



Professional Pathways *in* **Informal STEM Learning**

Developing Career Expertise

**Building Supports Towards a Useful,
Usable, and In-Use Framework of
Professional Competencies in the
Informal STEM Learning Field**



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Speakers



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Today's Agenda

1. Project overview 5 minutes
2. **Process:** what we learned 10 minutes
3. **Outcomes:** tools you can use 10 minutes
4. Questions and discussion 5 minutes





About the Project



Professional Pathways in Informal STEM Learning

Professional Pathways in Informal STEM Learning (ISL) is designed for anyone who works in ISL. Whether you're just starting out or advancing your career, the Pathways suite of tools can help you understand, plan, and advance your skills, knowledge, and capabilities.

The Pathways suite of tools

To best meet the complex and evolving needs of the ISL workforce, the Pathways tools were developed with input and review from ISL professionals representing a wide range of roles and experience. Each tool can be used flexibly by ISL professionals and organizations in a variety of settings and contexts.

This includes science and technology centers and museums, natural history museums, children's museums, zoos, aquariums, nature centers, botanical gardens, planetariums, and other types of museums and cultural organizations.

The Framework

Explore the competencies that are common across a broad range of ISL work.

LEARN MORE

Self-Assessment

Reflect on your skills and knowledge.

LEARN MORE

Learning Plan

Chart your path for professional growth.

