The Emerging Role of Open Web Annotation in Communities of Practice

Jeremiah H. Kalir

University of Colorado Denver
School of Education and Human Development
1380 Lawrence Street, Suite 645
Denver, CO 80204
remi.kalir@ucdenver.edu
(303) 315-0034

ORCID: 0000-0003-2302-7989

Abstract
This emerging technology report describes open web annotation (OWA) as a promising technology for mediating learning among academic communities of practice. OWA is defined by a standardized annotation architecture, open source code, public licensing of content, and support for open educational practices. This report examines OWA efforts advanced by Hypothes.is, an open platform that situates annotation activity in authentic contexts, affords multimodal expression, establishes connections across contexts, curates resources and conversations, and contributes to open educational resources and practices. The use of Hypothes.is OWA is described in three communities of practice associated with scientific research, educator professional development, and web literacy. The report concludes with three significant research challenges regarding the use of OWA among academic communities of practice that span formal and informal learning contexts.

Keywords
Web annotation, Hypothes.is, Communities of practice, Open educational resources, Open educational practices, Interest-driven learning

1 Introduction

Web annotation is a promising technology for architecting activity in academic communities of practice characterized by collaboration, problem solving, and knowledge production. The seeds of web annotation appear in Berners-Lee's (1989) proposal for an information system linked by hypertext – what we know as today's World Wide Web – with an explicit requirement that "one must also be able to annotate links, as well as nodes, privately" (para. 27). Robust use of web annotation now appears in journalism (Cillizza, 2015), legal education (https://h2o.law.harvard.edu/), civic engagement (https://mymadison.io/), and scientific research (https://paperhive.org/; see also O'Reilly, Iavarone, & Hill, 2017). Amidst burgeoning activity, this report defines and reviews the emerging role of open web annotation (OWA) in distributed and academic communities of practice, and examines how these interest-driven groups use OWA to create knowledge and build participatory intellectual commons.

Web annotation draws inspiration from the centuries-old practice of adding marginalia to books, and extends this layer as an interactive feature of the web allowing a reader to comment upon, correct, highlight, and categorize content. This report suggests OWA is defined by four characteristics germane to learning, and, in particular, the social interactions of a "networked peer community" that blur author and audience distinctions (Diemann & Peters, 2016). First, the technical specifications of OWA are defined by a standardized annotation architecture that is interoperable, sharable, and distributed. This emerging data model indicates that "annotations have finally become first-class citizens of the web" (Whaley, 2017, para. 3) as standardized annotation can be "linked, shared between services, tracked back to their origins, searched and discovered, and stored wherever the author wishes" (Web Annotation Working Group, 2017, para. 1). Second, OWA is an outcome of what Lessig (1998) describes as a software development "movement" that values openness, such as "code whose source is available to all, to be taken, to be modified, and to be improved" (p. 102). Third, OWA are attributed with Creative Commons licenses; the production of OWA content is material contributed to the public domain for others to use. OWA legal permissions are similar to those associated with open educational resources (OER), or educational content that is free and openly licensed. As part of the public domain, OWA can be produced, as well as reused, revised, remixed, and redistributed to architect OER (i.e. DeRosa & Robison, 2017). Fourth, OWA encourage open educational practices (OEP) which promote an "ethos" of "transparency around academic practice, such as blogging, tweeting, presenting, and debating scholarly and pedagogic activities, in ways that promote reflection, reusability, revision, and collaboration" (Havemann, 2016, p. 6).

Whereas some web annotation platforms may include OWA features, others – like the proprietary Genius (https://genius.com/) and Readcube (https://www.readcube.com/) – do not advocate a multifaceted commitment to openness. This report examines Hypothes.is (https://hypothes.is/), an "open platform" that exemplifies the four defining features of OWA. By scaffolding open annotation among specialist domains and in service of collaborative activity and knowledge production among distributed groups, Hypothes.is is a paradigmatic case highlighting the emerging role of OWA for learning in communities of practice.

2 Relevance for Learning

Communities of practice are formed through, and are defined by, people's participation in a domain of interest, their joint activity through regular interaction, and a shared repertoire of practice (Wenger, 1998). Research has established the important role of "community-oriented" technologies (Wenger, 2001) within communities of practice. In educator learning, for instance, community-oriented technologies include online forums mediating professional discussion (Goos & Bennison, 2008), and blogs guiding pedagogical reflection (Yang, 2009). This report examines how academic communities of practice utilize Hypothes.is OWA to coordinate joint activity and accomplish learning goals.

