Informal Resource REVIEW TOOL

INSTITUTE *for* GLOBAL ENVIRONMENTAL STRATEGIES

A Tool for Determining Product Linkages to Next Generation Science Standards (NGSS)

Introduction and Purpose

The Informal Resource Review Tool (IRRT) is designed to identify linkages of informal science education resources to support the Next Generation Science Standards (NGSS). This product was developed by the Institute for Global Environmental Strategies (IGES) as part of the NASA Science Mission Directorate Independent Product Review (IPR) under *NASA Grant NNX16AB39G*.

The IRRT was developed in response to the observation that many informal education activities or resources used in informal education settings (museums, parks, nature centers, libraries, out-of-school or afterschool activities, science clubs, or scouting groups) do not meet robust NGSS design and evaluation standards. This is understandable given that these activities or resources are not designed for that purpose. However, a recognition exists that curriculum and instruction need to shift to meet NGSS alignment. Informal education products can play an important role in providing key elements essential to NGSS. For example, informal education products can link and deliver one or more aspects critical to three-dimensional learning, whether it be Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and/or Crosscutting Concepts (CCCs). Informal education efforts can also provide formal classroom educators with unique opportunities to introduce scientific ideas and skills, highlighting and leveraging the benefits from formal and informal venues.

As educators are being challenged to present experiences that informal education can deliver, connections to those opportunities, and elements of three-dimensional learning, enable educators to link, integrate, and expand their curricula, providing a richer learning environment for all learners. The IRRT is intended to identify and strengthen those valuable connections.

IRRT Design

The IRRT was adapted from the NGSS Lesson Screener. The NGSS Lesson Screener has similar criteria to the EQuIP Rubric and is used to assess formal classroom materials. The IRRT does not address requirements for cohesive storylines, the monitoring of learner performance tasks, or in-depth assessment strategies, which are more appropriate to the formal education setting. Although informal activities are usually limited in the time available with audiences, suggestions can be identified for making an experience part of a larger unit of study or for extensions to increase the scope of the informal education activity or resource. The IRRT identifies ways that products respond to the vision of NGSS in formal or informal settings.

Five criteria comprise the IRRT, integrating elements of the NGSS Lesson Screener with the Six Strands of Informal Learning from **Learning Science in Informal Environments: People, Places, and Pursuits** (2009). The resulting rubric presented on the following pages provides guidance for infusing NGSS into unique informal environments and programs. The rubric can be applied by an individual, but a higher quality review will be accomplished with a team of reviewers as a collaborative process. Working as a group will not only result in a better informal education activity or resource but can also bring the group to a common and deeper understanding of designing informal education activities or resources for the NGSS.

Instructions

Using the form provided on the following pages reviewers should:

1. **Individually record criterion-based evidence;**
2. **Individually make suggestions for improvement; and then:**
3. **Collaboratively discuss findings with team members before checking one of the boxes under the "Evidence of Quality?" column.**

A table presenting the 5 criteria and evidence of linkages follows on pg. 3.

There could be several results of this review, depending on a product's strengths or weaknesses in each criterion. For example, an NGSS linkage strength rating of "Potential" might be given to an informal education activity or resource for criterion **1, Phenomena and Designing Solutions,** meaning learners have a limited role in the activity with at least one opportunity to explain/justify their thinking incorporating prior understanding. But the informal education activity or resource might be given an NGSS linkage strength rating of "None" for criterion **4, Cultural Relevance,** which means no linkage exists to cultural knowledge, experiences, or ways of knowing for learners and their communities.

