Sharing and Collaborating with Google Docs: The influence of Psychological Ownership, Responsibility, and Student's Attitudes on Outcome Quality

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Abstract: One hundred and eighteen undergraduate students participated in an experiment which tested the differences between shared- and collaborative- writing of an assignment. Participants were randomly allocated to one of five groups that carried out different types of collaborative writing. Psychological ownership and responsibility for the document quality differed across the groups. Level of ownership and responsibility increased after collaborating by suggesting comments to a peer's draft and decreased after editing a peer's draft. Initial ownership and responsibility, as well as students' attitude towards collaboration, predicted perceived outcome quality. Evaluation of collaboration was asymmetrical: participants felt that their contribution improved peer's draft, whereas peer's contribution deteriorated their own draft. We conclude that collaboration is superior to sharing, and improvement suggestions are preferred over editing.

Introduction

The use of collaborative technology in an educational context increases students' engagement with course content, enriches the learning process, and enhances active participation through content creation (Parker & Chao, 2007). Better outcomes were obtained when students collaborated using Wiki technology as opposed to course forums (Levin-Peled & Kali, 2008). In addition, students' involvement in learning activities via collaborative tools improves their final course grades (Ravid, Kalman & Rafaeli, 2008).

Collaboration through reciprocal edition of texts is usually perceived as a desired learning method (Tal-Elhasid & Meishar-Tal, 2007), but may lead to an unpleasant learning experience (Blau & Caspi, 2008). In addition, for many students, collaborative learning remains an individualistic act: using Wiki, students continued to cultivate a practice of individual accountability and individual ownership (Ioannou & Artino, 2008). When requested to collaborate, students often feel that it is inappropriate to edit peers' work (Coyle, 2007), tend to avoid changing other students' written products (Dalke, Cassidy, Grobstein & Blank, 2007), and do not encourage others to edit their own entries (Da Lio, Fraboni & Leo, 2005; Davies, 2004). Typical statements such as "My texts got deleted", "Someone can change what you have written, even when you know that what you have written is correct" reflect a sense of ownership (Lund & Smørdal, 2006), which may explain these results.

Studies of collaborative e-learning mostly focus on system-related variables. Understanding the nature of students' psychological dynamics – needs, wishes and perceptions – might prove effective in investigating pedagogical issues in the online learning processes and outcomes (Barak, 2007). One such psychological variable is psychological ownership. *Psychological ownership* refers to the relationship between an individual and an object in which the object is experienced as connected with the self (Wilpert, 1991), or becomes a part of the "extended self" (Dittmar, 1992). Ownership can be also felt towards nonphysical entities, such as information (Raban & Rafaeli, 2007), ideas, words, creations, or academic products (Pierce, Kostova & Dirks, 2003).

The current experiment was designed to test the relations between psychological ownership, perceived responsibility for collaborative documents, and perceived quality of outcomes. To do so, we created five groups. In the *control* group, each student wrote a draft, read another document that was written on the same topic, and then revised his or her own document. After writing the draft of the document, students in two other groups *shared* their written document by publishing it either to an unknown audience or to a peer. As in the control

group, after reading another document they revised their own document. Students in the last two groups *collaborated*: After writing the draft and publishing it to a peer, they either suggested improvements for a peer's draft or edited a peer's draft. They read peer's suggestions or editorial changes and then revised their draft.

We expected that students in the collaboration conditions will perceive lower psychological ownership and responsibility for a document quality, relative to students in the sharing conditions or in the control group. In addition, we expected that the perceived quality of outcomes will be higher in the collaboration conditions. Table 1 summarizes the procedure and presents the hypotheses.

