

# Student Awareness of Cloud-Based Collaborative Learning in Elementary School

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*Cloud-based collaborative learning (CBCL) has primarily been studied apropos university education. Very few extant studies have targeted elementary schools. In addition, the existing studies have predominantly attended to online CBCL, and studies on CBCL combining face-to-face and online are scant. CBCL pedagogy began in Japan after all elementary and junior high school students were provided with a one-to-one computer in 2021. This study elucidated the frequencies and reference levels of face-to-face and cloud-based collaborations among students experiencing CBCL for the first time. The results revealed no difference in the frequencies of face-to-face and cloud-based collaborations, but reference levels were higher for cloud-based collaboration.*

*Keywords: elementary school, cloud computing, collaborative learning, social constructivism, student awareness*

## Introduction

Collaborative learning is a form of *social interaction* in which learners work with others throughout the learning process to gain experience and knowledge (Baanqud et al., 2020). Social interaction enables learners to achieve a higher performance than they could achieve individually (Vygotsky, 1978).

Using cloud computing may exert a positive effect on collaborative learning (Wang & Huang, 2016). After conducting a review on practical studies on cloud-based collaborative learning (CBCL), Murakami et al. (2022) found that the majority of practical studies focused on university education with only a few examples in elementary and high schools. In Japan, all elementary and junior high school students were provided with individual computers and a communication network environment based on cloud computing in 2021. In a practical study on CBCL in elementary schools in Japan, Murakami et al. (2021) investigated the characteristics of classes in which students were engaged in CBCL and found that they were engaging in collaboration in the cloud while collaborating face-to-face. Such practices of face-to face (FtF) CBCL are an effective method for facilitating student learning (Wang & Huang, 2016). However, how do students who engage in CBCL with FtF use the two differently? The study conducted an awareness survey of students who were new to CBCL to elucidate the frequency and reference level of FtF collaboration and cloud-based collaboration.

## Method

### Participants

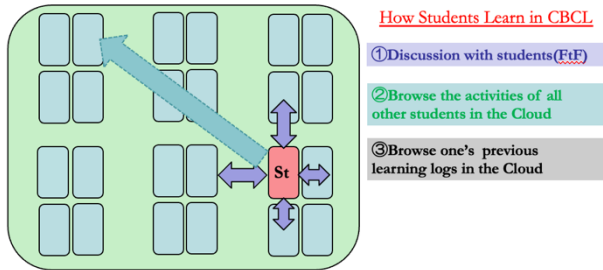
The study recruited 36 students (one class) in 4th grade at a public elementary school. The students had been using computers and the cloud for less than one year. The survey was conducted in October 2021.

### Study context

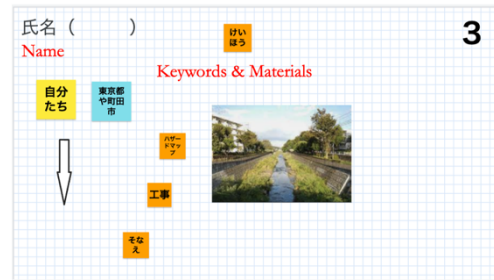
The students were given an assignment to draw a graphic on Google Jamboard about efforts to protect residents from flooding. The students had collected information on this topic and stored it in the cloud. The learning style was

that a group of four to five students could browse one another's Jamboards in the cloud at any time. Moreover, the students were able to browse their previous learning logs on the cloud at any time (Figure 1 and 2).

**Figure 1**  
How students learn in cloud-based collaborative learning (CBCL)



**Figure 2**  
Students' assignment on Jamboard



**Instrument**

After conducting the practice, a questionnaire (five cases) was used to examine motivation to learn, frequency, and the reference level of learning activities. Motivation to learn was examined using questions on “learning social studies,” “learning with computers,” and “collaborative learning.” The learning activities were (1) discussion with students (FtF); (2) browsing the activities of all other students (cloud), and (3) browsing one’s previous learning logs (cloud).”

**Results**

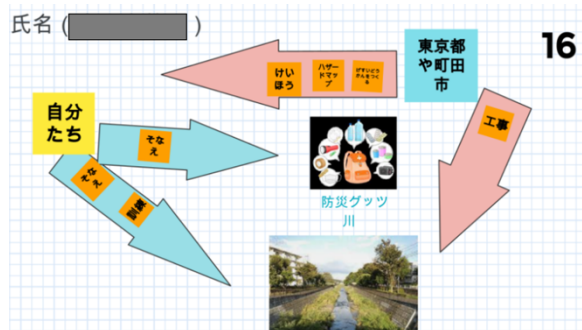
**Students' assignments**

Students worked on assignments as they engaged in FtF discussions with others and browsed in the cloud (Figure 3 and 4).

**Figure 3**  
*Students learn in CBCL*



**Figure 4**  
Examples of students' assignment



**Learning motivation**

The results of the questionnaire demonstrated that the motivation of students for learning social studies was 4.8; their motivation for learning using a computer was 4.8; and their motivation for collaborative learning was 4.6. The students were highly motivated to pursue social studies and to learn using computers; thus, they positively evaluated collaborative learning (Table 1).

