

Learning From Spatiotemporal Stories With Storix - One Size Fits All?

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Halden, Norway

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Hersonissos, Greece, September 30th, 2008

Spatiotemporal Storytelling

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Håkon Tolsby
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Storytelling

Experiment

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styles

Selected
findings

Final remarks

- 1 Storytelling
- 2 Experiment
- 3 Learning styles
- 4 Selected findings
- 5 Final remarks

Storytelling

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- Storytelling is a fundamental tool in education
- Today, most stories are non-orally distributed and consumed
- Cave paintings, Lascaux, 13000 BC: Persistent stories
- Gutenberg, 1450: Mass distribution
- Roundhay Garden Scene, 1888: First movie
- John Logie Baird, Scotland, 1926: First TV broadcast
- Tim Berners-Lee, 1990: First Web browser



Story browsing

Spatiotemporal Storytelling

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- All stories have a *structure*
- A common way to structure a story is to decompose it into atomic parts, often referred to as *events* [Bal, 97].
- However, events may be embedded in various *dimensions* (or *contexts*), for instance:
 - Narrative order (default)
 - Time
 - Space
- Stories may be accessed (browsed) along their dimensions:
 - Enhanced user experience
 - Novel insights [Eccles, 08]

Storix: A spatiotemporal story browser

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http://asia.hiof.no/stories/storyteller5/public/viewer/

Open a story

Classical Philosophers, ▾

Open story

1.1.1 Thales

1.1.2 Anaximander

1.1.3 Anaximenes of Miletus

1.1.4 Pythagoras

1.1.5 Xenophanes

1.2 500-400 BCE

1.2.1 Heraclitus

1.2.2 Parmenides

1.2.3 Anaxagoras

1.2.4 Zeno of Elea

1.2.5 Empedocles

1.2.6 Protagoras

1.2.7 Hippias

1.2.8 Gorgias

1.2.9 Socrates

1.2.10 Leucippus

1.2.11 Democritus

1.2.12 Archelaus

1.2.13 Melissus of Samos

1.2.14 Cratylus

1.2.15 Ion of Chios

1.2.16 Echechrates

1.2.17 Timaeus of Locri

1.3 400-300 BCE

Map Satellite Hybrid

EMAS Greece

Hippias

Aristotle

Socrates

Anaxagoras

Xenophanes

Anaximenes of Miletus

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January -470

Classical Philosophers, 600-0 BCE

Socrates


Wed Jan 01 -0470 00:00:00 GMT+0100 (CET) @ Athens

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Socrates (Greek: Σωκράτης c. 470 BC-399 BC) was a Classical Greek philosopher. He is best known for the creation of Socratic irony and the Socratic Method, or elenchus. Specifically, Socrates is renowned for developing the practice of a philosophical type of pedagogy, in which the teacher asks questions of the student in order to elicit the best answer, and fundamental insight, on the part of the student.

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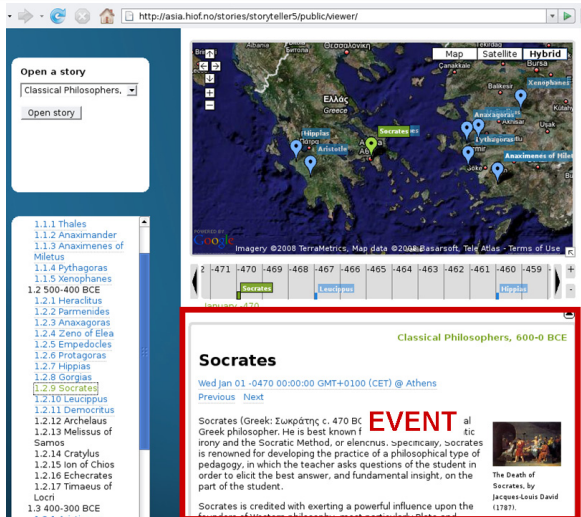
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Map Satellite Hybrid
Socrates
Leucippus
Hippas
Anaximenes of Miletus
Anaxagoras
Xenophanes

Classical Philosophers, 600-0 BCE

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EVENT

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Event [Bal, 97]

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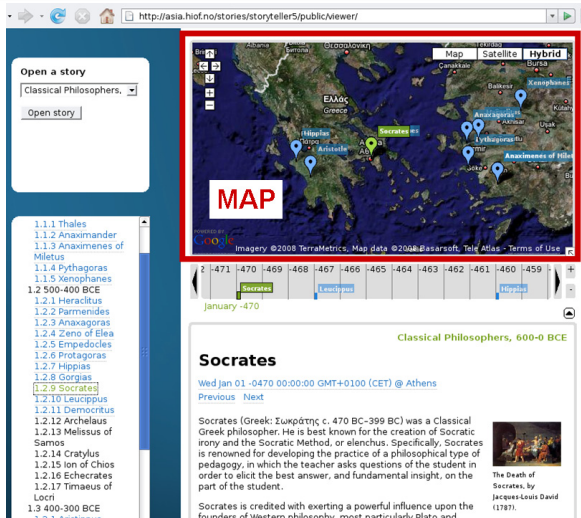
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MAP

