Contextually recommending expert help and demonstrations to improve creativity

Ailie Fraser
Thesis Defense
February 28, 2020
Thank you

Design Lab Ops
CSE Student Affairs
GradWIC
Aerial Silks fam
Miracles
Friends & Family
People are creative with powerful software
Non-professionals seek creative outlets too...
...but are thwarted by complex software

Photoshop: > 1000 commands

AutoCAD: > 1000 commands

[Lafreniere Thesis ’14, McGrenere GI ’00]
...but are thwarted by complex software

[Lafreniere Thesis '14, McGrenere GI '00]
PROBLEM

Complex software has a large gulf of execution

Hutchins, Hollan, & Norman 1985

I want to make this photo look like it was taken at sunset
PROBLEM

Complex software has a large gulf of execution

I want to make this photo look like it was taken at sunset

Hutchins, Hollan, & Norman 1985
PROBLEM

3 main challenges with creative software

Many options

Lack of vocabulary

Multiple steps
3 main challenges with online resources

Many options
3 main challenges with **online resources**

- Many options
- Lack of vocabulary
3 main challenges with online resources

PROBLEM

Many options

Lack of vocabulary

1. Download the Sample Images

DOWNLOAD

2. Open the Samples Images in Photoshop

First, place the how_to_create_a_dreamy_blurred_background_in_photoshop.jpg into Photoshop by going to File and Open... or by dragging and dropping the files into the workspace.

3. Sample Edit: Applying Gaussian Blur

Duplicate the Background layer by hitting CMD or CTRL + J on the keyboard or by clicking and dragging the Background layer to the New Layer symbol at that bottom of the Layers Panel to duplicate the layer.
PROBLEM

3 main challenges with online resources

Many options

Lack of vocabulary

Multiple steps
My dissertation introduces systems that address the…

3 main challenges with **online resources**

| Many options | Lack of vocabulary | Multiple steps |

…by:

- *curating expert help and demonstrations*
- *and presenting them in context*
• Curating expert help and demonstrations
• and presenting them in context

enables people to produce better work.

My focus: Creative work
Published Papers

2020 ACM CHI  Temporal Segmentation of Creative Live Streams.
C. Ailie Fraser, Joy Kim, Valentina Shin, Joel Brandt, Mira Dontcheva

C. Ailie Fraser, Joy O. Kim, Alison Thornsberry, Scott Klemmer, Mira Dontcheva

2019 ACM CHI  RePlay: Contextually Presenting Learning Videos Across Software Applications. Honourable Mention
C. Ailie Fraser, Tricia J. Ngoon, Mira Dontcheva, Scott Klemmer

2018 ACM CHI  Interactive Guidance Techniques for Improving Creative Feedback. Honourable Mention
Tricia J. Ngoon, C. Ailie Fraser, Ariel S. Weingarten, Mira Dontcheva, Scott Klemmer

2017 ACM CHI  WeBuild: Automatically Distributing Assembly Tasks Among Collocated Workers to Improve Coordination.
C. Ailie Fraser, Tovi Grossman, George Fitzmaurice

2016 ACM DIS  DiscoverySpace: Suggesting Actions in Complex Software.
C. Ailie Fraser, Mira Dontcheva, Holger Winnemöller, Sheryl Ehrlich, Scott Klemmer

2016 ACM CHI  Framing Feedback: Choosing Review Environment Features that Support High Quality Peer Assessment.
Catherine M. Hicks, Vineet Pandey, C. Ailie Fraser, Scott Klemmer
Expert resources can help with...

“I need help accomplishing my goal”

“I don’t know what my end goal is”

“I have a goal and want it done”
Expert resources can help with...

