CHALLENGING THE AUTHORITARIAN ROLE OF TEXTBOOKS

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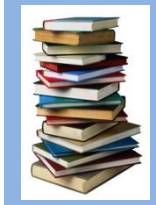
LINKS Learning In a NetworKed Society



A plan for this talk

A. Identify & suggest lenses to analyze key terms of the educational dynamics that e-Textbooks offer

B. Analyze the challenges related to the change of meaning of Author & Authority

   i. re-conceptualization of **student's interactions**

   ii. the **disappearance** of **objective order** (aspects of teaching)

   iii. the **authority** of the **process** (system's perspective)

C. Authority might take place elsewhere

e-Textbook
Necessary Dimensions of Design

- **Interactive** engagements for students and teachers
  interactions amongst learners and between learner and the textbook

- Flexible **Integration**
  integration of 'adds-on' traditionally not part of textbooks
  input/output from and to external systems

- **Evolving** continuously by its authors/users
  interactions amongst authors and users

e-Books
Lessons learned from e-Fiction

Classical Authoring & Reading:

The art and craft of authoring an engaging book involves a long process, as does the reading of it: self-reflection and engagement developed in a slow reading process.

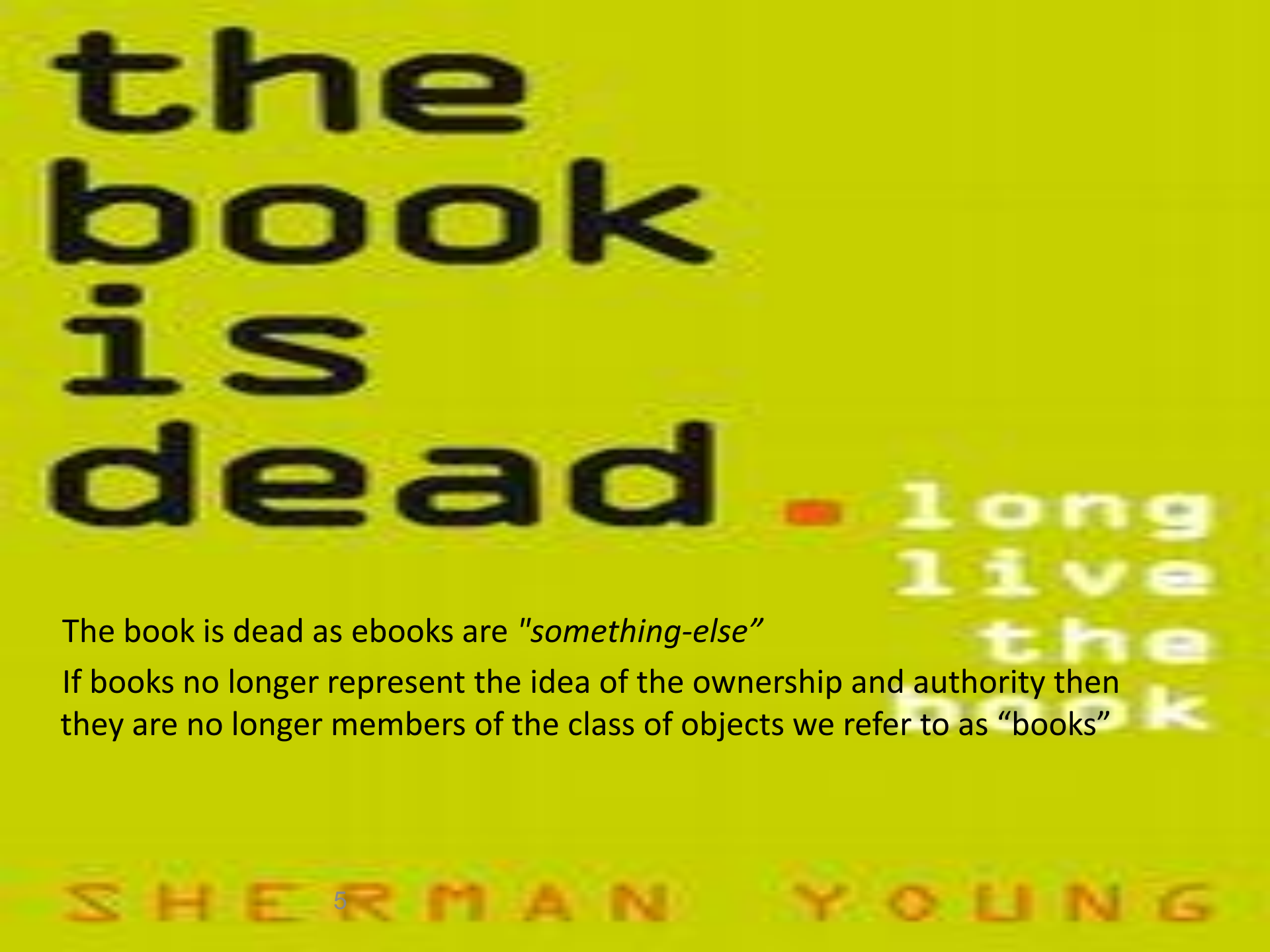
Contemporary Authoring & Reading:

Hyper-texting -- Nonlinear multiple path
Authoring is reading to form flexible trails

Networked -- evolving books

the reader being the writer – dramatic change of the idea of authorship

Role Playing as an example -- multiple path established through the content associated with key characters or topics



The book is dead as ebooks are *"something-else"*

If books no longer represent the idea of the ownership and authority then they are no longer members of the class of objects we refer to as “books”

Textbooks
Characteristics & Norms

Love and Pimm's (1996) "text on texts"

- A message from the professional community to students about **what they should learn**
- Represents the ideas of the author about **how the content should be taught**
- Textbooks are linear and demand "**linear textual flow of reading**"
- Textbooks are closed -- have been **created in the past**
- Special structure **expositions, examples & exercises**
- Its **authoritative image** has been the dominant aspect of the classroom culture

Textbooks
Contemporary Research

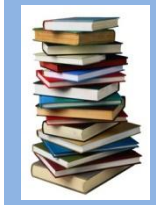
- **Drawing a direct link** between the author, the central authority and the way teachers teach and students learn **appears to be negotiable**
- Textbooks **structures of authority** have been constantly **evolving**
- **Teaching does not depend on a single textbook**: approximately 30% is accomplished by teachers using other teaching materials
- Although the textbook is assumed to provide devices for actively engaging the students, studies focus on **engagements with textbooks that reserved mostly for the teachers**
- **Technological resources** are reported to be considered as **enrichment**
- The textbook **remains a key object that acts as authoritative** pedagogic guideline for what should be learned and for how it should be taught and assessed

Textbooks
Authoritarian Lenses

- **The Author** is considered to be **recognized expert**
- The Textbook is an **objective representation** of knowledge thus external **authority** is an intrinsic property
- It represents **expectations of the external authority**: the school, the syllabus, or central assessment

E-textbook
Authoritarian changes

- It’s a process rather than a product/object
- Author & Authority acquire new meanings



