【Grant-in-Aid for Scientific Research (S)】

Integrated Disciplines (Complex Systems)

Title of Project : Renovating Assessment for the Future: Design-Based Implementation Research for a Learning-in-Class Monitoring System Based on the Learning Sciences

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【Purpose and Background of the Research】

Assessment reform requires a radical shift from a "summative assessment which ranks individuals" to a "formative assessment of the learning environment that helps all the students reach the next level of learning". Educational policy makers are also aiming for a similar shift in the revision of the Courses of Study and in high school/university articulation reform. The newly revised Courses of Study introduced "active learning", emphasizing its use of formative assessment. However, teachers lack appropriate tools to do this. Therefore, this study develops a "Learning-in-Class Monitoring System" and tests it in educational settings and assessment situations, in order to check whether it can serve as a foundation for assessment.

Lesson improvement requires a collaborative PDCA (plan-do-check-act) cycle of the teachers, but for most teachers, too much time and effort is required in completing this cycle. Thus, we put forward two ideas: first, a reciprocal collaboration between human beings and AI, and second, application of the teachers' usual efforts of assessment as a resource to advance the knowledge of both humans and AI.

【Research Methods】

Figure 1 represents an overview of the system, which depicts a teachers' PDCA cycle in its inner circle. The support systems shown in the outer circle help teachers turn the cycle in a timely manner. In addition, as teachers use these systems to plan, discuss, conduct, look back, and share the lessons iteratively, the entire system including the AI becomes smarter. For example, when a teacher creates a lesson plan, s/he predicts keywords that students will refer to in the lesson. Other teachers simulate this lesson plan from multiple perspectives, adding new keywords. If the teacher registers appropriate keywords in the transcription system beforehand, the speech recognition rate, which is the most difficult part of the dialogue analysis, becomes higher (shown in red letters in
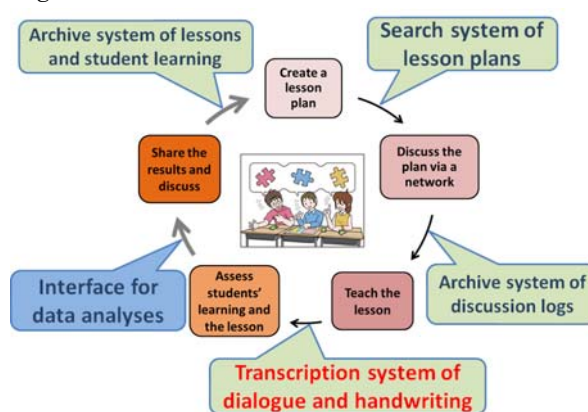
Figure 1).

Figure 1　Learning-in-Class Monitoring System

【Expected Research Achievements and Scientific Significance】

As expected research achievements, we would like to examine if such kind of speech-to-text translation is capable of promoting in-depth analyses of collaborative learning by researchers, high-quality lesson improvements by teachers, and context-driven approaches to semantic analyses of learning by engineers. Scientific significance lies in bringing forth a perspective that sees an intertwined cycle of teaching and assessment as an arena of mutual growth for humans and AI.

【Publications Relevant to the Project】

Shirouzu, H., et al. "Building on cultural capacity for innovation through international collaboration: In memory of Naomi Miyake." Looi, C-K., et al. (Eds.) *ICLS 2016 Conference Proceedings*, Singapore. 2016, 1074-1081.

【Term of Project】FY2017-2021

【Budget Allocation】154,500 Thousand Yen

【Homepage Address and Other Contact Information】http://coref.u-tokyo.ac.jp/legacy/en