Open Edx Annotation tools: breaking the unidirectionality of online course content

Philip Desenne and Leah Reis-Dennis
Why are annotations important for online education?
Breaking the unidirectionality of online course content
They are the foundation for a
New Paradigm of Online Education

StudentX / ProfessorX
What are the current issues with online education?
Disassociated engagement with related content

MOOC Media-rich Content and the monolithic Discussion Forums

StudentX / ProfessorX

Tuesday, October 21, 14
disassociated modules: video and forum contextually connected content only because on same page
I’m sure this is answered elsewhere... but where?

I'm sure this is answered elsewhere, but I'm curious if someone could enlighten me. . .

ecnalyr 22 days ago

At about 8:40 in the video, the instructor states that any variables you have in the controller are available in the view.

What about commentary metadata persistence?
need multiple forms of contextualized engagement by students and instructors
Multiple forms of engagement

ProfessorX / Student X

Keep track of **Blended Content**, Support **Personal Learning Environments**

*create study guides, review topics, flipped classroom, etc.*
Personal Learning Environment

Blended Content

HarvardX

MOOC

Open Content

Federated Content

StudentX / ProfessorX

Face-to-face classroom

Harvard Extension School

Online distant education

Tuesday, October 21, 14
Annotations are the glue for Blended Learning and Personal Learning Environments.
Multiple means of representation and expression

for students and instructors

The large and small steamers in motion, the pilots in their pilot-houses,
The white wake left by their journeying ship, the air is filled with the smell of the wheels,
The flags of all nations floating on the breeze, and the glistening
The scallop-edged storehouses by the shore,
The stretch afar seen are the buildings, and the bays,
On the river the ships are planked on each side by
On the neighboring houses shining high and
On the neighboring houses shining high and
Casting their flicker of light over the
glaringly into the

4
These and all else was my life, and all I loved
I loved well those cities, loved well the stately and rapid river,
edX Annotation tools

Annotate X
Common Annotation Tool Interface with media-rich annotations

Extended Annotator plugins library (10)

- Rich text (WYSIWYG from TinyMCE)
- Rich-media (images, video, audio)
- Plain HTML
- Assessment tools (& other widgets)
- Geolocation (Google map API)
- Sharing (email and social media)
- Groups
- Pre-populated tags and colored highlight
- Pre-populated tags and custom marks (diacritics)
- Flagging annotations for offensive content
ANOTATION: OF BEING NUMEROUS, 40

Instructions
As you annotate Oppen’s poem, remember what sorts of patterns and devices you’ve been noticing in Whitman’s poetry. How does this prose quotation from Whitman differ from his poetry? Where are there similarities? Highlight Whitman’s use of "I" and the first person point of view.

OF BEING NUMEROUS, 40

George Oppen

Whitman: 'April 19, 1864

The capitol grows upon one in time, especially on top of it now, and you can see it very well. It is a great bronze figure, the Genius of Liberty I suppose. It looks wonderful toward sundown. I love to go and look at it. The sun when it is nearly down shines on the headpiece and it dazzles and glistens like a big star: it looks quite curious...'

Typical letter to "Mom": sharing his day, almost like his childhood by the sea...looking at sunsets over water...just enjoying the simple beauty of the shine of the metal dome. More simplistic than WW's poetry.

Share: 
Video Annotations

VIDEO ANNOTATION

Instructions
Add the instructions to the assignment here.

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Open Technologies & Interoperable Systems

- **Annotator**
  - [http://annotatorjs.org/](http://annotatorjs.org/)

- **tinyMCE**

- **VIDEO.js**

- **CATCH / Annotopia**
  - [https://osc.hul.harvard.edu/liblab/proj/catch](https://osc.hul.harvard.edu/liblab/proj/catch)

- **Open Video Annotation Project**
  - [www.openvideoannotation.org](http://www.openvideoannotation.org)
Building the xModule

Open Video Annotation Project

HarvardX / edX
Video annotations: display

Here's a note

alice

Share:
Deep Zoom Image Annotations

OpenSeaDragon - Annotator Implementation
Deep Zoom Image Annotations

OpenSeaDragon - Annotator Implementation

IMAGE ANNOTATION

Instructions

Add the instructions to the assignment here.
Common Aggregated Grid and Filtering

the annotation dashboard
Aggregated notes and public display of notes

Link back to source
Common back-end database and API

CATCH/Annotopia
Interoperable Annotation HUB
Library Lab
CATCH Project

Normalized to Open Annotation Model

Public API for analytics
Annotations in edX Courses

Disrupting traditional online teaching and learning
Spring 2013

CB22X: The Ancient Greek Hero

First 3rd Party Tool in edX

SOURCEBOOK OF ANCIENT GREEK TEXTS IN ENGLISH TRANSLATION

CB22X 'The Ancient Greek Hero'
General Editor: Gregory Nagy
Managing Editor: Soo-Young Kim
Digital Editor: Jeffrey P. Emanuel

HOMER

YOU who see through us as if
We never walked the world,
Speculating as if we were
Simply imitating your words,
How absolute you are.

