# Overview of Today's Presentation

- Overview of Michigan Engineering OnRamp

- Data collection and assessment strategies for STEM pathway programs

- Case Study Activity

- Sample assessment and evaluation plan

- Q&A

# Learning objectives for today's presentation

1. Learn about a method for aligning assessment strategies across K-20 STEM pathway programs.
2. Recognize the importance of focusing on long-term effectiveness in data collection for STEM pathway programs.
3. Considerations for designing assessment plans and understand importance of data reading sessions.
4. Identify strategies for strengthening partnerships between assessment and program administrators.

# North Star Values

- **Access**: Provide K-12 pathway programs that invite young people to see themselves in engineering and prepares them for academic, social and emotional success across the lifetime of their college years (13-20)

- **Achievement**: Develop initiatives and programs designed to help Michigan Engineering students excel academically, professionally, and interculturally

- **Inclusion**: Offer engagement opportunities that create spaces for all K-20 students to build community and experience belongingness

# Engineering OnRamp Mission

Engineering OnRamp (EO) serves as a pathway for a diverse group of pre-college students to discover engineering as a profession and choose Michigan Engineering as the place where they want to prepare for their future. We do this through year-round activities that help students:

- ◉ Explore a variety of engineering disciplines

- ◉ Expand their vision of what they can achieve, and

- ◉ Experience tackling real-world challenges at the CoE

We equip families with the knowledge, skills, and the ability to support young people preparing for and applying to engineering colleges like Michigan Engineering.

In addition, we find and guide college students in their mentorship and support of future students and colleagues to expand the individual student's ecosystem.

# About Michigan Engineering OnRamp

**Engineering Exposure**

Elementary to Middle School

•One-day Summits

•Engineering Tours

•Virtual Workshops

**Engineering Enrichment**

Upper-Elementary to Early-High School

•Engineering Workshops

•Weekend Courses

•Commuter and Residential Camps

**Engineering Engagement**

High School

•Comprehensive Summer Residential Programs

•Sustained Year-Round Engagement

•College Readiness and Access Workshops

**Engineering Commitment**

Admitted Undergrad to PhD

•Holistic Success and Leadership Coaching

•Workshops on Intercultural Competency and Student Success

•Co-Creating Inclusive Spaces for Belonging and Community.

# Michigan Engineering ONRAMP

## EO program categorization Rubric

|  | E1 Exposure | E2 Enrichment | E3 Engagement | E4 Commitment |
|---|---|---|---|---|
| **Program Components** | -Tours<br>-workshops | -Complete a STEM class or project<br>-Standalone programs<br>-Short residential summer | -Sustained year-round engagements<br>-Summer intensive<br>-Cohort programs | College student development programs for UM ENGIN students |
| **Typical Duration** | **1 hour-1 Day** | **>1 Day** | **-Summer and year-round**<br>**-Multiple engagements** | **Varies based on program** |
| **Potential Outcomes** | • STEM Engagement<br>• Exposure to STEM education & careers | • STEM & college intention/interest<br>• STEM exposure & skills<br>• Acquired STEM academic knowledge<br>• STEM self-identity | • Intention to pursue STEM/engineering in college<br>• College readiness<br>• STEM/engineering skills<br>• Acquired STEM academic knowledge<br>• Social Emotional intelligence and skills | • Retention & graduation<br>• Graduate education and career placement |