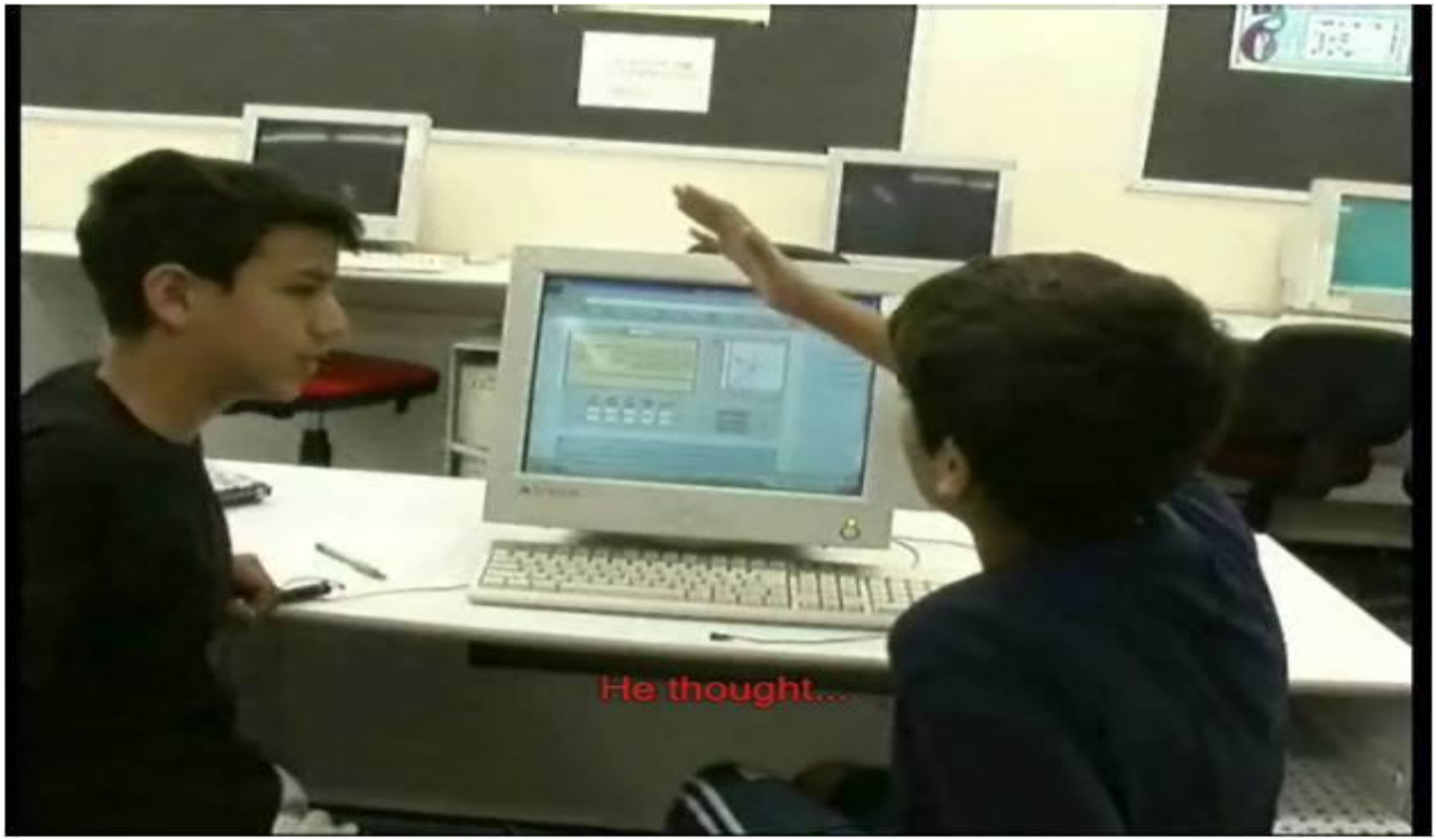
A plan for this talk

- ✓ Identify & suggest lenses to analyze key terms of the educational dynamics that e-Textbooks offer
- ▪ Analyze the challenges related to the change of meaning of textbook Author & Authority
  - i. **re-conceptualization of student's interactions**
  - ii. the disappearance of objective order (aspects of teaching)
  - iii. the authority of the process (system's perspective)

C. Authority might take place elsewhere

Interactive

AUTHORIZE STUDENTS' PERSPECTIVES



The Challenge:
Re-conceptualizing Design Supporting Students' Interactions with Textbook

- Authorizing students' perspectives is a challenge to any educational system
- Authorizing means "Engaging them as sense-makers, problem solvers, and creators of mathematical ideas" (Alan Schoenfeld in *What makes for powerful classrooms, and how can we support teachers in creating them?*)
- Teaching as guided inquiry seek to construct and strengthen students' authority
- Textbooks are not naturally supporting teaching as guided scientific inquiry
- External authority invoked by the expert author is at odds with readers' engagement
- Textbook authors have long been seeking less formal control structures

Multimodal Aspects of Design

The Space of Interactives

- Interactive Examples
- Interactive Exposition
- Interactive Exercise
- Interactive Feedback
- Interactive Task/challenge – Tools & Diagrams

Interactive Examples: Random-Generic-Specific

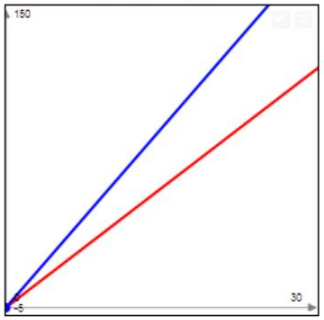
The dynamic figure presents graphic examples of linear functions and of their product function.

new example

Tag

Jenny and her little sister Kate, enjoy playing tag along a 150-meter path. Jenny tries to catch Kate before Kate reaches the end of the path.
The graphs, value tables, and a simulation that appear in the diagram describe a race between the two girls, in which both girls start at the same time and place. Click the run button to start the simulation. In order to create descriptions of various games of tag, you can use translations to change the functions describing the dependence of the girls' position on time .

time-position graph



tag | table

Kate 4x

Jenny 6x

duration of motion (seconds): 30

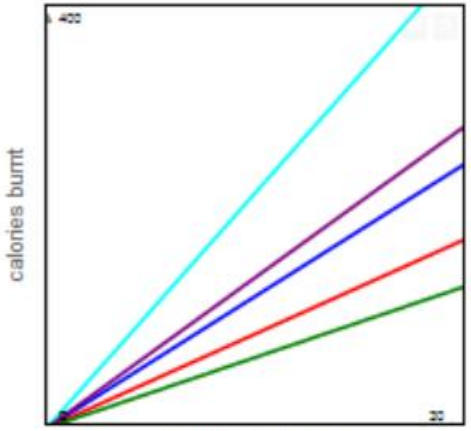
Clock: 0

run | stop | start position | step

time step: 1 trace

translations translation size 1

cancel translations



basketball game

basketball game

walking (5 km/hour)

running (12 km/hour)

swimming (3 km/hour)

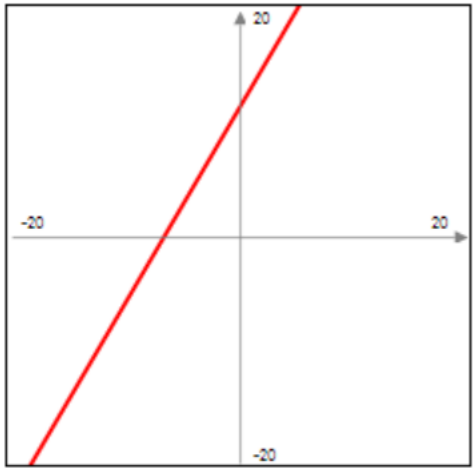
Body weight (in kg) 60

Interactive Exposition

Transformation of Graphs

This activity involves operations that change functions by changing their graphs: these operations are called **transformations**. Starting with one function, you can use transformations to construct an entire family of functions that share some common properties.

