Traditional (expository)

- Students engage in few scientific practices
- Instructor driven design
- Purpose is instructor defined
- Outcome is known to all
- students rarely present work
- findings are previously established
- Relevance of student work is limited to the course
- Not iterative
- Data is "clean"
- Collaboration occurs between students in course

Inquiry-Driven

- Students engage in multiple scientific practices
- Purpose is student defined
- Outcome is varied
- Findings may be novel
- Relevance of student work is limited to the course
- Students rarely present work
- Occasionally iterative
- Data can be "messy"
- Collaboration occurs among students in the course

URE, ATURE, ALLURE, CURE

- Students engage in multiple scientific practices
- Purpose is Student or Instructor defined
- *Outcome is unknown*
- *Relevance extends beyond the course*
- *Collaboration occurs among students, teaching assistants, instructor in course**
- *Iteration is present*
- *Risk of generating "messy" data is inherant*

What is Authentic?

Characteristics of CUREs

SCIENTIFIC PRACTICES

- "...the opportunity to engage in multiple scientific practices (e.g., not only data collection) ..."

DISCOVERY

- "...students are addressing novel scientific questions
- collectively... offer some new insight into how the natural world works."

BROADLY RELEVANT

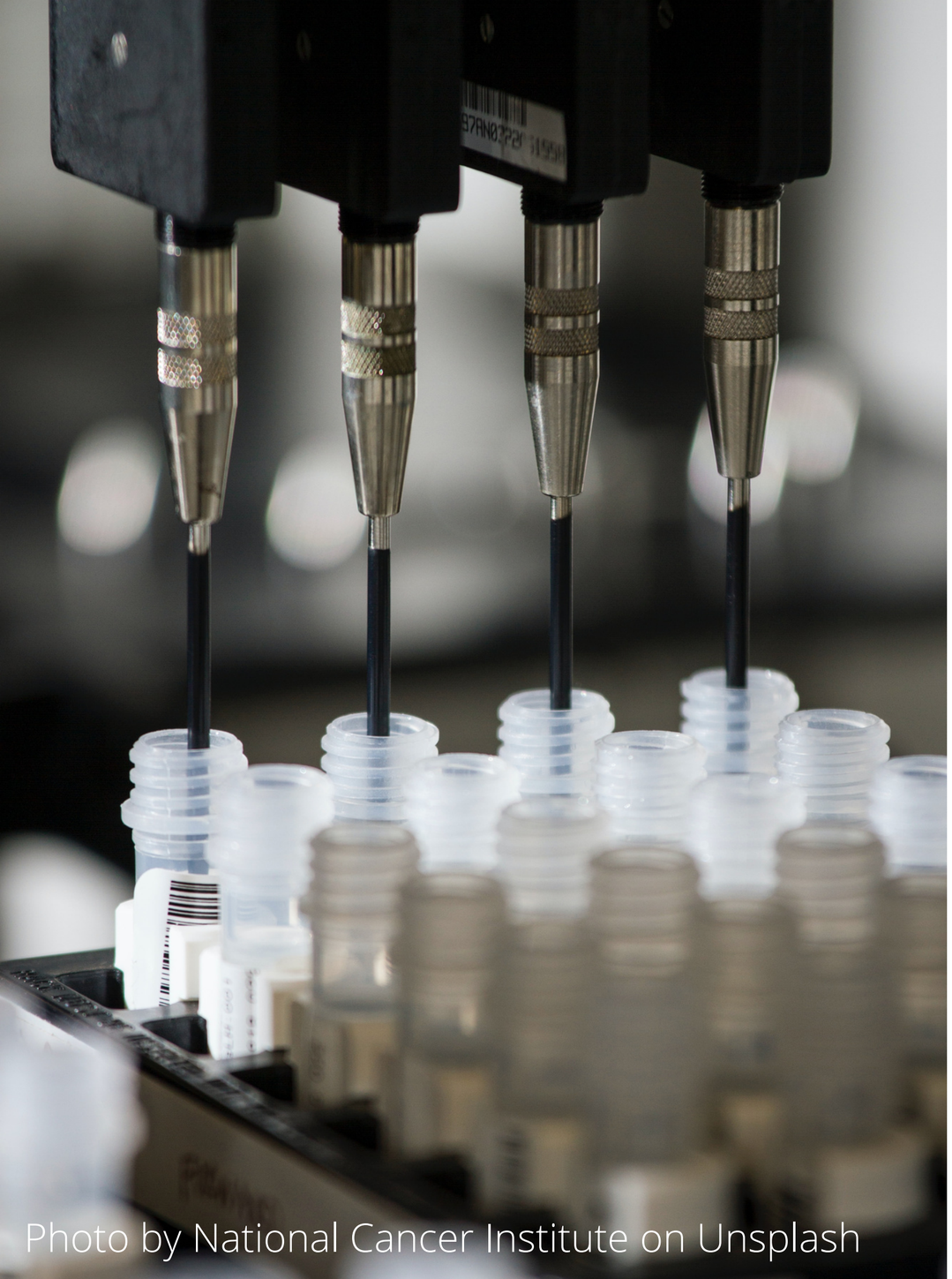
- "...involve students in work that fits into a broader scientific endeavor that has meaning beyond the particular course context."