“I need help accomplishing my goal”

“I don’t know what my end goal is”

“I have a goal and want it done”
Segmenting tutorials & displaying them in context eases in-task use

ToolScape. Kim CHI ’14

Social CheatSheet. Vermette CSCW ’17

[Kim CHI EA ’13, Banovic UIST ’12, Chi UIST ’12, Matejka CHI ’11, Nguyen CHI ’15, Vermette GI ’15, Chilana CHI ’12, Ichinco CHI ’17, Kelleher CHI ’05, Lafreniere OzCHI ’14]
Segmenting tutorials & displaying them in context eases in-task use

[Kim CHI EA ‘13, Banovic UIST ‘12, Chi UIST ‘12, Matejka CHI ‘11, Nguyen CHI ‘15, Vermette GI ‘15, Chilana CHI ‘12, Ichinco CHI ‘17, Kelleher CHI ‘05, Lafreniere OzCHI ‘14]
Segmenting tutorials & displaying them in context eases in-task use

ToolScape. Kim CHI ‘14

Social CheatSheet. Vermette CSCW ‘17

[Kim CHI EA ‘13, Banovic UIST ‘12, Chi UIST ‘12, Matejka CHI ‘11, Nguyen CHI ‘15, Vermette GI’15, Chilana CHI ‘12, Ichinco CHI ‘17, Kelleher CHI ‘05, Lafreniere OzCHI ‘14]
SOLUTION

Expert resources can help with...

"I need help accomplishing my goal"

→ segment tutorials & display in context

"I don’t know what my end goal is"

"I have a goal and want it done"
SOLUTION

Expert resources can help with...

“I need help accomplishing my goal”
“I don’t know what my end goal is”
“I have a goal and want it done”

→ segment tutorials & display in context
In-situ examples support learning & inspiration

ToolClips. Grossman CHI ’10

Herring CHI ’09

[Dontcheva CHI ’14, Matejka UIST ’09, Matejka CHI ’11, Bawden J. Inf. Sci ’86, Kulkarni DTR ’14, Siangliulue C&C ’15]
In-situ examples support learning & inspiration

ToolClips. Grossman CHI ’10

Herring CHI ’09

[Dontcheva CHI ’14, Matejka UIST ’09, Matejka CHI ’11, Bawden J. Inf. Sci ’86, Kulkarni DTR ’14, Siangliulue C&C ’15]
In-situ examples support learning & inspiration

ToolClips. Grossman CHI ’10

Herring CHI ’09

[Dontcheva CHI ’14, Matejka UIST ’09, Matejka CHI ’11, Bawden J. Inf. Sci ’86, Kulkarni DTR ’14, Siangliulue C&C ’15]
SOLUTION

Expert resources can help with...

“I need help accomplishing my goal”

“I don’t know what my end goal is”

“I have a goal and want it done”

→ segment tutorials & display in context

→ suggest example demonstrations
SOLUTION

Expert resources can help with...

“I need help accomplishing my goal”
→ segment tutorials & display in context

“I don’t know what my end goal is”
→ suggest example demonstrations

“I have a goal and want it done”
Contextual solutions & operations help accomplish tasks faster

Blueprint. Brandt CHI ‘10

```xml
<?xml version="1.0" encoding="utf-8"?>
  <urlLoader>
    <!-- Code goes here -->
  </urlLoader>
</mx:Application>
```

```xml
<?xml version="1.0" encoding="utf-8"?>
  <mx:Script>
    // @url http://livedocs.adobe.com/flex/3/net/URLLoader.html
    // @pasted Tue Mar 24 13:24:06 PDT 2009
    // @query: urlloader

    var loader:URLLoader = new URLLoader();
    loader.addEventListener(function(e:Event){
      trace("loaded");
    });
    loader.load(new URLRequest("example.com"));
  </mx:Script>
</mx:Application>
```
Contextual solutions & operations help accomplish tasks faster

Blueprint. Brandt CHI ’10

```xml
<?xml version="1.0" encoding="utf-8"?>
    <urlLoader>
        <!-- Code snippet here -->
    </urlLoader>
</mx:Application>
```

```xml
<?xml version="1.0" encoding="utf-8"?>
    <mx:Script>
        // @url http://livedocs.adobe.com/flex/3/net/URLLoader.html
        // @pasted Tue Mar 24 13:24:06 PDT 2009
        // @query: urlloader

        var loader:URLLoader = new URLLoader();
        loader.addEventListener(function(e:Event){
            trace("loaded");
        },
        trace("loaded");
    }
    loader.load(new URLRequest("example.com"));
</mx:Script>
```

[Adar UIST ‘14, Chilana CHI ’12, Hartmann CHI ’10, Kandel CHI ’11]
Contextual solutions & operations help accomplish tasks faster

Blueprint. Brandt CHI ’10

```xml
<?xml version="1.0" encoding="utf-8"?>
    <urlLoader>
        <mx:Script>
            var loader:URLLoader = new URLLoader();
            loader.addEventListener(function(e:Event){
                trace("loaded");
            }, true);
            loader.load(new URLRequest("example.com"));
        </mx:Script>
    </urlLoader>
</mx:Application>
```

[Adar UIST ‘14, Chilana CHI ’12, Hartmann CHI ’10, Kandel CHI ’11]
Expert resources can help with...

