm>



WORLD HERITAGE RAINFOREST

Other Rainforest trips include going north to Cape Tribulation where the rainforest meets the reef, visiting Mossman Gorge and having a cruise on the Daintree River and a great opportunity to see wildlife.

- **Cape Tribulation & Daintree (Tropic Wings)** – a great chance to see a number of spectacular & unique attractions. Begin by traveling to Port Douglas along one of Australia's most scenic coastal drives. After witnessing the beauty that is Mossman Gorge & Daintree Rainforest, stroll along Cape Tribulation Beach or boardwalks.

<http://www.tropicwings.com.au/tours/cape-tribulation-tour.htm>

Traveling south west you can experience the Atherton Tablelands which is a must see if you enjoy waterfalls and like to know about some of the history of the area.

- **Atherton Tablelands (Tropic Wings)** - Venture south of Cairns and stop off at attractions such as the Curtain Fig Tree, Millaa Millaa Falls and Woodleigh Cattle Station.

<http://www.tropicwings.com.au/tours/atherton-tour.htm>

- **Atherton Tablelands & Paronella Park (Northern Experience Eco Tours)** – Visit Wooroonooran National Park, Lake Barrine and among other sites, Paronella Park with its breathtaking Spanish castles in the rainforest.

<http://www.northernexperience.com.au/>

To book or enquire further about any of the tour options, please contact
the Cairns Colonial Club Resort Tour Desk:

TEL: +61 7 4053 8856 EMAIL: tours@cairnscolonialclub.com.au



ADVENTURE

For those looking for adventure, Cairns has many exciting options to choose from.

- **RnR White Water Rafting** - Our white water rafting adventures are suitable for all levels of fitness and enthusiasm. Ride through our planet's oldest continuously growing tropical rainforests on rivers that still run totally wild.
<http://www.raft.com.au/>
- **Bungy Jumping (AJ Hackett)** - The only bungy operation on the planet that offers 16 different jump styles from traditional swan dives to riding off the roof on a BMX Bike
<http://www.ajhackett.com.au/>
- **Skydiving (Skydive Cairns)** - Our drop zone is based so that your tandem skydive with Skydive Cairns takes you over breathtaking views of our fantastic rainforest.
<http://www.skydivecairns.com.au/>
- **Hot Air Ballooning (Hot Air)** - Rise up and float over the scenic Atherton Tablelands, its rainforest ringed mountains and tranquil country landscapes. Afterwards plenty of champagne to toast your first flight and a delicious hot breakfast in our historic Country Cafe.
<http://www.hotair.com.au/pages/Cairns.html>
- **Horse Riding (Blazing Saddles)** - With a stable of over 70 quiet and gentle horses, Blazing Saddles offers a safe and relaxing way to see the rainforest. Our horses have a friendly nature and will be matched to each riders experience and ability.
<http://www.blazingsaddles.com.au/horseridingtourride.html>
- **ATV – All Terrain Vehicles (Blazing Saddles)** - Our ATV's are easy to ride and provide the perfect transportation through the rainforest. No license or previous experience necessary. This tour is excitement plus and allows the participants to experience nature close up, at their own pace.
<http://www.blazingsaddles.com.au/atvquadbikeridetour.html>

To book or enquire further about any of the tour options, please contact
the Cairns Colonial Club Resort Tour Desk:
TEL: +61 7 4053 8856 EMAIL: tours@cairnscolonialclub.com.au



OTHER LOCAL ATTRACTIONS

- **Hartley's Crocodile Adventures** - Situated on the magnificent coastal drive between the popular destinations of Palm Cove and Port Douglas, Hartley's is famous for its exciting and educational wildlife presentations including crocodile shows, wetland wildlife, snake show, cassowary feeding and more.
<http://www.crocodileadventures.com/>
- **Cairns Tropical Zoo** - Cairns Tropical Zoo has broken the mould of traditional zoos by creating opportunities for you, the visitor, to interact with our animals. There are numerous opportunities during the day to get close, touch, feel and make some new animal friends.
<http://www.cairnstropicalzoo.com.au/>
- **Cairns Night Zoo** - Enjoy a delicious Aussie BBQ to begin the night. After dinner, our guides will provide you with a torch and lead you into the darkness to meet the creatures of the night. Join our hospitable Swaggie and enjoy billy tea and damper with him by the campfire, and join in the fun as our guides teach you some famous Aussie Bush Dances.
<http://www.cairnsnightzoo.com/home.htm>
- **Tjapukai Cultural Park** – you can experience a range of activities with the traditional people of Far North Queensland. Activities include a live dance performance, didgeridoo demonstration, spear & boomerang throwing. Another must see is the Creation Theatre where live performers interact with giant holograms and tell the story of the Tjapukai people.
<http://www.tjapukai.com.au/day.html>
- **Tkapukai By Night** - Tjapukai by Night is an evening of entertainment and indulgence with a beautifully presented buffet. Tjapukai by Night is a unique and memorable experience not to be missed.
<http://www.tjapukai.com.au/night.html>
- **Fishing the Tropics** - Cairns, Tropical North Queensland offers some of the best light tackle sports fishing opportunities on the globe. Be it in Cairns Rivers, Cairns Lakes, Cairns Estuaries or off-shore Reef Fishing, you can experience the thrill of chasing that elusive "big one" while surrounded by World Heritage listed rainforests or the magic of the Great Barrier Reef.
<http://www.fishingthetropics.com.au/>

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