IMPACT OF COMPUTER-MEDIATED SHARING ON CLASSROOM ACTIVITIES

Shaikh Rafikh, Harita Raval, Harshit Agrawal, and G. Nagarjuna
Homi Bhabha Centre for Science Education, TIFR

Many teaching-learning applications have a computer-mediated sharing feature and it is important that we study its role in the teaching-learning process in detail. The present study, which is a part of the larger study, probes the impact of the computer-mediated sharing feature on classroom activities. 45 students who belonged to a 4th-grade classroom were divided into two groups. One group has worked on a version of a digital game where each student played with the computer individually, whereas another group has worked on the version where a group of students played with each other mediated by networked computers. One classroom session from each setting was video recorded and analyzed. In this paper, we present the findings of the video analysis.

INTRODUCTION

Many teaching-learning applications have computer-mediated sharing feature. The feature makes collaborative activities possible. When students work collaboratively, they discuss, exchange explanations and co-construct knowledge (Hausmann, Chi, & Roy, 2004) which leads to learning (Junco, Heiberger, & Loken, 2011 Authors, 2013;), which is partly due to the increased motivation in the task (Rogat, Linnenbrink-Garcia, & DiDonato, 2013; Authors, 2017, Authors, 2013). Even though the role of computer-mediated sharing in learning has been studied, it has not been studied in controlled experiments with other variables are controlled. The present study attempts to do that.

Shared Memory Space (SMS)

Computer-mediated sharing can be understood using the distributed cognition framework. We can think of a shared computer screen as an extension of the students' memory space to which others have access (Hollan, Hutchins, & Kirsh, 2000). We are calling it Shared Memory Space or SMS. To us, the blackboard in the classroom is also an SMS if few students are standing near it and can read and write on it. Digital shared memory space is nothing but a much better version of the blackboard which extends the time and space boundaries.

METHODOLOGY

For the larger study, a mixed-method research design was adopted, the study aimed to understand the role of the computer-mediated sharing feature in learning in a computer-supported classroom. Students from the same class were chosen to keep most of the variables constant. Various types of data were collected for a period of six months. Data included pre and post-test (arithmetic proficiency test), computer logs, audio, and video recordings, along with the field notes. Data were analyzed to understand the role of computer-mediated sharing at different levels. A holistic approach was taken to study the motivational, intellectual and behavioral aspects of learning. Part of the analysis has been reported (Authors, 2017). In this paper, the analysis of the video data is being reported. The focus of the analysis is to understand how computer-mediated sharing feature changes the nature of classroom activities when other variables are constant.

The students were divided into two groups and interacted with the computer on alternate days. The computers (OLPC1 laptops) on which students worked were the same except for one game and one feature (computer-mediated sharing or SMS feature). The game which students played was designed specifically for the study. It had two versions, in one version student played individually against the computer Whereas in the other version, students played with each other via computers which were connected through the network. Researcher played the role of observer-cum-teacher.

A brief description of the game:

A) Control group-Game: It is an arithmetic game designed to help students learn arithmetic. In the control group, individual students played against the computer. The game starts with the student getting a number pair randomly based on the difficulty level he/she selected. Number pair has one starting number and one stepping number. The student is supposed to repeatedly add the stepping number starting from the starting number. For every post of the student, the computer does a reply post. The game ends when the student reaches the pre-decided milestone for the respective difficulty level (ex. first three-digit number in the series for the medium difficulty level). After the game ends, the computer generates a scoreboard with accuracy and speed and also awards a badge based on the student's performance. Student moves to next number pair and game continue.

B) Experimental group-Game: The experimental group version of the game is very similar to the control group version but here the student is playing against other students instead of the computer. A student or teacher start the session, other students join. Games start with participants deciding the number pair (or the teacher giving the number pair). Once number pair is decided, like the control version game, students are supposed to keep adding the stepping number starting from the 'starting number'. All the students can see each other's answers, the game ends when they reach a pre-decided milestone for the specific difficulty level. Those who finished the game can either monitor others work by looking at screen or go and help others. Students get extra marks for pointing out the mistakes of others. At the end of the game (when all students reach the milestone), the computer generates a scorecard based on the accuracy, speed and mistakes. Students move to the next number pair and the game continues.

One session (45 minutes) of each group settings was video recorded. 10 minutes of the video was analyzed and dynamic texts were created using a method inspired by Flewitt and Rosie's (2006) work. Dynamic text is the textual description of the video data which contains verbal, temporal, spatial, kinaesthetic information. The dynamic text was coded and several occurrences of each code were counted.

OBSERVATION, RESULT AND DISCUSSION

Even though complete videos were not analyzed as the analysis is in progress, the limited analysis did give some insights. Timeline of student and teacher's actions as seen in the recorded video (Figure 1) showed that there were qualitative differences in both settings. Using a distributed cognition framework we see that in both settings there is a teacher, students, and computers but how they are interacting with each other is different in both settings.

Analysis of Teacher's activities:

The teacher spends his time mainly in three activities: managing class (non-academic issues), helping students (technical troubleshooting) and giving feedback (game-related) or participating in the game. Presence or absence of SMS had an impact on the teacher's activities. In the control setting, teachers spend considerable time in validating students performance in the game and giving feedback about computations in the game. In the experimental setting, the teacher does not have to directly do it as the socio-technical system (composed of the teacher, students and machines) is doing both the jobs. Both versions of the number game provide on-screen feedback. The students seek human validation and feedback (Mandernach, 2005), which is why students in the control setting even after getting the feedback from the computer seek validation and feedback from the teacher. The students in the experimental setting are satisfied with the feedback they get through the game as it is not given by the computer but by other humans via connected computers. SMS makes it possible and easier for teachers and students to give and receive feedback. In the experimental setting, the teacher is part of the game and some of his time goes in monitoring the game. Teacher need to occasionally glance at his computer to see what is going on, suggest number pairs, announce winners and advise students. This activity is not as taxing on the teachers as the feedback activity in the control setting.

