Collective intelligence in physics class: how the whole is more than the sum of its parts?

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In science education research, many researchers recognize for the importance of social-constructivist approach that knowledge is socially constructed. But empirical studies for the ways to enhance students’ co-construct in science classroom seems to be insufficient. In sociology, the concept of collective intelligence is used to describe a type of shared or group intelligence that emerges from the collaboration and competition of many individuals. Collective intelligence can be understood as an emergent property from the synergies among: data-information-knowledge; software-hardware; and experts those with new insights as well as recognized authorities that continually learns from feedback to produce just-in-time knowledge for better decisions than these three elements acting alone. Cloud computing and web-based poll systems enable us to share and to collaborate works synchronously by storing data on web. In this talk, the issue whether collective intelligence in physics class is something different from conceptual achievement will be addressed. And then the way how the whole can be more than the sum of the parts will be discussed. To do, firstly, the quantitative and qualitative data of team-based assessments at Applied Physics 50 which was designed by Eric Mazur, Harvard are analyzed. The data show that teamwork ability is something difference from conceptual mastery and can be measured by team-based assessments. Secondly, the type of collaboration in small group scientific modeling activities with Google docs by Korean high school students will be described. Finally, individual and team outcomes of modeling sound waves by the middle school students and types of utterances are described to get suggestions of enhancing collective intelligence. Role composition and specific utterance type seemed to be crucial to enhance collective intelligence.