Science Mathematics and Technology Education: Beyond Cultural Boundaries

Proceedings of the Fifth International Conference on Science, Mathematics and Technology Education

Udon Thani, Thailand
16-19 January 2008

Edited by
Darrell Fisher and Rekha Koul
Curtin University of Technology, Australia

Supatra Wanpen
Udon Thani Rajabhat University, Thailand
EDITORS

Darrell Fisher  
Curtin University of Technology, Australia

Rekha Koul  
Curtin University of Technology, Australia

Supatra Wanpen  
Udon Thani Rajabhat University, Thailand

EDITORIAL BOARD

Bill Atweh  
Curtin University of Technology, Australia

Perry den brok  
Eindhoven University of Technology, The Netherlands

Vinesh Chandra  
Queensland University of Technology, Australia

Cedric Grieve  
Avondale College, Australia

David Lloyd  
University of South Australia, Australia

John Malone  
Curtin University of Technology, Australia

Chenichei Sid Nair  
Monash University, Australia

Kathy Paige  
University of South Australia, Australia

Nigel Shepstone  
Manukau Institute of Technology, New Zealand

Wahyudi  
SEAMEO RECSAM, Malaysia

Bruce Waldrip  
University of Southern Queensland, Australia
PREFACE

The Fifth International Conference on Science, Mathematics and Technology Education was held in Udon Thani, Thailand in January, 2008. The theme of the conference was ‘Science Mathematics and Technology Education: Beyond Cultural Boundaries’ and it was organised jointly by the national Key Centre for School Science and Mathematics, Curtin University of Technology, Australia and the Udon Thani Rajabhat University, Thailand.

The conference provided an intellectually challenging and culturally enriching experience for science, mathematics and technology teachers, teacher educators, researchers and administrators from primary, secondary and tertiary education from around the world. Over 120 participants from 15 countries had an opportunity to interact and exchange innovative ideas, research findings and practical implications in the traditional fields of science, mathematics and technology as well as new areas of international significance related to conference theme.

These proceedings are a result of the conference. All papers contained in the proceedings were presented at the conference and consequently submitted to a reviewing process. Each paper was reviewed by at least two referees.

This conference is now providing a supportive environment, particularly for early-career researchers, a number of who presented papers and have papers in these proceedings. The papers have been organised alphabetically.

We have continued our mode of publication as an electronic form. However, people may order a book of the proceedings by contacting one of the editors.
ACKNOWLEDGEMENTS

The conference would not have been possible without the support of the Key Centre for School Science and Mathematics, Curtin University of Technology, Australia and Udon Thani Rajabhat University, Thailand.

We would like to thank all the authors who contributed their papers to these proceedings. We would also like to thank the reviewers and particularly the members of the Editorial Board for their time and diligence.

The book represents contributions from many nations including Australia, Brunei, Canada, Japan, Mauritius, New Zealand, Singapore, South Africa, South Korea, Taiwan, Thailand, Turkey, The Netherlands, United Arab Emirates, and USA. We acknowledge the contributions of people from all these countries. The fields of science, mathematics and technology education research represent a truly international endeavour.

Darrell Fisher, Rekha Koul and Supatra Wanpen
Editors
August, 2008
Table of Contents

1. The Effects of Some Contextual Factors on School Students’ Proportional Reasoning and Solution Strategies
   Othman N. Alsawaie
   United Arab Emirates University, United Arab Emirates 1

2. Teachers’ Perceptions Of Their Principals’ Interpersonal Behaviour And Their Attitudes To The Use Of ICT In Teaching And Learning In Primary Schools In Singapore
   Agnes Ang and Darrell Fisher
   Curtin University of Technology, Australia 15

3. Towards Response-Able Mathematics Education
   Bill Atweh
   Curtin University of Technology, Australia 30

4. An Investigation into the Effectiveness of Using Analogies to Teach and Learn Scientific Concepts
   Florence N. Ballard and David F. Treagust
   Curtin University of Technology, Australia 36

