Development of an active-learning program about mechanical wave

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In our preliminary survey of students' conceptual understanding of a mechanical wave with Wave Diagnostic Test\cite{1}, we found that Japanese students have "particle pulses mental model" such that the wave speed changes depending on frequency and/or amplitude of the wave source.

We have developed an active-learning program about the mechanical wave based on instructional strategies used by Physics Education Group\cite{2} to improve students' mental model. The procedure of the program is as follows:

1. Students see a pulsewave on a string, then they discuss their own predictions how to change speed of the pulsewave to \emph{elicit} their mental model.

2. They discuss how to make an experiment to confirm their predictions.

3. They carry out the experiment and confirm the result. They often find the conflict between their own prediction and the result and hence they \emph{confront} their mental model.

4. They discuss the conflict to \emph{resolve} their mental model.

5. They review the modification of their own thinking through the program; metacognition.

Our developed program and results of its practice will be shown in detail.

\cite{1} M. Wittmann, R. Steinberg, and E. Redish, Phys. Teach. 37, 15-21 (1999).