Calming "Internet Arguments" with Design.

ABSTRACT

"Internet arguments" are refer to users exchanging heated comments online. However, argumentation can also be beneficial for exchanging ideas on a topic with conflicting information. This is the situation with what Horst Rittel refers to as “wicked problem,” whereby solutions to problems are complex due to conflicting information. To assist discourse surrounding wicked problems, scholars created Computer Supported Argument Visualizations (CSAV). This exploratory pilot gathered user insight on when people prefer argumentation tools by asking participants to debate the complexities of Climate Change online. The results in this pilot study suggests that CSAVs for more formal argumentation might assist science journalism students with developing more informed opinions on the subject of Climate Change.

INTRODUCTION

“Internet arguments” might repel a user-base from engaging with one another. While Internet arguments can be unproductive, the process of *argumentation* is a fundamental component in communication theory, logic, and important for collaborative critical-thinking. The purpose of this pilot was to understand how different web design approaches could assist students with writing articles about Climate Change. The results of the study are not a comparison of web designs, but an exploration of how the different interfaces complement each other. More specifically, due to the disproportionate focus in the literature on discussion threads and the brevity of this abstract, this pilot explores at which point in a task process the interface of a Computer Supported Argument Visualizations (CSAV) become useful.

VISUALIZATION DIFFERENCES BETWEEN CSAVs AND THREADS

The more common interfaces used for social media communication tend to be traditional linear visualizations. For example, the Facebook feed, Twitter feed, and article comment sections (i.e., often referred to as "threads") expand online discussions via the vertical axis of a webpage. For example, the vertical scrollbar is a commonly feature used by these social networks, as oppose to the horizontal scrollbar. A common feature of these type of social networks is that they utilize a visualization commonly referred to as discussion “threads” where a user follows a discussion from the top page and then reads downwards to the bottom of the page. Because of the design of the thread, the user is rarely expected, if even allowed, to scroll sideways through a discussion thread.

By definition, discussion threads are limited to the metaphor of a thread. However, a thread is not a perfect metaphor for how discussion take place. There is not a one-to-one relationship with a face-to-face group discussion and a piece of thread. A thread only represent a sequential order of discussion, but discussions are not always sequential, but can occur in parallel between different group members simultaneously.

The implication of the CSAV design is that whereas a vertical list requires some form of hierarchy, such as the chronology of comments, the horizontal expansion challenges the hierarchy. Both readers and commentators may question the underlying assumptions of any comment in the hierarchy and disrupt the vertical order of communication at any point in a hierarchy [Figure 1].

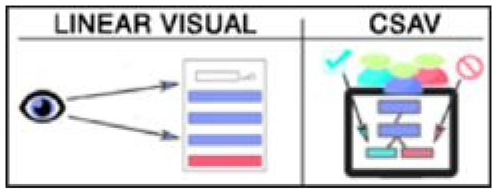

Figure 1 A Hierarchical Visualization can Undervalue a Counterpoint (Red Box) while a CSAV can Contextualize it.

CSAVs were found to work best for specialized tasks, such as students collaborating on science topics or politicians debating government policy. Over the course of four months, this abstract built software to test methods of addressing the need for a computer-supported argumentation tool when it comes to science journalism students discussing climate change issues [Figure 2].

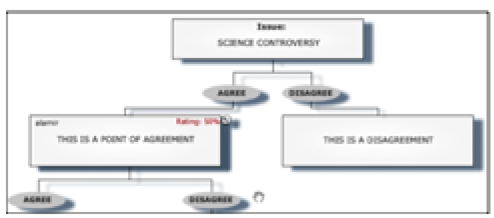

Figure 2 Demo Screenshot of Web Application

This study asked “When student groups are writing about an issue, such as Climate Change, do CSAVs become useful for online discourse? If so, at which point in a student’s work task does a CSAV become more useful than other interface designs?”

Literature Review

The Internet is becoming the primary method the public informs themselves about science topics (“National Science Board (2014) Science and Engineering Indicators,” 2014). However, certain science topics provide conflicting information. There is a class of problems known as “Wicked Problems” that are near impossible to solve due conflicting or complex information (Rittel, 1973). Originally, these were the type of complex problem that troubled scientists. In fact, the term was coined at a NASA funded meeting where researchers were trying to transfer space research to urban problems. Beginning with Rittel (1973), there are a number of scholars who think that the best way to begin addressing these problems is through some form of "argumentation" and dialogue mapping (See: Conkin (2006) Dialogue Mapping). These dialogue maps are the precursors to CSAVs (Shum, 2003).