LEARN MORE



Professional Pathways in Informal STEM Learning

Developing Career Expertise

ASTC Association of Science and Technology Centers



CENTER FOR RESEARCH & EVALUATION

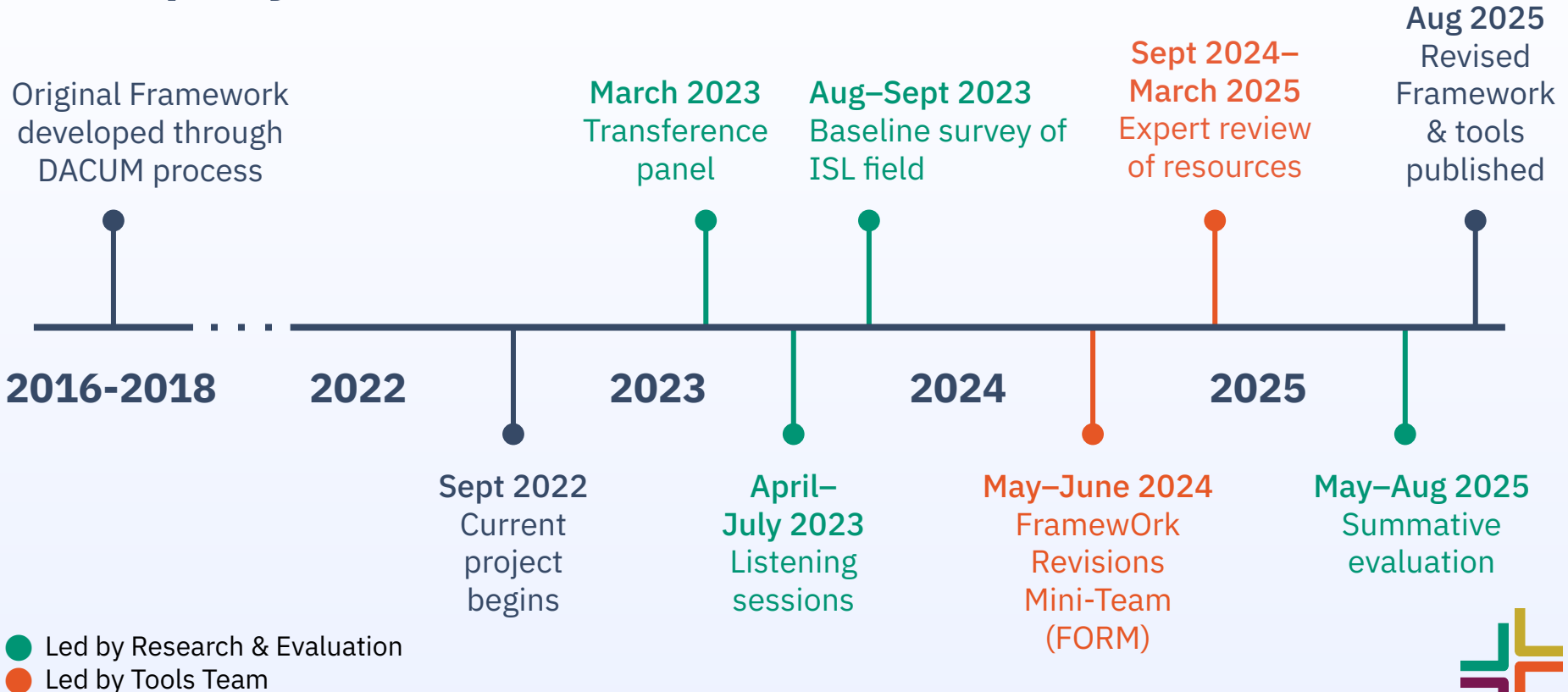


Oregon State University
STEM Research Center

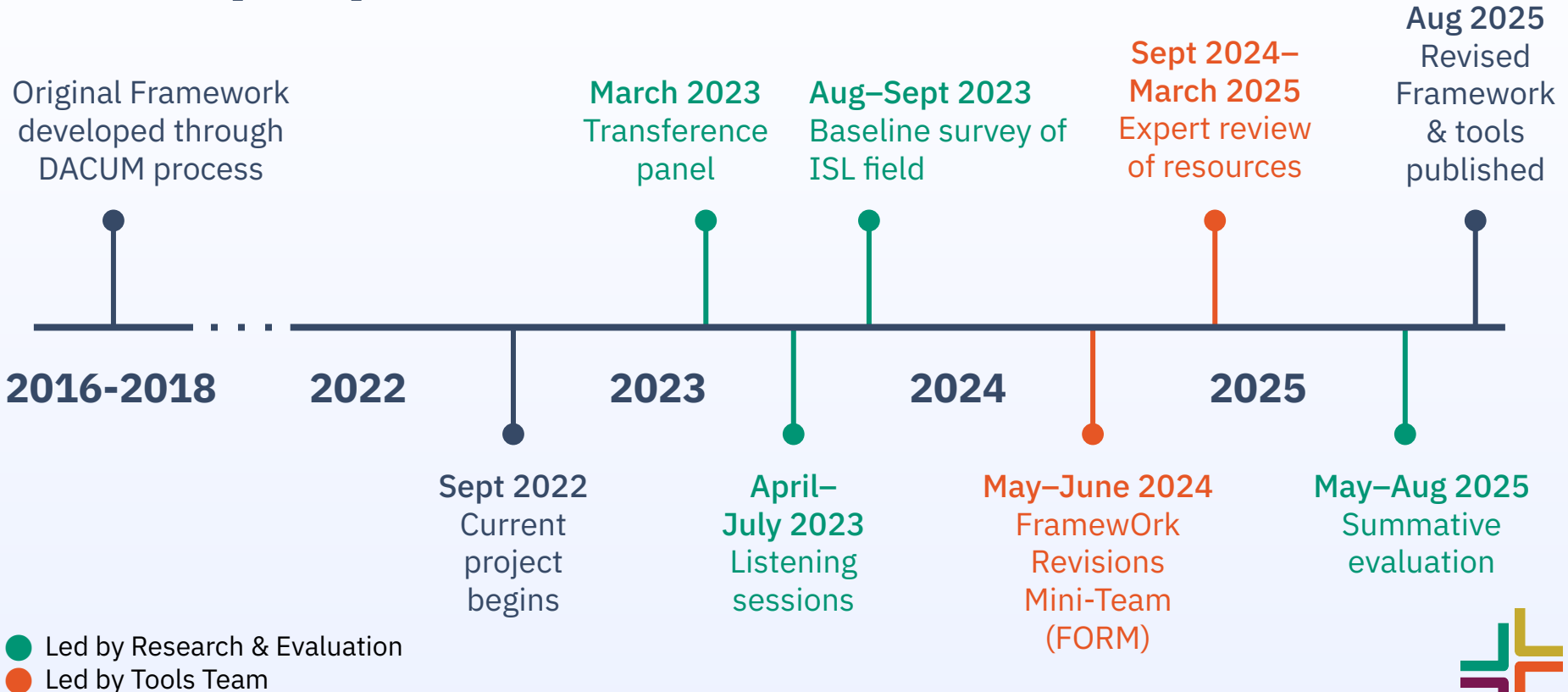


This material is based upon work supported by the U.S. National Science Foundation under Award No. 2215274. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of NSF.

Our project has been evidence-based...




...and people-centered.



Challenges

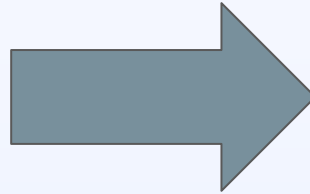
- **Inside the project**
 - Staffing transitions (both planned and unplanned)
 - Need for alignment and common language
 - Need to both honor the past and respond to the present
- **Outside the project**
 - Shifts in broader sociopolitical context
 - Shifts in professional field
 - Real-time changes to federal guidance

A photograph of two women in a workshop or classroom setting. The woman on the right, with short dark hair, is wearing a blue polo shirt with a NASA logo and a lanyard with 'Imagine ASSTC' text. She is holding a small, flat, greyish object and gesturing with her hands as if explaining something. The woman on the left has long dark hair and is wearing a blue t-shirt with a green and yellow pattern and a lanyard. She is holding a larger, flat, greyish object. In the background, other people are visible, including a man with a long white beard. The text 'Process: what we learned' is overlaid in white on the left side of the image.

Process: what we learned

An Example Process:

FramewOrk Revision Mini-team aka FORM



An Example Process:

FramewOrk Revision Mini-team aka FORM

- Cross-Org members
- Deep Working Group
- Clear goals and rules of engagement

Takeaway #1

Identifying and agreeing on collective needs

