Invoking Social Comparison to Improve Electronic Brainstorming: Beyond Anonymity

MORGAN M. SHEPHERD, ROBERT O. BRIGGS, BRUCE A. REINIG, JEROME YEN, AND JAY F. NUNAMAKER, JR.

MORGAN M. SHEPHERD is an Assistant Professor in the IS department at the University of Colorado at Colorado Springs. His research interests include technology support for distributed groups, applications for technology in the learning environment, and evaluating factors that affect the diffusion of technology in organizations. He received his Ph.D. in management information systems from the University of Arizona and B.S. in mechanical engineering from the University of Virginia.

ROBERT O. BRIGGS is a Research Fellow in the Center for the Management of Information at the University of Arizona. His research interests include the use of groupware to change and improve the dynamics of learning and the use of groupware to support geographically distributed teams. He received his Ph.D. in management information systems from the University of Arizona and B.S. and M.B.A. from San Diego State University.

BRUCE A. REINIG is a Researcher in management information systems at the University of Arizona. His research interests include the use of groupware to improve the learning process, diffusion of information technology, human–computer interaction, and management and social policies regarding information technology. He received his B.S. in business administration from Northeast Missouri State University.

JEROME YEN is an Assistant Professor in the Department of Information and Systems Management at the Hong Kong University of Science and Technology. His research interests include information economics, information retrieval, digital libraries, group and negotiation supports systems, artificial intelligence, and neural networks. He received his Ph.D. in systems engineering from the University of Arizona.

JAY F. NUNAMAKER, JR. See Guest Editors’ Introduction.

ABSTRACT: This paper presents a study of electronic brainstorming (EBS) that begins with theory building, tool development, and experimentation, and ends with practical guidance for facilitators and developers. The paper argues that social loafing impairs the productivity of EBS groups, and that social comparison is a way to decrease the effect(s) of social loafing. The literature on brainstorming productivity suggests that there is a correlation between the quantity of ideas produced and the number of high-quality ideas produced. By inducing social comparison with a graphical feedback tool and increasing the salience of that social comparison with facilitation techniques, we increased the productivity of EBS groups by 63 percent.
KEY WORDS AND PHRASES: electronic brainstorming, group creativity, group support systems, social loafing.

THERE ARE SOLID THEORETICAL REASONS TO BELIEVE that the productivity of electronic brainstorming (EBS) can be improved. Brainstorming is a process whereby participants generate as many new ideas as they can. Participants are encouraged to submit all ideas as they occur, regardless of quality, in the hope that even unconventional or impractical ideas will stimulate the thinking of other group members, leading to more good ideas than may have otherwise occurred. In EBS, participants contribute their ideas simultaneously and anonymously by typing into personal computers connected by a network. The system makes all contributions available to other members on their screens.

Nearly four decades ago, Osborn [22] introduced brainstorming as a structured technique to improve group problem solving. He reasoned that his rules—no criticism, quantity over quality, build on the ideas of others—would increase the productivity of idea generation by reducing evaluation apprehension (fear of negative assessment from other group members) and by increasing synergy (Figure 1).

More than eighty studies were subsequently published comparing Osborn’s brainstorming groups with nominal groups (the same number of individuals working alone, then combining their results) (e.g., [9, 16, 28]). None of these studies found the results Osborn expected. Despite Osborn’s rules, nominal groups tended to outperform brainstorming groups.

On the other hand, electronic brainstorming groups, working anonymously and in parallel, tend to outperform both manual brainstorming groups and nominal groups [4, 7, 12]. This paper briefly examines the research leading up to and following the development of electronic brainstorming. Social loafing, we argue, may occur during electronic brainstorming, and we present the results of two experiments that study this phenomenon. The first experiment examines the use of technology to induce social comparison as a means of reducing social loafing. The second experiment examines facilitation techniques to increase the salience of social comparison in an effort to further reduce social loafing. The paper concludes with a discussion of the implications of the findings for facilitators and developers, and with suggestions for future research into social loafing and social comparison in EBS productivity.

