QCoR
QUANTUM COLLABORATIVE RESEARCH CORPS

LQC

Education and Outreach Activities at QCoR, UMD College Park



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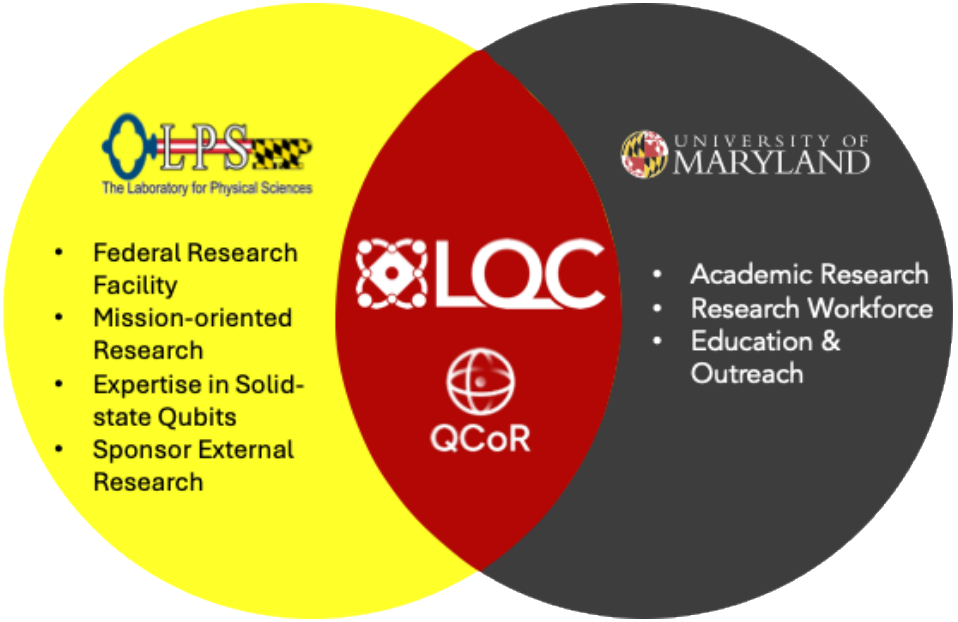
UMD CP

CSAAPT Fall Meeting, 10/11/2026

QCoR at UMD



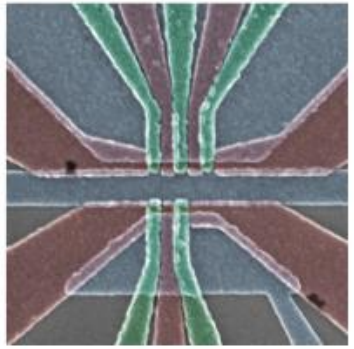


- A QIST research organization focusing on cryo-based qubit research, consisting of 55+ collaborators (senior and junior scientists, PhD and UG students)
- Embedded in LPS Qubit Collaboratory (LQC), one of the 14 NQI research centers housed at LPS and UMD
- Position provides opportunities to actively collaborate with many nation-wide labs, universities and industry partners as well as UMD-based labs

