Introduction from SMT Director, Indigo Esmonde

This is the 2011 Annual Report for the Centre for Science, Mathematics & Technology Education (SMT), a research centre within the Department of Curriculum, Teaching and Learning (CTL) at OISE, University of Toronto.

This report highlights the Centre’s accomplishments for 2011. This year we collectively produced over 175 publications and presentations, and we currently hold over $2,700,123.00 in research funding. As a Centre, we continue to make an impact on mathematics, science and technology-related education research and practice, in and outside of schools. Within OISE, we strive for excellence in our contributions to initial teacher education and to graduate education, and we continue to foster connections to SMT educators across the university.

As a research centre located within the Department of Curriculum, Teaching and Learning, we organize a variety of activities designed to support our instructors and students, in both teaching and research. Our seminars, newsletter and graduate student events are a way of building and maintaining our small community. Furthermore, the Centre is the proud home of the internationally regarded Canadian Journal for Science, Mathematics and Technology Education.

None of our work would be possible without the expertise and assistance of our administrative assistants. In 2011, we were supported by Michael Tan, Celia West, and Cheryl Clarke. I extend my thanks to them for all that they have done.
<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Department</th>
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<tbody>
<tr>
<td>Indigo Esmonde</td>
<td>Centre Director &amp; Assistant Professor, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>Larry Benceze</td>
<td>Associate Professor, Department of Curriculm, Teaching and Learning</td>
</tr>
<tr>
<td>Clare Brett</td>
<td>Associate Professor, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>Wanja Gitari</td>
<td>Associate Professor, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>Jim Hewitt</td>
<td>Associate Professor, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>Ron Lancaster</td>
<td>Senior Lecturer, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>Cathy Marks Krpan</td>
<td>Senior Lecturer, Department of Curriculm, Teaching and Learning</td>
</tr>
<tr>
<td>Doug McDougall</td>
<td>Associate Professor and Chair, Department of Curriculm, Teaching and Learning</td>
</tr>
<tr>
<td>Erminia Pedretti</td>
<td>Professor, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>John Percy</td>
<td>Professor Emeritus, Department of Astronomy and Astrophysics</td>
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<tr>
<td>Jim Slotta</td>
<td>Professor, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>John Wallace</td>
<td>Professor, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>Gila Hanna</td>
<td>Professor Emeritus, Department of Curriculm, Teaching and Learning</td>
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<tr>
<td>Rina Cohen</td>
<td>Professor Emeritus, Department of Curriculm, Teaching and Learning</td>
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Centre Activities

Canadian Journal of Science, Mathematics, and Technology Education (CJSMTE)

CJSMTE, established in 2000, is Canada’s first academic journal in this field. Originally co-edited by Derek Hodson and Gila Hanna, the Journal has an editorial board of 45 internationally prominent educators and a rigorous review policy. Published quarterly, it includes articles in English and in French. Currently edited by Professor John Wallace, the journal provides an international forum for the publication of original articles written in a variety of styles, including research investigations using experimental, qualitative, ethnographic, historical, philosophical, or case study approaches; critical reviews of the literature; policy perspectives and position papers; curriculum arguments; and discussion of issues in teacher education.

Research Seminars

The Centre sponsors research seminars that bring together faculty, graduate students, visiting scholars and practitioners from the field of science, mathematics and technology education to present their research, as well as highlight current trends in the field. This contributes greatly to the vibrancy of the Centre.

Seminar topics from 2011 included:

- Dr. Aaron Price: Rasch Analysis of Scientific Literacy in a Citizen Science Project (April 21, 2011)
- Dr. Ruhama Evan: Teaching the Same Probability Syllabus in Classes of Different Levels (September 26, 2011)
- Dr. Lyn Carter: Globalization and Science Education (September 29, 2011)
- Dr. Phil Clarkson: Social Justice Issues and Mathematics Education (September 29, 2011)
- Dr. Clare Kosnik, Lydia Menna (CTL Ph.D. Candidate) and Dr. Shawn Bullock: It is not so simple to do Web 2.0: A study of integration of technology into literacy methods courses (November 25, 2011)

Student Steering Committee

The SMT Director encouraged an increased level of graduate student participation in SMT with the development of a Student Steering Committee. This committee is composed of Master’s and Doctorate students who are supervised by SMT faculty members. Members of the Student Steering Committee attend and participate in SMT Centre meetings, hold student-based seminars and workshops for their colleagues assist in disseminating SMT-related information to the broader community, and help arrange SMT events.

