

Effective teaching model using a fully-digital approach

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Presenter:

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Ask yourself the question: how can technology be used in mathematics courses? In this presentation, mathematical learning goals such as content coverage, problem-solving, and student engagement are explored and demonstrated. Technology to achieve these goals can include digital video, digital whiteboards, and digital gaming.

The format of this presentation will include a summary of experience with these technologies, good and bad, and an opportunity to participate in the presentation like a student. Bring a computer, smartphone or tablet to participate.

Participants will be engaged in this presentation through the use of WebAssign, an online assessment system. Each of the items discussed in this presentation (video usage, whiteboards, and gaming) will be embedded in WebAssign as activities. Each participant will be given a student user account to access and participate in each form of technology.

Effective teaching model using a fully-digital approach

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<http://bit.ly/CSS2017>

Abstract

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The format of this presentation will include a summary of experience with these technologies, good and bad, and an opportunity to participate in the presentation like a student. Bring a computer, smartphone or tablet to participate.

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Results

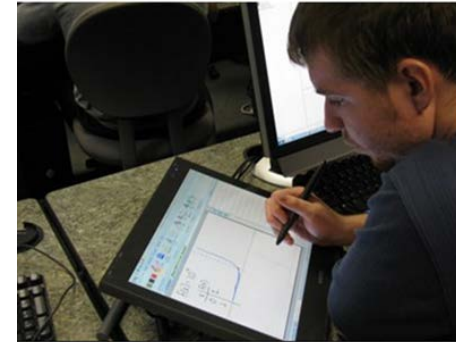
Quantitative – Digital Ink

Effect size of mathematical students engaging and using digital ink yielded an effect size of 1.2 (Lafreniere, 2015).

Well above the benchmark of 0.4 described by Hattie (2012).

Results compiled using paired t-test analysis of students completing a nationally available math placement test before and after treatment using digital ink and WebAssign®.

The combination of digital ink and online assessment capabilities of WebAssign® were the technological tools employed in this study. Given the cost prohibitive nature of the interactive pen display hardware used and the cognitive load demands on students using two software systems, an integrative approach using only WebAssign® was sought.



Results

Quantitative – Video Engagement

Focused on WebAssign and Video Engagement integration (no digital ink)

Early indications

- Better validation of student engagement (time spent and questions quizzed)
- Higher student / teacher accountability



Learning is an acquired skill, and the most effective strategies are often counterintuitive.

(Brown, Roediger, & McDaniel, 2014, p. 2)



Image Source:

<http://www.lifehack.org/articles/lifestyle/what-are-some-counter-intuitive-life-lessons.html>

Three Digital Approaches

Content Coverage using

- Video

Problem-Solving using

- Whiteboard
- Assessment

Student Engagement using

- Simulations
- Games



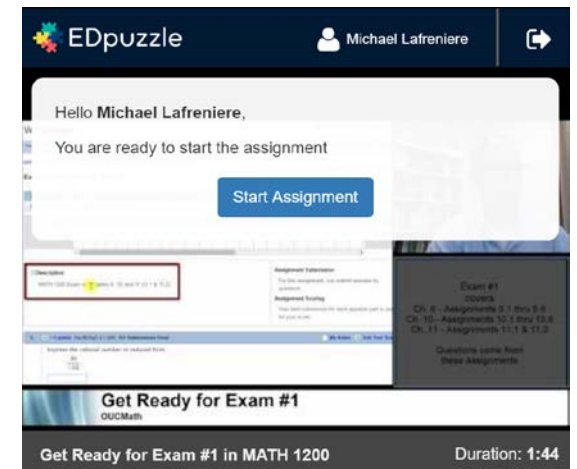
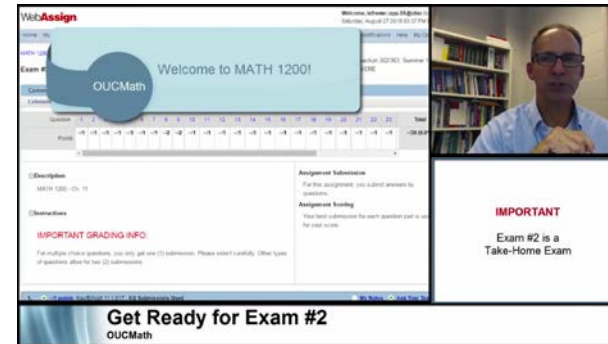
Content Coverage and Video Usage

Initially – Show Video

- Did student watch?
- Did they engage?
- Did student retain anything?

