

Bridging Public Discourse and Knowledge Building Discourse in Science Classrooms With the IdeaMagnets Tool

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Abstract: We designed the IdeaMagnets tool to bridge Knowledge Forum, an established knowledge-building environment, with the open web via web annotation. With the tool, we conducted a classroom intervention in science classes where students studied energy in connection with public discourse on the *Green New Deal*. Preliminary findings suggested that students developed a culture of working with public sources via the IdeaMagnets tool and incorporated their collective web annotations to improve ideas in Knowledge Forum. This work has strong implications for the design of future knowledge-building environments.

Introduction

How can we engage youths in building knowledge relevant to public discourse on vital issues such as climate change and poverty? To what extent can we bring knowledge practices essential for knowledge creation to students' engagement with public discourse? This paper introduces a design research project named IdeaMagnets that attempts to explore these two questions. In this poster, we describe the tool design and report initial findings from an intervention conducted in five science classrooms.

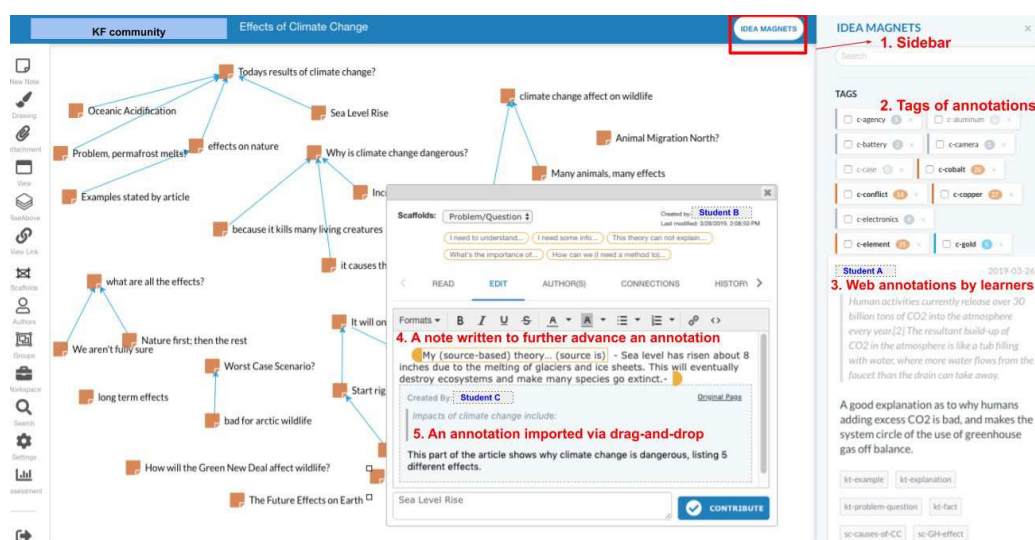


Figure 1. The IdeaMagnets sidebar (right) aggregates web annotations from the community and allows students to filter/search annotations by tags/keywords and drag annotations into KF for further discussion (left).

The IdeaMagnets tool

The IdeaMagnets project aims to advance Knowledge Building (KB; Scardamalia & Bereiter, 2006) by forging a deeper connection between classroom discourse with the public sphere. As an integrated system of theory, pedagogy, and technology, KB aims to “refashion education in a fundamental way, so that it becomes a coherent effort to initiate students into a knowledge creating culture” (Scardamalia & Bereiter, 2006, p. 97). Central to KB is to involve students in solving authentic problems by continually improving their own ideas. While the main KB environment—Knowledge Forum (KF)—is successful, novel technologies are needed to tap into new modes of connectedness, participation, and expression. We conjecture that by creating new ways of linking student work with public discourse, knowledge building can become even more personally relevant, achievable, and pervasive.

The IdeaMagnets tool responds to the call by creating a knowledge infrastructure that couples a private KF space with the open web space. Ideas are “pulled” from various web spaces to form larger knowledge structures to give birth to promising and big ideas in KF (Chen, Scardamalia & Bereiter, 2015); hence the metaphor of “idea magnets.” Informed by iterative co-design workshops participated by teachers and researchers, the tool was designed to include two components:

(1) *A collaborative web annotation system based on Hypothes.is.* Using a custom setup of Hypothes.is—an open-source web annotation tool—a student can annotate any web document with reflective texts and contribute these annotations to their private/protected community (see <https://hypothes.is/>).

(2) *IdeaMagnets as a KF feature that queries and imports Hypothes.is annotations.* While Hypothes.is allows threaded comments, KF provides unique affordances for continual idea development. Via IdeaMagnets, students can have direct access to their community's annotations within KF; they can index, filter, search, and dynamically import annotations into KF for further discussion (see Figure 1).

The pilot study

With the IdeaMagnets tool, we conducted a classroom pilot in five 9th-grade science classes of an urban public school in the US. Students in these classes ($n = 97$) were taught by the same teacher who had been using KF for more than five years. At the time of this study, students were already familiar with KB, KF, and Hypothes.is.

During the pilot, the classes worked on a curriculum unit about energy and energy sources. With the *Green New Deal* (GND) trending in the news, the teacher situated students' work within public discourse on this highly contested topic. During a period of four weeks, students were asked to (a) identify authentic knowledge problems to which GND alludes, (b) formulate problems in groups, (c) annotate information on the web while seeking to understand and solve these problems, and (d) engage in evidentiary reasoning on KF using annotations.

To investigate students' use of IdeaMagnets, we posed two research questions: (a) In what ways did the use of web annotation facilitate students' sense-making of public discourse? and (b) In what ways did IdeaMagnets encourage students to connect public discourse with their classroom discourse? To address these questions, we collected and coded student interviews, fieldnotes, and software system logs for salient patterns.

Findings and conclusions

During the pilot, 57 students (59%) used Hypothes.is to engage with public discourse and news articles on topics such as causes of climate change and alternative energy sources. Based on interviews, students used web annotation to collect information and take notes when reading online articles. Besides these surface-level use cases, student also used web annotation to facilitate knowledge building at both the individual and community levels. Some students intentionally used a diverse set of tags to increase searchability of their annotations and thereby benefit their class' collective efforts. These students demonstrated a sense of community when annotating public sources and viewed individual annotation as a new way to contribute to community ideas.

In terms of connecting public discourse with their classroom discourse, all the students used the IdeaMagnets feature to review and filter annotations in KF. 33 students (34%) imported web annotations into their KF posts during the final week of this pilot. During interviews, students shared that IdeaMagnets helped them grapple with a diverse pool of ideas that were grounded in public discourse. Some students developed sophisticated tag-based search strategies to filter this pool of community annotations. When introducing specific annotations into KF, some students also enjoyed integrating multiple ideas and making justified claims based on public sources. Some students found the process of utilizing this pool of community annotations encouraged them to add more evidence to their knowledge base by seeking more web materials. Interestingly, no matter whether students used or did not have enough time to import annotations via IdeaMagnets, they acknowledged that their group's use of IdeaMagnets was helpful in tackling their group problems.

In conclusion, preliminary findings from data analysis provided a glimpse into the ways in which students navigated their discourse spaces and constructed understanding based on collective sensemaking of public discourse. Discourse patterns revealed from student interviews implied the emergence of a classroom culture of annotating public sources and intentionally using sources to advance ideas. Future research will seek to deepen this preliminary analysis, explore pedagogical strategies to integrate IdeaMagnets in classrooms, and refine the current technology design. and identify, explore and seek to solve these problems

References

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