MindMargin: How Article-Adjacent Comments Challenge Our Opinions

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Abstract
Commenting systems are a popular means for facilitating conversation among readers online. Typically, comments are displayed below articles. However, the increasing prevalence of insulting and low-quality comments has motivated us to question the existing system. Supported by prior research in education, we hypothesize that article-adjacent comments have the ability to motivate people to consider others' opinions, even those contrary to their own. We present MindMargin, a platform that displays textually anchored comments on an horizontal infinite scroll. This system thus exposes users to a diverse and relevant array of opinions as they read.

Introduction
News pages, media sites, online shops, blogs, and social networks allow their users to provide content-related feedback with comments. For these users, online commenting holds a compelling promise: to share their views, to contribute their relevant knowledge, and to engage in lively, thoughtful discussion with each other. As political discourse online increasingly polarizes and generalizes individual political views, the prevailing opinion among researchers has been to present people with diverse perspectives in order to encourage more nuanced, independently reached views [4, 5, 7]. In light of this research focus, the promise of deep and thoughtful

online discussion becomes more relevant. However, because irrelevant and low-quality comments frequently crowd and dilute meaningful online conversations [3, 6], this promise remains unfulfilled.

We hypothesize that enhancing comment quality is only part of the challenge. Even high-quality comments have a limited influence on readers because of the collectively limited visibility of all comments. Commenting systems most commonly rest beneath, and detached from, the main content of modern websites. Compelling existing research has shown that this separation amplifies the reader's confusion of the comments [9]. The reader must use more cognitive effort to match information referenced in comments to the primary content when there is greater distance between the information [11]. This also encourages a cycle in which the reader is more likely to misinterpret or misreference the primary content, and comments become more error prone. This separation interferes with the transfer of information from the primary to secondary text [1, 2, 8]. It ultimately hinders the fluid facilitation of multi-reader discussions in the secondary content [10, 12].

An alternative, explored chiefly in educational settings [1, 2, 8, 10], is to present comments on the margin of the primary text, visibly linked to relevant sections of the text. Such anchored discussions improve conversation among readers of academic texts by making the context of the conversation clearer [1, 2, 8]. A study, which examined the placement of student- and teacher-generated annotations on students' comprehension of a text, found that students who saw and used annotations adjacent to the main text displayed a deeper understanding of the text than those who interacted with annotations placed at the end of the text [10].

We build on these insights to investigate whether placing user comments beside the primary text can encourage people to consider diverse perspectives when forming their individual opinions of an issue online. To enable an empirical investigation into this question, we have developed MindMargin, a system that exposes users to comments alongside the primary text as they read. The comments are anchored to relevant sections of the content in a minimally invasive design and are placed on an infinite horizontal scroll to reduce comment congestion.

We propose two hypotheses for MindMargin's effect on users, in contrast to the traditional vertical interface:

1. When presented with identical comments, users of MindMargin will develop more thoughtful and nuanced opinions of an article than users of a traditional vertical interface. Specifically, we expect users who interact with MindMargin to report more moderate stances on controversial issues.

2. Users of MindMargin will also report a more positive impression of the existing comments because MindMargin displays comments anchored next to the text. We expect that this comment placement will make the relevance of comments more apparent to users of MindMargin.

The results of our online study show that participants had significantly more positive impressions of the comments related to a controversial article when those comments were presented with MindMargin, as opposed to when those same comments were presented below the main article. Participants who used MindMargin also reported a more moderate stance on the controversial issue raised in the article than participants who interacted with the

Figure 1: The MindMargin system with the reference medium on the left and an adjacent commenting system on the right.

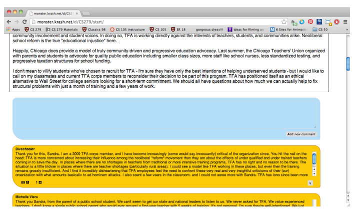

Figure 2: The traditional commenting system with a vertically ordered design.

traditional vertical layout interface. Although this difference was not yet significant, it provides sufficient evidence for us to pursue a larger-scale study.

MindMargin

We implemented two commenting systems. The first commenting system is MindMargin with anchored comments on a horizontal infinite scroll next to the reference medium (see Figure 1). The second commenting system is a traditional vertical interface (see Figure 2).

MindMargin is split into two sides: the primary content on the left and and an adjacent commenting system on the right. Comments are displayed in a horizontal infinite scroll. Thus, an unrestricted amount of comments can be linked to the reference medium. Navigation within the infinite scroll component can be performed via mouse-wheel interaction (either left/right or top/down scrolling with the same effect) or by adjustment of a slider on the bottom of the right split screen. While navigating through the infinite scroll, the reference medium remains fixed on the left. Similar to [11, 12], comments are anchored to the horizontal reference point of the primary content. We minimize disturbance by avoiding interactions with the primary text, as defined by [11], and using thin dotted lines for anchoring to the article's right edge. This design decision was motivated by MindMargin's inherently more visible and thus distracting interface than the traditional vertical system's.