“I need help accomplishing my goal”
→ segment tutorials & display in context

“I don’t know what my end goal is”
→ suggest example demonstrations

“I have a goal and want it done”
→ suggest applicable operations
Expert resources can help with...

“I need help accomplishing my goal”
→ segment tutorials & display in context

“I don’t know what my end goal is”
→ suggest example demonstrations

“I have a goal and want it done”
→ suggest applicable operations

</>
SOLUTION

Expert resources can help with...

“I need help accomplishing my goal”  → segment tutorials & display in context

“I don’t know what my end goal is”  → suggest example demonstrations

“I have a goal and want it done”  → suggest applicable operations

</>
RePlay: Contextually Presenting Learning Videos Across Applications

Ailie Fraser, Tricia Ngoon, Mira Dontcheva, Scott Klemmer
Proceedings of CHI 2019 - Honourable Mention 🎁
Complex activities often comprise multiple applications.

- Canva
- Photoshop
- Adobe XD
- Powerpoint
Applications are walled gardens
Research Questions

• How might we provide contextual assistance across multiple applications?

• Does contextual assistance help people find what they need more quickly?
RePlay: an application-independent approach
1. Help users create better search queries
1. Help users create better search queries

Detect user behaviour

OS Accessibility API

Desktop software

RePlay
<AXApplication: "XD">
<AXWindow: "template-edited">
<AXCheckBox: "">

Attributes:
AXIdentifier: "toolbarEllipseButton"
AXEnabled: "1"
AXDescription: "Ellipse"
AXParent: "<AXWindow: "template-edited">
AXSize: "w=28 h=24"
AXFocused (W): "0"
AXActivationPoint: "x=382 y=156"
AXRole: "AXCheckBox"
AXTopLevelUIElement: "<AXWindow: "template-edited">
AXHelp: "Ellipse (E)"
AXValue: "1"
AXPosition: "x=368 y=144"
AXWindow: "<AXWindow: "template-edited">
AXRoleDescription: "toggle button"
AXTitle: ""
AXSubrole: "AXToggle"
AXFrame: "x=368 y=144 w=28 h=24"

Actions:
AXPress - press
hello i am text
2. Find relevant moments in videos

- Detect user behaviour
- OS Accessibility API
- Desktop software

RePlay

Find clips in videos

User Interface

Online video corpus

Search videos

Captions:
23:27: also use a feature that is unique to XD
23:29: and that is the **repeat grid** tool so if
23:31: we click this this whole section turns
23:36: green and we can drag down and we can
23:37: **select** in between each of them and just
Obtaining captions for YouTube videos

Heres some code I wrote which grabs all the caption tracks from any youtube video without having to use the API. Just plug the video URL in the $video_url variable.

```php
// get video id from url
$video_url = 'https://www.youtube.com/watch?v=kYX87kkyubk';
preg_match("/(?<=v=)[a-zA-Z0-9-]+(?=&)|(?=v\\)/[^&\n]+(?=\?)|(?=v=)[^&\n]+(?=youtu.be)/[^&\n]+","$video_url",$matches);
$video_id = $matches[0];

// get video info from id
$video_info = file_get_contents('http://www.youtube.com/get_video_info&video_id='.$video_id);
parse_str($video_info, $video_info_array);

if (isset($video_info_array['caption_tracks'])) {
    $tracks = explode(',', $video_info_array['caption_tracks']);

    // print info for each track (including url to track content)
    foreach ($tracks as $track) {
        parse_str($track, $output);
        print_r($output);
    }
}
```

Obtaining captions for YouTube videos

get_video_info

youtube.com/api/timedtext?
3. Present moments to the user
Does contextual assistance help people find what they need more quickly?

