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Ongoing Formative Assessment with Concept Map in Proposition Level Exact Matching

Jaruwat PAILAI[a*], Warunya WUNNASRI[a], Yusuke HAYASHI[a], Tsukasa HIRASHIMA[a]
[a]*Graduate School of Information Engineering, Hiroshima University, Japan*
*jaruwat@lel.hiroshima-u.ac.jp

Abstract: Formative assessment is widely used in education area for improve learning achievements. And we propose a framework of Kit-Build concept map for utilizing in ongoing formative assessment. Concept map strategy is already proven to represent learner's understanding and becomes to a suitable strategy for formative assessment. We investigate the proposition of concept map that is constructed by connecting two concepts via linking words. The framework can gather and assess concept maps as learners' evidence for identifying learners' state in classroom situation that is a task of formative assessment. It provides assessment result and diagnosis result to instructor. These results are generated by using the proposition level exact matching method of an automatic concept map assessment. The assessment result is the similarity score between instructor's concept map (Goal map) and learner's concept map (Learner map). And the diagnosis result is represented in form of concept map with three error types. The errors show the different proposition between goal map and learners map, which is called individual-goal difference map. Both assessment result and diagnosis result provide information about understanding of each learner on lecture content to instructor that is called individual diagnosis. It can contribute instructor's feedback that is a key of formative assessment. As more as possible to gather and assess learner's evidence provides more opportunities to instructor for improving learner's achievements. Providing overview of learners can reduce analysis time of instructor to recognize learners' understanding. It means instructor can design and provide instructor's feedback in less time based on group diagnosis of Kit-Build concept map. The group diagnosis includes group map and group-goal difference map. The group map is generated from overlaying all of learners map. It shows common understanding of learners that is used to generate group-goal difference map, this group-goal difference map shows most common misunderstanding. In this paper, we would like to propose the scenario that is suitable for supporting through of learning process since setting goal, gathering evidence of learners and providing effective information to designing instructor's feedback for improving teaching and learning in classroom situation.

Keywords: Ongoing Formative Assessments, Concept map, Kit-Build concept map, Proposition level exact matching

1. Introduction

Concept map that is used as a formative assessment strategy is a useful method for responding to formative assessment requirement. It is used for goal setting, gathering learner's evidence and identifying learner's state. Automatic concept map assessment is required for ongoing formative assessment in classroom situation. The assessment can provide information of learners immediately, which is used to design instructor's feedback for improving learner's understanding. The most suitable solution to identify the disagreement is exact matching between learner map and instructor map. The analyzer generates diagnosis results that can provide formative information for designing instructor's feedback together with instructor's actions. In other words, this information will contribute instructor to reflective practitioner in part of "Reflection-in-action" and "Reflection-on-action" for intra-class feedback and inter-class feedback. They can be used to improve learning achievements.

2. Proposition Level Exact Matching

Technology-enhanced formative assessment is the best alternative approaches for improving learners' achievement in classroom situation. More opportunities make more chance to success. Concept maps as a formative assessment strategy is used to represent instructor's expectation following lecture content, and is also used to represent learner's understanding on lecture content. An instructor constructs a concept as a goal map that is used to declare an objective of class as final state. Gathering learners map is the way to collect learner's evidence, and assess them to identify learner's state. Many researchers have proposed designing and implementing software for supporting construction of concept maps and have also developed automatic concept maps assessment for using in their tasks. The criteria propositions are created from instructors and additional criteria derivatives by supplying different technique. An alternative criteria set expands with natural language processing such as WordNet and ontology. The criteria map for quality and quantity assessment are widely used that can influence the effective assessment. Propositions are primary important in concept map. The easiest assessment method is comparison between instructor's map and learner's map.

