

Korero: Facilitating Complex Referencing of Visual Materials in Asynchronous Discussion Interface

Paper Presentation, CSCW 2018

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Computer Science, University of British Columbia

School of Computing, KAIST

NUS-HCI Lab, National University of Singapore



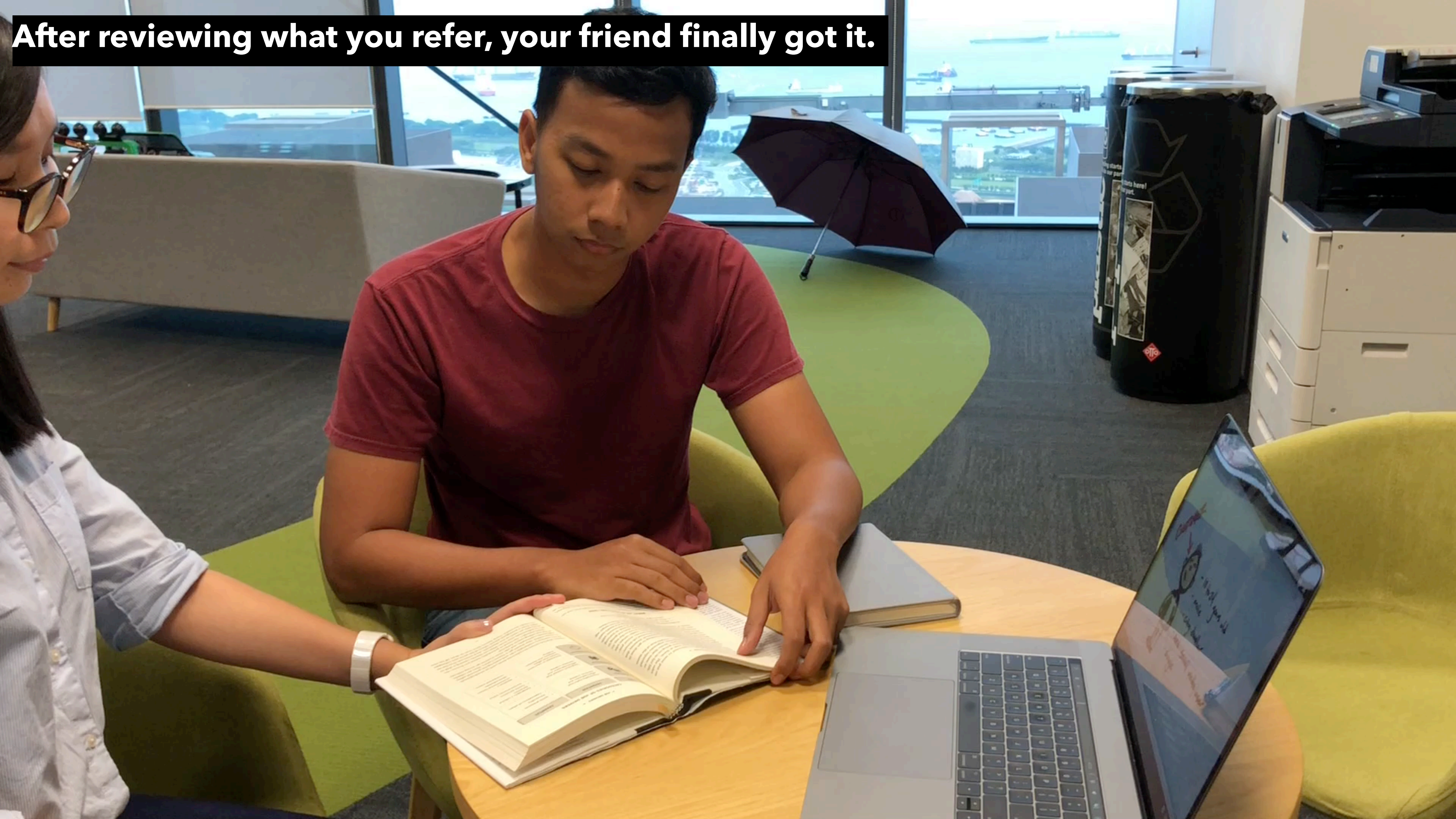
Imagine you're having a face-to-face discussion with a friend. To help make a point,

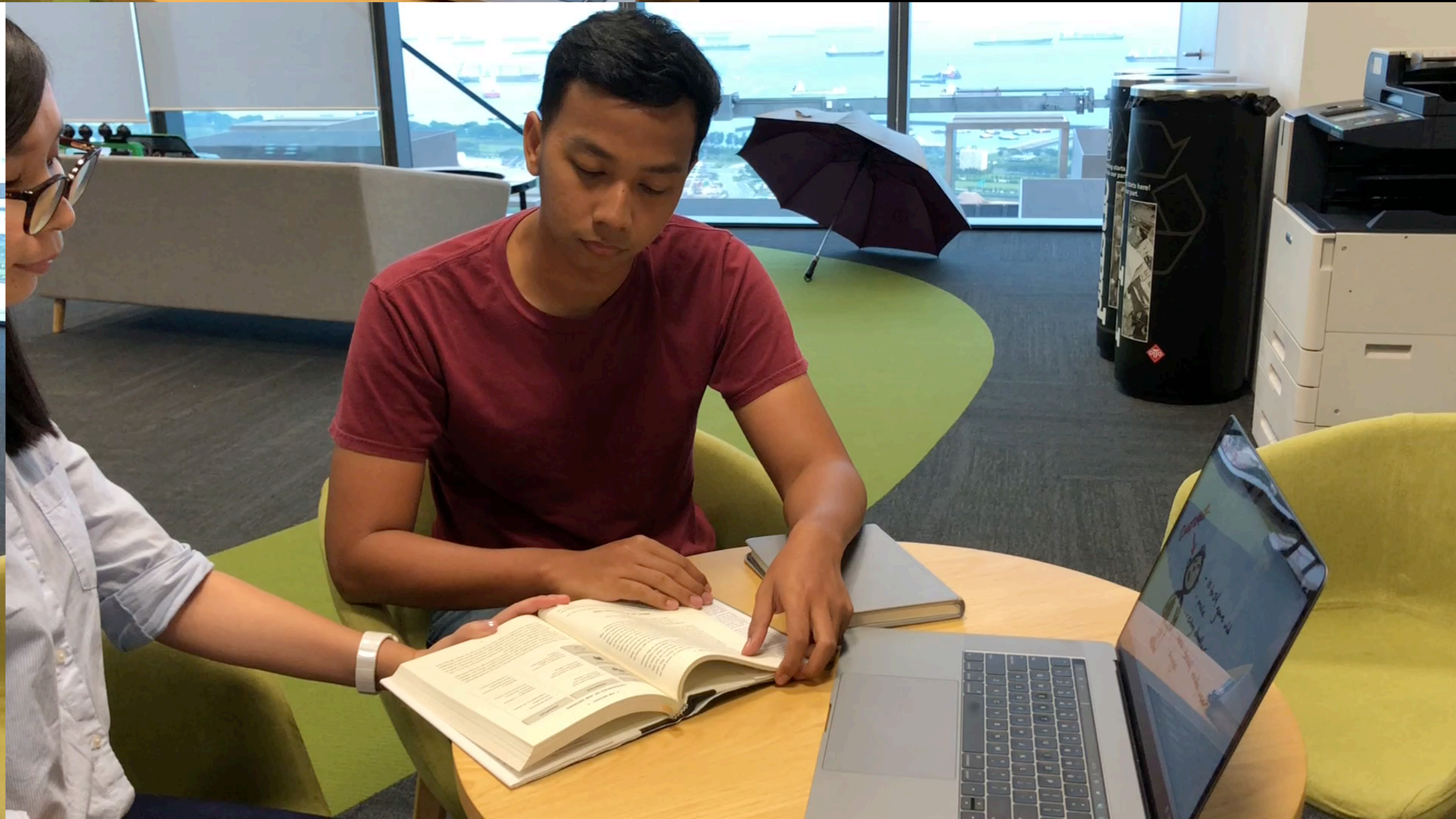


You point to a particular paragraph in the book, as well as a particular segment in the learning video.



After reviewing what you refer, your friend finally got it.

