The Quantum Interactive Learning Tutorials (QuILTs) are research-based learning tools based on the investigation of students' common difficulties in learning quantum mechanics. The QuILTs are suitable for upper-level undergraduate quantum mechanics courses. They can either be used as an in-class tutorial on which two or three students can work together with full class discussion and instructor feedback as appropriate, or they can be given as homework supplements.

The pre-test should be administered in class after traditional instruction but before using a QuILT. The tutorial can be distributed to students in the same class after the pre-test. In some QuILTs, there are also warm-ups (that students must work on at home before working on a tutorial) and homework sections (after working on the tutorial) as supplements to the tutorials. Since all students cannot finish the tutorial in one class-period, it is better to administer the post-test in the next class so that all students have adequate opportunity to finish it.

The tutorial development goes through a cyclical iterative process that includes research on student difficulties in learning a particular physics concept, followed by the development, evaluation and refinement of the material. The following features of the QuILTs make them particularly suited for the challenging task of teaching quantum physics:

1. They are based upon research in physics education and pay particular attention to cognitive issues.
2. They employ visualization tools to help students build physical intuition about quantum processes.
3. They consistently keep students actively engaged in the learning process by asking them to predict what should happen in a particular situation and then providing appropriate feedback.
4. They attempt to bridge the gap between the abstract quantitative formalism of quantum mechanics and the qualitative understanding necessary to explain and predict diverse physical phenomena without dumbing down the content.
5. They are based on systematic investigations of difficulties students have in learning various concepts in quantum physics.
6. They can be used in class by the instructors once or twice a week as supplements to lectures or outside of the class as homework or as self-study tool by students.
7. They consist of self-sufficient modular units that can be used in any order that is convenient.

A majority of the computer-based visualization tools for this project are being developed by M. Belloni and W. Christian at Davidson College under the Open Source Physics (OSP) project (see http://www.opensourcephysics.org/projects/packages/index.html)
However, some computer-based visualization tools are adapted from Phet simulations (see http://phet.colorado.edu)

Related References below are at https://sites.google.com/site/professorsinghswebpage/

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