OWA scholarly initiatives, case studies, and related literature indicate Hypothes.is affords multiple learning practices relevant to communities of practice. *OWA situates activity in authentic contexts*. By layering new information atop a webpage, Hypothes.is OWA transforms an online text into a

discursive context for collaborative activity among specialist and interest-driven domains (i.e. Dean & Schulten, 2015; Kennedy, 2016), establishing the conditions for situated learning (Fig. 1). *OWA supports multimodal expression*. The content of Hypothes.is annotations can feature text, digital imagery, and embedded video; such media expand the expressive register utilized for collaboration and interest-driven learning (i.e. BLINDED & AUTHOR, 2017). *OWA establishes connections across contexts*. Annotations can be tagged with descriptors applicable to other texts and conversations, determining the "associative trails" described in Bush's (1945) vision of an information architecture that produces, stores, and connects knowledge across contexts. *OWA curates resources and conversations*. Hypothes.is' archival features aid searches among annotations by keyword, username, tag, URL, or group (https://hypothes.is/search; Fig. 2), signaling multiple entry points for others to access information, join ongoing activity, and contribute new content. *OWA contributes to OER and OEP*. Attributed with a Creative Commons CC0 public domain dedication, Hypothes.is OWA help create OER (i.e. McNutt, 2014), can function as OER (AUTHOR, 2017), and also support varied OEP (i.e. Robbins, 2017).

[insert Fig. 1 about here]
Fig. 1 Example of Hypothes.is annotation layer situating discursive activities in context

[insert Fig. 2 about here]
Fig. 2 The Hypothes.is search dashboard

Communities of practice associated with scientific research, educator professional development, and web literacy are utilizing OWA to coordinate varied learning activities. The following section briefly describes three projects in which scientists, educators, and undergraduate students leverage Hypothes.is OWA to collaborate, accomplish goals, and produce new knowledge.

3 Emerging Technology in Practice

3.1 Climate Feedback

Established as a reference of reliable information about climate change, Climate Feedback (http://climatefeedback.org/) is a distributed collective of research scientists who use OWA to peer review the news (Revkin, 2016). The community has an expressly "pedagogical" mission committed to distinguishing "inaccurate climate change narratives from scientifically sound and trustworthy information in the media" (Climate Feedback, 2017, para. 2). When media organizations publish news about climate change, scientists with relevant expertise (i.e. paleoclimatology, oceanography) voluntarily contribute public Hypothes.is annotations that serve to evaluate the accuracy of reported information. Following this phase of collaborative and post-publication peer review, the final "feedbacks" (http://climatefeedback.org/feedbacks/) are assigned a summative score indicating an article's overall scientific credibility (Fig. 3). The Climate Feedback model suggests a distributed community of experts can successfully utilize OWA to situate and showcase their professional practices for the purposes of media accountability, information credibility, and a more scientifically-literate public (Perrin, 2017).

[insert Fig. 3 about here]
Fig. 3 Scientific credibility score provided via OWA as public peer review of news article

3.2 Marginal Syllabus

The Marginal Syllabus (http://marginalsyllab.us/) is a free and public educator professional learning initiative that convenes conversations about educational equity via OWA. Launched in August 2016, this multistakeholder partnership is organized by university researchers (including AUTHOR), K-12 educators, Hypothes.is, and the National Writing Project. The Marginal Syllabus embraces an intentional

political and technical double-entendre; the initiative partners with authors whose writing may be considered marginal – or contrary – to dominant education narratives, and educator conversation occurs in the margins of partner authors' texts as open, political, and dialogical forums (AUTHOR & BLINDED, 2018). During the 2016-17 academic year, 63 educators contributed a corpus of 1,147 annotations atop nine texts while discussing information accessibility, critical literacy, curricular design, culturally relevant pedagogy, and the business of educational technology, among other topics. By opening texts as contexts for interest-driven learning, the Marginal Syllabus illustrates how OWA can mediate open learning environments for educators to exercise agency through dialogue, question dominant schooling narratives, and critique inequitable educational practices.

3.3 Digital Polarization Initiative

Affiliated with the American Association of State Colleges and Universities' nonpartisan American Democracy Project, the Digital Polarization Initiative (Digipo; http://digipo.io/) is a web literacy effort that supports students in fact-checking, annotating, and providing context to news media (Wang, 2017). Facilitated primarily through undergraduate courses at Washington State University Vancouver, Digipo builds students' web literacy skills as fact checkers (Caufield, 2017a) and has partnered with Hypothes.is to create a "toolkit" for fact checking (Udell, 2017). This toolkit integrates OWA practices into issue-specific wiki-pages (i.e. about voter suppression) so that readers can gather together annotations with the same issue tag from across multiple primary sources, arrange timelines of annotations from multiple sources with auto-assigned date tags, and create hyperlinked footnotes whereby cited evidence connects to annotated quotes in the context of original sources. This repertoire of practice demonstrates how students' use of OWA can establish evidence-based connections across texts and contexts, contributing to a healthier web information environment (Caufield, 2017b).

