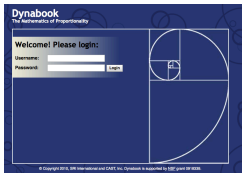
SmartGraphs



The Challenges of Scaling Up

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June, 2012

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This material is based upon work supported by the National Science Foundation under Grant No. DRL-0918522. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Today's Agenda

1. Introductions: Who is here and why?
2. Nine big ideas about scaling up
3. SmartGraphs and Dynabook's approaches
4. Questions, discussion, next steps

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Nine Big Ideas

1. For today's purposes, scaling up means having many users
2. NSF funds multiple types of projects, so scale-up measures vary
3. Most NSF grantees do not choose to, and are not funded to, scale up
4. The "value proposition" for the innovation is one key to scaling up
5. Scaling up requires understanding one's "customers"
6. Rogers says five criteria increase potential for "diffusion"
7. Scaling up requires business mindset: marketing, revenue, support, etc.
8. There are multiple approaches to scaling up
9. Approaches and goals of the host organization and of the innovation itself should be aligned

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Big Idea #1

For today's purposes, scaling up means having many users

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Big Idea #2

NSF funds multiple types of projects, so scale-up measures vary

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Product Types

Product Type	Description	Examples	Measures of scale	Comments
1. Commercial curricular product	Distributed by a for-profit partner	Connected Mathematics; Geometer's Sketchpad	Sales, market share	For-profit provides an income stream for marketing, updating, etc. However, the market does not always respond positively even to the best innovations.
2. Free curricular product	Distribution via Internet or other "free" access	PhET; Nat'l Library of Virtual Manipulatives	Quantity distributed (e.g., number of downloads), no. of users	Free is an appealing price to end-users! Rapid scale up can happen (e.g. PhET). However, sustainability is an issue, and PD may be lacking. Income stream often absent.
3. Research (knowledge)	Findings and/or data from research	Wait time I and II; NAEP; TIMSS; uses of student misconceptions	Frequency of use (e.g., no. of citations), importance to policy makers	Use of knowledge by practitioners may or may not correlate with volume of citations in the research literature.
4. Models and practices	Powerful ideas that spread, with or without obvious attribution	Development and use of probes & sensors for science education (R. Tinker's work)	Spread of idea to practitioners (e.g. percent of teachers or schools)	"Inside knowledge" may be needed to trace the influence of particular models and practices back to their sources.
5. Support tools	Scales, instruments, and other products used for STEM R&D, assessment, etc.	RTOP observation protocol; force concept inventory	Numbers of users; importance of uses; influence on next set of tools	Although not as visible to the public as curricula, tools are essential for progress in the R&D field.
6. Standards, issue briefs, policy doc's	Documents intended to guide practice	Project 2061 Benchmarks; NSES; AERA Research Points	Copies distributed; knowledge among policymakers	Although little research or evaluation about the impact of these documents is supported, they may be very influential.

Big Idea #3

Most NSF grantees do not choose to, and are not funded to, scale up

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Big Idea #4

The "value proposition" for the innovation is key to scaling up

NABC: Need, Approach, Benefits per cost, Competition

Develop, test, and repeat (iterate)!

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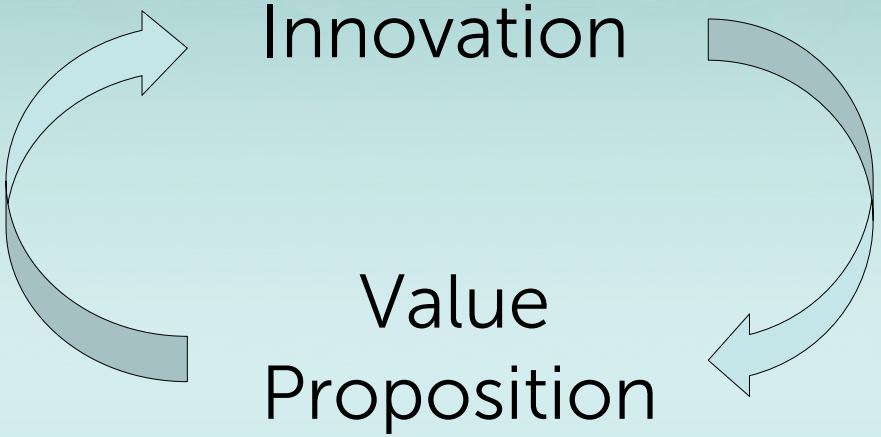
* Source: Carlson, C.R. & Wilmot, W.W. (2006). *Innovation: The five disciplines for creating what customers want*. New York: Crown Business.