Informal Resource REVIEW TOOL

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THE 5 CRITERIA	Strong Linkage	Potential Linkage	Weak Linkage	No Linkage
1. Phenomena and Designing Solutions Learners are engaged in authentic and meaningful scenarios that reflect the practices of science and engineering as experienced in the real world.	Learner thinking has a central role in the activity. Facilitation includes asking about prior knowledge to better meet the needs of the audience.	Learners have a limited role in the activity, with at least one opportunity to explain/justify their thinking, incorporating prior understanding.	Learners have a passive role in the activity. Materials are very educator-centric.	The informal education activity or resource does not link to an opportunity for learners to explain/justify their thinking, or reflect on prior knowledge.
2. Three Dimensions The informal education activity or resource helps learners develop and use grade-appropriate elements, or the informal education activity or resource makes connections to standards/ dimensions that are above or below grade level for building background, or for providing extensions for learners working with the three dimensions of NGSS.	Two or more dimensions are identified and work together to provide a grade-appropriate informal education activity or resource for learners. The product strongly connects to standards/ dimensions that are above or below grade level for building background or for providing extensions for learners. Sense-making, designing solutions, and building skills are highlighted.	The dimensions that are selected are grade-appropriate. They may also connect to standards/ dimensions that are above or below grade level for building background, or for use as extensions that help develop learner concepts and skills.	The dimensions that are identified are not covered in the informal education activity or resource, or performance expectations are identified but not the three dimensions.	SEPs, DCIs, and CCCs are missing, are not grade-appropriate, or do not connect well to standards/ dimensions that are above or below grade level for building background or for providing extensions for learners. Two or more dimensions are not identified to work together to provide a grade-appropriate informal education activity or resource for learners that can assist an instructor for use with an NGSS unit.
3. Three Dimensions Integrated into Instruction The informal education activity or resource integrates elements of the SEPs, CCCs, and DCIs to build learner proficiency, make sense of phenomena, or design solutions to problems.	Learners are provided with opportunities to reflect on their subject or skill. Identified dimensions are well integrated with scientific activities or engineering design.	The dimensions are integrated in a limited fashion. Learners have opportunities to reflect on the subject or skill, but these do not adequately address the identified dimensions.	There is little evidence that the dimensions are integrated. Learners do not have opportunities to reflect on the subject or skill.	No linkage exists to the three dimensions or instruction.
4. Cultural Relevance The informal education activity or resource motivates learner sense-making or problem-solving by taking advantage of learner questions and prior experiences in the context of the learner's home, neighborhood, and community, as appropriate.	The informal education activity or resource makes meaningful connections to cultural knowledge, experiences, and ways of knowing for learners. Motivates sense-making and/or problem solving in this context.	Limited discussion of cultural relevance exists and/ or materials include opportunities for learners to represent their ideas.	Learner sense-making strategies are not emphasized or there are few connections to the individual's cultural experiences.	No linkage exists to cultural knowledge, experiences, or ways of knowing for learners and their communities.
5. Educator Connections The informal education activity or resource background should include enough information so that the facilitator feels comfortable using the informal education activity or resource. Facilitation includes asking about prior knowledge to better meet the needs of the audience.	Prior learning is discussed fully with how that knowledge will be built upon. Opportunities for the informal education activity or resource and formal lessons to be brought together in a learning sequence that extends and deepens the knowledge or skills of the learner and opportunities to link to formal NGSS curriculum.	Prior learning is discussed and explained how it will be built upon. Links to other lessons or resources are not present or minimally referenced.	Prior learning is discussed but there is little discussion about how it will be built upon, and/or there are no links to other lessons or curriculum resources.	No linkage exists to other resources making connections to content and practices. Prior learning is not discussed; and there is little discussion about how prior learning will be built upon, and/or there are no links to other lessons or curriculum resources.

1 Phenomena and Designing Solutions

Record Criterion-based Evidence

Informal education activity or resource(s) include clear and compelling evidence of the following:

The informal education activity or resource focuses on supporting learners to make sense of a phenomenon or design solutions to a problem. Clear discussion about facilitator actions to assist learner approach based on prior knowledge is present.

Learners are engaged in authentic and meaningful scenarios that reflect the practices of science and engineering as experienced in the real world.

The informal education activity or resource provides opportunities for learners to generate excitement, interest, and motivation to learn about phenomena in the natural and physical world.

Learners have opportunities to design investigations and build evidence for scientific models that explain phenomena. Learners have opportunities to initiate explorations linked to what they think is important, what they wonder about, and what is happening in their local educational context.

Reviewer

What evidence was in the materials to show learner involvement in explaining phenomena or designing solutions?

Record Criterion-based Evidence

Evidence of quality? *(Check only one)*

- ☐ **Strong linkage** exists to phenomena or solution design — Learner thinking has a central role in the activity. Facilitation includes asking about prior knowledge to better meet the needs of the audience.
- ☐ **Potential linkage** exists to phenomena or solution design — Learners have a limited role in the activity, with at least one opportunity to explain/justify their thinking, incorporating prior understanding.
- ☐ **Weak linkage** exists to phenomena or solution design — Learners have a passive role in the activity. Materials are very educator-centric.
- ☐ **No linkage** — The informal education activity or resource does not link to an opportunity for learners to explain/justify their thinking or reflect on prior knowledge.

Reviewer

Suggestions for improvement?

2 Three Dimensions

Record Criterion-based Evidence

Informal education activity or resource(s) include clear and compelling evidence of the following:

The informal education activity or resource helps learners develop and use ***grade-appropriate elements, or the informal education activity or resource makes connections to standards/dimensions that are above or below grade level for building background, or for providing extensions for learners*** working with the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs).

These three-dimensional elements are selected to aid learner sense-making of phenomena or designing of solutions. If performance expectations are identified, underlying SEPs, DCIs and CCCs are also identified.

Learners engage in scientific and/or engineering practices (no longer the "scientific method") to gain knowledge about the world around them and solve problems. They manipulate, test, explore, predict, question, observe, and make sense of the natural and physical world.

Reviewer

Component identified with evidence that it is incorporated into the informal education activity or resource?