Our implementation of the traditional vertical commenting system follows a vertically ordered design: The primary content appears first and on top of the commenting system that follows below. Navigation within the article as well as within the comments can be performed via top/down scrolling.

Experiment

We performed a between-subjects online experiment with young adults.

Participants. 106 online participants landed on our page for our user study and evaluation, of which 46 proceeded to begin and complete the study (30 female). 19 participants were randomly assigned to the Mind Margin condition and 27 to the vertical interface condition. Participants were recruited online through social media and college listservs. Participants were college students, aged 18 to 25, and 68% hailed from the local university. The self-reported reading frequency of online news among participants ranged from daily to almost never.

Experimental Conditions. The two conditions in our study were MindMargin and the traditional vertical interface. The article was selected on the basis of its opinionated nature and its relevance both in recent news and to our anticipated participant pool. We chose an opinion piece from our university's undergraduate publication, titled "Don't Teach for America.". Teach For America (TFA) is a non-profit organization that recruits recent college graduates to teach for two years in public schools.

The article already had over fifty comments by affiliates and non-affiliates of the university alike, from which we selected the top 39 comments as ranked by Disqus, the existing commenting system on the publication's website, to be used in our study. The same comments were used in both conditions. In the traditional vertical interface, the comments appeared in the identical order as ranked in the original article. In MindMargin, we anchored them to the article based on textual references, specific phrases, quotes, and relevant content in each comment.

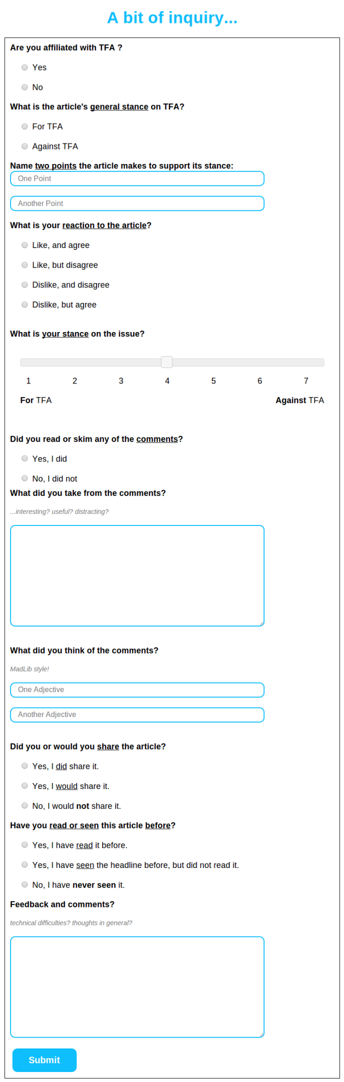

Figure 3: The post-experiment questionnaire for validation and stance quantification.

Tasks. To ensure that our results would be informative for the design of real-world commenting systems, we designed the experimental tasks to focus participants' attention on the content of the article. The study design did not emphasize that the evaluation of the commenting system was the object of the study, but this information was clearly communicated and disclosed in the consent form.

Participants were presented with an article and they were instructed to read the article and to anticipate a questionnaire that followed, but were not asked or required to interact with the commenting system. Once they completed reading the article, we asked them the general stance of the article – For TFA or Against TFA – and, in a free-text response, we requested two pieces of supporting evidence used in the article to verify their reading and comprehension of the article. All 46 participants gave correct and thorough answers to these verification questions. Participants were then asked to complete a post-experiment questionnaire (see Figure 3), which asked for their personal stance on the issue, whether they liked the article, and whether they agreed with the article. They were also asked to self-report whether they read the comments in the article and to provide two adjectives that described either their reaction to, or a description of, the comments.

To further incentivize participants to focus on the content of the article and reflect on the issue discussed therein, we used the following tagline to advertise the study: "Do you (really) think like a Harvard student?" and at the completion of the study, we provided them with feedback comparing their answers to the responses made by other Harvard students.

Procedure. Participants were given an initial questionnaire asking basic demographics and news reading frequency. Before being shown the article, they were also asked either to provide a username or pseudonym, or to remain anonymous. Participants were allotted 10 minutes to read the article. After 2 minutes, they were permitted to proceed to the questionnaire. The 2-minute delay was to ensure the reading of the article, and did not seem to prevent fast readers from moving too slowly, as the average reading time was 3 minutes 47 seconds.

Design and Analysis. We used a between-subject full factorial design with two factors and the interaction between them.

The two factors were: *Prototype* {"mindmargin" for the new horizontal interface MindMargin or "regular" for the traditional vertical interface}, and *Prior exposure to the article* {"read" if they have read or skimmed the article before, "seen" if they have seen the article but did not read or skim it, and "none" if they have neither read nor seen the article previously}. To compare conditions, we excluded 9 participants who reported not to have read the comments (5 MindMargin). In addition to commenting system design, there was no significant difference in gender, reading frequency, or other demographic information among excluded participants.

