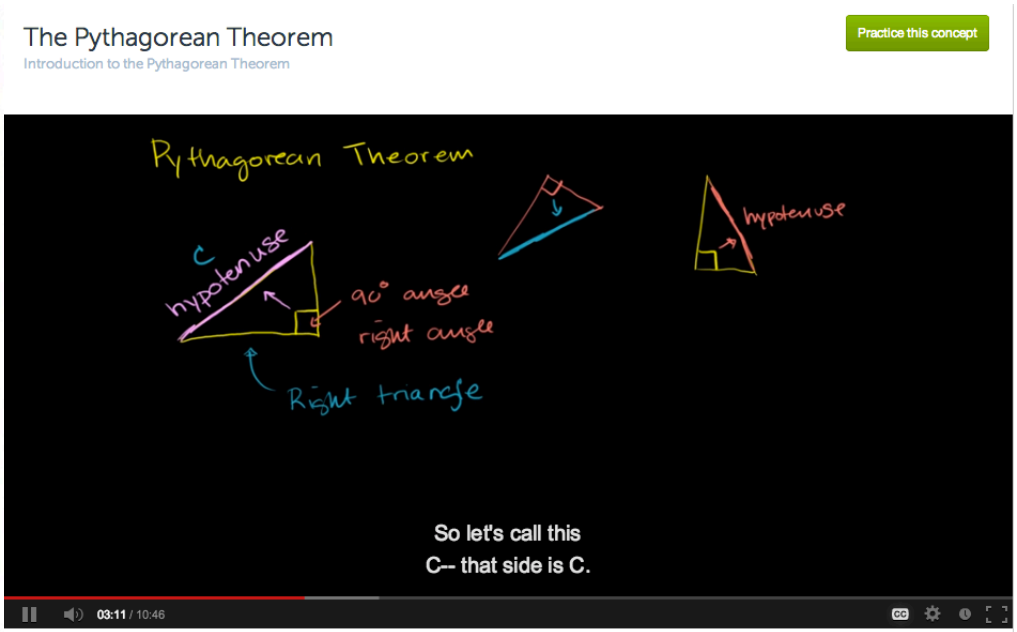
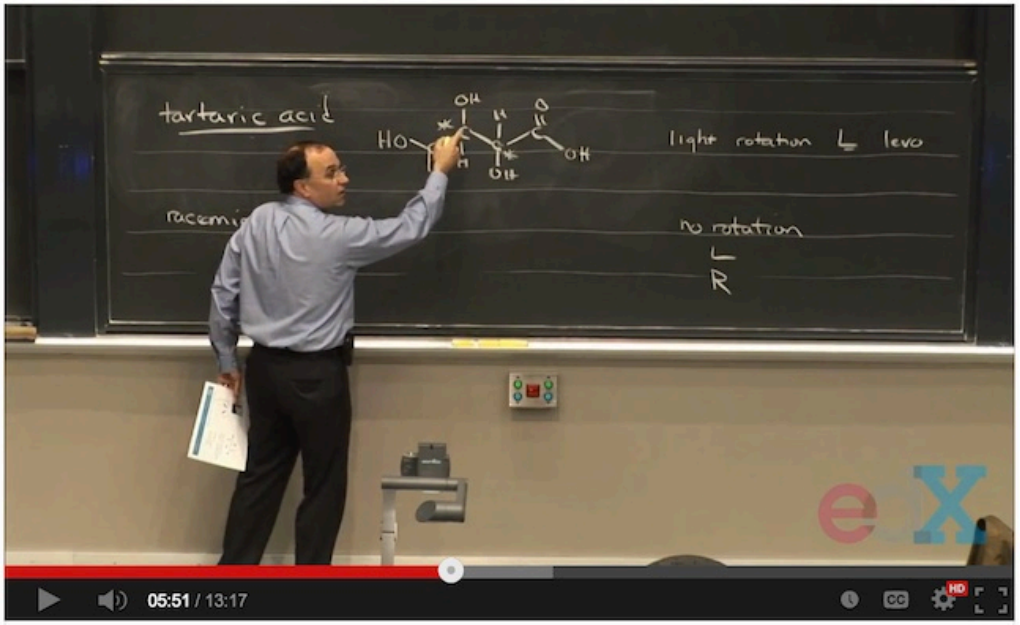
Learnersourcing:

Improving Video Learning with Large-Scale Interaction Data

Juho Kim (MIT CSAIL)