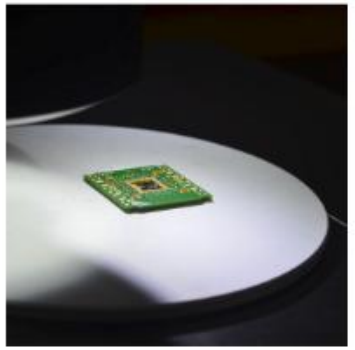
QCoR Research Areas



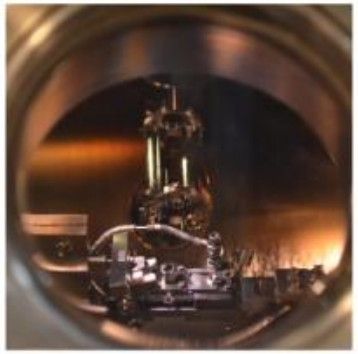
Superconducting Qubits



Semiconducting Spin Qubits



Hybrid Superconductor-Semiconductor Qubits



Scanning Probe Microscopy for



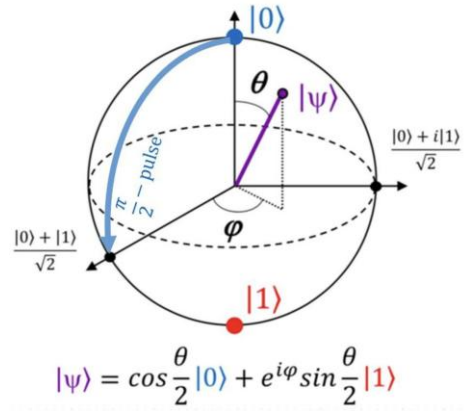
Materials for Qubits



Quantum Information Theory

QIST Training and Education Needs

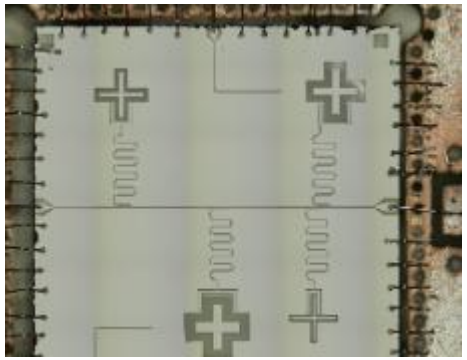
Textbook



DOI:10.21203/rs.3.rs-4465421/v1

Lab



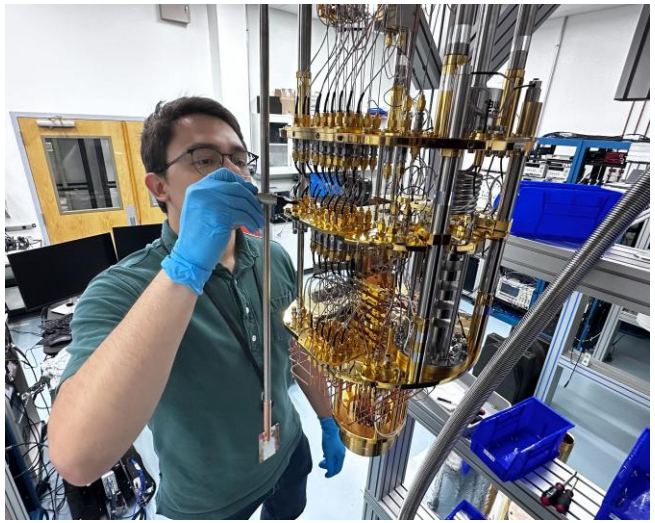


There are very few places where trainees can engage directly with real (cryo-based) quantum hardware as part of structured training:

- Limited access to real (and high-budget) hardware
- Training is slow and fragmented, and not interdisciplinary enough