COLLABORATIVE

- "...group work is not only a common practical necessity but also an important pedagogical element..."

ITERATIVE

- "...involve students in iterative work, which can occur at multiple levels."



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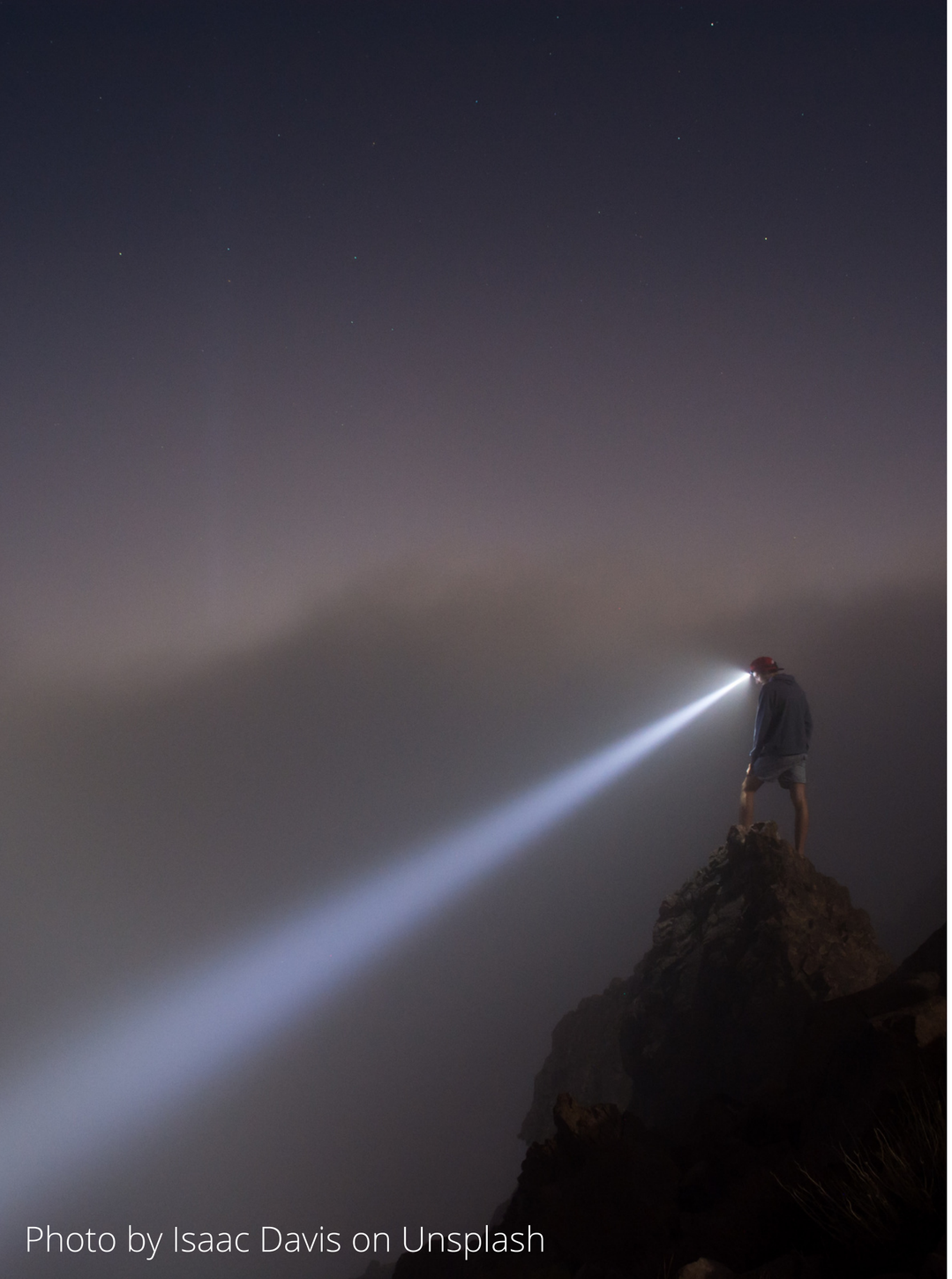
Scientific Practices

- asking questions
- building and evaluating models proposing hypotheses
- designing studies
- selecting methods
- using the tools of science,
- gathering and analyzing data
- identifying meaningful variation
- navigating the messiness of real-world data
- developing and critiquing interpretations and arguments and communicating findings



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Discovery

- Results can be ambiguous
- Students choose how to interpret the data
- Necessitates exploration and evidence-based thinking.

Broadly Relevant

work that fits into a broader scientific endeavor that has meaning beyond the particular course context

PUBLICATION

authorship or acknowledgment in a science research publication

EXPAND KNOWLEDGE IN THE FIELD

"...develop reports of interest... or evidence-based recommendations for community action." Or perhaps, upload files to national database

Photo by Shane Rounce on Unsplash

Collaborative

- Practical necessity for students to learn how to work on a team.
- Pedagogical technique
- Increases oral and written communication through exchanges with peers

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Iterative

- Knowledge is built upon prior knowledge
- Students refine an experimental approach they have developed
- Students repeat/validate work that was completed by other students/institutions