Theory

DIEHL AND STROEBE [9] DEMONSTRATED THAT PRODUCTION BLOCKING was a significant inhibitor to idea generation for traditional brainstorming groups (Figure 2). Production blocking occurs when something prevents verbalization of ideas as they occur. One may forget an idea while waiting for a turn to speak, or may devote attention to remembering an idea, becoming too distracted to generate new ideas [9, 21].

The losses from production blocking, free riding (slacking off and letting others
generate ideas), and evaluation apprehension appeared to outweigh any possible benefits from synergy in face-to-face brainstorming groups. Diehl and Stroebe [9] found small but statistically significant losses in brainstorming productivity from evaluation apprehension and free riding, and Collaros and Anderson [3] found that productivity varied inversely with evaluation apprehension (Figure 2). While Osborn's rule proscribing open criticism of ideas may have slightly reduced evaluation apprehension, it could not completely eliminate it. People still felt reluctant to disagree with those in authority or to risk the ridicule of their peers.

The advent of group support systems (GSS) offered new ways to overcome production blocking and evaluation apprehension. With GSS, all participants contribute simultaneously by typing their ideas into computers. The system immediately makes all contributions available to other participants on their terminals. Because nobody has to wait for a turn to speak, production blocking is eliminated.

The anonymity of electronic brainstorming eliminates evaluation apprehension. Anonymous members feel free to offer novel but poorly developed ideas, unpopular ideas, or politically risky ideas that might otherwise elicit negative responses or reprisals from peers or superiors [4, 5, 6, 21, 28].

Studies show that groups using GSS for electronic brainstorming tend to generate more unique ideas, and higher-quality ideas than groups doing manual brainstorming, and both electronically supported and manual nominal groups [7, 11, 20, 27]. Apparently, eliminating production blocking and evaluation apprehension permitted the benefits of synergy that Osborn posited (Figure 3). Connolly, Jessup, and Valacich [4]
demonstrated that the anonymity effect is independent of the parallel contribution effect. They also demonstrated that anonymous contribution eliminated the need for Osborn’s restriction on making critical comments about the ideas of others. Unlike identified brainstorming groups, anonymous EBS groups were even more productive when permitted to make both critical and supportive statements than when only permitted to make supportive statements [4].

Although anonymous brainstorming is demonstrably superior to identified brainstorming, anonymity may be a mixed blessing. A large body of social loafing research shows that individuals tend to expend less effort in group tasks than they do in individual tasks, unless their contribution can be specifically identified, or unless they believe that their contribution is critical to the success of the task [9, 14, 15, 18, 23, 24, 25, 26]. The social loafing phenomenon has been demonstrated in a variety of physical [18] and cognitive [23] tasks, ranging from tug-of-war to shouting to idea generation. Given that anonymity tends to promote social loafing in many tasks, one might expect individuals to exert less cognitive effort during anonymous EBS than during identified EBS. It may be that the demonstrated benefits of anonymous EBS are actually the net of two opposing effects of anonymity. The benefits of reduced evaluation apprehension may outweigh the losses from social loafing, but social loafing may nonetheless occur (Figure 4). If social loafing occurs during EBS, and if a way could be found to reduce it without sacrificing anonymity, it might be possible for EBS groups to become even more productive.

There is little empirical research to show whether social loafing occurs during EBS, and if it does occur, whether anything can be done to overcome it. However, social comparison has been shown to offset social loafing in studies of manual brainstorming sessions [23, 24]. Social comparison is a phenomenon wherein people match their rate of performance to the rate of the people working around them. Participants working in an environment where others are performing at a high level also tend to perform highly. Participants working in an environment where others are performing at a low level match the inferior performance rate [13]. Paulus et al. [24] demonstrated that they could improve the productivity of manual brainstorming sessions by inducing the group members to compare their own performance to an absent and mythical “average” group.
We reasoned that if participants engaged in anonymous EBS received real-time feedback about their performance compared with an imaginary “average” group, the social comparison effect might reduce social loafing. This line of reasoning led us to our first hypothesis:

**H1: Anonymous participants with a basis for social comparison with an absent “average” group will produce more unique ideas during electronic brainstorming than participants with no basis for social comparison.**

**Experiment 1. Social Comparison versus No Social Comparison**

To establish a basis for social comparison, we developed an electronic graph to be projected on a wall during EBS (Figure 5). The graph had three main features: real-time feedback, a reference baseline, and background-color changes. The real-time feedback feature displayed the cumulative number of lines of text the group had produced over time.

