



Southeast Asian Ministers of Education Organization
Regional Centre for Education in Science and Mathematics

Course Code : PM-2233
Course Title : Enhancing Online Teaching and Learning for Primary Mathematics Teachers
Duration : 4 weeks (6 Nov – 1 Dec 2006)

1. Rationale

Information and Communication Technology (ICT) has impacted teaching and learning opportunities in essentially two principal ways within the classroom, as we know of. It has enabled teaching and learning to occur beyond the confines of the classroom, and it has also made it possible for teaching and learning to occur asynchronously.

This course endeavors to provide opportunities for primary school mathematics teachers to explore systematically on how to leverage ICT, especially the Internet and intranet for the teaching and learning of mathematics.

2. Course Objectives

The main objective of this course is to introduce participants to the various online strategies that can be used to teach and learn in primary mathematics classrooms.

At the end of the course, the participants should be able to:

- 2.1 describe and explain the current trends and issues in Mathematics, online Mathematics education & constructivism;
- 2.2 use effective strategies to search, link and collect online mathematics materials for teacher and student use;
- 2.3 use effective and meaningful ways of learning mathematics through the Internet using appropriate student-centered approaches;
- 2.4 use a variety of methods to evaluate educational websites based on appropriate instructional design;
- 2.5 promote communication and collaboration through the use of asynchronous tools (like email and threaded discussion) and synchronous tools (like chat and video conferencing) using an e-learning system;
- 2.6 empower students to take part in global projects, like data exchange with students from schools of other countries, participate in virtual fieldtrips, Science Across the World projects or Web Quests in other countries;
- 2.7 empower students to collect data, pool resources, create databases, analyze and publish the findings and useful information through web-based multimedia;
- 2.8 assess students' understanding of content through online teaching and learning; and
- 2.9 design, develop & implement lesson plans for online teaching & learning of primary mathematics.

3. Course Contents

The course stresses on a good grasp of the use of ICT in online teaching learning, classroom practice and action research. Emphasis will be given to discussions and activities to demonstrate the strategies involved in the teaching and learning of the mathematics through the use of internet and intranet.

The major areas include:

- 3.1 Trends and issues in mathematics, online mathematics education & constructivism;
- 3.2 Effective and productive use of search engines;
- 3.3 Website design, maintenance and upgrade basics, including appropriate instructional design;
- 3.4 Treasure chests of best practices in primary school mathematics sites for teachers & students;
- 3.5 Essence of effective e-learning;
- 3.6 e-Learning system & communication tools - to set up, use and maintain synchronous and asynchronous tools for the classroom;
- 3.7 Participation in global primary mathematics projects;
- 3.8 Scientific data collection, resources pooling and use of databases and electronic spreadsheets in the classroom;
- 3.9 Students' understanding of content through online teaching and learning and its subsequent measurement & assessment; and
- 3.10 Planning, designing, developing and implementing lesson plans / activities / materials using the Internet.

4. Participants

Primary mathematics teachers, teacher educators, curriculum developers with at least a year's experience in using the internet.

5. Online Discussions

Participants are encouraged to actively participate in weekly online discussions asynchronously. Ideally they are to log on to the course site everyday for 10-15 minutes to join the course discussions. They are required to answer initial questions posted by the course supervisor and respond to other participants' postings each week. They are also encouraged to post their own questions. The participants will have first hand experience in maintaining a good online learning community by posting quality feedback and through active participation.

6. Project Work

Participants are to be teamed up comprising 4-6 members in each team. Members in each team will design an online lesson using effective strategies & materials. Topics are to be selected early in the course. Lessons are to be planned, designed & developed based on an instructional design model. Lesson tried-outs will be evaluated, revised and refined. Each member will post their work at various stages in a discussion board as scheduled below. A final team report in printed form is to be submitted to the course supervisor. The report may include lesson plans, worksheets, assessments, teachers' & students' guide, teaching & learning aids, findings, discussions, etc.

7. Schedule for Project Work

The following schedule is meant to help the participants plan their project work more systematically.

