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STEM Pathways for Rural Youth: Experience Sampling Feedback and Scoring Manual

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Phase 2 Experience Sampling Feedback Framework (AISL #2213919)

Overview: The project's main research question is, *Can the emerging outdoor recreation economy serve as a context for informal STEM learning in rural communities, and for forming STEM identities?*

To address this question, it is necessary to design methods for (a) assessing youths' insights into STEM and OR; (b) piloting tools for generating and deepening those insights; (c) capturing evidence of learning; (d) connecting learning and identity processes; and (e) capturing evidence of "movement" in identity processes relative to emerging economic opportunities and the cultural values they represent.

OR Folio challenge design

Challenges are designed to promote connections between STEM and outdoor recreation from the users' point of view. Content-related challenges are organized into four categories per the [NH State Outdoor Recreation Competencies](#) and include STEM competency "tags" from the Next Generation Science Standards. This design will help identify which STEM competencies cluster under which outdoor recreation competencies, suggesting connections that could be further developed in a future intervention.

There are also Project Challenges which are designed for communication with researchers about (a) project-related items or (b) extensions to content challenges prompted by researcher feedback (see below), expressed in: "I Am..." challenges, "Story" challenges, or challenges inviting participants to respond to feedback (all initial feedback includes at least this third extension challenge).

Challenge response "tips" (for students)

ORFolio includes a function that includes pre-established "tips" for how to enter relevant and thorough responses to the challenges. These tips are based on principles of mastery-based instruction. This function replaces the rubric in previous versions of the app.

Tips as of 2/27/23 are:

1. Remember the Project Goal: To identify if you (students) see a connection between outdoor recreation and STEM (science, technology, engineering, and math)
2. Notice Details: What did you see, hear, feel? Who was there? What were you doing?
3. Make the STEM Connection: Be clear. How does what you are doing relate to science, technology, engineering, and math?
4. Share Your Perspective: Remember you are a researcher, don't forget to tell us how your response connects to the project. How do you see this activity connecting to the project goal?

Feedback on ORfolio challenges #1 and #2 (completed 1/12 at AMC Highland Center)

Project leads left comments intended to be encouraging and supportive on the two "January 12" challenges youth participants completed at the AMC Highland Center on 1/12/23.

Score youth responses to ORfolio challenges

Two types of “quality” scores for youth responses are indicated in the challenge and feedback tracking process: (1) the quality of participants’ STEM engagement and/or STEM-OR connections, and (2) the quality of participants’ meaning making around identity.

1. STEM engagement / STEM-OR connection quality

Rating	Depth of STEM engagement	Depth of STEM-OR connection
0	No mention of STEM in the response.	No STEM-OR connection described in the response.
1	Science, technology, engineering, or math are named/labeled/tagged only, but not unpacked.	Science, technology, engineering, or math are stated as part of an OR activity or skill only (e.g., “there’s a lot of math needed to build good trails”), but not explained.
2	A STEM component (knowledge) or process (e.g., critical thinking) is named and/or described.	A STEM component is connected to OR and unpacked in terms of knowledge (e.g., “you have to think about how the materials used to build skis will respond in cold temperatures”) and/or processes (e.g., “ski lift mechanics need to be able to find and solve problems they can’t see... quickly!”)
3	All of the above plus the response includes reference to a specific scientific (or T-E-M) principle	All of the above plus a specific scientific (or T-E-M) principle is referenced in the context of an OR activity, setting, context, or resource

These scores should be indicated in the “Quality-STEM” column of the [ORfolio Feedback Tracking and Coding Sheet](#).

