More Evenly Distributed Participation Through Feedback on a Shared Display

Abstract
This paper explores the effect of providing feedback on the participation levels of individuals in a discussion on a shared display. I describe the prototype that I developed that uses Wizard of Oz techniques to capture and display participation data. I evaluate the merits of the feedback by collecting experimental data and point out interesting directions for future research.

Keywords
Feedback, shared display, participation, collocated collaboration, behavior.

ACM Classification Keywords
H.5.3 [Group and Organization Interfaces]: Evaluation/methodology, Organizational design; K.4.3 [Organizational Impacts]: Computer-supported cooperative work.

Introduction
In many discussions there are those who over-contribute and those who under-contribute. The latter might have interesting ideas to add to the discussion, but they are either unable to speak up because of those who are over contributing or because they hope to blend into the background.
My intuition is that a shared display that provides feedback regarding individual participation in a discussion will result in a more even distribution of participation. The display will make people more aware of their level of contribution and they can adjust accordingly. Additionally, under-contributors would find it more difficult to fly under the radar because their lack of participation is made more evident to the group. Thus goal of the shared display is two-fold: reduce the level or participation of over-contributors and encourage more participation from under-contributors.

Prototype
The prototype was built to run in a standard web browser and to be controlled using Wizard of Oz techniques. It consists of an input client webpage (see Figure 1), a server, and a display client webpage. The “wizard” has the ability to add people to the system at any point during the discussion. Once someone is in the system, the “wizard” is able to indicate when that person starts talking by clicking on their name and when they stop by clicking on their name again.

The server receives commands from the input client via Asynchronous Javascript and XML (AJAX) requests that are sent in real-time. The server logs all of the actions for later analysis and forwards them to the display client. The display client maintains a streaming AJAX connection with the server. It processes all of the incoming events and decides how to properly display them.

For the prototype, I developed two distinct methods of displaying the information received by the display client. Both methods are arranged such that each person is represented by a row on the display that contains his or her name. If someone is currently speaking, their row is highlighted in yellow to direct attention to them.

In the first display (see Figure 3), horizontal bars are drawn within a person’s row that correspond with his
Figure 3. Feedback display formatted using horizontal bars to indicate level of participation for individuals. Also sorts names from highest level of contribution to lowest. Used in first class with display.

Figure 4. Feedback display formatted using the height of the row to indicate the level of participation for individuals.
or her level of participation. The person who is currently participating the most would have his or her bar extend completely across the display while the bar for every other person would be some fraction of that. Additionally, the order in which names are displayed is sorted such that those who participate the most are displayed at the top of the display, which results in explicit ranking.

In the second display (see Figure 4), the height of the row for each person is adjusted to correspond with his or her level of participation. Therefore, those who participate the most take up the most space vertically on the display. A minimum height is maintained for those who do not participate much, so that they always remain visible on the display. The order is not sorted as in the first display in order to have less explicit ranking and also do to the fact that doing so was too visually jarring.

**Experiment**

I performed a within subjects experiment on the students in CS376 during the last four class periods of the quarter. The class begins with a lecture led by the professor followed by a student led discussion of the topic at hand. Students are encouraged to participate and add to the discussion at any point during the class.

I used the prototype for a total of four class periods, which had an average of fifteen students present at each class. The first two class periods acted as a control, in which the prototype was used to collect data, but the display was not visible to the class. For the third class period, I ran the prototype with the first display method that shows participation via a sorted list of names with horizontal bars. Finally, for the fourth class period, I ran the prototype with the second display method that adjusts the heights of people’s rows according to his or her level of participation.
Evaluation
Experimental data showed that the standard deviation of the average participation for each person in the discussion was lower with the display (16.4 seconds, see Figure 5) than without it (23.5 seconds, see Figure 5). The lower standard deviation is an indication that the distribution of participation is lower with the display. Also, comparing the participation levels of specific individuals with and without the display shows some interesting data (see Figure 6). People who had under-participated less without the feedback tended to participate more. Similarly, those who over-contributed with the feedback tended to contribute less with the feedback.

Results of an exit survey taken by ten of the subjects in the class found that 90% did not believe that the display affected their level of participation. As the display was meant to work in the background to accomplish its goal, it is promising that even while the data shows that participation changed, people were not consciously aware of it.

Conclusion
Feedback regarding the participation levels of individuals in a discussion may result in a more even distribution of participation. While this cannot be concluded for certain due to the limited scope of the experiment, results are promising that further studies could further support this idea. The most important conclusion may be that there is still much to research regarding participation feedback.

Future Work
For simplicity, participation was measured purely by the amount of time spoken by each person. However, this is not the most accurate measurement of participation, since actual contribution to a discussion and the time it took to do so can be very unrelated. In reality, someone who spoke for two minutes might have contributed less than someone who just said a few words. Different measures of participation, such as the number of times someone speaks, frequency of speaking, or a more qualitative measure could be used.

Figure 6. Average participation of individuals with and without feedback. Each point along the x-axis is an individual with their point on the blue line indicating their participation without feedback and the red line indicating their participation with the feedback.
to provide more valuable feedback.

Due to the short timeline for this project, I was only able to implement two methods of displaying the participation information. However, one could imagine countless other methods that might yield different results. For example, a more subtle display that only shows a person’s name when they are over contributing or under contributing might better encourage people to adjust their behavior.

Additionally, there are many evaluation axes that could be varied and studied in order to determine their effect upon the usefulness of the display. For example, many subjects complained that the display was too distracting, which hindered its ability to be a valuable resource. The distracting nature of the display may have been caused by how large it was. Thus, experiments that vary the size of the display may have interesting findings regarding the impact of the display’s size upon its utility.

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References