So now we wander here and there
Lives pausing in their moments,
The sights that you offered we
Repeat when the sun is strong
For action to be obvious.
Early 2014

AI 12.2x: Poetry in America: Whitman

First pilot course to test new tools

The capstone of student engagement in this module was digital annotation

Text annotations

Concept tagging and color highlights (incipient semantic tagging)
In a traditional classroom environment, students are asked to read poems actively.

The first time, students simply read a poem. Then, they read it again, marking passages, words, or moments that strike them as unusual or interesting.

Perhaps, then, they read the poem a second time out loud, and use a pen to mark instances that have a distinct sound, meter, or cadence.

This multi-step annotation lies at the heart of "cracking open" a poem.
In this pilot case, the annotation tool allowed:
students to identify poetic imagery with images from the internet;

students to riff on the meaning of a single word, in conversation with their peers;

for text-based responses to questions of poetic devices.
Preliminary data from course

Enrollment 13,755

certificate: 386

2.8% completion
1147 Students (12% of enrollees)

~ 60,000 Annotations

16 passages from 14 poems

8.3% engaged

Average Annotations per poem passage: 3700
Average per individual: 52.08
PoetryX: Annotations per day
Jan - Feb 2014 (~ 7 weeks)

AVG daily ~ 1,250 / Users daily ~ 90

Jan 29: Course Started
Feb 12: Part 2 Released
Feb 26: Part 3 Released
Mar 15: Course Ended

Tuesday, October 21, 14
Chart 5

PoetryX

Average per individual ~ 50

Max 714  -  Min 30

Top 500 users
Annotations per poem passage

16 passages from 14 poems

Average # per poem passage: 3700

To A Stranger; Song of Myself (v22); Song of the Broad Axe
Crossing Brooklyn Ferry
Song of Myself (s22)
Of Being Numerous (s40)
Song of Myself (s33)
Song of Myself (s15)
Song of Myself (s6)
Song of Myself (s5)
Song of Myself (s52)
Song of Myself (s1, s2)
Song of Myself (s5), Out of the Cradle Endlessly Rocking
1861, Cavalry Crossing a Ford
Song of Myself (26)
To A Locomotive in Winter
I Sing the Body Electric
A Passage to India (2,3)
The Sleepers, From Pentup Aching Rivers, This Compost,
PoetryX: Annotations and Users per Poem Passage

New Module every 2 weeks over 7 weeks

Song of Myself ~ 22,000 Annotations

Part 1 (Jan 29)
Total: 29,813
indiv: 2479

Part 2 (Feb 12)
Total: 14,911
indiv: 1548

Part 3 (Feb 26)
Total: 15,015
indiv: 1595

# Annotations
# individuals
User Experience (UX) Issues

- **Scale**: how to display 1000s of annotations?
- **Engagement**: how to stimulate community participation?
- **Discovery**: how to find meaningful peer annotations?
Pedagogical Questions

Why do we annotate?  How do we annotate?

The teaching team can't take for granted an understanding of annotation.

Giving explicit instructions and prompts that allow students to engage on multiple levels (tagging simple devices for beginners, or analyzing complex moments for more advanced students) will make these annotation exercises more beneficial.

We found that many students had never annotated before, whether virtually or in brick-and-mortar settings.
ChinaX

Spring 2014

https://courses.edx.org/courses/HarvardX/SW12.6x/2T2014/info
Scholars Module

18th Century China
Qing Dynasty

capstone of student engagement for this section was annotation

- 30 texts from “The Scholars”
- One image “Prosperous Suzhou” scroll (40ft - 12 m long)
The novel, commonly known as The Scholars, might more properly be called “The Unofficial History of the Confucians”, or Rulin Waishi was written by a disillusioned literatus who set the story in the Ming dynasty rather than the Qing dynasty in the city of Nanjing formerly the southern capital of the Ming dynasty along the Yangtze River.