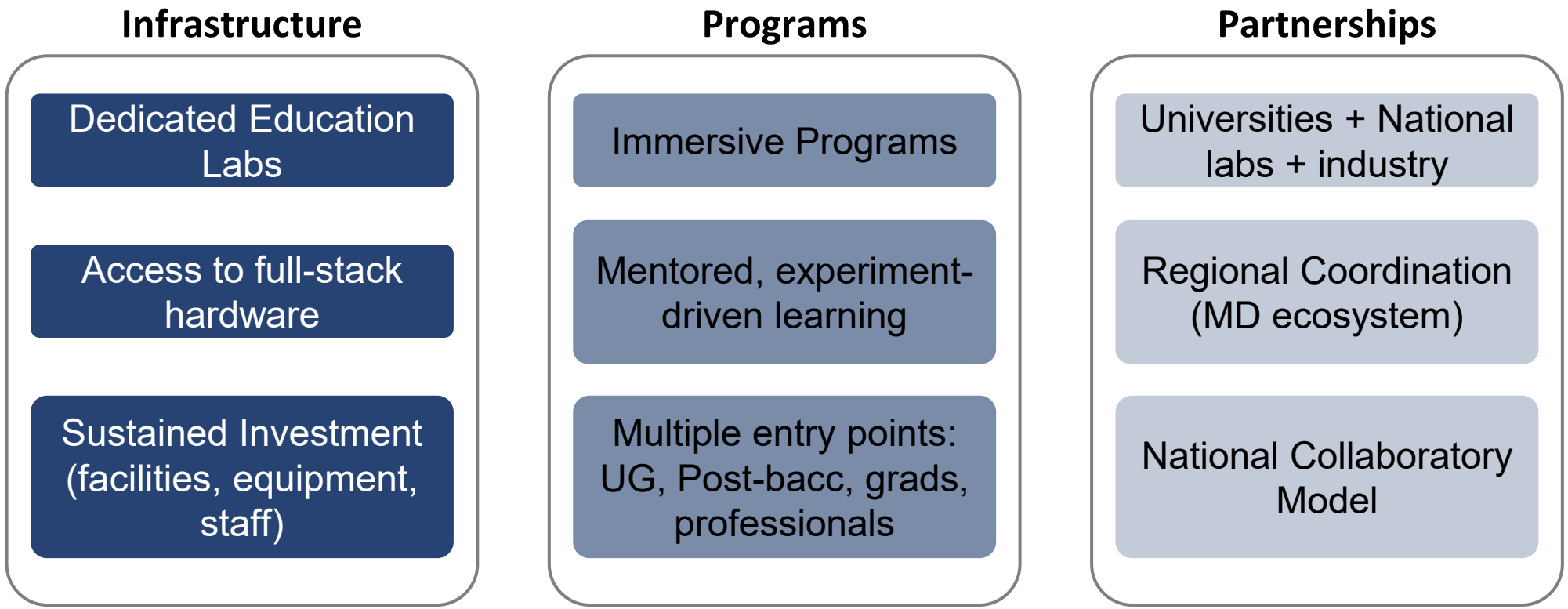
Education & Outreach at QCoR

- **Education, Outreach, and Access** is one of the four core thrust areas of LQC, following from the National Quantum Initiative (NQI)
- In collaboration with LQC, we
  - Develop educational programs in QIST on UMD campus
  - Facilitate student training and mentorship, including career readiness
  - Initiate technologically-advanced workforce development pathways through programs
  - Engage with outreach activities to expand the quantum workforce and public understanding of quantum (tours, fairs, events)
  - Harmonious collaboration with UMD quantum E&O ecosystem (RQS, MD Q Nexus, MathQuantum, Science Academy, QSF, and others)



A QCoR student working on a cryo-system (DR)

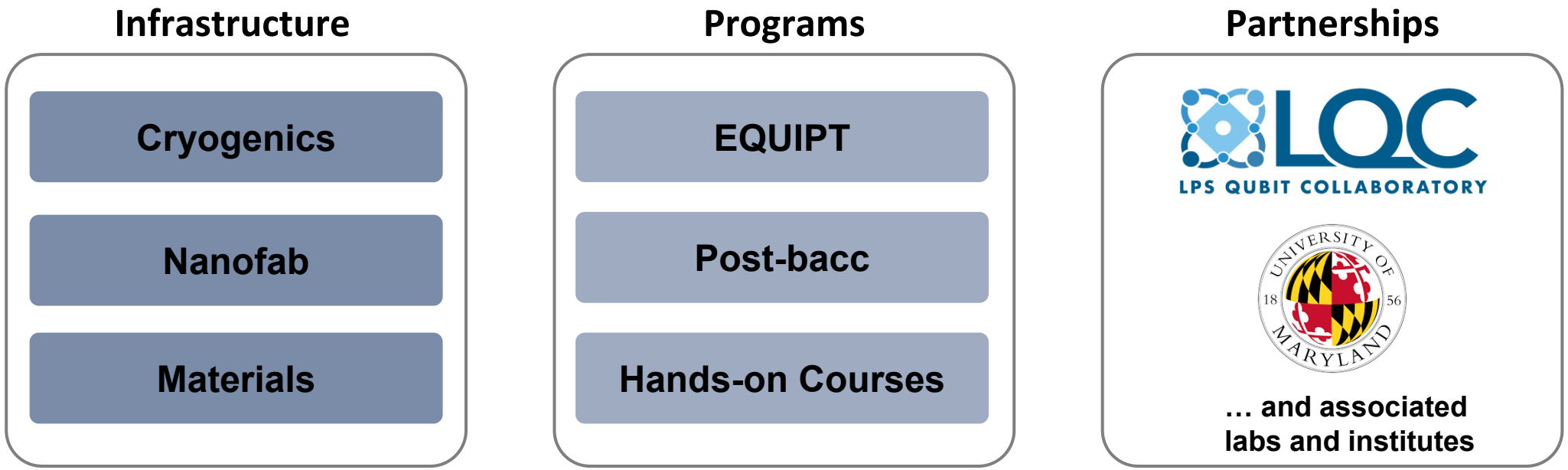
Building a scalable and accessible hands-on training model



