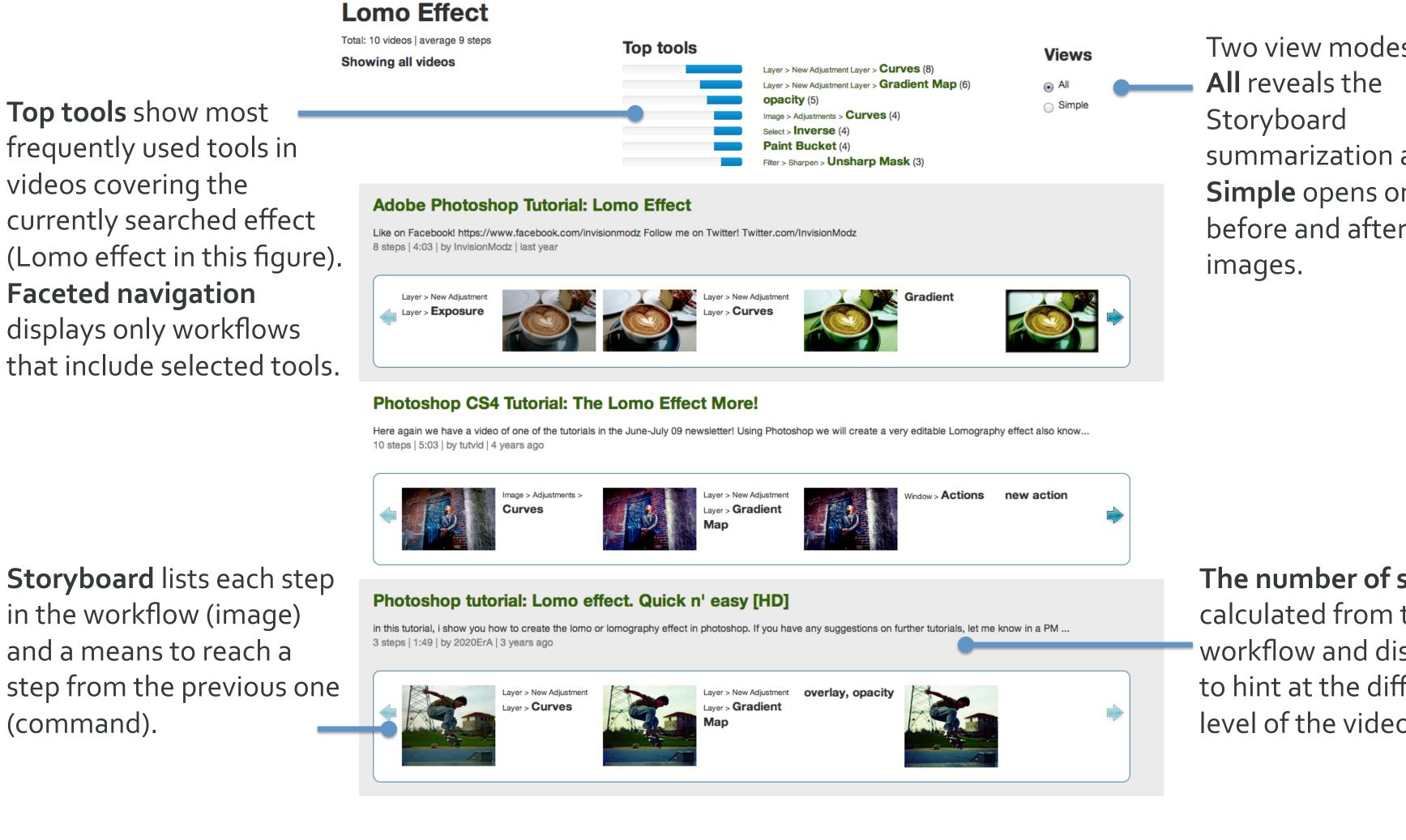# ToolScape
Enhancing the Learning Experience of How-to videos

Juho Kim (MIT CSAIL) with Phu Nguyen (MIT CSAIL), Krzysztof Z. Gajos (Harvard SEAS), and Robert C. Miller (MIT CSAIL)

