題目 VALIDITY INVESTIGATION OF RECONSTRUCTIONAL CONCEPT MAP AND ITS COLLABORATIVE USE FOR SHARING UNDERSTANDING
（再構成型概念マップの妥当性の検証と理解共有のための協調的利用に関する研究）

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Several previous researches of Kit-Build concept map have shown that the KB map is suitable for use in teaching situation where the instructor gives directions followed by instructor's interpretation. However, we have not previously compared the KB method with other well-known manual methods that are also used practically. Although the automatic assessment method has advantages over manual assessment, for example, real time assessment/feedback, load reduction of the rater/teacher, etc., the quality of automatic assessment requires investigation. As an investigation of the validity of this method, an experiment was conducted as a case study to compare the assessment results of the method with the assessment results of two other manual assessment methods. In this experiment, it was found that the scores of the KB method had a very strong correlation with the scores of the other manual methods. The results of this experiment are one of evidence to show the automatic assessment of the Kit-Build concept map can attain almost the same level of validity as well-known manual assessment methods.

In the validity investigation, the participants also confirmed that they can use KB map for expressing their understanding. Hence, KB map should support the participants to share their understanding to each other clearly. A collaborative use of KB map called "Reciprocal KB map" is proposed. In a Reciprocal KB map for a pair discussion, at first, the two participants make their own concept maps expressing their comprehension. Then, they exchange the components of their maps and request each other to reconstruct their maps by using the components. The differences between the original map and the reconstructed map are diagnosed automatically as an advantage of the KB map. Reciprocal KB map is expected to encourage pair discussion to recognize the understanding of each other and to create an effective discussion. In an experiment reported, Reciprocal KB map was used for supporting a pair discussion and was compared with a pair discussion which was supported by a traditional concept map. The results of the experiment were analyzed using three metrics: a discussion score, a similarity score, and questionnaires. The discussion score, which investigates the value of talk in discussion, demonstrates that Reciprocal KB map can promote more effective discussion between the partners compared to the traditional concept map. The similarity score of concept maps demonstrates that Reciprocal KB map can encourage the pair of partners to understand each other better compared to the traditional concept map. Last, the questionnaires illustrate that Reciprocal KB map can support the pair of partners to collaborate in the discussion smoothly and the participants accepted this method for sharing their understanding with each other. These results suggest that Reciprocal KB map is a promising approach for encouraging pairs of partners to understand each other and to promote the effective discussions.

The thesis consists of five chapters. In **Chapter 1**, the research context and the goals, contribution, evaluation methods, and the structure of the thesis are described. **Chapter 2** outlines the KB map. **Chapter 3** presents the validity investigation on the concept map assessment method and the comparison of validity between the manual methods and KB method. In **Chapter 4**, an applied collaborative learning technique with KB map is described as Reciprocal KB map. The results of preliminary experiments demonstrate that it can utilized for sharing understanding. Finally, **Chapter 5** explains the conclusion of this thesis and future work directions.