Classical Philosophers, 600-0 BCE

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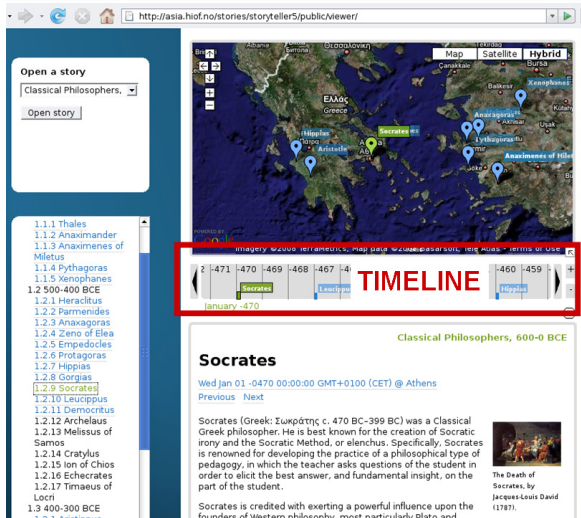
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Map Satellite Hybrid
Socrates
Hippias
Aristotle
Anaxagoras
Xenophanes
Anaximenes of Miletus

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January -470

TIMELINE

Classical Philosophers, 600-0 BCE

Socrates

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Timeline

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1.2.17 Timaeus of Locri

TOC

1.3 400-300 BCE
1.3.1 Aristotle

Map Satellite Hybrid
Athens, Greece
Socrates
Hippias
Aristotle
Anaxagoras
Xenophanes
Anaximenes of Miletus
Leucippus
Democritus
Archelaus
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Cratylus
Ion of Chios
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Table of
content (TOC)

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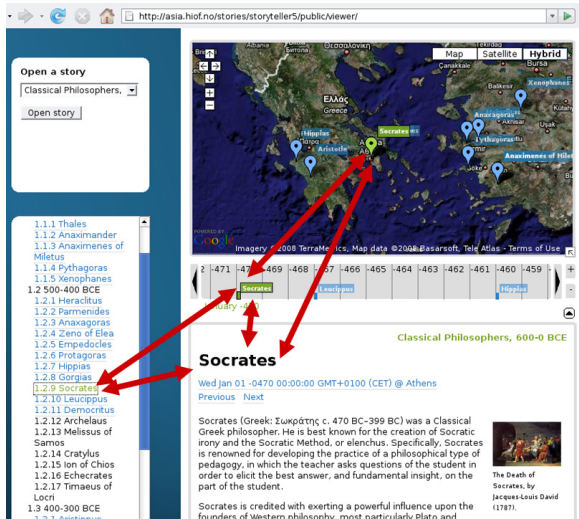
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The screenshot shows the Storix application interface. On the left, there is a sidebar with a search bar and a list of classical philosophers. The main area displays a map of Greece with markers for various philosophers. A red arrow points from the 'Socrates' marker on the map to the 'Socrates' entry in the list. Another red arrow points from the 'Socrates' entry in the list to the detailed view of Socrates on the right. The detailed view includes a timeline, a TOC, and a description of Socrates.

Open a story
Classical Philosophers, ▼
[Open story](#)

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All story elements are synchronized: Clicking on a map marker updates event view, timeline and TOC, and so on.

Storix as a learning tool: Research questions

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- ❶ Will spatiotemporal story browsing, with a rich and potentially confusing interface, work in a realistic educational setting in primary school?
 - Will they manage to operate the tool?
 - Will the tool provide satisfactory learning outcomes?
- ❷ Will spatiotemporal stories favor particular learning styles?

Setup (1)

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- Grade seven class (11 yrs), 8 girls, 6 boys
- “Regular” class setting: Lecture in local history (however, on our campus)
- Activity: Solving tasks by browsing a spatiotemporal story

Setup (2)

- Teams of two
- 10 min Storix intro, 20 minutes assignment
- Assignment: 23 tasks, given on sheets of paper; combination of crossword (11 tasks), filling out missing words in statements (8) and questions (4)
- Some tasks encouraged map searching, others were temporally biased, and yet others inquired examination of textual content



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The story

- Fredriksten Fortress, Halden, Norway
- 25 events; some only text, other combination of text and image(s)
- Time span: 111 year (1659 - 1770)
- Geographic area: Approx one square kilometer
- Focus on buildings and their associated events