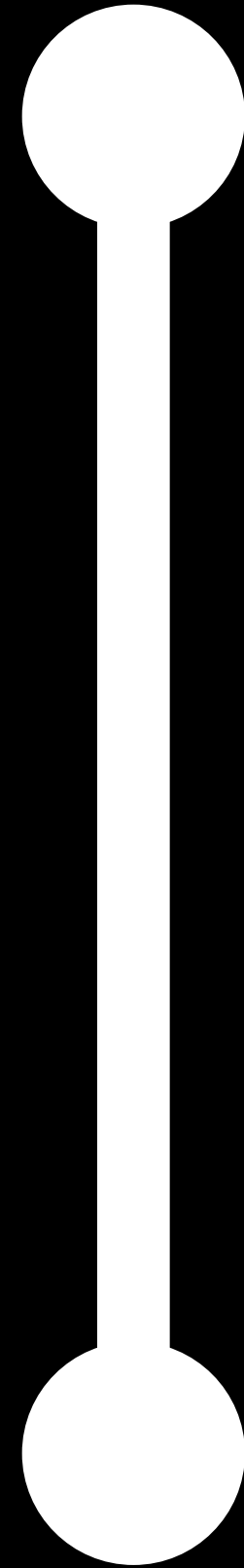




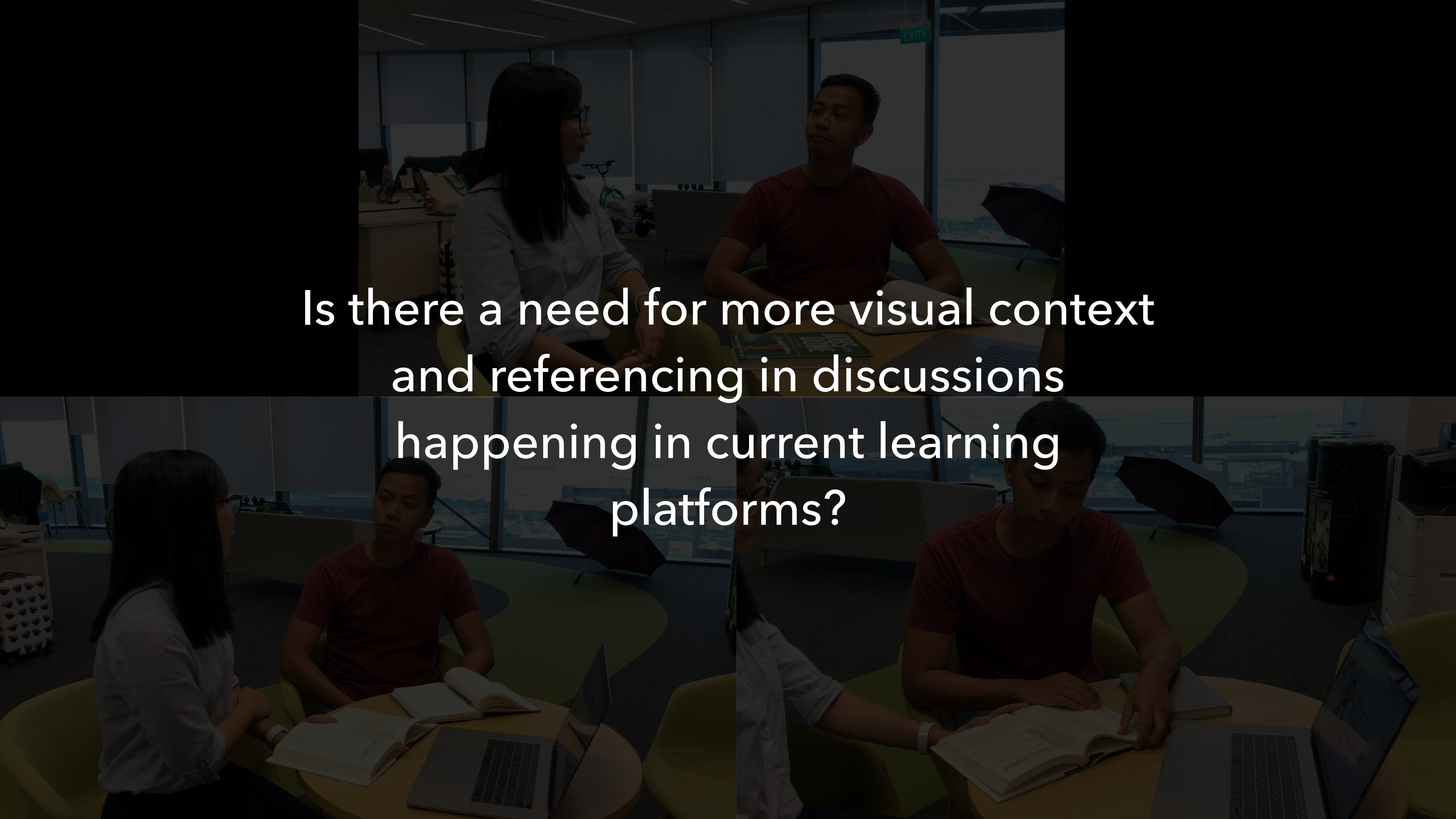
Rising prevalence in the digital space

- **Trend 1:** Growing popularity of online learning platforms
- **Trend 2:** Creating knowledge from different sources/ materials

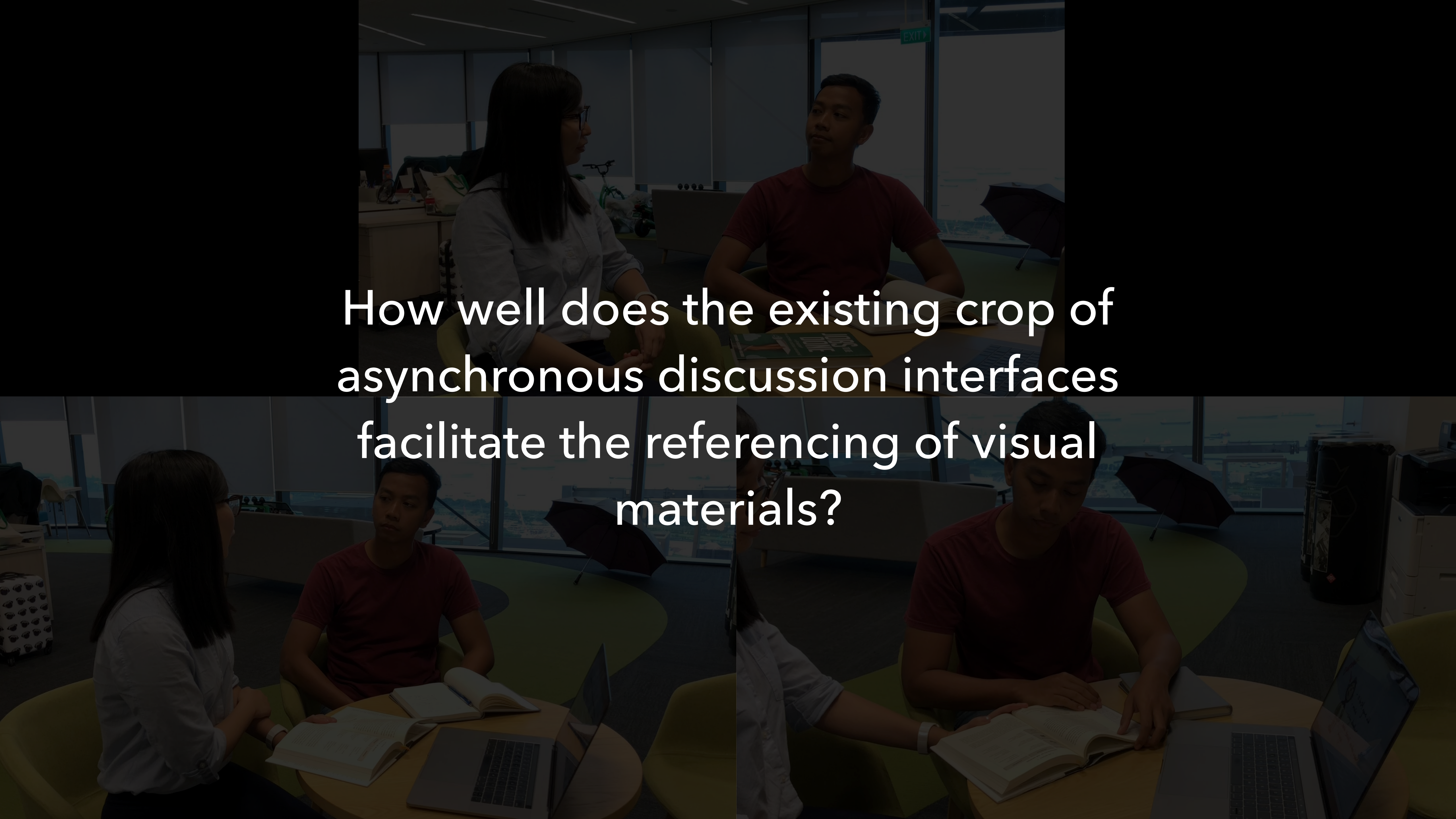
Trend 1: Growing popularity of online learning platforms



Trend 2: Creating knowledge from different sources/ materials



Is there a need for more visual context
and referencing in discussions
happening in current learning
platforms?



How well does the existing crop of asynchronous discussion interfaces facilitate the referencing of visual materials?

Preliminary Investigations

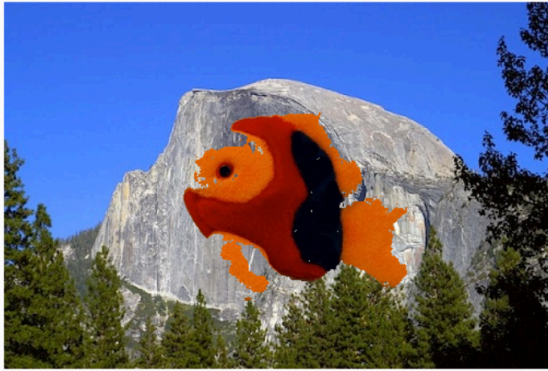
Study 1: User interviews with experienced forum users in the MOOC context

- Need for more context in discussion
- Text-only discussion is pretty limited
- Use of external resources in the discussion

Preliminary Investigations

Study 2: Observational study of making references to visual materials in asynchronous discussion interfaces


Jasmine Zhang · 6 months ago



```
image = new SimpleImage("striped-fish-green.jpg");
image2 = new SimpleImage("yosemite.jpg");
image2.setSameSize(image);

for (pixel: image) {
    avg = (pixel.getRed() + pixel.getGreen() + pixel.getBlue())/3;
    if (pixel.getRed() < avg * 1.4) {
        if (pixel.getBlue() < avg * 1.1) {
            img2pix =
            image2.getPixel(pixel.getX(),
```

Output:



↑ 0 ↓ · flag

Cora Lauderdale · 5 months ago

You have a correct and clean output, but did you get full credit? When I worked on the logic code I was only get one response that stated I was correct.

↑ 0 ↓ · flag

Jasmine Zhang · 5 months ago

Nope, it didn't match the example fish, and I can't figure out how to

↑ 0 ↓ · flag

Threaded forum

r20-dimensions-light-bending.pdf* r19-dimensions-hydrogen.pdf* 2 global comments New ...

94

5.3.2 Atomic sizes and substance densities

Hydrogen has a diameter of 1\AA . A useful consequence is the rule of thumb is that a typical interatomic spacing is 3\AA . This approximation gives a reasonable approximation for the densities of substances, as this section explains.

Let A be the atomic mass of the atom; it is (roughly) the number of protons and neutrons in the nucleus. Although A is called a mass, it is dimensionless. Each atom occupies a cube of side length $a \sim 3\text{\AA}$, and has mass $A m_{\text{proton}}$. The density of the substance is

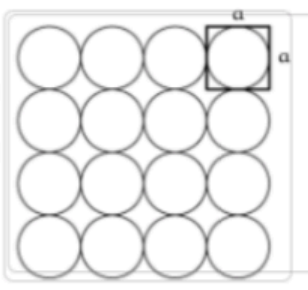
$$\rho = \frac{\text{mass}}{\text{volume}} = \frac{A m_{\text{proton}}}{(3\text{\AA})^3}$$

You do not need to remember or look up m_{proton} if you multiply this fraction by unity in the form of N_A/N_A , where N_A is Avogadro's number:

$$\rho \sim \frac{A m_{\text{proton}} N_A}{(3\text{\AA})^3 \times N_A}$$

The numerator is $A g$, because that is how N_A is defined. The denominator is $3 \cdot 10^{-23} \text{ cm}^3$.