The dynamic figure below lets you perform translations of graphs. The figure contains graphs of three linear functions. Pointing the mouse at a graph and dragging it, you can translate the graph horizontally or vertically.



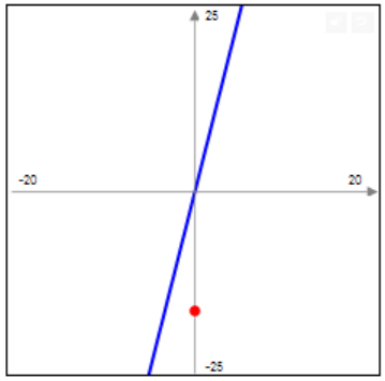
New graph

Reflections:

Interactive Exercise

Exercise 1

A linear function g_1, whose graph passes through the origin, and a point on the y-axis, are given. Construct a linear function whose graph is parallel to the graph of g_1 and passes through the given point.



g_1 $5x$

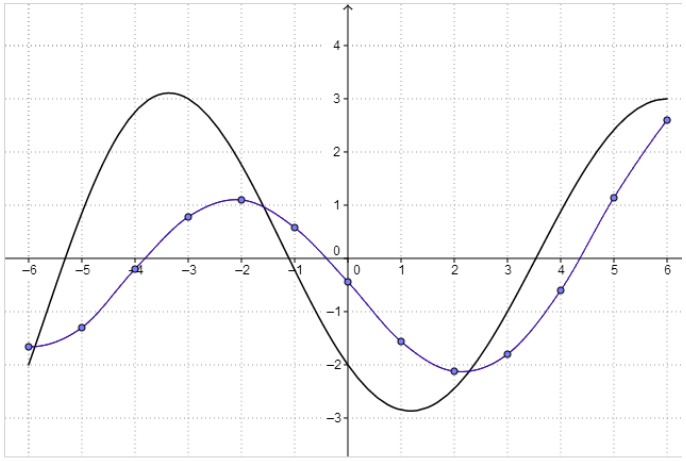
g_2

g_3

New data

x	g_1	g_2	g_3
-20	-100	-	-
-19	-95	-	-
-18	-90	-	-
-17	-85	-	-
-16	-80	-	-
-15	-75	-	-
-14	-70	-	-
-13	-65	-	-
-12	-60	-	-
-11	-55	-	-
-10	-50	-	-
-9	-45	-	-
-8	-40	-	-

Try to Graph the Derivative Function

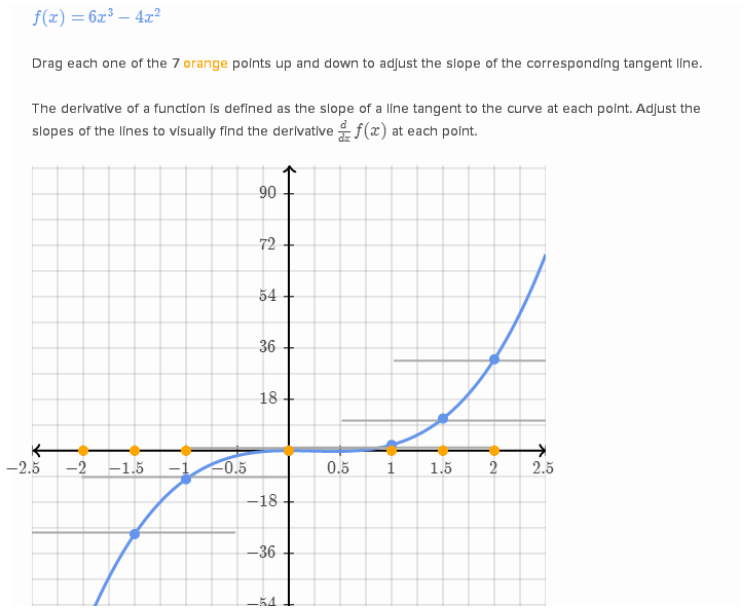


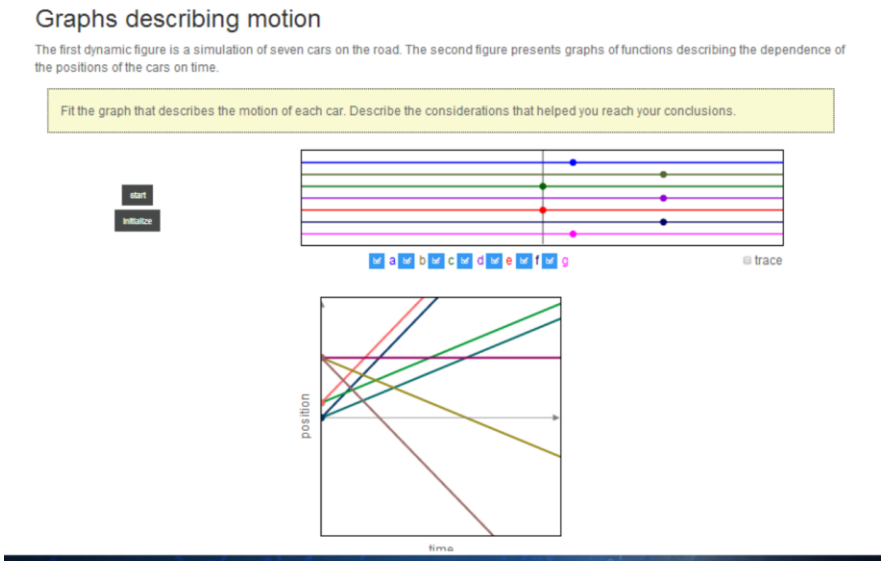
Reset the graph

Check accuracy

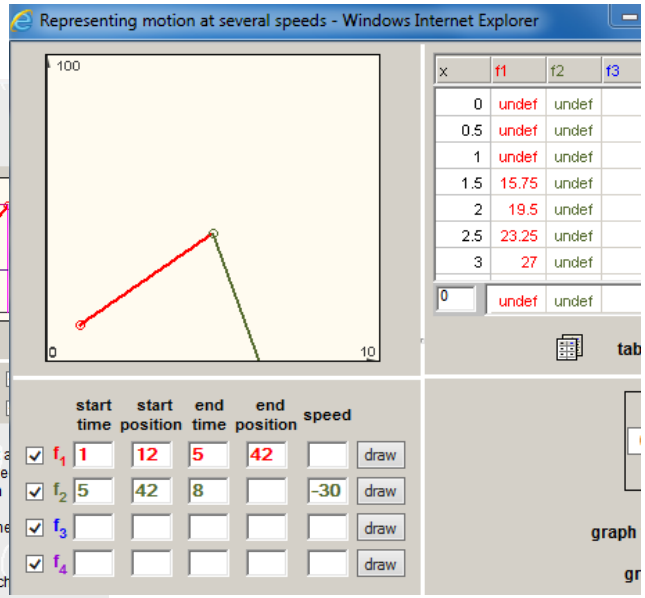
Show results!