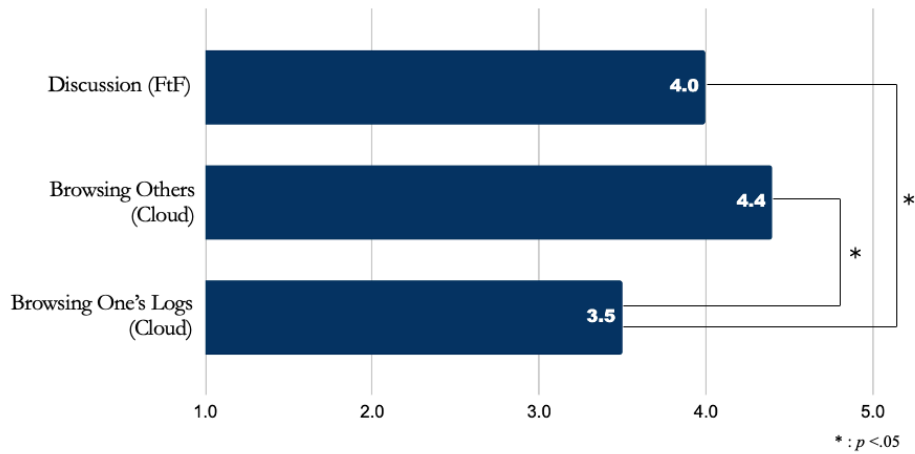
**Table 1**  
*Learning motivation*

Item	Average
Social Studies	4.8
Using PC for Learning	4.8
Collaborative Learning	4.6

**Frequency and Reference Level in CBCL**

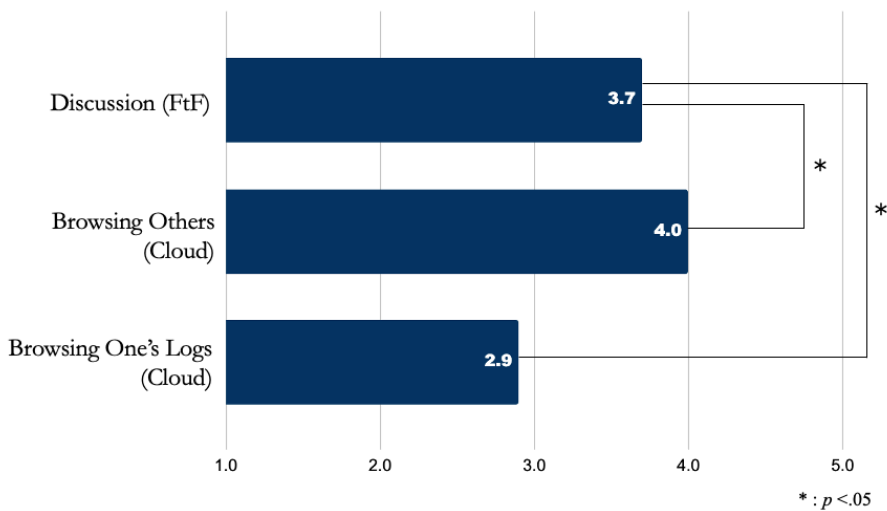
“Frequency” was 4.0 for “discussion with students (FtF),” 4.4 for “browsing all other students’ activities (cloud),” and 3.5 for “browsing all other students’ activities (Cloud).” The results of the one-factor analysis of variance with the learning method as a factor demonstrated that the effect of the learning method was significant ( $F(2,105) = 8.01, p < .01$ ). Multiple comparisons revealed that “discussion with students (FtF)” and “browsing all other students’ activities (cloud)” were significantly higher than “browsing own previous learning logs” (cloud) (Figure 6).

**Figure 6**  
Frequency of learning activities



Reference level was 3.7 for “discussion with students (FtF),” 4.0 for “browsing all other students’ activities (cloud),” and 2.9 for “browsing own previous learning logs (cloud).” The one-factor analysis of variance with learning method as a factor revealed that the effect of learning method was significant ( $F(2,105) = 5.85, p < .01$ ). Multiple comparisons revealed that “browsing all other students’ activities (cloud),” “discussion with students (FtF),” and “browsing own previous activities (cloud)” were significantly higher in that order (Figure 7).

**Figure 7**  
Reference level of learning



## Discussion

The study observed no difference in the “frequencies” of “discussion” and “browsing (others),” but noted a difference in the “reference level” of the students. Thus, the study suggested that the students collaborated on both channels (i.e., FtF and cloud), however, they found collaboration over the cloud to be more helpful. However, this response may be a result dependent on the assignment of this practice, which is difficult to explain in language. Thus, further detailed analyses are needed in the future.

“Browsing (self)” was less frequent and less referential than “discussion” and “browsing (others).” Thus, the results suggested that students felt that the extent of collaboration is better and helpful when conducted with others who share the same assignment, instead of reflecting on their learning records.

## Conclusion

Scholars have primarily CBCL apropos university education, such that very few extant studies have targeted elementary schools. In addition, the existing studies have predominantly focused on online CBCL, and studies on CBCL that combines face-to-face and online methods are scant. CBCL pedagogy originated in Japan after the government provided all elementary and junior high school students with individual computers in 2021. The study elucidated the frequencies and reference levels of face-to-face and cloud-based collaborations among students undertaking CBCL for the first time. The results revealed no difference in the frequencies of face-to-face and cloud-based collaboration, however, reference levels were higher for cloud-based collaboration.

In CBCL, which is based on constructivism, interaction in the learning group affects learning outcomes (Kaymak & Akgun, 2019). Future work is needed to clarify how the students found a partner to collaborate with, and what they found more useful in crowd-based collaboration compared to FtF collaboration.

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