- Does RePlay make searching and browsing faster than online video search?
- Does RePlay change how people browse and navigate videos?
Does contextual assistance help people find what they need more quickly?

Between-subjects study

Web (n = 12)

RePlay (n = 12)
Task: make changes to a design

Adobe XD

Canva

Powerpoint

Changes made:
- Added logo to welcome screen
- Added “My TravelStory” page with grid of photos
- Clicking first photo shows enlarged view
People with contextual assistance spent 40% less time searching.

\[ t = 2.52, p = .02 \]

- **Web**: Mean: 72.62s
- **RePlay**: Mean: 42.83s
Does contextual assistance help people find what they need more quickly?

- Does RePlay make searching and browsing faster than online video search?  
  YES

- Does RePlay change how people browse and navigate videos?  
  YES
Timeline markers help to find specific moments.

Make your travel dreams come true.

...video and select the color that I have...

...that’s what it’s worth for so that’s it for this video please do notify me in my comment section on YouTube as well as...
People could browse multiple videos simultaneously.
How might we improve contextual help search?

- People often preferred exploration over search
  
  "I felt like I could find it if I searched for it [in the interface], which I did. I was able to figure it out." – P8

- People perceived search as more time-consuming
  
  "I knew I didn’t have time. I wanted to complete the task so I just hacked it." – P11

- People searched for actions more than tools
  
  "how to crop image"
  
  "how do i record a video"
  
  "round corners"
ReMap: Multimodal Help-Seeking

Ailie Fraser, Julia Markel, James Basa, Mira Dontcheva, Scott Klemmer
UIST 2019 Demo
When people help each other, they use language, gestures, and context
Language and gesture work well together

[Bolt SIGGRAPH ‘80]
Language and gesture work well together
Multimodal input for creative work can help maintain flow state

[Kim CHI ‘19, Sedivy C&C ’99]
Research Questions

• How might we bring the benefits of multimodal interaction to help-seeking?

• Does multimodal interaction help people stay focused on their task?

• Does multimodal interaction lower the barrier to searching?
ReMap: Multimodal help-seeking

1. Use speech to initiate and dictate a search
2. Use speech to navigate videos
3. Deictic resolution: Point at interface elements

...this or your picture in picture you can crop either one of the videos which is a really good feature as well but now ...
1. Use speech to initiate and dictate a search
2. Use speech to navigate videos
3. Deictic resolution

...head over to the iTunes Store and download iMovie and you're ready to unleash the editor within so without any ...
OS Accessibility API

Desktop software

Web speech page

ReMap

User Interface

Server

Video players
How do people use multimodal search for a real task?
Main findings

- Participants used multimodal interaction for multitasking
- Some preferred manual video navigation, others preferred speech
- Deictic resolution mostly used for canvas elements
Participants used multimodal interaction for multitasking
Some preferred manual video navigation, others preferred speech

Preferred manual:
"I don’t really know what [the timeline markers] are until I scroll over them" – P11

Preferred speech:
“If I hear the info I want and I’m kind of following along I can pause it, take the instructions, apply it, and then ... continue watching ... without having to stop the fluidity of work.” – P8
Deictic resolution mostly used for canvas elements

• 22% of spoken queries included a deictic reference (24/111)

• 23/24 deictic references were canvas elements
  • Only 25% were successfully resolved (6/24) due to missing accessibility labels
  • 10/18 unsuccessful references asked for help with a chart
  • Accessibility common for widgets; more rare for the “insides”

→ Computer vision could help address accessibility API limitations e.g. [Dixon CHI ’10]

→ Mobile accessibility is better
Expert resources can help with...