The reference baseline was a horizontal line in the middle of the graph. Participants were told that the reference baseline represented the performance level of an “average” group working on the same task. The tool allowed the experimenters to set the baseline to any value. The rest of the graph would automatically scale to the value of the baseline so that all participants were presented with nearly the same visual stimulus. The graph displayed as a red area below the baseline, and as a green area above the baseline.

The background color of the graph provided the participants with additional feedback about their performance. If they produced fewer than four lines of text in the previous minute, the background turned black. When they produced between four and eight lines of text in the previous minute, the background turned gray. If the group submitted more than eight lines of text, the background turned blue. The graph updated every fifteen seconds.

Several other features were designed to encourage participants to notice the graph while they were brainstorming. First, rather than simply adding another data point to
the graph every fifteen seconds, the entire screen cleared and the graph was redrawn, a process that took about one second. Thus, every fifteen seconds there was visible motion on the front screen. Second, if the update included a color change, the graph was redrawn twice to draw more attention. Third, when the graph reached the baseline, the tool produced a five-second display to attract attention to the event.

Participants

One hundred and eighty male and female students in four sections of an “Introduction to Computer Technology” course participated in the study for course credit. Participants were randomly assigned to groups of five, and each group was randomly assigned to a treatment.

Task

In a moderate-ambiguity variation on the School of Business task [29], participants in our study used the EBS tool from GroupSystems® to propose solutions for wicked problems in an imaginary school of business. Each participant was assigned to one of five roles: Associate Dean, President of the Student Council, President of the Alumni Association, Chairperson of the Faculty Council, and Vice President of Undergraduate Instruction. Each participant was given a packet of information about his or her assigned role. Each role had different information and each role had a vested interest in a different outcome.

The group faced a total of nineteen interrelated problems, such as declining budgets,
overcrowded classrooms, declining reputation, and faculty resignations. Solutions to any given problem tended to exacerbate other problems, and solutions favorable to one role tended to be unfavorable to another.

The School of Business task has several advantages in brainstorming research. First, this task is not controversial, nor does it require special knowledge not generally available to the participants, two factors identified as potential inhibitors to brainstorming activity [9]. Second, the task is complex enough to simulate real-world problem solving. Wood [30] defines task complexity in terms of three components: (1) products (deliverables), (2) acts (behavior required to create products), and (3) information cues (knowledge that allows actors to make judgments), and three types of complexity: (1) component complexity (number of acts and information cues needed to create products), (2) coordination complexity (the frequency, timing, and intensity of sequencing interactions required to produce products), and (3) dynamic complexity (the degree to which required acts and information cues change during the task). More complex tasks require more information, more coordination between activities, and involve more changes in requirements, and so place higher demands on attention resources than do simple tasks.

Task complexity should not be confused with cognitive difficulty. For example, Harkins and Petty [15] found that the social loafing effect only occurred during a cognitively easier idea-generation task, and disappeared when participants were engaged in a cognitively more difficult task. In their study, the difficult task required students to generate uses for a detached doorknob, and the easy task required students to generate uses for a knife. Although one of these tasks is more difficult than the other, both are low in complexity. Results of studies with the School of Business task may be more generalizable to the workplace because of the higher degree of complexity.

Treatments

The experiment compared the performance of participants with no basis for social comparison to that of participants viewing a graph-and-baseline to induce social comparison. The experiment had two control groups: (1) no performance-feedback-graph; and (2) performance-feedback-graph without a baseline and without background color changes. The second control group was necessary to assure that results were not simply attributable to the presence of a graph.

Because the goal-setting literature suggests that people with higher goals tend to outperform people with lower goals [10, 19], we used three different levels of baseline to establish a basis of social comparison: low, average, and high. In pilot studies, we found that control groups produced an average of 206 lines of text during a forty-minute brainstorming session. The most productive group produced 304 lines, and the least productive group produced 145 lines. Therefore one-third of the treatment groups received an average baseline treatment; they were told that an average group would produce “about 210.” Another third of the treatment groups received a low baseline treatment; they were told that an average group would produce “about 140.” The final
third of the treatment groups were given a high baseline treatment; they were told that an average group produced “about 310.”