"Tune" the Value Proposition *and* the Innovation



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Big Idea #5

Scaling up requires understanding one's "customers"

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Big Idea #6

Rogers says five characteristics increase potential for "diffusion"

1. The relative advantage of the innovation compared to existing products or practices
2. Compatibility with people/environment where used
3. Complexity of the innovation (inverse relationship)
4. "Trialability"
5. "Observability"
6. *Capacity for re-invention (to local circumstances)*

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* Source: Rogers, E.M. (2003). *Diffusion of innovations* (Fifth edition). NY: Free Press.

Big Idea #7

Scaling up requires a business mindset:

- user support and PD
- marketing
- technology updates and bug fixes
- revenue streams

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Big Idea #8: There are Multiple Approaches to Scaling Up

- Provide a free service (e.g. PhET)
- License a commercial company
- Spin off a new company (e.g. VHS)
- Fee-for-service (e.g. ETLO)
- Fees from affiliates (e.g., Moodle)

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Big Idea #9

Approaches and goals of the host organization and of the innovation itself should be aligned

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* Source: Carlson, C.R. & Wilmot, W.W. (2006). *Innovation: The five disciplines for creating what customers want*. New York: Crown Business.

Summary

1. Iterate!

2. Make a plan
3. Align the plan with your organization's needs, goals, approach, etc.

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Dynabook

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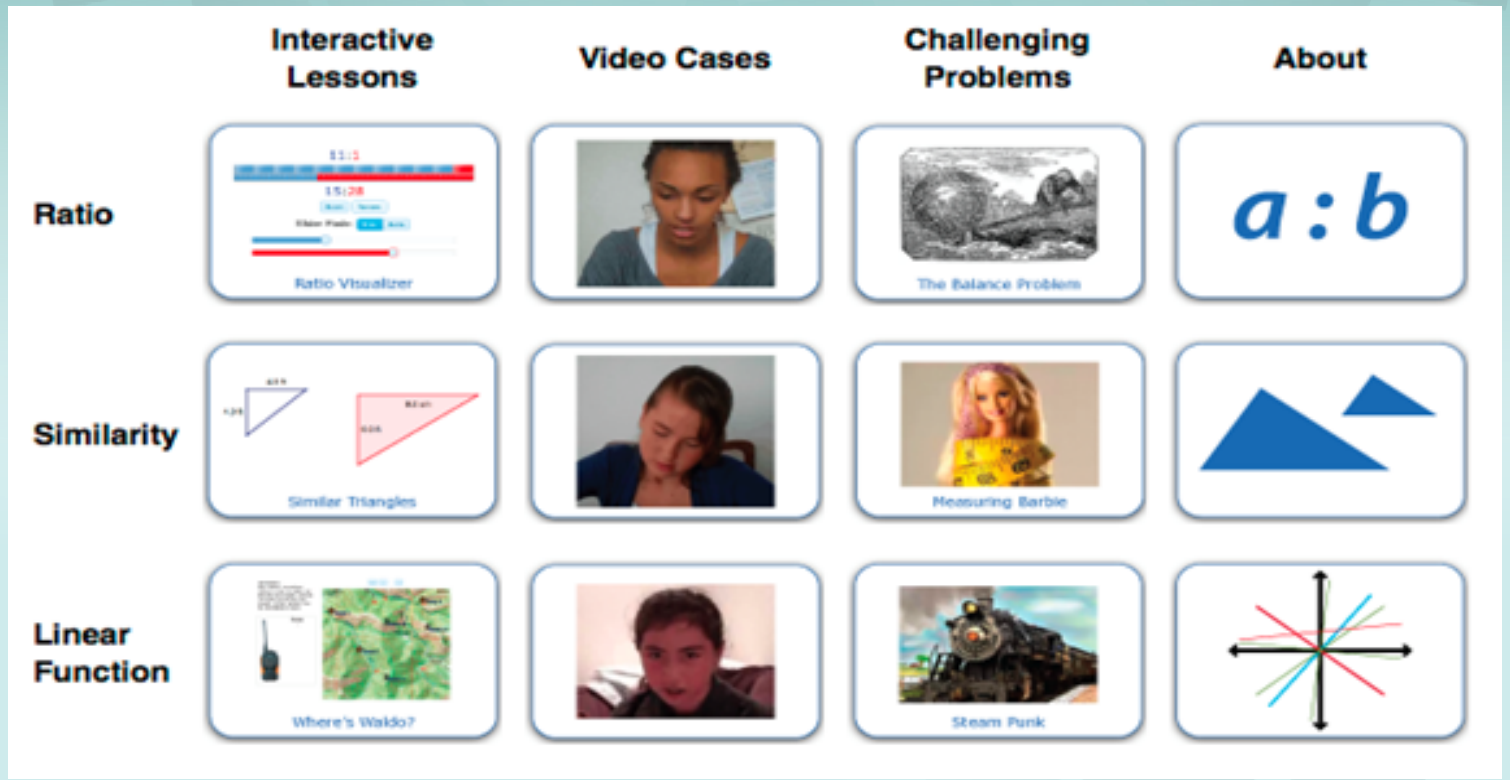
General Education and Special Education

