

Abstract Submitted
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Student reasoning about superposition in quantum mechanics

GINA PASSANTE, PAUL EMIGH, PETER SHAFFER, Univ of Washington — Superposition is at the heart of quantum mechanics, and yet we have found that many students struggle with this idea even at the end of instruction. Although most students can successfully use the idea of superposition to calculate probabilities of different measurement outcomes, we have found that they often fail to recognize how a superposition state differs from a mixture or from a system whose initial state is unknown. This distinction is one of fundamental importance in quantum mechanics and has implications for more complex topics such as entanglement. We present data from undergraduate and graduate-level quantum mechanics courses that illustrate some of the difficulties that students have with superposition. We also discuss how the results have guided the design of a lecture-tutorial that improves student understanding both immediately and months after instruction.

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