So instead of remembering m_{proton} , you need to remember N_A . However, N_A is more familiar than m_{proton} because N_A arises in chemistry and physics. Using N_A also emphasizes the connection between microscopic and macroscopic calculations.



What's that? $3 \cdot 10^{-23} \text{ cm}^3$

Class: Reply Requested

Staff: Myself Sign

Discard Save

6 notes(s) 2 ?

Anonymous 18 Mar, 02:06PM options...

Class: How did we get 3 from 1? 18 Mar, 06:36PM options...

Anonymous 18 Mar, 07:28PM options...

Class: The 1 was the diameter of hydrogen. The 3 is typical interatomic spacing. 18 Mar, 07:42PM options...

Anonymous 18 Mar, 09:15PM options...

Class: Why doesn't this vary significantly based on the size of the atom? Or is three just the overall average. 19 Mar, 09:13AM options...

Instructor: As you say, it is based on the size of the atom. Hydrogen is at the very small end, and uranium is at the large end. 3 Angstroms is a good average size to use for the common atoms in ordinary substances. As a "very" rough approximation, think of the diameter as 1 Angstrom per shell. (The number of shells is the row number in the periodic table.)

1 note(s)

Too many 's' in this sentence.

1 note(s)

This paragraph's wording is a little bit confusing.

1 note(s)

I feel like I have seen this drawing before...where it asks you what is the area of wholes in betwe

2 note(s) ✓

If it's not a mass, don't call it a mass. Just introduce it as the number of protons and neutrons f

Anchored discussion interface (Zyto et. al. 2012)

Techniques for designing and comparing UI



By: Hunter Collins

Posted On: Tuesday, Sep 20, 2016, 5:10 PM

REPLY SHOW THREAD

Any reading recommendations for evaluating design?



By: Teresa Ford

Posted On: Tuesday, Sep 20, 2016, 5:09 PM

REPLY SHOW THREAD

Interesting parts in this week's lecture



By: Cole Ballard

Posted On: Tuesday, Sep 20, 2016, 5:12 PM

Which parts of this week's lecture and materials are interesting to you?

New Post:

In the video, these two frames at 7:15 and 10:51 are interesting to me. A|

CANCEL POST

Can computers evaluate UI design?



By: Vincent Erickson

Posted On: Tuesday, Sep 20, 2016, 5:11 PM

REPLY SHOW THREAD

Shortcoming of threaded forum: referring to something specific in the material can be cumbersome; requires the right deixes to point to the referent's actual location in the material

Anchored Discussion Interface

Shortcoming of ADI: Referring to more than one object in the main material is difficult. This difficulty increases when objects are in more than one material

Questions, answered

Q: Is there a need for more visual context and referencing in discussions happening in current learning platforms?

A: Yes.

Q: How well does the existing crop of asynchronous discussion interfaces facilitate the referencing of visual materials?

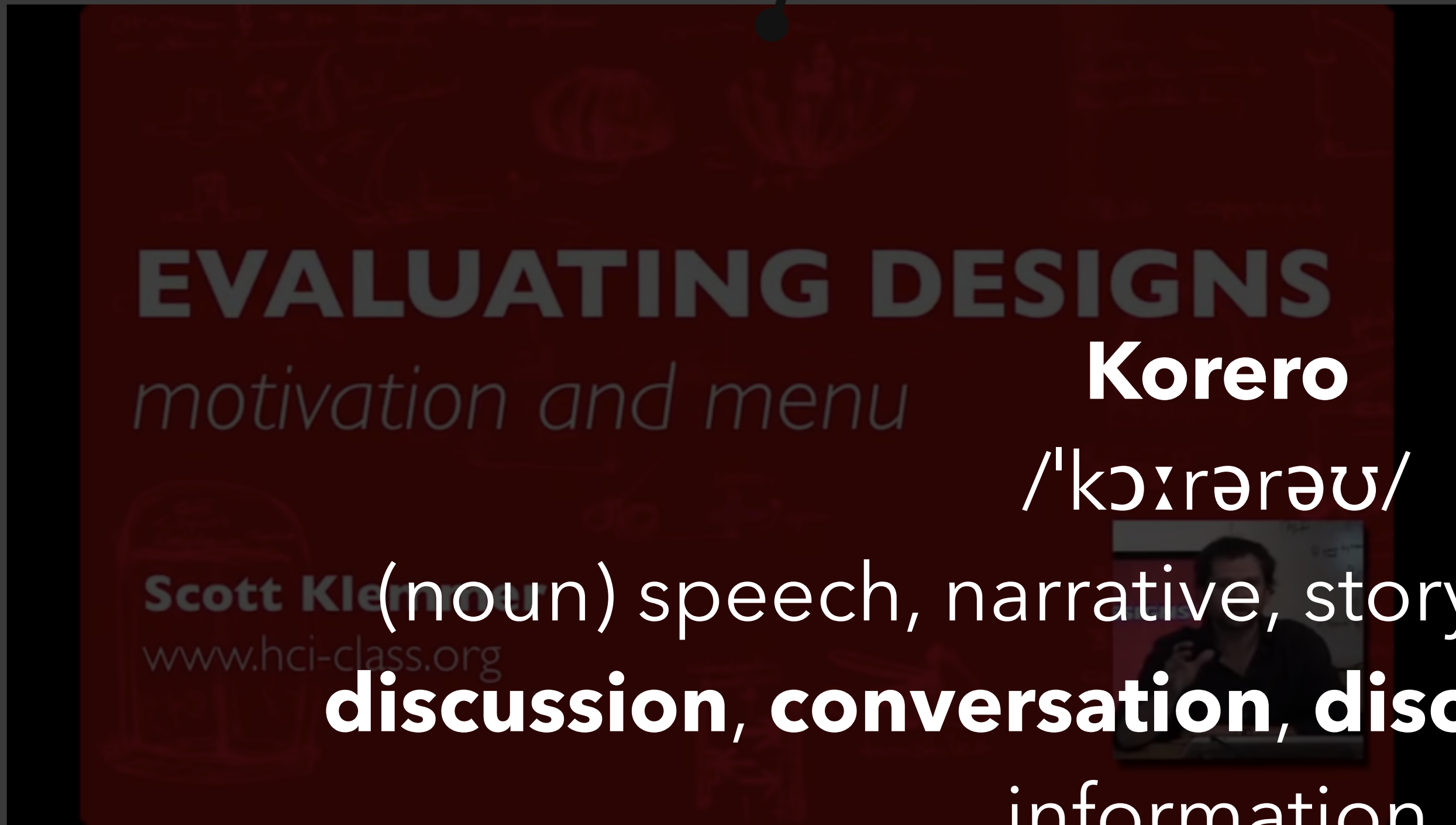
A: Can get cumbersome and inefficient in referencing scenarios with **multiple** and ***specific*** referents.

Design requirements to fulfil

DR1: Users can refer to varying granularities of referents, from specific to general, with minimum deixes.

DR2: Users can view the referent materials/objects alongside the discussion

DR3: Users can visualize all the referents and choose which to focus on



EVALUATING DESIGNS

Korero

/'kɔːrərəʊ/

motivation and menu

Scott Klein
www.hci-class.org

(noun) speech, narrative, story, news, account, **discussion, conversation, discourse, statement,** information

Māori dictionary

Any reading recommendations for evaluating design?

By: Leo Frank
Posted On: Monday, Sep 19, 2016, 6:51 PM

REPLY SHOW THREAD

Can computers evaluate UI design?

By: Randy Simmons
Posted On: Monday, Sep 19, 2016, 6:48 PM

REPLY SHOW THREAD

Techniques for designing and comparing UI

By: Gary McGuire
Posted On: Monday, Sep 19, 2016, 7:21 PM

I'm wondering what are some of the common techniques or tools HCI researchers use for designing and comparing UI

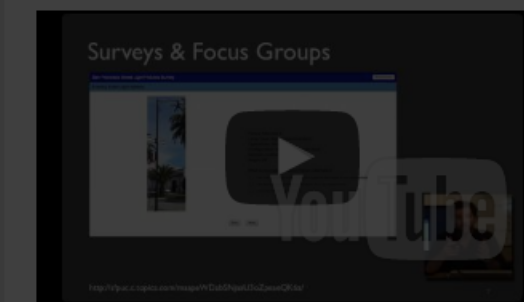
REPLY HIDE THREAD

By: Doris Steyer
Posted On: Monday, Sep 19, 2016, 7:33 PM

This is a huge topic by itself. **Here** are a few tools and techniques for you to know they'll help!

Referential term: "Here"

Main Video



7:48 - 7:48

Main Video



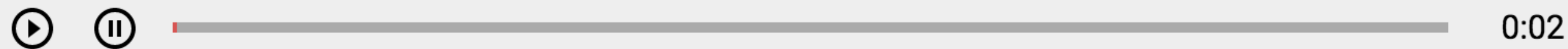
6:49 - 6:49

X
PL

Pag



General interface features



Activity Window

Any reading recommendations for evaluating design?

By: Leo Frank
Posted On: Monday, Sep 19, 2016, 6:51 PM

REPLY SHOW THREAD

Can computers evaluate UI design?

By: Randy Simmons
Posted On: Monday, Sep 19, 2016, 6:48 PM

REPLY SHOW THREAD

Techniques for designing and comparing UI

By: Gary McGuire
Posted On: Monday, Sep 19, 2016, 7:21 PM

I'm wondering what are some of the common techniques or tools HCI researchers use to design and compare UI?