Takeaway #2

Creating mechanisms for action and consent

- Document, document, document
- Multiple ways of weighing in
- Agree on agreement

Takeaway #3

Increasing permeability of group boundaries


- Resisting organizational silos
- Reconsidering norms for input and review

Takeaway #4

Fostering intentional opportunities for collaboration

- Mutually-reinforcing efforts
- Joint public-facing outreach

Outcomes: Overview of the Pathways Tools

**Professional Pathways
in Informal STEM Learning**
Developing Career Expertise
astc.org/isl-pathways



Professional Pathways in Informal STEM Learning (ISL) is a set of tools that supports professional learning and career development for anyone who works in ISL—that means YOU!

Whether you are just starting your career or leading an institution, the Pathways tools can help you along your learning journey.

The Framework

Self-Assessment

Professional Pathways in Informal STEM Learning (ISL) is a set of tools that supports professional learning and career development for anyone who works in ISL—that means YOU!

Learn More

What professional competencies do you want to develop?



The Framework includes competencies in four domains:
General Expertise, Job-Specific Expertise, Operations, and Audiences & Impact.

Competency refers to the ability to accomplish a desired outcome by applying skills and knowledge in a particular area of work. In other words, a competency is what you need to be able to do and know to do your job.

Use sticky notes to share what competencies you want to develop this week.

General Expertise

How do I work with others to solve problems and accomplish our goals?

CATEGORIES OF COMPETENCIES

- Interpersonal Skills & Knowledge
- Reflective Self-Awareness
- Communication
- Problem Solving

Operations

How do I engage with my organization's systems and structures?

