So, H. J. et al. (Eds.) (2020). Proceedings of the 28th International Conference on Computers in Education.
Asia-Pacific Society for Computers in Education

Online Collaborative Kit-Build Concept Map

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Abstract:
Many studies show promising benefits of using concept maps as an effective approach to support learning, thus enhance students' understanding. Concept mapping with the Kit-Build concept map framework is known as one practical approach to improving students' understanding of learning material. Supporting meaningful learning in an online collaborative learning environment is challenging, where the students need an effective and meaningful interaction during the collaboration. Both the use of concept maps and collaborative learning are promising to promote an engaging learning environment, thus yielding a better learning outcome. This research introduces a newly developed concept mapping tool that fuses collaborative learning into the Kit-Build concept map framework. It allows students to learn by collaboratively working with concept maps in a distant real-time learning environment. This research investigates the tool's effectiveness in a learning environment where the students use different concept mapping approaches to learn with concept maps online collaboratively.

Keywords: collaboration, concept map, Kit-Build, learning effect, online

1. Introduction

A learning framework, namely Kit-Build concept-map framework, is a closed-ended concept mapping approach where the students reconstruct a concept map from the provided concept and link components of a teacher's concept map (Hirashima, Yamasaki, Fukuda, & Funaoi, 2015). In a learning environment with the Kit-Build concept map framework, students learn and express their understanding by reconstructing the teacher's concept map components. In its practical use, the teachers and the students use a computer-supported concept map authoring tool to create and reconstruct the concept maps, respectively. Several studies related to the Kit-Build concept map framework show that the use of Kit-Build concept map in learning context has many advantages in improving the students' understanding of learning material (Alkhateeb, Hayashi, Rajab, & Hirashima, 2015; Andoko, Hayashi, Hirashima, & Asri, 2020). The use of concept mapping tool may also provide some assistance in the concept map creation activities (Pinandito, Az-zahra, Hirashima, Hayashi, 2019).

Collaborative learning is known to promote greater benefits towards students' self-discovery, cognitive achievement, and productivity while engaging them to an active knowledge-sharing, social, and psychological learning environment (Laal & Ghodsi, 2012; Ibrahim, Shak, Mohd, Ismail, Perumal, Zaidi, & Yasin, 2015). As education systems were shifting from offline classroom to a distant or online context, the adoption of online education technology raises significantly. Activities in distant learning become more challenging, especially in learning activities that involve collaborative work.

This research introduces a new approach to learning with the Kit-Build concept map that allows students to learn, discuss, and work collaboratively in the distance and in real-time through an online concept mapping tool. Even though a similar tool has been developed (Farrokhnia, Pijeira-Diaz, Noroozi, & Hatami, 2019), this research has its implementations that extend its previous functionalities to the extent that the students and teachers can discuss and collaboratively work in real-time. The extension removes the offline barrier of the current concept mapping tool that supports a meaningful interaction among learners when they learn with Kit-Build concept maps (Wunnasri, Pailai, Hayashi, & Hirashima, 2018; Sadita, Hirashima, Hayashi, Furtado, Junus, & Santoso, 2019; Prasetya, Widiyaningtyas, Hirashima, & Hayashi, 2019). Furthermore, the effectiveness of two concept mapping approaches in improving students' understanding of a learning material while using the online collaborative concept mapping tool is also investigated.

2. Methodology

An experiment is designed to evaluate the tool's effectiveness in the context of an online real-time collaborative learning that uses the Kit-Build concept map method. The experiment involves 40 international graduate students divided into two groups of dyads, i.e., Collaborative Scratch Mapping (CSM), and Collaborative Kit-Building (CKB). The dyads in the CSM group create a concept map from scratch, while dyads in the CKB group create the concept map from a pre-defined Kit-Build concept map component (kit). An English learning material is prepared as the learning subject for the students to learn and comprehend its contents.