Solution: Multiple Pathways



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Range of Topics Addressed in Dynabook Research

Math Content and Pedagogy

- Technology Design
- Use of Interactives
- TPACK
- Universal Design for Learning
- Student Thinking
- Technology Supported Instruction

Instruction in Pre-Service Classes

- Lesson Planning and Activities
- Integrating Dynabook and other resources: "Mashups"
- Classroom Practice
- Classroom Roles

Instruction in Pre-Service Classes (Continued)

- Use of Dynabook
- Feature Use
- Usefulness
- Problems
- Insights

Outcomes

- Engagement
- Content Learning
- Pedagogy
- Awareness
- Discussion

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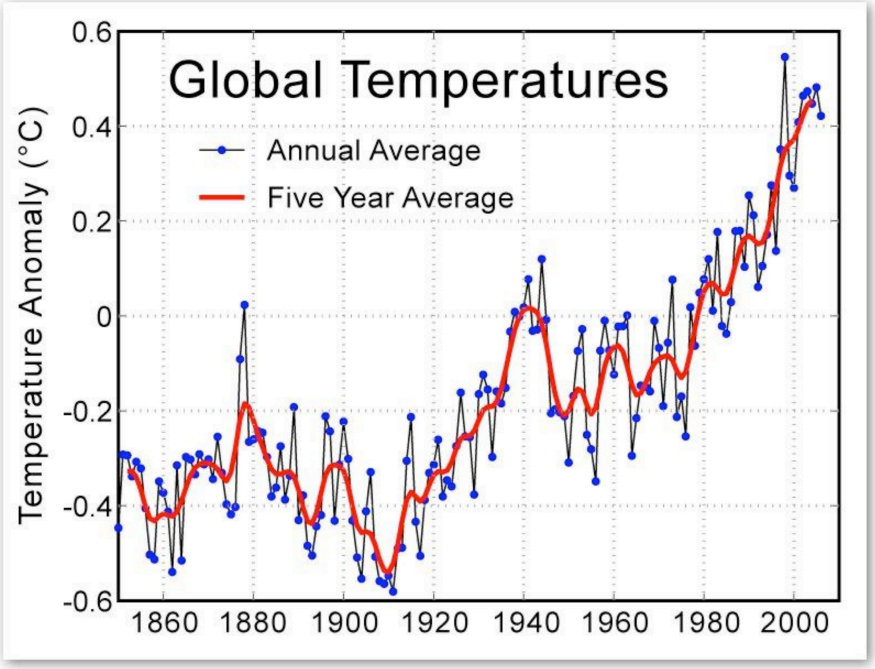
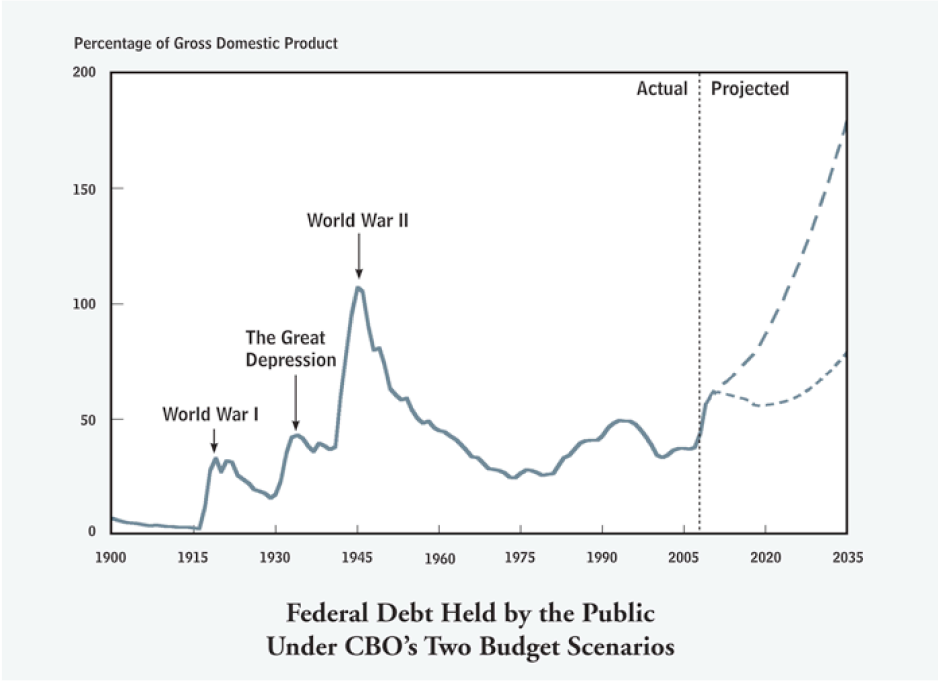
Graphs are vital to everyone