2. Identity meaning making quality

Proposed basis: McLean & Pratt (2006) meaning making scoring system. See:

A score of 0 was given to narratives with no meaning reported. A score of 1 was given to narratives with a lesson reported. As in the original system, lessons were defined as meanings that were often behavioral and did not extend the meaning beyond the original recalled event. For example, a participant reported the following lesson about his career, “I also worked temporarily at a law firm and realized that I did not want to practice law, but wanted to deal with some aspect of the law.” This participant indicated thought and behavioral action taken, but without complex reasoning. A score of 2 was given to narratives with vague meaning. These narratives contained meanings that were slightly

more sophisticated than lessons but were not as explicit as insights. For example, 1 participant wrote the following narrative, “The event gave me motivation to learn more about medicine as a career and learn much more about myself and my desires in life. I also had to learn to see my own value outside of academics.” Finally, a score of 3 was given to narratives with insights, which were defined as meanings that extend beyond the specific event to explicit transformations in one’s understanding of oneself, the world, or relationships. (p. 717)

McLean, K., & Pratt, M. W. (2006). Life’s little (and big) lessons: identity statuses and meaning making in the turning point narratives of emerging adults. *Developmental Psychology, 42*(4), 714-722.
<https://doi.org/10.1037/0012-1649.42.4.714>

Additional sensitizing construct: *Chronotope*. See:

Blommaert, J., & De Fina, A. (2017). Chronotopic identities: On the timespace organization of who we are. In *Diversity and superdiversity: Sociocultural linguistic perspectives* (pp. 1-15). Georgetown University Press.
<https://biblio.ugent.be/publication/8552817>

Chronotopes serve as “identity frames”: In its most simple formulation, the idea we develop here [chronotope] is that the actual practices performed in our identity work often demand specific timespace conditions as shown by the fact that changes in timespace arrangements trigger complex and sometimes massive shifts in roles, discourses, modes of interaction, dress, codes of conduct and criteria for judgment of appropriate versus inappropriate behavior, and so forth. (p. 4)

The idea is that precipitating thought or even simple behavior in a new/expansive and future-oriented chronotopic arrangement helps youth “[stand a head taller](#),” which is a precondition for development.

Rating	Internal conditions	External conditions
0	No meaning reported; simply descriptive of an event or activity (internal state)	No meaning reported; simply descriptive of an event or activity (external conditions)
1	Lesson learned about oneself but limited to immediate event or activity, or simple behavior change.	Lesson learned about external conditions (STEM, community, economy, recreational activity) but limited to immediate event or activity, or simple suggestion of future engagement.
2	Lesson learned alludes to some deeper insight into an abiding feature of the self.	Lesson learned alludes to some deeper insight into an abiding feature of STEM or outdoor recreation in a local or global context.
3	Narrative explicitly describes a shift or transformation in the meaning of past events or intentions about future states of being or aspirations. (it is meta-reflective)	Narrative explicitly describes a shift or transformation in the meaning of past or future encounters with STEM or outdoor recreation in some wider context.

These scores should be indicated in the “Quality-Identity” column of the [ORfolio Feedback Tracking and Coding Sheet](#).

Another way to think about the difference between 1 and 3 is that 1 is merely descriptive of current interests, skills, activities, roles, and relationships, whereas 3 indicates a changing orientation to time, *past* and *future*, and space, *here* and *there* - i.e., the response suggests (a) a reimagining of the meaning or continuity of past events in light of emerging awareness of one’s interests, capabilities, or goals; (b) an integration of STEM or outdoor recreation into one’s current self concept (“I am realizing how much I actually like STEM when it is connected to things I love doing”); and/or (c) a projection of a future model of oneself that includes a more well-defined commitment to an idea, skill, or occupation, geographic (re)location, and/or movement across institutions.

Note: A 3 might suggest integration of internal and external dimensions.

Note from Weekly Meeting on 3/2/2023 re. STEM quality of challenge submissions. Potential scale to measure quality could be Norman Webb’s Depth of Knowledge (DOK). Here’s a good general history/description [blog post at ASCD](#).

Karin Hess, in VT, superimposed DOK on Bloom’s Taxonomy for several learning domains, including CTE. She calls it cognitive rigor. Her website:

