The Role of Visual Feedback and Reflection in Online Discussion

Young Hoan CHO[a*], Hyun-Jeong PARK[a], Jungyeon KIM[a], Youmi SUK[a], Sinhye LEE[a], Sun Young HUH[a], Hyun Kyung LEE[a]
[a]*Department of Education, Seoul National University, South Korea*
*yhcho95@snu.ac.kr

Abstract: A growing number of studies have shown the importance of student interaction, which may influence learning outcomes, in computer-supported collaborative learning. To encourage productive interaction between students in online discussion, this study provided undergraduates (n=102) with visual feedback on participation frequency, a time series of participation, a social network, and a profile of discussion messages. Participants significantly improved their online discussion through reflection on the feedback. In addition, the quality of reflection on visual feedback was significantly related to the improvement of online discussion. We discussed how to improve the quantity and quality of student interaction in online discussion through visual feedback and reflection.

Keywords: Online discussion, feedback, reflection, peer interaction

1. Introduction

Online discussion encourages learners to share a variety of perspectives and collaboratively build knowledge. Despite the benefit of online discussion, it is a legitimate concern that students do not actively participate in online discussion due to the lack of experience or communication skills. Instructional supports are needed to help learners to actively interact with each other through challenging and integrating different opinions (Weinberger & Fisher, 2006).

As an instructional support, feedback can be much helpful for increasing peer interaction in online discussion. Recently, a growing number of studies have paid attention to visualizing collaboration process and peer interaction patterns in online discussion (e.g., Janssen, Erkens, & Kanselaar, 2007). The visual feedback intuitively represents how often learners participate in online discussion, how they interact with other group members, and what contributions they have made to group discussion. The feedback allows learners to reflect on their performance in online discussion and make a plan for the next discussion. Park et al. (2015) found the effectiveness of social network-based visual feedback about collaborative interaction patterns in online discussion. To enhance peer interaction in online discussion, more research is needed to explore the roles of visual feedback and reflection.

The purpose of this study is to examine whether learners improve their online discussion through reflection on visual feedback about participation frequency, a time series of participation, a social network, and a profile of discussion messages. In addition, this study intends to explore the relationship between the quality of reflection and the improvement of online discussion.

2. Method

2.1 Participants

A total of 102 undergraduates (male: 47, female: 55) enrolled in a Korean university participated in the current study as part of their coursework in the Introduction to Education course. In this study, 92% of participants had 10 or less online discussion experiences, and 52% of participants had no experience of online discussion.

2.2 Procedure

Before the online discussion, participants were randomly assigned to 11 groups of 8-10 members. All discussion activities were conducted in the online environment out of school. The first discussion about a Korean policy of the evaluation in secondary school was carried out for one week. The participants were required to post at least one message in the online discussion board along with the label of the message type (i.e., Opinion, Agreement, Challenge, Question, Answer). After the online discussion, participants received four types of visual feedback in a website (see Figure 1). Participants were also provided with text descriptions about visual feedback and reflection prompts. In the website, participants were asked to reflect on the strengths and weaknesses of their online discussion performance. Lastly, participants conducted the second online discussion about a Korean policy of the secondary school system for one week.
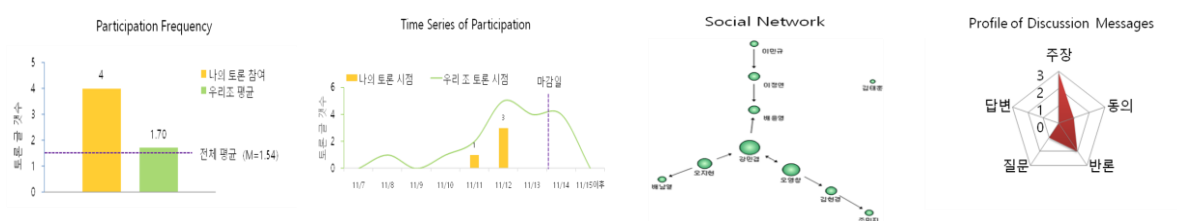

Figure 1. Visual Feedback Examples

2.3 Data Collection and Analysis

From the discussion board, we collected discussion messages and logs that would be used for analyzing participation frequency (a total number of discussion messages), the first participation date (from 0 to 6; 0: due date, 6: six days before the due date), a social network (indegree and outdegree centralities), and the types of discussion messages. To classify discussion messages, we used the labels that participants selected as the types of their discussion messages. In addition, two researchers independently rated the quality of reflection messages, which were collected from a visual feedback website, using a rubric from 0 (no statement of a strength/weakness) to 3 (specific statement of strengths/weaknesses along with explanations and examples) points. The inter-rater reliability (Cohen's kappa) was high, .91 for the reflection of strengths and .89 for the reflection of weaknesses.

