Integrating Computers and Technologies in the Teaching and Learning of Mathematics

EDSE 442 Summer 2011
Section B1, H1
July 4 – 22 M – F 9:00 – 11:05 a.m.
lab W 12:00 – 3:30 p.m.

Instructor contact information:

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Course Description
A variety of information and communication technologies useful for secondary mathematics teaching and learning are explored and critiqued through the hands-on use of computers and electronic technologies relating to curriculum, with critical consideration of relevant associated research. Emphasis is placed on exploring, assessing and presenting technology-based classroom instruction in ways that enhance, deepen and give meaning to student learning in mathematics.

Course Policies

Course Objectives[1]
The student will:

1. Attend class and participate fully in all class activities
2. Contribute regularly to the class "wiki" space.
3. Investigate various Information Communication Technologies useful for the teaching and learning of secondary mathematics.
4. Read and access materials in the Alberta Program of Studies to plan activities which meaningfully involve the use of technology in mathematics education.

[1] See Appendix A for a detailed list of Learning Outcomes

5. Demonstrate competence in using various technologies to investigate, explore, extend and present secondary mathematics concepts.
    - Manage technology in ways that enhance and deepen students' development of mathematical understanding.
6. Discuss, disseminate and present activities that integrate ICT effectively in mathematics learning; create accompanying resources and strategies for implementing technology in the mathematics classroom
7. Critique the effectiveness and applicability of currently available ICT research and resources.

Prerequisites
Introductory Professional Term and 24 credits in mathematics, or by consent of instructor

Instructional Strategies Used
Modeling, Demonstration; Guided Instruction; Cooperative Learning; Collaborative Learning; Constructivist Practice; Student-Led Instruction

Knowledge, Skills and Attributes: (for Interim and Permanent Teacher Certification in Alberta)

j) Teachers are expected to demonstrate consistently that they understand the functions of traditional and electronic teaching/learning technologies. They know how to use and how to engage students in using these technologies to present and deliver content, communicate effectively with others, find and secure information, research, word process, manage information, and keep records;

h) Teachers apply a variety of technologies to meet students' learning needs.

Teachers use teaching/learning resources such as the chalkboard, texts, computers and other auditory, print and visual media, and maintain an awareness of emerging technological resources. They keep abreast of advances in teaching/learning technologies and how they can be incorporated into instruction and learning. As new technologies prove useful and become available in schools, teachers develop their own and their students' proficiencies in using the technologies purposefully, which may include content presentation, delivery and research applications, as well as word processing, information management and record keeping.

Teachers use electronic networks and other telecommunication media to enhance their own knowledge and abilities, and to communicate more effectively with others.

Required Resources:

- Regular internet access
- Computer storage device (memory stick)
- (4) AAA alkaline batteries (may be rechargeable) + (2) AA alkaline batteries
    - *n.b. Class sets of TI 84+ and TI N-Spire (CAS) Graphing Calculators will be available for use in-class only*

- Alberta Education Programs of Study: *Secondary Mathematics Grades 7 – 12* (NEW) and *Information and Communication Technology* and *Mathematics* (secondary) including the Illustrative Examples Databases. Online access:
  - http://education.alberta.ca/teachers/program/ict/programs/division/div3.aspx (ICT Program of Studies Div 3)
  - http://education.alberta.ca/teachers/program/ict/programs/division/div4.aspx (ICT Program of Studies Div 4)
  - http://education.alberta.ca/teachers/program/ict/resources.aspx (ICT assessment)
  - http://education.alberta.ca/apps/ict/ie.asp (Illustrative Examples and rubrics for ICT outcomes)
  - http://education.alberta.ca/teachers/program/math/programs.aspx (Program of Studies for Mathematics in Alberta)
  - http://education.alberta.ca/teachers/program/math/resources.aspx (Resources for teachers for mathematics)

You are expected to access the following site **daily**:

- Class WIKI http://edse442su11.wikispaces

Attendance, Assignments, Missed in-class activities:
Regular attendance is required. Late assignments will be docked 10% per day.

Course Evaluation:

Assignment	**Percentage**	**Due Date***
Tools Focus: Organization and Presentation Web 2.0 tools (small groups)	30	Daily: July 5 - 8
Wiki Journals	10	Ongoing As assigned
Content Focus using Tech: Investigation, Data analysis & Problem Solving	20	July 11-15
Research and Exposition: Individual Final project and presentation	40	July 21-22

Changes to this schedule may occur based on class' interests and needs

Final Grade:
Final grades will be determined by considering the distribution of weighted raw scores. Normally the course mean for a 400 level course is 3.11. **Students must receive a minimum raw score of 60 to pass the course**.

Equity Statement and Inclusive Language Policy
The Faculty of Education is committed to providing an environment of equality and respect for all people within the university community, and to educating staff and

students in developing teaching and learning contexts that are welcoming to all. In seeking to achieve a climate of respect and dignity, all staff and students must use inclusive language to create a classroom in which an individual's experience and views are treated with equal respect and value in relation to his/her gender, racial background, sexual orientation, and ethnic background.

Code of Student Behaviour

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online www.ualberta.ca/secretariat/appeals.htm) and avoid any behaviour that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Appendix A Learning Outcomes

Research & procedure

Demonstrate an understanding that technology is a process, technique or tool used to enhance human mathematical exploration and activity

1. access and operate multimedia applications and technologies from stand-alone and online sources; demonstrate the ability to troubleshoot technical problems
2. evaluate the authority, reliability and relevance of electronic sources

Respect ownership and integrity of information

3. model and assume personal responsibility for ethical behaviour and attitudes and acceptable use of information technologies and sources in local and global contexts
    - cite sources when using copyright and/or public domain material
    - download and transmit only materials that comply with the established network use policies and practices
    - consult a wide variety of sources that reflect varied representations; demonstrate discriminatory selection of electronically accessed information that is relevant and appropriate to the concept or topic , including primary and secondary sources

4. identify and apply safety procedures required for the technology being used
5. apply terminology appropriate to technology in all forms of communication
6. demonstrate an understanding of the general concepts of the algorithms that enable technological devices to perform operations and solve problems

Mathematics as an Investigative Science

7. investigate and solve problems of prediction, calculation and inference
8. investigate and solve problems of organization and manipulation of information
9. manipulate data by using charting and graphing technologies in order to test inferences and probabilities
10. analyze and synthesize information to determine patterns and links among ideas
11. solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments

Presentations & projects

12. analyze and synthesize information to create a product (Secondary mathematics content)
    - articulate clearly a plan to use technology to solve a problem [or explore a concept]
    - identify the appropriate materials and tools to use in order to accomplish a plan of action
13. create multimedia presentations that incorporate meaningful graphics, audio, video and text gathered from a variety of sources
    - integrate a variety of visual and audio information to highlight a math concept targeted for a specific audience
    - create presentations that take into account audience diversity

- apply principles of design to enhance meaning and audience appeal
- make connections among related, organized data, and assemble various pieces into a unified message

14. communicate in a persuasive and engaging manner, through multimedia projects and presentations, applying information technologies for context, audience and purpose that extend and communicate understanding of mathematical concept
    - use appropriate presentation software to demonstrate personal understandings of math concept
    - generate new understandings of a concept by using some form of technology to facilitate the process
15. create and post multiple-link documents to the class wiki, appropriate to the content of a particular topic
    - demonstrate proficiency in uploading and downloading text, image, audio and video files