“I need help accomplishing my goal”

→ segment tutorials & display in context

“I don’t know what my end goal is”

→ suggest example demonstrations

“I have a goal and want it done”

→ suggest applicable operations

RePlay & ReMap
**SOLUTION**

**Expert resources can help with...**

“I need help accomplishing my goal”

“I don’t know what my end goal is”

“I have a goal and want it done”

→ segment tutorials & display in context

→ suggest example demonstrations

→ suggest applicable operations

RePlay & ReMap
LiveClips: Contextual Video Demonstrations to Help People Learn Creative Techniques

Ailie Fraser, Mira Dontcheva, Scott Klemmer, Andy Edmonds, Joy Kim, Alison Thornsberry
C&C 2019 / Unpublished
Livestreaming: Real-time broadcasting

twitch.tv/ninja
facebook.com/HamiltonMusical/videos/1315061111854096
youtu.be/hHW1oY26kxQ
pscp.tv/w/1LPkgowBzAbJb
very extremely creative title that grabbed your attention
Camera view of work

very extremely creative title that grabbed your attention

Category: Art  Team: Nekotopia

twitch.tv/neko
Camera on artist’s face

very extremely creative title that grabbed your attention
very extremely creative title that grabbed your attention
Creative live streams are an untapped source of expert knowledge

Large volume
Show creative knowledge
Too long to browse

- twitch
- Behance
- YouTube
- Periscope
- PICARTO

Deltiee: Do you use 100% density for line art?

Kergony: do you actually need a shading on the emote? @39daph

Time: 08:12:45
Research Questions

• What are creative live streams?

• Why do people live stream and why do others watch?

• What challenges do live stream viewers face?

• How might we better leverage the expert knowledge in these videos?
Formative Work

Content analysis of a sample of creative livestreams on Twitch

Semi-structured interviews with 8 streamers

3 online surveys with 165 viewers over 1.5 years
Main findings

• 4 main types of creative livestreams: Teaching, Making, Socializing, Performing

• Community & engagement are important to streamers and viewers

• Streamers face a tension between working and engaging with viewers
Main findings

• 4 main types of creative livestreams: Teaching, Making, Socializing, Performing

• Community & engagement are important to streamers and viewers

• Streamers face a tension between working and engaging with viewers

• People want to view archived livestreams, but they are hard to navigate
Example Streamers and viewers value audience engagement, but have trouble keeping up.

Example

Getting Started in Adobe XD with Paul Trani

6,317 views

500 views

Like

6

Share

Save
1. Extract short clips

Based on [Lafreniere et al. 2014]
2. Crop clips to thumbnail size
3. Rank clips for presentation

- Time in original video
- Amount of visual change
- User context
Initial user feedback

• Useful to see how other artists use tools

• One preferred tooltips, other preferred ambient side panel

• Clips provided an entry point to the full videos
How might we improve contextual inspiration?

• Are tools the right granularity for segmenting?
  • Extract moments based on what the streamer is saying
  • Summarize live streams in a short clip
SOLUTION

Expert resources can help with...

“I need help accomplishing my goal”

→ segment tutorials & display in context

RePlay & ReMap

“I don’t know what my end goal is”

→ suggest example demonstrations

LiveClips

“I have a goal and want it done”

→ suggest applicable operations

<\/>
Expert resources can help with...

“I need help accomplishing my goal”
→ segment tutorials & display in context

“I don’t know what my end goal is”
→ suggest example demonstrations

“I have a goal and want it done”
→ suggest applicable operations

SOLUTION

RePlay & ReMap

LiveClips

DiscoverySpace

CritiqueKit
Reusable actions and examples help novices build confidence & produce better work

DiscoverySpace
Ailie Fraser, Mira Dontcheva, Holger Winnemöller, Sheryl Ehrlich, Scott Klemmer
DIS 2016

CritiqueKit
Tricia Ngoon, Ailie Fraser, Ariel Weingarten, Mira Dontcheva, Scott Klemmer
CHI 2018 - Honourable Mention 🏆
Thesis Statement

- Curating expert help and demonstrations
- and presenting them in context

enables people to produce better work.
Future Directions

- Integrating resources more closely into the creative process
- Improving navigation and browsing of video resources
Integrating resources more closely into the creative process

• Engage the user in a conversational dialogue

“I want to edit this”

“What aspect of the graph do you want to edit? (data, axis labels, colour, size, type of graph)”

“The axis labels”

“Here is a video about editing the axis labels on a graph”
Integrating resources more closely into the creative process

- Engage the user in a conversational dialogue
- Link results more closely to the software
Integrating resources more closely into the creative process

- Engage the user in a conversational dialogue
- Link results more closely to the software
- Allow users to issue commands directly