An automatic concept map assessment of Kit-Build concept map is the proposition level exact matching. Although it was impossible to assess traditional concept maps, which learners can create concept maps and linking words by themselves. But learners map of Kit-Build concept map is constructed by learners who integrate a kit to learners map. The kit is concepts and relation with linking words, which is decomposed form the goal map. It can control the number of proposition and also control relationship and linking words of learner's map. The proposition level exact matching can identify result of each proposition clearly. It can be used to generate individual diagnosis that includes the assessment results and the diagnosis results. The assessment result is similarity score between goal map and learner map that can used to identify learner's state. The diagnosis result can explain about incorrect proposition, which requests instructor and learners have to think and correct it again. Moreover, Kit-Build concept map can generate a group map that is created from all of learner maps. It represents about common understanding of learners. Kit-Build concept map can also generate a group-goal difference map to represents most common misunderstanding in form of three error types. These error links include lacking links, which are the link of propositions in goal map but it disappears in learners map, the excessive links are the link of propositions in learners map but does not exist in the goal map, and the leaving links is the links of learners map that is not connected to any concept. These results are represented in group diagnosis. The diagnosis results in the form of graph visualization can address the help requirement in content, group, segment or area of critical region that is important point for improving learner's understanding. It helps instructor clearer and easier to recognize learners understanding. The excessive link and leaving link identify where you should pay your attention. And the answer of questions what is next step or how to close the learner's state is lacking link. According to the ability of Kit-Build concept map, it can show the advantage of Kit-Build concept map in ongoing formative assessment. Automatic concept map assessment can provide assessment result immediately. And the assessment method to clarify the result is especially advantageous to recognize the learner understanding. We suggest the group diagnosis for grasp an overview of the class, and individual diagnosis for more detail analysis.

However, the vulnerability of Kit-Build concept map is more restriction because of the kit. The automatic concept map assessment of traditional concept map has a variety of methods and also has many considerations. For example, synonym matching or graph theory is additional condition such as the compromising of learner's mistakes to calculate learner's score. The result shows learner state approximately such as high score that responds to good understanding or less score that responds to learner who cannot understand well. It requests instructor to confirm the assessment result again. It also makes additional task and time to instructor. And it is difficult to decide the proposition that need to be more understanding. In this case, the proposition level exact matching of Kit-Build concept map can simplify instructor's task. The instructor can find correct or incorrect proposition easily and can recognize it in time less.

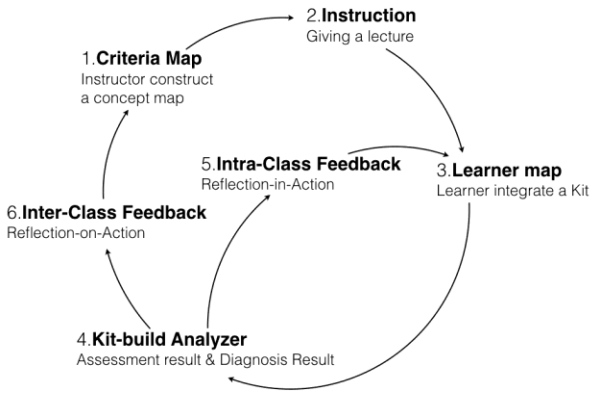

Figure 1. Ongoing formative assessment based on Kit-Build concept Map

3. Discussion

The framework of Kit-Build concept map is technology-enhanced approach for supporting concept map strategy and providing formative information to instructor in the form of assessment result and diagnosis result. In proposition level diagnosis, it explains about incorrect proposition, which requests instructor and learners have to think and correct it again. The assessment results and diagnosis results support instructor to use instructor's feedback for feeding forward. The group map and difference map that are generated by automatic assessment are informative information and it is sufficient to ongoing formative assessment. We propose ongoing formative assessment cycle that is represented in Figure 1.

The cycle shows general situation for using kit-build framework in ongoing formative assessment through learning process. Goal map can define as a good pattern that can prove about learners' successful. It means instructor hopes learners to construct learner map as the exact same thing with goal map. Kit-build ability that can support instructor for identifying progressive stage of knowing at the successive stage is the difference map. Providing instructor's feedback to learners is a kind of reflection in action. Reflection practice challenges instructor to broaden its perspective and revise the goal or teaching technique. It encourages instructor to recognize the importance of experience in learning process again. However, the number of learner is one problem to make immediate instructor's feedback in a classroom. For capturing learners' overview, pick up maps of learners is the simple way but it may not reflect the real overview. Group map is generated from all of learner maps, and group-goal deference map represents about common misunderstanding. These are overview from all of learners' evidence. Instructor can consider and analyze only one time from goal-group difference map as quick as possible that is intra-class feedback. We suggest the ability of Kit-Build concept map to utilize in ongoing formative assessment according to intra-class feedback with group diagnosis and inter-class feedback with individual diagnosis.

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