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Practical Use of Kit-Build Concept Map in Classroom with Tablet-PC

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Abstract: We have proposed a framework of kit-build concept map that can be diagnosed automatically, and have already implemented two fundamental softwares to practically use the kit-build concept map, that is, (1) KB-map Builder where learners can build concept map by combining provided kit, and (2) KB-map Analyzer that gathers the maps built by learners on-line and diagnoses them. We have been using the kit-build concept map in real class in an elementary school. This paper is a work-in-progress report of the practical use of the kit-build concept map for science learning in the elementary school. In this report, map building with tablet-PCs is mainly described. Based on the results of questionnaire, we have confirmed that the students found concept-map building useful, and preferred to use tablet-PCs rather than desk-top PCs.

Keywords: Kit-Build Concept Map, Tablet-PC, Waxing and Waning of the Moon,

Introduction

"Kit-Build Concept Map" is a framework to realize automatic diagnosis of concept maps [1, 2]. In the framework of the kit-build concept map, the task to build a concept map is divided into two sub-tasks: 1) "segmentation task" where parts (called "kits") of a concept map are extracted and 2) "structuring task" where the extracted parts are connected. An ideal concept map (goal map) is, then, prepared by an expert or a teacher at first, and parts are generated by decomposing the goal map. The parts are provided to the learner, and then the learner builds a concept map (learner map) by connecting the parts. Therefore, in the framework of the kit-build concept map, the segmentation task is carried out by teacher or domain expert, and learner carries out recognition task instead of the segmentation task. Then, the construction task remains as it is.

In the KB map, because the learner builds a learner map with the same parts with the goal map, it is possible to diagnose learner maps automatically by comparing with the goal map. This diagnosis makes the following matters possible for a teacher and learners: (i) getting the differences between a goal map and a learner map, (ii) getting the differences between each of learner maps, and (iii) getting an overlaid concept map which is generated by overlaying several learner maps including a group of learners. We have already implemented (I) Kit-Build Concept Map Building Tool for a learner (KB-Map Builder) and (II) Analyzer of KB-Map for educator (KB-Map Analyzer). KB-Map Builder and KB-Map Analyzer are connected through internet and real time analysis is realized.

This paper is a work-in-progress report of practical use of the kit-build concept map in an elementary school. The learning target is "waxing and waning of the Moon" in science learning. Map building on tablet-PCs is mainly described in this paper.

1. Practical Used of Kit-Build Concept Map for "Waxing and Waning of the Moon"

1.1 Goal map, learner map and overlaid map

Figure 1 is the goal map that was prepared by a class teacher. By taking apart the goal map, kit of a concept map is generated. A learner builds a concept map by using the kit. Figure 2 shows parts of the kit and a half-build learner's map. Because all nodes and links are the same ones, the differences between a learner map and the goal map appear as inconsistence in the link connections. Then the links are targets for remedial learning of the learners. Figure 3 shows an example of an overlaid map which is generated by overlaying several learner maps. The overlaid map describes understanding of a student group.

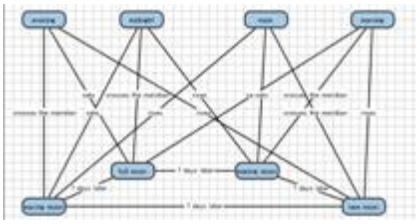

Fig. 1: Goal Map

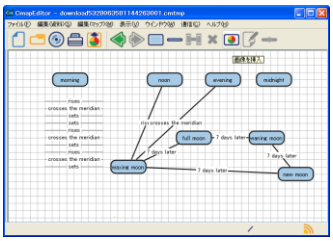

Fig. 2: Learner Map Building

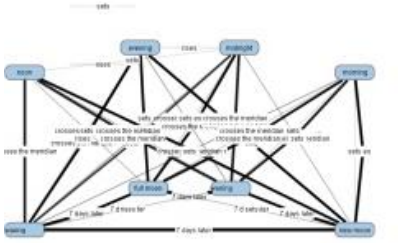

Fig. 3: Overlaid Map

1.2 Practical Use

Seventy-three 4th grade students in two classes attended this practical use. The student firstly received two classes of "waxing and waning of the Moon" by building the kit-build concept map. Three weeks later, the students build the maps with table-PCs as an additional class. In this class, the students built the maps individually for twenty minutes, and then, improved the maps collaboratively with peers while moving with the tablet-PC freely. Questionnaire was carried out three days after the use.

Figure 4 shows a map building on a desktop PC. Figure 5 is a scene of the classroom of map building with table-PCs. Figure 6 shows a map building on a tablet-PC. Figure 7 shows a scene where two students are collaboratively improving their maps.