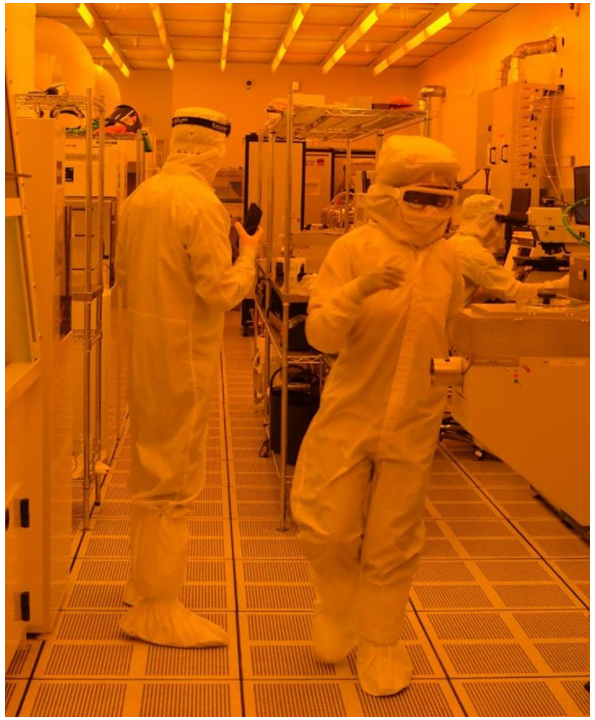
Hands-on training must be accessible at scale, not limited to a few specialized labs, and must be a part of HE course offerings to students with well-established learning outcomes.

An Infrastructure-Driven Model for Quantum Education

- Combining Infrastructure, structured programs, and partnerships to establish a flagship hands-on quantum workforce development program at UMD.



LQC Post-Baccalaureate Fellowship Program



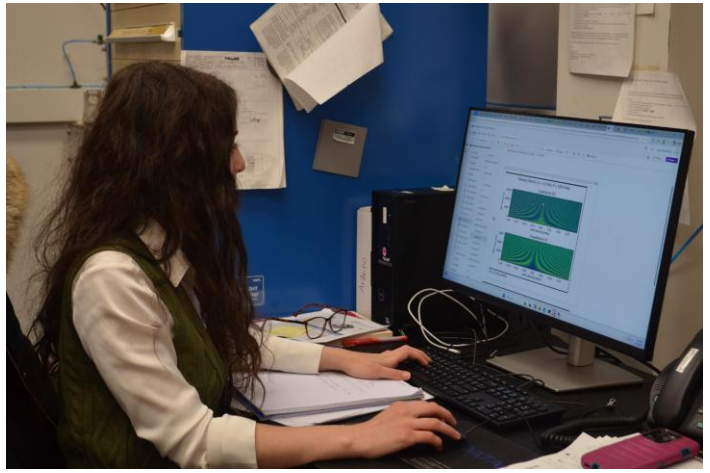
- Full-time, paid research fellowship at LQC labs
- **1–3 years of structured program** designed to bridge undergraduate training → PhD programs or quantum R&D careers
- Hands-on work on **real quantum systems** (fabrication, qubit characterization, measurement)
- **Eligibility:** U.S. citizens within 3 years of B.S./M.S. graduation (physics, engineering, CS, related fields)
- **Potential Research areas:** quantum device fabrication, qubit characterization & gate analysis, superconducting/spin qubits, and materials growth for quantum circuits