Video learning at scale





Video enables learning at scale

Scalable delivery ≠ Scalable learning

# of learners

one

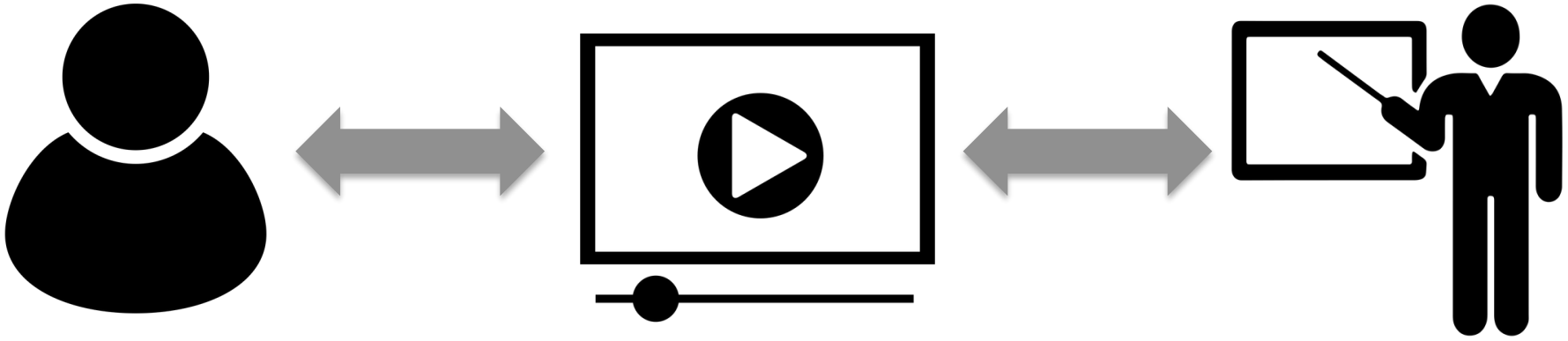
hundreds

millions

In-person learning: Direct learner-instructor interaction

Effective pedagogy
- high engagement
- immediate feedback
- adaptive instruction

Video learning: Mediated learner-instructor interaction



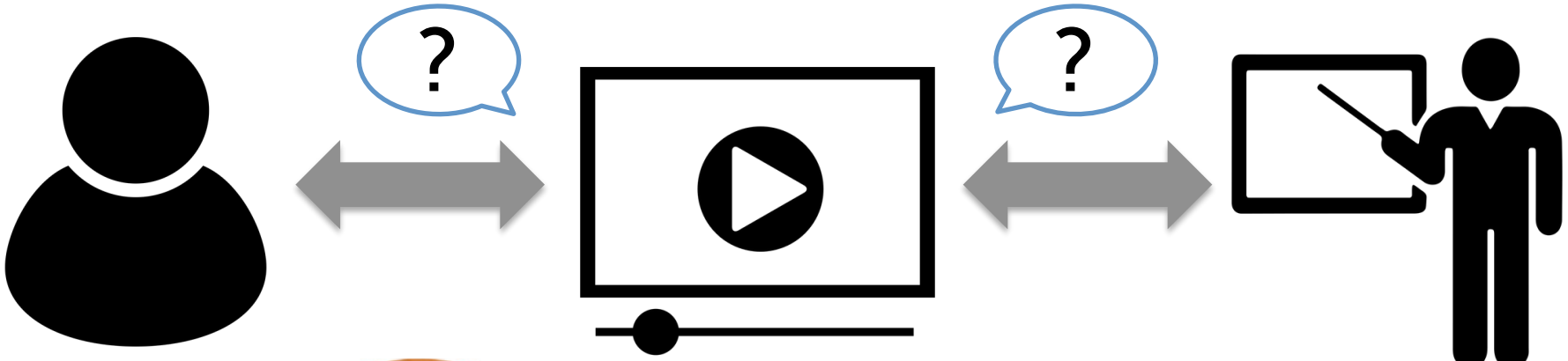
Video interfaces are limiting.

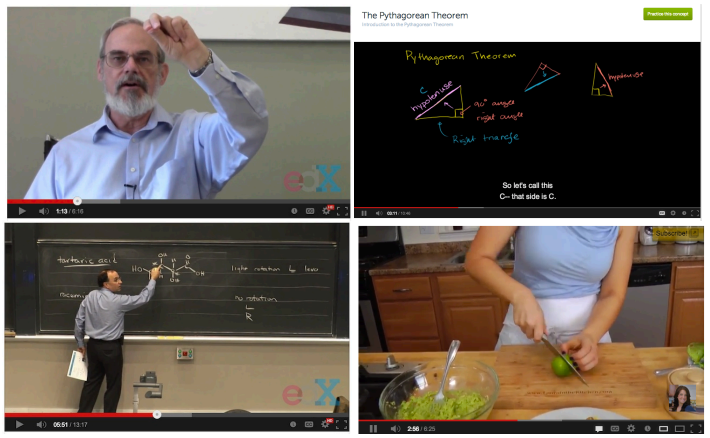
- passive, isolated viewing
- not adapting to learner
- difficult to find info and navigate freely

Challenges in video learning at scale

No information about learners

No information about content





Data-Driven Approach

use data from learners' interaction to
understand and improve learning

second-by-second
process tracking

data-driven
content & UI updates

Learnersourcing

crowdsourcing with learners as a crowd

inherently motivated
naturally engaged

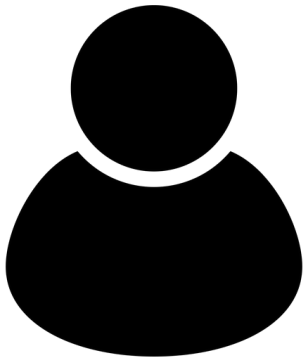
"Learners' natural learning activities
dynamically improve content & UI for future learners."

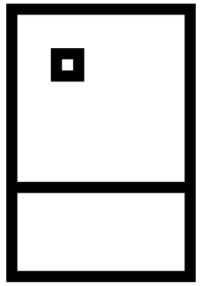
Video player adapts to collective learner engagement

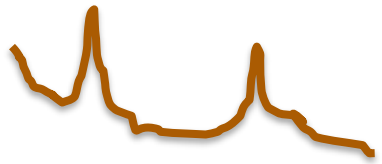
[Learner3879, Video327, "play", 35.6]
[Learner3879, Video327, "pause", 47.2]
...

