A Peer Instruction based Physics class at High School in Japan

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Our research group has studied about physics lessons based on cooperative learning activity as known as Peer Instruction (PI), with Tokyo Gakugei University senior high school students in Japan since five years ago. The study focuses on PI and student experiments.

PI was developed by Mazur and is known as a simple but effective social learning process. In PI, students think of and discuss conceptual questions (conceptests). In our study we have included PI in every lesson throughout the year. We have also valued hands on experiments which make students actively engage in a physical phenomena interacting with each other.

Students have taken the Force Concept Inventory (FCI) before and after the semester, and we gave a quantitative evaluation of the lessons using Hake’s normalized gain. Besides, we have analyzed distracters with a list of misconceptions compiled by Hestenes and his collaborators, and investigated a tendency and shift of students’ misconceptions through the semester. These analyses have been used for the improvement of the lesson in every next year.

In the present study, we assign students “reflections” to improve the PI styled lesson. This new style is based on knowledge of cognitive psychology. Students must write what they were and were not able to understand in the lesson. We wrote in reply to student’s “reflection sheet” and returned it to them at the next lesson. Alongside, we made handouts as summary about all of classmates’ comments including our reply, and shared it with the students in next class. We found that “reflection” is helpful for the students for not only reviews in a lesson but also for teachers to plan lessons based on students’ thoughts.

In this presentation, we show the result of our practice about fields of dynamics and kinematics, and quantitative results on, for example, FCI gain. It is found that the number of words and “profundity of thought” (rate degrees of metacognition on a scale of 1 to 3) relates to FCI gain.