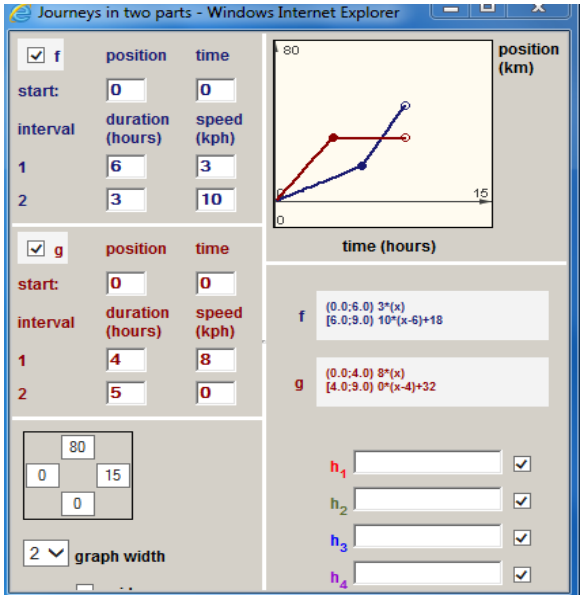
Self Evaluation/Reflecting feedback

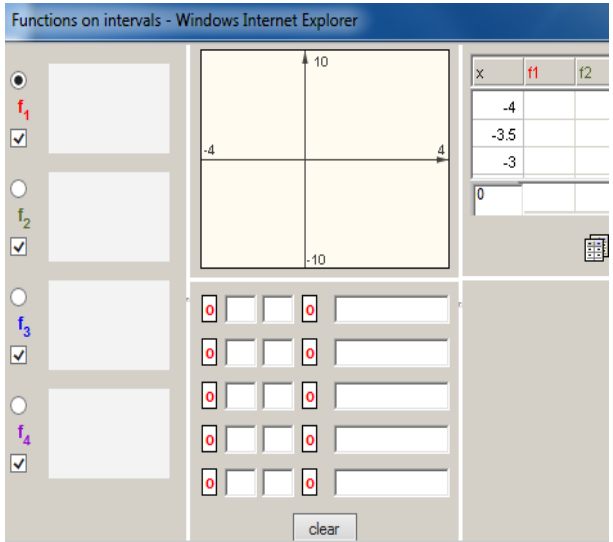




Interactive Task Design
VisualMath







Multiple Dimensions of Interactive Diagrams

- A diagram presents information & a point of view implicitly engaging the viewer in meaningful interpretations

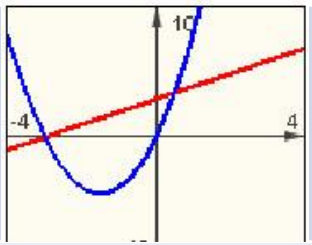
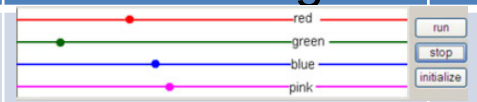
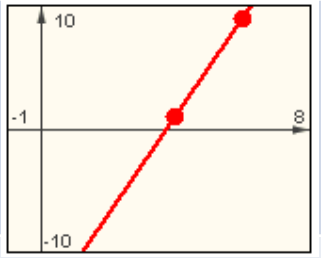
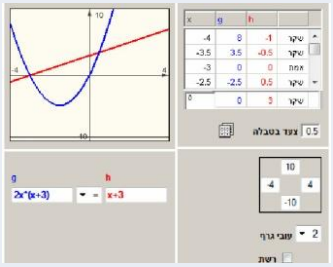
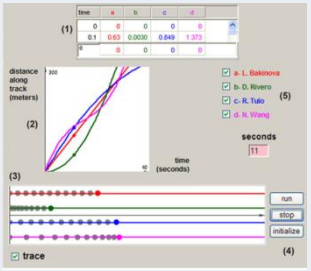
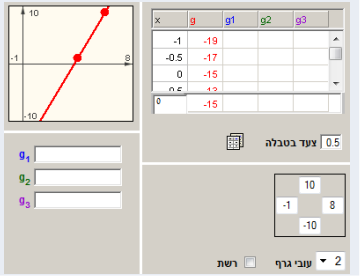
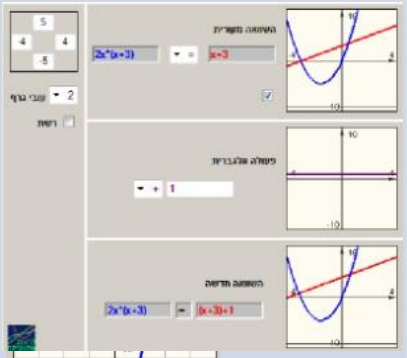
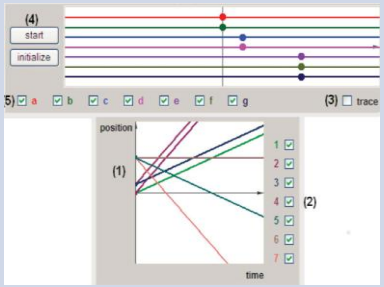
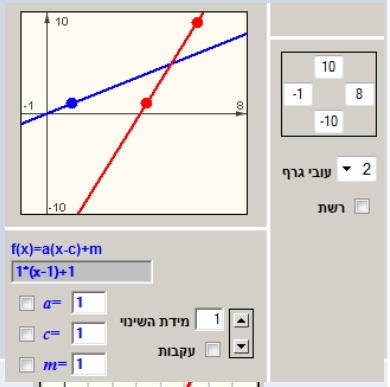
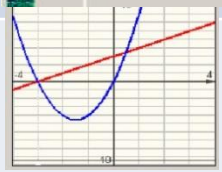
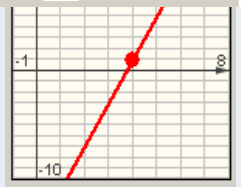
- The interactive diagram explicitly requires the viewer to take action and change the diagram within given limitations

- An interactive diagram is built around a **pre-constructed example**

- An **interactive diagram differs from an interactive tool** in that it is built for a specific task and contains a complete example

Interactive Diagrams site: Elena Naftaliev
http://sites.google.com/site/interactivediagrams

Visual Semiotic Choices
Comparative view on design alternatives

	Manipulating	Modeling	Formulating
Illustrating ID			
Elaborating ID			
Guiding ID		 	
Static diagram Video clip			

Authorizing Student Engagement: Challenges for Research & Instruction

- Which design features support **teachers' moves to expand access** of students to meaningful mathematics?
- What are possible technological interfaces and their functionality in supporting teachers who **author interactive text**?
- What types of **interactive feedback** should be considered and how do they function?
  Christian Bokhove work on types of feedback is a leading example
- How do students respond to assistance of interactive representations in an **assessment setting**?

Flexible

Challenges of Transparency

- Textbook acts as syllabus and time keeper thus is central “how to teach”
- Digital resources can be flexibly ordered
- Gueudet and Trouche (2010) argued that the notion of author and authorship is often less transparent in online sources than in printed material
- Usiskin (2013), discuss the disappearance of transparency in integrative multilinked and multimodal textbooks

To consider a collection of non-sequential, multimodal digital “pages,” which to a certain extent stand on their own, the structure and the interrelations must be conceptually “clean” & “clear”

Are Real Textbooks Flexible?

"Real textbooks appear to reside somewhere between a novel and an encyclopedia in the degree to which they can be modularized, or at least in the degree of effort required to integrate the modules into a coherent whole recognizable as a textbook. "(Benkler 2005, p.20).