Support finding relevant videos with summaries of step-by-step instructions

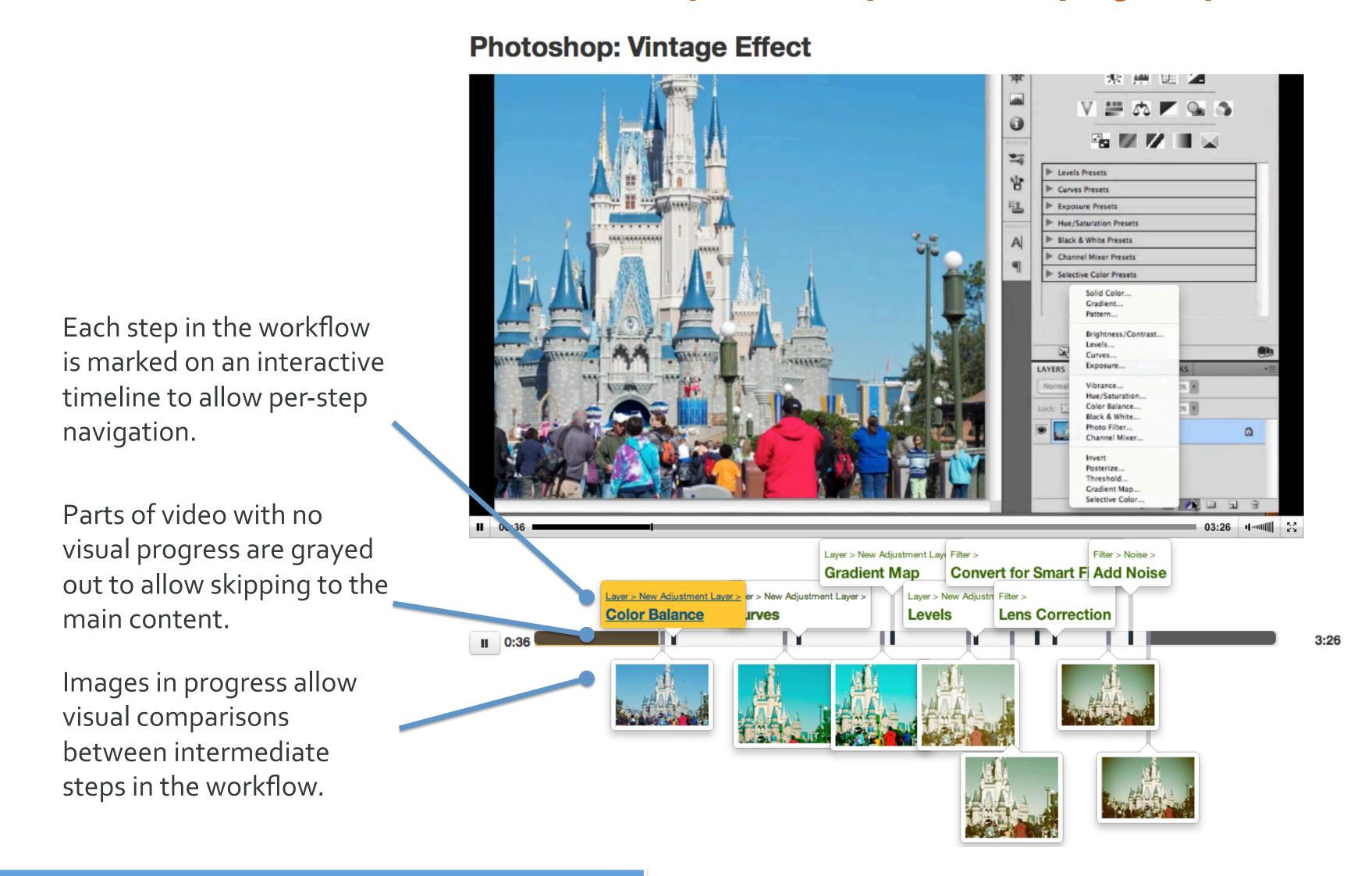### Storyboard summarization: actions and work-in-progress

Lomo Effect
Total: 10 videos | average 9 steps
Showing all videos

Top tools
Layer > New Adjustment Layer > **Curves** (8)
Layer > New Adjustment Layer > **Gradient Map** (6)
opacity (5)
Image > Adjustments > **Curves** (4)
Select > **Inverse** (4)
Paint Bucket (4)
Filter > Sharpen > **Unsharp Mask** (3)

Views
○ All
○ Simple

Top tools show most frequently used tools in videos covering the currently searched effect (Lomo effect in this figure). **Faceted navigation** displays only workflows that include selected tools.

Two view modes: **All** reveals the Storyboard summarization and **Simple** opens only before and after images.

Storyboard lists each step in the workflow (image) and a means to reach a step from the previous one (command).

The number of steps is calculated from the workflow and displayed to hint at the difficulty level of the video.

Support video navigation with more interactivity and learner control

Interactive timeline: stepwise repeat / skip / jump

Each step in the workflow is marked on an interactive timeline to allow per-step navigation.

Parts of video with no visual progress are grayed out to allow skipping to the main content.