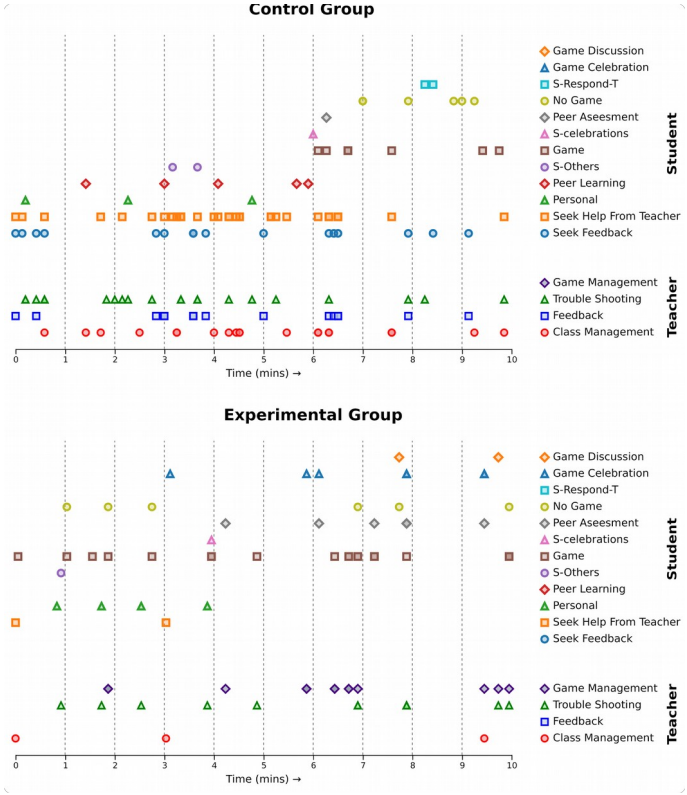

Figure 1: Timeline of the classroom activities

Class management is the second activity which consumes teachers time. The teacher needs to see if students are roaming around in the class, disturbing others, or fighting, etc. As the students who participated in the study are primary students and the study was done in the classroom instead of lab, the classroom used to be quite playful. The presence or absence of SMS had an impact on the amount of time the teacher spent in class management. The presence of SMS engaged the students in a common task with a shared goal. It made the teacher's task of class management much easier than the control setting where students are working with their computers and did not have a shared goal. The control setting classroom remained playful and the teacher had to spend considerable time managing it.

The teacher spent a lot of time in helping the students in technical issues as the students were not quite familiar with computers. It doesn't matter whether SMS is present or absent, the teacher had to spend more or less equal time in troubleshooting.

Analysis of Student's activities:

Students spend their time in various activities, but we will focus our attention on the most prominent ones. One such activity was seeking feedback from the teacher. We observed difference between settings. In the control setting, the students spend a lot of time in calling teacher to show their work and get feedback and validation. Seeing the student and teacher's activity together we notice that teacher is so busy that she can't attend to all the calls (See Figure 1). Between 0-1 and 8-9 minute, multiple student called teacher but the teacher could attend to half them. The students in the experimental setting were satisfied with the feedback/validation they got from the system.

Students seek help from the teacher when they get stuck. There was a difference between help seeking the two settings. In the control setting students are continuously asking for help but the teacher is unable to respond to every request. There is also difference in the possibility of peer assessment and peer learning. In the presence of SMS peer assessment becomes possible, where as in the absence there is hardly any scope.

CONCLUSION

Findings presented in the presented paper corroborates earlier analysis of computer logs, personal interview and focused group discussion which show that the presence of SMS makes the task motivating and creates a space for collaborative learning. Also it showed that in the absence of SMS teacher remains the central figure to which students go for help whereas in the presence of SMS the socio-technical system (made up of teacher, students and computer) takes the central role. The present study showed that SMS has an effect on how students seek feedback and validation. In the absence of SMS students go to teacher whereas in the presence of SMS the task of giving feedback goes to the socio-technical system. Similarly, presence of SMS makes teacher's job of class management easier. The presence of SMS creates a space where students can do peer assessment which also acts as human feedback, whereas in the absence there is limited scope of peer assessment (just one case observed). Overall, the present analysis tries to show how SMS alters the learning space in the classroom.

References

Authors, 2013 Authors, 2017.

Flewitt, R. (2006). Using video to investigate preschool classroom interaction: education research assumptions and methodological practices. *Visual communication*, 5(1), 25-50.

Hausmann, R. G., Chi, M. T., & Roy, M. (2004). Learning from collaborative problem solving: An analysis of three hypothesized mechanisms. *In Proceedings of the Cognitive Science Society* (Vol. 26).

Junco, R., Heiberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning*, 27(2), 119–132.

Hollan, J., Hutchins, E., & Kirsh, D. (2000). Distributed cognition: toward a new foundation for human-computer interaction research. *ACM Transactions on Computer-Human Interaction* (TOCHI), 7(2), 174–196.

Mandernach, B. J. (2005). Relative effectiveness of computer-based and human feedback for enhancing student learning. *The Journal of Educators Online*, 2(1), 1-17.

Rogat, T. K., Linnenbrink-Garcia, L., & DiDonato, N. (2013). Motivation in collaborative groups. *International Handbook of Collaborative Learning*, 250–267.