



QUANTUM WORKFORCE DEVELOPMENT ROADMAP

FALL 2024

Quantum Learner Stories:
Themes & Threads

Objectives and Methodology

Document Objectives

- To share stories of people who have engaged in quantum learning journeys.
- To anecdotally understand how each learner was inspired to learn more about quantum, what experiences they had, what they aspire to do in quantum, and where they encountered challenges and opportunities.

Methodology

The methodology included the selection of 10 people who were inspired to learn more about quantum, including learners from K12 through those currently employed in the quantum industry. Virtual interviews were conducted to capture stories, and findings were aggregated into four broad categories featuring 'threads' common across the interviews, supported by a sampling of quotes. Considerations and questions are intended to provoke further conversation.

Note: Learners who were not yet inspired to embark in quantum learning were not included as a part of this effort.

Learned Interviewed

COMMUNITY COLLEGE

- Community College of Aurora

4-YEAR UNIVERSITIES

- University of Colorado at Denver
- University of Colorado at Boulder
- Colorado School of Mines

K-12

- Boulder Valley School District/Monarch H.S

INDUSTRY

- Maybell
- Xairos

Story Themes

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Inspiring Quantum Learners

Many backgrounds can lead to quantum, and quantum is viewed as the future

2 /

The Power of Support

Professors, mentors and community are pivotal to engage and retain learners in quantum

3 /

The Impact of Experiences

Learners are hungry for manageable and real-life hands-on quantum programs and exposures

4 /

Beliefs About Quantum Jobs

While perceived as lucrative, learners view breaking into the quantum job market as a challenging

Inspiring Learners to Engage in Quantum

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Many backgrounds can lead to quantum, and quantum is viewed as the future.

THREADS

- Some learners didn't understand just how easy it would be to apply their backgrounds to quantum learning
- Making the decision to formally engage in a quantum learning journey can be intimidating and many learners weren't sure that they had the "right" skills or backgrounds
- Learners are highly inspired by the field of quantum because they perceive it to be revolutionary, forward-thinking, full of growth, and has the potential to change the world
- Understanding the potential of the Colorado quantum ecosystem inspired some learners to engage

WHAT WE HEARD

"I was a medic in the military and inspired by physics because of my work with x-rays"

"I thought I wanted to be a nurse, but I wanted to create stuff, and saw a TikTok video of a machine that allows people to wear a vest and feel hugs, and was inspired to look into computer science"

"I didn't realize that my probability and stats courses would help me in my quantum classes"

"Quantum is the cutting edge of where the world is going to go – this is where the future is headed"

"When I came to the U.S. I started to understand that the future would evolve based on quantum computing ... I wanted to be a part of that future"

"I heard about a quantum company's research project working with cancer cells and it inspired me to think about being able to be a part of improving the world"

"I didn't realize Colorado was becoming a hub for quantum, and it was during one of my first lectures where I learned about the employability of quantum careers"

The Power of Support

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Professors, mentors, and community are pivotal to engage and retain learners in quantum.

THREADS

- Professors are instrumental in helping learners to understand that it's possible to explore a quantum learning journey
- All learners expressed that support was essential in their quantum learning journeys, especially when they were struggling or felt intimidated
- Beginning quantum classes were helpful for students to learn terminology and feel less intimidated
- Community support, student-led groups are powerful especially when accessible at any hour

WHAT WE HEARD

"I had an amazing physics teacher in high school who inspired me to explore what the universe could give me in terms of modeling and ideas ...when I chose my major, I knew I wanted to do physics"

"I wasn't sure if I could do the quantum research exchange or if I'd have the time, but my professor said I could do it"

"I completed my [quantum experience] because my mentor, Joan, was there"

"The most important part of my student journey has been community – I'm part of a Discord student community and it's a place where we are always coming together"

"Dealing with concepts about things you can't really touch can 'break your brain' – and you need support – sometimes at 12:30am when your TA isn't available"

"Support communities need to be organic and student-led"

"Some of the grad students in my classes became mentors to me"

"When I started my first quantum program, some of the terms were intimidating, and I didn't know if I belonged here. The beginner 'quantum-friendly' session made quantum terms understandable"

The Impact of Experiences

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Learners are hungry for manageable and real-life, hands-on quantum programs and exposures.

THREADS

- Learners want more hands-on experiences with applicable instrumentation that will be used when they get quantum jobs
- Even when getting some exposure to hands-on lab experiences, learners crave more
- Bite-sized experiences can be easier to entice learners to engage
- Basic lab skills are critical habits that learners can apply to other areas of their lives
- Research experiences are highly coveted, but it can be hard to engage learners based on their school or job commitments
- Internships are viewed as a highly practical way to understand if quantum (or other) career directions are a good fit

WHAT WE HEARD

“I wish I had more exposure to the instrumentation that is used, more of a deep dive into instruments like oscilloscopes and VNAs”

“I thought that my hands-on classes would have been more helpful when I started my quantum job, but I needed more experiences”

“Labs gave some exposures to instruments but there wasn’t a lot of room to play with and fiddle with them”

“It’s important for students to learn about the small things in the lab and how a tech role is important – these habits can be applied to everything else in life”

“We have a lot of students that are very passionate about physics and not yet involved in research, it’s hard to get them involved”

“I heard about quantum from my chemistry teacher and she told me about the quantum research exchange (as a way to explore more)”

“I believe if I had an internship, I would have seen the practical side of quantum computing and understood how quantum could be applied”

“Getting more quantum companies to allow us to tour their labs or talk about what they do would have been really cool”

Beliefs About Quantum Jobs

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While perceived as lucrative, learners view breaking into the quantum job market as a challenging.

THREADS

- While viewed as a lucrative field to enter, there is a perception that quantum jobs are difficult to find and that opportunities are either limited to a few large companies, or to startups who don't yet have a strong hiring volume
- Some learners perceive that they need more advanced degrees to obtain a quantum job (note – 4-year students seemed to have this feeling more than community college students)
- Learners are inspired by, and eager, to have more information of the local quantum job market and how to talk to companies

WHAT WE HEARD

“I expect the money to be similar to how computing engineering and programming jobs were 15–20 years ago”

“I didn't understand how diverse the quantum industry was and initially thought it was only applicable to computer companies like IBM”

“The field is mostly full of startups”

“Quantum feels hard and intimidating, I don't know what quantum jobs would be like (high school student)”

“It seems like it would be tough to get a job in quantum without the exposure of my capstone class – it would have been very difficult to have known what to look for”

“My hesitation would be thinking that quantum is a very specific field that most people know super well, and have much more education than I do”

“Access to the right place to start, to catch yourself up before you talk to a company, would have been helpful”

“A 1-credit course on the quantum ecosystem would have been helpful”

Considerations

Further exploring these topics may help to illuminate solutions. How might we ...

- Help potential and existing quantum learners to see that quantum is a many sizes fits all field?
- Help learners to see that quantum jobs are in a myriad of interest areas and applications?
- Offer more bite-size, less intimidating or “committed” quantum experiences for more learners to engage?
- Help more learners to understand that there are quantum opportunities for many skill & education levels?
- Help more teachers and professors to include quantum experiences in their curricula?
- Increase student-led support opportunities, including mentoring from grad students?
- Better inform learners of the Colorado quantum industry ecosystem and opportunities?
- Offer more hands-on experiences that will prepare learners for quantum jobs?
- Increase research experiences – potentially ones that aren’t heavy time commitments?