SMT Newsletter

The Centre published a Fall 2011 and a Spring 2012 newsletter highlighting faculty and graduate students’ activities, research and development initiatives, conference presentations and publications. It is a forum for faculty and graduate students to communicate, share and disseminate their work within OISE and the larger U of T community. The newsletter is published in hard copy, and is also made available electronically through the SMT website. The SMT Newsletter is compiled and edited by the SMT Administrative Assistant (in Fall 2011, by Celia West and in Spring 2012, by Cheryl Clarke).
### Graduate Studies Courses: Curriculum Studies and Teacher Development (CSTD) Program

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Session</th>
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<tbody>
<tr>
<td>CTL1217H SV 6331</td>
<td>Integrating Science, Mathematics and Technology Curricula</td>
<td>Winter</td>
</tr>
<tr>
<td>CTL1219H S 0101</td>
<td>Making Secondary Mathematics Meaningful</td>
<td>Winter</td>
</tr>
<tr>
<td>CTL1602H SV 6331</td>
<td>Introduction to Computers in Education</td>
<td>Winter</td>
</tr>
<tr>
<td>CTL1608H SV 6331</td>
<td>Constructive Learning and Design of Online Environments</td>
<td>Winter</td>
</tr>
<tr>
<td>CTL1609H SV 6331</td>
<td>Educational Applications of Computer-mediated Communication</td>
<td>Winter</td>
</tr>
<tr>
<td>CTL1797H SV 6331</td>
<td>Practicum in Curriculum: Master’s Level</td>
<td>Winter</td>
</tr>
<tr>
<td>CTL1799H SV 6331</td>
<td>Special Topics in Curriculum: Master’s Level: School Science and the Search for Optimal Living Conditions</td>
<td>Winter</td>
</tr>
<tr>
<td>CTL1841H S 0101</td>
<td>Research Seminar in Science, Mathematics and Technology Education</td>
<td>Winter</td>
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<tr>
<td>CTL1212H FV 6331</td>
<td>Curriculum Making in Science: Some Considerations in the History, Philosophy and Sociology of Science</td>
<td>Intersession</td>
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<tr>
<td>CTL1799H F2 0102</td>
<td>Special Topics in Curriculum: Master’s Level: Effective Instructional Strategies in Mathematics: Research and Practice</td>
<td>Intersession</td>
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<tr>
<td>CTL1999H F2 0102</td>
<td>Special Topics in Curriculum: Doctoral Level: Theories of Mathematics Education</td>
<td>Intersession</td>
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<tr>
<td>CTL1799H F2 0102</td>
<td>Special Topics in Curriculum: Doctoral Level: Effective Instructional Strategies in Mathematics: Research and Practice</td>
<td>Summer</td>
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<tr>
<td>CTL1218H S 0101</td>
<td>Culture and Cognition in Mathematics, Science and Technology Education</td>
<td>Summer</td>
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<tr>
<td>CTL1018H F 0101</td>
<td>Introduction to Qualitative Inquiry in Curriculum, Teaching and Learning</td>
<td>Fall</td>
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<tr>
<td>CTL1207H FV 6331</td>
<td>Teaching and Learning about Science: Issues and Strategies in Science, Technology, Society and Environment (STSE) Education</td>
<td>Fall</td>
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<tr>
<td>CTL1209H FV 6331</td>
<td>Current Issues in Science and Technology Education</td>
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<td>CTL1215H F 0101</td>
<td>Teaching and Learning about Science and Technology: Beyond Schools</td>
<td>Fall</td>
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<td>CTL1216H FV 6331</td>
<td>Teacher Leadership in Science, Mathematics and Technology Education</td>
<td>Fall</td>
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<tr>
<td>CTL1220H F 0101</td>
<td>Socio-cultural Theories of Learning</td>
<td>Fall</td>
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<tr>
<td>CTL1602H FV 6331</td>
<td>Introduction to Computers in Education</td>
<td>Fall</td>
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<tr>
<td>CTL1609H FV 6331</td>
<td>Educational Applications of Computer-mediated Communication</td>
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### Graduate Studies Courses: Master of Teaching in Elementary and Secondary Education (MT)