Table 1: Procedure and Hypotheses

<table>
<tr><td></td><td></td><td colspan="3">PROCEDURE</td><td colspan="2">HYPOTHESES</td></tr>
<tr><td>Condition</td><td>Group</td><td>Phase 1</td><td>Phase 2</td><td>Phase 3</td><td>Psychological ownership / Responsibility</td><td>Perceived outcome quality</td></tr>
<tr><td></td><td>Control</td><td rowspan="5">Write a document (draft)</td><td>Read someone's document</td><td rowspan="5">Revise own document</td><td>High</td><td>Low</td></tr>
<tr><td rowspan="2">Sharing</td><td>Publishing</td><td>Publish draft, read someone's document</td><td>High</td><td>Low</td></tr>
<tr><td>Reading</td><td>Share draft with a peer, read peer's draft</td><td>High</td><td>Low</td></tr>
<tr><td rowspan="2">Collaborating</td><td>Suggesting</td><td>Give draft for review by a peer, suggest improvements to peer's draft</td><td>Low</td><td>High</td></tr>
<tr><td>Editing</td><td>Give draft for editing by a peer, edit peer's draft</td><td>Lowest</td><td>High</td></tr>
</table>

The present study focused on the differences between sharing and collaborating while creating documents using *Google Docs*. The Google Docs application allows access from any computer and eases the ability to collaborate by sharing a document with others as viewers or collaborators, or by publishing it on the web (Conner, 2008). Google Docs affords real-time collaborative learning by supporting synchronous editing, comment writing, and saving versions of the document. Sharing content using this application is simple, allows peer review of academic materials, may facilitate collaboration, and affords collective generation of knowledge (Educause Learning Initiative, 2008). Similar to Wikis, Google Docs enables collaboration by *editing* a document written by other students, as well as *by suggesting* modifications through comment writing, without editing the document itself.

Method

Participants

One hundred eighteen undergraduates (80% women) from the Department of Education and Psychology at the Open University of Israel received an academic credit for participation in this research. None of the participants had utilized Google Docs before, but all reported that the application was easy or very easy to use (Mean: 5.09, scale from 1 to 6). The participants' ages range was 16 to 54, mean age was 27.1 years, and the median was 25.

Instruments and Procedure

Participants were randomly allocated to one of five experimental conditions. First each participant read the same academic material (a translated to Hebrew and slightly shortened version of Myers, 2007), wrote a draft with up to 400 words, and was asked to evaluate the quality of their draft. In the second phase, the

participants read another document. The last task was to revise their draft, to reevaluate the quality of the final version, and to report a sense of ownership, responsibility, and perceived quality of collaboration. As presented in Table 1, groups differed at phase 2. At this phase students in the five groups were asked to either: (1) read a document "published" by someone else (Control, N = 23); (2) published their own draft on the web and read someone else's document (Publishing, N = 22); (3) read another participant's draft while the other participant read their draft (Reading, N = 23); (4) suggested improvements for another participant's draft while the other participant suggested improvements to their draft (Suggesting, N = 25); (5) edited another participant's draft while the other participant edited their draft (Editing, N = 25). Table 2 shows no significant demographic differences between groups in terms of age, gender, and number of courses already completed.

Table 2: Participants' Demographics

Condition	Age (SD)	Women (%)	Number of courses (SD)
Control	26.7 (4.3)	78.3	11.2 (9.7)
Publishing	26.7 (6.6)	72.7	7.53 (5.1)
Reading	27.9 (7.6)	78.7	9.9 (6.5)
Suggesting	27.2 (6.4)	92.0	7.7 (5.6)
Editing	26.9 (4.9)	80.0	7.5 (4.5)