# Michigan Engineering Zone (MEZ)

# Summer Camp Programs (2024)
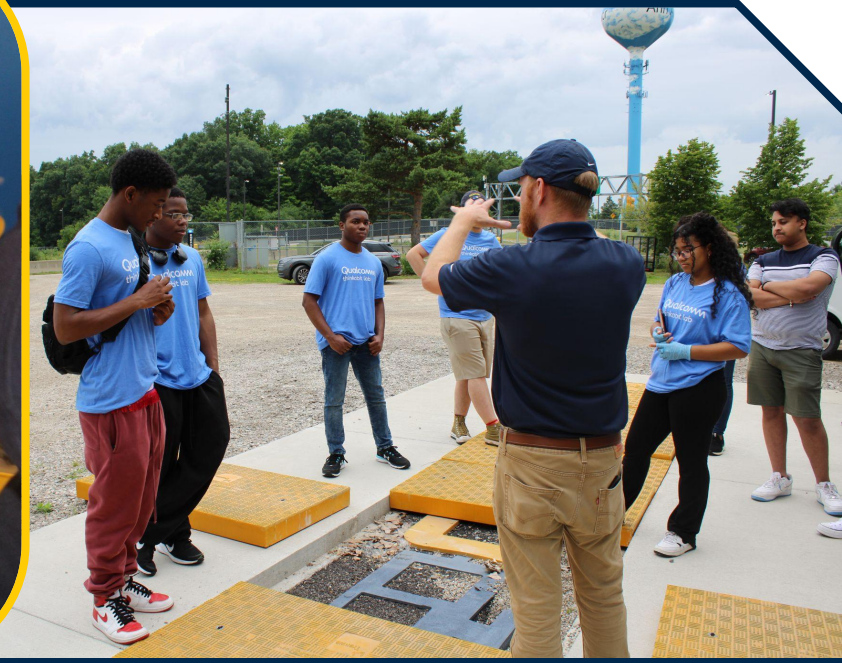
# Effectiveness of STEM pathway programs

**Evidence**
- Pathway programs have been shown to influence students' intent to pursue STEM + confidence and self-efficacy [1-3]
- Effective program design and implementation are critical for success [4]
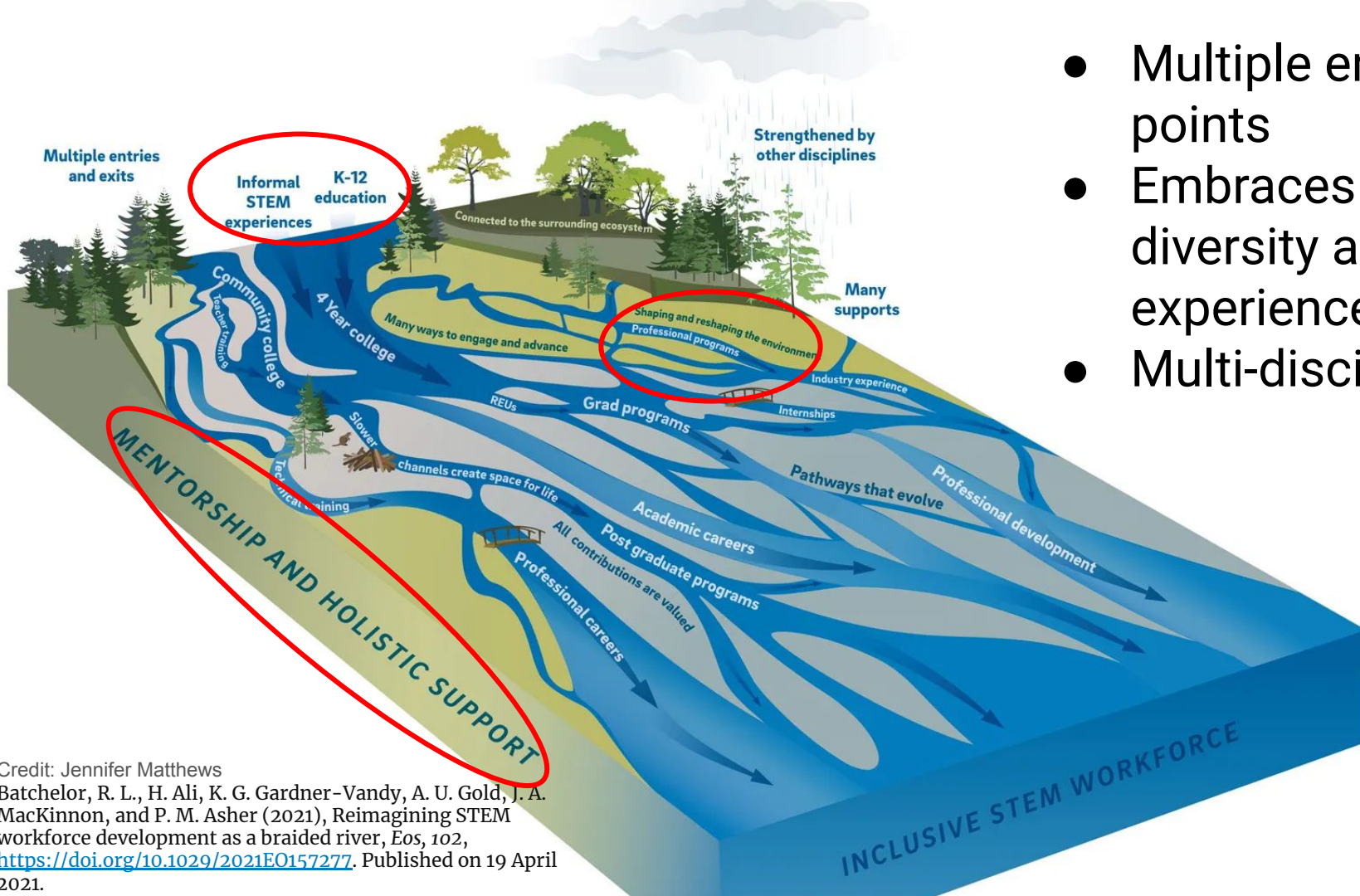
**Braided River Model**
- A reimagined model of the STEM pathway system [5]
- Challenges the linear and structured path to STEM careers

