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Close Reading of Science Texts with Online Annotations

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Abstract: Making annotations is a major technique to investigate the structure and the central ideas of a complex text. In this paper we present an intervention, where undergraduate physics students have been using online annotations to identify and discuss argumentative problems in science texts. Based on the positive results we are planning to apply online annotations to a greater extent.

Keywords: online annotations, close reading, critical thinking, hypothes.is, physics, philosophy

1. Introduction

Online annotations, i.e. annotations directly added to electronic texts, have been pioneered since the early 2000s (Glover Xu and Hardaker, 2007). Those annotations nowadays include highlighting of the original text, glossing of text passages and adding discussion threads directly to the original text. Furthermore, the annotations can be private, public or restricted to a defined group of users. Sharing annotations with peers and teachers is one of the major assets of online annotations (Jones, 2014). Compared to threaded discussion forums, the comments made via online annotations turn out to be more context specific and lead to a more focused discussion (Sun and Gao, 2014). When closely analyzing a text, online annotations, thus, seem to be the preferred method.

A large body of research on learning benefits resulting from online annotations in different educational areas is now available, e.g. Kennedy (2016) for literary studies, Jensen and Scharff (2014) for philosophy, and Tseng, Yeh and Yang (2015) for foreign language acquisition.

With the introduction of online annotations, we wanted to teach and to promote close reading of science texts, especially texts dealing with the philosophy of science. In the past, we have noticed that a great number of our students are lacking techniques to accurately deal with complex argumentative texts. According to Brummett (2010) close reading involves "the mindful, disciplined reading of an object (i.e. text) with the view to a deeper understanding of its meaning". The main approach of close reading consists in determining which argumentative claims are the most important and how they fit together to support the author's main ideas. Close text reading, especially focusing on non-narrative complex science texts, supports students to engage more easily in critical thinking and problem solving while developing their communication and collaboration skills (Cummins, 2013, Lapp et al., 2013).

Johnson, Archibald and Tenenbaum (2010) already reported on the benefits of online annotations to foster general reading comprehension skills. Our aim was to check if these findings are consistent within a close reading setting and if our students are willing to adapt online annotations as part of their learning techniques.

2. Instructional Setting

Within the physics curriculum at ETH Zurich we are offering a first-year elective course "Philosophical Reflections on Physics II" which critically evaluates topics from electrodynamics against a broader historical and philosophical/systematic background. As a major learning objective of this course,

students should be able to critically evaluate different topics and approaches in physics. They should also be enabled to communicate their insights to peers from other disciplines and fields. Part of the weekly assignment consists in reading and discussing online an original science text related to the topic that is to be covered in-class. In the past, we have noticed that students experience difficulties in accurately reading these texts. For this reason, in 2017, we have introduced an extra two-week module focusing on close reading. Part of this module is a web annotation tool added to an instructional unit on close reading. Two philosophical science texts were made available in the annotation tool for training purposes. During the two-week run of the module, students were invited to use the annotation tool and to submit at least one online annotation or a reply to an existing annotation.

We have chosen hypothes.is (https://hypothes.is) as annotation tool (Figure 1). Hypothes.is is free of charge and offers an easy to use interface with flexible options for private, public and group annotations. The annotation system can easily be embedded in a WordPress (https://wordpress.org) or Moodle (https://moodle.org) environment. It is developed and maintained by a non-profit organization and has a clear commitment to educational purposes.

The course included 6 plenary in-class sessions as well as 6 monitored face-to-face discussion meetings in fixed groups (5-11 participants). In the first week, students got an online introduction to close reading and had to apply close reading to a selected text via hypothes.is. The task was kept rather simple in the way that students should identify problematic argumentative statements and explain their choice. In addition, students were invited to comment on annotations provided by other students. The following discussion meeting focused on the annotations and comments that students had provided online. We repeated this procedure a couple of weeks later with a second close-reading text.