Learners watch videos.

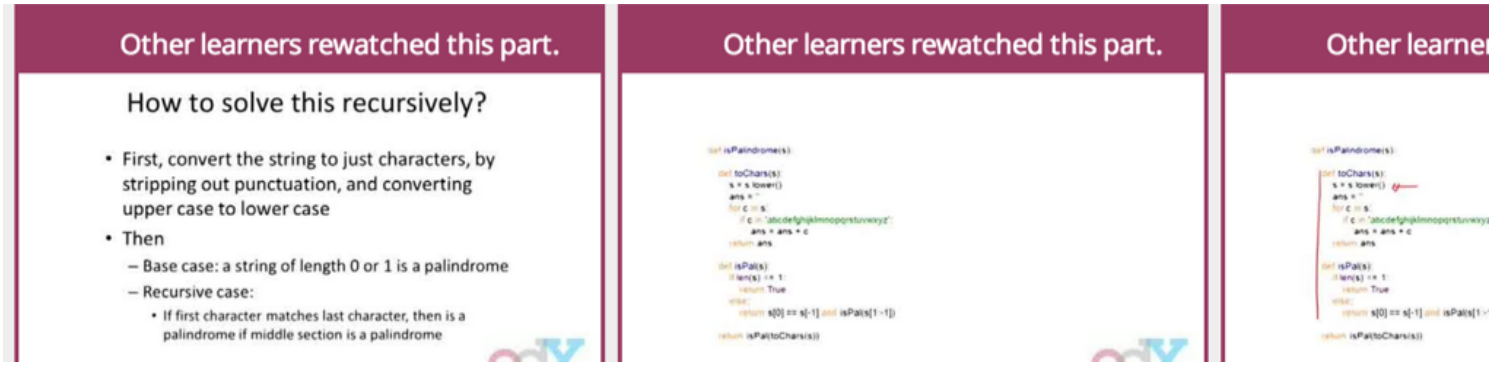
System analyzes interaction traces for hot spots.