For the experiment, an online concept mapping system has been specifically built following the experiment flow. All participants were asked to represent their understanding in the form of a concept map while also discussing the map they made. Every participant uses a separate computer and rooms in such a way that they neither can see nor have a face-to-face discussion. Hence, simulating an online distant learning activity where direct verbal discussions are difficult or impossible to conduct. As shown in Figure 1, all participants were given training about how to use the tool, read the learning material, and answer some pre-test questions before doing the concept mapping with their partner collaboratively. The post-test and the delayed-test measure the students' understanding after they collaborate with their partner and measuring their knowledge retention, respectively.

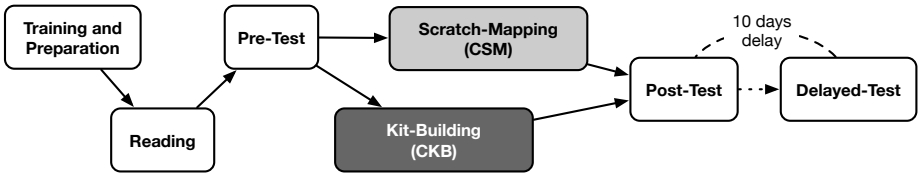

Figure 2. Experiment flow.

3. Results

According to the analysis and comparison of the pre-test result, as shown in Figure 2, both the CSM and CKB groups have a similar level of understanding. According to the students' post-test results, learning collaboratively with the Kit-Build concept map is shown effective in improving the students' understanding of learning material. Their understanding improves significantly, according to the Wilcoxon paired test (*p-value* < 0.001). Furthermore, it can also be seen that their understanding is starting to decay after several days. The decline in their understanding is statistically significant as per Wilcoxon paired test *p-value* is less than 0.001. The comparison of the students' test scores from both groups is shown in Figure 2.

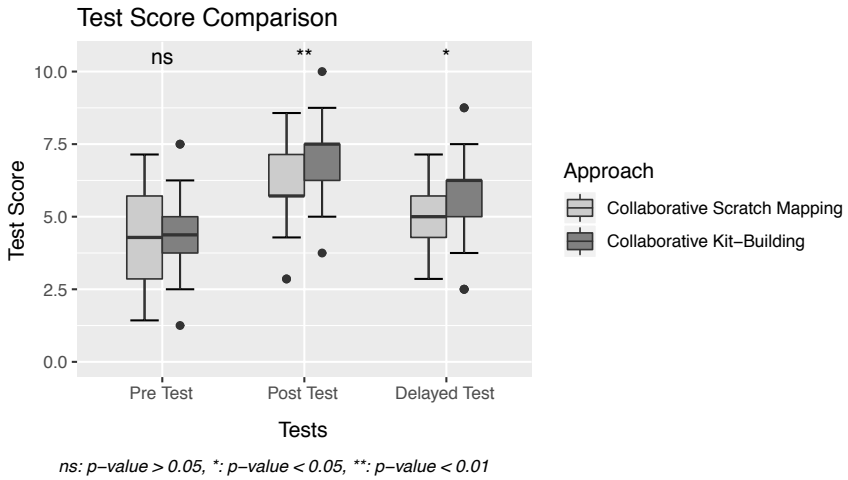

Figure 2. Test score comparison between two concept mapping approaches.

4. Conclusion and Future Works

The concept mapping tool introduced in this research, which combines the Kit-Build and collaborative learning approach, is promising to use in an online collaborative learning environment that uses concept maps. The online concept mapping tool introduces a new approach to learning with Kit-Build concept maps that combine the Kit-Build concept mapping activities with a collaborative learning environment. It creates an integrated online collaborative learning environment that incorporates concept mapping activities. The students can use the tool to collaboratively create concept maps with their partners and make an effective discussion that helps them learn while creating or reconstructing a concept map. The online collaborative learning with the online collaborative Kit-Build concept map tool also improves students' understanding of a given learning material regardless of the concept mapping approach used during concept mapping activities. The collaborative concept mapping activities with the Kit-Build concept map can now be conducted online in real-time where distance learning is an issue.

Still, there are many research opportunities to be addressed as the future works of this research. Further analysis of the resulting concept maps, analyzing the students' activities and their discussions during the collaborative work, and evaluating the usability of the tool in practical use are only several interesting future research topics that will benefit this research more.

Acknowledgements

This research is partially supported by JSPS KAKENHI Grant Numbers 19H04227.

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