CATEGORIES OF COMPETENCIES

- Organizational Structures
- Leadership & Management
- Policies, Standards, & Procedures
- Resources

Pathways Suite of Tools

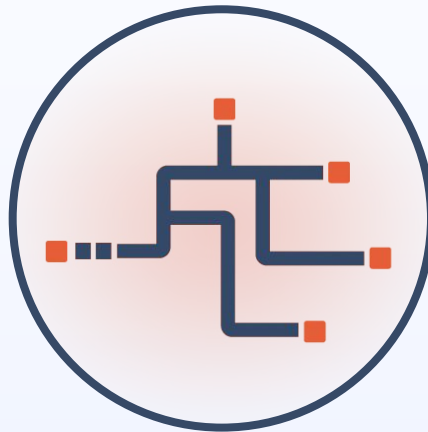
www.astc.org/isl-pathways



Framework



Self-Assessment



Learning Plan



**Strategies &
Resources**

Framework



Professional Pathways in Informal STEM Learning Developing Career Expertise

The Framework

Professional Pathways in Informal STEM Learning (PIL)—or, Pathways for Career Expertise—supports professional learning for anyone in the field. From writing and editing content to writing grant reports, leading tours to leading an organization, and sharing budgets for buying office supplies, PIL work calls for specific skills and knowledge and the ability to use those skills and knowledge in a variety of contexts. This involves what we call competency or competencies. The Pathways sets of tools was created by and for professionals who are doing this complex, evidence-based work in informal organizations with a STEM mission or culture or operations with a non-stem STEM program.

The Framework's competencies—organized into domains and indicators—can help individuals, organizations, academic programs, and professional associations better understand and build the skills and knowledge needed in the field, workforce.

General Expertise

How do I meet workplace needs to solve problems and accomplish my goals?

DOMAINS OF COMPETENCIES

- Interpersonal Skills & Knowledge
- Reflective Self-Awareness
- Communication
- Problem-Solving

Job-Specific Expertise

How do I understand and engage with the practices and activities of the informal STEM learning field?

DOMAINS OF COMPETENCIES

- Professional Learning & Knowledge
- Engagement in the Profession
- Strategic Practices
- Technology-Based Skills

Operations

How do I engage with an organization's systems and structures?

DOMAINS OF COMPETENCIES

- Organizational Structures
- Leadership & Management
- Policies, Standards, & Practices
- Resources

Audiences & Impact

How do I navigate the relationship between my organization's values and the multi-stakeholder communities we serve?

DOMAINS OF COMPETENCIES

- Purpose & Ethics
- Individual, Groups, & Communities
- Diversity & Equity
- Research & Evaluation



Learn the entire framework and more at www.pil-pathways.org

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Explore the entire framework and full suite of field tools.



Learn the entire framework and more at www.pil-pathways.org

General Expertise

How do I meet workplace needs to solve problems and accomplish my goals?

These competencies describe the ways you interact with your work and work environment through interpersonal relations, self-awareness, communication, and problem-solving. Your previous work continues to develop these competencies to support your career.

- Interpersonal Skills & Knowledge**
 - OE1. Develop and maintain effective relationships and collaborations.
 - OE2. Manage organizational and conflict constructively.
 - OE3. Demonstrate cultural competency.
 - OE4. Recognize and respond effectively to various individuals' approaches to solve or address a problem.
- Reflective Self-Awareness**
 - OE5. Reflect on personal values, attitudes, and ways of thinking.
 - OE6. Consider how background and experiences influence ideas and motivations.
 - OE7. Recognize how self-perception and mood can impact.
 - OE8. Hold oneself accountable for actions and their consequences.
- Communication**
 - OE9. Express ideas and information in a clear and compelling manner.
 - OE10. Apply communication approaches, format, and content with awareness and consideration.
 - OE11. Ask clear and relevant questions.
 - OE12. Demonstrate active listening skills.
 - OE13. Foster a culture and environment of open communication.
- Problem Solving**
 - OE14. Approach problems with resilience and persistence.
 - OE15. Identify and analyze the cause, problems, and solutions.
 - OE16. Consider alternative approaches to identify and solve problems.
 - OE17. Use necessary techniques and strategies for solving problems.