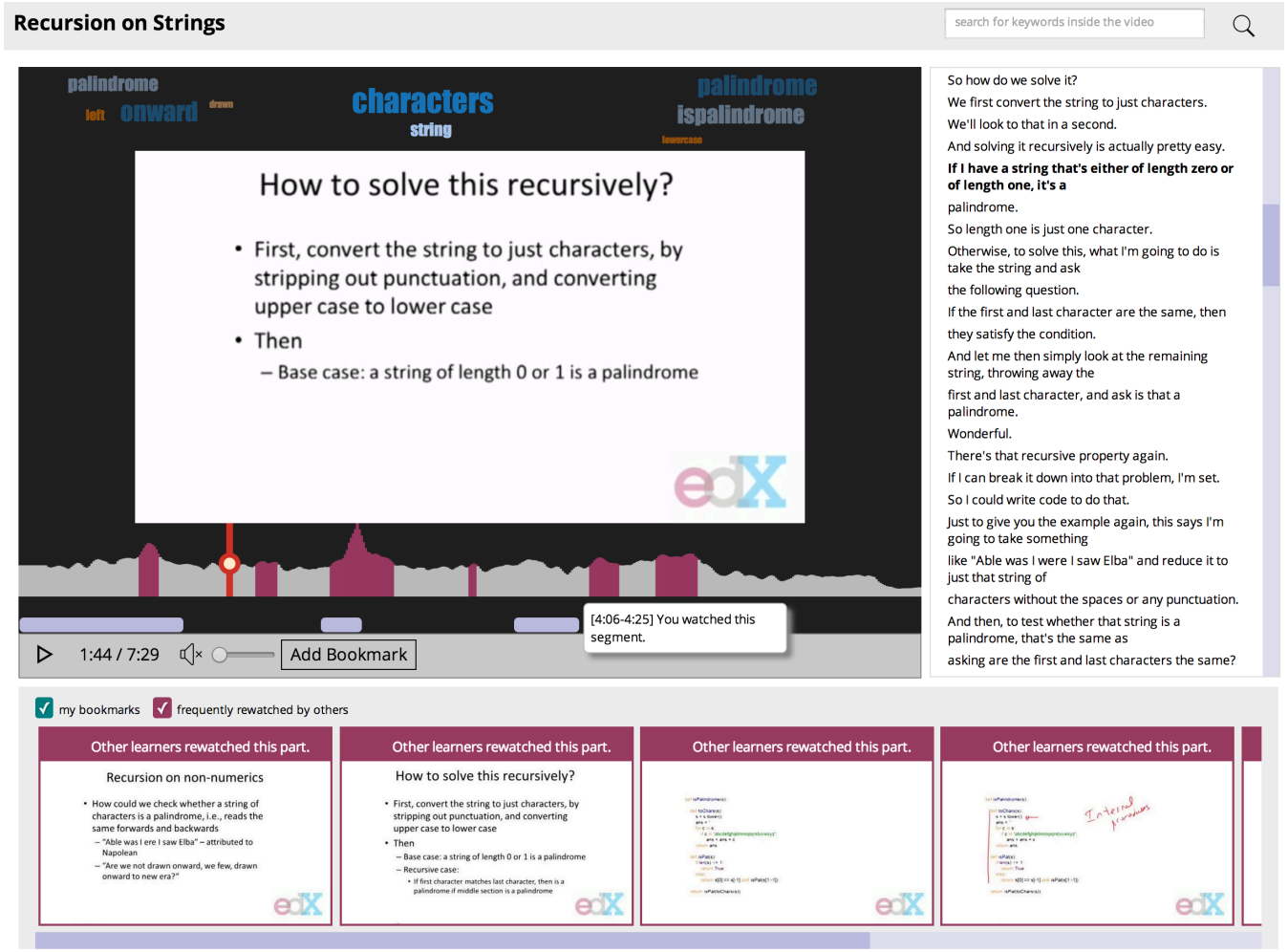




UI supports social navigation & summarization.



Video player adapts to collective learner engagement



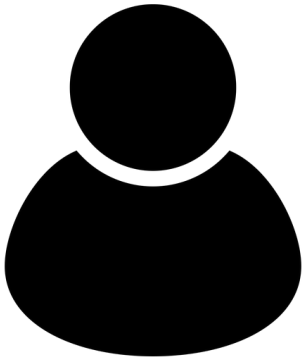
Data-driven interaction techniques for improving navigation of educational videos.
Juho Kim, Philip J. Guo, Carrie J. Cai, Shang-Wen (Daniel) Li, Krzysztof Z. Gajos, Robert C. Miller.
UIST 2014.

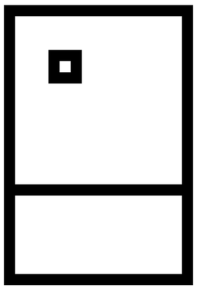
Video player coordinates learners to generate a video outline

What's the overall goal of the section you just watched?

Learners are prompted to summarize video sections.

System coordinates learner tasks for a final summary.

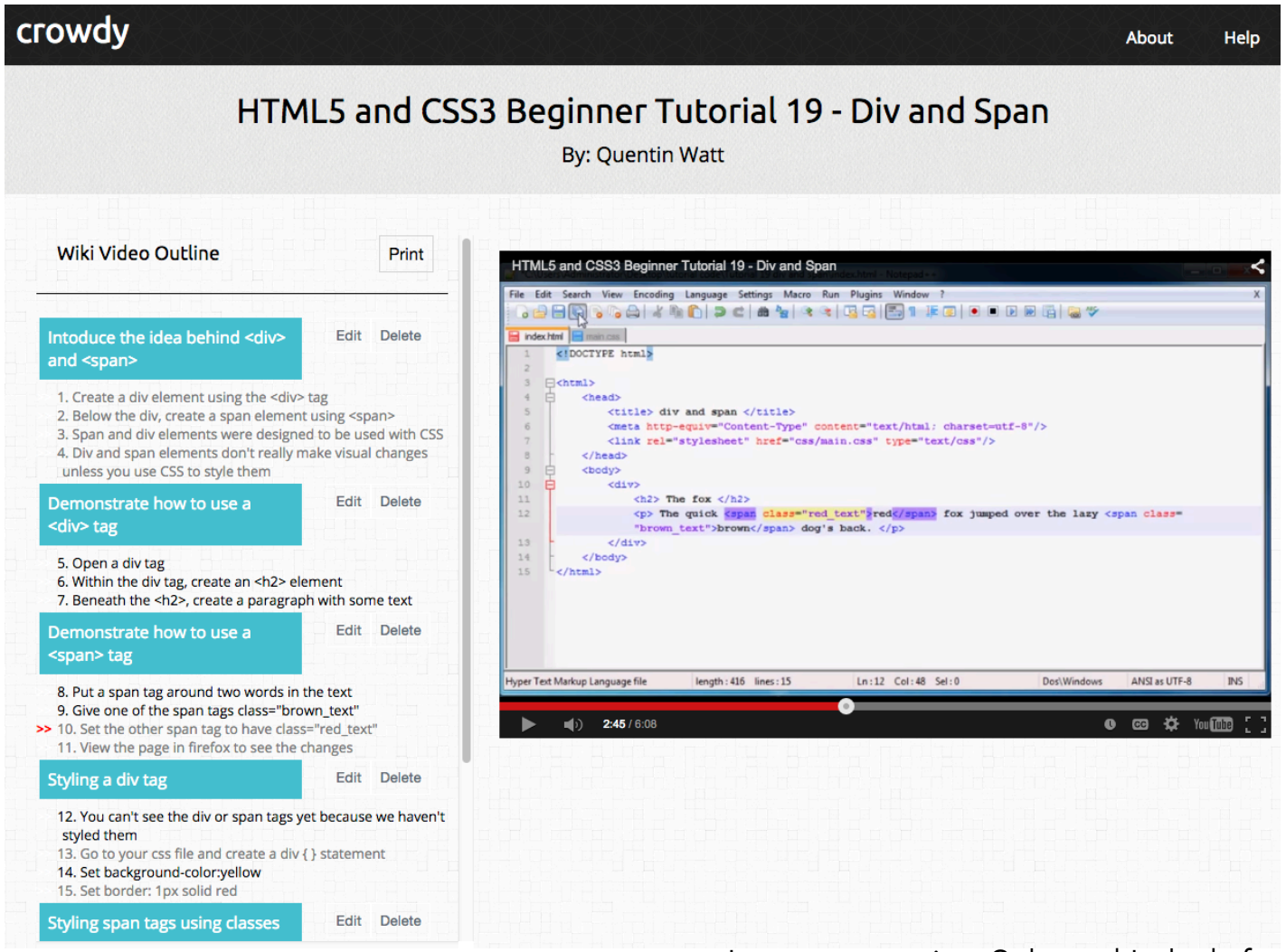




X .....
V .....
X .....
X .....

