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Surveying Students' Understanding of Quantum Mechanics[1] CHANDRALEKHA SINGH, GUANGTIAN ZHU, University of Pittsburgh — Development of research-based multiple-choice tests about quantum mechanics is important for assessing students' difficulties and for evaluating curricula and pedagogies that strive to reduce the difficulties. We explore the difficulties that the undergraduate and graduate students have with non-relativistic quantum mechanics of one particle in one spatial dimension. We developed a research-based conceptual multiple-choice survey that targets these issues to obtain information about the common difficulties and administered it to more than a hundred students from seven different institutions. The issues targeted in the survey include the set of possible wavefunctions, bound and scattering states, quantum measurement, expectation values, the role of the Hamiltonian, time-dependence of wavefunction and time-dependence of expectation value. We find that the advanced undergraduate and graduate students have many common difficulties with these concepts and that research-based tutorials and peer-instruction tools can significantly reduce these difficulties. The survey can be administered to assess the effectiveness of various instructional strategies.

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