

QUANTUM PHYSICS

WITH DR JACQUILINE ROMERO

Talking points

KNOWLEDGE AND COMPREHENSION

1. What is a qubit?
2. What are the advantages of the quantum internet over the regular internet?
3. What is the difference between bipartite qubit entanglement and multipartite qudit entanglement?
4. How does Jacq create entangled photons in her lab?

APPLICATION

5. Apart from increasing internet security, what other applications do you think quantum physics could have for society?
6. If you met Jacq, what questions would you ask about her research and career journey?

ANALYSIS

7. How will the quantum internet be more secure than the regular internet?
8. Why did Jacq feel inferior when starting her PhD in the UK?

EVALUATION

9. Quantum physics is often seen as a complex field that is very difficult to explain. How helpful did you find Jacq's analogy of Alice and Bob for understanding the concept of entanglement? Can you think of any other ways of explaining this quantum theory?
10. "People are inspired by stories, and I hope my story as a member of a minority group in science (Filipino, woman and mother) can inspire others." What aspects of Jacq's career journey inspire you? What other stories have inspired you, and why?

Activities

1. Increasing diversity in science

"It is really important to have cultural and gender diversity in science." In the 1970s, a study asked 5,000 children to draw a scientist. Less than 1% drew a woman. The study has since been repeated, but still only 28% of drawings show a woman scientist.

Design a poster for your science classroom to campaign for greater diversity in scientific fields. Your poster should be eye-catching, engaging and encourage all people to consider a career in science.

Your poster could:

- Highlight the current diversity (or lack thereof) among scientists in different fields
- Profile current or past scientists of different genders, ethnicities, sexualities, nationalities, abilities etc.

2. Explaining physics

The 2022 Nobel Prize for Physics (www.nobelprize.org/prizes/physics) was awarded to quantum physicists for their experiments with entangled photons. Find out what topics have won the Nobel Prize for Physics in the past five years, and choose one of these to investigate further.

Create a short presentation to explain this topic to your classmates. Think about how you will explain the information in an accessible and understandable way. For instance, Jacq uses the analogy of Alice and Bob opening boxes containing cards to explain quantum entanglement. What analogies could you use to demonstrate the concepts you are trying to explain?

More resources

- Read this inspirational article from Jacq, titled 'On why successful women doubt themselves': shorthand.uq.edu.au/small-change/on-why-successful-women-doubt-themselves
- In this article, Jacq explains what quantum physics is: www.gmanetwork.com/news/scitech/science/384055/quantum-physics-made-simple-by-a-pinay-physicist
- As a physicist and mother of three young children, Jacq is inspiring many other scientists: www.marieclaire.com.au/why-dr-jacquiline-romero-is-our-hero
- Confused by quantum entanglement? Watch this QuTech video 'What Is a Quantum Internet?' to hear more about the 'Alice and Bob' analogy that Jacq mentions: www.youtube.com/watch?v=PCKoT9xcyXI
- Listen to Jacq talking about her upbringing, her research and the importance of having diversity in science: www.youtube.com/watch?v=YwpaekDVXV8