UI presents a video outline.

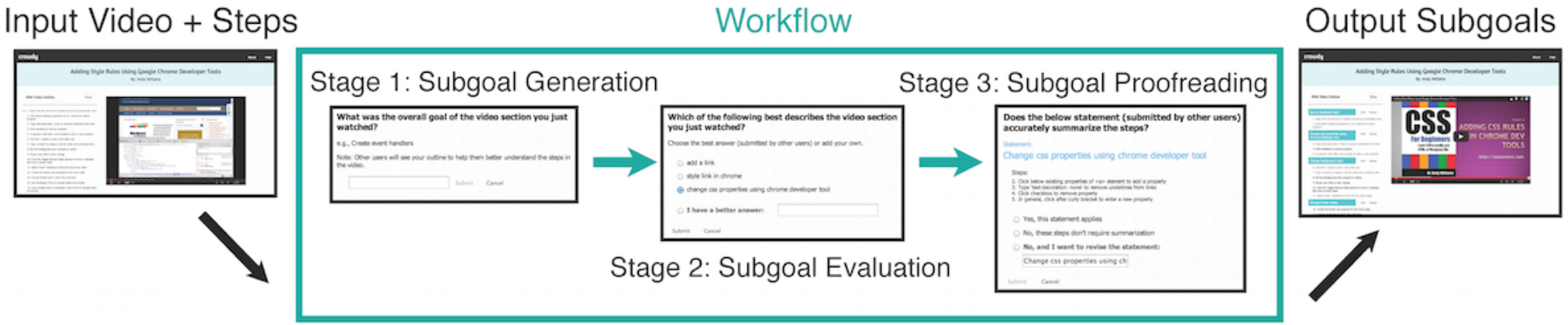
Video player coordinates learners to generate a video outline



Learnersourcing Subgoal Labels for How-to Videos.
Sarah Weir, Juho Kim, Krzysztof Z. Gajos, & Robert C. Miller.
CSCW 2015.

Generating section summary in video

- Requires domain experts and knowledge extraction experts to work together. [Catrambone, 2011]
- Insight: the summarization activity is a good learning exercise!



- Crowd workflow for complex tasks

  Soylent [UIST 2010], CrowdForge [UIST 2011], PlateMate [UIST 2011], Turkomatic [CSCW 2012], Foundry [UIST 2014]

crowdy

About Help

Interactive, Collaborative, Crowd-powered Video Learning

Which subject are you interested in learning?

Statistics

Web Programming

{ Choose from the how-to videos below }

As you watch the videos, we'll periodically check in and ask what you're learning. It's an experiment to help you learn better from videos.

{ Featured videos }

CSS

Introduction to styling with CSS

By: BeginnerTutsdotcom

CSS

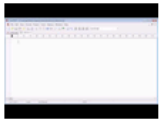
Making Divs Side by Side using CSS

By: I Teach Stuff

jQuery

Introduction to Selectors

By: thenewboston

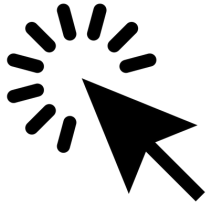


Crowdy: live deployment

- ~50 web programming + statistics videos
- Apr 2014 ~ Jun 2014, Jan 2015~
- ~1000 participating users (out of ~2,500 visitors)