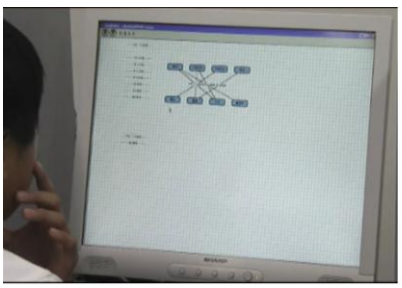

Fig. 4: Map Building with Desktop PC

Fig. 5: A Scene of the class

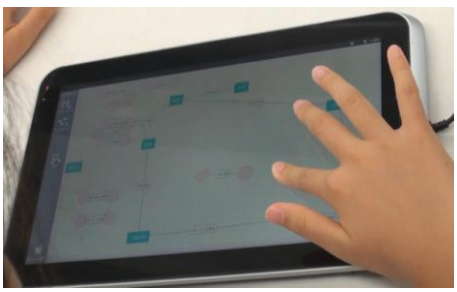

Fig. 6: Map Building with Table-PC

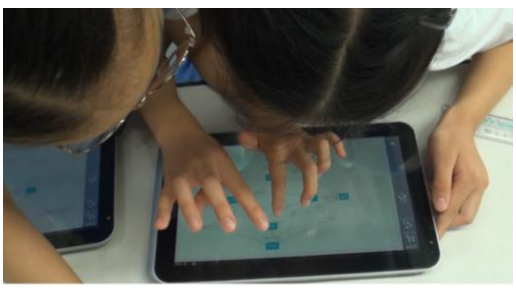

Fig. 7: Collaborative Building

1.3 Results

Figure 8 shows average scores of similarity of learner maps to the goal map in three times, that is, (1) "first map" means that a leaner made it in previous class with desktop PC (score = 79.6 (SD=25.4)), (2) "second map" means that a learner made it by him/herself at the beginning of this class with tablet-PCs (74.4(28.1)), and (3) "third map" means that a learner improved it though collaboration with other students (83.3(24.2)). The data was analyzed by one-way ANOVA followed by Ryan's method. As the result, there is a significant difference in the map scores ($F(2, 134)=4.89$, $p < 0.01$). There is also significant difference between scores in the second maps and the third maps ($p < 0.01$). These results suggest that the collaborative building was useful to improve the quality of their maps.

Table 1 shows the results of questionnaire. For questions from (1) to (4), we asked the students to agree or disagree with statements on 4 point scales, that is, 4 =strongly agree, 3=agree, 2=disagree and 1=strongly disagree. As for questions from (5) to (7), we asked them to select 3=tablet-PC, 2=both, and 1=desktop-PC. The results suggest that most of the students find map building a useful and enjoyable activity. Furthermore, they prefer to use tablet-PC to build the maps.

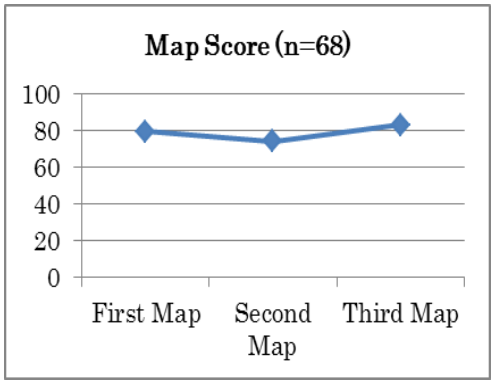

Fig. 8: Map scores

Table 1: Results of questionnaire

	4	3	2	1
(1) Did you enjoy map building?	68	6	0	0
(2) Was map building useful to learn the Moon?	57	15	1	0
(3) Do you like to use the map for other subjects?	66	8	0	0
(4) Was talking about the maps with your friends useful for your learning?	55	18	1	0
(5) Which tablet-PC or desktop-PC was better for you to build the maps?		62	5	7
(6) Which tablet-PC or desktop-PC was better for you to talk about the maps with your friends?		73	1	0
(7) Which tablet-PC or desktop-PC will you prefer to use in the next time?		64	8	2

2. Conclusions Remarks

This paper is a work-in-progress report of practical use of the kit-build concept map. In this paper, we mainly described practical use with tablet-PCs. By using tablet-PCs, learning activity with the kit-build concept map can be conducted in a usual classroom although wireless LAN is necessary. Moreover, students are allowed to collaboratively build the maps while moving with their own tablet-PC freely. Results of questionnaire suggest that they really enjoyed this learning activity. Detailed analysis of this practice has not been completed, but we have already confirmed that tablet-PC is a promising approach to use the kit-build concept map practically.

References

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