REPLY HIDE THREAD

By: Dora Stevens
Posted On: Monday, Sep 19, 2016, 7:33 PM

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Page



Discussion Window

Multi-linking popup

Referential term

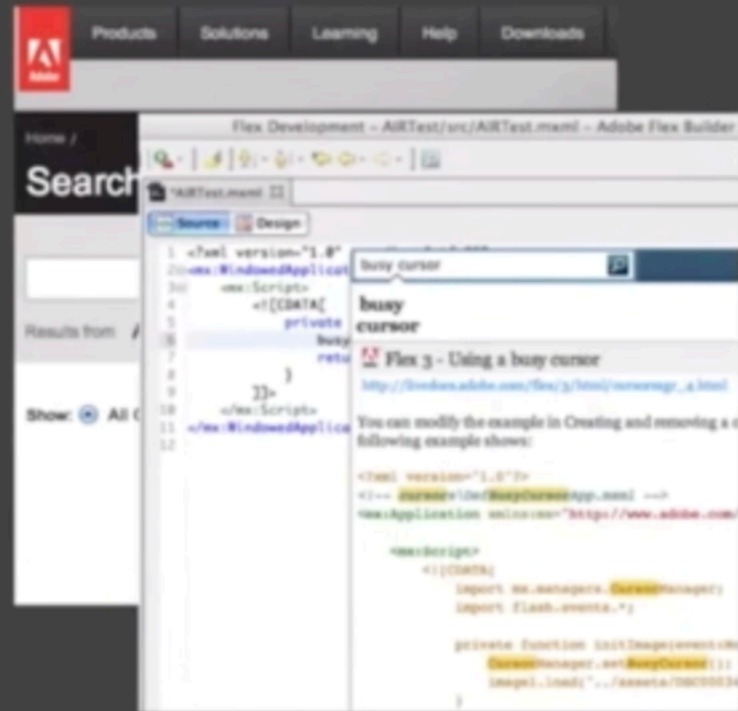
This is a huge topic by itself. **Here** are a few tools and techniques for you to know further. Some of them help! Hope they'll help!

Refer this term to:

THIS LECTURE VIDEO

CANCEL POST


Comparative Experiments



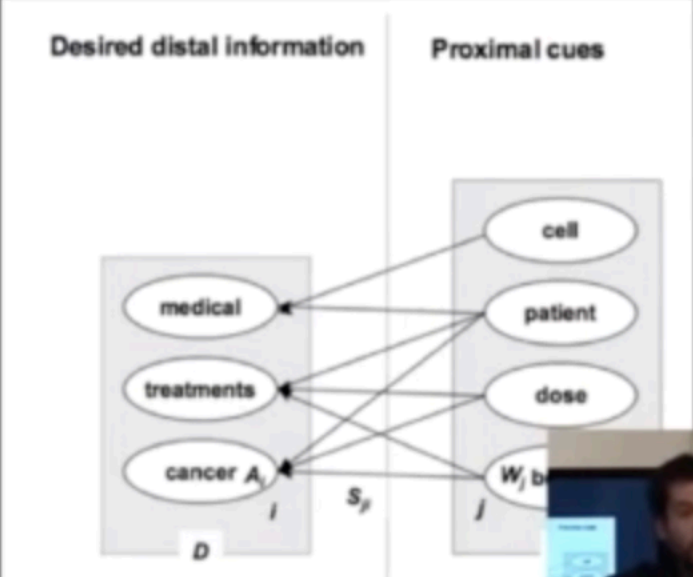
Joel Brandt et al., comparing Community Help and Blueprint