Date Due	Item	Notes
07 Nov 2006 (Tue)	1. Analysis & Design	Project work is to be posted as scheduled in an online discussion board created for each team in the course site by each member of the team. Members of the team will give constructive comments and offer suggestions. Defense & counter suggestions are encouraged. Discussions using emails should be cc-ed to the course supervisor. Email: boontat_teoh@recsam.edu.my
14 Nov 2006 (Tue)	2. Development	
16 Nov 2006 (Thu)	3. Implementation & Evaluation	
17 Nov 2006 (Fri)	4. Development	
21 Nov 2006 (Tue)	5. Evaluation & Development	
23 Nov 2006 (Thu)	6. Evaluation & Development	
27 Nov 2006 (Mon)	7. Final Report	



COURSE OUTLINE

PM-2233: Enhancing Online Teaching and Learning for Primary Mathematics Teachers
6 November – 1 December 2006 (4 Weeks) **Course Supervisor: Teoh Boon Tat**

No	Topic/Activity	Hours	Staff	Suggested Approach	Intended Outcomes/Output
1.0	ORIENTATION, ADMINISTRATION & EVALUATION COMPONENTS [10]				
1.1	Opening Ceremony & General Briefing, Tour of RECSAM's Facilities	4	VAR	Official welcoming by Centre Director followed by briefing by heads of divisions and accountant. Tour of RECSAM's facilities & briefing by Librarian.	Familiarisation with RECSAM facilities, knowledge of Learning Resource Centre rules and regulations, library loans, library cards.
1.2	Course Briefing & Pretest	2	TBT	Discussion; Questionnaire: paper & pencil assessment	Overview of the 4-week course and objectives; Pre-instructional perception of level of knowledge and skills.
1.3	Course Evaluation & Posttest	2	TBT	Questionnaire: paper and pencil assessment	Feed-back and comments on the learning process at RECSAM, Post-instructional perception.
1.4	Closing Ceremony & Presentation of Certificates	2	VAR	Official closing and certificate presentation by Guest of Honour	Awarding of certificates to participants.

2.0		GENERAL COMPONENTS [16]			
2.1	Basic ICT Skills	[8]	CAN	Demonstration & Hands-on Activities	Familiarize & optimise the usage of RECSAM's Internet & intranet facilities. Apply the basic ICT skills acquired in course projects, reports, proposals, demonstrations, communications & presentations throughout the course when required.
	2.1.1 RECSAM's ICT System	2			
	2.1.2 Word Processor	2			
	2.1.3 Spreadsheet	2			
	2.1.4 Presentation	2			
2.2	Multiplier Effects Initiating and implementing changes and proposal presentation.	2	CUH / TBT	Discussion & Workshop	A proposal outlining a practical plan of action to disseminate information and knowledge learnt from the course.
2.3	Classroom-based Action Research for Professional Development & Assessment	6	CUH / WAH		Understand the concept of action research and be able to begin doing action research in the classroom.
3.0		CORE COMPONENTS [100]			
3.1	Trends and Issues			Lecture, Discussion & Workshop	
	3.1.1 Trends and Issues in Mathematics & <i>Online</i> Mathematics Education	2	JAC		Describe and explain the current issues regarding mathematics education generally & online mathematics education specifically.
	3.1.2 Constructivism: Theory, Practice & Research	2	MLTL		Conceptual understanding of constructivism based on different paradigm and perspectives and ideas that reflect the constructivist's practice of mathematics teaching.

3.2	Search Engines	2	CAN	Demonstration, Discussion, Practice & Hands-on Activities	Use various types of search engines; meta-search engines; general & advanced searches; Boolean search for more effective & precise searches for mathematics education materials. Use effective strategies to collect online exemplary mathematics materials for teacher and student use.
	Effective & Productive Use				
3.3	Web Design	4	CAN	Workshop, Discussion, Demonstration & Hands-on Activities	Use Knowledge as Design as a framework for website design. Use web editors like Microsoft Word or FrontPage to design & develop effective websites for teaching & learning of mathematics. Knowledge of file/folder hierarchical structure & HTML. Incorporating web sites in an e-learning system. Use effective strategies to link and collect online mathematics materials for teacher and student use.
	Knowledge as Design in Web Design				
3.4	Treasure Chests of Best Practices	[16]		Workshop, Demonstration, Group Work, Discussion & Hands-on, Minds-on Activities	Use effective and meaningful ways of learning mathematics through the Internet using appropriate student-centered approaches.
	3.4.1 Online Collaborative Approach	4	TBT		
	3.4.2 Online Inquiry Approach	4	JAC		
	3.4.3 Online Cooperative Approach	4	TBT		
	3.4.4 Online Problem Solving	4	JAC		

