

Socio-Emotional Regulation in Knowledge Building Mediated by CSCL Reflection

Jin Michael Splichal, Jun Oshima, and Ritsuko Oshima,
jin.m.splichal.15@shizuoka.ac.jp, joshima@inf.shizuoka.ac.jp, roshima@inf.shizuoka.ac.jp
Shizuoka University

Abstract: There are few studies focused on supporting socio-emotional regulation in knowledge building contexts, so we designed a project-based learning environment that supports socio-emotional regulation. Fifty first-year university students participated in the project, using Knowledge Forum (KF) as a digital portfolio to collaboratively reflect on face-to-face activities. Metacognitive prompts were provided through KF's scaffold function to facilitate reflection, especially on socio-emotional aspects. Our analyses revealed that not all students fully regulated socio-emotional challenges encountered through experiencing collaboration in the environment. Moreover, in the case studies, we found that students who attempted to maintain idea diversity to rise above the ideas of individual group members tended to resolve socio-emotional challenges, while others tried to proceed with tasks through avoiding both consolidating ideas and regulating socio-emotional challenges. These findings imply that in addition to socio-emotional supports, epistemic supports are necessary to facilitate socio-emotional regulation.

Keywords: idea improvement, idea diversity, rise above, socio-emotional regulation, computer-supported collaborative learning

Introduction

Incorporating the processes of knowledge-creating enterprises into education has been considered as a promising approach toward helping learners meet the emerging needs of the 21st-century economy (Griffin, McGraw, & Care, 2012). Through long efforts, knowledge building theory has come to describe what should be seeping into a community of learners to transform them into knowledge-creating organizations (e.g., Scardamalia, 2002). Knowledge building (KB) emphasizes learner autonomy and community self-organizing processes for creating knowledge that is of value to the community. Learners are encouraged to take ownership of their learning for sustainably improving ideas. Central activities in KB are idea generation, co-elaboration, and diversification, which improves the depth and breadth of generated ideas (Hong & Sullivan, 2009). Learners collaboratively develop, improve, and consolidate ideas to innovate more complex idea structures that remain available for subsequent use. Scardamalia (2002) listed 12 principles for guiding these knowledge-creating processes in classrooms. Closely related principles to the central activities are *improvable ideas*, *idea diversity*, and *rise above*. In KB, all ideas are treated as improvable and are surrounded by various other ideas, including contrasting ones. Knowledge-creating activities entail formulating higher-level problems through synthesizing new ideas that supplement weaknesses of competing ideas for further knowledge advancement. Therefore, facilitating sustainable idea improvement and maintaining idea diversity are essential for improving both the depth and breadth of ideas.

These collaborative idea-developing and idea-improving activities necessitate *teamwork*, which is an essential skill for success in a constantly changing world (Griffin et al., 2012). Nevertheless, recent studies (e.g., Näykki, Järvelä, Kirschner, & Järvenoja, 2014) reported that learners often fall into socio-emotional conflicts during idea co-elaboration and diversification processes. Learners fail to negotiate a fit between their ideas and those of other group members, resulting in abandoning idea diversity because such processes require learners to change their initial beliefs, thoughts, and opinions. Some learners try to overrule other members' ideas, or disagreeably elaborate on other members' ideas because they do not want to change their own. In such situations, supports for socio-emotional regulation are vital (Näykki et al., 2014). Because socio-emotional aspects of collaboration have been neglected for so long (Dillenbourg, Järvelä, & Fischer, 2009), few studies, especially in KB contexts, have researched developing supports for socio-emotional regulation and analyzing its effectiveness.

In this study, therefore, we attempted to design a computer-supported collaborative learning environment for supporting socio-emotional regulation and examined how students solved socio-emotional challenges. Knowledge Forum (KF; Scardamalia, 2002) was used as a digital portfolio where students collaboratively reflect on face-to-face project-based learning with an ill-structured task from the perspective of

teamwork. We provided metacognitive prompts through KF's scaffold function to facilitate student reflection, especially on socio-emotional aspects. We assessed how students' socio-emotional challenges emerge and how they resolve those challenges.

Method

Design description

Fifty first-year university students (22 female, 28 male) took a thirteen-week course for learning how to manage teamwork through participating in project-based learning. They were randomly divided into thirteen groups of four to five, then given the task of collaboratively applying data-science techniques to make innovative propositions for improving the city where the campus is located. Four mentors supported group activities and collected classroom observational data. Each week, students engaged in ninety-minute face-to-face sessions, then wrote their reflections on the regulatory processes on KF.

The project was mainly divided into three stages. In the first stage (weeks 1–4), students were expected to understand the basics of data-science techniques through co-constructing visualizations of restaurant data from four major Japanese cities, obtained from a restaurant guide website (<https://tabelog.com/>). Students were required to choose appropriate visualization methods and to adequately interpret visualizations. In the next stage (weeks 5–8), students identified problems to solve in the city where the campus is located. Students were also required to gather necessary data on their own and to illustrate and support their ideas through data visualization. Students then held a poster fair in week 9 to exchange ideas on the problems and subjects they identified. In the last stage (weeks 10–12), students co-invented propositions for improving the city based on the problems they identified in stage 2. Students were required to once again co-construct data visualizations that support their propositions. In week 13, students held a final poster fair.