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<th>Course Code</th>
<th>Course Title</th>
<th>Session</th>
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<tbody>
<tr>
<td>CTL7002H Y:</td>
<td>Curriculum and Teaching in Mathematics</td>
<td>Fall/Winter</td>
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<tr>
<td>CTL7003H Y:</td>
<td>Curriculum and Teaching in Social Studies and Science</td>
<td>Fall/Winter</td>
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<tr>
<td>CTL7004H Y:</td>
<td>Practicum in Schools (Year 1)</td>
<td>Fall/Winter</td>
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### Undergraduate Courses: Initial Teacher Education

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDU5517:</td>
<td>Science &amp; Technology in Context</td>
<td>Fall/Winter</td>
</tr>
<tr>
<td>EDU1220:</td>
<td>Mathematics</td>
<td>Fall/Winter</td>
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<tr>
<td>EDU5509:</td>
<td>Equitable Math Education</td>
<td>Fall/Winter</td>
</tr>
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</table>
**Theses Supervised**

**M.A. Graduates**

- Najmeh Fakhraie (M.A.) *What’s in a Note?: Sentiment Analysis in Online Educational Forums*
  Supervisor: Jim Hewitt

- Rebecca Alexandra M. Weigand (M.A.) *A Garden of Learning: Exploring Critical Place-Based Pedagogy in Kindergarten*
  Supervisor: Indigo Esmonde

- Vanessa Wonnacott (M.A.) *Teaching Mathematics for Social Justice and its Effect on Affluent Students*
  Supervisor: Indigo Esmonde

**Ph.D. Graduates**

- Beverly Ann Caswell (Ph.D.) *Teaching Toward Equity in Mathematics*
  Supervisor: Indigo Esmonde

- Jordis Jodi Asbell-Clarke (Ph.D.) *Martian Boneyards: Sustained Scientific Inquiry in a Social Digital Game*
  Supervisor: Jim Hewitt

- Gunawardena Egodawatte Arachchige Don (Ph.D.) *Secondary School Students’ Misconceptions in Algebra*
  Supervisor: Doug McDougall

- Sheryl McMath (Ph.D.) *Learning in an Integrated Curriculum Setting: A Case Study of Classroom Practices*
  Supervisor: John Wallace

- Dorian Stoilescu (Ph.D.) *Technological Pedagogical Content Knowledge Framework for Inservice Secondary Mathematics Teacher*
  Supervisor: Doug McDougall

- Gita Wassmer (Ph.D.) *Supporting New School Leaders: The Benefits of Online Peer Communities*
  Supervisor: Jim Slotta

- Lora Cheryl Woodall (Ph.D.) *Transitioning to Online Education in the Caribbean: The UWI Open Campus*
  Supervisor: Jim Hewitt

**Research and Development**

**Research Grants**

Bencze, L. Social Science and Humanities Research Council (SSHRC)-Standard Research Grant: $115,698
*Critical and emancipatory science education (mCASE) – 2010- 2014*

Brett, C. CIHR: $60, 075
*Chronic illness collaborative care: A scoping review to examine computer supported collaborative learning (CSCL) in health professional education – 2012-2015*
Esmonde, I. Knowles Science Teaching Foundation: $110,000 USD
Learning to teach mathematics for social justice - 2009-2012

Esmonde, I. Social Science and Humanities Research Council (SSHRC)-Insight Development Grant: $48,150
Developing analytic methods for digital media – 2011-2013

Esmonde, I. Social Science and Humanities Research Council (SSHRC)-Standard Research Grant, New Scholar: $28,336
Changing the equation: Mathematics and social justice - 2011-2013

Gitari, W. Social Science and Humanities Research Council (SSHRC)-Internal Grant: $2000.00
Problem solving practices in everyday life: A case study of school science and community development in India – 2011-2013

Gitari, W. Empirical study: $3,500
The use of school-based science by high school students to solve non-curricular-related problems – 2011-2012

Gitari, W. Empirical Study (with Dr. Isha Decoito, York University): $10,000
First Nations science outreach research study contracted by Scientists in Schools – 2012-2014

Hewitt, J. & Woodruff, E. Social Science and Humanities Research Council (SSHRC)-Standard Research Grant: $102,936
Toward the synergistic integration of computer-mediated communication and wikis – 2010-2011

Marks Krpan, C. Numeracy and Literacy Secretariat Grant: $8,500
Supporting struggling learners through collaborative problem solving in mathematics: Examining the impact on student success - 2011.

