

The Laptop Learning Project

“Teaching The Way Students Learn”

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A Word of Caution

- This talk is not about e-learning.
- This talk is not about online-learning.
- This talk is not about blended-learning.
- This talk is not about flipped-learning.

This talk is about learning (and about its flip side - teaching).

Laptop Learning

- If this conversation were taking place in the stone age, we might be talk about learning using pebbles in the sand.
- If this conversation were taking place at the time of Gutenberg, we might be talking about learning using books.

Each age has its medium.

- When I was talking about teaching in 1996, I put it this way:

“Let us look back in the history of mathematical technology. First there was

- *sand and sticks, then*
- *stone and chisel,*
- *pencil and paper was a major advance, after that the*
- *slide rule, then the*
- *calculator, after that the*
- *computer with Maple, Mathematica, and other software. But now there is*
- *Scientific WorkPlace.*

It is now possible to teach interactive courses in linear algebra, calculus, differential equations, etc., that deal dynamically with concepts and calculations through live screen objects that can be manipulated and recomputed instantly ad infinitum. The arithmetic obstacle to computationally complex problems has been eliminated.”

[\(Mackichan Technical Report\)](#)

A New Kind of Learning

- About 40 years ago, a new markup language called **L^AT_EX** was invented that allowed mathematician to write mathematical documents that were easy to produce and really looked like mathematics. The result: mathematicians started to communicate and became more collaborative.
- About 25 years ago, a new tool was invented called *Mathematica* (and other such systems) that made it possible to relegate some repetitive calculations to machines and concentrate on the conceptual aspects of mathematics. The system was very expensive and we couldn't afford it. Hence I used Scientific WorkPlace, based on *Maple*, a competitor of *Mathematica*.
- I have been teaching with Scientific Notebook, an offspring of Scientific WorkPlace, ever since. My three eConcordia courses, Math 204 (Linear Algebra), Math 208 (Business Math), and Math 209 (Business Calculus), still use Scientific Notebook. Why change?
- Time marches on and after six years of hard work and lobbying, I managed to persuade Concordia to acquire a site license for *Mathematica*. We can all use it free of charge and I am converting all of my courses from Scientific Notebook to *Mathematica*, for many reasons.

What is new about it?

- The pedagogy is new. *Mathematica* allows for both command-line and menu-driven teaching. *Mathematica* also has a predictive interface. Moreover, an offspring of *Mathematica* called Wolfram Alpha is pioneering the idea of using natural language to communicate with computers.
- Mathematicians can sit back and give orders (properly expressed in ordinary English) and the computer will produce the answers. Instead of brainless calculations taking hours, we can concentrate on the meaning of the computed results and solve problems of such complexity that we should all be in awe of the power of the mathematical tools we have created. Just think of the Explorer rummaging around on Mars and sending data including beautiful images that are really outside our physically accessible world. Mathematics at its best. That's new.
- Wireless communication, image process, data collection based on the most sophisticated scientific principles. Learning how to use, understand and manipulate these systems is a new kind of learning.

The hardware

- Slide rules
- Calculators
- Mainframes
- Desktops
- **Laptops**
- Tablets

Teaching and learning of mathematics with laptops is still state-of-the-art technology.

Yesterday's classroom



Today's classroom





Laptop Learning Courses

- Math 212 (The Fascinating World of Numbers)
- Mast 232 (Mathematics with Technology)
- Mast 235 (Second Course in Linear Algebra)
- Math 616 (Graduate Course in Linear Algebra)
- Three eConcordia Courses (Math 204, 208, and 209)

Remind me again just what is new?

- Interactive teaching and learning with *Mathematica*
- Interactive teaching and learning with *Wolfram Alpha*
- Interactive teaching and learning math using natural language
- Interactive teaching and learning with laptops

Where do we go from here?

Answer: It'll be π in the sky.

It's still a secret.

So please keep it to yourself.

It'll be *Mathematica Online*.

online.wolfram.com/mathematica/ — Mathematica Online

Wolfram Mathematica ONLINE PRERELEASE

Welcome to the *Mathematica* Online Prerelease

Prerelease News

March 4, 2013

Onward and upward!

We've pushed another update—our fifth so far, if you're counting—that significantly improves the editing experience and makes many aspects of *Mathematica* Online more stable and more responsive.

The first thing you're likely to notice are those upgrades to the editing environment. We've added auto-spacing, bracket matching, syntax highlighting, and auto-completion. Give it a try and let us know what you think!

