WORKSHOP STRUCTURE

Phenomenon-Based Quantum Fundamentals

qolour

A phenomenon-based crash course in quantum information. Students walk through a series of hands-on experiments and are asked to record their results. They are then asked to come up with their own theory of quantum which matches their observations. It concludes with a discussion of the limitations of entanglement.

DURATION 2h 45m	WITH BREAK 2h 55m
FORMAT Fully hands-on	AUDIENCE Grades 9 to 12+
GROUP SIZE 2 per Qubi pair	PREP None required

0:00 PART 1 Single qubits — 75 min

- 0:00 **Framing: what are we trying to predict?**
- 0:08 **Exercise 1 · Measure a random qubit**
- 0:18 **Exercise 2 · Measure twice, no rotation**
- 0:28 **Exercise 3 · Flip it upside down**
- 0:40 **Exercise 4 · Rotate 90 degrees**
- 0:53 **Exercise 5 · Rotate less than 90 degrees**
- 1:07 **Students derive the Born rule**

Break · 10 minutes

1:25 PART 2 Quantum entanglement — 60 min

- 1:25 **The mystery procedure**
- 1:33 **Exercises 1 to 3 · Measure the entangled pair**
- 1:48 **Hypothesis: glove theory**
- 1:56 **Exercise 4 · Rotate one, then measure**
- 2:08 **Exercise 5 · Rotate both 90 degrees**
- 2:20 **The reveal: the Singlet state**

2:25 PART 3 Create your own entanglement — 30 min

- 2:25 **Can we use this to communicate?**
- 2:40 **Why it cannot signal**

WHAT PARTICIPANTS LEAVE WITH

Quantum is about measurement
Predicting outcomes, nothing more mystical than that.

Born rule and Bloch sphere
An introduction to physical modeling of experimental results.

Entanglement
A deep understanding of what quantum entanglement means.

Gates, if time allows
Single-qubit gates and CX, combined to build new states.

hello@qolour.com