During this project, we asked students to collaboratively keep public group progress notes on KF and to add individual reflections as public build-on notes each week after the ninety-minute face-to-face sessions (Figure 1). To support their reflections, especially regarding socio-emotional aspects, we used KF's scaffold function to provide metacognitive prompts, based on the Adaptive Instrument for Regulation on Emotion (AIRE; Järvenoja, Volet, & Järvelä, 2013). Example prompts are “Did each member have different priorities toward the group task?,” “Did you find it difficult to create a collaborative atmosphere?,” “Did each member fully commit to the group task?,” and “Is there any disagreement among group members on ideas about how to conduct the group work?” AIRE focuses on assessing learner experiences of socio-emotional challenges by asking them to rate how well generic scenarios of socio-emotional challenges that Järvenoja et al. identified describe their experiences. We utilized those generic scenarios to develop the metacognitive prompts.

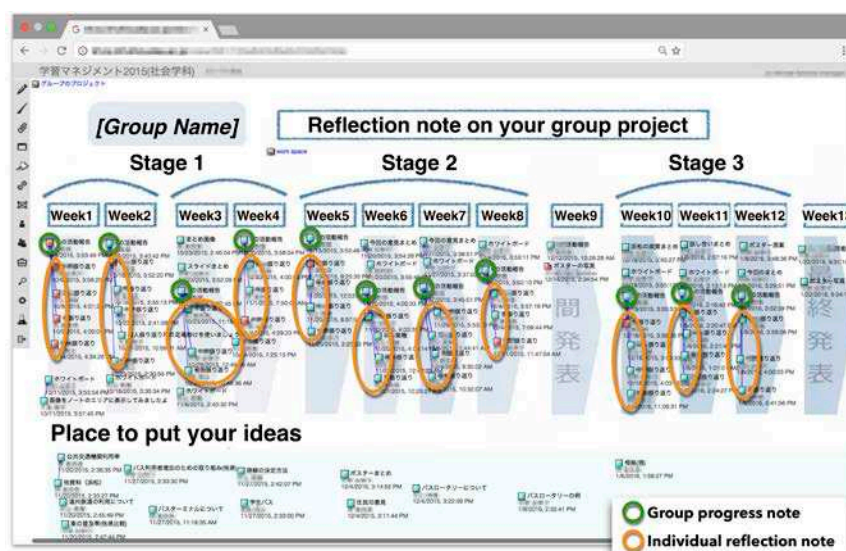


Figure 1. Knowledge Forum view of projects by group.

Data collection and analysis

In addition to the collected data on KF (group progress and individual reflection notes, mentor observations reported in private KF notes not visible to students), we also conducted free-response questionnaire surveys

after the poster fairs on weeks 9 and 13 to examine socio-emotional challenges and regulation strategies that students applied during the project. In both questionnaire surveys, we asked students to individually describe how they engaged in group work (“Describe what did and did not go well in your group work. Also, describe how you or others further improved your group work.”). We also collected behavioral engagements in group activities using audio recorders.

In the first analysis step, we assessed the questionnaire responses to reveal the number of socio-emotional challenges that each student encountered and how many of them were regulated. We first counted socio-emotional challenges and regulation strategies reported in each response to the questionnaire. We then evaluated each reported regulation strategy for challenges that students experienced. For example, the description “*I asked her politely to be cooperative*” is a regulation strategy corresponding to “*One member doesn’t fully commit to the group work,*” which describes a socio-emotional challenge. At the end of the first analysis step, we counted by group the socio-emotional and challenges that were regulated, and then calculated the proportion of regulated challenges. In the second analysis step, we conducted case studies to further elucidate how students resolved socio-emotional challenges, or why they could not regulate unsolved socio-emotional challenges.

Result

Regulated socio-emotional challenges

Table 1 shows the result of the first analysis step. We found that not all students fully regulated socio-emotional challenges. For example, students in group A regulated 94% of socio-emotional challenges, while half of the challenges encountered in group B remained unresolved. To elucidate how students resolved socio-emotional challenges and why some students could not, we further conducted case analysis of group A as a successful group and group B as an unsuccessful group. Group A had the highest and Group B had the lowest proportion of regulated socio-emotional challenges among groups in which members encountered ten or more socio-emotional challenges.

Table 1: Number of socio-emotional challenges and proportion of regulated challenges by groups

Group ID	A	B	C	D	E	F	G	H	I	J	K	L	M
Number of socio-emotional challenges	17	10	2	13	1	12	3	6	4	1	2	3	5
Proportion of regulated challenges (%)	94	50	0	77	100	58	100	67	100	100	50	100	60

Case studies: How socio-emotional challenges were regulated

Successful regulation of socio-emotional challenges

Group A resolved socio-emotional challenges as expected. One group member (“A1”) did not actively participate in discussions at first, and was absent several times (e.g., “[A1] dozed off several times today,” from a mentor’s observation notes in week 6). Other members attempted to co-regulate her to participate in discussions, because they wanted to involve all members in the discussion (e.g., “[A1] seemed to not be good at discussion, so I helped her to discuss with us,” from a group member’s responses to the questionnaire in week 9). In week 13 they were able to present a proposition that included all members’ ideas.

