Assessing computation in quantum mechanics

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- **Objectives**
  1. Engagement, empowering doing physics vs just thinking it
  2. Insight/intuition development in QM, in-dept exploration
  3. Building multi-skill set in computation & visualization
  4. Attitude change on computation, cross-use beyond QM

- **Assessment and feedback**

  **Computational activities**, see https://jwang.sites.umassd.edu/p341

  - *Time-dependent* and time-independent QM
  - Eigenvalue and nonstationary problems
  - Numerical + symbolic + graphical/visual
  - Inclass, homework, and exams

**Assessment and feedback**

- During semester: Student work, performance
- End-of-semester: Anonymous survey

**Overall**

- Objectives 1, 3 (doing + skill-building) achieved; 2, 4 (insight+cross-use) partially achieved
- Most students became more comfortable, confident, and productive with computation
- Some students use computation routinely, even where not required or necessary

**Q: How has computation helped with your learning of the subject? How about homework?**

The plots helped *visualize time dependent* and *time independent* wave functions which was cool. Using the *numerical* solver with the homework was awesome as well as sympy’s *algebraic* capabilities.

The codes have been good ways to *visualize concepts* which seem abstract at first. The homeworks are good for *reinforcing concepts* covered during class.

I feel like computation has been *very helpful* in the course. Several problems, such as eigenvalue equations and integration of *complicated* wavefunctions, were *made easier* with the concepts introduced in the class. Additionally, the numerical methods introduced *added* to my overall knowledge of computation, which will surely be *helpful moving on in general academics*.
I wasn't able to get much from the code.

It has been extremely helpful, I think its effects can't be understated; it's very helpful to visualize the topics found in quantum mechanics, as well as learning how to think about the course material in another way, which can be fruitful in the long run when in other courses/research. As far as the homework goes, it immensely helps in solving very complex, and often abstract, problems with less hassle.

To do

More quantitative rubrics