Simulation & Formal Models


shorthand

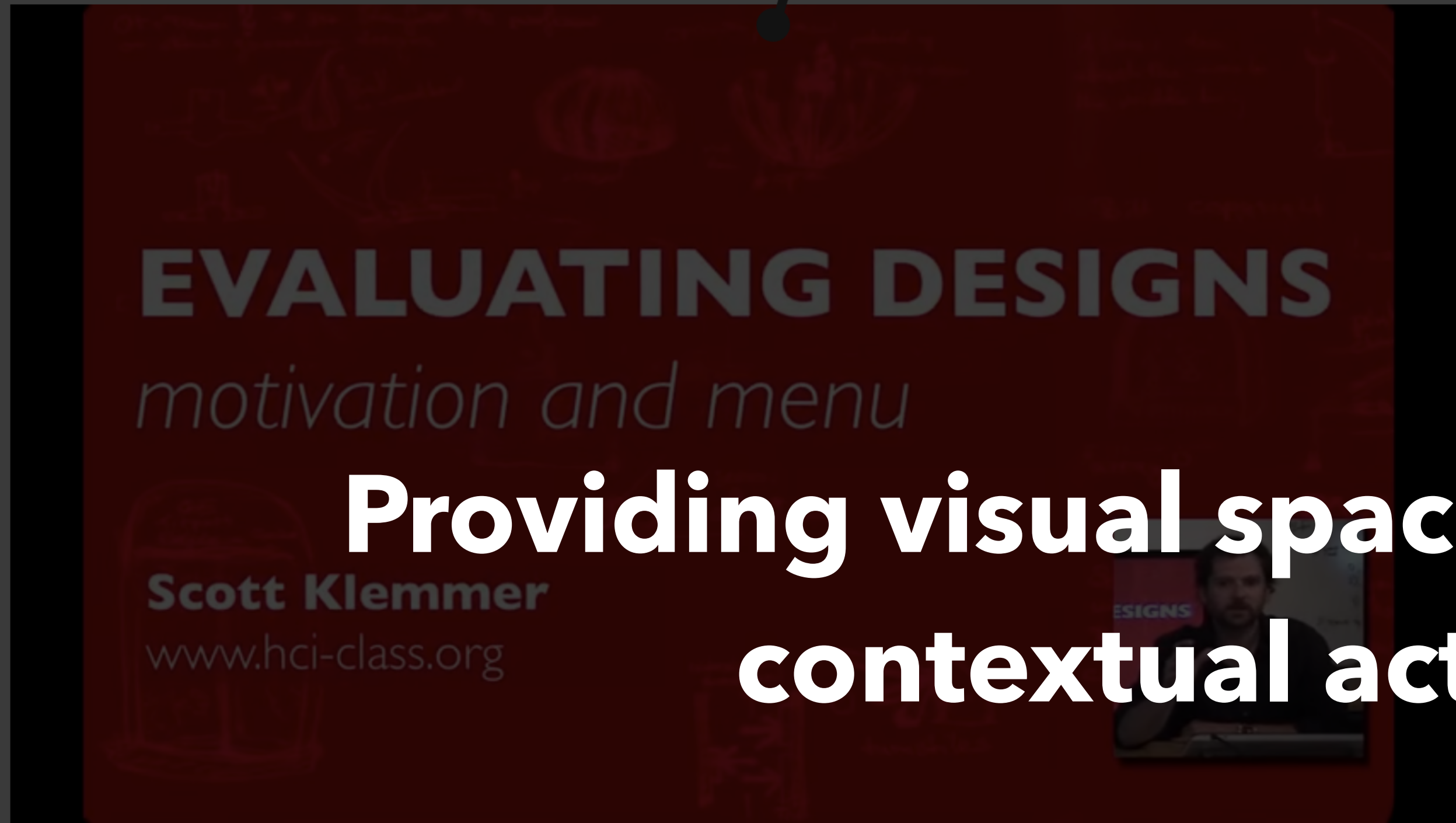


courtesy Shumin Zhai



courtesy Peter Pirolli





Providing visual space to support contextual actions

0:02

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7:48 - 7:48

Main Video



6:49 - 6:49



Pag





Contextual Activity Window

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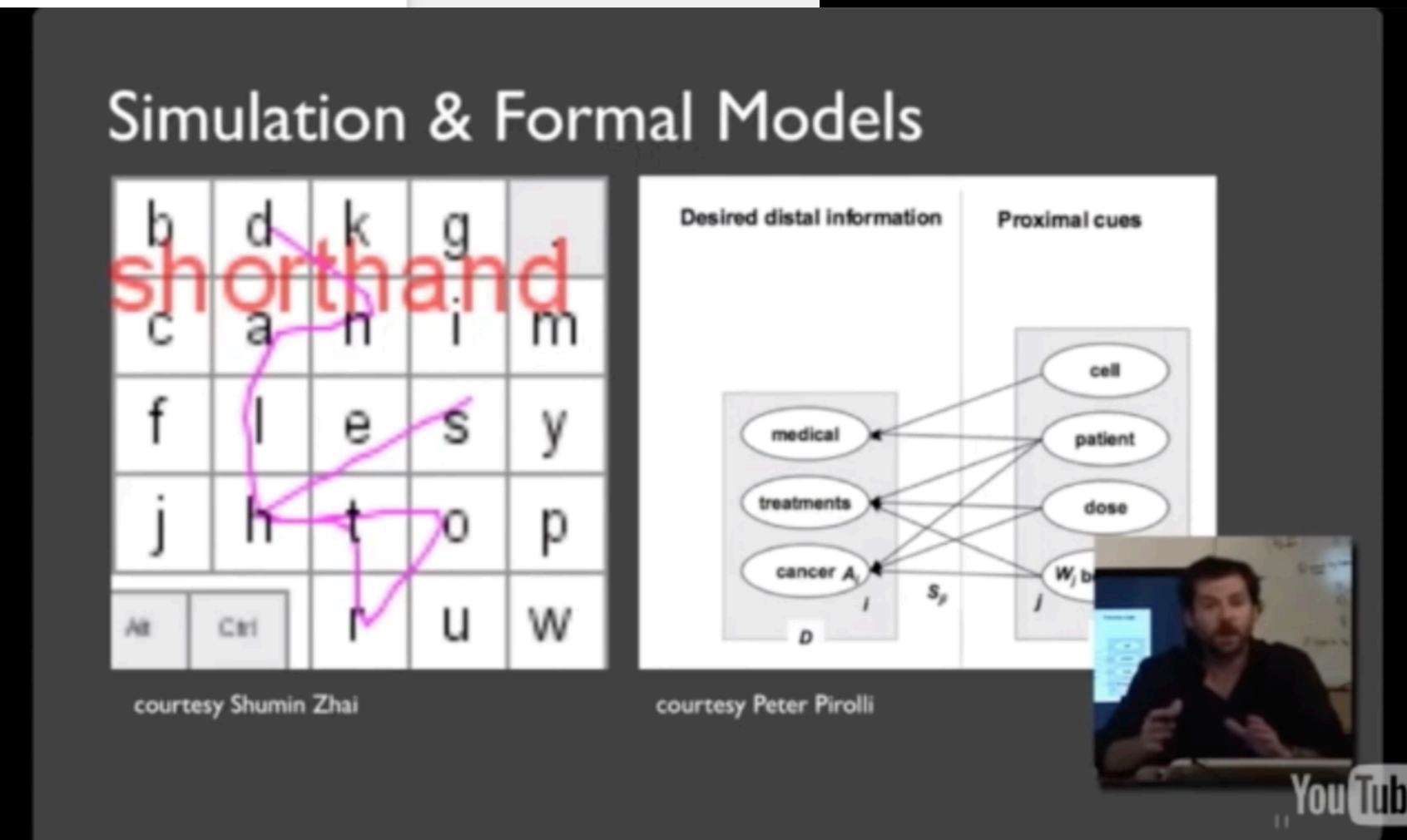
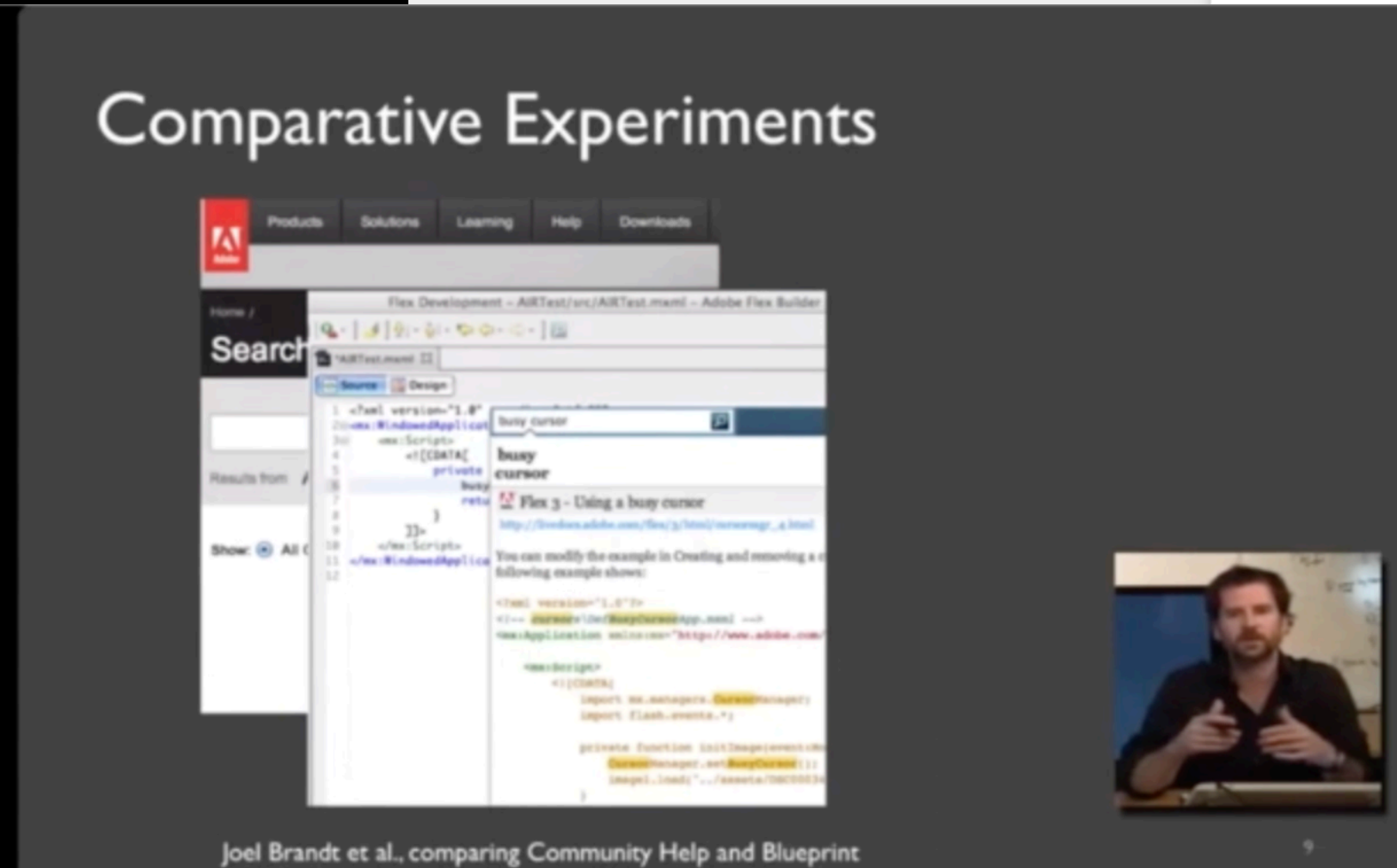
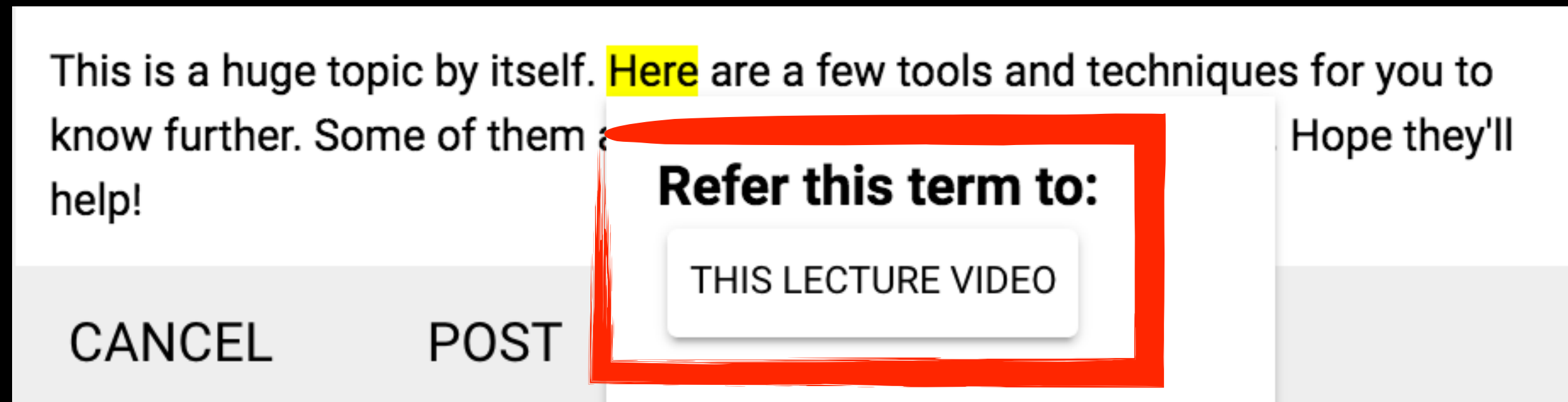
Main Video	Main Video

Page



Discussion Window

How to refer two video timestamps in the discussion interface?



How to refer two video timestamps in the discussion interface?

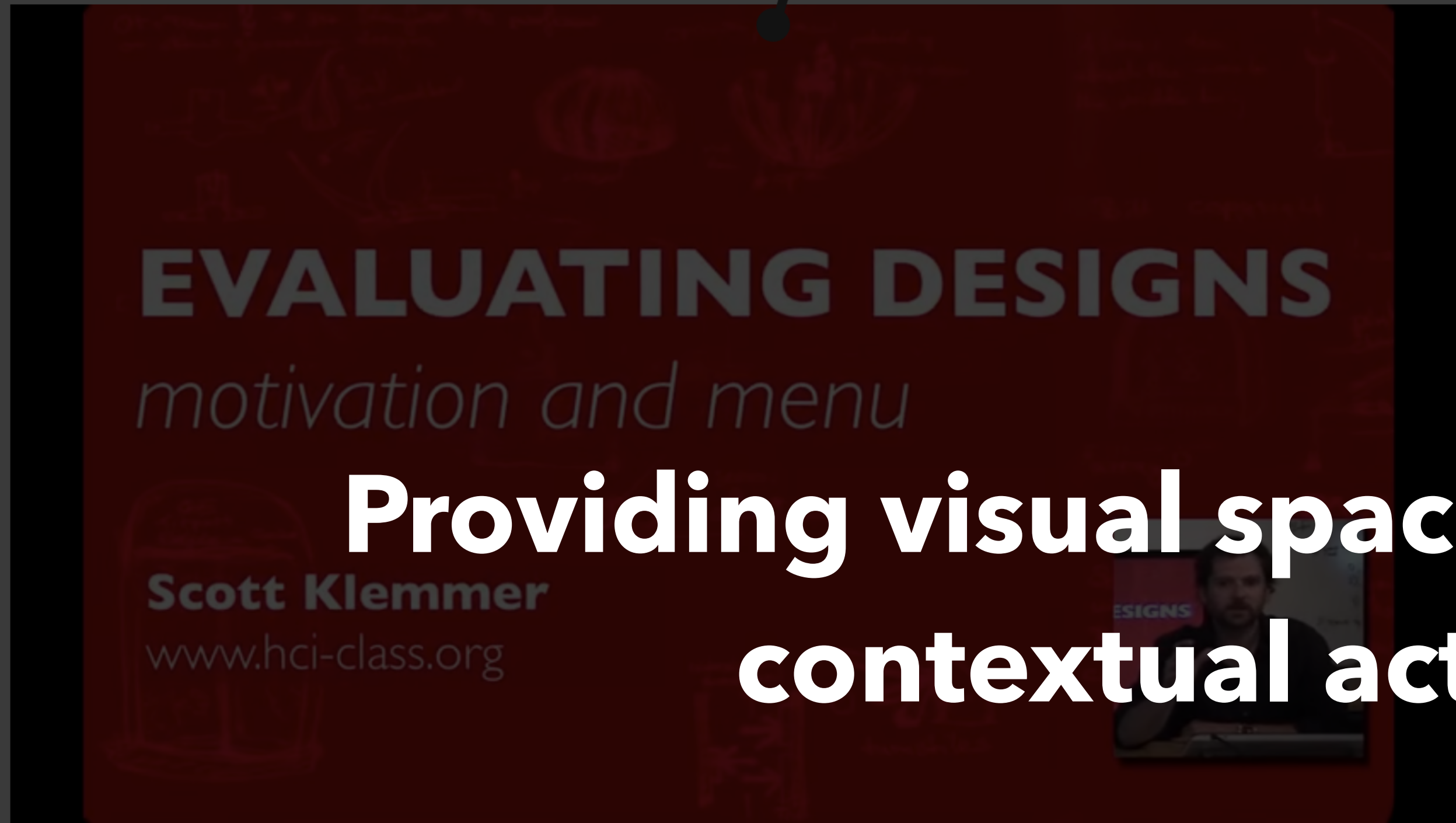
The screenshot shows a web interface for a discussion forum. At the top, there is a blue header with the name "Korero" on the left and a "Logout" link on the right. The main content area is split into two columns. The left column features a video player with a red background. The video title is "EVALUATING DESIGNS" in large white letters, with the subtitle "motivation and menu" in a smaller, italicized font. Below the title, the name "Scott Klemmer" and the website "www.hci-class.org" are displayed. A small video thumbnail of Scott Klemmer is visible in the bottom right corner of the video frame. The video player controls at the bottom show a play button, a pause button, and a progress bar that is currently at 0:03. The right column contains a list of discussion posts. Each post has a title, a globe icon, the author's name, and the posting date. The posts are: "Any reading recommendations for evaluating design?" by Alfred Foster (Monday, Sep 19, 2016, 6:51 PM); "Techniques for designing and comparing UI" by Clayton Baldwin (Monday, Sep 19, 2016, 7:21 PM); "Interesting parts in this week's lecture" by Alejandro Hopkins (Tuesday, Sep 20, 2016, 5:08 PM); and "Can computers evaluate UI design?" by Juan Watts (Monday, Sep 19, 2016, 6:48 PM). Each post has "REPLY" and "SHOW THREAD" links. Below the "Interesting parts in this week's lecture" post, there is a text input field with the placeholder text "Which parts of this week's lecture and materials are interesting to you?". Below the input field are "CANCEL" and "POST" buttons. At the bottom right of the page, there is a red circular button with a white speech bubble icon.