The scroll, the Prosperous Suzhou was painted less than a decade later, commissioned by the emperor Qianlong to depict the impressive city of Suzhou not too far from Nanjing.
Concept tagging - incipient ontologies

As you go through consider all the different characters and highlight then tag each character as either:

- **longs** (pink): one who longs for power, fame, wealth and rank and therefore flatters others and lower themselves
- **relies** (maroon): one who relies on power, fame, wealth and rank and therefore belittles others and are overbearing
- **pretends** (red-orange): one who pretends to have no interest in power, fame, wealth and rank and thinks themselves above it all but are eventually seen through and mocked
- **refrains** (orange): one who ultimately refrains from pursuing power, fame, wealth and rank, who is of the highest virtue, and is the pillar upon whom all rely

As you read through the text think about the author's view of his world. Highlight then tag text that you believe illustrates either his:

- **cynicism** (chartreuse)
- **idealism** (purple)

Later, at the end of reading the selections from the novel, we shall invite you to turn to the Scroll and make a comparison between Wu Jingzi's novel and the scroll's depiction in our final discussion forum.
Guiding contextual questions and embedded surveys

“Two bow shots from my gate is the lake,” he said, pointing outside. “And by the lake is a belt of green where all the buffaloes of the village browse. There are a few dozen big willows there too, so that it is quiet, shady and cool; and if the buffalo is thirsty it can drink at the water’s edge. You can play there, son; but don’t wander off. I shall see that you get rice and vegetables twice a day; and each morning I shall give you a few coppers to buy a snack to eat while you’re out. Only you must work well. I hope you’ll find this satisfactory.”

Now that you've taken a look at *The Scholar* turn to this scroll titled *Prosperous Suzhou*, a long handscroll by Xu Yang, a native of Wu county, Suzhou.

In 1751, when the Qianlong emperor visited Suzhou during his southern tour, Xu Yang and his friend presented their paintings to the emperor, and in 1753, Xu Yang received a provincial (juren 舉人) degree from the emperor in recognition of his contribution. In 1757, Xu Yang finished this scroll painting, *Prosperous Suzhou*, and presented it to the emperor. You will find detailed representations of life in Suzhou during this period, including illustrations of more than 4,600 figures and 400 boats within the painting.

As you look at this scroll remember to start on the right side of the scroll and end at the left. While looking through the scroll think about why this scroll was created, what was it trying to represent? As you peruse this scroll see if you see any parts of the scroll that portray a particularly cynical view of society or particularly idealistic view of society.

There are many scenes within this scroll showing the busy commercial life of the city. As you look at the streets scenes portrayed here, see if you can tell what goods are being sold. [Feel free to tag *wares* the different wares being sold and include a comment on the type of ware]
Student Image Crowdsourcing

As you look through the scroll find and tag:

- farmer (tag four): How can you tell they are farmers? What is each farmer doing?
- woman (tag four): What do you think each woman is doing?
- school (tag two): There are two schools within this scroll. One is a free school that provides free education for the poor, the other is a village school. How can you tell it’s a school? What type of school do you think it is?
- official (tag four): Why do you think they are officials? How can you tell? What do you think each official is doing?
- performance (tag four): There are four different types of performances taking place in this scroll. Find, tag and comment on each performance. Who is the audience? What is the venue? Who is performing? What are they performing?
- yamen (tag one): Why are people gathered there? What do you think they are doing?
Prosperous Suzhou

a 12m (40ft) handscroll by Xu Yang, a native of Wu county, Suzhou
A-B testing

• Does the act of annotating images impact students’ learning outcomes in ChinaX?

• Does image annotation impact students’ engagement with the learning material?
Please, stop experimenting. We don't have enough time for these experiments. Many of us work most of the week or have other obligations, we do this in our free time, which for many of us is not a lot. Do you have an idea how long it is taking to go through this session? Have you tried doing it yourself?

A counter point to the complaint. I have taken any number of courses on EdX and Cousera. I enjoy learning with new tools even when they don't work exactly perfectly. As example a recent chemistry course which used a formula drawing program with issues. I missed every question, but enjoyed learning a new computer skill. Another course had us twittering pictures. So I was good with the annotate tool, in spite of minor problems. And encourage the experimentation and continued development.
Preliminary Results from ChinaX

22,000 annotations, 9000 tags on the text passages and the scroll generated by over 800 individuals, over a span of five weeks.

very active, creating over 2,000 annotations a day during the first week of the module release tapering to about 500/day towards the end of the period
What’s next for HarvardX?
Improve User Experience

Instructions

Be on the lookout for Whitman's usual bag of tricks here—you should be getting used to them by now, but don't stop looking for subtle variations in the ways they're used.

Also, be on the lookout for **metaphors**—they're not so common in Whitman, so they pack a big punch when they do appear. (A **metaphor** is the comparison of two different things by stating that they are, in fact, the same. For example: "The football star was a sharp bullet running down the field.")