# Reimagining STEM Workforce Development as a Braided River

A braided river in New Zealand. Credit: Findley Watt, stock.adobe.com

- Multiple entry points
- Embraces diversity and experiences
- Multi-disciplinary

Credit: Jennifer Matthews
Batchelor, R. L., H. Ali, K. G. Gardner–Vandy, A. U. Gold, J. A. MacKinnon, and P. M. Asher (2021), Reimagining STEM workforce development as a braided river, *Eos, 102*, https://doi.org/10.1029/2021EO157277. Published on 19 April 2021.

# Re-imagining data collection, evaluation and assessment (DAE)

- **Goals**:
  - Systematic method for collecting, analyzing, and using data that **embraces the braided river model**
  - Alignment of DAE strategies across K-20 programming
  - Clarity on the DAE process and team roles in implementation
- **Outcomes**:
  - Streamlined DAE process and analysis allow,
    - More complete understanding of program outcomes & impact
    - Assess learning outcomes
    - Greater insights and data-driven decision making!

# Overview of DAE Components for Summer 2024

| Area | Component(s) | Audience |
|---|---|---|
| Summer Staff Onboarding Training | -Reflection Assignments<br>-Training feedback post-survey | Summer Staff Members |
| Summer Programming | -Enrollment forms | Students & Parents |
| Summer Programming **(Measure program outcomes)** | -Pre/post assessments (Google Forms)<br>-Pre/post surveys (Qualtrics)<br>-Pulse feedback survey from faculty-led sessions (Google Forms) | Student participants |
| Faculty OnRamp | -Faculty Feedback | Faculty |

# How do we use the data?

- **DAE is everyone's responsibility**
  - Preparation, collection, analysis and reporting
- **Reviewing & examining the data** helps us to be informed about our programs
  - How did students feel about the programs?
  - What ways can we improve the program to better meet the needs of students?
- **Inform the SWOT analysis** → to inform changes/enhancements for next program year

# Considerations for designing STEM pathway program assessment plans

- **Identifying needs for assessment and reporting**
  - Internal needs
  - Partner/funder needs
- **Assessment categories**
  - Availability and quality of data
  - Research
- **Establishing the process**
  - Explore existing processes and tools
  - Develop strategy & timeline
  - Analyzing and sharing data
- **Roles for each contributor**
  - Buy-in from the team
  - Defining roles and responsibilities - WHO and WHAT

***Background:*** In 5-10 years, AI technologies have advanced, significantly transforming the workforce landscape. Recognizing the unique strengths that neurodivergent individuals bring to tech innovation, Apple has partnered with University B to diversify its workforce. University B is renowned for its expertise and commitment to supporting neurodivergent individuals, with established summer programs, bridge programs, and undergraduate coaching programs. However, these resources are currently siloed and funded by different corporate partners, which presents challenges in creating cohesive support for students.

***Current Challenges***: Despite University B's robust offerings, the fragmentation and varied funding sources create gaps that hinder the full potential of these programs. The partnership with Apple aims to integrate these resources, focusing on creating a unified, impactful program that leverages the existing strengths.