Participants evaluated document's quality, psychological ownership, responsibility for own and peer's document, attitude towards collaboration, and quality of contribution through a self-report online questionnaire[1]. The *perceived quality of the document* was measured twice, before and after the revision of the draft, by six items – Cronbach's alpha = .93 for pre-revision and .94 for post-revision, the scale ranged from 1 to 10. *Ownership and responsibility for own document* was measured twice, before and after the revision. Before the revision it was measured by one psychological ownership item and one responsibility item, $r = .52$, $p < .001$, the scale ranged from 1 to 6. For the final version, the index included two ownership items and one responsibility item, Cronbach's $\alpha = .77$. *Responsibility for peer's document* was measured only after the revision by two items, $r = .56$, $p < .001$, the scale ranged from 1 to 6. Students' initial *attitude towards collaboration* was measured before the revision by the item "I think that a collaboratively written document is better than a document that is written alone", the scale ranged from 1 to 6. *Quality of contribution* for own document was measured after the revision by the item "Reading or revising my document by someone else made this document worse", and for peer's document by the item "My reading or revising of another document made this document worse", for each item the scale ranged from 1 to 6.

Results and Discussion

Perceived Outcome Quality

The perceived quality differed significantly between pre- and post-revision, $F(1,116) = 11.85$, $p < .001$, partial $\eta^2 = .10$. Perceived quality after revising the draft was higher than prior to the revision (Mean: 7.74, SD: 1.43 for pre-revision, and Mean: 8.01, SD: 1.50 for post-revision), signifying that students overall felt that revising the draft improved the document. But more important is the significant interaction between experimental groups and timing of perceived quality measurement, $F(4,113) = 2.63$, $p < .05$, partial $\eta^2 = .09$. The interaction is presented in Figure 1. As revealed by a post-hoc analysis, significant differences in perceived quality were found only for the collaborative conditions: For the Editing group, $t(24) = 4.24$, $p < .001$, $d = 0.87$; for the Suggesting group, $t(24) = 2.03$, $p = .05$, $d = 0.86$. There was no effect for the other groups. Thus, our hypothesis was confirmed.

[1] The full versions of the pre- and post- questionnaires are available from the authors upon request.

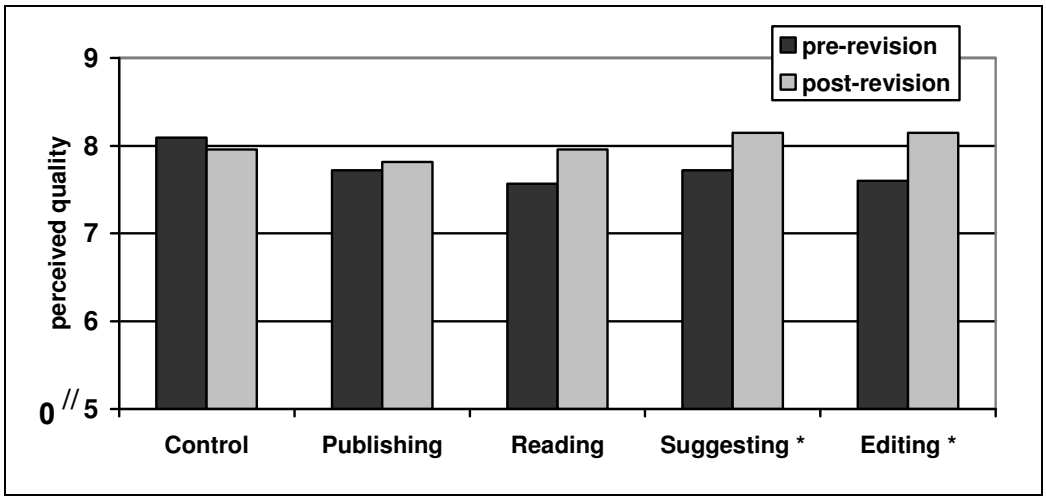

Figure 1: Perceived Quality of Document Before and After Revision
(* statistically significant difference)

Psychological Ownership and Responsibility for Own Document

Repeated measure ANOVA showed that ownership and responsibility for own document did not change significantly before revision (Mean: 4.63, SD: 1.11) and afterward (Mean: 4.5, SD: 1.01). The effect of groups was significant, $F(4, 113) = 3$, $p < .05$, partial $\eta^2 = .10$. Post-hoc comparisons showed that after the revision, the Publishing and Suggesting groups had a significantly higher sense of ownership and responsibility compared to other groups (see Table 3). Most importantly, there was a significant interaction between groups and timing of measuring ownership and responsibility, $F(4, 113) = 3.5$, $p < .01$, partial $\eta^2 = .11$. Post-hoc analysis revealed that ownership and responsibility for own document increased significantly between pre- and post-revision for the Suggesting group, $t(24) = 2.2$, $p < .05$, $d = 0.40$, but decreased significantly for the Editing group, $t(24) = 2.27$, $p < .05$, $d = 0.41$. The interaction is presented in Figure 2.