Unsuccessful regulation of socio-emotional challenges

Contrary to expectations, group B did not resolve many socio-emotional challenges. The group had a member (“B1”), who was resistant to other members’ ideas. Until the poster fair in week 9, they were very concerned about the credibility of their identified city problems (“*Progress is slow, though they are carefully considering backups,*” from a mentor observation note in week 5). Due to time constraints, they decided to focus on B1’s idea (e.g., one group member said, “*We shouldn’t make an incomplete presentation [in week 9],*” from voice recordings in week 8). After week 9, B1 barely incorporated other member ideas, and members ended up just searching for data to support B1’s idea (e.g., “[B1] is strictly sticking to her idea,” from a mentor observation note in week 10). Consequently, they created a poster based on B1’s idea.

Discussion

This study aimed at designing a learning environment that supports socio-emotional regulation for accelerating collaborative idea development and improvement. We examine how students solved socio-emotional challenges in the environment. In the first analysis step, we found that not all of the students in our study successfully regulated socio-emotional challenges. We thus conducted further case studies of two groups to identify underlying factors describing why students successfully or unsuccessfully regulated socio-emotional challenges for future instructional design. Qualitative analysis revealed that a group that attempted to maintain idea diversity to rise above the ideas of individual group members regulated most challenges, because improving both the depth and breadth of ideas necessitates socio-emotional regulation. On the other hand, a group that tried to improve only the depth of ideas could not resolve socio-emotional challenges. Members of group B applied *avoidance-focused strategies*; in other words, they engaged in tasks without removing the source of socio-emotional challenges (Näykki et al., 2014). This may be because improving only the depth of ideas is to some extent possible without resolving socio-emotional challenges. These findings suggest that in addition to socio-emotional supports, epistemic supports for broadening ideas, such as maintaining idea diversity and encouraging rise above, are essential to facilitating socio-emotional regulation.

There is room for further discussion. Since we provided metacognitive prompts not for supporting solutions to socio-emotional challenges but for student awareness of challenges, we could see that group B members did not express competencies for resolving challenges, whereas members of group A did. Moreover, we can interpret that it is necessary to support students in regulating socio-emotional challenges. To prepare students for the 21st-century economy, however, we must encourage students to be engaged in the self-organizing processes of a knowledge-creating community and let them “learn by doing.” We should thus find ways to induce students’ socio-emotional regulation. In future studies, therefore, we will adopt the jigsaw method (Miyake & Kirschner, 2014) as an epistemic support to further facilitate deeper and broader ideas by promoting co-elaboration and diversification processes.

To more rigorously test our discussion, we should first conduct further case studies of other groups. Although we highlighted two groups in which members encountered socio-emotional challenges, there were groups in which members experienced few socio-emotional challenges. More investigations are needed to confirm our findings. Second, we should assess students’ regulatory processes concerning specific metacognitive prompts through analyzing weekly KF notes. We expect that such analyses would further reveal that how the supported reflection worked and theoretically contribute to establishing generalizable findings to design learning environments. Lastly, although we qualitatively examined how students improved ideas in relation to socio-emotional regulation, to further elucidate links between regulation and collaborative idea improvement, we should also quantitatively analyze idea quality and how ideas are developed.

References

- Dillenbourg, P., Järvelä, S., & Fischer, F. (2009). The evolution of research on computer-supported collaborative learning. In N. Balancheff, S. Ludvigsen, T. de Jong, A. Lazonder, S. Barnes (Eds.), *Technology-enhanced learning* (pp. 3-19). Netherlands: Springer.
- Griffin, P., McGaw, B., & Care, E. (Eds.). (2012). *Assessment and teaching of 21st century skills*. Dordrecht: Springer.
- Hong, H. Y., & Sullivan, F. R. (2009). Towards an idea-centered, principle-based design approach to support learning as knowledge creation. *Educational Technology Research and Development*, 57(5), 613.
- Järvenoja, H., Volet, S., & Järvelä, S. (2013). Regulation of emotions in socially challenging learning situations: An instrument to measure the adaptive and social nature of the regulation process. *Educational Psychology*, 33(1), 31-58.
- Miyake, N. & Kirschner, P. A. (2014). The Social and Interactive Dimensions of Collaborative Learning. In K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (2nd ed.) (pp. 418-438). New York: Cambridge University Press
- Näykki, P., Järvelä, S., Kirschner, P. A., & Järvenoja, H. (2014). Socio-emotional conflict in collaborative learning—A process-oriented case study in a higher education context. *International Journal of Educational Research*, 68, 1-14.
- Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. In B. Smith, & C. Bereiter (Eds.), *Liberal education in a knowledge society* (pp. 67-98). Berkeley, CA: Distributed by Publishers Group West.

Acknowledgments

This work was supported by JSPS KAKENHI Grant Number 24240105 and 16H0187.