5. Investigating Mathematics Students’ Attitudes Toward Computers and Their Interaction with Achievement and Gender
   Anastasios (Tasos) Barkatsas
   Monash University, Australia
   Vasilis Gialamas
   University Of Athens, Greece
   Katerina Kasimatis
   Pedagogical Institute, Greece 44

6. Effectiveness Of Maea’s Interactive Science Programs In Terms Of African-American Students’ Attitudes, Achievement and Classroom Learning Environment
   Darryl Lee Baynes and Barry J. Fraser
   Curtin University of Technology, Australia 49

7. An Analysis of Secondary School Students’ Perception of Mathematics and Mathematicians in a Developing Country
   Hemant Bessoondyal
   Institute of Education, Mauritius 57

8. Responding To National Curriculum Initiatives
   Deborah Beswick
   Curtin University of Technology, Australia 63

9. Survey Instrumentation, Development, Trialling, Implementation and Evaluation
   Greg Calvert
   Elizabeth College, Australia 70
10. Designing Learning Activities for a Technologically Integrated Curriculum (Tic)
Vinesh Chandra
Queensland University Of Technology, Australia 76

11. Design and Technology for Pre-Service Primary Teachers
Vinesh Chandra and Chris Chalmers
Queensland University Of Technology, Australia 81

12. A Learning Environment Study of Tertiary Classrooms and Students’
   Attitudes to Chemistry in Rajabhat Institutes in Thailand
   Chanes Kongkarnka and Darrell L. Fisher
   Curtin University of Technology, Australia 90

13. Computer Classroom Learning Environments and Students’ Attitudes
    Towards Computer Courses in Tertiary Institutions in Thailand
    Kanokporn Charik
    Rambhai Barni Rajabhat University, Thailand
    Darrell Fisher
    Curtin University of Technology, Australia 100

14. Students’ Perceptions of Their Learning Environments and Outcomes in
    Mathematics and Statistics Classrooms at Rajabhat Universities in Thailand
    Charoen Chantavong
    Udon Thani Rajabhat University, Thailand 110

15. What Type Of Learning Environment Is My Classroom? Typologies of
    Turkish Students’ Perceptions of Their Secondary Biology Classrooms
    Perry Den Brok
    Eindhoven University Of Technology, the Netherlands
    Sibel Telli, Nilüfer Milli Piyango
    Anatolian High School, Turkey
    Jale Cakiroglu
    Middle East Technical University, Turkey
    Ruurd Taconis
    Eindhoven University Of Technology, the Netherlands
    Ceren Tekkaya
    Middle East Technical University, Turkey 120

16. Subject or Style? Differences in Teacher-Student Interpersonal Behaviour
    Between Science Teachers and Teachers of Other (School) Subjects
    Perry Den Brok and Ruurd Taconis
    Eindhoven University Of Technology, The Netherlands
    Darrell Fisher
    Curtin University of Technology, Australia 128
17. Underlying Factors Affecting Mathematics Anxiety in School Children
Nicholas Flegg and John Malone
Curtin University of Technology, Australia
136

18. Proportional Reasoning: A Case Study Highlighting Its Significance in
Mathematics Curriculum
John M. Green
University Of Southern Queensland, Australia
142

19. The Use of Surprise and Sequential Questioning As a Teaching Technique
Cedric Greive and Kevin De Berg
Avondale College, Australia
152

20. Air-Flow Phenomena and Bernoulli’s Equation: An Example of the Use of
Surprise as a Vehicle for Learning
Cedric Greive and Lynden Rogers
Avondale College, Australia
162

Y. Gulatee & S. P. Maj
Edith Cowan University, Australia
J. Taecho
Nakhonphanom University, Thailand
168

22. Identifying Social Barriers in Teaching Computer Science Topics in a
Wholly Online Environment
Yuwanuch Gulatee and Barbara Combes
Edith Cowan University, Australia
173