Referring to section(s) in document

The screenshot shows a web application interface with a blue header containing the name "Korero" on the left and "Logout" on the right. The main content area is divided into two columns. The left column features a video player with the title "Comparative Experiments" and a thumbnail showing a code editor and a person speaking. Below the video player is a progress bar and the text "Joel Brandt et al., comparing Community Help and Blueprint". The right column contains a list of posts:

- Any reading recommendations for evaluating design?**
By: Alfred Foster
Posted On: Monday, Sep 19, 2016, 6:51 PM
- Techniques for designing and comparing UI**
By: Clayton Baldwin
Posted On: Monday, Sep 19, 2016, 7:21 PM
- Interesting parts in this week's lecture**
By: Alejandro Hopkins
Posted On: Tuesday, Sep 20, 2016, 5:08 PM

Below the posts is a section titled "Which parts of this week's lecture and materials are interesting to you?" with a "New Post:" label. A text input field contains the text "These parts of this week's lecture and materials are interesting." A red circle highlights a context menu that is open over the video player, showing options such as "Undo", "Redo", "Cut", "Copy", "Paste", "Paste and Match Style", "Select All", "Language Settings", "Writing Direction", and "Inspect". A "Main Video" thumbnail is also visible in the bottom right corner of the red circle.



Providing visual space to support contextual actions

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Posted On: Monday, Sep 19, 2016, 6:51 PM

REPLY SHOW THREAD

Can computers evaluate UI design?

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Posted On: Monday, Sep 19, 2016, 7:33 PM

This is a huge topic by itself. [Here](#) are a few tools and techniques for you to know they'll help!

Referential term: "Here"

Main Video



7:48 - 7:48

Main Video



6:49 - 6:49



Pag





Accessing and providing awareness of the referents

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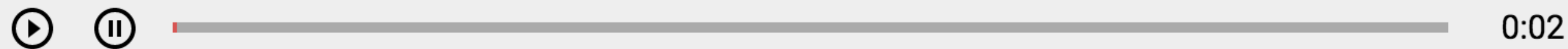
Pag



What the contextual activity window does not do

- Provide users with an awareness of all the referents of a referential term
- Get a quick glimpse at the referents and choose which to focus on

Existing interface still lack the necessary component to facilitate these actions



**On-demand widget
with 2 action views**

Any reading recommendations for evaluating design?

By: Leo Frank
Posted On: Monday, Sep 19, 2016, 6:51 PM

REPLY SHOW THREAD

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Main Video	Main Video

Close button (X) and pagination (Page 1 of 1)

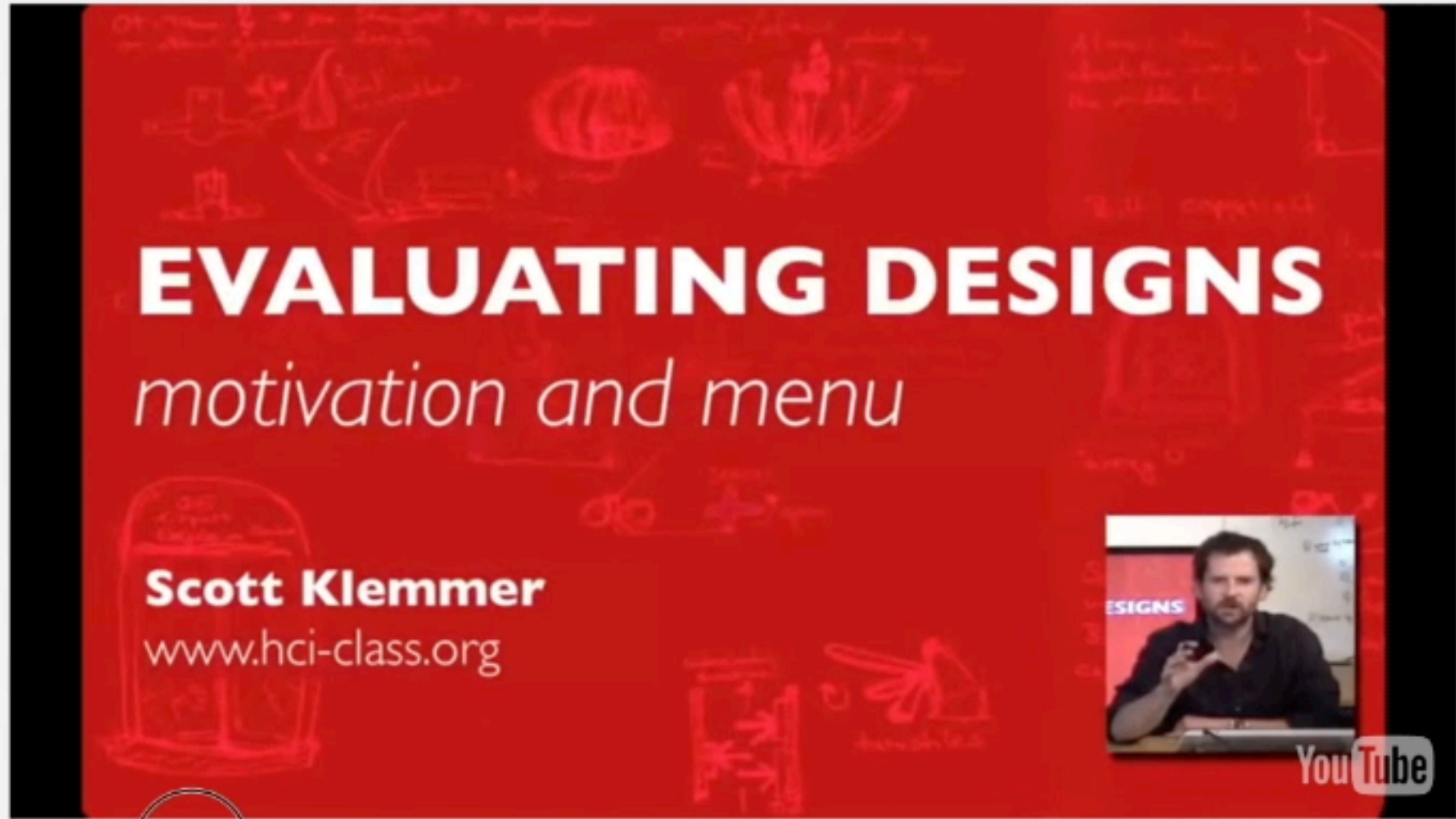


Contextual Activity Window

Discussion Window

How referents are stored and displayed

Korero Logout



0:00 12:15 0:03

✓ ✕ + ADD ONE MORE SEGMENT

Contextual activity window allows users to specify the sections to refer in the video

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REPLY SHOW THREAD

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Posted On: Monday, Sep 19, 2016, 7:21 PM

REPLY SHOW THREAD

Interesting parts in this week's lecture

By: Alejandro Hopkins
Posted On: Tuesday, Sep 20, 2016, 5:08 PM

Which parts of this week's lecture and materials are interesting to you?

New Post:

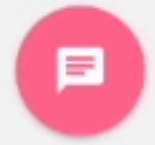
These **parts** of this week's lecture and materials are interesting.

CANCEL POST

Can computers evaluate UI design?

By: Juan Watts
Posted On: Monday, Sep 19, 2016, 6:48 PM

REPLY SHOW THREAD



“How can I see what others have referred in their discussion post?”



On-demand widget with
2 action views

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REPLY SHOW THREAD

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Close button (X) and pagination (Page 1 of 1)



Contextual Activity Window

Discussion Window

Hovering: Glimpsing what others have referred

The screenshot shows a web interface for 'Korero' with a blue header bar containing the name 'Korero' on the left and a 'Logout' link on the right. The main content area is split into two columns. The left column features a video player with a red background. The video title is 'EVALUATING DESIGNS' in large white letters, with the subtitle 'motivation and menu' in a smaller, italicized font. Below the title, the name 'Scott Klemmer' and the website 'www.hci-class.org' are displayed. A small video thumbnail shows a man speaking. The video player has a play button, a progress bar, and a '0:08' timestamp. The right column contains a list of discussion topics, each with a globe icon, the author's name, and the posting date. The topics are: 'Any reading recommendations for evaluating design?' by Derrick Waters (Monday, Sep 19, 2016, 6:51 PM); 'Techniques for designing and comparing UI' by Earl Gross (Monday, Sep 19, 2016, 7:21 PM); 'Interesting parts in this week's lecture' by Mildred Walton (Tuesday, Sep 20, 2016, 5:08 PM); and 'Can computers evaluate UI design?' by George Blair (Monday, Sep 19, 2016, 6:48 PM). Each topic has 'REPLY' and 'SHOW THREAD' links. Below the third topic, there is a question 'Which parts of this week's lecture and materials are interesting to you?' with a 'REPLY' and 'HIDE THREAD' link. A response by Dennis Fields (Tuesday, Sep 20, 2016, 5:52 PM) is visible, stating 'These parts of this week's lecture and materials are interesting.' A pink speech bubble icon is located at the bottom right of the page.