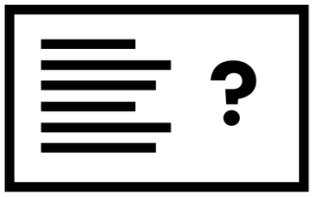
Two types of learnersourcing

Passive



track what
learners are doing

Active



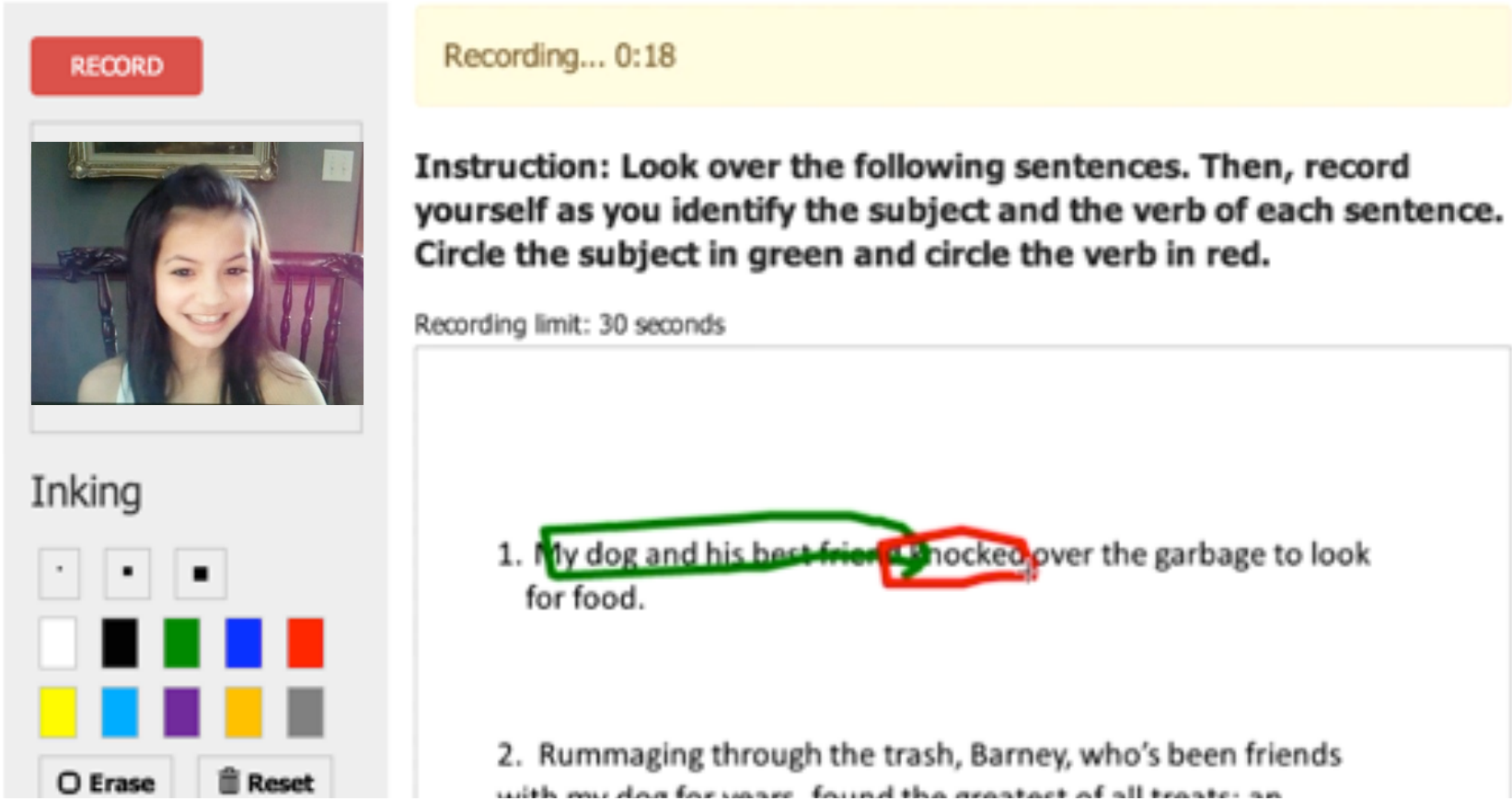
ask learners to
engage in activities

Designing learnersourcing activities

Engaging & pedagogically meaningful tasks, while byproducts make useful information

- Summarize, Compare, Inspect [Crowdy]
- "Record your own explanation." [RIMES]
- "Where is this lecture most confusing ?Why?" [Mudslide]