<https://www.karin-hess.com/cognitive-rigor-and-dok>

Feedback going forward on ORfolio challenges after 2/13 monthly check-in meeting

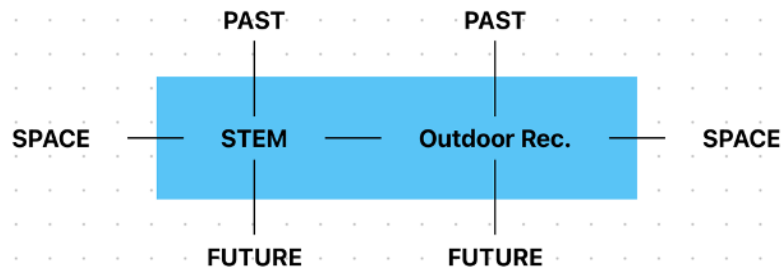
Feedback given to youth participants aims to scale toward a kind of chronotopic intervention that would function proleptically to trigger identity-related shifts, so we can establish an empirical baseline of engagement and then better track identity shifts over time through challenges that are more purely instructional, or related to *learning*, rather than to *identity*. This will allow us to better analyze the relationship between the two processes, learning and identity – for whom do they start becoming integrated (i.e., move up in the scale above)? In other words, do youth begin to engage with learning tasks as people with STEM identities? This would make mastery oriented pedagogy and identity processes distinct from one another until the youth themselves start demonstrating integration of the two.

Feedback on subsequent challenges that youth participants complete in ORfolio should always contain 3 components:

1. Encouraging feedback, providing specific, positive support for what’s there in the response to the challenge. This feedback should attempt to build rapport and sustain motivation. This can include encouragement, compliments, observations, connections, etc.

2. Mastery-oriented feedback, aiming to deepen (a) STEM knowledge or know-how, (b) outdoor recreation knowledge or know-how, or (c) connections between STEM and outdoor recreation. This type of feedback may, for example, draw youths’ attention to the tips, emphasize youths’ strong capabilities, stress persistence, or attribute success to effort as with “growth mindset” interventions. It focuses on the blue region in the diagram below. Aim to be specific and timely.

3a. Chronotopic feedback, aiming to move students into making identity-salient extensions of STEM, OR, or STEM-OR responses. See areas outside the blue region in the diagram below.



The first aspect of chronotopic feedback gives **directionality** to the identity-salient extensions offered by the feedback, drawing on the concept of prolepsis in sociocultural theories of learning and development.

P = A past-oriented extension might ask youth participants to make connections to their prior or current experiences with STEM or OR in their families, communities, or existing peer groups. Its purpose is to connect individual and collective memory.

F = A future-oriented extension should encourage youth to imagine a possible future version of themselves or a feature of their environment/context. For example, it might ask youth participants to imagine what next steps might be in pursuing work in an outdoor recreation activity that they have expressed interest in within the challenge response.

S = A spatially oriented extension might ask youth to think of new people they could meet, new activities to try out, or new places they might visit based on something they've described or mentioned in a challenge response. *Space* could be geographic, relational (a new social network), or ideational (imagining ideas in a new context).

The second aspect of chronotopic feedback gives **quality** or **depth** to the identity-salient extensions offered by the feedback, drawing on the "Career Adaptability" area of mediator variables in the "Psychology of Working Theory" (Duffy et al., 2016, p. 136; see also [Savickas & Porfeli, 2012](#)). If the past/future/space feedback operates on a 2D plane, this feedback operates on a 3D plane, or the personal characteristics required to strengthen connections across time and space in the vocational domain.

Career adaptability has 4 subcomponents. The guidance below summarizes each subcomponent and lists the items included in Savickas and Porfeli's (2012) *Career Adapt-Abilities Inventory V2.0*, which may provide a useful basis for constructing feedback in narrative or question form. Note, Savickas and Porfeli achieved the highest validity across international settings when using a 5-point scale asking respondents to rate themselves "strongest" to "not strong," so it might help to think of the statements as *strengths* that can be assessed and developed (for final scale, see p. 672).

Definitions: "Concern means the extent to which an individual is oriented to and involved in preparing for the future. Control means the extent of self-discipline as shown by being conscientious and responsible in making decisions. Curiosity means the extent to which an individual explores circumstances and seeks information about opportunities. Confidence means the extent of certitude

that one has the ability to solve problems and do what needs to be done to overcome obstacles” (p. 664)

1. **Concern** about one’s vocational future “helps individuals look ahead and prepare for what might come next” (p. 663)

Feedback statement roots:

- Thinking about what my future will be like
- Realizing that today’s choices shape my future
- Preparing for the future
- Becoming aware of the educational and vocational choices that I must make
- Planning how to achieve my goals
- Concerned about my career

2. Feeling in **control** of one’s life and surroundings “enables individuals to become responsible for shaping themselves and their environments to meet what comes next by using self-discipline, effort, and persistence” (p. 663).