***Program Objectives***: The new initiative, funded by Apple, will establish a one-week residential program designed to support neurodivergent students. Apple envisions starting with 30-35 students in the first year and scaling up to 150 students by year four. The program aims to develop both academic and social skills, fostering a supportive environment to help students thrive.

**Discussion Questions:**

1. How would you *identify* **the needs for assessment** of this program?

2. What **areas would you assess** *and what* **outcomes** would you measure?
   *For this activity this could be immediate (short-term gains) and long-term (broader goals) outcomes.

3. How do you go about **establishing the assessment process**? What factors do you need to consider?

4. What **role** does *each* **contributor play** and **how do you keep collaboration**?
   *If stuck think about these contributors: Director of Outreach, Department Assessment Manager, Apple Project Manager, Outreach Program Manager*

# Strategies

- **Identifying needs for assessment**
  - Collaborative conversations around data needs
    - (talking through logic models, historical context and role formation)
    - Not only figuring out incentivizing data collection but mitigating data fatigue
  - Think critically *intended* outcomes of STEM K-12 pathway programs
    - Academic outcomes vs. intangible outcomes (hidden curriculum, college readiness)
- **Assessment categories**
  - We worked collaboratively to understand when and where data can be collected. What are the creative solutions to prevent survey burnout and over sourcing of data?
  - We focused on understanding what data needed to be collected to showcase long term vs. short term gains
- **Establishing the process**
  - We had a hands-on approach to implementation of assessment and evaluation. Where the evaluation and assessment team was present in the process and not just 'in-the office' waiting for data to come in.
  - Discussing unique ways to get data collection
- **Roles for contributor**
  - Leverage strengths and align passion for team buy-in
  - Co-defining of roles and responsibilities and frequent checks about roles and responsibilities
  - Data reading sessions were held between the program administrator and assessment professional

# Example Evaluation & Assessment Components for our Engineering Engagement Program

**Intended Outcomes:**

- STEM academic knowledge
- STEM skills
- STEM identity
- STEM exposure
- Career interest and intention
- College intention
- College readiness
- Social/Emotional Skills
- Program feedback

**How we measure:**

- Academic growth measured by academic assessments & student projects
- Growth (quantitative) in other outcome areas as measured by pre/post program surveys
- Institutional data to measure post-secondary plans
  - # of students applied, admitted, and enrolled at UM

# Helpful resources for building your STEM program assessment plans

- REVISE (Reimagining Equity and Values in Informal STEM Education). **Evaluation tools and Instruments**

- **STEM Programming Planning Tool from California AfterSchool Network and California STEM Learning Network**
  - This program planning tool provides a template for schools and/or districts in the process of implementing a STEM program including programmatic planning, professional development, and fiscal sustainability. The guide includes helpful worksheets, check lists, and action plans, to ensure successful implementation of programs.

- Peterman, K., Withy, K. & Boulay, R. **Validating Common Measures of Self-Efficacy and Career Attitudes within Informal Health Education for Middle and High School Students.** CBE Life Sci. Educ.17,ar26 (2018).114.

- Kizilay, E., Yamak, H. & Kavak, N. **Development of the STEM Career Interest Scale for High School Students.** Eur. J. Educ. Sci.7,48–70 (2020)

- Unfried, Faber, Stanhope, and Wiebe (2015). **The Development and Validation of a Measure of Student Attitudes Toward Science, Technology, Engineering, and Math (S-STEM)**

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3. Hunt PK, Dong M, Miller CM. A multi-year science research or engineering experience in high school gives women confidence to continue in the STEM pipeline or seek advancement in other fields: a 20-year longitudinal study. *PLoS One*. 2021;16(11):e0258717. doi: 10.1371/journal.pone.0258717
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5. Batchelor, R. L., H. Ali, K. G. Gardner-Vandy, A. U. Gold, J. A. MacKinnon, and P. M. Asher (2021), Reimagining STEM workforce development as a braided river, *Eos, 102*, https://doi.org/10.1029/2021EO157277. Published on 19 April 2021.

# Charting the Course: Navigating Collaborative Assessment Strategies for K-20 STEM Pathway Programs

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Submit your answers via this poll:
PollEv.com/amandamilliken134