- 5 post-bacc fellows at LPS in 2025-2026
- Currently 3 post-back fellows residing

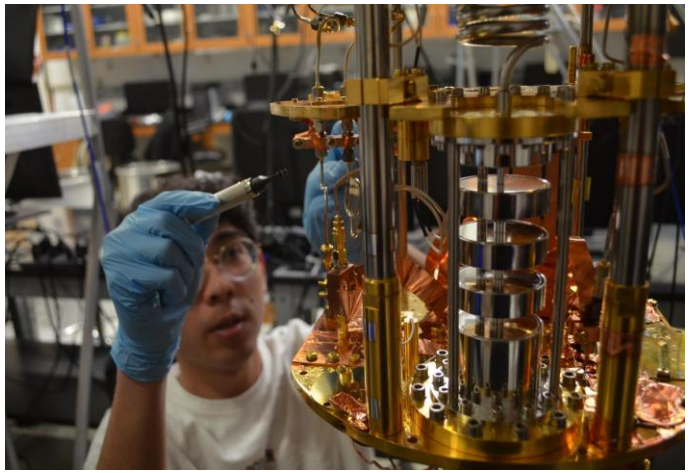
https://qcor.umd.edu/outreach-education/

Training QC-MS Students at UMD

- QC-MS program recently established as an applied, course-based **M.S. (MPS)** program at UMD
- **QCoR:** Providing hands-on / experimental training as **RGA trainees**, embedding them in real research projects (typically 1–2 years)
- Many students bring strong **programming foundations (anchor skill)** → expanded into hardware, measurement, and experimental techniques
- **High-impact pipeline:** mostly afternoon/evening-only classes enable daytime research
- Training feeds directly into quantum careers and PhD pathways



- Currently 6 QC-MS students at LPS and on campus
- Working on a variety of projects within QCoR



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EduLab - QCoR's Dedicated Multi-purpose Q-education UMD Infrastructure

- Putting together a dedicated training infrastructure on UMD campus
- Access to state-of-the-art cryogenic qubit hardware and control, RF electronics with 3x dilution refrigerators in 2027
- Starting with a pilot course in spring 2027
- Potential to hold single and multi-semester courses (with independent projects in later semesters) and other training programs
- Lab spaces for non-cryo electronic test and training beds to serve our students and our UMD q-partners.



@AI creation of future course



Pilot setup with a DR

Classes for UMD Students (size: 12)

Winter Bootcamps

Summer Schools

Up-skilling Camps

EQuIPT: Hands-On Experiential Training in Practice

10 -week, full-time immersive training program

- Students embedded in state-of-the-art quantum labs
- Work alongside researchers on real experiments and devices



End-to-end, hands-on experience across the quantum stack

- Hardware prototyping
- Device fabrication
- Qubit control
- Data analysis

Structured + mentored

- 15 distinct projects across LPS and UMD campus labs
- Interns co-design experiments, test devices, solve real problems