Feedback statement roots:

- Keeping upbeat
- Making decisions by myself
- Taking responsibility for my actions
- Sticking up for my beliefs
- Counting on myself
- Doing what’s right for me

3. “Possible selves and alternative scenarios that they might shape are explored when **curiosity** prompts a person to think about self in various situations and roles” (p. 663).

Feedback statement roots:

- Exploring my surroundings
- Looking for opportunities to grow as a person
- Investigating options before making a choice
- Observing different ways of doing things
- Probing deeply into questions I have
- Becoming curious about new opportunities

4. “... exploration experiences and information-seeking activities produce aspirations and build **confidence** that the person can actualize choices to implement their life design” (p. 663)

Feedback statement roots:

- Performing tasks efficiently
- Taking care to do things well
- Learning new skills
- Working up to my ability
- Overcoming obstacles
- Solving problems

3b. Feedback extending a participant response to a challenge, via a “call to action”

There are 3 options for inviting students to complete an extension challenge. All feedback provided on participants’ completed challenges ends with a “call to action” that, at least, invites the participant to continue the conversation and respond to the feedback.

Respond to Feedback HERE challenge. This is a challenge always available for participants, and is designed to be generic in the sense that it can be used to complete responses to questions asked or invitations offered of various kinds.

The second two extension challenges are identity related, and start as possibilities after the March monthly meetings. In most cases, these are appropriate when participants’ responses indicate at least a “1” rating on the identity connection and meaning making quality scale.

“I Am...” challenge. This option, based on the [“I Am Poem”](#) concept, may be used to encourage introspection based on youths’ initial challenge response. Users interact with “I Am...” challenges by selecting from a list of verbs and using them to describe their ideas, feelings, aspirations, etc. about themselves or another person. I Am... challenges also should elicit brief explanations as to why youth composed the poem the way they did. *Why do you think or feel this way? Why do you think the person you wrote about feels or thinks that way?*

“I Am...” challenges can also facilitate imaginative perspective-taking with another person (see below).

Story challenge. Incorporate your ideas about STEM, outdoor recreation, or the connection between them into a [true/plausible/possible] story about yourself, your family, your community, or your state/region. How is what you’re learning changing your perspective on these ideas or activities and how they fit into your life or the history or future of your community? As with the I Am Challenge, encourage youth to record explanations of the story and/or take a picture that represents the story.

Feedback logging / preliminary coding

Project leads providing feedback on student responses to ORfolio challenges should log the type of feedback in the shared Google Sheet linked below, at the moment the feedback is given, as well as other details.

Link to Google Sheet: [ORfolio Feedback Tracking and Coding Sheet](#)

Monthly check-ins and “I Am” challenges

Monthly check-ins. Monthly check-ins follow the same format as the response feedback in the challenges, except they are conducted over zoom or in person: (1) Welcome & roll call with encouragement and rapport building; (2) Mastery-oriented feedback to check on and emphasize relevant and thorough responses; (3) Questions or discussion about how learning is getting them to think about things in new ways (their future, connections between STEM and OR, where their interests might take them). Check-ins can also include (4) Logistical or technical troubleshooting. For example:

Pre-start to the meeting: While students are arriving, remind them that if they haven't done a challenge for that month then they can open the app and take/complete a "I am challenge..." if they have not already done so.

1) Welcome & roll call with encouragement and rapport building

- You are co-researchers
- We are excited to be collaborating with you
- We couldn't do this without you
- Share the payment schedule and reminder about paying 1-challenge per month
- Share payment visual
- Feedback reminder

2) Mastery-oriented feedback to check on and emphasize relevant and thorough responses;

- Compare and contrast challenges
- Remind them about payment schedule
- Look at feedback samples
 - Analyze tips
 - How would you rewrite this?