Video with Tracking

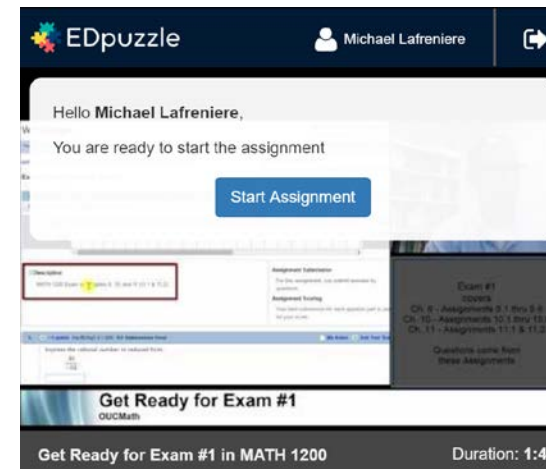
- Track with Edpuzzle
- Pausing and Questioning



Content Coverage and Video Usage

Video with Tracking and Assessment

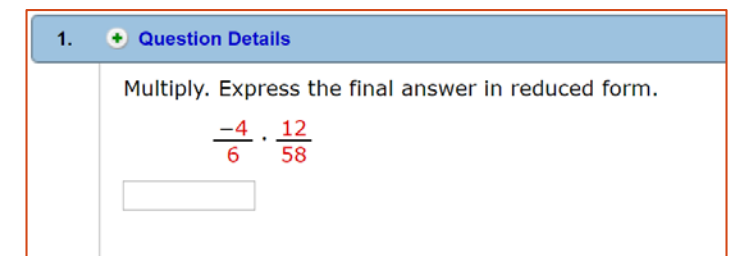
- Better questions that are open-ended
- One grade – tied to video engagement and answers submitted



Video that Guides Students in Course

- Teacher guidance is “content” for optimal learning

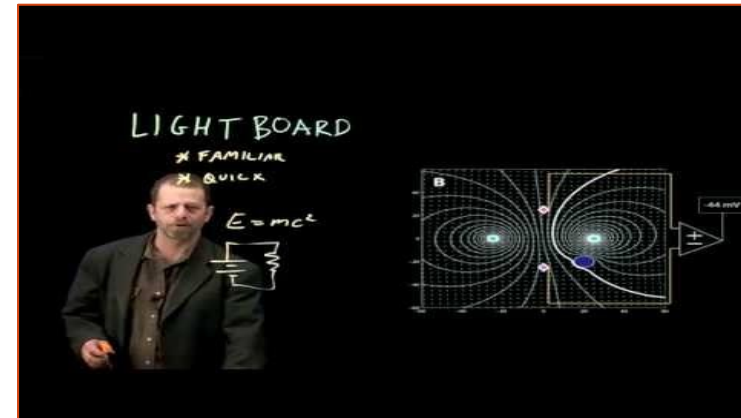
WebAssign®



Content Coverage and Video Usage

Next Steps with Content Coverage and Video Usage

- Lightboard videos speak to the listener
- Custom videos speak to the listener with personal and problem specific detail