Procedure

Participants signed an attendance sheet when they arrived, and then seated themselves at one of five computers. The computers were situated side-by-side facing the projection screen at the front of the room. One of three treatment-blind facilitators greeted the participants and read them instructions from a script. Participants then received a packet of information, and were given ten minutes to read about their roles. Each facilitator ran an equal number of sessions for each treatment level.

It was important for all the groups in the study to start with a similar understanding of the nineteen problems and the five conflicting viewpoints they faced before they started to generate solutions (the task was not to be an exercise in problem identification, but in solution generation). Therefore, the facilitator, still treatment-blind, conducted a structured interview with each participant in the presence of the others. Each participant was asked to explain to the other group members all the problems she or he had identified in the School of Business. During the interview, an accomplice, seated at a word processor, pretended to record the problems the participants identified. At the end of the interviews the accomplice printed and distributed a standard list of problems, to ensure that all groups started generating solutions to an identical problem set.

At this point the facilitator learned what treatment would be administered, and instructed participants about how to use the EBS tool and the feedback graph, if the graph was to be used. If the participants were assigned to the social comparison treatment, the facilitator was to read the following instructions from the script:

Do you see the line at the middle of the graph? Most groups generate about that many solutions during a problem-solving session like this one. In effect, we’ve put you in competition with the rest of the world. So, try to push the graph above this line by generating as many different solutions as you can. . . .

. . . the background color of the graph will give you an additional bit of information. If the background is black it means that no solutions are coming in. When few solutions are coming in, the background turns gray. When you are producing more solutions than the average group, the background turns blue. Try to keep the background blue, by generating as many unique solutions as quickly as you can. . . .

Participants were allowed forty minutes to brainstorm solutions. During the forty minutes the facilitator called the participants’ attention to the graph at seven pre-planned, randomly spaced intervals by stating the time and the cumulative number of lines generated, as in, “It’s been 11 minutes and you’ve got 57.” At the end of the brainstorming session the participants were given a printout of everything they had typed and were sent to a conference room to write a recommendation to the imaginary Provost. Then they were debriefed, thanked, and released. The experimental sessions lasted approximately ninety minutes.

The design of this experiment precludes a Hawthorne effect because all participants used EBS.
Dependent Variable

The dependent variable was the number of unique, or nonredundant, solutions the group generated for problems in the school of business. Three different treatment-blind coders analyzed the output from the brainstorming sessions for the number of unique ideas (intrarater reliability = 0.84).

Results of Experiment 1

There was no statistically significant overall effect on the number of unique ideas by facilitator (Table 1). There was not a difference in the number of unique ideas generated between the two control treatments (Table 2) so the results from both control groups were combined.

As we hypothesized, the participants who had a basis for social comparison produced significantly more unique ideas than did the participants who had no basis for social comparison (Tables 2 and 3). There was no statistically significant difference in number of unique ideas by baseline level (Table 1). There were no statistically significant differences by gender, age, years of work experience, typing ability, or time of day.

Discussion of Experiment 1

The results supported our hypothesis: participants given the graph and baseline as a basis for social comparison were more productive than participants who had no basis for social comparison. This suggests that social loafing may actually occur in anonymous EBS sessions, and that invoking social comparison with a mythical “average group” reduces the social loafing phenomena.

The goal-setting literature suggests that people will be more productive if they are given a high goal than if they are given a low goal. However, we found no effect by goal level. The baseline was necessary to establish a basis for social comparison, but the baseline setting did not seem to matter. All social-comparison participants were approximately equally productive at all goal levels. It may be that the social comparison effect overwhelmed any goal-setting effect. It may also be that goal-setting effects do not occur as readily in a very complex task as they do in tasks of lower complexity. Further research into this question is warranted.

Because there was no difference in the performance of the two control groups, one can rule out the possibility that the results were due to the presence of a graph rather than a social comparison effect. Participants viewing a graph without a baseline, and hence no basis for social comparison, did not perform differently than participants with no graph at all.