3.5	Essence of Effective e-Learning	6	TSC	Simulation, Demonstration, Group Discussion & Hands-on Activities	Knowledge of & incorporating the essence of good design in a student-centered e-learning environment particularly on motivation & interactivity.
	3.5.1 Primary Components of e-Learning				
	3.5.2 Motivation				
	3.5.3 Interactivity				
3.6	e-Learning System & Communication Tools	16	TBT	Demonstration, Workshop & Hands-on Activities	Use an internet or intranet e-learning system to plan, deliver, track, coordinate, quantify and manage online teaching & learning. Synchronous Modes – to set up & use chat, teleconferencing or other appropriate tools for effective communication and collaboration. Asynchronous Modes – to set up & use websites, email with attachments, list groups, forums or other appropriate tools for effective communication and collaboration.
	3.6.1 e-Learning System				
	3.6.2 Synchronous Mode				
	3.6.3 Asynchronous Mode				
3.7	Global Primary Mathematics Projects	4	NKT	Demonstration, Workshop & Hands-on Activities	Participate in virtual fieldtrips, Science Across the World projects or WebQuests in other countries.
3.8	Data Processing Tool	2	JAC	Simulation, Demonstration & Hands-on Activities	Scientific data collection, resources pooling and electronic spreadsheets in the classroom. Use Microsoft Excel or other online publishable tools.
	Spreadsheets				

3.9	Assessments	[12]		Demonstration, Workshop & Hands-on Activities	Use diagnostic, formative and summative assessments in student understanding of online content.
	3.9.1 Types of Assessments for Learning	6	JAC		Use various methods of alternative assessment of students who use online approach in learning mathematics.
	3.9.2 Alternative Assessments for Learning				
	3.9.3 Evaluation of Educational Websites				
	3.9.4 Online Assessments	6	CAN		Evaluate educational websites based on appropriate instructional design.
3.10	THEORY INTO PRACTICE	[34]		Lecture, Working and Discussion in Groups, Presenting Ideas to Fellow Participants, Lesson Try-Outs	
	3.10.1 Instructional Design				Plan, design & develop exemplar teaching & learning materials for use in online student - centred mathematics lessons. Materials include lesson plans, worksheets, assessments, teacher's guide, teaching & learning aids, findings, etc.
	3.10.1.1 Principles of Instructional Design	18	TBT		
	3.10.1.2 Analysis, Design & Development				
	3.10.1.3 Implementation – Lesson Try-outs				
	3.10.1.4 Evaluation & Improvement	6	JAC / TBT		Implement these online materials in lesson try-outs.
	3.10.2 Project Work	10	TBT		Evaluate the materials for revision, refinement and further development.
			Post, defend, present & report your project work from instructional design & pedagogical perspectives.		

4.0	ENRICHMENT [4]				
	4.1 Online Mathematics Offline	4	TBT	Educational visits, observation, interview, data collection	Enrich experience and knowledge.
5.0	HOLIDAYS [0]				
	No special holiday(s) within the course duration	0			
	TOTAL NUMBER OF HOURS	120	Excluding the <i>Orientation, Administration & Evaluation Components</i>		

DISTRIBUTION OF HOURS

Course Components	No. of Hours	Percentage of Hours
Orientation, Administration & Evaluation Components	10	-
General Components	16	13.33
Core Components	100	83.33
Enrichment	4	3.33
Holidays	0	0.00
TOTAL	120	100.0

TEACHING STAFF OR PERSONNEL INVOLVED

DRP	Mr. Devadason Robert Peter (Head, Training Programme)
CUH	Dr. Cheah Ui Hock (Head, Research and Development)
IDA	Dr. Ida Karnasih (Specialist, Mathematics Education)
JAC	Mr. Jerome A. Chavez (Specialist, Mathematics Education)
CAN	Mr. Chockalingam Annamalai (Specialist, Technology Education)
NKT	Ms. Ng Khar Thoe (Specialist, Research & Development)
WAH	Dr. Wahyudi (Specialist, Research & Development)
TBT	Mr. Teoh Boon Tat (Specialist, Mathematics Education)
TSC	Assoc. Prof. Dr. Toh Seong Chong (Consultant)
MLTL	Dr. Michael Liau Tet Loke (Consultant)
VAR	Various Persons

REFERENCES

- Allen, M.W. (2002). *Michael Allen's Guide to E-Learning: Building Interactive, Fun, and Effective Learning Programs for Any Company*. New Jersey: John Wiley & Sons.
- Charles, R. & Lester, F. (1982). *Teaching problem solving. What, Why and How?* Palo Alto, CA: Dale Seymour Publication.
- Clegg, V. et al (September 1986). *Improving multiple-choice tests*. Idea Paper No. 16. Kansas: Center for Faculty Evaluation and Development. [accessed on-line, 9/20/2006] http://www.idea.ksu.edu/papers/Idea_Paper_16.pdf
- Dick, W., Carey, L. & Carey, J. O. (2001). *The Systematic Design of Instruction*. (5th Ed.). U.S.A.: Longman.
- Forman, G. & Pufall, P. B. (1988). *Constructivism in the Computer Age*. London: Lawrence Erlbaum Associates.
- Fox, B, Smith A.M., (Editor), Wilkes, S. (2002) *Using ICT in Primary Schools*. New York: David Fulton Publishers.
- Grabe, M. & Grabe, C. (2006). *Integrating Technology for Meaningful Learning*. Fourth Edition. Boston: Houghton Mifflin College Div.
- Jonassen, D.H. (2000). *Computers as Mindtools for Schools: Engaging Critical Thinking*. New Jersey: Prentice-Hall.
- NCTM. (1991). *Curriculum and evaluation Standards*. Reston, VA: NCTM.
- Perkins, D. (1986). *Knowledge as Design*. Lawrence Erlbaum Associates, Inc., Hillsdale: New Jersey.
- Polya, G. (1945). *How to solve it: A new aspect of mathematical method*. Princeton, NJ: Princeton University Press.

