Digital Textbooks for Mathematics: Promise and Reality

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Technology has revolutionized how everyone does some things …

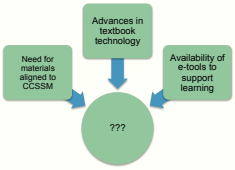
- Access news
- Purchase, store, and access music
- Navigate (replacing printed maps)
- Read, write, communicate

Value added - convenience, features, timeliness of information, transition speed, … (quality?)

Technology has revolutionized how everyone does some things …

In what ways will it transform school textbooks and the ways we use and interact with mathematics curriculum materials?

We have a unique opportunity to adapt and create materials that capitalize on present and emerging technologies to support CCSSM implementation.



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 the function of a mathematics textbook?

For students, it …

- Provides a summary/record of mathematics ideas/ topics/problems (record for parents).
- Includes graphics, tables of information, glossary, and other resources for reference.
- Provides problems or "homework" sets for individual work.

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's much stronger for learning.*

Jeremy Roschelle, SRI International, 5/24/11 Podcast
www.sri.com/news/podcasts/JeremyRoschellePodcast.html

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."

Inkling promotion video

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 has the ability to be accessed at any time and anywhere."

(FL SB 2120, Section 21.1006.29,3,a, 2011)

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 $267.3 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 simulators, 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

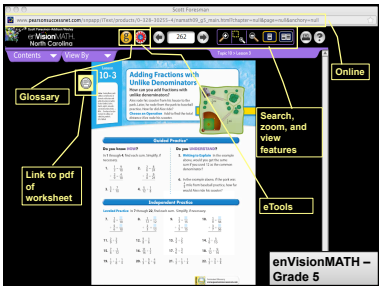
THE REALITY…

Current digital textbook initiatives/examples

enVisions by Prentice Hall

- Elementary mathematics program.
- Printed textbook is supported by digital resources for teachers and students.
- Glimpses from a 5th grade textbook show some of the digital features.

Print textbook + Digital version with additional features



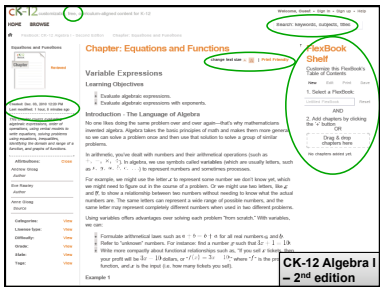
enVisionMATH – Grade 5

CK12 Flexbooks

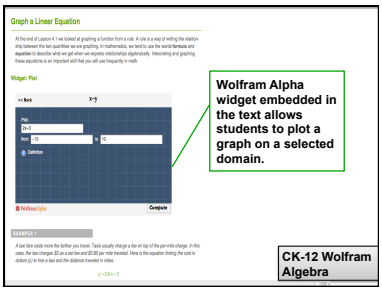
customizable, free, curriculum-aligned content for K-12

- 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 textbook, online, open access



CK-12 Algebra I – 2nd edition



Wolfram Alpha widget embedded in the text allows students to plot a graph on a selected domain.

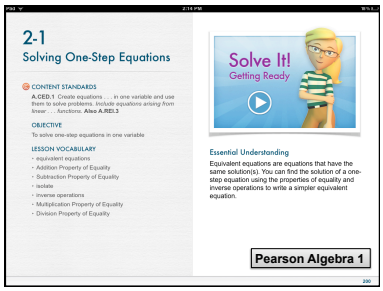
CK-12 Wolfram Algebra

iBooks

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.

- Titles include Algebra and Geometry
- Partnership between Apple and three major textbook publishers
- Titles available for $15 for iPad

Digital textbooks exclusively for iPad

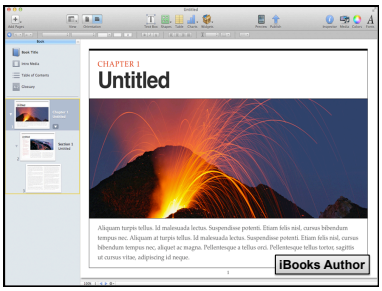


Pearson Algebra 1

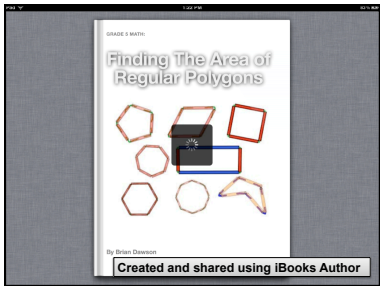
iBooks Author

- 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.

Tools to Create a Digital Textbook for iBooks



iBooks Author



Some other currently available K-12 digital math textbooks

- Kinetic Books Pre-algebra, Algebra I, Algebra II (Perfection Learning)
- HMH Fuse Algebra I, Geometry, Algebra II (Houghton Mifflin Harcourt)
- GYLO Statistics Statistics I (GetYa Learn On)
- Additional iBooks Algebra, Geometry (McGraw Hill)
- Digits Middle school math program (Pearson)
- GO Math! K-6 math program (Houghton Mifflin Harcourt)
- TimeToKnow Grades 4-5 (Time To Know)

MAKING THE PROMISE A REALITY

Keys to increasing the quality of curriculum materials

Regardless of the medium of delivery/ engagement, what is central is *mathematics instruction that engages students in important mathematics and supports their learning.*

- Rich mathematical tasks
- Tools and methods to support learning

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)

(http://blog.mrmeyer.com)

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

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