Experiment 2. Facilitation and the Salience of Social Comparison

ALTHOUGH THERE WERE NO OVERALL DIFFERENCES BY FACILITATOR in the first study, a detailed examination of the data revealed that participants working with a particular
facilitator in the social-comparison treatments consistently produced about 50 percent more ideas than the participants working with the other two facilitators (Table 3). This rather startling effect did not occur in either control group, only in the social comparison groups. This suggested that something in the facilitation style of the one facilitator might be dramatically increasing the effect of the social comparison manipulation.

There is little written about facilitation style and its impact on productivity [2]. There is little empirical literature to explain the effect we uncovered, although there are several prescriptive and descriptive papers about the role of the facilitator [2, 8, 17, 21]. Bostrom, Anson, and Clawson [1] argue that a facilitator can improve group performance by encouraging effective task and relational behaviors. Dickson, Partridge, and Robinson [8] posit that one key role of the facilitator is to “reduce the mystique associated with the GSS technology.” However, in our study, all facilitator interactions with participants were scripted, and were virtually identical for all participants.

We could not simply attribute the observed differences to the “star quality” of the one facilitator because the effect only occurred in the social-comparison treatments; the performance of that facilitator’s participants in the control treatments was unremarkable. Nor could we attribute the effect to mere random fluctuations in the data because participants under this facilitator had produced the top ten scores among the thirty-five groups in the study, and the difference was substantial.

An experimenter who had attended all of the sessions reported that the high-performing facilitator had routinely adopted a mildly jocular tone during participant instructions, while the other facilitators maintained a neutral tone. The high-performing facilitator also deviated from the script in a seemingly minor way when instructing the participants about the feedback graph. Instead of reading the routine instructions given above, he said:

The background color of the graph will give you an additional bit of information. When the background is black like this, it means you’re brain-dead! If the background turns gray, it means you are doing a little bit, but you are still below average. If the background turns blue, it means you are really smoking! Try to keep the background blue, by generating as many unique solutions as quickly as you can.

Further, rather than delivering the straight time-and-line-count verbal cues, this facilitator made mildly jocular comments about the background color of the graph, as in, “It’s been 11 minutes and the background is black. I guess your fingers fell asleep,” or “It’s been 16 minutes and the background is blue. You are doing great!”

We reasoned that these differences in facilitation style might be increasing the salience of the social comparison for the participants and further reducing the effects of social loafing. This line of reasoning led to the hypothesis for experiment 2:

H2. As the salience of social comparison increases, the number of unique ideas produced during anonymous electronic brainstorming will also increase.

We extended the original study to examine this hypothesis.
Table 1. ANOVA Results of Differences in Number of Unique Ideas Generated

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>( F )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitator</td>
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<tr>
<td>Baseline level</td>
<td>3</td>
<td>1.70</td>
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</tbody>
</table>

Table 2. \( t \) tests of Differences in Number of Unique Ideas Generated

<table>
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<th>df</th>
<th>( t )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control treatment 1 vs. control treatment 2</td>
<td>12</td>
<td>1.45</td>
<td>ns</td>
</tr>
<tr>
<td>Social comparison vs. no social comparison</td>
<td>33</td>
<td>2.22</td>
<td>0.033</td>
</tr>
</tbody>
</table>

Table 3. Number of Unique Ideas for Each Group
Means and Standard Deviations

<table>
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<th></th>
<th>Mean</th>
<th>STD</th>
<th>( n )</th>
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<tbody>
<tr>
<td>Social comparison</td>
<td>54.43</td>
<td>23.07</td>
<td>21</td>
</tr>
<tr>
<td>No social comparison</td>
<td>39.85</td>
<td>15.77</td>
<td>14</td>
</tr>
<tr>
<td>Low baseline</td>
<td>49.14</td>
<td>17.12</td>
<td>7</td>
</tr>
<tr>
<td>Average baseline</td>
<td>60.14</td>
<td>29.11</td>
<td>7</td>
</tr>
<tr>
<td>High baseline</td>
<td>54.00</td>
<td>23.72</td>
<td>7</td>
</tr>
<tr>
<td>Facilitator 1</td>
<td>57.67</td>
<td>24.92</td>
<td>15</td>
</tr>
<tr>
<td>Other facilitators</td>
<td>41.80</td>
<td>15.91</td>
<td>20</td>
</tr>
</tbody>
</table>

Participants

Two hundred and eighty-five male and female students from several sections of an “Introduction to Computer Technology” course participated for course credit. Participants were randomly assigned to groups of five, and each group was randomly assigned to a treatment.