3) Questions or discussion about how learning is getting them to think about things in new ways (their future, connections between STEM and OR, where their interests might take them)

- [Student Graphic Organizer](#)
- How has doing this changed the way you think about science (Pick a letter per meeting)
- How do you tell people about this project?
- What have you done in science classes that connects with what you have seen in the outdoor recreation activities you've been doing?
- Technical Assistance
- Share a picture
 - Caption this

4) Nuts and Bolts

- Technical issues? (call on 3 kids but then have them to write these down and give them to the adult in the room - so you don't waste time hearing from everyone)
- Familiarize learners with the payment calendar below

Season and Payment Schedule	# of Group Meetings	# of paid challenges possible
Kick-off Meeting	1	2
Winter: Feb	2	2
Winter: March - Payment		
Spring: April	3	3
Spring: May		

Spring: June - Payment		
Summer: July	2	2
Summer: Aug - Payment		
Fall: Sept.	2	2
Fall: Oct. Payment		
Final in-person Meeting	1	2 all challenges (\$50)
		14 challenges

- Identity reflection
 - Build off “I Am…” challenges

Training youth on the I Am challenges. At the first monthly check-ins starting 2/13/23, youth participants are introduced to the “I Am” challenge in two steps. First, youth do an I Am Poem based on themselves. Second, all youth at the check-in watch a 1- to 2-minute video of a well-known person – ideally related to STEM or OR – and each write an I Am Poem based on their own reactions and observations. Students share both I Am Poems during the monthly check-in, and complete both using a recurring challenge in the app for the purpose of developing I Am Poems.

After the check-ins, and to further support the I Am Poem process but with a greater connection to the project, project leads will ask two adult participants to record a 1- to 2-minute autobiographical blurb about themselves and their work.

These two videos will be embedded into the next I Am Poem challenge, which youth participants are asked to complete prior to the second monthly check-in. To complete the challenge, youth submit an I Am Poem based on one of these videos, and also record a 1-2 minute audio or video explaining why they included what they did in the poem. This format – submitted poem and recording explanation – becomes the response format for future I Am Poem challenges.

I Am Poems are also, after the second monthly challenge, an option for chronotopic feedback, for example: “Hey, it looks like you were really interested in all of the things that Fish & Game Warden knew how to do. I’d encourage you to imagine you had that job and complete an I Am Poem like you think they might be thinking about themselves and their work.”

Protocol for Observation Note Taking

- Take notes on key communication if sound might be an issue

Background

Students will receive Mastery Oriented ([resource on mastery oriented feedback language](#)) - “**Wise Feedback**” - along with a question (from the list below) and a recommendation to share the answer to the question by completing a challenge currently available in the app.

Feedback will be no more than 5 sentences long. And, should include all the components “wise feedback” listed above, plus a recommendation to reply to a question (from the list below) using one of the challenges already in the app.

Components of Wise Feedback are:

- **Feedback description.** The teacher describes the nature of the feedback being offered.
- **High standards.** The teacher emphasizes and explains the high standards used to evaluate the student work and generate the instructional feedback.
- **Assurance of student ability.** The teacher states explicitly that the student has the skills necessary to successfully meet those standards.

Example:

- "I'm giving you these comments because I have very high expectations for you in science, and I know that you can reach them."
- "These comments are meant to help you focus your work and reach high standards, and I am confident that you can reach them."
- "Look through my comments. I know that you are able to meet the high standards that I've set for this science class."

Background/Research:

- The wise-feedback strategy appears deceptively simple but is powerful in application. Wise feedback prevents the student from misconstruing teacher comments as negatively biased by proactively offering an alternative, positive explanation: the teacher is giving detailed, ambitious feedback because the standards of the course are high and the teacher is confident that the student has the skills and motivation to meet them.
https://www.interventioncentral.org/student_motivation_wise_feedback
- How can one offer criticism without undermining the motivation and self-confidence needed to improve? (Yeager et al., 2013, Jnl Exp Psych; Cohen, Steele, & Ross, 1999)
- Connects to UDL Engagement Principle.
- "Students must not only internalize the core of their discipline to a sufficient degree, but also must be comfortable acquiring new knowledge and solving problems that they may not have encountered earlier." (Kulasegaram and Rangachari, 2018)

More about Wise Interventions: <https://www.wiseinterventions.org/what-are-wise-interventions>

Questions: (Can links be included in the feedback - could we directly link to the challenge)