It is important for Information Scientists to continue to explore how the medium of the Internet can affect how we learn about science. In the past, Information Scientists found the structure of technology impedes how it is used (Bromme & Stahl, 2002; Fogg, 2003; Höchstötter & Lewandowski, 2009; Hutchins, 1995). A user design that makes information less accessible can create unwanted cognitive biases in science communication. For example, a user's cognitive biases are largely influenced by the information that dominates a hierarchical list to the detriment of alternative perspectives (Epstein, Robertson, Lazer, & Wilson, 2017; Novin & Meyers, 2016). It is important to come up with methods that can counter these cognitive biases. One possible way to reframe the hierarchical visualization is by using CSAVs.

CSAVs show some success with assisting groups map out the points in debates (Andriessen, Baker, & Suthers, 2003). Due to their ability to "map" points by different people, CSAVs can be used in ways that discussion "threads" can not (Renton, 2006; Shum, 2003). Generally, the maps resemble link and node maps. The maps creates a hierarchy of an argument with adjacent counter-points (i.e., as oppose to a list of comments). In the past, there were several different types of CSAV's, most notably "Argnoter" by Xerox, that showed promising results (Renton, 2006; Shum, 2003).

A challenge for this project was to better understand where a CSAV can be placed in the process of student's work task, if they wish to write about a wicked problem, such as climate change.

Methods

The pilot involved 14 senior science journalism students over the course of a semester. Science journalism students were selected because their syllabus required a background in balancing scientific evidence with government policies and public discourse. In addition, if the pilot proved to be successful it would inform a future study using CSAVs with professional science journalists. On a weekly basis, students were asked to debate Climate Change issues face to face in groups of 4 in the classroom. Outside of the class, students were also informed they could use a blog's commenting system (the discussion thread) and a CSAV to communicate topics. However, students were also informed neither platforms were mandatory. During the four months, students also provided feedback on which features were useful and made feature requests. Throughout the project, participation on the different platforms was always voluntary and participants were informed that they may submit their opinions on the application's usefulness, ideas, and/or bug reports at any time.

The Logic Behind the Design for the CSAV

One of the goals for the CSAV was to introduce it seamlessly in a journalist's already existent story production process. This meant creating a web application with a low learning curve (2 minutes of explanation) that would achieve the goal of countering biases.
The overall goal required from the CSAV for this project was to 1) provide a way for students to break up the hierarchical visualizations they encounter in a visualization to reduce cognitive biases, 2) provide a balanced visualization of information so that multiple perspectives are represented, and 3) provide argumentation logic to falsify inaccurate summaries.

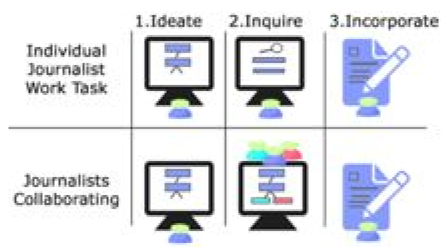

Figure 3 Introducing CSAV into the Student Writing Task

The Science Controversy and Work Task

The students were allowed to write on any topic related to climate change and to use the CSAVs to discuss the topics. They were never instructed to report on the controversies. Prior to writing the article, students were asked to use the CSAV to ideate a potential story skeleton for their story. Students were asked to input the main point and their premises in the map. The last step on the CSAV occurs when other participants collaborate by filling out a concept map by contributing information that either "agrees" or "disagrees" with the root premise. Afterwards, students wrote their article.

Data collection

The data collection occurred at four phases: 1) When groups discussed offline 2) When the online discussion are created, 3) when the final articles are created, 4) And in a post-questionnaire.

Offline Discussions

Observation of group members in groups of 4 discussing Climate Change offline. Here the topics of discussion were not as important as the behaviour and sequence of order during discussions.

Online Discussions

Throughout the four months, dialogue on the discussion threads and CSAV was collected. During the fourth month, students had a final project (a science article on Climate Change). At this point in the study, students were informed they can continue to use the online platforms for creating their final article, but were reminded that participation would be completely voluntary.

Maps were first compared using a concept map point-system. This method requires analyzing the geometry of the map by awarding points to each successive branching (Novak & Cañas, 2008). In addition, a CSAV analysis of how often students falsify or report “the other side” of a controversy was conducted.