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The screenshot displays the mobile application interface for the Fredriksten Fortress. On the left, a sidebar contains navigation options: 'Open a story' (with a dropdown menu showing 'Fredriksten festning' and buttons for 'Open', 'Edit', and 'Create new story'), 'Fredriksten festning' (with a 'Table of Contents' link), and a list of locations including 'Borgerskansen', 'Hufsfjells batteri', 'Citadellet', 'Dronningens bastion', 'Gamle kommandantbolig', 'Klokketårnet', and 'Kongens bastion'. The main content area shows a map of the fortress with various points of interest marked. Below the map, a detailed view of the 'Gamle kommandantbolig' is shown, including a photograph of the building and a text description: 'Bygningen av den gamle kommandantboligen ble ist holdt på frem til 1758. Den gamle kommandantboligen ble i 1825 sterkt skadet på Fredriksten festning, og det var kun grunnstod igjen. Det ble da planlagt at en ny kommandantbolig skulle bygges på Citadellet (den indre delen av festningen). Citadellet, og stod ferdig i 1830. Navnet, 'den gamle bygningen som ligger inne i Citadellet da den nye kj...' (partially visible). The interface also includes a 'Show' menu with 'Table of Contents' and 'Map' options, and a 'Close window' button at the bottom right.

Data collection

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- Observations
- Teacher interviews
- Click data: All clicks recorded with team ID, event number, timestamp, and origin (map, timeline, TOC)
- Evaluation of committed assignments
- Assessment of the teams' learning styles

Learning styles: Convergers and Divergers, 1

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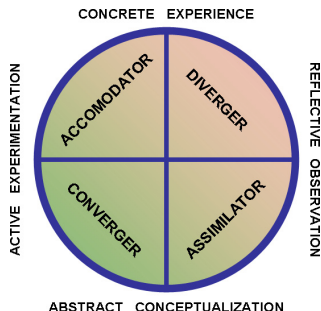
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- Kolb's four types of "learning styles"[Kolb, 84]:
 - 1 Accomodator
 - 2 Diverger
 - 3 Assimilator
 - 4 Converger
- The teacher was asked to categorize the teams based on his knowledge of how they performed in regular educational contexts
- The teacher identified four groups as *Convergers*, and four as *Divergers*, and none as *Assimilators* or *Accomodators*



Learning styles: Convergers and Divergers, 2

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- *Convergers:*

- Pragmatists favoring abstract conceptualization and active experimentation.
- Solve problems relying on methodical and predictable approaches
- They often achieve good scores

- *Divergers:*

- Reflectors preferring concrete experience and reflective observation
 - Approach problem solving in a more nonlinear and unpredictable fashion
 - Normally not among the best performers
- The absence of *accommodators* and *assimilators* may reflect class room practise where neither theoretical conceptualization nor pure practical tasks are emphasized.

Click categories for each event

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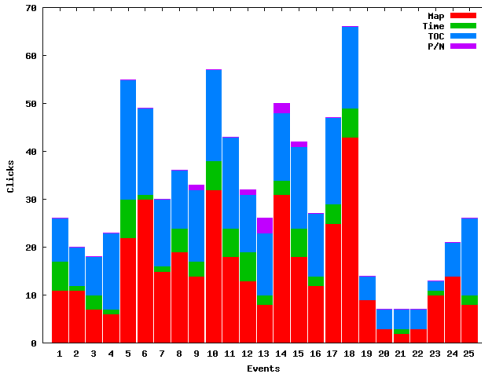
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- 775 recorded clicks
- Map is the dominating click origin, with 49.5%, then comes TOC (40%), and the timeline (9.5%)

Clicking efficiency

- We needed a way to characterize the *browsing behavior*
- Introduced *clicking efficiency* as a ratio between the total number of required clicks (in worst case), related to score, and the performed clicks
- No extra clicks yields 100% efficiency

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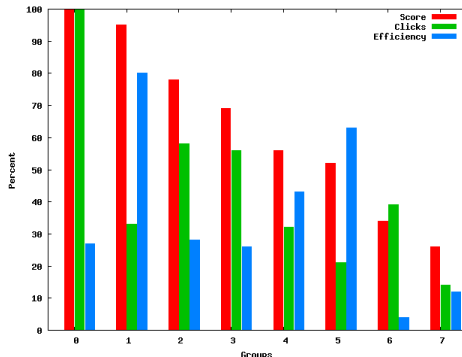
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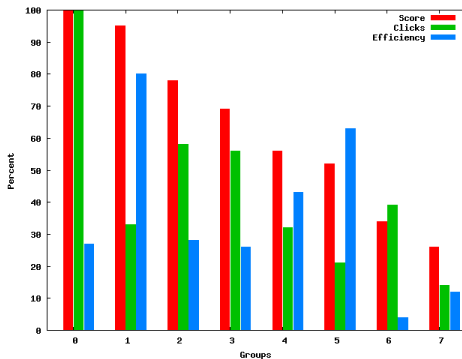
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Scores, click rates and efficiency



By plotting efficiency, achieved scores, and number of clicks (all as percentages), we notice a large variation in number of clicks (from 32 to 217) and efficiency (from 26% to 100%).