3. Results

3.1 Influence of Visual Feedback in Online Discussion

Repeated-measures ANOVAs were carried out to investigate the influence of visual feedback on the online discussion variables. For the participation frequency, learners posted significantly more discussion messages in the second online discussion (M=2.89, SD=1.97) than the first one (M=1.67, SD=1.07), F=56.92, p<.001. They also participated in the second online discussion (M=2.83, SD=2.1) earlier than the first one (M=.97, SD=1.94), F=51.87, p<.001. In the social networks, the indegree centrality (Ms=.13 vs. .27, F=31.93, p<.001), and outdegree centrality (Ms=.11 vs. .2, F=58.82, p<.001) were all significantly improved from the first online discussion to the second one. In regards to discussion messages, all types of discussion messages increased from the first online discussion to the second one: opinions (Ms=.76 vs. .99, F=7.5, p=.007), agreements (Ms=.55 vs. 1.02, F=13.16, p<.001), challenges (Ms=.58 vs. 1.1, F=27.97, p<.001), questions (Ms=.27 vs. .75, F=27.35, p<.001), and answers (Ms=.15 vs. .55, F=20.67, p<.001). Particularly, the percentage of questions increased from 12% to 17%, and that of answers increased from 6% to 12%. Overall, the visual feedback significantly influenced the online discussion participation and peer interaction patterns.

3.2 Relationship between Reflection Quality and the Improvement of Online Discussion

A correlation analysis was carried out to investigate the relationships between the reflection quality and the improvement of online discussion. As shown in Table 1, the quality of reflection on strengths was positively related to the improvement of agreement messages ($r=.3$, $p=.002$), but there was no other significant relationship ($ps > .05$). The quality of reflection on weaknesses was positively related to the increase of participation frequency ($r=.28$, $p=.004$), indegree ($r=.26$, $p=.007$) and outdegree ($r=.22$, $p=.025$) centralities in social networks, and opinion messages ($r=.22$, $p=.026$). These results show that reflection, particicularly on weaknesses, plays an important role in improving online discussion.

Table 1: Pearson's correlation coefficients between reflection quality and the improvement of online discussion

Reflection quality	Improvement of participation frequency	Improvement of first participation dates	Improvement of social networks		Improvement of discussion messages				
			Indegree centrality	Outdegree centrality	Opinion	Agreement	Challenge	Question	Answer
Strength	.09	.02	.03	.13	.09	.3**	-.04	.07	-.04
Weakness	.28**	.16	.26**	.22*	.22*	.18	.13	.14	.11

Note. Improvement scores were calculated by subtracting the first online discussion scores from the second ones.
* $p < .05$, ** $p < .01$

4. Discussion

This study found that visual feedback was beneficial for improving online discussion in regards to participation and peer interaction patterns. The improvement of online discussion was also closely related to the quality of refelection on visual feedback. Particularly, the reflection on weaknesses played an important role in improving online discussion. These results show that the effectiveness of visual feedback varies depending on how learners reflect on the feedback. Some participants might have difficulty in making sense of visual feedback or applying it to a plan for the next discussion. It is also possible that they do not perceive the importance of reflection on visual feedback. In the future study, an instructor can provide instructional supports like meta-cognitive prompts and exemplars to enhance reflection on visual feedback.

The findings of this study can be used for the development of a social leanring analytics system in which visual feedback on social interaction is automatically provided to learners (Ferguson & Buckingham Shum, 2012). Future research is recommended to investigate how learners make sense of visual feedback on their online interaction as well as to improve the design of visual feedback. The feedback should be easy to understand and useful for improving online interaction. In addition, future research is necessary to investigate the influence of visual feedback in a long-time period. Learners can internalize the feedback and self-regulate their online discussion activities without instructional supports.

References

Ferguson, R., & Buckingham Shum, S. (2012). Social learning analytics: Five approaches. Paper presented at the 2nd International Conference on Learning Analytics & Knowledge, Vancouver, BC.

Janssen, J., Erkens, G., & Kanselaar, G. (2007). Visualization of agreement and discussion processes during computer-supported collaborative learning. *Computers in Human Behavior, 23*, 1105-1125.

Park, H., Kim, H., Park, H., & Lim, K. (2015). Effects of social network-based visual feedback on interaction in online discussion. In G. Chen, V. Kumar, Kinshuk, R. Huang & S. C. Kong (Eds.), *Emerging issues in smart learning* (pp. 157-158). Heidelberg: Springer.

Weinberger, A., & Fischer, F. (2006). A framework to analyze argumentative knowledge construction in computer-supported collaborative learning. *Computers & Education, 46*(1), 71-95.