TIP
The order of the competencies does not indicate importance level or difficulty.

The Framework

Job-Specific Expertise

How do I understand and engage with the practices and activities of the informal STEM learning field?

These competencies describe the ways you engage with the field, connect to professional learning, and strategically use your knowledge, skills, and technology to do your work.

- Professional Learning & Knowledge**
 - JE1. Understand basic STEM content and processes.
 - JE2. Understand and apply principles of informal learning.
 - JE3. Monitor and be responsive to practices that inform informal STEM learning work.
 - JE4. Demonstrate a commitment to professional learning.
- Engagement in the Profession**
 - JE5. Engage with professional organizations, networks, publications, and other resources.
 - JE6. Use and contribute to the knowledge base of the field.
 - JE7. Represent and promote the work of informal STEM learning organizations and the informal STEM learning field.
 - JE8. Strengthen work force capacity, retention, and utilization.
- Strategic Practices**
 - JE9. Demonstrate project management skills and strategies.
 - JE10. Identify and understand the purpose, goals, or objectives of programs, projects, and activities.
 - JE11. Align strategy, implementation, and assessment of projects, products, and services with goals.
 - JE12. Demonstrate reflective and evidence-based practices.
 - JE13. Adjust actions and activities to achieve desired goals, outcomes, or objectives.
- Technology-Based Skills**
 - JE14. Identify and apply relevant technologies.
 - JE15. Select and use appropriate technologies for communication and collaboration.
 - JE16. Consider reliability, ethics, confidentiality, and purpose when selecting technology based tools or products.

The Framework

Operations

How do I engage with an organization's systems and structures?

These competencies describe how you contribute to the internal operations that support an organization or institution's public activities. Workplace operations vary, so the ways that professional learning and development operations competencies will likely be dependent on position and environment.

- Organizational Structures**
 - OP1. Understand expectations and responsibilities associated with one's position.
 - OP2. Understand the purpose and functions of organizational units or departments.
 - OP3. Understand and navigate internal and external management structures.
 - OP4. Monitor, implement, or develop organizational protocols.
- Leadership & Management**
 - OP5. Understand management and leadership skills and responsibilities.
 - OP6. Provide vision, oversight, or support for projects, activities, or initiatives.
 - OP7. Recognize the capacity and capacity of teams or staff.
 - OP8. Promote staff well-being and satisfaction.
 - OP9. Consider the broad and long-term implications of actions.
- Policies, Standards, & Practices**
 - OP10. Inform decisions and actions with relevant policies, standards, and/or regulations.
 - OP11. Uphold employee rights, responsibilities, and policies in the workplace.
 - OP12. Monitor, implement, or develop policies, standards, and practices.
 - OP13. Support and advocate for policies and practices that enhance informal STEM learning efforts.
- Resources**
 - OP14. Identify, monitor, and steward resources.
 - OP15. Develop or implement strategies and practices to increase efficient use of resources.
 - OP16. Understand and apply budgeting, accounting, and other fiscal management concepts.
 - OP17. Select and monitor resources to provide long-term organizational sustainability.

The Framework

Audiences & Impact

How do I navigate the relationship between my organization's values and the multi-stakeholder communities we serve?

These competencies describe the ways you engage with the field to build the values, culture, and goals of your organization and understand the role of informal STEM learning organizations to engage audiences to establish and sustain practices.