We're working hard to bring access to *Mathematica* Online to as many devices as possible. To that end, this release includes additional enhancements to the adaptive interface and better support for iOS and mobile browsers.

Getting Started

A QUICK OVERVIEW OF
Wolfram Mathematica ONLINE
FOR PRERELEASE MEMBERS

0:00 | 6:42

Prerelease Resources

- Discuss in Community
- Mathematica Environment
- Notebook Rendering
- Sharing
- Prototypes
- FAQs

Feedback

[Mathematica Online](#)

The role of Moodle

- We have talked about learning without an e.
- We have talked about learning without online.
- We didn't have to removed the e from teaching because few people, if any, talk about e-teaching.
- We haven't really talked about teaching with technology since this has gone on forever. Only the technology keeps changing.

- But we did briefly mention the impact of “communication” on teaching and learning.

Moodle turns teacher and students into great communicators, to the benefit of all.

Moodle and A New Kind of Learning

- Math 212 (The Fascinating World of Numbers)
- Mast 232 (Mathematics with Technology)
- Mast 235 (Second Course in Linear Algebra)
- Math 616 (Graduate Course in Linear Algebra)
- [A New Kind of Learning Seminar Site](#)
- [Three eConcordia Courses \(Math 204, 208, and 209\)](#)

Some of the Moodle features used:

- Lecture notes in Mathematica
- Lecture notes in HTML
- Randomized multiple-choice quizzes
- After-class feedback on course material
- News forums for course announcement
- Posting and viewing of course projects and slideshows
- Personal anecdotes illustrating mathematical ideas

Wolfram Demonstrations

Let us take a brief look at the range of Wolfram Demonstrations.

[A Smörgåsbord of applications](#)

Learning with *Wolfram Alpha*

The way we compute

What is the approximate value of the log function at 45 to five decimal places?

The way we visualize

how me the graph of the sine function at x times y

The way we classify

What are the world's five longest rivers?

The way we speak

How do you say "I love you?"

The way we hear

What is the sound of the middle C?

The art of spelling

How do you spell hippopotomos?

The way we speak

How do you integrate sine x?

The way we think

Is the area enclosed by a circle equal to pi if the radius of the circle is one?

Do you speak French?

The way we solve

Solve $3x^2+x-7=4x$

The way we see

Is red a primary color?

Is grey a primary color?

The way we philosophize

how many angels can dance on the head of a pin?

The way we measure

How long is the Nile river?

do you love me?

Adobe Meeting Layouts Pods Audio

Attendees (1)

Using the tutorials.pdf

10 Mathematica Tutorials

The following ten tutorials are designed to help you learn how to use *Mathematica* in your course.

- Tutorial 1 - *How to create and save documents*
- Tutorial 2 - *How to activate and work with toolbars*
- Tutorial 3 - *How to create and work with layouts*
- Tutorial 4 - *How to work with math and text*
- Tutorial 5 - *How to work with vectors and matrices*
- Tutorial 6 - *How to input math and text*
- Tutorial 7 - *How to compute symbolically and numerically*
- Tutorial 8 - *How to get Help*
- Tutorial 9 - *How to plot and graph lists and functions*
- Tutorial 10 - *How to work with notebook stylesheets*

How you should use the tutorials

1. Create a new *Mathematica* notebook and save it with the name "MyTutorials," or any other name you prefer.
2. Keep the notebook open.
3. Play one of the videos and repeat the illustrated operations in your MyTutorials notebook. You can stop and restart the videos whenever you want to practice some of the *Mathematica* features being illustrated.
4. When you have completed all of the tutorials you can either repeat them or complete the Bonus Quiz.
5. Upload completed the Bonus Quiz to eConcordia to obtain your bonus marks for having learned the basics of *Mathematica* required to succeed in your course.

It's time to get started.

1 / 1 100%

To Summarize:

The Future of Learning will be a New Kind of Learning

- Laptops, tablets, and other smart devices
- Cloud computing using Wolfram Technologies such as *Mathematica* Online
- Adobe Connect or similar communication and synchronization software
- Lateral learning using hyperlinked interactive documents and visualization tools
- Peer-to-peer teaching and learning, assisted and monitored by academics

The reality of A New Kind of Learning
puts a smile on my face.

Back to the future!

[Smile](#)

Thanks for listening!