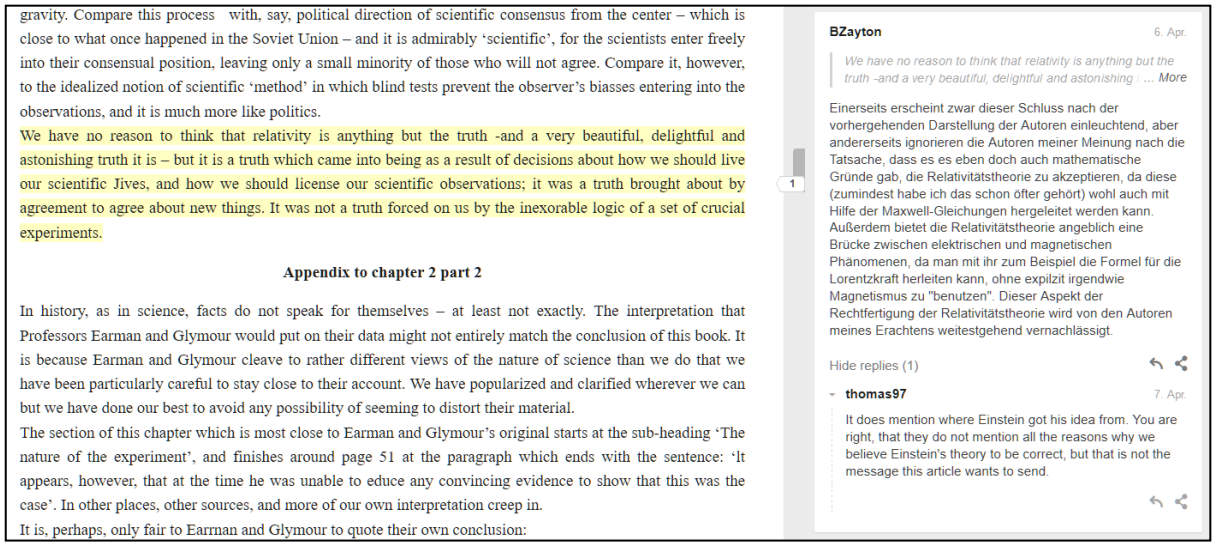

Figure 1. Screenshot of the annotation tool hypothes.is (right) embedded in a WordPress environment (left).

3. Results and Discussion

29 out of 32 students made use of the annotation tool and submitted a total of 68 annotations plus 21 replies to existing annotations. We asked the students if they consider online annotations helpful to understand the texts. 58% answered positively, while 17% did experience only a marginal comprehension gain, the remaining 25% were undecided. Online annotations as a tool to work with texts was highly appreciated (Table 1). All students agreed that online annotations simplify discussions related to texts. With an average count of 58 words, students provided a rather substantial body of annotations and the instructors noticed a considerable increase of the discussion quality (Table 1). To sum up, students have adapted online annotations as a valuable tool for reading and discussing texts, and they have largely met the requirements linked to close reading.

We decided to adopt this group of the discussion meetings to the close reading module and configured the annotation tool to make annotations visible only at the group level. Public annotations, i.e. annotations visible to the whole class, were available as well. 28% of the annotations were put in the public area, probably by negligence. Group annotations and especially the engendered discussions turned out to be more appropriate for our setting.

Table 1: Selected comments from students and instructors concerning online annotations (translated from German).

Students: *hypothes.is is an awesome tool that facilitates the interaction with text comments substantially.*
Instructors: *Students reported that online annotations are extremely helpful to prepare the discussion meetings and we as instructors were positively surprised by the quality and nature of the annotations.*

According to data privacy regulations, we were not allowed to use the annotations for grading purposes. The third-party organization hypothes.is stores the annotations on external servers, which are out of our control. This violates our legal directions concerning archiving and maintaining students' performance data. Furthermore, students have to register for hypothes.is by providing a valid email address. With regard to personal data protection, we cannot force students to enter this registration process. Those legal restrictions considerably curtailed our options and we could offer the online annotation functionality only as an optional feature. Students, however, did not feel worried about these concerns. Nevertheless, we have to work out a legal solution if we want to use online annotations at a larger scale. We are presently engaged in negotiations with hypothes.is.

4. Conclusion

The results from our pilot intervention on promoting close reading with an online annotation tool look promising. Students have adopted the tool and were able to meet the instructional goals at a very satisfying level. In the future, we are planning to extend the use of online annotations and to study the learning benefits of online annotations related to close reading in more detail.

References

Brummett, B. (2010). *Techniques of close reading*. Thousand Oaks, CA: Sage.

Cummins, S. (2013). *Close reading of informational texts: Assessment-driven instruction in grades 3–8*. New York, NY: Guilford.

Glover, I., Xu, Z., & Hardaker, G. (2007). Online annotation - Research and practices. *Computers & Education, 49(4)*, 1308-1320.

Jensen, M., & Scharff, L. (2014). Using E-Book annotations to develop deep reading. *Journal of Teaching and Learning with Technology, 3(2)*, 83 - 86.

Johnson, T. E., Archibald, T. N., & Tenenbaum, G. (2010). Individual and team annotation effects on students' reading comprehension, critical thinking, and meta-cognitive skills. *Computers in human behavior, 26(6)*, 1496-1507.

Jones, J. (2014). There Are No New Directions in Annotations. In J. Dougherty and T. O'Donnell (Eds), *Web Writing: Why and How for Liberal Arts Teaching and Learning* (pp. 263-274). Ann Arbor: University of Michigan Press.

Kennedy, M. (2016) Open Annotation and Close Reading the Victorian Text: Using Hypothes.is with Students. *Journal of Victorian Culture 21 (4)*, 550-558.

Lapp, D., Grant, M., Moss, B., & Johnson, K. (2013). Students' close reading of science texts. *The Reading Teacher, 67(2)*, 109-119.

Sun, Y., & Gao, F. (2014). Web annotation and threaded forum: How did learners use the two environments in an online discussion? *Journal of Information Technology Education: Innovations in Practice, 13*, 69-88.

Tseng, S.-S., Yeh, H.-C., & Yang, S.-H., (2015) Promoting different reading comprehension levels through online annotations, *Computer Assisted Language Learning 28(1)*, 41-57.