4 Significant Challenges and Conclusions

Communities of practice will continue to spark interest-driven learning via OWA. A review of the web annotation literature – accompanied by related developments in open education and learning analytics – suggest three significant research challenges that may influence the continued use of OWA among academic communities of practice that span formal and informal learning contexts.

   Connecting OWA with the study of annotation in formal education settings. Literature about annotation and learning has primarily examined the acquisition of academic skills and domain-specific knowledge in K-12 and post-secondary settings (i.e. Castek, Beach, Cotanch, & Scott, 2014; Sun & Gao, 2017). For example, Novak and colleagues' (2012) literature review of social annotation use in higher education identified a need to further study changes in students' annotation practices over time, as well as the relationship between student annotation and educator instruction. Much of this literature appears disconnected from developments in open technologies and practices associated with OWA. This report has defined and described how OWA mediates learning activities among communities of practice that thrive outside of, though may be connected to, classroom settings. To bridge this gap between literatures and learning environments, future research should connect the emerging role of OWA in communities of practice with studies of annotation in formal contexts.

   Researching OWA as relevant to the development of OER and OEP. Assessments of educational openness note that a strategy primarily favoring free content is an insufficient means of creating more equitable learning futures: "Openness in education is not a movement for the emancipation of resources, but of people and practice" (Havemann, 2016, p. 6; see also Diemann & Peters, 2016). This report details an emerging sociotechnical infrastructure for OWA that researchers may draw upon to study both OER and OEP. Similar to the ways in which open data have been accessed and utilized as OER (Atenas & Havemann, 2015), how might the interoperable architecture and licensing permissions of OWA position Hypothes.is annotation layers as OER that can travel across texts and contexts? As for OEP, how might

the five previously noted OWA learning practices bolster the design of sustainable and vibrant public knowledge commons associated with open pedagogy (i.e. DeRosa & Jhangiani, 2017)?

    Examining OWA metadata and data as forms of learning analytics. It is not uncommon for learning analytics researchers to utilize annotation practices or tools as a means of generating data about learners and their interactions with technology (i.e. D'Mello, 2017; Pardo, Poquet, Martínez-Maldonado, & Dawson, 2017). While annotations can provide evidence of external thinking, like "metacognitive traces" (Winne, 2017), learning analytics researchers have yet to widely embrace open platforms and data (a notable exception is DBpedia Spotlight; see Mendes, Jakob, García-Silva, & Bizer, 2011). OWA platforms like Hypothes.is make available both open annotation metadata (i.e. timestamps, tags) and data (i.e. multimodal content) that can be studied as forms of learning analytics, whether in formal classroom or informal settings. Furthermore, Hypothes.is' advocacy for a standardized annotation data model should strengthen researchers' capacity to collect and analyze open data about learning across multiple platforms and diverse learning environments.

References

AUTHOR. (2017). BLINDED FOR REVIEW.

BLINDED & AUTHOR. (2017). BLINDED FOR REVIEW.

AUTHOR & BLINDED. (2018). BLINDED FOR REVIEW.

Almas, B. (2017). Perseids: Experimenting with Infrastructure for Creating and Sharing Research Data in the Digital Humanities. *Data Science Journal*, *16*.

Atenas, J., & Havemann, L. (Eds.). (2015). *Open data as open educational resources: Case studies of emerging practice*. London, UK: Open Knowledge, Open Education Working Group.

Berners-Lee, T. (1989). *Information Management: A Proposal*. Retrieved from https://www.w3.org/History/1989/proposal.html

Bush, V. (1945). As we may think. *The Atlantic Monthly*, 176(1), 101-108.

Castek, J., Beach, R., Cotanch, H., & Scott, J. (2014). Examining middle-school students' uses of Diigo annotations to engage in collaborative argumentative writing. In R. Anderson & C. Mims (Eds.), *Handbook of research on digital tools for writing instruction in K–12 settings* (pp. 80-101). Hershey, PA: IGI Global.

Caufield, M. (2017a). *Web literacy for student fact-checkers*. Montreal, QC: Michael Caufield.

Caufield, M. (2017b). Info-environmentalism: An introduction. *EDUCAUSE Review* 52(6), 92-93

Cillizza, C. (2015, October 7). How annotation can save journalism. *The Washington Post*. Retrieved from https://www.washingtonpost.com/news/the-fix/wp/2015/10/07/why-i-believe-annotation-is-the-future-of-journalism/

Climate Feedback. (2017). *About*. Retrieved from http://climatefeedback.org/about/

Dean, J., & Schulten, K. (2015, November 12). Skills and strategies: Annotating to engage, analyze, connect and create. *The New York Times*. Retrieved from https://nyti.ms/2iGgLkl

Deimann, M., & Peters, M. (Eds.). (2017). *The philosophy of open learning: Peer learning and the intellectual commons*. New York, NY: Peter Lang.