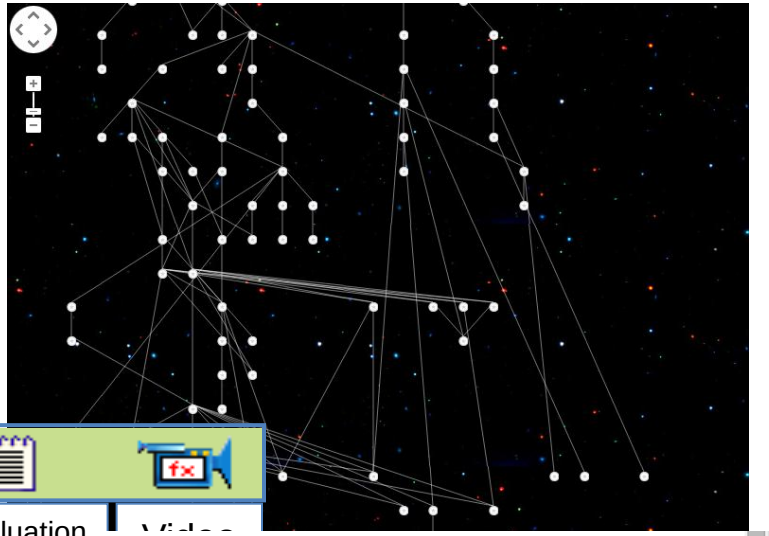
The development of the Linux open source derives its success from being entirely **modular** (Bonaccorsi & Rossi, 2003)

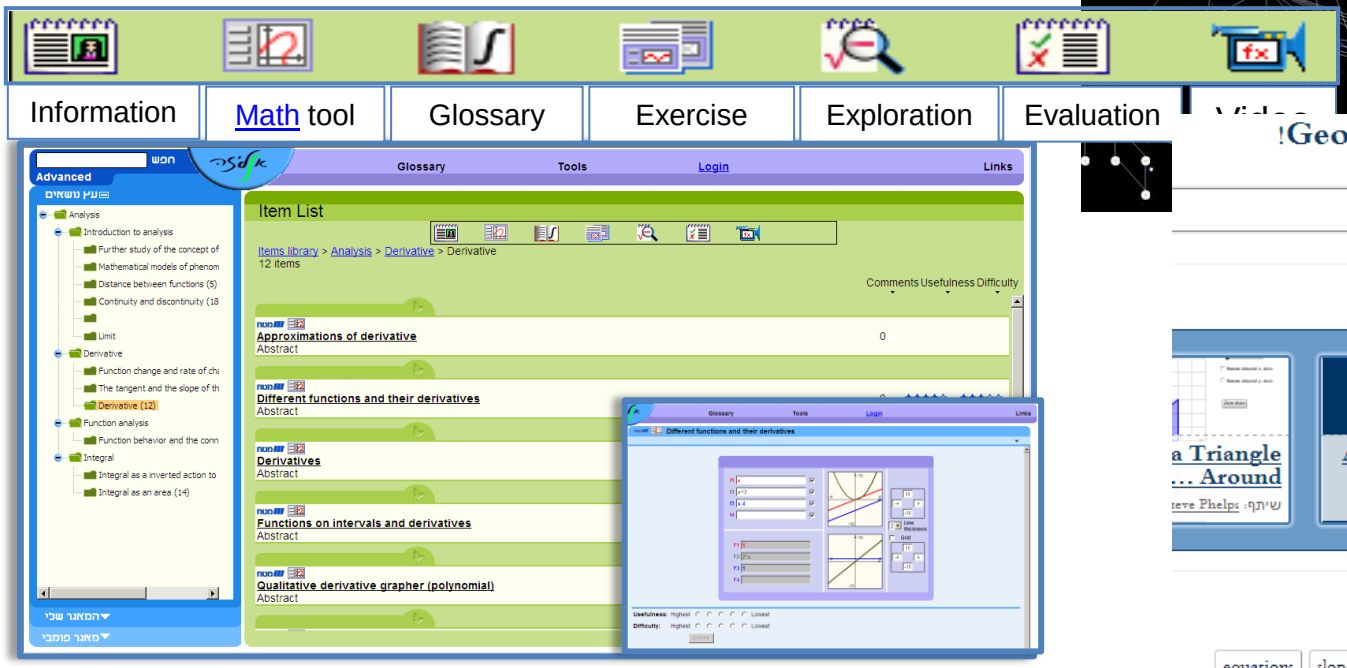
"Moreover, the chunks or modules seem to be bigger. It is very hard to add a single sentence, although it may be possible to add a single example or a better-rendered equation or chart" (Benkler ibid.).

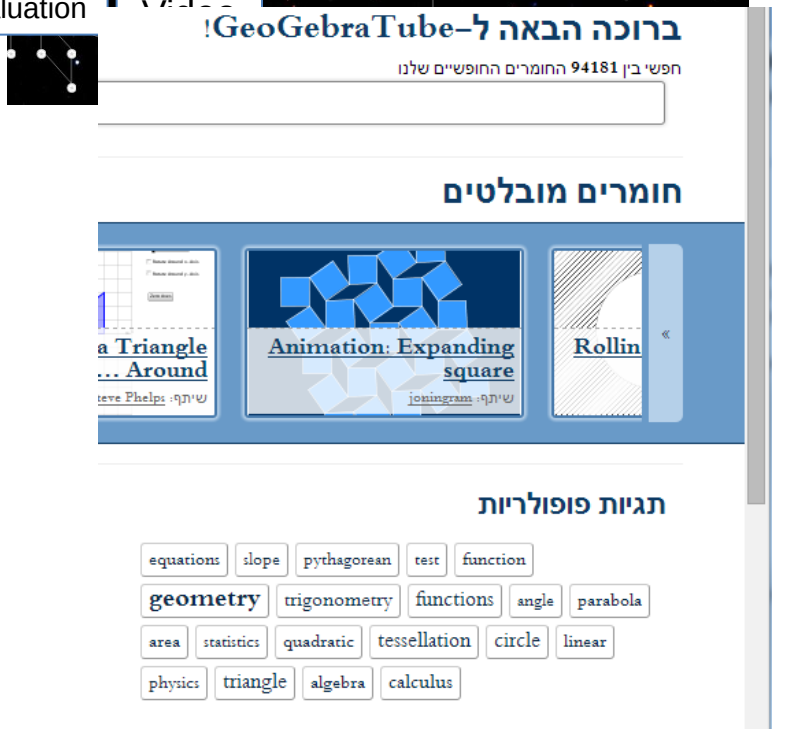
Writing about the meanings of composition, Kress and van Leeuwen (1996) observed non-linear texts imposing paradigmatic. "They select the elements that can be viewed and present them according to a certain paradigmatic logic… but leave it to the reader to sequence and connect them"

Navigation in eTextbooks

- Hierarchical trees – VisualMath Calculus
- Tags – GeoGebra eBook
- Object oriented – Khan Academy Dashboard

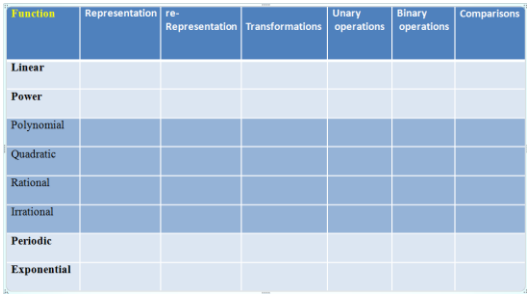






VisualMath Paradigmatic Logic
Object Oriented Map

- organize the content along **a single view** of the algebra of functions
- organize the materials around a **small number of mathematical** objects and operations that can mathematically and pedagogically support a variety of progressions and sequences
- Each mathematical occurrence can take place in **multiple representations**

