New study outlines steps higher education should take to prepare a new quantum workforce

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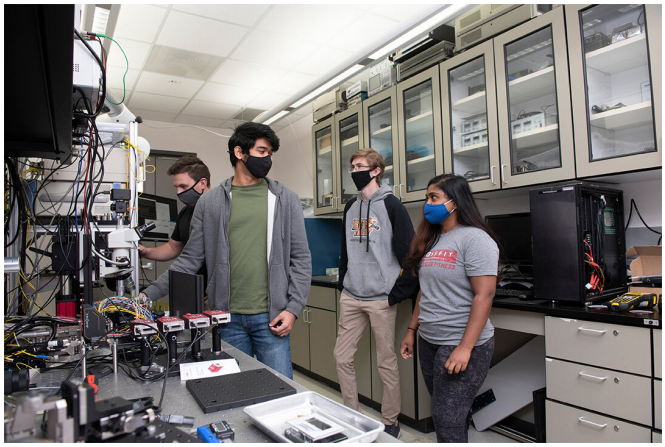

An interdisciplinary team of students conduct quantum research in an integrated photonics laboratory. Credit: A. Sue Weisler

A new study outlines ways colleges and universities can update their curricula to prepare the workforce for a new wave of quantum technology jobs. Three researchers, including Rochester Institute of Technology Associate Professor Ben Zwickl, suggested steps that need to be taken in a new paper in *Physical Review Physics Education Research* after interviewing managers at more than 20 quantum technology companies across the U.S.

The study's authors from University of Colorado Boulder and RIT set out to better understand the types of entry-level positions that exist in these companies and the educational pathways that might lead into those jobs. They found that while the companies still seek employees with traditional STEM degrees, they want the candidates to have a grasp of fundamental concepts in quantum information science and technology.

"For a lot of those roles, there's this idea of being 'quantum aware' that's highly desirable," said Zwickl, a member of RIT's Future Photon Initiative and Center for Advancing STEM Teaching, Learning and Evaluation. "The companies told us that many positions don't need to have deep expertise, but students could really benefit from a one- or two-semester introductory sequence that teaches the foundational concepts, some of the hardware implementations, how the algorithms work, what a qubit is, and things like that. Then a graduate can bring in all the strength of a traditional STEM degree but can speak the language that the company is talking about."

The authors said colleges and universities should offer introductory, multidisciplinary courses with few prerequisites that will allow software engineering, computer science, physics, and other STEM majors to learn the core concepts together. Zwickl said providing quantum education opportunities to students across disciplines will be important because quantum technology has the opportunity to disrupt a wide range of fields.

"It's a growing industry that will produce new sensors, imaging, communication, computing technologies, and more," said Zwickl. "A lot of the technologies are in a research and development phase, but as they start to move toward commercialization and mass production, you will have end-users who are trying to figure out how to apply the technology. They will need technical people on their end that are fluent enough with the ideas that they can make use of it."

Zwickl's participation in the project was supported in part by funding RIT received from the NSF's Quantum Leap Challenge Institutes program. As a co-PI and lead on the education and workforce development for the proposal, he said he is hoping

to apply many of the lessons learned from the study to RIT's curriculum. He is in the process of developing two new introductory RIT courses in quantum information and science as well as an interdisciplinary minor in the field.

More information: Michael F. J. Fox et al. Preparing for the quantum revolution: What is the role of higher education?, *Physical Review Physics Education Research* (2020). DOI: 10.1103/PhysRevPhysEducRes.16.020131

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