Scores, click rates and efficiency



The two groups with best scores, exhibit radically different behavior. One group has many clicks and, thus, low efficiency, opposed to the other, which has been more restrictive in their clicking.

Scores, click rates and efficiency: Convergers

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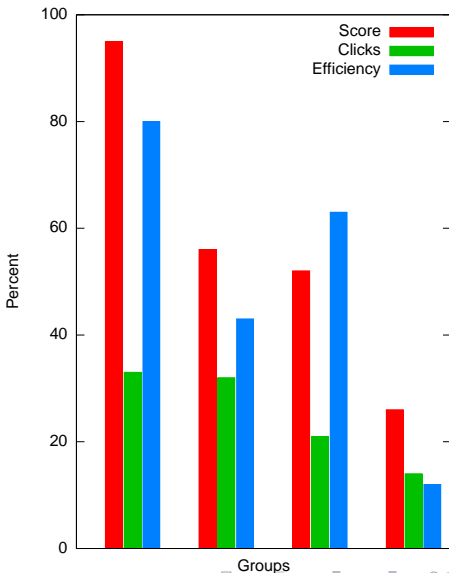
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- High level of efficiency, few clicks
- Scores: As expected by the teacher



Scores, click rates and efficiency: Divergers

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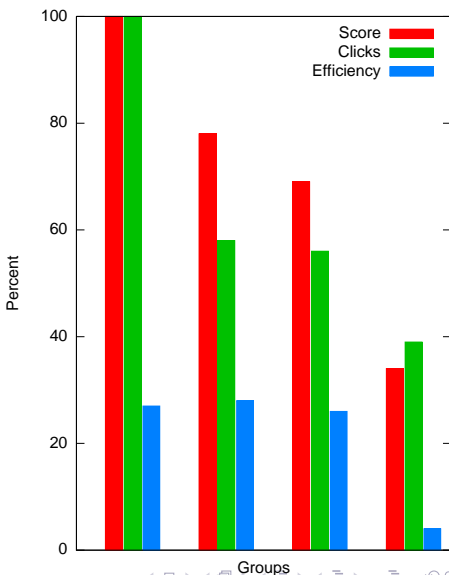
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- Low level of efficiency, many clicks
- Surprisingly: The average score is higher among the *Divergers* than the *Convergers* (70.7% against 57.6%)
- The teacher anticipated significantly lower scores for these teams



Scores, click rates and efficiency: Convergers and Divergers

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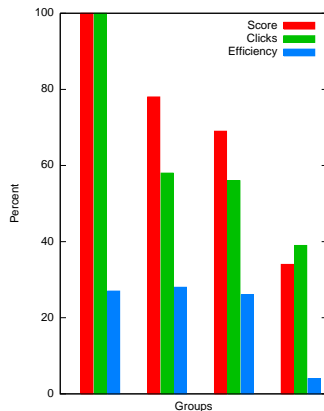
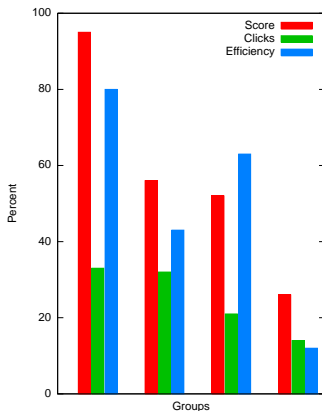
Storytelling

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findings

Final remarks



Is this indicating that Storix is an educational tool that in particular supports the *Divergers*, a traditionally “weak” group?

Research limitations

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- Small scale pilot study; questionable validity
- Using assignment score as the (only) indication of learning outcome; naïve approach
- Kolb's model of learning styles is developed for college/university students; rarely applied to primary-school pupils
- Used the teacher to categorize the teams according to learning styles; formal methods would yield more valid characterizations

Conclusions

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- We have demonstrated that the 7th graders understand, accept and enjoy spatiotemporal storybrowsing
- The pupils preferred the map as the main navigation tool, secondly the table of contents
- Using Storix as a learning tool, the *converger* type pupils performed as expected
- *Divergers* performed far better than expected
- Is Storix a “one size fits all” concept? Further research needed!

Questions?

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STORIX demo available on
<http://asia.hiof.no/storix>

...and as free and open source from
<http://storix.sourceforge.net>

...and there is more to read in Øyvind's master thesis
[Håkestad, 07]

Thank you for your attention!

References

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