QUANTUM MECHANICS CURRICULUM IN THE US: QUANTIFYING THE INSTRUCTIONAL TIME, CONTENT TAUGHT, AND PARADIGMS USED

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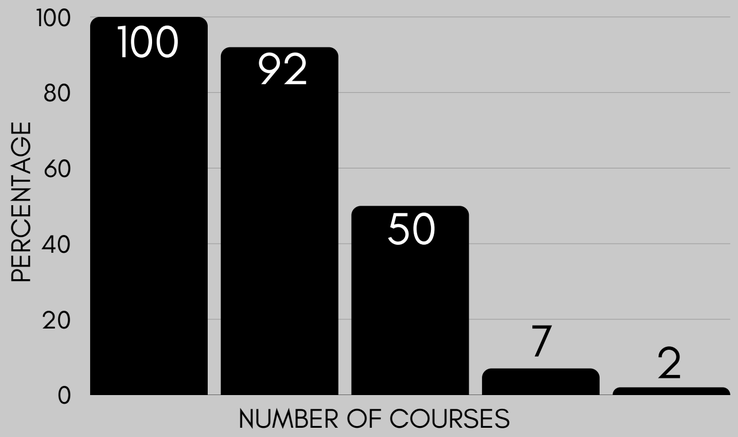
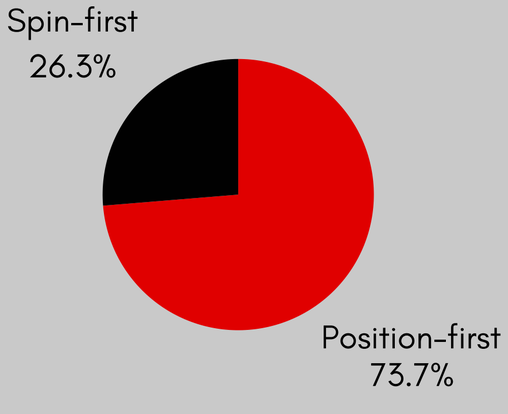
Number of required quantum courses

- 188 US Institutions
  - 74.5% R1, 22.3% R2, 3.2% not classified
  - 69.7% public institutions
  - 16.5% Minority Serving Institutions (MSIs)
  - Awarded 56.7% of US bachelor's degrees in 2022
- Utilized course catalogs to determine number of required courses to earn four-year degree in physics



Spin-first or position-first approaches

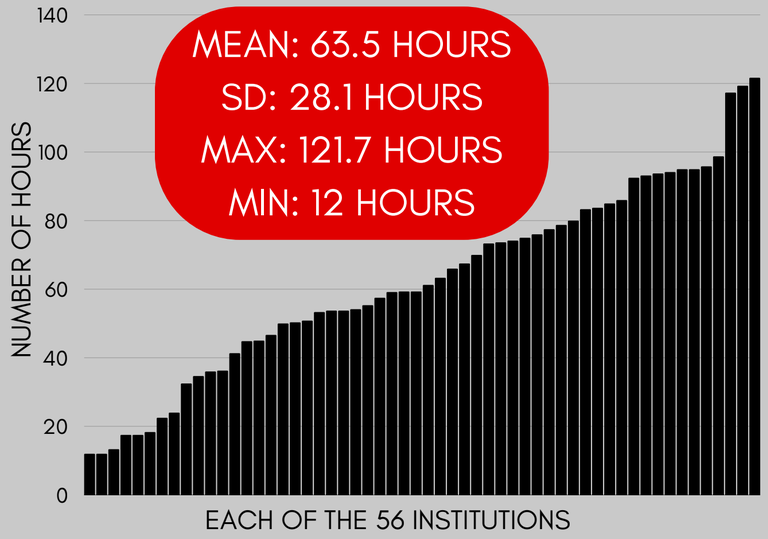
- Syllabi for 99 quantum mechanics courses collected
  - 79.8% R1, 17.1% R2
  - 17.2% MSI
  - Awarded 34.7% of bachelor's degrees in 2022



Number of classroom hours spent on quantum topics

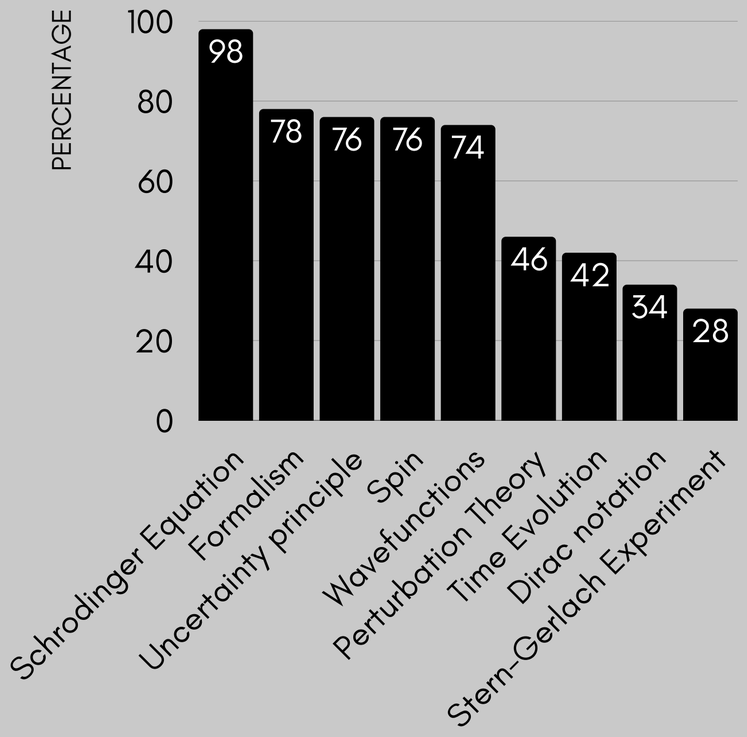
- Created database of syllabi from 56 institutions for all required quantum courses for four-year degree
  - 82.1% R1, 16.1% R2
  - 69.6% public
  - 16.1% MSI
  - Awarded 20.8% of US Bachelor's degrees in 2022

Schrodinger	Fermi's golden rule
Schrodinger Equation	Photons
Photoelectric effect	Pauli's exclusion principle
Wave-particle duality	Square well
Operators	Identical particles
Eigenvalues	Matter waves
Tunneling/reflection	Frank Hertz experiment
Stern-Gerlach experiment	Wave mechanics
Dirac notation	Wave functions
States	Wave properties of particles
Quantum measurement	Particle properties of waves
Expectation Values	de Broglie hypothesis
Uncertainty	Quantum theory of light
Superposition	Blackbody radiation
Mixed states	Spin
Quantization	
Planck's postulate	



Topics taught in the US quantum curriculum

- Syllabi analysis of 50 institutions to determine topics taught, full graph available using QR code above



Conclusions

- Time spent on quantum concepts in four-year US programs is varies widely.
- Position-first is preferred approach of quantum instructors
- Courses most commonly teach the Schrodinger equation.
- The Stern-Gerlach is only explicitly mentioned in 28% of the entire four-year curriculum syllabi.