Pedretti, E. Social Science and Humanities Research Council (SSHRC)-Standard Research Grant: $118,000
Promoting teaching for scientific literacy through university-school district collaboration – 2007-2011

Percy, J.R. Natural Sciences and Engineering Research Council of Canada (NSERC)-Operating Grant: $90,000
Variable stars and stellar evolution - 2004-2011

Percy, J.R. University of Toronto President’s Teaching Award Grant: $50,000
Teaching Development Projects - 2006-2011

Slotta, J. Social Science and Humanities Research Council (SSHRC)-Standard Research Grant: $151,770
Knowledge community and inquiry for elementary science classrooms - 2011-2014

Slotta, J. STELLAR Theme Team Award: $21,250 (16,000 Euros) [STELLAR is a European Union funded project concerned with scholarly networks for technology enhanced learning]
Multiple surfaces for collaborative learning (MuSuCo) - 2011

Slotta, J. National Science Foundation (NSF): (US$431,039) subaward to the University of Toronto [US$1.8 million in total]
Supporting technologies for the enactment of complex science pedagogical forms - 2011-2015

Slotta, J. Canadian Foundation for Innovation Canada Research Chair in Information Technology: $524,500
Technology environments for knowledge community and inquiry – 2011-2014
Slotta, J. Social Science and Humanities Research Council (SSHRC) & University of Toronto funded Project #192319: (US$81,635) 
*Sustaining a technology community for the learning sciences.* Canada-California Strategic Innovation Partnership (CCSIP) – 2011-2012

Slotta, J. National Science Foundation (NSF) project DRL 10316802010: ($305,894 U.S.) subaward to the University of Toronto [$1.13 Million U.S. in total]  
*Promoting 21st Century science: Technology-enhanced learning across formal and informal environments* – 2011-2013

Slotta, J. Social Science and Humanities Research Council (SSHRC): $123,000  
*Technology enhanced activities and interactions in the science classroom: Pedagogical scripts for knowledge communities* – 2008-2012

Slotta, J. European Union FP7-ICT-2007-1 Project 212814: (8.5 million Euros) no subaward for non-EU countries  
*Science created by you* – 2008-2012

Slotta, J. National Science Foundation (NSF) project DRL-0733299: ($314,029 U.S.) subaward to University of Toronto [$2.5 Million U.S. in total]  
*Logging opportunities in online programs for science (LOOPS): Student and teacher learning* – 2008-2013

Wallace, J. Connaught Grant: $10,000  
*Knowledge That Counts in a Global Community* – 2009-2011

Wallace, J. Social Science and Humanities Research Council (SSHRC)-Support for Scholarly Journals Award: $89,250  
*Canadian Journal of Science, Mathematics and Technology Education* – 2011-2013

**Scholarly Publications and Presentations**

**Summary**

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Editing a Special Issue of a Journal</td>
<td>1</td>
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<tr>
<td>Book Chapters</td>
<td>4</td>
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<tr>
<td>Refereed Journal Articles</td>
<td>17</td>
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<tr>
<td>Non-Refereed Journal Articles</td>
<td>16</td>
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<tr>
<td>Technical/Research Reports</td>
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<tr>
<td>Papers in Conference Proceedings</td>
<td>20</td>
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<tr>
<td>Papers Presented at Conferences and Academic Forums</td>
<td>44</td>
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<tr>
<td>Keynote Addresses</td>
<td>6</td>
</tr>
<tr>
<td>Invited Workshops, Academic Lectures, Colloquia and Seminars</td>
<td>65</td>
</tr>
<tr>
<td>Media Productions</td>
<td>5</td>
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</table>

*Editing a Special Issue of a Journal*

**Book Chapters**


**Refereed Journal Articles**


**Non-Refereed Journal Articles**


**Technical/Research Reports**


**Papers in Conference Proceedings**


**Papers Presented at Conferences and Academic Forums**


² This paper won the Emerging Scholar Award, Applied Research in Virtual Environments for Learning Special Interest Group, American Educational Research Association.