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**SONG OF MYSELF**

Walt Whitman

6
A child said **What is the grass?** fetching it to me with **full hands**;
How could I answer the child? I do not know what it is any more than he.

I guess it must be the flag of my disposition, out of hopeful green stuff woven.

Or I guess it is the handkerchief of the Lord,
A scented gift and remembrancer designedly dropt,

Bearing the owner's name someway in the corners, that we may see and remark,
and say Whose?

Or I guess the grass is itself a child, the produced babe of the vegetation.
Accessibility

making sure all tools are accessible to all learners

Past experimentation phase

changeling for graphic visual media
Increase Interaction with Annotations

New Annotation Dashboard

- Live updates
- Email notification
- Multilevel replies
- Relevant visualizations
New tools: Comparative Analysis
Exportable data (common formats)

Aggregated notes, student journal

- PDF
- TXT
- HTML
- XML
- RDF
Learning Tool Interoperability (LTI)

http://www.imsglobal.org/lti/

Modularity of Future LMS
Semantic Tagging for Teaching, Learning and Research

- Ontologies for Digital Humanities
- Poetry Ontology
- Chinese Poetry Ontology
- Classics Ontology
- etc.
Assessment Rubrics Inside Annotations

embedding Qualtrics surveys

< Comp 1 >
< / Rubr 1.1 >
< / Rubr 1.2 >

< Comp 2 >
< / Rubr 2.1 >
< / Rubr 2.2 >

< Comp 3 >
< / Rubr 3.1 >
< / Rubr 3.2 >
Analysis and Visualizations
Regional perspectives
Leveraging Collaborations for New Tool Development

Intra-institutional / x-institutions / industry
National and International

• Center for Hellenic Studies
• Mind Informatics (MassGeneral Hospital)
• Berkman Center
• Hypothes.is: tools and ui improvements
  ○ Grants for annotation development: 5-15K
• Stanford-HX Data Analysis (dev with Justin)
• MITX
• Center for Research and Interdisciplinarity (Paris)
• University of Malaga
• EAFIT (Colombia)
• CritiqueI^it: enterprise development
• UC Berkley
Annotation Tools for
Teaching and Learning ... and research

Crowd sourcing and massive data

*unique research opportunities!*
Research drives Teaching
Future Data Analysis

Can we compare student engagement?

• Completion rates compared to annotation engagement
• How does completion rates compare to annotation engagement.
• Are the more engaged students also the ones that complete the course?
• Do annotations exercises increase the completion rate?
• Hypotheses that can be tested in future iterations
• A/B testing
Retroactive data analysis

- **Text Analysis**
  - Structural - Topic Modeling *(words associated with each topic)*
  - Syntactic pattern recognition *(arrangement of words and phrases)*

- **Interviews**
  - with course participants
  - Instructors
Discover Annotations

text analysis

connected content

http://texttexture.com

http://www.rhizi.org/
Clickstream Data and API request

when and where each learner clicked to engage with various learning materials
The big picture

AnnotateX Platform
Persistent Annotation Meta-layer

Open API Access

Ephemeral Content / Learning Management Systems

Stable Digital Repositories

URNs resolving to URLs
Open edX Annotation Tools

http://tinyurl.com/qb8vpbq

Annotation Tools for Teaching, Learning and Research

These annotation tools offer multiple means of engagement with the edX course material and introduce new models of online, peer-to-peer and student-instructor interactions inside the platform. Digital annotation tools allow contextual commentaries and conceptual tagging of media fragments within MOOCs, thereby transforming the unidirectional delivery of the online course content.

Text Annotation Tool

Image Annotation Tool

Video Annotation Tool

Here are instructions on how to install and operate three annotation/tagging tools to add media-rich commentaries to text passages, video clips, high definition images (with deep-zoom), inside the edX platform. All annotations can be aggregated under one section of the platform, where students can browse and review their own notes, as well as the instructors’ and other students’ contributions. All notes maintain hyperlinks to their original annotated fragment on the corresponding target page.
Public Portal

annotations.harvard.edu

documentation, testimonials, resources, code repositories
• Multiple means of representation to give learners various ways of acquiring information and knowledge (UDL)
• Multiple means of expression to provide learners alternatives for demonstrating what they know (UDL)
• Multiple means of engagement to tap into learners' interests, challenge them appropriately, and motivate them to learn (UDL)
• Promotes community-building through communication and collaboration
• Incorporates foundations for close analysis of content
• Fosters crowdsourcing to enhance learning though collaborative research
• Empowers mechanisms for formative assessment (just-in-time teaching)
• Helps monitor of quality and level of engagement of the individual, of groups, and of the entire student population
• Lays the groundwork for a much-needed method of assessing the Humanities at scale