Task

Participants used the same moderate-ambiguity version of the School of Business task used during the first study.

Treatments

There were three levels of social comparison: no-comparison, low-salience comparison, and high-salience comparison. As before, there were two no-comparison control
groups, one without a graph, the other with a graph that did not have either a baseline or background-color changes for social comparison. All facilitators adopted a neutral tone, and adhered strictly to the original script when instructing the low-salience social-comparison treatment participants on how to use the graph. For the high-salience social comparison all facilitators adopted a jocular tone, used the colorful metaphors described above to explain the meaning of the color changes in the background of the graph, and used colorful, jocular verbal cues to call the participants’ attention to the graph at predetermined, randomly spaced intervals during the EBS session.

As in the first study, to control for goal-setting effects, participants in the two social-comparison treatments were exposed to one of three baseline levels: 140, 210, or 310.

Dependent Variable

We measured the number of unique solutions generated by each group for the problems of the imaginary school of business.

Procedures

Other than the changes required to manipulate the salience for social comparison, the procedures were identical to those in experiment 1.

Results

There was no difference in the number of unique ideas generated between the control treatments (Table 4), and no difference in unique ideas generated by facilitator (Table 5). There were not any statistically significant differences by gender, age, years of work experience, typing ability, or time of day.

As in the first experiment, a t-test revealed those groups with a basis for social comparison outperformed groups with no basis for social comparison (Table 4). ANOVA tests revealed statistically significant differences by level of salience of comparison (Table 5). A Scheffé test revealed that participants in the high-salience treatment produced significantly more unique ideas than participants in the low salience and no-comparison treatments. Thus, the results support our second hypothesis stating that as the salience of social comparison rises, the productivity of electronic groups rises (Table 6). There was no statistically significant difference in number of unique ideas by level of baseline (Table 5).

Discussion of Experiments 1 and 2

As hypothesized, EBS productivity increased as the salience of social comparison increased. We observed that the participants in the low-baseline treatment appeared to enjoy reaching their goal at about mid-meeting. We inferred their enjoyment from
Table 4. *t* tests of Differences in Number of Unique Ideas Generated

<table>
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<th></th>
<th>df</th>
<th><em>t</em></th>
<th><em>p</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Control treatment 1 vs. control treatment 2</td>
<td>12</td>
<td>1.45</td>
<td>ns</td>
</tr>
<tr>
<td>Social comparison vs. no social comparison</td>
<td>1</td>
<td>2.28</td>
<td>0.027</td>
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Table 5. ANOVA Results of Differences in Number of Unique Ideas Generated

<table>
<thead>
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<th></th>
<th>df</th>
<th><em>F</em></th>
<th><em>p</em></th>
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</thead>
<tbody>
<tr>
<td>Salience of social comparison</td>
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<td>5.57</td>
<td>0.006</td>
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<tr>
<td>Facilitator</td>
<td>2</td>
<td>1.25</td>
<td>ns</td>
</tr>
<tr>
<td>Baseline level</td>
<td>3</td>
<td>2.24</td>
<td>ns</td>
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</table>

Table 6. Number of Unique Ideas Means and Standard Deviations

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>STD</th>
<th><em>n</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>No social comparison</td>
<td>39.85</td>
<td>15.77</td>
<td>14</td>
</tr>
<tr>
<td>Low salience social comparison</td>
<td>48.68</td>
<td>22.63</td>
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</tr>
<tr>
<td>High salience social comparison</td>
<td>64.71</td>
<td>26.05</td>
<td>21</td>
</tr>
<tr>
<td>Low baseline</td>
<td>50.28</td>
<td>24.11</td>
<td>14</td>
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<tr>
<td>Average baseline</td>
<td>59.20</td>
<td>23.33</td>
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<tr>
<td>High baseline</td>
<td>59.85</td>
<td>29.23</td>
<td>14</td>
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</tbody>
</table>

Vocal, kinesic, haptic, and verbal cues. However, having passed the goal, they did not slow their effort. This suggests that two different social comparison effects may have been at work. First, participants may have begun their work quickly in response to being compared with an "average" group. Having begun their work quickly, individuals may then have compared their own efforts to the efforts of those around them, and so continued high production even after reaching the baseline. This is consistent with the effort-matching hypothesis of social comparison theory discussed earlier. It may be that *any* opening ploy that encourages them to work quickly at the beginning of a session will lead to high productivity throughout the session.

