Sample lecture: [MIT Quantum Information Science II: ENT Lecture 1 (April 2026)]

Why teach. Research and teaching are complementary aspects of a career in science: mentorship and education provide a consistent and meaningful contribution to our future against a backdrop of uncertainty, since research is often unpredictable. While new discoveries are few and far between, teaching gives one an opportunity to share the experience of discovery with others, even when the discoveries themselves are already known. That gives more meaning to scientific ideas and, arguably, is one of the main reasons for doing science in the first place.

In addition to imparting new technical and problem-solving tools, teaching mathematics, physics, or computer science serves as an opportunity to convey unifying principles that are transferrable regardless of where life takes a student. For example, logical thinking, breaking problems into smaller components, seeking elegance when appropriate, and clear explanations of solutions are universally beneficial.

The weight I give to education is reflected in the fact that I have sought out opportunities to teach beyond the expectations for a PhD student in physics at MIT. For example, in the past year I have given lectures on information theory and entanglement for two different graduate-level courses, which I will discuss in more detail shortly. One of these is available through the link above.

How I teach. As an educator, my goal is not merely to communicate knowledge, but to inspire curiosity, confidence, and judgment that will allow students to discover ideas for themselves; or at least to feel as though they could have done so, which is an important first step. In teaching courses, I strive to make the process of discovery and creative problem-solving visible to students. The challenge here is in toeing a fine line between inviting students to discover an insight, and in not revealing enough information to make it accessible. I believe I have been successful in striking this balance up to this point; for example, a testimony from a former student of mine in a first-year classical mechanics course at MIT reads [MIT]:

> "Angus was really great at helping us during office hours, and was able to give us good hints on how to continue a problem without spoiling the answer, allowing us to actually solve it for ourselves...he was really great at explaining concepts... Additionally, he was really great at being even throughout class and helping out people during group problems."
>
> — Anonymous student in Physics I, 2025 at MIT.

Besides discovery over passive learning, my approach to teaching emphasizes intuition prior to formalism, reserving detailed derivations once the core idea has been conveyed. In every case I have encountered, both in computer science and in physics, this can be done without sacrificing clarity.

With this overarching approach in mind, I have experience making adjustments depending on the level and aims of the course being taught, and have applied my guiding principles to several courses: as a TA for Linear Algebra and three separate optimization courses, including an advanced fourth-year course, during my time at Waterloo; as a TA for Physics I and Quantum Information Science (QIS) II, a graduate-level course at MIT; and in delivering guest lectures for both QIS II and III at MIT. Applying these principles in office hours, advanced lectures, and graduate assessments has enabled me to witness a natural progression toward the overall goal outlined in the previous section, on multiple occasions, and identify areas for improvement.

My core teaching values are especially visible in my guest lecture on entanglement and other TA duties for QIS II. For instance, in the lecture describing entanglement distillation, I emphasized a non-standard classical analogue of the task we wanted to build toward—randomness distillation—first, so as to make the quantum version feel inevitable. (The lecture notes are available online [Low26a].) Apart from this lecture, I also wrote four exams for QIS II, covering topics from coding theory and error correction to quantum algorithms. In these exams, I put my philosophy of guiding students through the process of discovery into practice. Since this was a graduate course, I was able to approach the boundaries of our current knowledge

in quantum algorithms on one occasion, asking them to derive the performance, with guidance, of the recently proposed DQI algorithm [Jor+25] for optimization, despite never having explicitly covered it in the course.

What I hope to build toward. Going forward, I would be enthusiastic about teaching a range of undergraduate courses, including probability, algorithms, and foundational physics, as well as graduate courses in quantum information, quantum algorithms, and quantum computing more broadly. I would also welcome opportunities to expand my teaching into, for example, information theory and statistical mechanics.

Outside of courses, I look forward to mentoring students in research, where I hope I can apply relevant aspects of the teaching philosophy described above. In particular, I would like to emphasize curiosity and a willingness to discover yet more questions along the way to a solution. This will be important for my research ambition to discover new applications of quantum algorithms for science, as described in my research statement. I also recognize that becoming a good educator is itself an ongoing learning process, and I am always open to continuing to improve my pedagogy through feedback. Ultimately, I would like my students to leave with not only a deeper understanding of the subjects I teach, but also a lasting enthusiasm for scientific and mathematical discovery, and a desire to learn how to ask good questions in the first place.

References

My work

[**Low**26a] **Angus Lowe**. *Entanglement as a Resource*. Lecture notes for MIT 8.371 (Quantum Information Science II): ENT Lecture 1. Apr. 22, 2026. URL: https://angusjlowe.github.io/files/entanglement-lecture.pdf (page 1).

[**Low**26b] **Angus Lowe**. *MIT 8.371 (Quantum Information Science II): ENT Lecture 1*. YouTube video. 2026. URL: https://www.youtube.com/watch?v=3wC7FWFHvmc.

Other references

[Jor+25] Stephen P. Jordan, Noah Shutty, Mary Wootters, Adam Zalcman, Alexander Schmidhuber, Robbie King, Sergei V. Isakov, Tanuj Khattar, and Ryan Babbush. "Optimization by decoded quantum interferometry". In: *Nature* 646.8086 (2025), pp. 831–836. DOI: 10.1038/s41586-025-09527-5 (page 2).

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