23. Teacher-Student Interactions in a Technology-Supported Science
Classroom Environment In Relation To Selected Learner Outcomes: An Indian
Study
Adit Gupta
Model Institute of Education and Research, India
Darrell Fisher
Curtin University of Technology, Australia
183

24. Mathematics Content Knowledge of Pre-Service Primary Teachers:
Developing Confidence and Competence
Brenda Hamlett
Curtin University of Technology, Australia
195

25. Note-Taking Revisited: The Effect of Note-Taking Strategies on Students’
Comprehension in Psychology Classes at Japanese Universities
Sonomi Hirata
Hakuoh University, Japan
Makoto Ishikawa
Joetsu University Of Education, Japan
202
26. The Laboratory in Science Education: From Theory to Practice
   Avi Hofstein
   The Weizmann Institute of Science, Israel

27. Science Is Unimaginative And Uncreative! Challenging Pre-Service Primary
    Teachers’ Views of Science and Science Teaching Through Explicit Perturbing
    Reflections
   Christine Howitt
   Curtin University of Technology, Australia

    Grid
   Phongpat Isarakul, Dusadee Sukawat, and Anirut Luadsong
   King Mongkut’s University Of Technology Thonburi, Thailand

29. An Interdisciplinary Investigation of High School Students” Approaches To
    Learning Science: The Relations Amongst Achievement Goals, Constructivist
    Pedagogical Dimensions, Motivational Beliefs and Self-Regulated Learning
   Michael R. Iverach and Darrell L. Fisher
   Curtin University of Technology, Australia

30. Development of Learning, Teaching and Application of Local Science on
    Biodiversity Rajabhat University Network in the Upper North Eastern Region
   Varanya Jeeravipoolvarn
   Udon Thani Rajabhat University, Thailand

31. The Use of ICT as A Pedagogical Tool in Pre-Vocational Education: A
    Mauritian Experience
   Vikashkumar Jhurree
   Mauritius Institute of Education, Mauritius
   Pascal Achille-Sautrelle
   BPS College
   Hemant Bessoondyal
   Mauritius Institute of Education, Mauritius

32. Improving the Learning Environment in Health Science Class: A Case Study
    in Thailand
   Achara Jinvong
   Udon Thani Rajabhat University, Thailand
   Darrell Fisher
   Curtin University of Technology, Australia