Table 3. Comparing Ownership and Responsibility for Own Document between the Groups: Post-Hoc Tests

Compared groups	*p*	Effect size
Publishing- Reading	< .05	d = .63
Publishing- Editing	< .01	d = .86
Suggesting- Control	< .05	d = .68
Suggesting- Reading	< .001	d = .96
Suggesting- Editing	< .001	d = 1.25

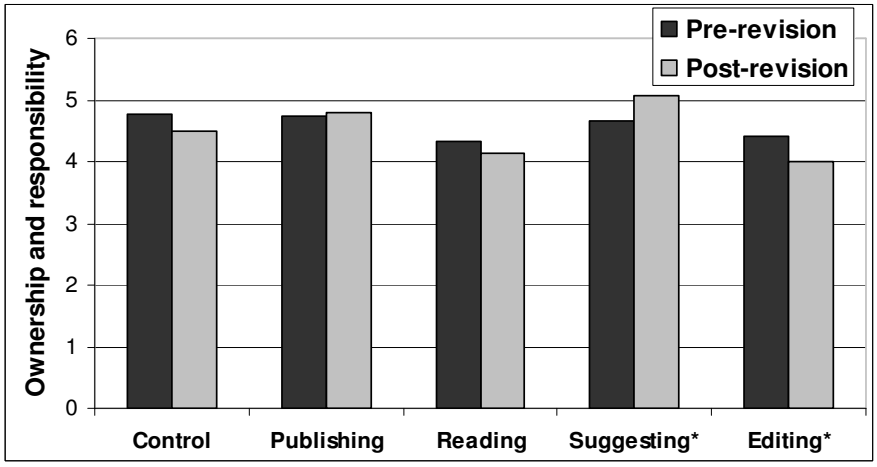

Figure 2. Ownership and Responsibility for Own Document Before and After Revision
(* statistically significant difference)

Regression analysis showed that ownership and responsibility for own document before the revision predicted the perceived quality of the first draft, $F(1,116) = 28.51$, $p < .001$, $R^2 = .20$, $\beta = .44$ as well as the quality of the final version, $F(1,116) = 19$, $p < .001$, $R^2 = .14$, $\beta = .38$. Ownership and responsibility after the revision predicted the perceived quality of the final version, $F(1,116) = 10.56$, $p < .01$, $R^2 = .08$, $\beta = .29$. Ownership and responsibility (before and after revision) were entered into a multivariate regression analysis as predictors of the perceived quality of the final version. The regression was significant, $F(2,115) = 9.86$, $p < .001$, $R^2 = .15$, but only ownership and responsibility before the revision predicted the perceived quality of the final document, $\beta = .32$.

Attitude towards Collaboration

Participants in all groups believed that collaboration results in better documents (Mean: 4.17, SD: 0.70). Regression analysis showed that this initial attitude towards collaboration predicted the perceived quality of the final version, $F(1,116) = 8.18$, $p < .01$, $R^2 = .07$, $\beta = .26$. Attitude towards collaboration, as well as ownership and responsibility (before and after revision) were entered into a multivariate regression analysis as predictors of the perceived quality of the final version. The regression was statistically significant, $F(3,114) = 8.92$, $p < .001$, $R^2 = .19$. Initial attitude towards collaboration, $\beta = .21$, as well as ownership and responsibility before the revision, $\beta = .30$, predicted the perceived quality of the final version.