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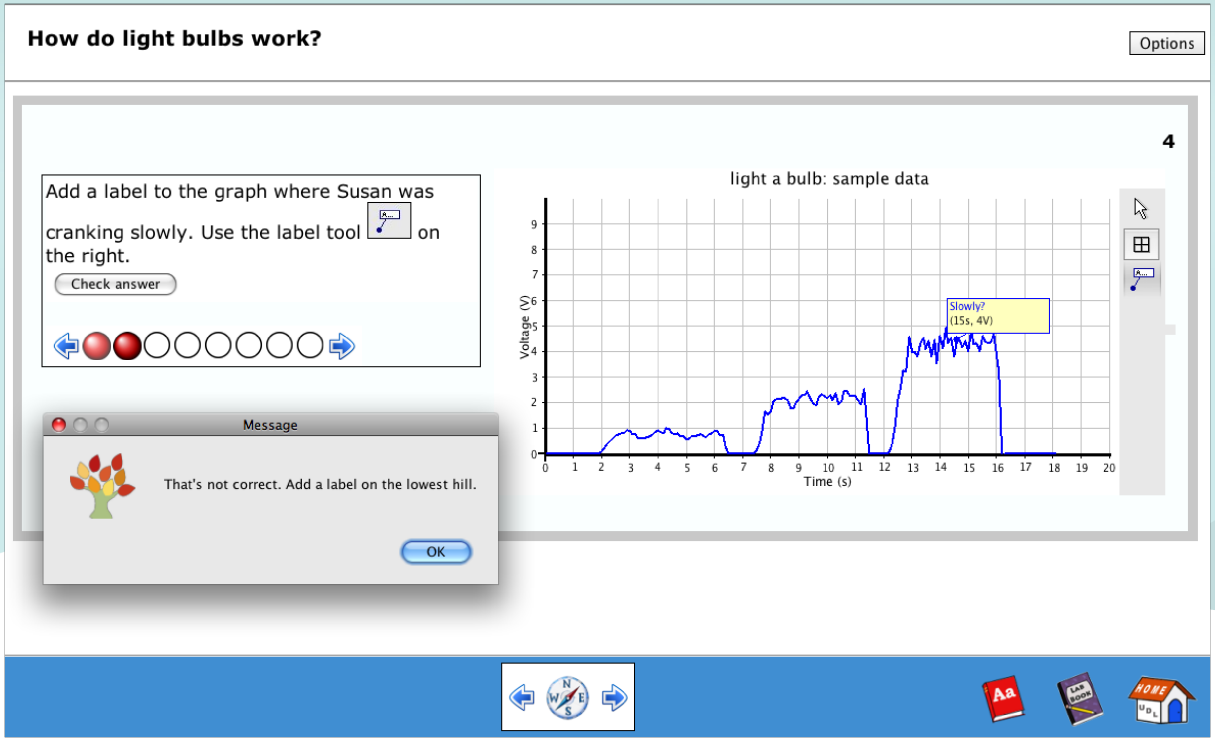
Origin of SmartGraphs

Universal Design for Learning (UDL) project

- Grades 3-6 science activities
- Scaffolds student learning, as needed
- Prepares students for data collection and display



Mission Statement

The SmartGraphs project will develop, test, and disseminate (scale up) interactive graphical objects and activities that are:

- open source
- browser-based
- authorable or customizable by teachers

SmartGraphs will accept inputs from:

- students' responses (including point-and-click)
- sketches
- probes
- functions
- models