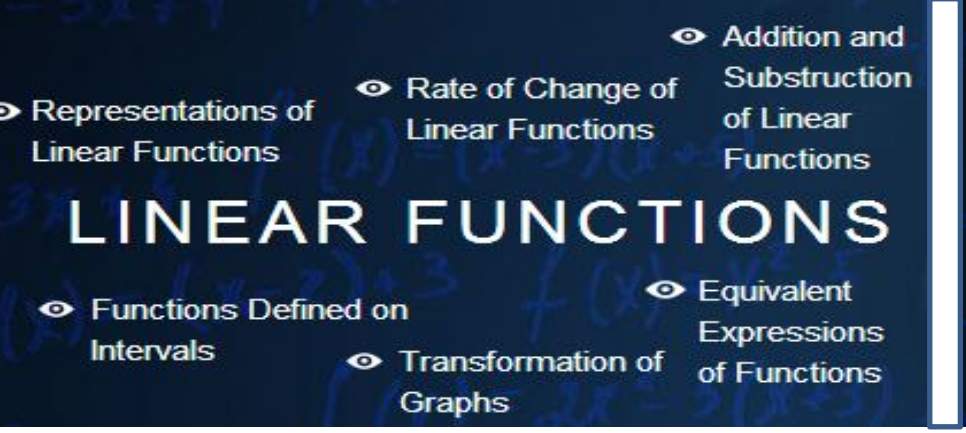


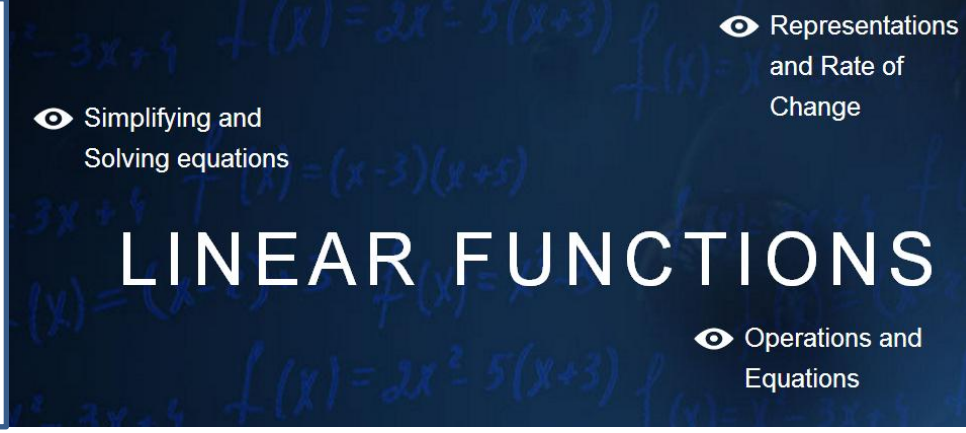
Function	Representation	re-Representation	Transformations	Unary operations	Binary operations	Comparisons
Linear						
Power						
Polynomial						
Quadratic						
Rational						
Irrational						
Periodic						
Exponential						

	Represent	Modify	Transform	Analyze	Operate with 2	Compare
Linear						
Quadratic						

TEACHING AS CONCEPTUAL NAVIGATION

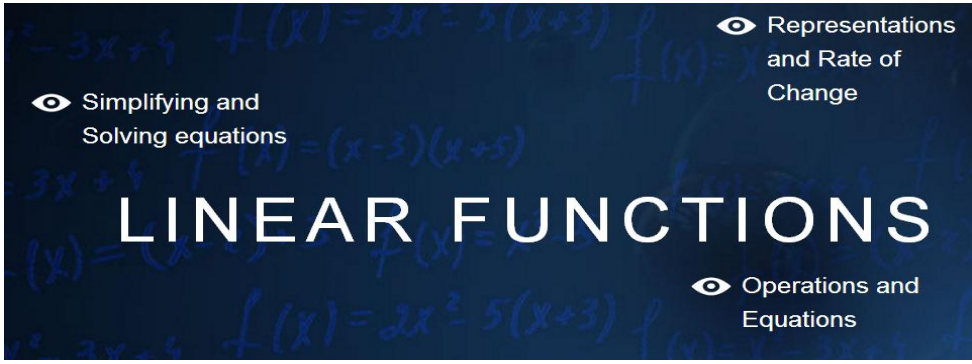
Decisions taken by teachers

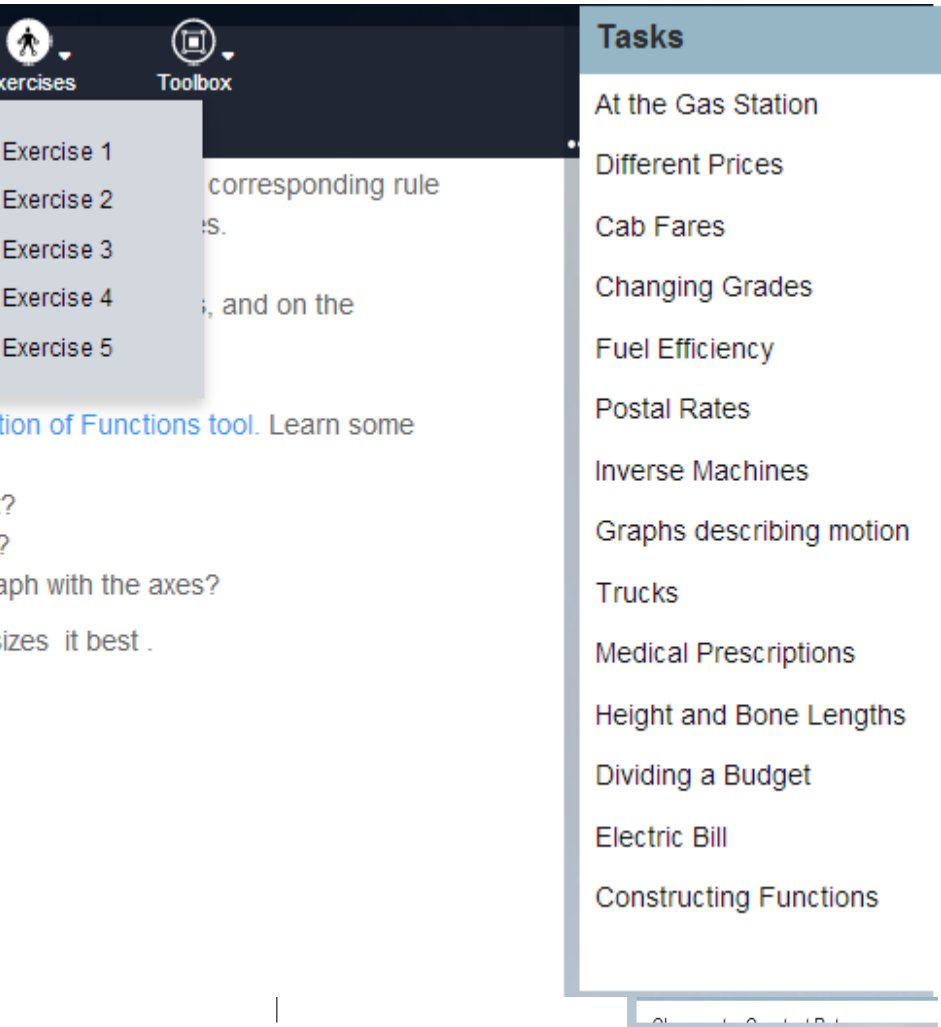




Intended Curriculum or Sequence of Instruction	Represent	Modify	Transform	Analyze	Operate with two	Compare
Linear Function: Representation and Analyzing						
Simplifying and Solving Equations						
Operations and Equations as Preparation to Quadratic Function						$f(x)-g(x)=0$ $f(x)\cdot g(x)=0$


