Digital Textbooks for Mathematics: Promise and Reality

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Technology has revolutionized how everyone does some things ...
- Access news
- Purchase, store, and access music
- Navigate (replacing printed maps)
- Read, write, communicate

Value added: convenience, features, timeliness of information, transition speed, ... (quality?)

Presentation Overview

- What is the role and function of textbooks?
- What is the promise of digital textbooks?
- What is the reality (current status) of digital textbooks?
- Making the Promise a Reality
  - What's next? What's needed?

What is the function of a mathematics textbook?

- For teachers, particularly new teachers, it ...
- Organizes and sequences mathematics content that students are expected to learn.
- Provides problems and contexts to introduce ideas to students.
- Suggests activities to engage students in learning mathematics.

What is a digital textbook?

An organized set of materials and tools aligned to curriculum goals that are enabled and enhanced by a digital device and used by teachers and/or students to pace and structure mathematics instruction.

A digital textbook is not just taking an image of a [print] textbook and putting it on an electronic device to read it. A digital textbook is something that takes school content and takes advantage of the properties of digital media to produce that school content in a completely new way that is much stronger for learning.

Jeremy Roschelle, 5th International, 3/14/11 Podcast
www.pcti.com/browse/bookmarks/3438195397zapc0p4h
A digital textbook ...
- Provides a means to do everything that can be done via a print textbook.
- Makes possible some things that are difficult or impossible via print textbooks.

"A textbook doesn’t have to be text and it doesn’t have to be a book."

THE PROMISE...
Potential benefits of digital textbooks for K-12 mathematics

What are the affordances of digitally-organized and delivered textbooks?
"... provides the student with various interactive functions that can be searched, tagged, distributed, and used for individualized and group learning that includes multimedia content such as video clips, animations, and virtual reality, and that can be accessed at any time and anywhere."

What is driving the movement to Digital Textbooks?
- Economic forces
  - Perception of cost savings (open source content)
  - Emerging market for publishers
- Health and environmental concerns
- Technological advances (it’s now possible)
- Increase in device availability
- Web 2.0
- Appeal to teachers and students ("digital natives")

Sales of e-textbooks in U.S. higher education grew 44.3 percent to $187.3 million in 2011. Estimates are that e-textbooks will account for more than 11 percent of the $4.5 billion textbook market by 2013.
Source: Herff Jones, 2012

In what ways might digital textbooks be promising for K-12 mathematics education?

Digital mathematics textbooks can ...
- Consolidate mathematics textbook, graphing calculators, CAS, dynamic applets and simulations, spreadsheets, games, intelligent tutors, and (soon) dynamic geometry environments in ONE space, on ONE mobile device
- Allow for online collaboration and sharing through clickers, discussion boards, communication tools
- Provide teachers with real-time assessment data to guide and differentiate instruction
- Animate ... Engage ... Excite

THE REALITY...
Current digital textbook initiatives/examples
Apple announced in January 2012 that it had reached an agreement with three major textbook publishers (McGraw-Hill, Pearson and Houghton Mifflin Harcourt) to distribute their content through its iBooks service. Digital textbooks exclusively for iPad.

**iBooks**
- Available for grades K-12
- Authored by teachers and content experts
- Developed to be web-based
- Multiple CK12 math books have been reviewed and approved for use in California as part of their Digital Textbook Initiative

**Digital textbooks, online, open access**

**CK-12 Algebra I - 2nd edition**

**CK-12 Algebra II**

**CK-12 Algebra I**

**Tools to Create a Digital Textbook for iBooks**

**iBooks Author**
- Anyone can create their own digital textbook.
- Can insert widgets to enable interactivity.
- Can be kept for private use, given to any iPad user, shared on iTunesU, or submitted to iBooks.
Some other currently available K-12 digital math textbooks

- Kinetic Books: Pre-Algebra, Algebra I, Algebra II (Percussion Learning)
- HMH/Turn: Algebra I, Geometry, Algebra II (Houghton Mifflin Harcourt)
- FOCUS Algebra: Introductory Algebra I (Jamestown Learning)
- Additional Books: Algebra, Geometry (McGraw-Hill)
- Digital: Middle school math program (Houghton Mifflin Harcourt)
- GeoGebra: 8-12 math program (Houghton Mifflin Harcourt)
- Time Tables: Grades 4-5 (Time to Know)

MAKING THE PROMISE A REALITY

Keys to increasing the quality of curriculum materials

Can digital textbooks enhance our ability to engage students in rich mathematical experiences?

- More opportunities to create, share, discuss and refine rich tasks
- Embedded video to launch tasks, engage students
- Provide varied supports for individual learners

Will it Hit the Hoop?

Algebra Task by Dan Meyer

http://blog.mrmeyer.com/

“Three Act Math Tasks” could be incorporated into digital mathematics textbooks.

For more information and to see more of Dan Meyer’s work, attend his session:

Session 529.1: Why Students Hate Word Problems
Lead Speaker: Dan Meyer
Friday, April 27, 2012: 2:00PM-3:00PM
Terrace Ballroom 4 (Convention Center)

Embed and utilize tools specific to Mathematics

- Applets and virtual manipulatives
- Graphing utilities
- Spreadsheets
- Dynamic geometry environments
- Core Math Tools (new free NCTM product)
- Wolfram Alpha

Challenges

- Digital infrastructure
- Costs (Devices and licensing)
- Equity (Digital divide)
- Preferences for print?
- Perceptions and expectations
- Curricular coherence
Technology has revolutionized how everyone does some things ...
It WILL transform the medium of school curriculum resources.

In what ways can we use the momentum toward digital textbooks formats to advance our goal of supporting student engagement and learning of mathematics?

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PPT and references available at NCTM 2012
Online Conference Planner

References