DeRosa, R., & Jhangiani, R. (2017). Open pedagogy. In E. Mays (Ed.), *A Guide to Making Open Textbooks with Students* (pp. 6-21). Montreal, QC: Rebus Community.

DeRosa, R., & Robison, S. (2017). From OER to open pedagogy: Harnessing the power of open. In R. Jhangiani & R. Biswas-Diener (Eds.), *Open: The philosophy and practices that are revolutionizing education and science* (pp. 115-124). London, UK: Ubiquity Press.

D'Mello, S. (2017). Emotional learning analytics. In C. Lang, G. Simens, A. Wise, & D. Gasevic (Eds.), *Handbook of Learning Analytics* (pp. 115-127). Society of Learning Analytics Research.

Goos, M., & Bennison, A. (2008). Developing a communal identity as beginning teachers of mathematics: Emergence of an online community of practice. *Journal of Mathematics Teacher Education*, 11(1), 41-60.

Havemann, L. (2016). Open educational resources. In M. A. Peters (Ed.), *Encyclopedia of Educational Philosophy and Theory*. Singapore: Springer Singapore.

Kennedy, M. (2016). Open annotation and close reading the Victorian text: Using Hypothes.is with students. *Journal of Victorian Culture*, *21*(4), 550-558.

McNutt, M. (2014). More science in the classroom. *Science*, 346(6212), 895-895.

Mendes, P., Jakob, M., García-Silva, A., & Bizer, C. (2011). DBpedia Spotlight: Shedding light on the web of documents. In C. Ghidini, A. Ngomo, S. Lindstaedt, & T. Pellegrini (Eds.), *Proceedings of the 7th International Conference on Semantic Systems* (pp. 1-8). New York, NY: ACM.

Novak, E., Razzouk, R., & Johnson, T. E. (2012). The educational use of social annotation tools in higher education: A literature review. *The Internet and Higher Education*, *15*(1), 39-49.

O'Reilly, C., Iavarone, E., & Hill, S. L. (2017). A framework for collaborative curation of neuroscientific literature. *Frontiers in Neuroinformatics*, *11*(27), 1-16.

Pardo, A., Poquet, O., Martínez-Maldonado, R., & Dawson, S. (2017). Provision of date-driven student feedback in LA & EDM. In C. Lang, G. Simens, A. Wise, & D. Gasevic (Eds.), *Handbook of Learning Analytics* (pp. 163-174). Society of Learning Analytics Research.

Perrin, C. (2017, May 24). Climate Feedback accredited by the International Fact-Checking Network at Poynter. Retrieved from https://climatefeedback.org/climate-feedback-accredited-international-fact-checking-network-poynter/

Revkin, A. (2016, May 3). Scientists build a hype detector for online climate news and commentary. *The New York Times*. Retrieved from https://dotearth.blogs.nytimes.com/2016/05/03/scientists-build-a-hype-detector-for-online-climate-news-and-commentary/

Robbins, T. (2017). Case study: Expanding the open anthology of earlier American literature. In E. Mays (Ed.), *A Guide to Making Open Textbooks with Students* (pp. 61-74). Montreal, QC: Rebus Community.

Sun, Y., & Gao, F. (2017). Comparing the use of a social annotation tool and a threaded discussion forum to support online discussions. *The Internet and Higher Education*, *32*, 72-79.

Udell, J. (2017, January 17). A Hypothesis-powered toolkit for fact checkers. Retrieved from https://hypothes.is/blog/a-hypothesis-powered-toolkit-for-fact-checkers/

Wang, S. (2017, April 11). This "Wikipedia for fact-checking" by students makes more room for context and origins of claims online. *Nieman Journalism Lab*. Retrieved from http://www.niemanlab.org/2017/04/this-wikipedia-for-fact-checking-by-students-makes-more-room-for-context-and-origins-of-claims-online/

Web Annotation Working Group. (2017). What are web annotations? In *Web annotation working group*. Retrieved from https://www.w3.org/annotation/

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge, UK: Cambridge University Press.

Wenger, E. (2001). *Supporting communities of practice: A survey of community-oriented Technologies*. Retrieved from https://guard.canberra.edu.au/opus/copyright_register/repository/53/153/01_03_CP_technology_survey_v3.pdf

Whaley, D. (2017, February 24). Annotation is a now a web standard. Retrieved from https://hypothes.is/blog/annotation-is-now-a-web-standard/

Winne, P. (2017). Learning analytics for self-regulated learning. In C. Lang, G. Simens, A. Wise, & D. Gasevic (Eds.), *Handbook of Learning Analytics* (pp. 241-249). Society of Learning Analytics Research.

Yang, S. H. (2009). Using blogs to enhance critical reflection and community of practice. *Journal of Educational Technology & Society*, 12(2), 11-21.