Representations of Linear Functions
Rate of Change of Linear Functions
Addition and Substruction of Linear Functions
LINEAR FUNCTIONS
Functions Defined on Intervals
Transformation of Graphs
Equivalent Expressions of Functions


Representations and Rate of Change
Simplifying and Solving equations
LINEAR FUNCTIONS
Operations and Equations


xercises
Toolbox
Exercise 1
Exercise 2
Exercise 3
Exercise 4
Exercise 5
corresponding rule
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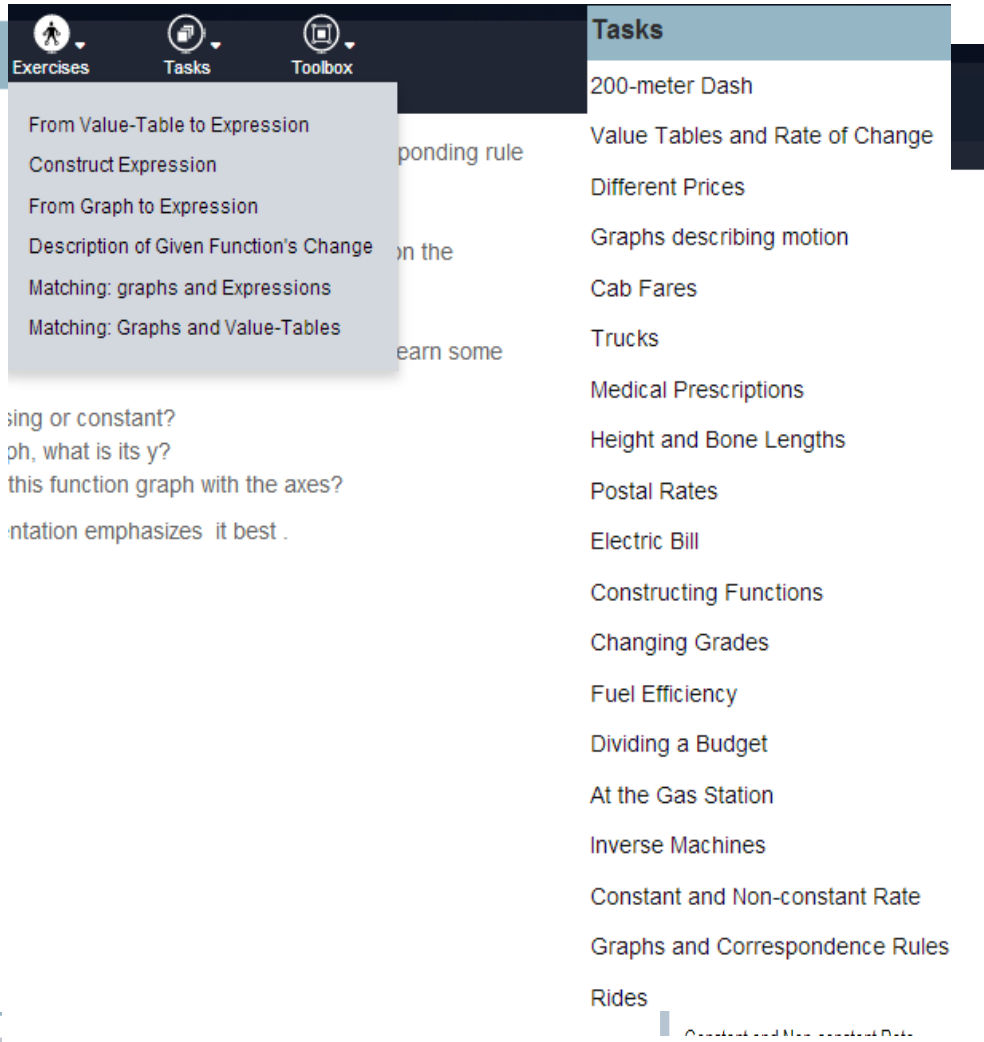
, and on the
tion of Functions tool. Learn some
?
?
aph with the axes?
izes it best .
Tasks
At the Gas Station
Different Prices
Cab Fares
Changing Grades
Fuel Efficiency
Postal Rates
Inverse Machines
Graphs describing motion
Trucks
Medical Prescriptions
Height and Bone Lengths
Dividing a Budget
Electric Bill
Constructing Functions


Exercises
Tasks
Toolbox
From Value-Table to Expression
Construct Expression
From Graph to Expression
Description of Given Function's Change
Matching: graphs and Expressions
Matching: Graphs and Value-Tables
ponding rule
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ph, what is its y?
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ntation emphasizes it best .
Tasks
200-meter Dash
Value Tables and Rate of Change
Different Prices
Graphs describing motion
Cab Fares
Trucks
Medical Prescriptions
Height and Bone Lengths
Postal Rates
Electric Bill
Constructing Functions
Changing Grades
Fuel Efficiency
Dividing a Budget
At the Gas Station
Inverse Machines
Constant and Non-constant Rate
Graphs and Correspondence Rules
Rides

Navigating & Re Writing Flexible textbook: Challenges for Research

- How do flexibly ordered e-Textbooks challenge the external authoritarian role of the textbook as a message from the past delivered in an orderly manner?
- How is teachers content knowledge of Transparency & Navigation developed? *Gueudet,* Pepin *& Trouche work on Teachers using Live Resources*
- Rewriting: for whom? With whom? For what purpose?
  What sense of authorship teachers develop by editing content that is written by a recognized expert?

Even, Ayalon & Olsher long term study program in M-TET project

Evolving

Practicing communities become Authoring communities

- Web 2.0 participatory tools support participatory norms that seem to be consistent with constructivist pedagogies
- The new norms and values brought to higher education by the participatory tools have the potential to fundamentally change the way authors, instructors and students produce, share and use educational materials worldwide (Kelty, Burrus, and Baraniuk 2008)

Evolving Textbook pose a challenge to the accepted function of the textbook as a message completed in the past by a recognized external authority

Challenging Systems' Authority

Coherence

- Inline with the formal curriculum or official standards
- Conceptual continuity (Yerushalmy & Chazan 2008)
- Connectivity between the textbook and the interactive linked “complements”

Criteria of Quality

- Trgalova (2011) nine *i2geo* criteria to assess **a platform** for **interactive** (geometry) **resources**: technology, pedagogy, curriculum, interface, interactivity
- Choppin et al. (2014) analyzing **digital curricula** according to three themes: student's interactions, curriculum adaptation & online assessment criteria
- The quality determined by **the crowd**:
  The volume of cooperation
  Most Wikibooks textbooks seem to have been authored by a single writer, occasionally with minor contributions from a small group
- The quality determined by **open review**