- Purpose & Role**
 - AI1. Understand the characteristics, purposes, and distributions between mission, vision, and goals.
 - AI2. Align actions and decisions to promote the organization's mission, vision, and goals.
 - AI3. Identify and respond to priorities within the field and communities.
 - AI4. Monitor and be responsive to different perspectives about the mission role of informal STEM learning organizations.
- Individuals, Groups, & Communities**
 - AI5. Understand and respond to the interests and needs of all stakeholders and audiences.
 - AI6. Develop and implement practices that respect and support well-being outcomes.
 - AI7. Develop and maintain equitable relationships and collaborations with individual community groups and organizations.
 - AI8. Shape efforts to strengthen audience experiences and address community and societal practices.
- Diversity & Equity**
 - AI9. Understand the underlying goals, perceptions, and practices associated with equity and diversity in the informal STEM learning field.
 - AI10. Advocate for practices that include, support, and welcome to historical and present audiences.
 - AI11. Include diversity and equity by including into all practices.
 - AI12. Pursue actions that diversify the informal STEM learning workforce.
- Research & Evaluation**
 - AI13. Understand the purpose and value of research and evaluation.
 - AI14. Select and use appropriate research and evaluation practices.
 - AI15. Contribute to and support research and evaluation efforts.
 - AI16. Produce research and evaluation products and processes.

The Framework

The Framework



Framework

Covers the wide range of knowledge & skills that ISL professionals use in their work.

General Expertise

- Interpersonal Skills & Knowledge
- Reflective Self-Awareness
- Communication
- Problem Solving

Job-Specific Expertise

- Prof. Learning & Knowledge
- Engagement in the Profession
- Strategic Practices
- Technology-Based Skills

Operations

- Organizational Structures
- Leadership & Management
- Policies, Standards, & Practices
- Resources

Audiences & Impact

- Purpose & Role
- Individuals & Communities
- Diversity & Equity
- Research & Evaluation

Framework: Categories

Job-Specific Expertise

How do I understand and engage with the practices and activities of the informal STEM learning field?



**Professional
Learning &
Knowledge**



**Engagement in the
Profession**



**Strategic
Practices**



**Technology-
Based Skills**



Framework: Competencies



Engagement in the Profession

- JE.5 Engage with professional organizations, networks, publications, and other resources.
- JE.6 Use and contribute to the knowledge base of the field.
- JE.7 Represent and promote the work of informal STEM learning organizations and the informal STEM learning field.
- JE.8 Strengthen workforce capacity, retention, and satisfaction.



Self-Assessment



Reflecting on your skills and knowledge.

General Expertise

Interpersonal Skills & Knowledge

1 2 3 4

SE1 Identify and maintain effective relationships and collaborations.

SE2 Manage disagreements and conflict constructively.

SE3 Express and cultivate empathy.

SE4 Recognize and respect differences in the ways individuals approach situations or problems.

Professional Pathways Informal STEM Learning Self-Assessment

Job-Specific Expertise

Professional Learning & Knowledge

1 2 3 4

JE1 Understand basic STEM content and processes.

JE2 Understand and apply principles of informal learning.

JE3 Identify and are responsible to practices that inform Informal STEM learning work.

JE4 Demonstrate a commitment to my professional learning.

Professional Pathways Informal STEM Learning Self-Assessment

Professional Pathways in Informal STEM Learning

Developing Career Expertise

Self-Assessment

A Tool for Reflecting on Your Professional Competencies

This Self-Assessment will help you understand:

- The skills and knowledge you use in your work.
- Where you are on your professional learning path.

Getting Started

- As you work through the assessment, think about what's most relevant to you.
- Consider the competencies or categories of competencies that connect to your current work or your career goals. You can note priorities to your reflection at the end of each section.
- Remember, competency looks different for each person and in each circumstance. The Self-Assessment provides descriptions of what competency might look like. Some descriptions may be relevant for you, while others may not.

The Self-Assessment Rating Scale

Think of this scale as a spectrum of professional development. Where do you see yourself at this time? The scale helps you identify where you are, but it does not suggest or imply where you should be or could be.

Emerging	Developing	Capable	Advanced	Expert
Have limited knowledge, skills, or experience.	Have intermediate skills and knowledge, actively seek to learn, and demonstrate the willingness to learn.	Have intermediate skills and knowledge, actively seek to learn, and demonstrate the willingness to learn.	Have significant skills, knowledge, or experience. Can provide support or leadership to others in this area.	Have extensive, specialized skills, knowledge, or experience. Can provide support or leadership to others in this area.