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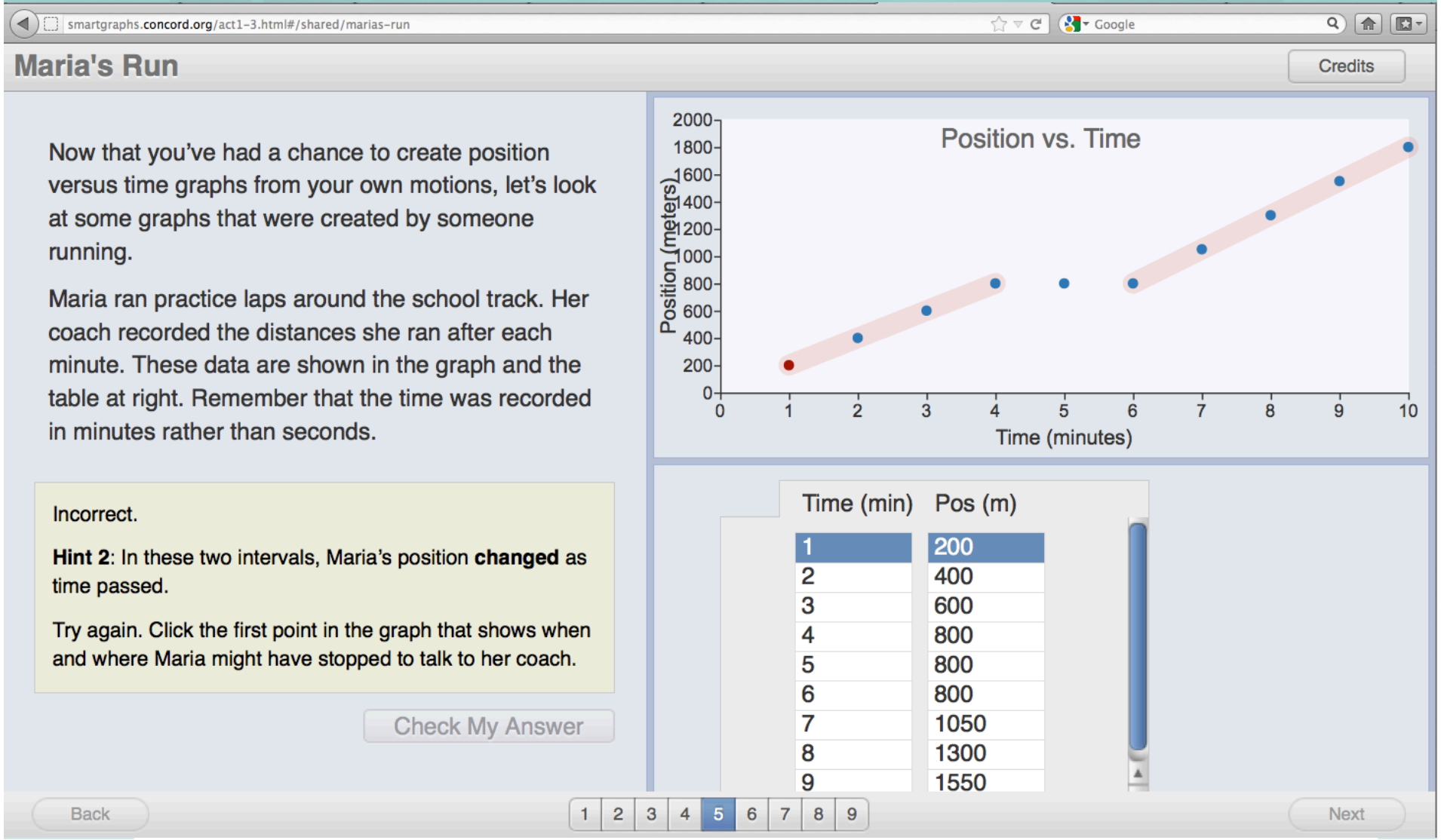
Screenshot of a SmartGraphs activity



A Value Proposition for SmartGraphs

For teachers:
Graphs are central to STEM learning in algebra, physical science, and other K-12 courses yet many students have difficulty understanding graphs and the concepts they represent. Free *SmartGraphs* activities help students to understand graphs better than other software. *SmartGraphs* works with standard curricula, in typical schools—and there's nothing to install!

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References

SmartGraphs: www.concord.org/smartgraphs (be sure to look at all three "tabs")

Dynabook: http://ctl.sri.com/projects/displayProject.jsp?Nick=dynabook

Carlson, C. R., & Wilmot, W. W. (2006). *Innovation: The five disciplines for creating what customers want*. New York: Crown Business.

Ries, E. (2011). *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. New York: Crown Business.

Rogers, E. M. (2003). *Diffusion of innovations* (Fifth ed.). New York: Free Press.

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The End

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