Outcome

Students transition from classroom learning to experimental capability

Applications for Summer 2027:
Will be opened in November 2026

https://equipt.umd.edu/

LQC LPS QUBIT COLLABORATORY

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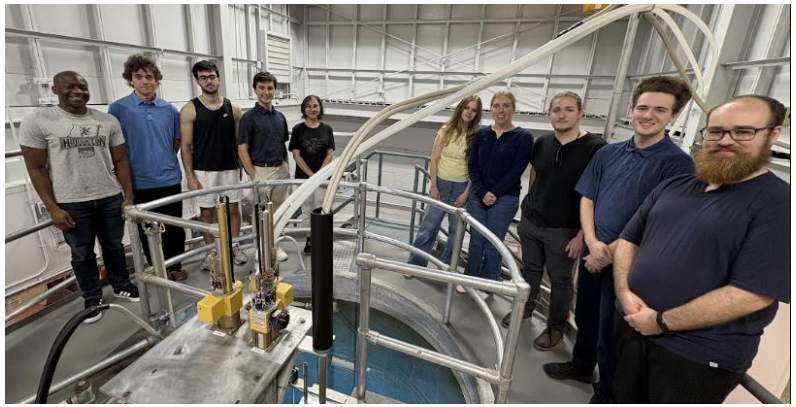
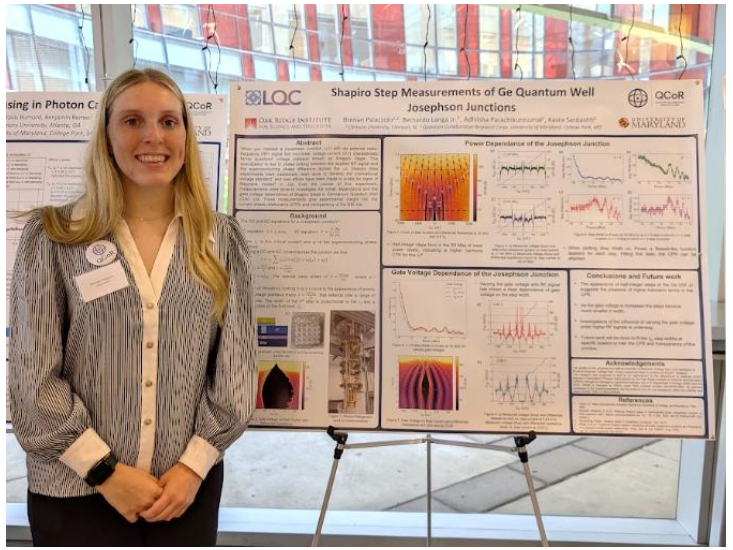
Shaping the Future of Science

EQuIPT 2026 Highlights



- 15 projects at UMD and LPS, 15 nation-wide UG students, 20+ mentors
- 10 weeks research program encompassing intensive training many SD, TD, PD sessions, and social activities (June 1st - Aug 7th 2026)
- An end-of-program talk and poster “quantum summer showcase” event co-hosted with RQS: 15 EQuIPT talks and posters (+1 QCoR GA + 7 RQS REU)
- Already measurable success via metrics as well as interns presenting at local and national meetings (e.g, APS GS 2027, APS unit meetings, UMD QuRISE applications)





An EQuIPT intern at the Quantum Summer Showcase Event, Aug 2026

Edulab+: Greater QISE/QIST Community

Expanding the reach of the EduLab project beyond UMD: DMV area and nation-wide

Edulab: Classes for UMD Students

Winter Bootcamps

Graduate students & postdocs · qubit characterization

Summer Schools

Undergraduates · hands-on internship style

Up-skilling Camps

Working professionals · Technicians & Mid-career Professionals

NATIONAL TRAINING PROGRAM

Grad students and postdocs from across the nation seeking focused, in-depth training
Intensive short-format workshops targeting specific areas of qubit characterization

EQuIPT PROGRAM COMPLEMENT

Mirrors core UMD course content with a stronger emphasis on hands-on experimentation
Structured like a paid research internship: rigorous, collaborative, workshop in spirit

EXTERNAL PARTNERSHIPS

Partnering with technical colleges, UMD and other universities
Curriculum tailored to career-changers: practical, credentialed, industry-aligned

Conclusions

- QCoR is heavily committed to realizing the next generation QIST **workforce through education and outreach efforts**
- We are looking forward to welcoming students in our courses and to our summer internship program (EQuIPT 2027), and fellows to out post-back program
- We are looking for **volunteers for a future survey on quantum education**. Please fill out this brief form if you are interested in being contacted. Thank you!
- Happy to brainstorm for future ideas as well as discussing details on topics listed here

Connect with us: Please visit our website (qcor.umd.edu) for more information

- Follow us on LinkedIn for updates and news: (QCoR) | LinkedIn
- Email us at *mkaragoz@umd.edu* *or at* *info-qcor@umd.edu*



Contact request form

Acknowledgements: Grateful to all the QCoR team members, our sponsors, collaborators and partners, especially the education and outreach team.

Thank you!