Hesser, J.E., Percy, J.R. et al. (2011, October). Canadian experiences with Year 1 of Beyond the International Year of Astronomy. Paper presented at Communicating Astronomy with the Public Conference, Beijing, China.


**Keynote Addresses**


Lancaster, R. (2011, November). *Numeracy Day: A day-long, school-wide event for all students in Grades 9-12*. Keynote address presented at David and Mary Thomson Collegiate Institute, Toronto, ON.


**Invited Workshops, Academic Lectures, Colloquia and Seminars**


Brett, C. (2011, January). *Technology-enhanced teaching: Strategies for increasing social presence online - does this improve learning? Demo: Making mini videos or talk-overs for your classes—all on your own computer!* A series of workshops presented for OISE Curriculum, Teaching & Learning Faculty Professional Development, Toronto, ON.

Brett, C. (2011, March). *Saturday support for part-time students*. A series of meetings moderated to support flex time and part time Curriculum, Teaching & Learning graduate students, Toronto, ON.


Hewitt, J. (2011). A series of 3 presentations made to the University of Toronto Mindshift Project Continuing Education group, Toronto, ON.

Lancaster, R. (2011, April). *Listen to this: using the new sound feature of V5 to make a telephone dialling pad and much more.* A presentation repeated 4 times at the National Council of Teachers of Mathematics Annual Conference, Indianapolis, IN.

Lancaster, R. (2011, April). *Numeracy across learning.* A workshop presented for the entire teaching staff and all administrators from David and Mary Thomson Collegiate Institute, Toronto, ON.


Lancaster, R. (2011, April). *The use of technology in the Ontario high school mathematics curriculum.* A workshop presented for mathematics teachers at Villanova College, King City, ON.

Lancaster, R. (2011, December). *Puzzles, problems and powers of 2.* A workshop presented twice for Grades 5-8 students at St. Mark Elementary School, Mississauga, ON.


Lancaster, R. (2011, December). *Using photos and videos to engage students and to deepen their understanding of mathematics.* A workshop presented for the OISE BEd Program, Toronto, ON.
Lancaster, R. (2011, February). *Connections between mathematics and daily life, commerce, design, art, architecture and science; making mathematics more relevant and meaningful for students; contextualized learning*. A workshop presented at Taylor's College, Kuala Lumpur, Malaysia.


Lancaster, R. (2011, February). *Problem-based learning; active learning; solving problems in more than one way; connections between mathematical topics; using technology to delve deeper and to deepen students' understanding of mathematics*. A workshop presented at Taylor's College, Kuala Lumpur, Malaysia.

Lancaster, R. (2011, February). *Problem-based learning; active learning; solving problems in more than one way; connections between mathematical topics; using technology to delve deeper and to deepen students' understanding of mathematics*. A workshop presented at Sunway College, Kuala Lumpur, Malaysia.


Lancaster, R. (2011, May). *Using trigonometric graphs to model periodic phenomena, touch-tone dialling and g, the acceleration due to gravity*. A workshop presented at the Ontario Association for Mathematics Education Annual Conference, Windsor, ON.


Lancaster, R. (2011, October). *Taking a mathematical ride on an escalator: One activity for many grade levels*. A workshop presented at the Credit Humber Association for Mathematics Promotion, Mississauga, ON.

Lancaster, R. (2011, October). *Taking a mathematical ride on an escalator: One activity for many grade levels*. A workshop presented at the Scarborough Association for Mathematics Education Fall Conference, Scarborough, ON.


Lancaster, R. (2011, October). *The warehouse problem: How students from grades 9-12 can solve the same problem in dramatically different ways and then share their method at a Math Fair*. A workshop presented for mathematics teachers at David and Mary Thomson Collegiate Institute, Toronto, ON.

Lancaster, R. (2011, September). *The Open Box Problem, Math Trails & The Housekeeper and the Professor*. A workshop presented for the OISE Master Teaching Program, Toronto, ON.

Lancaster, R., & Kanaesu, S. (2011, May). *Mathematics field trip to the Financial District of Toronto*. An all-day workshop for Grade 10 students from Parkdale Collegiate Institute, Toronto, ON.


Slotta, J. D. (2011, October). *Knowledge community and inquiry: Four iterations of a design research study*. A colloquium presentation for the Ludwig Maximilians University Faculty of Psychology, Munich, Germany.


**Media Productions**