Korero Logout

EVALUATING DESIGNS
motivation and menu

Scott Klemmer
www.hci-class.org

0:08

Any reading recommendations for evaluating design?
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REPLY SHOW THREAD

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Posted On: Monday, Sep 19, 2016, 6:48 PM

REPLY SHOW THREAD

What about clicking?

Clicking: Viewing in more detail while interacting with other elements

Korero Logout

Simulation & Formal Models

courtesy Shumin Zhai courtesy Peter Pirolli

10:55

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REPLY SHOW THREAD

Scrollable discussion window

Evaluation

Forum | ADI | Korero

Two studies: Establishing & comprehending references

Research Questions

- Does Korero facilitate efficient and easy establishment and comprehension of references with **multiple and specific referents**?
- How do users create references with multiple and specific referents? **What can we learn from their referencing behaviors and preferences to support rich and expressive referencing?**
- What are the benefits of Korero for simpler references (singular or non-specific referents)? **How could Korero influence behaviors around the referencing actions**, such as users' engagement with the materials being referred?

Referencing Tasks for Both Studies

Tasks were devised based on the referential complexity framework

Referencing tasks (RT)	Related RQs		
	1	2	3
RT1: Refer to 1 video and 1 document	-	✓	✓
RT2: Refer to 1 timestamp in a video	-	✓	✓
RT3: Refer to 2 timestamps in a video	✓	✓	-
RT4: Refer to 2 timestamps in a video and 2 arbitrary passages in a document	✓	✓	-

Study 1: Establishing references



12 participants proficient in advanced-level written English were recruited from the host university.



Discussion **posting** scenario with different RTs as the references condition were applied for each trial. Participants were instructed to refer to materials/objects (specified in the trial's instructions) in the post.



Repeated-measures within-subject design, with interface as independent variables. Trials were randomised, used different materials, and RT blocks were counterbalanced (Latin Square). Lasted 1.5 to 2 hours.

Any reading recommendations for evaluating design?

By Alfred Easton
Posted On: Monday, Sep 19, 2016, 6:51 PM

REPLY SHOW THREAD

Techniques for designing and comparing UI

By Alfred Easton
Posted On: Monday, Sep 19, 2016, 7:21 PM

REPLY SHOW THREAD

Interesting parts in this week's lecture

By Alfredo Montoya
Posted On: Monday, Sep 19, 2016, 7:21 PM

What are the most interesting parts in this week's lecture?

New Post

I

CANCEL POST

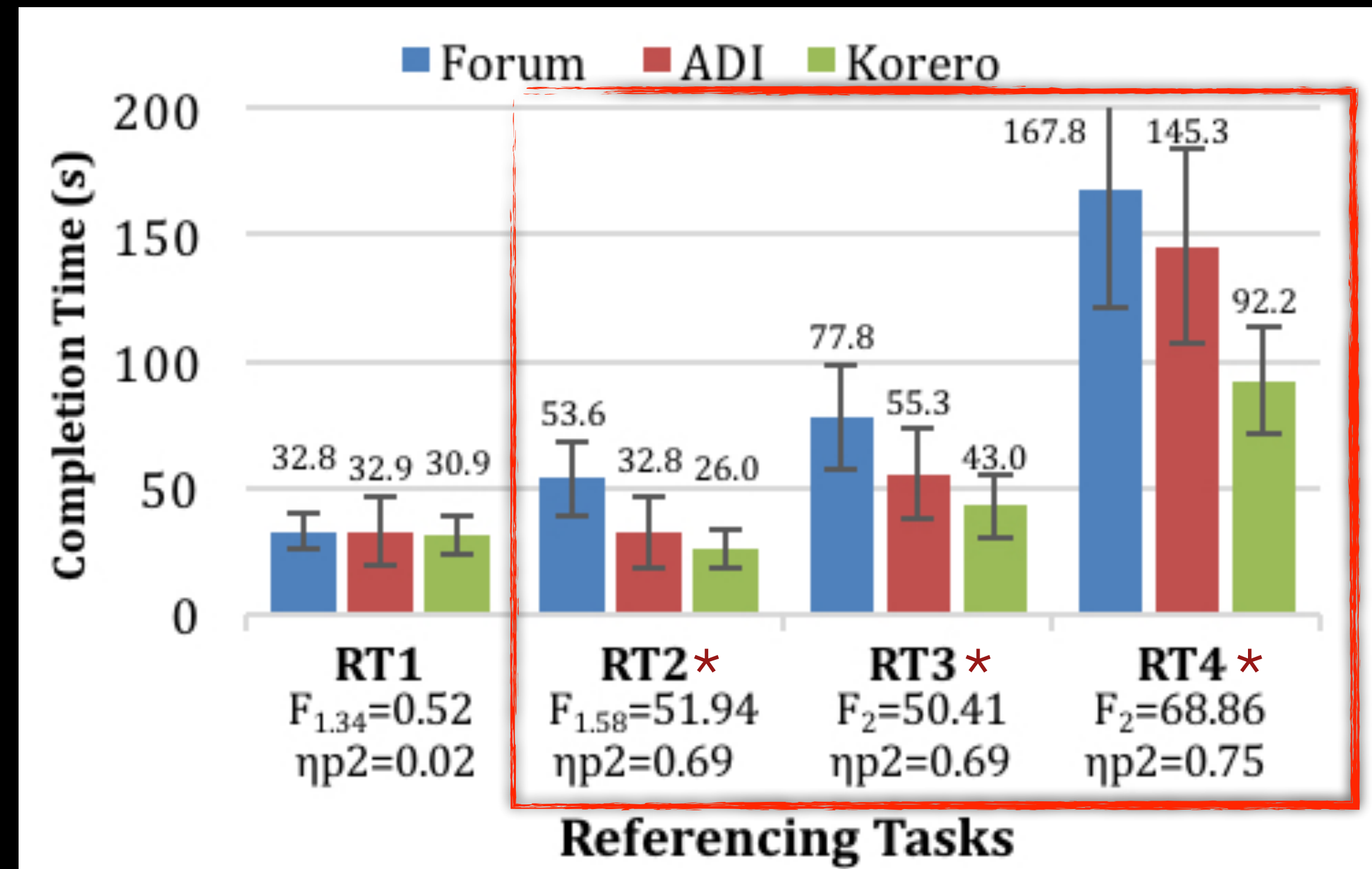
Can computers evaluate UI design?

By Alfredo Montoya
Posted On: Monday, Sep 19, 2016, 6:48 PM

REPLY SHOW THREAD

Study 1: Establishing references

Completion time (shorter is better)



Referencing tasks (RT)

RT1: Refer to 1 video & 1 doc

RT2: Refer to 1 timestamp (video)

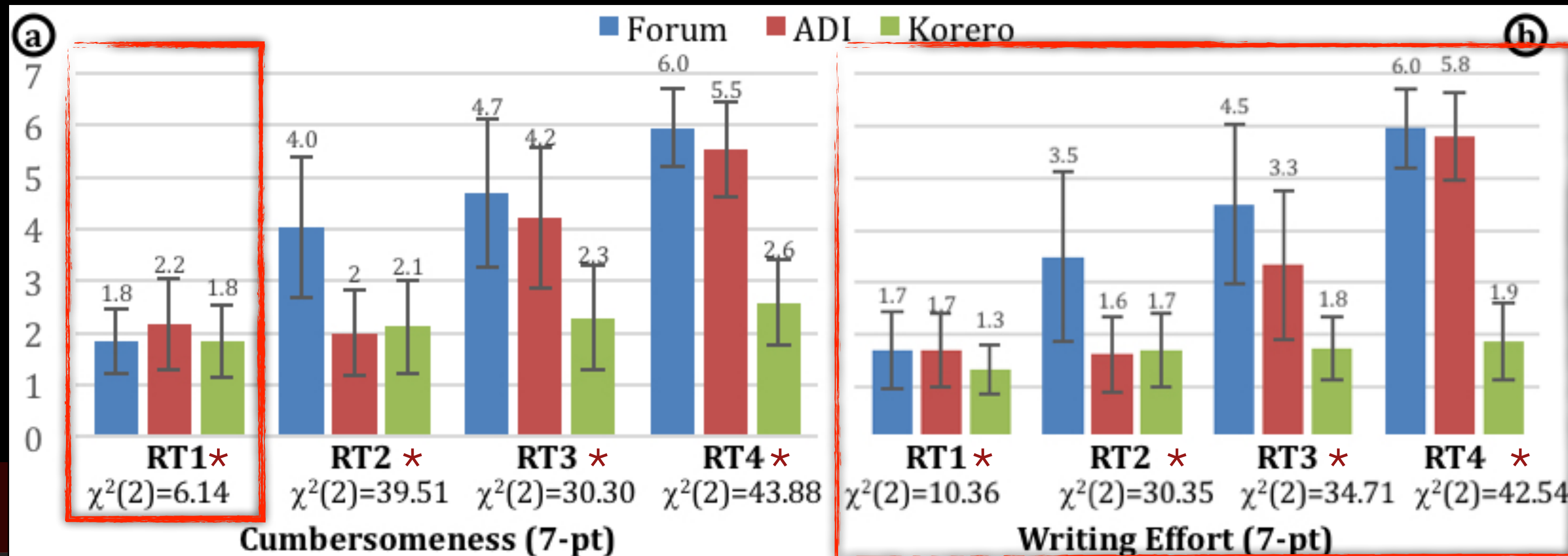
RT3: Refer to 2 timestamps (video)

RT4: Refer to 2 timestamps (video) & 2 passages in a doc

Korero < ADI < Forum (RT2-4)
(Completion time)

Study 1: Establishing references

Cumbersomeness and writing effort (lower is better)



Referencing tasks (RT)

RT1: Refer to 1 video & 1 doc

RT2: Refer to 1 timestamp (video)

RT3: Refer to 2 timestamps (video)

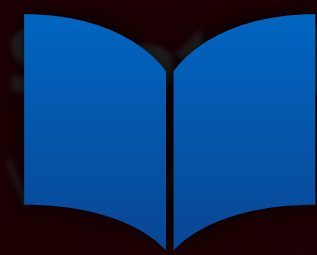
RT4: Refer to 2 timestamps (video) & 2 passages in a doc

ADI is not always better than the forum
(Cumbersomeness, RT1)

Study 2: Comprehending references



12 participants were recruited with the same recruiting requirements as Study 1. **None took part in Study 1.**



Discussion **reading** scenario with different references condition was designed. Subjects were instructed to read post containing reference to visual materials and answer question related to the referent itself (not contingent on prior knowledge).