- The *Connexion* project, to which anyone can contribute educational modules and learning objects, with a third party providing free reviews http://cnx.org/help/viewing/lenses. (Kelty et al., 2008)

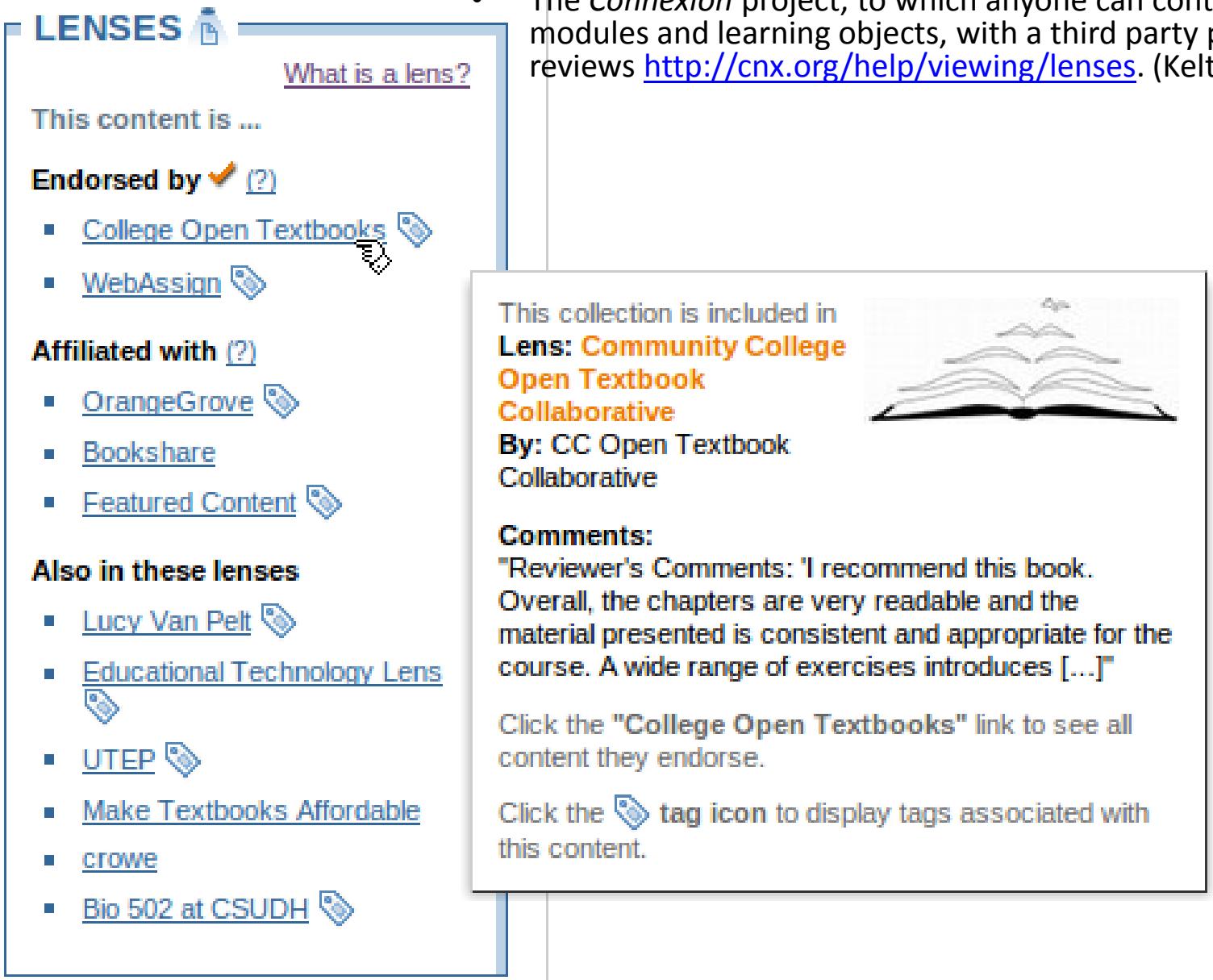


Figure 1: Display lens information in a popup.

Regulation

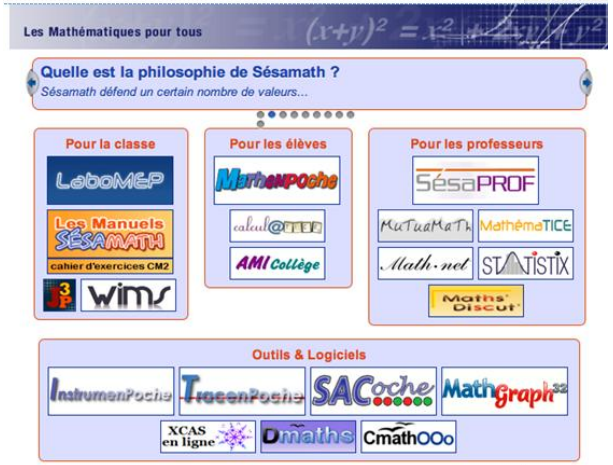
- Textbook regulation policy is to assure qualified material & eliminate inappropriate material
- Textbook is a “quasy-policy document” (Pepin et al. 2013 ZDM)
- Textbook regulation assume an object (approved at a specific time, rigid, periodical evaluation)
- Adoption & regulation policy assume approved qualified providers

Sustainability & Leadership

- “Two factors shape the lifecycle of a successful Open Source project: a widely accepted leadership setting the project guidelines and driving the decision process, and an effective co-ordination mechanism among the developers based on shared communication protocols. ….In general, no one in the project is forced to perform a particular task but agents choose freely to focus on problems that they think to best fit their own interests and capabilities.” Bonaccorsi & Rossi (2003)
- It is difficult to imagine that open communities creating evolving textbooks will assume a central role in this enterprise without some fundamental changes in expectations and norms.

Sesamath Sustainability & Leadership

- Sesamath, a French online association of mathematics teachers started in 2001
- Started by twenty mathematics teachers, who shared their personal websites, and subsequently designed, together, a 'drill-and-practice' package --*Mathenpoche*
- Sesamath is a major reference in the French educational landscape
- The economic model: resources can be freely downloaded. A printed-paper version can be bought for half the price of other mathematics textbooks in France.
- Authors are not paid but books' sales cover employment of a few teachers



http://www.sesamath.net/)
(Trouche *et al.* 2013)

Evolving Collaborative Textbooks: Challenges for Research

- Develop better understanding of the field – a lot is there already
- Under what systemic conditions teachers commit themselves to long-term participation in an evolving project?
- How should regulation of textbooks change to support peer production?
- Where would the required leadership come to provide extended guidance for teachers and school systems?

Authority Takes Place "Elsewhere”

- Some **curriculum documents** have grown to the size of a “slim textbook”
- Mass **Central assessment** tracking and reporting improved by technology
- New social norms can elevate **personal learning and coaching** opportunities, to a status of authority
- **Teachers demand authority** in revolutionizing their teaching resources
- **Public concerns** with the top-down curriculum dictated by national standards

The Future of Textbooks

Carriers or followers of a new inquiry curriculum?
or:
Just a reminder of the past?

It's the time to examine:
whether the disappearance of the traditional authority will result in the freedom to support inquiry-based student-centered learning or a new tyranny in which traditional textbook authority is replaced by massive technology-driven standardization