Clearly, there is an effect for facilitation style in addition to the effect for the technology. The groups with low-salience instructions produced 23 percent more unique ideas than the control participants. The groups who received high-salience instructions produced 33 percent more than the low-salience groups, or 63 percent more ideas than the control groups produced. Thus, it appears that real-time feedback
for social comparison and facilitation techniques to enhance the salience of comparison are both useful for improving the use of EBS technology.

Neither experiment found an effect for level of goal. Contrary to the literature, those with a higher goal did not outperform those with a lower goal. It was important to have some goal in order to establish a basis for social comparison, but the level of the goal did not seem to matter. It may be that the goal-setting effect occurs with some kinds of tasks but not others. It may also be that the social-comparison effect overwhelmed the goal-setting effect.

Implications for Facilitators and Developers

The results of this study suggest facilitators must be aware that social loafing occurs during anonymous group work, and take steps to deal with it. Social comparison appears to be a useful and inoffensive method for reducing the effects of social loafing. Facilitators can develop a repertoire of techniques for invoking social comparison, thereby increasing group productivity. There may well be other methods for reducing social loafing. These should be explored. We discovered that seemingly minor improvements in facilitation techniques caused major increases in group productivity during EBS. It may also be that seemingly minor deficiencies could cause equally large decreases in productivity. This highlights the need for more extensive investigation into the effects of facilitation techniques on GSS use. It also emphasizes the value of using multiple facilitators for GSS research to assure that the findings are not the result of idiosyncratic facilitation techniques, and to learn more about the role of the facilitator as we learn about technology.

Developers of group support systems must also attend to social loafing issues when designing new technologies. As demonstrated in this study, minor variations in the technological interventions can make large differences in group productivity. A single horizontal line across the projection screen led to a productivity increase of 63 percent. This highlights the need for more research into the effects of interface design on GSS productivity.

Limitations

The generalizability of these studies is limited in several ways. First, participants were all students. More work with participants from other populations will help establish how widely this effect occurs. Second, these experiments were all conducted with a single task. Further work with tasks of differing complexity and difficulty will be illuminating. Finally, these experiments took place in a laboratory setting with a realistic, but nonetheless imaginary task. Subsequent research in the field will help determine whether social loafing and social comparison occur in the same way when people have more of a vested interest in the outcome.

Conclusions and Future Directions

The results of these studies provide support for the argument that the productivity of anonymous EBS can be diminished by social loafing, and that social
comparison is a useful means of reducing social loafing. The results also offer empirical support that facilitation techniques and user interface are important variables in the successful use of GSS technology.

Our results were different from those of Harkins and Petty [14] who found that social loafing only occurred with cognitively easy tasks, not with cognitively difficult tasks. The task we used required participants to grapple with five competing constituencies and nineteen interrelated problems, clearly a cognitively difficult task, and yet we found a large social loafing effect. It may be that the effects they observed only hold for tasks of low complexity. It may also be that besides being more complex, our task was more difficult than Harkins and Petty's difficult task, and that social loafing occurs with very easy and very difficult tasks, but does not with tasks of moderate difficulty. Participants may find moderately difficult tasks interesting enough to be engaging, but not so taxing as to cause them to give up.

There are many other ways to invoke social comparison for participants besides the tools and techniques we used. For example one could create a tug-of-war graph pitting one group of participants against another in real time. Or one might eliminate the graph entirely and simply change the background color of the EBS tool. One might present the graph and baseline, but offer no verbal cues during the session to call attention to it. Further study is needed to understand the efficacy of differing approaches.

Problem solving is more than idea generation, and GSS is more than EBS. Much empirical work is needed to explore and explain social loafing, social comparison, and facilitation effects in all aspects of the electronic meeting process.

REFERENCES


