THE EFFECT OF KBDEX FOR ANALYZING CONSTRUCTIVE INTERACTION

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ABSTRACT

In this study, we argue that visualizing words' network and the speaker of the word in discourses could help students learn the effect of discussion. Constructive interaction is a mechanism for deepening participants' understanding in discussions, but it is difficult to see as an effective activity because evaluating deepness is difficult. We tried to teach the effect of constructive interaction showing when each keyword appears and who referred to the keyword by presetting KBDeX (Knowledge building Discourse eXplorer). Forty-one first-year undergraduates used KBDeX to analyze the discourse for studying constructive interaction. The students who used KBDeX found characteristics of constructive interaction and recognized the effect of collaboration though they could not without preset.. These results suggest that our preset for KBDeX helped the students study the effect of collaboration reflecting the discourse.

INTRODUCTION

In recent years, we have tried to find new ways of assessing students' learning that fit curricula derived from "21st century skills" (Griffin, McGaw, & Care, 2012). In this context, the main objective of education has transformed into learner-centered knowledge construction. Collaborative learning is adopted to design new curricula, and the assessment method had to be reconstructed to capture the improvement of the students' 21st century skills. One of the important theories for assessing the 21st century skills is "constructive interaction" (Miyake, 1986). Miyake suggests each student eventually deepens his/her understanding level through explaining his/her thinking and questioning each other about it. In Japan, Miyake and her collaborators attempted to use discourses acquired in the classes to assess students' understanding levels (CoREF, 2013). The levels are closely related to keywords within discourses. Thus, to find the keywords that reflect the participants' understanding level about the theme of discussion is difficult for analyzers who have no knowledge of the content.

KBDeX was developed for discourse analysis focusing on each participant's spoken words (Oshima, Oshima, & Matsuzawa, 2012) based on the theory of network analysis. If the analysts set appropriate words, KBDeX may draw graphs that highlight the characteristics of constructive interaction. Thus, we hypothesized that KBDeX helps visualize the characteristics of constructive interaction.

TARGET CLASS

Our targets were first-year undergraduates who studied "Learning Management" held in 2013 at a Japanese University. The students were expected to recognize how people learn from the viewpoint of learning sciences in relation to their daily experiences in this class. We asked them to analyze a discourse of constructive interaction using KBDeX to learn the effect of collaborative learning.

TOOLS AND DATA

The students analyzed a discourse about solving the "bobbin problem" (Yamanaka, 2002; Fig. 1) in KBDeX and preset their own laptops. In the discourse, two master course students discuss the mechanism of a bobbin's rotation when its string is pulled. This problem looks simple at first but is difficult to explain, so speakers repeatedly tried explaining and questioning each other, a typical constructive interaction. To evaluate the quality of the interaction, a main speaker and the deepness of spoken concepts are needed. KBDeX could show the speaker of each line automatically, so we selected 27 keywords like "point of load" to help the students visualize the speaker's understanding. We separate the discourse into 11 phases based on the change in the speakers' role (main speaker or listener) to help the students follow each speaker's trajectory. The keywords and the separation of the phases were decided by the first author. We call them "presets."

  The students presented a network of the speakers, a network of each sentence, and a network of the

keywords in KBDeX. The discourse was printed and distributed to each student, and it identified the separation of the 11 phases of the discourse.
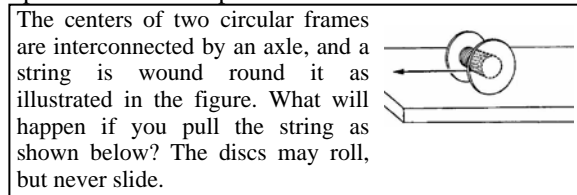

The centers of two circular frames are interconnected by an axle, and a string is wound round it as illustrated in the figure. What will happen if you pull the string as shown below? The discs may roll, but never slide.

Fig. 1.   Bobbin problem.

CLASS DESIGN

The students analyzed discourses using KBDeX twice in the curriculum. The subject of the first discourse was "Collaborative Figure Description Building" (Araki *et al.*, 2008); that of the latter discourse was the bobbin problem. The objective of analyzing the former one is to recognize that each participant has a unique viewpoint and that the difference encourages deepening discussion. The students experienced both activities and then analyzed the discourse of each activity. The students analyzed the discourse freely in the former experience but were helped in the analysis by presets in the latter one. They record these analysis results on their worksheets. The students wrote three reports about "what is the ideal group work for you?" (before the former experience, before the latter experience, and after the latter experience).

RESULTS

Forty-one first-year undergraduates were analyzed.

Result 1. Characteristics of the discourses

We analyzed the students' worksheets to assess how many students recognized that differences of participants' viewpoints encourage deepening discussion. The result was that only four students recognized it in the former experience. In contrast, over 30 students pointed out the pivotal words of phases one to four correctly (Fig. 2). However, it seemed difficult to capture the pivotal words in phases five and six. The pivotal words of phases one to four were more concrete than in phases five and six, so KBDeX helped the students when they analyzed concrete words.

Result 2. Belief change

We categorized reports into "task dividing" or "exchange opinions." Students who think of collaborative learning as task dividing were categorized into "task dividing." Students who think that the importance of collaborative learning is exchanging opinions to deepen one's understanding were categorized into "exchange opinions." The

results are presented in Fig. 3. There was a significant difference between the pre- and post-reports ($\chi^2=10.92$, $df=1$, $p<.01$).
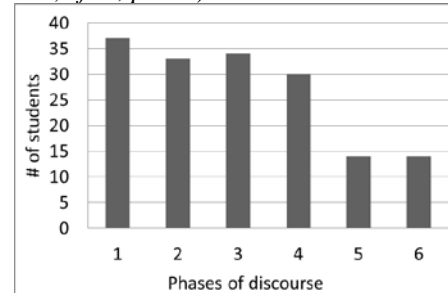

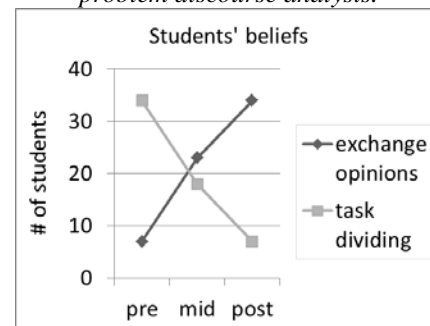Fig. 2. Correctly analyzed pivotal words in bobbin problem discourse analysis.

Fig. 3. Students' beliefs.

DISCUSSION

KBDeX promoted students' learning of constructive interaction in relation to the concrete data if they were presented notable words that were closely related to the understanding levels of speakers. Network analysis tools like KBDeX could show graphs of the process of constructive interaction if we set pivotal words for analyzing understanding levels.

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