Questionnaire

Using Creswell's “Principles of Questionnaire Construction” as a guide, a semi-open questionnaire documented the use, benefits, and criticisms of the work task (Creswell, 2014). The questionnaire focused on whether the concept maps were helpful, whether peer collaboration was helpful, and whether journalists would use this process of writing articles again.

Writing Output

The final writing output was a science article about the science controversy and was collected for a textual analysis. Themes were identified and the textual analysis looked for whether multiple-sides of science controversies are mentioned.

Results

Offline Discussions

Over four months of observing how participants discussed in face-to-face groups there were many examples of non-sequential discussions: 1) Sometimes there are parallel discussions in a group. During a lively group discussion between people, there are often two discussions occurring simultaneously in parallel. 2) Sometimes people in the group switch whom they are speaking to which, in turn, multiplies the number of discussion threads, so that they are not quite exclusive threads nor parallel. Still, other times, 3) People weave in and out of different discussions, even relating different points from each discussion together. In this situation, someone might find a point to be especially important to multiple discussions someone might even interrupt everyone else’s discussion to bring attention to it.

Online Discussions

Throughout the four months, dialogue on the discussion threads contained sparse discussion on topics (3 users made 3 comments). The CSAVs also showed moderate participation from 7students (albeit the CSAV contained more participation from the 7 users making 76 comments).

During the fourth month, students had a final project (a science article on Climate Change). At this point in the study, students were informed they can continue to use the online platforms for creating their final article, but were reminded that participation would be completely voluntary. The 7 students volunteered to continue to use the CSAV. No one chose to use the discussion threads.

Analysis of Maps

The students created root premises based on the angle they chose for their stories. They then proceeded to lay out the main points and citations to support or challenge their angle. During this process, journalists also contributed points to maps other than their own and shared their citations. They connected the nodes by relating them on the CSAV as concepts which agree/disagree with former concepts. A few times this generated debate within the maps. Citations were also shared between members. The citations often their points or inform other users on a related point. The maps grew both vertically and horizontally, which is an important feature because it removes false hierarchies. In other words, if it were to grow linearly in one direction, then it would be more difficult to justify its advantage over a list or SERP.

The students were then surveyed on their experience with using the CSAV. Table 1 reports their answers. One student did not take the survey.

Questionnaire Answers	CSAV Improved Knowledge on Subject	Would Use CSAV Again	Improved Final Article
Students	6/6	6/6	4/6

Table 1 Summary of Science Journalism Student Responses to Questionnaire on CSAV (N=6)

The majority of students confirmed that the CSAV approach increased the number of useful sources of information to draw from for their articles, improved their knowledge on their article's subject, and improved their articles overall. Importantly the majority also said it saved time. One of the more promising feedbacks was when all the participants said they would consider using it again.

Discussion

Controversial scientific topics, such as Climate Change, require comprehensive discussion. This pilot explored how to combine the work of student science journalists so that different sides of a scientific debate have a greater chance of being presented alongside the context of their scientific validity.

In science journalism, many forms of information ought to be shared, and thus the software's challenge was to fit them into a visual diagram with a low learning curving. This often meant decluttering the CSAV "features" to simple elements while maintaining argumentation principles. After four months of pilot testing, participants appreciated the software's ease of use and felt the CSCW approach helped their overall articles.

Visualizing the various interactions between users is difficult. Many social network discussion threads do not allow for these parallel or intertwined discussions to occur and expect user to start a new visual “discussion thread.” However, this might be asking for extra effort from group members. A separate discussion thread might risk alienating points from an overall discussion. If new discussion threads occur, then it still does not account for the three observed situations mentioned in the results: Sometimes people weave between different discussions. Sometimes people relate points from one discussion into a second discussion. And sometimes people feel a point is especially important and wish to interrupt everyone to bring attention to it.

In these cases, a discussion “thread” might not be the right way to visualize a discussion between people. It might make sense to consider the horizontal sides adjacent to a thread to make space for such discussions. Instead of discussion threads, we can think of them as discussion cloths, or discussion fabric. There are a few examples of non-vertical visualizations online that attempt such designs. For example, there are concept maps, decision-trees, flowcharts, and CSAVs that represent multiple concepts on both the vertical and horizontal axis and can expand in either direction.

This research builds on the scholarly work showing the effectiveness of group argumentation in science education. The results suggest that CSAVs are a useful line of scholarly inquiry to pursue further.

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