

Web 2.0 for Linear Algebra Classes

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2012 Joint Mathematics Meetings

Introduction

Background

Course Wiki and Definitions Project

Integrating Software using Video Instruction

Benefits and Success

Problems and Possible Improvements

Extensions to Other Classes

Background

Pacific Lutheran University - small liberal arts

Linear Algebra - 300 level; introduction to proofs

Teaching and Learning with Technology

Developing a hybrid component to an existing course,
Developing an online version of an existing course, or
**Incorporating a significant new use of technology in the
classroom or laboratory.**

Ideas

Blogs

Use a wiki for course organization and student-generated
content

Integrate software package (Sage) completely outside of class
time with video tutorials

Course Wiki

What is a wiki?

Free[†] online community

User-generated content

wikidot, wikispaces, zoho

Supports mathematical typesetting (\LaTeX)

How did I use the Wiki?

Definitions project

Homework and project questions forum

Place to aggregate video tutorials

Example Wiki

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Technology via Video Instruction

Used Sage (open source software package)

- Free

- Can run without install

- Built on Python

- Talk later today

Camtasia (Jing) or Captivate

- Screencast software

- Approximately 10 minutes per video

- Upload to YouTube or Vimeo

7 Sage Projects (link)

- Extras about downloading Sage and using wiki software

- Most videos about content from text

- Easily extendable to interesting applications

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Benefits

Wiki Benefits

Instant feedback

Easy \LaTeX experience

Online community

Creating viewable content (owning their work)

Participating with lower stress

Introduction to technology

Software Benefits

No waste of class time

Visualization

Students work at their own pace

Can ask harder questions

Advanced students can probe deeper

Weaker students can use software to check computations

Benefits

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Examples and Success

Finished Definitions Page (Link)

Seven Sage Projects

Most Helpful

Four Fundamental Subspaces, Linear Transformations,
Eigenvectors

Most Interesting

Solving Systems, Graph Theory

Feedback

16/17 students were satisfied with the wiki and videos
Most students wished we had done more with the wiki
Enjoyed thinking on their own and creating content
Hoped for use of Sage and videos in other courses

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Feedback

Representative comments about the wiki:

"Wiki was a fun way to get the class involved in learning and the use of technology. Very cool."

"I like the wiki, it was easy to understand and well organized. Easy to find assignments and ask questions."

"I think that we should have used the wiki more. Maybe have each student do a "wiki project" which would include putting up a definition or two and assign each student their own proof to put on the wiki."

Feedback

Representative comments about the Sage Videos:

"Your videos were great. Perhaps turn up the volume levels by about 30% but other than that, they were extremely helpful and well produced."

"I would say either make the projects harder or longer. I found them extremely easy to do and did not take a while, so I don't know exactly how much of it I actually retained, but I feel as though if there were either more assignments with it, it would have been different."

"Overall, I liked Sage, but sometimes the assignments were a little long in addition to the homework. I know it's hard to stagger Sage and HW assignments since they coincide with one another, but it sometimes was a lot to get done within one week's time."

Problems

Wiki Problems

- Too much of my own feedback on forums

- Students resistant to \LaTeX

 - Need a lot of documentation

 - Don't fully understand how to work with it

- Motivation to do extra

Sage and Video Problems

- Tech-savvy vs. Tech-dependent

- Videos are time consuming

 - Instructor time

 - Student time

- Connecting Sage routines to homework and proofs from class

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Improvements and Ideas for the Future

Make the user interaction more substantial

- Require examples in addition to definitions

- Worth more points

- Require posting of questions and attempts to answer

- Require mini-projects (Adopt a Vector Space)

Stack Exchange

- Mathoverflow

- Require students to create online community

Require peer review or in-class discussions

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Other Classes?

Wiki and Definitions

Any course - especially proof-based.

Software via Videos

Calculus Sequences (especially multivariable)

Differential Equations

Abstract Algebra

Thanks!

Any Questions?

Resources

Wikis - <http://www.wikidot.com>

My wiki (with video links) - <http://plufa11m331.wikidot.com/>

Sage - <http://www.sagemath.org>

Camtasia - <http://www.techsmith.com/camtasia.html>