Study design used in Study 1 was adopted for Study 2, including the stimuli postings to be read by participants. Lasted for 1 to 1.5 hours.

Any reading recommendations for evaluating design?

By: Derrick Waters
Posted On: Tuesday, Sep 20, 2016, 6:51 PM

REPLY SHOW THREAD

Techniques for designing and comparing UI

By: Paul G. ...
Posted On: Tuesday, Sep 20, 2016, 7:21 PM

Interesting parts in this week's lecture

By: Mildred Walton
Posted On: Tuesday, Sep 20, 2016, 5:08 PM

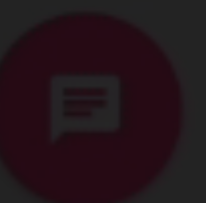
Which parts of this week's lecture and materials are interesting to you?

By: ...
Posted On: Tuesday, Sep 20, 2016, 5:52 PM

Which parts of this week's lecture and materials are interesting.

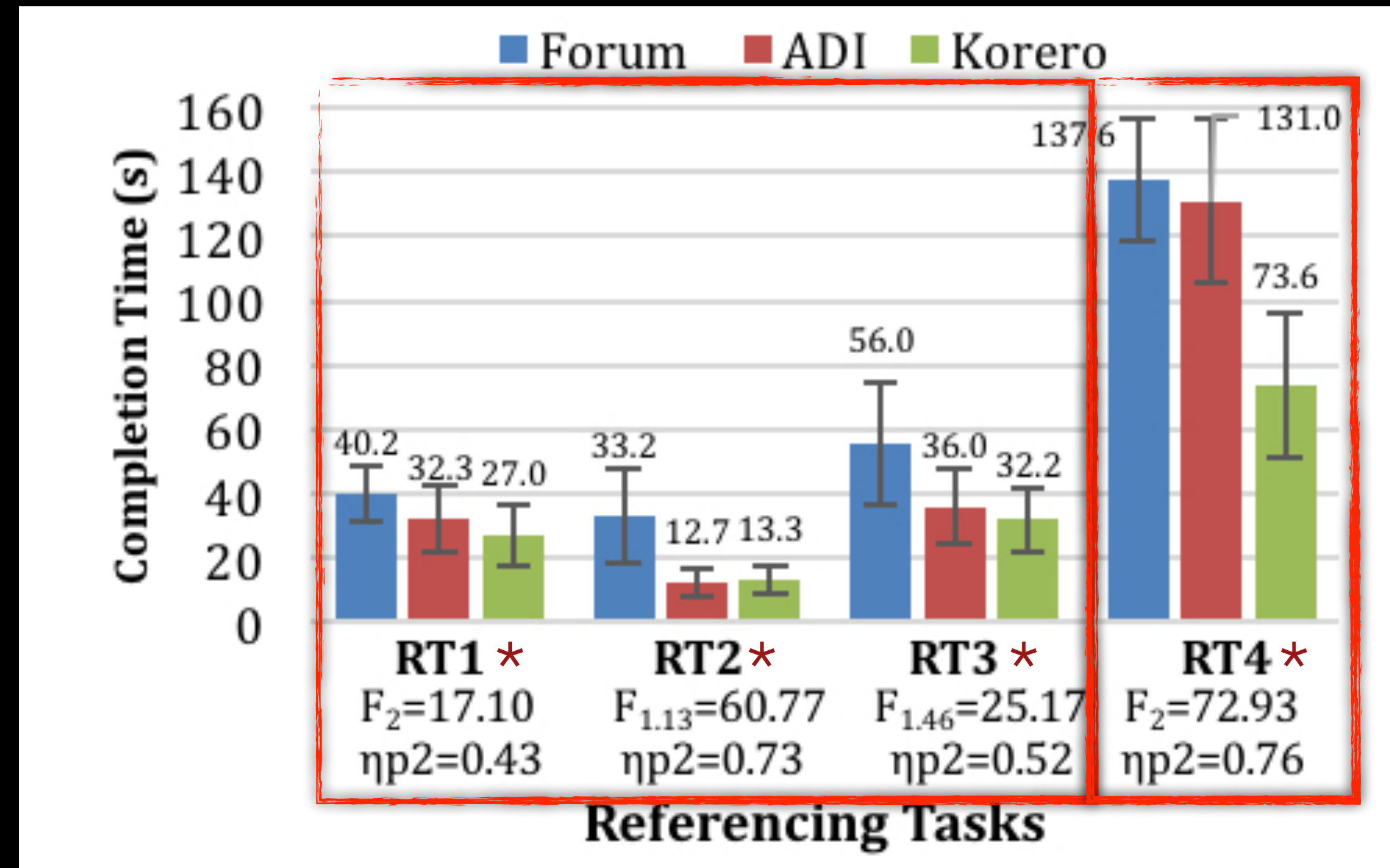
Can computers evaluate UI design?

By: ...
Posted On: Tuesday, Sep 20, 2016, 6:48 PM



Study 2: Comprehending references

Completion time (shorter is better)



Referencing tasks (RT)

RT1: Refer to 1 video & 1 doc

RT2: Refer to 1 timestamp (video)

RT3: Refer to 2 timestamps (video)

RT4: Refer to 2 timestamps (video) & 2 passages in a doc

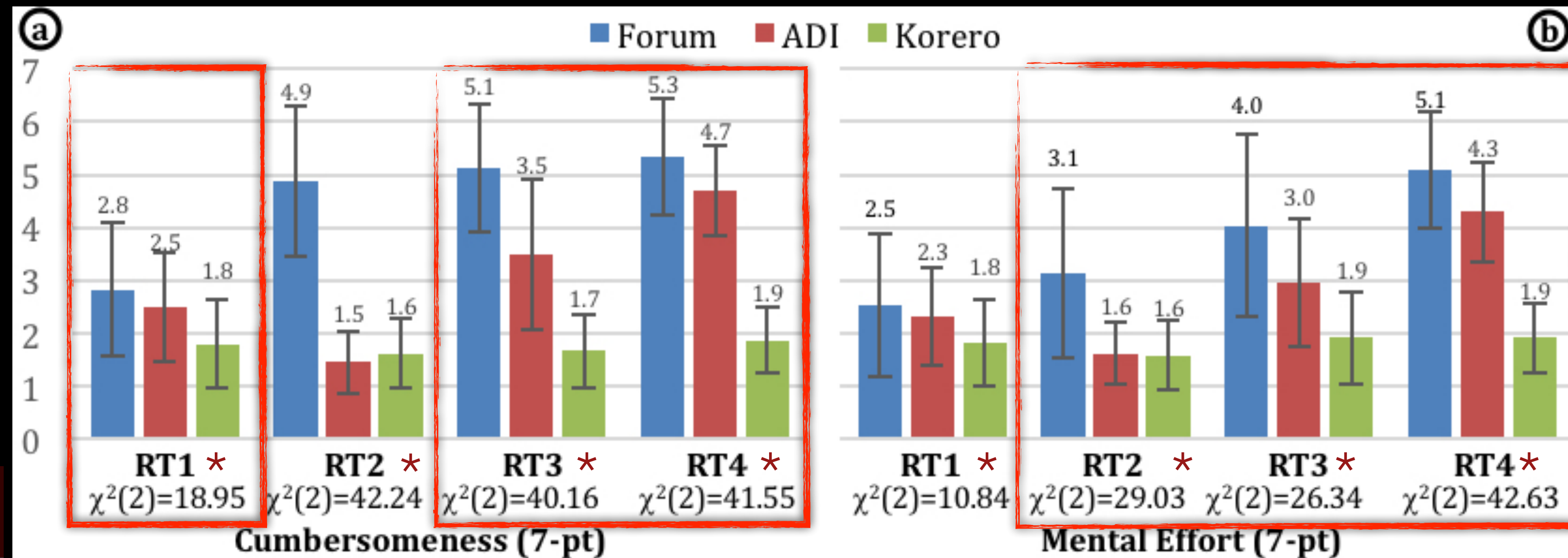
Korero < ADI < Forum (RT4)
(Completion time)

Repeated-measures ANOVA (Greenhouse-Geisser)

Post-hoc: Pairwise t-tests (Bonferroni)

Study 2: Comprehending references

Cumbersomeness and mental effort of comprehending the references (lower is better)



Referencing tasks (RT)

RT1: Refer to 1 video & 1 doc

RT2: Refer to 1 timestamp (video)

RT3: Refer to 2 timestamps (video)

RT4: Refer to 2 timestamps (video) & 2 passages in a doc

More than 1 referent

Korero shines in references with multiple and specific referents
(RT3-4, cumbersomeness and mental effort)

Concluding notes

- Korero is faster, less cumbersome and effortful than forum and ADI in establishing and comprehending references (with multiple and specific referents)
- Contextual activity window and on-demand widget are effective in providing the necessary visual space and awareness for facilitating referencing actions

Main takeaways

- **Findings:** The need to change referencing strategies (e.g. direct anchoring and writing deixis) halfway through the reference making process (ADI) **takes more mental effort** than using the same strategy (forum)
- **Takeaway:** Having a consistent referencing method is important for complex references (multiple and specific referents)

Main takeaways

- **Findings:** Most participants preferred using features of the discussion interface to make references, instead of writing deixes manually, even for simpler referencing tasks
- **Takeaway:** Providing features to facilitate referencing (in terms of affording visual space and awareness) creates a better discourse experience

Main takeaways

- **Findings:** Most participants were more willing to check out learning materials referred by other discussants in Korero
- **Takeaway:** Learners' engagement with the learning materials can be strengthened by facilitating its access and consumption (e.g don't need to navigate to a new window in the browser)

Future Work

1. Deploy Korero in actual courses with substantial discussions held online
2. Investigate its effectiveness in other collaborative learning activities such as group assignments
3. Explore other meaningful interactions on referent objects/material to better utilise them in discourse

Korero: Facilitating Complex Referencing of Visual Materials in Asynchronous Discussion Interface

Paper Presentation, CSCW 2018

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