ONLINE REFERENCES

Assessments

<http://www.unisa.edu.au/evaluations/program.htm#Online>

Best Practices for Primary Mathematics Education

www.educationalalliance.org/Downloads/Research/TeachingMathematics.pdf

www.etsu.edu/devstudy/spin/bestpractices.pdf

<http://www.glencoe.com/sec/math/studytools/index.php4>

<http://www97.intel.com/education/teach/> - Intel Teach to the Future

<http://www.remc11.k12.mi.us/bstpract/>

<http://www.tea.state.tx.us/math/BestPract.htm>

http://www.tki.org.nz/r/assessment/exemplars/maths/index_e.php

Communication Tools

<http://www.asaging.org/webseminars> - Free Online Seminars about online learning

<http://bravenet.com/forum>

<http://groups.yahoo.com/>

<http://mathforum.org/>

<http://www.mathlinks.ro/Forum/portal.php>

<http://www.microsoft.com/downloads/details.aspx?FamilyID> - Microsoft Net Meeting

<http://www.msn.com/> - building free online communities and host free online chat rooms

Data Processing Tools

<http://www.bcschools.net/staff/ExcelHelp.htm>

<http://www.microsoft.com/excel/>

<http://spreadsheets.google.com/>

<http://www.usd.edu/trio/tut/excel/>

E-Learning Systems

<http://www.blackboard.com/us/index.aspx>

<http://www.broadoak.tameside.sch.uk/course/view.php?id=7>

<http://www.humboldt.edu/~jdv1/moodle/all.htm>

<http://www.mindflash.com/pages/home.asp>

<http://moodle.org/>

<http://www.opensource.idv.tw/moodle/>

<http://www.sreccsam.edu.my/moodle/>

Global Mathematics Project

http://www.britishcouncil.org/ukraine-science-science_across_world.htm

<http://www.pca.state.mn.us/water/standards/index.html>

<http://www.scienceacross.org>

Instructional Design

http://carbon.cudenver.edu/~mryder/itc_data/idmodels.html

<http://fog.ccsf.cc.ca.us/~mmalacho/OnLine/ADDIE.html#E>

<http://www.pitt.edu/~poole/onlinelearninglinks.html#assessment>

Interactive Mathematics

<http://www.aplusmath.com/>

<http://www.bbc.co.uk/schools/revisewise/maths/>

<http://www.coolmath4kids.com/>

<http://www.cut-the-knot.org/index.shtml>

<http://www.explorelearning.com/index.cfm?method=cResource.dspChildrenForCourse&CourseID=122>

<http://www.hungryfrog.com/>

<http://www.internet4classrooms.com/month2month.htm>

<http://www.k111.k12.il.us/KING/math.htm>

<http://www.primarygames.co.uk/>

<http://www.primarygames.com/math.htm>

<http://pbskids.org/cyberchase/>

<http://www.shodor.org/interactivate/activities/>

http://teachingtreasures.com.au/maths/Maths_more.html

<http://www.topmarks.co.uk/MathsGames.aspx>

Online Search

<http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/ToolsTables.html> - Types of Search Tools

<http://www.google.com>

<http://www.live.com>

<http://www.msn.com>

<http://www.virtualsalt.com/howlook.htm> - Guidelines for searching the Internet for sources, including the use of engines and directories, formulating search terms and using Boolean logic.

<http://vivasimo.com>

<http://webquest.sdsu.edu/searching/specialized.html> - Specialized Directories and Databases

<http://www.yahoo.com>

Web Design

http://en.wikipedia.org/wiki/Web_design

<http://www.oswd.org/> - Free Design

<http://webdesign.about.com/>

Others

<http://www.amphi.com/teachers/psteffens/math.html> - A directory of Maths sites

<http://www.dynamicdrive.com> - Free Scripting to make your web page more dynamic and interesting.

http://www.pewinternet.org/pdfs/PIP_Schools_Report.pdf - Internet and Education: Reporting on daily internet activities of users