RIMES: Interactive exercises embedded into lecture videos

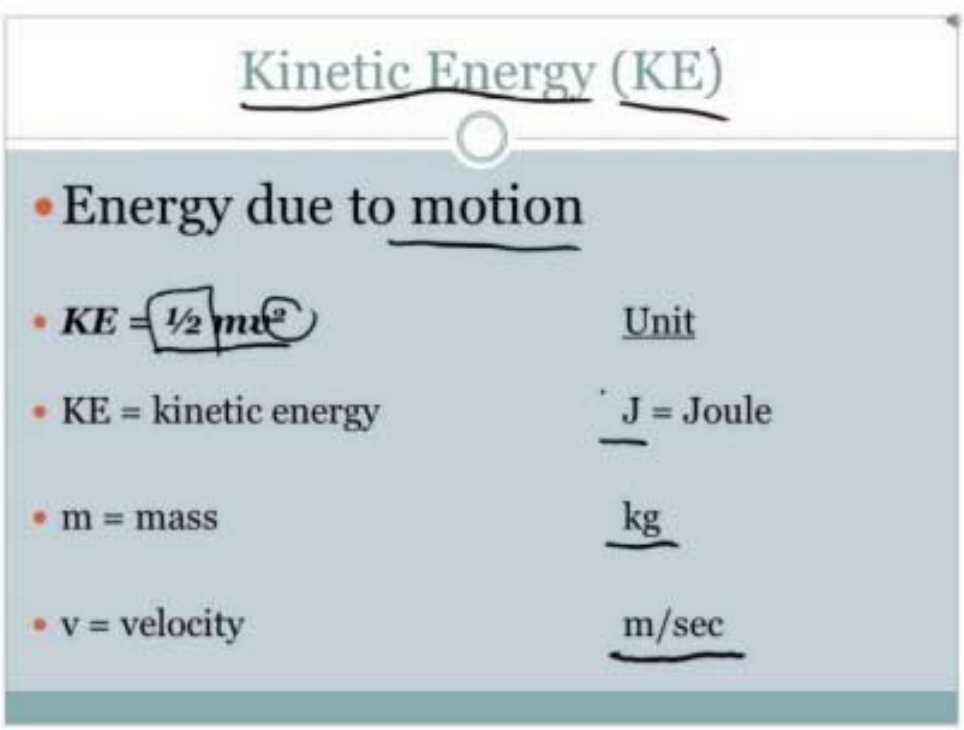


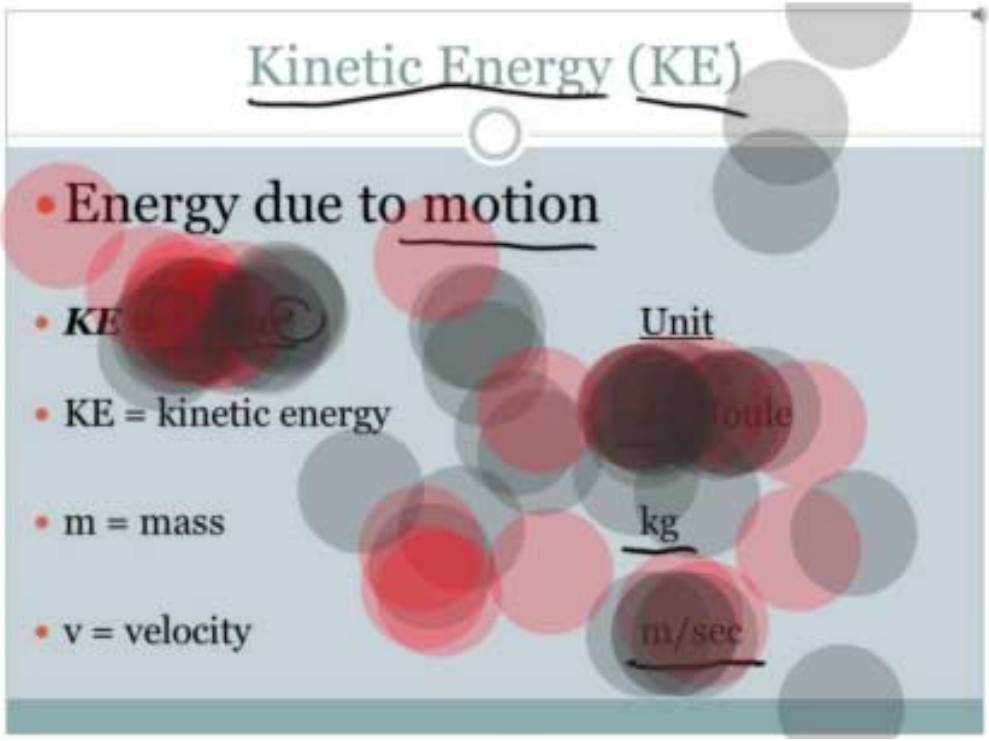
RIMES: Embedding Interactive Multimedia Exercises in Lecture Videos.
Juho Kim, Elena L. Glassman, Andrés Monroy-Hernández, Meredith Ringel Morris.
CHI 2015.

Gallery of submitted responses

RIMES: Embedding Interactive Multimedia Exercises in Lecture Videos.
Juho Kim, Elena L. Glassman, Andrés Monroy-Hernández, Meredith Ringel Morris.
CHI 2015.

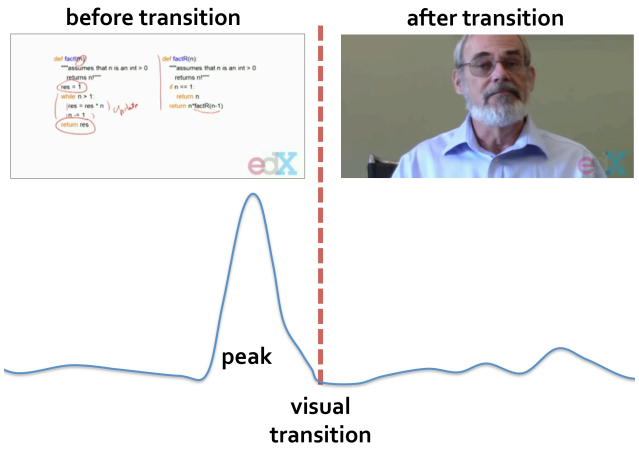
Mudslide: Spatially anchored confusion via learnersourcing



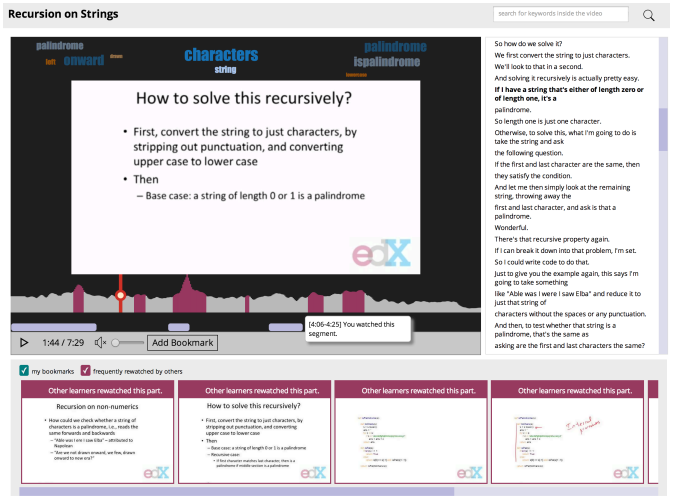


Mudslide: A Spatially Anchored Census of Student Confusion for Online Lecture Videos.
Elena L. Glassman, Juho Kim, Andrés Monroy-Hernández, Meredith Ringel Morris.
Best of CHI Honorable Mention. CHI 2015.