“Make **this** ease in from **here**”
Improving navigation and browsing of video resources
Improving navigation and browsing of video resources
Contributions

- Algorithms that curate and rank four different types of expert resource (tutorial videos, live stream videos, action macros, and written feedback)

- Interfaces that present curated expert help and demonstrations in-situ

- Evaluations that demonstrate the efficacy of contextually presenting expert resources
Dissertation Outcomes

Full Papers

2020 ACM CHI  Temporal Segmentation of Creative Live Streams.  
C. Ailie Fraser, Joy Kim, Valentina Shin, Joel Brandt, Mira Dontcheva

C. Ailie Fraser, Joy O. Kim, Alison Thornsberry, Scott Klemmer, Mira Dontcheva

2019 ACM CHI  RePlay: Contextually Presenting Learning Videos Across Software Applications. Honourable Mention  
C. Ailie Fraser, Tricia J. Ngoon, Mira Dontcheva, Scott Klemmer

2018 ACM CHI  Interactive Guidance Techniques for Improving Creative Feedback. Honourable Mention  
Tricia J. Ngoon, C. Ailie Fraser, Ariel S. Weingarten, Mira Dontcheva, Scott Klemmer

2017 ACM CHI  WeBuild: Automatically Distributing Assembly Tasks Among Collocated Workers to Improve Coordination.  
C. Ailie Fraser, Tovi Grossman, George Fitzmaurice

2016 ACM DIS  DiscoverySpace: Suggesting Actions in Complex Software.  
C. Ailie Fraser, Mira Dontcheva, Holger Winnemöller, Sheryl Ehrlich, Scott Klemmer

2016 ACM CHI  Framing Feedback: Choosing Review Environment Features that Support High Quality Peer Assessment.  
Catherine M. Hicks, Vineet Pandey, C. Ailie Fraser, Scott Klemmer
Dissertation Outcomes

Extended Abstracts (Demos, Posters, Workshops)

- **2019 ACM UIST**
  - **Demos**
    - *ReMap: Multimodal Help-Seeking.*
      - C. Ailie Fraser, Julia M. Markel, N. James Basa, Mira Dontcheva, Scott Klemmer

- **2019 ACM CHI**
  - **Live Streaming Workshop**
    - *Creative livestreaming: How sharing one’s process can inspire, educate, and engage.*
      - C. Ailie Fraser, Joy O. Kim, Scott Klemmer, Mira Dontcheva

- **2018 ACM UIST**
  - **Doctoral Consortium**
      - C. Ailie Fraser

- **2018 ACM CHI**
  - **Sensemaking Workshop**
    - *Software videos: Rich content and learning potential, but a challenge for sensemaking.*
      - C. Ailie Fraser, Mira Dontcheva, Scott Klemmer

- **2017 ACM UIST**
  - **Demos**
      - C. Ailie Fraser, Tricia J. Ngoon, Ariel S. Weingarten, Mira Dontcheva, Scott Klemmer

- **2016 ACM CSCW**
  - **Demos**
    - *DiscoverySpace: Crowdsourced Suggestions Onboard Novices in Complex Software.*
      - C. Ailie Fraser, Mira Dontcheva, Holger Winnemöller, Scott Klemmer

- **2015 ACM Learning at Scale**
  - **Posters**
    - *Do numeric ratings impact peer reviewers?*
      - Catherine M. Hicks, C. Ailie Fraser, Purvi Desai, Scott Klemmer
Dissertation Outcomes

Other Publications

Jan 2020  C. Ailie Fraser, Mira Dontcheva, Joy Kim, Scott Klemmer

Medium  How to download public YouTube captions in XML.
May 2019  C. Ailie Fraser
Dissertation Outcomes

Impact on Industry Product
Next Steps: Adobe Research - Seattle

Research Engineer
Final thoughts

• Lowering the barrier to get started is a key step toward enabling creativity

• Expert help and demonstrations are powerful tools for learning, execution, and inspiration

• Bringing expert resources into the user’s context makes them more useful
Thanks!

- Lowering the barrier to get started is a key step toward enabling creativity

- Expert help and demonstrations are powerful tools for learning, execution, and inspiration

- Bringing expert resources into the user’s context makes them more useful