33. Towards a Holistic Model for Professional Development of Science
    Educators in Africa Through Distance Education
   Esther Kibuka-Sebitosi
   University Of South Africa (UNISA)
<table>
<thead>
<tr>
<th>Paper Number</th>
<th>Title</th>
<th>Authors</th>
<th>Affiliations</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>Laboratory Learning Environments and Attitude to Biology Classes in Thailand</td>
<td>Duangsmorn Kijkosol, Darrell Fisher</td>
<td>Udon Thani Rajabhat University, Thailand, Curtin University of Technology, Australia</td>
<td>289</td>
</tr>
<tr>
<td>35</td>
<td>Student Perceptions of Classroom Environments in Streamed Middle Secondary Mathematics Classes in Australian Christian Schools</td>
<td>Peter Kilgour and Tony Rickards</td>
<td>Curtin University of Technology, Australia</td>
<td>298</td>
</tr>
<tr>
<td>36</td>
<td>The Use of Mixed Mode Delivery as an Effective Pedagogical Approach in ICT-Rich Classroom</td>
<td>Koh Noi Keng</td>
<td>National Institute Of Education Singapore Nanyang Technological University, Singapore</td>
<td>306</td>
</tr>
<tr>
<td>37</td>
<td>Identifying Culturally Sensitive Factors of Science Learning Environments in Western Australia</td>
<td>Rekha B Koul and Darrell Fisher</td>
<td>Curtin University of Technology, Australia</td>
<td>318</td>
</tr>
<tr>
<td>38</td>
<td>Learning Environments and Environmental Education Instrument</td>
<td>Rekha B. Koul</td>
<td>Curtin University of Technology, Australia, David Zandvliet</td>
<td>325</td>
</tr>
<tr>
<td>39</td>
<td>Valued Science and Mathematics Learning In Middle Schooling: Connecting To Students’ Lived Experiences</td>
<td>David Lloyd and Kathryn Paige</td>
<td>University Of South Australia, Australia</td>
<td>334</td>
</tr>
<tr>
<td>40</td>
<td>Exploring Futures Scenario Writing In Science Learning With Undergraduate Education Students</td>
<td>David Lloyd</td>
<td>University Of South Australia, Australia</td>
<td>348</td>
</tr>
<tr>
<td>41</td>
<td>Associations Between Students” Abilities to Solve Geometry Problems, Students’ Attitudes and the Learning Environment</td>
<td>Rinna K. Ly and John A. Malone</td>
<td>Curtin University of Technology, Australia</td>
<td>359</td>
</tr>
<tr>
<td>42</td>
<td>The Impact of Remote Laboratories in Improving Blended Learning in the Science and Technology Arena</td>
<td>Steve Mackay and Darrell Fisher</td>
<td>Curtin University of Technology, Australia</td>
<td>367</td>
</tr>
</tbody>
</table>
43. Evaluations and Quality: A Symbiotic Union for Evidence-Based Decision Making To Affect Change
Chenicheri Sid Nair and Lorraine Bennett
Monash University, Australia

44. A Digital Implementation of Integrator by FPGA for Application with Teaching and Learning in Thai Electronic Classroom
Chaiyong Pagarapun
Udon Thani Rajabhat University, Thailand

45. E-Learning Issues: Probing Pedagogy, Interface and Culture
Jeremy Pagram and Penporn Pagram
Edith Cowan University, Australia

46. Assessment Through Exhibition: Connecting Fourth Year Primary/Middle Science and Mathematics Education Students to Place
Kathryn Paige
University Of South Australia, Australia

47. The Two Cultures and Hidden Truths: A Personal Tribute
Bill Palmer
Curtin University of Technology, Australia

48. The Effectiveness of Constructivist Teaching On Improving Learning Environments in Thai Secondary School Science Classrooms
Panomporn Puacharearn
Rajabhat Nakhornsawan University, Thailand
Darrell Fisher
Curtin University of Technology, Australia

49. Creating a Networking Process Among University Staff, Supervisors and Schools for Improving In-service Teachers’ Competencies
Panomporn Puacharearn
Rajabhat Nakhornsawan University, Thailand
Darrell Fisher
Curtin University of Technology, Australia

50. A Study Of Science Learning Achievement Of Prathomsuksa 3 Students In Hydrologic Cycle Using Clouding And Raining Demonstration Accessories
Patcharin Sripaisaan
St. Mary’s School, Thailand
Chutima Intarapanich
Udon Thani Rajabhat University, Thailand

51. Effects of Providing Activities Based On Increasing Efficacy of Forages for Dairy Cows of Small Holder Farmers at Udon Thani, Thailand
Montha Phuedam
Udon Thani Rajabhat University, Thailand
52. Teacher Interpersonal Behaviour: It’s Influence on Student Motivation in Science
Catherine Reid and Darrell Fisher
Curtin University of Technology, Australia 437

53. Using Industry-Based Needs Analysis to Inform Curriculum Development: A Case Study from the Tourism Industry
Wilailak Riach
Udon Thai Rajabhat University, Thailand 446

54. Teachers’ Interpersonal Behaviour in Secondary Schools
Hunus Riah
Universiti Brunei Darussalam, Brunei
Nurdiyanah Goh Abdullah
Sekolah Menengah Sayyidinah Othman Brunei Darussalam, Brunei 452

