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An Analysis of the Interactional Patterns in One-to-One and One - to- Many Collaborative Concept Mapping Activities

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Abstract: This paper reports on a study to investigate the effects of collaborative concept mapping in a one-device-per-student (1:1) digital learning environment, as compared with one-device-to-many-students (1:m), in terms of students' overall learning gains, knowledge retention, quality of the concept maps, interactional patterns, and learning perceptions. Guided by the methodology of quasi-experimental research, we adopted Group Scribbles (GS) 1.0 in our empirical study where students carried out collaborative concept mapping activities in two different settings: (a) students working in pairs with one Tablet PC assigned to each of them; (b) multiple students sharing a Tablet PC. In particular, we investigated the students' learning process, identified and compared various interactional patterns exhibited by the student groups who were engaged in both settings, and discussed how such group dynamics might have affected the quality of the student artifacts produced by individual groups.

Introduction

Social study is an integrative theme that applies multiple disciplines of learning concepts and principles to social life. In most of the routine social study lessons in schools, teachers are in general still practicing didactic instructions, drill and practice, and continuous assessments. They are learning outcome-oriented but not keen on ensuring students' thorough understanding of what they learned, which results in the fact that students only focus on memorizing fragmented knowledge without synthesizing it. This paper reports on a study that aimed to investigate the process and the effects of collaborative concept mapping in a 1:1 digital learning environment, as compared with 1:many mode. In particular, we are keen on exploring the students' learning process and identifying various interactional patterns exhibited by the student groups who were engaged in the two collaborative modes through our analysis of student interview transcripts and video recordings during the activities. Eventually, we triangulated all the data and formulated our findings in the nature of 1:1 and 1:4 computer-supported collaborative concept mapping activities.

Literature Review

One-to-one technology enhanced learning is the way that a student uses at least one computing device with a networking environment for learning (Chan *et al*, 2006). The devices used for such a learning mode usually incorporate the affordances such as: personalization, connectivity and supporting social interactivity (ibid). With the advancement of the information technology, the concept mapping software that provides the affordances of selecting, deleting, classifying, sequencing, modifying, connecting and listing of concept maps has been developed. Plotnick (2001) also points out that as computer-supported concept mapping offers the ease of editing, dynamic linking, format conversion, ease of transfer and storing, which are very conducive for learners to create concept maps. Otherwise, various researchers have been seeking for ways to categorize interactional patterns in small learning groups, with or without computer supports, through their ethnographic studies on such learning activities. In Table 1, we compare three relevant studies and a recent effort to synthesize them.

Table 1: Consolidation of interactional patterns in small groups

	Milson (1973)	Roth (1995)	Huang (2001)
Ideal	Ideal	Symmetric interaction	Turn taking
Leader	Dominant leader	Asymmetic interaction	Leader
		Shifting symmetric interaction	Focus
Tete-a-tete	Tete-a-tete	Parallel occasional interaction	
Fragmented	Fragmented, cliquish	Asymmetric interaction	Fragmented
	Stilted		
No participation	Unresponsive	No participation	
	Unsocial		

Methodology

Sixty four students from two Grade 6 classes in a primary school were involved in the study. They were taught in the second unit of the Social Study lesson, *"Investment, Financial Management and Economic Activities"*, as well as taking a competency pre-test on the subject, prior to the study. Students were split into eight "1:1 groups" and eight "1:4 groups". By using the Group Scribbles (GS 1.0) software, each of the members of the 1:1 group was assigned a Tablet PC to perform collaborative concept mapping, in the 1:4 group 4 students sharing one Tablet PC. The quantitative data consisted of the results of pre-, post- and postponed-tests, with the "N-G score" proposed by Novak & Gowin (1984) about the scoring rubric of the students' concept maps. A questionnaire was administered to investigate student attitudes in collaborative learning, the usability of the software, and learning by concept mapping. Eventually, we triangulated all the data and formulated our findings of the nature of 1:1 computer-supported collaborative concept mapping activities.

Figure 1: collaborative concept mapping activities

Figure 2: Students' concept map

Conclusions

Social Studies emphasizes the skills of synthesis and application. The key to the mastery of the subject is to move away from the conventional "rote learning" and take place with actively engagements in meaningful learning and knowledge building. In this study, we investigated collaborative concept mapping as a solution to this issue. Both 1:1 and 1:4 settings were implemented and compared, with the following findings being drawn,

- Learning outcomes: Our analysis of student performances show that both 1:1 and 1:4 settings had indeed been able to improve the students' results and demonstrated good retention. Furthermore, both settings did not result in significant differences in the improvement in these two aspects.

- Results of concept mapping: Although little difference in the concept map scores between students engaged in the two settings, the standard deviations of the 1:1 groups had been greater than those of the 1:4 groups. According to our analysis, the underlying reason of the greater differences in the performances among the individual 1:1 group members would be that the levels of group bonding had a greater influence on the effectiveness of their collaborations.

- Interactional patterns: We analyzed all the student groups' interactions and discovered that the 1:1 groups had practiced four interactional patterns respectively, namely, "ideal" (the most popular mode), "leader", "tete-a-tete" and "fragmented". The 1:4 groups, on the other hand, assumed the "leader" and "fragmented" (the most popular) patterns but not the other two. We argue that the 1:1 group had demonstrated interactions of better quality as compared with the 14 groups as the former setting had facilitated greater autonomy to individual students, thus enhancing their level of participations in collaborative learning. On the other hand, there had been isolated students occurred in some of the 1:4 group, resulting in far-from-ideal group interactions.

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