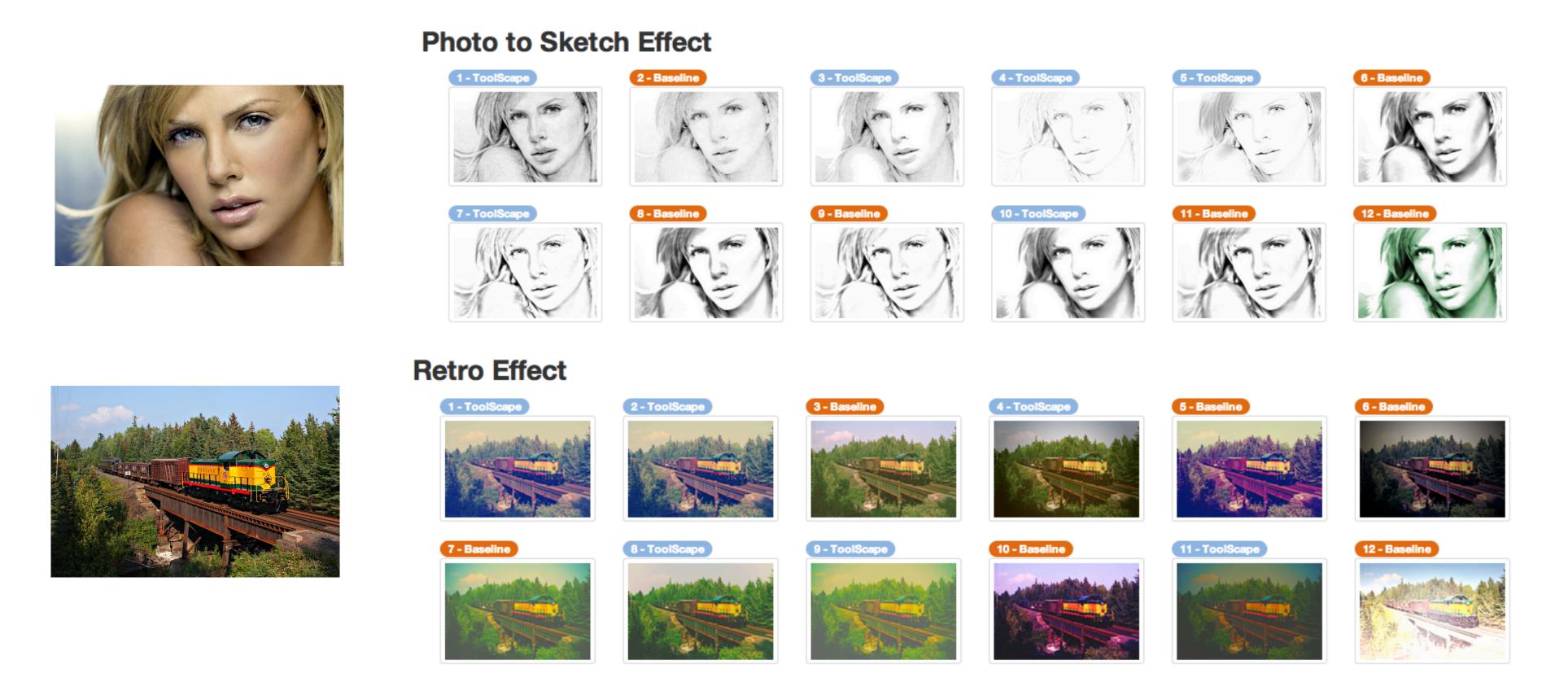Images in progress allow visual comparisons between intermediate steps in the workflow.

User Study: Photo manipulation design tasks in Photoshop

Learners produced better designs with ToolScape.
- External ratings show better performance with ToolScape.
- Learners rated their own work higher with ToolScape.

Learners gained more self-efficacy in their skills with ToolScape.

Task: Apply the following visual effect to the given image, only using the provided video browsing interface.
12 participants, within-subjects (ToolScape vs Baseline video interface)

Photo to Sketch Effect

Retro Effect

Learners found ToolScape features to be more helpful.

Non-sequential ways to navigate workflows are highly used (8.9 times per task) and preferred.

Learners using ToolScape had more direct cues to rely on than title, video length, and description.

Feature	Value
after image	6.7
visualization of actual start/end in a clip	6.5
click to jump to images and commands	6.4
interactive timeline	6.3
work-in-progress images in Storyboard	6.1
thumbnail (Baseline only)	5.8
Storyboard summarization	5.7
before image	5.6
list of tools in Storyboard	5.2
title **	5 / 5.6
top tools	4.7
thumbnail preview in the player **	4.6 / 4.3
tool filtering	4.6
number of steps	3.9
video length **	3.5 / 5.2
description **	2.7 / 3.8
upload date **	2.3 / 2.3
uploader **	2.3 / 1.8

ToolScape / Baseline

**: features that exist in both conditions. Bars: 95% confidence intervals.
7-Likert scale qustion: 1(strongly disagree)-7(strongly agree).