Professional Pathways Informal STEM Learning Self-Assessment

Organizational Expertise

1 2 3 4

O1 Understand the structures and responsibilities associated with my position.

O2 Understand the purposes and functions of organizational units or departments.

O3 Understand and are able to navigate internal and external management operations.

O4 Evaluate, implement, or develop organizational protocols.

Professional Pathways Informal STEM Learning Self-Assessment

Audiences & Impact

1 2 3 4

AI1 Understand the characteristics, purposes, and objectives between initiatives, sites, and goals.

AI2 Define actions and decisions to promote the organization's initiatives, sites, and goals.

AI3 Identify and respond to priorities within the field and community.

AI4 Identify and are responsible to different perspectives of the changing field of Informal STEM Learning operations.

Professional Pathways Informal STEM Learning Self-Assessment



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Self-Assessment



A closer look at one section—General Expertise.

General Expertise

Reflective Awareness

GE.5 I reflect on my personal values, attitudes, and ways of thinking.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

General Expertise

Communication

GE.8 I express ideas and information in a clear and compelling manner.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

General Expertise

Interpersonal Skills & Knowledge

GE.1 I develop and maintain effective relationships and collaborations.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Respecting the opinions and efforts of others.
- Fostering positive relationships.
- Working towards mutually beneficial outcomes.
- Being flexible to others as good will change.

GE.2 I manage disagreements and conflict constructively.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Recognizing when issues is present and responding with sensitivity and respect.
- Expressing and negotiating disagreements constructively.
- Facilitating efficient or complex discussions.
- Building common ground through supportive and constructive language.

GE.3 I express and cultivate empathy.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Acknowledging and respecting expressions of emotions.
- Setting a tone of acceptance.
- Leaving space for others to be heard.
- Acknowledging that the ability to understand others' experiences is limited.
- Paying attention to body language and tone of voice.

GE.4 I recognize and respect differences in the ways individuals approach situations or problems.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Appreciating diverse work styles.
- Considering the influence of career domains in interactions.
- Welcoming diverse perspectives.
- Respecting others' experiences, attitudes, and approaches to work.

General Expertise

Problem Solving

GE.14 I approach problems with resilience and persistence.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Adapting to various situations with flexibility.
- Acknowledging and addressing setbacks or delays.
- Trying different strategies when one doesn't work.
- Knowing when to give up and when to continue.

GE.15 I identify and analyze issues, problems, and solutions.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Identifying key or underlying issues and factors.
- Considering which alternatives to or solve after problems.
- Gathering information from a range of sources.
- Drawing conclusions based on analysis, input from others, and experience.

GE.16 I consider alternative approaches to problems and practices.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Considering ideas from other fields that may inform practices.
- Invoking those affectively problems in the creation of solutions.
- Applying to conventional and practices that attempt to shift narratives and challenge the status quo.
- Being open to new or different ideas.

GE.17 I use a variety of techniques and strategies for solving problems.

1 2 3 4 5

Emerging Developing Capable Advanced Expert

Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Developing techniques and strategies to foster individual or group problem solving.
- Developing techniques and strategies to generate creative thinking.
- Applying multiple techniques and strategies.
- Preparing materials, spaces, and circumstances to support strategies.

REFLECTIONS ON General Expertise

Which **General Expertise** competencies or larger categories, if any, are particularly important for your current work or future career goals? Notice where you placed yourself on the scale.

List any competencies or categories that may be priorities for professional development or career exploration.

Which competencies, if any, were difficult to rate? Which competencies, if any, do you want to better understand?

Make a note for further reflection or research.

What other observations or questions do you have about the General Expertise section?

What's next? | Explore your competencies in the other domains or move on to mapping out your priorities and action steps in the Learning Plan.



Self-Assessment



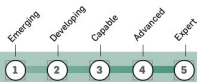
Examples of what the competency looks like in practice can help you think about your work.