Responsibility for Peer's Document

The responsibility for peer's document (Mean: 2.99) differed significantly from the responsibility for own document before the revision (Mean: 4.63, $F(1,116) = 104.37$, $p < .001$, partial $\eta^2 = .47$), as well as the responsibility for own document after the revision (Mean: 4.49, $F(1,116) = 100.89$, $p < .001$, partial $\eta^2 = .46$).

To further explore these differences we run repeated measures ANOVA for the collaborative conditions: Suggesting and Editing groups. We found significant main effects for responsibility type, $F(1, 49) = 25.56$, $p < .001$, partial $\eta^2 = .35$, and for experimental groups, $F(1, 49) = 6.54$, $p < .05$, partial $\eta^2 = .12$, as well as significant interaction, $F(4, 113) = 4.95$, $p < .05$, partial $\eta^2 = .09$. The responsibility was significantly higher for own document compared to peer's document, and for Suggesting group relative to the Editing group. While there was no difference between the two groups in responsibility for peer's document, the responsibility for own document in Suggestion group was significantly higher in comparison to the Editing group. The interaction is presented in Figure 3.

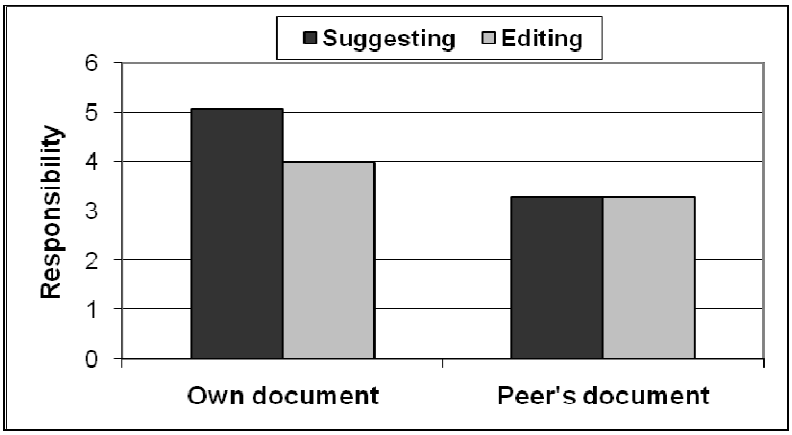

Figure 3. Responsibility for Own Document and for Peer's Document – Suggesting and Editing group

Evaluation of Contribution

Students' evaluation of the contribution for own document and for peer's document did not correlate significantly. These two variables differed significantly, $F(1, 116) = 98.56$, $p < .001$, partial $\eta^2 = .47$. Students felt that while they did not exacerbate the document they read or edited (Mean: 2.27, SD: 1.26), others made

their own document worse when suggesting, editing or even just reading it (Mean: 3.98, SD: 1.28). There was neither a group nor evaluation by group interaction effects (both *p*'s > .10).

In summary, most hypotheses were supported. The findings indicated the importance of collaboration: The quality of a revised document was perceived as higher only after collaborative work. Some support for the role of psychological ownership and responsibility was found: Editing resulted in lower levels of psychological ownership and responsibility for own document, whereas Publishing resulted in high levels. However, opposite to our hypotheses, suggesting improvement resulted in the highest level of psychological ownership and responsibility for own document.

It seems that two factors played a role in the formation of the perceived quality of a document shared or collaboratively written with others: ownership and responsibility for the quality of their document as well as attitude towards collaboration with peers.

Participants in all groups *believed* that collaboration improved the document quality. However, evaluation of the *real contribution* of collaboration was asymmetrical - students felt that while they did not exacerbate the document they read or edited, others worsened their own document by reading, suggesting or editing it. We therefore suggest that collaborative learning may be improved by encouraging collaboration mainly through suggesting and receiving improvements and less by editing each others' writing.

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Acknowledgements

This research was supported by a grant from the Israeli Internet Association.