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You Mean Now? Investigating Student Understanding of Time in Special Relativity¹

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With calls of increasing urgency to include exciting modern physics results earlier in the curriculum, it is important to probe the effectiveness of current instruction in helping students at all levels grasp basic targeted concepts. The relativity of simultaneity is a cornerstone idea of special relativity and lies at the foundation of most (if not all) paradoxes. It is also a topic that is routinely taught in courses that include the study of special relativity. In this talk, results of a multi-year investigation will be presented to illustrate the step-by-step process by which a detailed picture of student thinking was obtained through the design and successive refinement of research tasks. Excerpts from written questions, taped interviews, and classroom interactions will help illustrate that little meaningful learning of the relativity of simultaneity often takes place as well as show the intense cognitive conflict that students encounter as they are led to confront the incompatibility of their deeply-held beliefs about simultaneity with the results of special relativity. Implications for instruction of advanced topics and the preparation of instructors of science at the pre-college and university levels will also be discussed.

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