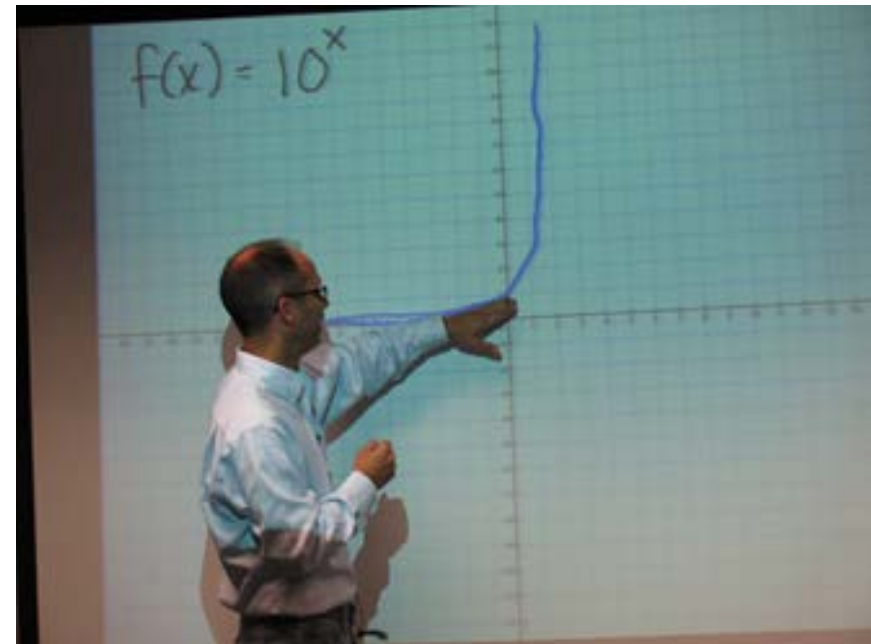
Problem-Solving

Initially – Teacher Notes

- OneNote
- Students not “note-takers”
- Students are “listeners”

Collaborative Notes

- DyKnow
- Engaged “listeners”
- Everyone writes – teacher gets feedback



Problem-Solving

Increasing student effort

- Videos became JIT
- More Online Assessment (WebAssign)
- “Write out” thinking desired
- Hardware limitation
 - Not all had digital pens
 - Not all platforms (Flash required)
 - Had to rethink for online courses

Show your work using the PencilPad tool below.

The screenshot shows the WebAssign PencilPad interface. On the left is a toolbar with icons for Draw, Erase, Clear, Add, Remove, Print, and Help. The main workspace contains a geometry diagram of two parallel horizontal lines intersected by a transversal line. The top-right angle is labeled $aX+5$ and the bottom-right angle is labeled bX . Below the diagram, the following algebraic work is shown:

$$\begin{aligned} \text{If } a &= 4 && 4X+5 \\ \text{if } b &= 3 && 3X \\ (4X+5) + (3X) &= 180 \\ 7X + 5 &= 180 \\ X &= 25^\circ \end{aligned}$$

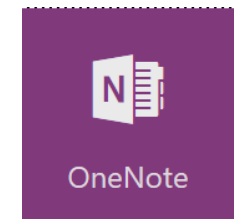
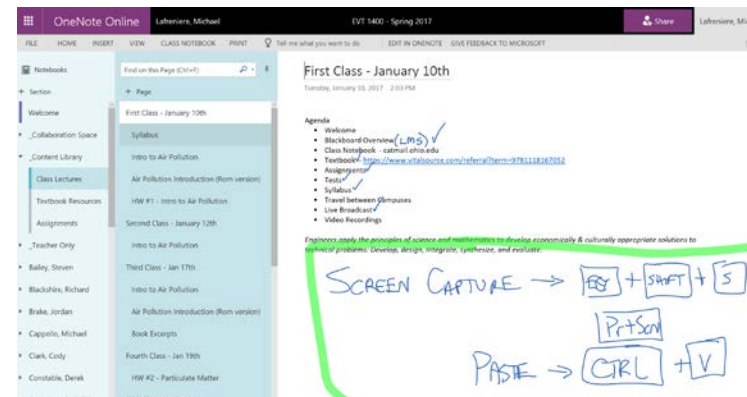
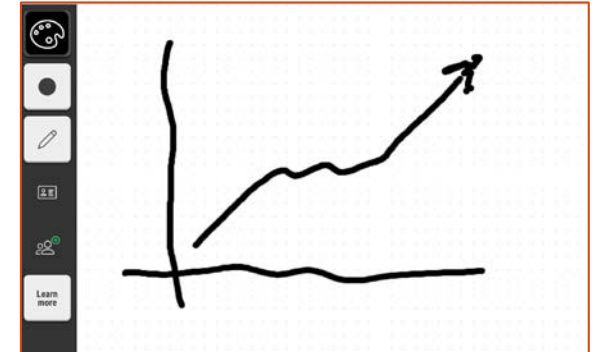
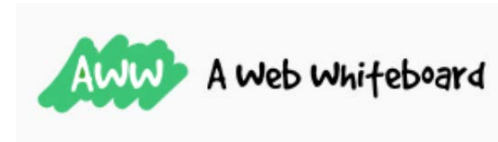
The bottom right corner of the workspace contains the text "WebAssign pencilPad".