We analyzed two dependent variables. First, we computed *Stance Polarization (SP)*, which captured how far a participant's personal stance on the issue (on a scale from 0-Strongly For TFA to 100-Strongly Against TFA) was removed from the neutral stance (50).

Second, we measured *Attitude Toward Comments (ATC)*. As mentioned earlier, each participant who reported having read the comments was asked to provide two adjectives describing their reaction to the comments accompanying the article. We asked four independent

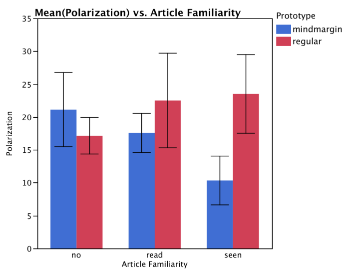

Figure 4: When using MindMargin, participants with prior exposure to the article reported less extreme stance.

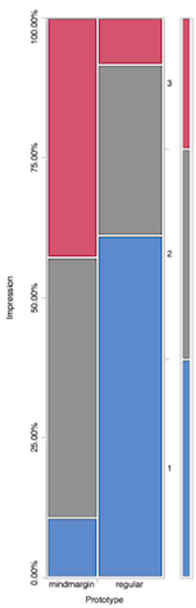

Figure 5: When using MindMargin, the majority of participants described the comments as positive (3) rather than neutral (2) or negative (1).

raters, blind to the experiment, to classify these adjectives using a four-bin classifier (“Positive,“ “Negative,“ “Neutral,“ and “Invalid“). We removed adjectives given two or more “Invalid“ classifications. For the remaining adjectives, we used the majority vote. Disagreements among raters were never between “Positive” and “Negative”. We were thus confident in using the resulting median encodings for the final classification of the specified adjectives.

We treated SP as a continuous variable and we analyzed it using analysis of variance. We treated ATC as an ordinal variable and we analyzed it using ordinal logistic regression.

Results

People who used MindMargin reported a less extreme SP ($m = 17$). People who used a traditional vertical interface reported a more extreme SP ($m = 27$). However, this difference was not statistically significant ($F_{1,40} = 1.16$, $p = .29$). We also tested for interaction between commenting system design and prior exposure to the article, and found that people who had prior exposure to the article had a more moderate stance using MindMargin than the traditional vertical interface. This effect is illustrated in Figure 4.

As illustrated in Figure 5, we observed a significant main effect of Prototype on ATC ($\chi^2_{1,N=64} = 16.55$, $p < .0001$). People who used MindMargin had a more positive than negative impression of comments (positive: 42.86%, negative: 10.71%, neutral/descriptive: 46.43%). People who used a traditional vertical interface had a more negative than positive impression of comments (positive: 8.33%, negative: 61.11%, neutral/descriptive: 30.56%). There was no significant or substantial effect of prior exposure to the article on ATC.

Discussion

The lower SP values among MindMargin users reveal that participants with MindMargin who had prior exposure to the article reported less polarized views to reading the article for a second read or glance. MindMargin users also had a significantly more positive impression of the comments.

The implications of these results are substantial. They suggest that MindMargin exposes readers to comments when they are most relevant to the reader, making the comments seem more engaging, thoughtful, and reliable. Since all participants were exposed to identical comments, we conclude that MindMargin readers consider the comments more substantial and ultimately consider others' opinions more seriously. Through greater exposure to diverse perspectives, MindMargin also motivates readers who had a prior opinion of the issue to consider opposing perspectives. As a result of this consideration, they are compelled to revise their own views of an issue to be more moderate. This is particularly compelling in light of the growing number of irrelevant, low-quality, and insult-ridden discussions, in which people's opinions are not taken seriously, on existing commenting systems. Because MindMargin forces readers to choose an appropriate anchoring place for their comments, it also makes it more difficult to leave inflamed comments.

However, there are limitations to our observations, since the results of our first hypothesis indicate that our trends are not yet statistically significant. This is chiefly a result of our sample size being not large enough. Another reason is the lack of a preliminary test in choosing a between-subjects methodology for our experiment. To address these limitations in subsequent research, we aim to expand the participant pool both in number and diversity. Additionally, we plan to use a within-subjects methodology, where we will ask participants for their stance on the article's issue prior to their reading of the article. We will subsequently observe the deltas in SP values.

In addition to these results, a MindMargin user gave us written feedback on their experience that suggests he/she took actions beyond the scope of reading and commenting article: "This article showed me a new perspective on TFA, which after doing research, I have realized I agree with." No similar feedback was received from participants with the traditional commenting system. While this is not enough to conclude that MindMargin motivated the participant to research the subject further, this nevertheless indicates that he/she, when exposed to the MindMargin interface, thought critically and independently about the issue discussed in the article.

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