General Expertise



Problem Solving

GE.14 I approach problems with resilience and persistence.



Mark the circle that you identify with.

THIS MIGHT LOOK LIKE

- Adapting to various situations with flexibility.
- Acknowledging and addressing setbacks or delays.
- Applying different strategies when one doesn't work.
- Knowing when to give up and when to continue.

GE.15 I identify and analyze issues, problems, and solutions.

THIS MIGHT LOOK LIKE

- Identifying key or underlying issues and factors.
- Considering who is affected by or can affect problems.
- Gathering information from a range of sources.
- Drawing conclusions based on analysis, input from others, and expertise.

GE.16 I consider alternative approaches to problems and practices.

THIS MIGHT LOOK LIKE

- Considering ideas from other fields that may inform practices.
- Involving those affected by problems in the creation of solutions.
- Engaging in conversations and practices that attempt to shift narratives and challenge the status quo.
- Being open to new or different ideas.

GE.17 I use a variety of techniques and strategies for solving problems.

THIS MIGHT LOOK LIKE

- Developing techniques and strategies to foster individual or group problem solving.
- Developing techniques and strategies to prompt creative thinking.
- Applying different techniques and strategies.
- Preparing materials, spaces, and circumstances to support strategies.

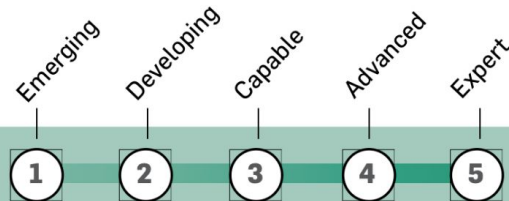


Problem Solving

GE.14 I approach problems with resilience and persistence.

THIS MIGHT LOOK LIKE

- Adapting to various situations with flexibility.
- Acknowledging and addressing setbacks or delays.
- Applying different strategies when one doesn't work.
- Knowing when to give up and when to continue.



Mark the circle that you identify with.

Resources & Strategies

HOME ABOUT MEMBERSHIP CONFERENCES & EVENTS RESOURCES & LEARNING IMPACT & INITIATIVES FIND A PASSPORT LOCATION MEMBER LOGIN

Resources

Discover more ways to support your professional learning goals.

This curated collection includes a sampling of articles, online courses, professional organizations, and other tools that ISL professionals from a wide range of roles and settings have found useful.

While exploring these resources, it may be helpful to focus on specific competencies you want to develop (see [Framework](#) and [Self-Assessment](#)), your own personal learning goals (see [Learning Plan](#)), and/or broader [strategies for professional learning](#). The [Key Terms](#) page can offer additional insight into Pathways language.

Q Search

Web-based resource

Informational Interviewing

Website provides strategies and suggestions for setting up and implementing an informational interview including example questions.

Filters

- Web-based resource (14)
- Training, Course, or Certification (8)
- Professional Organization (19)
- Journal or Article (18)
- Book (26)

Journal or Article

Situating Reflective Practice in Experiential Learning: A Case Study of Educators' Professional Learning through Tinkering at Home

Author(s): Thomas Murphy, Ciara and Martin, Lee

Article describes a professional learning experience for educators based on tinkering, and explores the value of experiential learning related to educators' reflective practices and professional learning. Open access/free download.

Professional Organization, Web-based resource

Best Practices in Science Communication

Author(s): The American Society for Cell Biology®

Website from a professional association of scientists offers general science communication tips, resources, and references applicable to many learning situations.

Strategies for Developing Competencies

- **Independent Learning**
 - Reflective practice
 - Reading
 - Informational interview
- **Collaborative Learning**
 - Book club
 - Communities of practice
 - Coaching & mentorship
- **Experiential Learning**
 - Workshop or training
 - Internship
- **Formal Learning**
 - Higher education or certification
 - Professional organizations
 - Online learning



How can I use the tools in my context?



Individuals



Organizations



**Academic
Programs**



**Professional
Associations**





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Questions and Thoughts?

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