WebAssign.

Problem-Solving

Current Environment

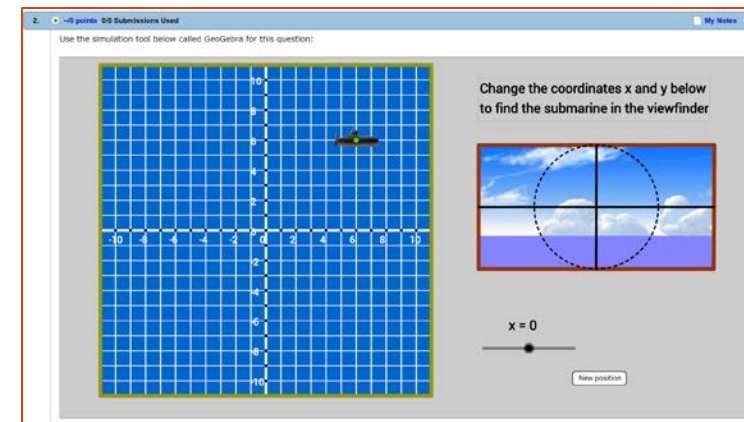
- Whiteboards
 - Tough to manage for each student and each assignment
 - Great for Tutoring
- OneNote Class Notebook or Google Classroom
 - Good for each student and each assignment



Engagement

Simulations

Games



Application to Developmental Mathematics

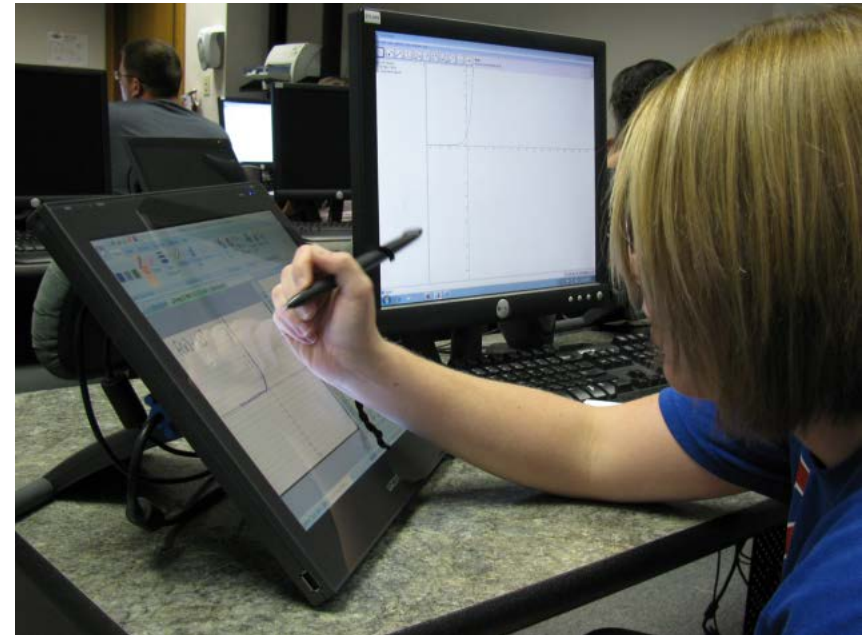
Retrieval Practice for Developmental Mathematics in WebAssign

Emporium Model

- Online assessment
- Allot time
- Self-paced
- Feedback support

Spaced and Interleaving Practice

- Alternate between different problems (WebAssign's My Class Insights)
- Avoid Blocked Practice (like textbook sections)
 - Feeling of getting better is illusory



WebAssign®

In virtually all areas of learning, you build better mastery when you use testing as a tool to identify and bring up your areas of weakness.

(Brown et al., 2014, p. 5)



Image Source:

<http://www.cosmeticsdesign-europe.com/Market-Trends/Test-Yourself!-CosmeticsDesign-Europe.com-s-May-Quiz>

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