55. Learning Environments On “One District: One Dream School” Project in Science Classes in Thailand
Toansakul Santiboon
Udon Thani Rajabhat University, Thailand 461

56. An Interactive Whiteboard in the Singapore Classroom: The Impact on Students
Jimmy Seah
Nanyang Technological University, Singapore 468

57. Understanding: An Enigma
Nigel Shepstone
Manukau Institute of Technology, New Zealand 472

58. The Role of Teacher-Student Interpersonal Behaviour in Improving Mathematics Teaching and Learning in Thailand
Lert Sitthikoson and John Malone
Curtin University of Technology, Australia 476

59. Gender and ICT: Toys for the Boys or Pearls for the Girls?
Sarah Snell and Catherine Snell-Siddle
Universal College Of Learning, New Zealand 485

60. Mobile Technologies: Enhancing Possibilities for Learning
Sarah Snell and Catherine Snell-Siddle
Universal College Of Learning, New Zealand 490

61. Writing Chemistry and the Four Skills: An Ongoing Process
Steven Graham
Udon Thani Rajabhat University, Thailand 495
62. Primary Science Curriculum. The Constraints and Limitations of Learning and Teaching an ‘Over-Stuffed’ Science Curriculum: A Case Study from Fiji.
   Wili Suluma
   The University of the South Pacific, Fiji
   502

63. A Study of a Nation-Wide Pilot Program in School Mathematics
   Kevin Swincicky
   North Albany Senior High School, Australia
   John Malone
   Curtin University of Technology, Australia
   509

64. Content Knowledge And Science Teaching: How Confident Are UAE Prospective Elementary Science Teachers?
   Hassan H. Tairab
   United Arab Emirates University, United Arab Emirates
   516

65. International Field Schools as International Education: An Ethnographic Approach
   Andra P. Thakur
   Udon Thani Rajabhat University, Thailand
   526

66. Primary Educators Competency in Language, Vocabulary and Technicalities in the Curriculum and Instruction of Mathematics in Schools (Primary) In Fiji
   Iowane Ponipate Tiko
   Lautoka Teachers College, Suva, Fiji Islands
   533

67. Reflections on the Development of a Web-Based Course to Support EFL Learning for Pre-Service Teachers in Thai Rajabhat University: A Case Study
   Vijittra Vonganusith
   Sakon Nakhon Rajabhat University, Thailand
   Dr Jeremy Pagram
   Edith Cowan University, Australia
   543

68. Peer Review: Our Experiences
   Wahyudi and Cheah Ui Hock
   Seamo Recsam, Malaysia
   553

69. Students’ Perceptions of Assessment Process: Questionnaire Development and Validation
   Bruce G. Waldrip
   University Of Southern Queensland, Australia
   Darrell L. Fisher
   Curtin University of Technology, Australia
   Jeffrey P. Dorman
   Australian Catholic University, Australia
   561
70. Perspectives on Early Career Science Teachers' Work Lives
Gillian Ward
The University of Auckland, New Zealand
Darrell Fisher
Curtin University of Technology, Australia

71. Becoming “The Provider” Identity: Peer Discourses Of Masculinities in School Cultures
Rebecca Wilson
Curtin University of Technology, Australia

72. An Investigation of Students’ Achievement in Biology, Their Attitudes, Motivational Traits and Socio-Psychological Interactions in Single-Sex Schools
Bob Chui-Seng Yong
Universiti Brunei Darussalam, Brunei

73. The Effects of Reciprocal Teaching on Thai High-School Science Students’ English Reading Comprehension
Yuwadee Yoosabai and Saegchan Hemchua
Srinakarinwirot University, Thailand

74. Pre service Mathematics Teachers’ Perception Toward Model Courseware: A Malaysian Perspective
Effandi Zakaria, Md Yusof Daud, Zolkepeli Haron and Mohamed Amin Embi
University Kebangsaan, Malaysia