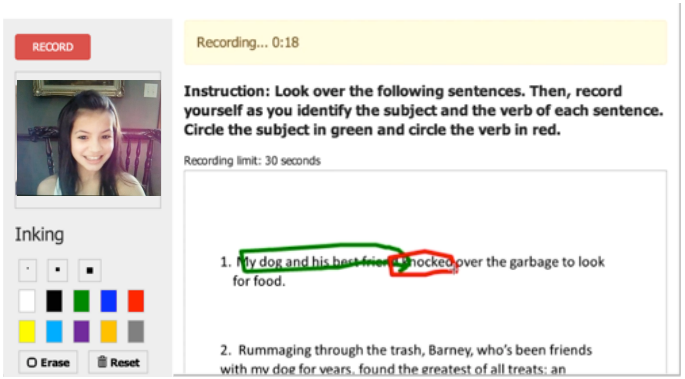
Learnersourcing applications for educational videos



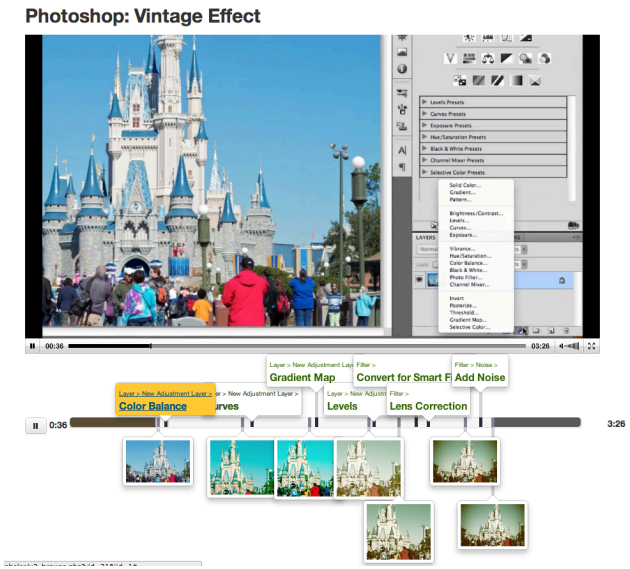
Interaction Peaks [L@S 2014]



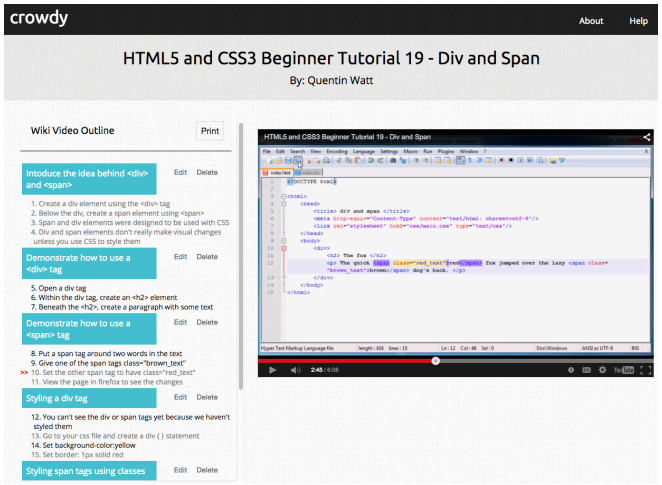
LectureScape [UIST 2014]



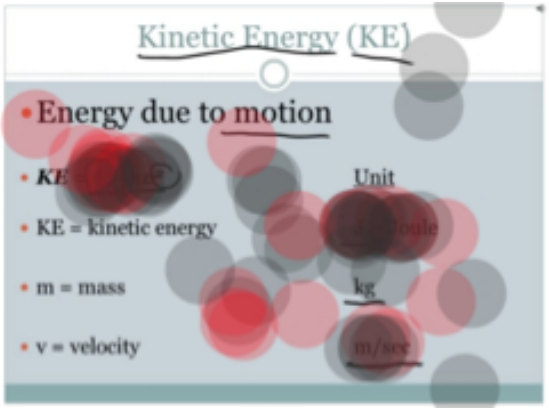
RIMES [CHI 2015]



ToolScape [CHI 2014]



Crowdy [CSCW 2015]



Mudslide [CHI 2015]

Learnersourcing design principles

Learnersourcing vs Crowdsourcing

- pedagogically meaningful task
  vs. simple and concrete task
- incentive design + minimal distraction
  vs. quality control
- learning + data collection
  vs. data collection
- overall contribution visible
  vs. microscopic, focused task
- cost: learners' time & effort
  vs. cost: money

Learnersourcing requires a multi-disciplinary approach

Crowdsourcing techniques
- Quality control, Task design, Large-scale input mgmt

Social computing
- Incentive design, Sense of community among learners

UI design
- Data-driven, Dynamic interaction techniques

Video content analysis
- Computer vision, Natural language processing

Learning science
- Pedagogically useful activity, Theoretical background

Let's think about...

- Beyond video learning
- How can we capture and understand richer learning interactions?
  - peer learning, creative process
- Completely learnersourced courses