Component Identified	SEP	DCI	CCC
Evidence in the informal education activity or resource?	☐ **Strong linkage** — SEPs listed and incorporated so that learners have a full experience in using one or more SEPs. ☐ **Potential linkage** — SEPs listed and incorporated but incompletely. ☐ **Weak linkage** — SEPs listed but not incorporated. ☐ **No linkage** — No SEPs are identified.	☐ **Strong linkage** — DCIs listed and incorporated so that learners have a full experience to understand a DCI. ☐ **Potential linkage** — DCIs listed and incorporated but incompletely. ☐ **Weak linkage** — DCIs listed but not incorporated correctly. ☐ **No linkage** — No DCIs are identified.	☐ **Strong linkage** — CCCs listed and incorporated so that learners have an experience that demonstrates a CCC. ☐ **Potential linkage** — CCCs listed and incorporated but incompletely. ☐ **Weak linkage** —CCCs listed but not incorporated correctly. ☐ **No linkage** — No CCCs are identified.

2 Three Dimensions (cont.)

Record Criterion-based Evidence

Evidence of quality? *(Check only one)*

☐ **Strong linkage** to three-dimensional learning — Two or more dimensions are identified and work together to provide a grade-appropriate informal education activity or resource for learners. The product strongly connects to standards/dimensions that are above or below grade level for building background or for providing extensions for learners. Sense-making, designing solutions, and building skills are highlighted.

☐ **Potential linkage** to three-dimensional learning — The dimensions that are selected are grade-appropriate. They may also connect to standards/dimensions that are above or below grade level for building background, or for use as extensions that help develop learner concepts and skills.

☐ **Weak linkage** to three-dimensional learning — The dimensions that are identified are not covered in the informal education activity or resource, or performance expectations are identified but not the three dimensions.

☐ **No linkage** — SEPs, DCIs, and CCCs are missing, are not grade-appropriate, or do not connect well to standards/dimensions that are above or below grade level for building background or for providing extensions for learners. Two or more dimensions are not identified to work together to provide a grade-appropriate informal education activity or resource for learners that can assist an instructor for use with an NGSS unit.

Reviewer

Suggestions for improvement?

3 Three Dimensions Integrated into Instruction

Record Criterion-based Evidence

Informal education activity or resource(s) include clear and compelling evidence of the following:

The informal education activity or resource integrates elements of the SEPs, CCCs, and DCIs to build learner proficiency, make sense of phenomena, or design solutions to problems. The activity may focus on a limited number of dimensions.

Learners have opportunities to reflect on science as a way of knowing; on processes, concepts, and institutions of science; and on their own process of learning about phenomena.

Learners have opportunities to use scientific language and tools to investigate phenomena or use engineering design principles to solve a problem. They have opportunities to engage in reasoning from evidence.

The informal education activity or resource provides opportunities for learners to express, clarify, justify, interpret, and represent their ideas.

Reviewer

Evidence that the informal education activity or resource includes elements of the SEPs, CCCs, and DCIs working together.

Record Criterion-based Evidence

Evidence of quality? *(Check only one)*

- ☐ **Strong linkage** to three-dimensional integration — Learners are provided with opportunities to reflect on their learning. Identified dimensions are well integrated with scientific activities or engineering design.
- ☐ **Potential linkage** to three-dimensional integration — The dimensions are integrated in a limited fashion. Learners have opportunities to reflect on their learning, but these do not adequately address the identified dimensions.
- ☐ **Weak linkage** to three-dimensional integration — There is little evidence that the dimensions are integrated. Learners do not have opportunities to reflect on their learning.
- ☐ **No linkage** exists to the three dimensions or instruction.

Reviewer

Suggestions for improvement?

4 Cultural Relevance

Record Criterion-based Evidence

Informal education activity or resource(s) include clear and compelling evidence of the following:

All science is a cultural process. Place-based education in an urban or rural context can give youth the power and knowledge to author their own stories about their community that focus on community resilience, strengths, and wisdom. Additional items to consider include:

- The informal education activity or resource motivates learner sense-making or problem-solving by taking advantage of learner questions and prior experiences in the context of the learner's home, neighborhood, and community, as appropriate.
- The informal education activity or resource makes meaningful connections to the cultural knowledge, experiences, and ways of knowing for learners and their communities.
- The informal education activity or resource provides opportunities for community members and/or parents to be part of the learning experience.
- Learner are encouraged to think about themselves as science participants and develop an identity as someone who knows about, uses, and can contribute to science (citizen science).

Reviewer

How does the informal education activity or resource connect to the learner's local, cultural or community experience?

How does it motivate the participant to be part of the learning?

Record Criterion-based Evidence

Evidence of quality? ***(Check only one)***

☐ **Strong linkage** to cultural relevance/sense-making — The informal education activity or resource makes meaningful connections to cultural knowledge, experiences, and ways of knowing for learners. Motivates sense-making and/or problem solving in this context.

☐ **Potential linkage** to cultural relevance/sense-making — Limited discussion of cultural relevance exists and/or materials include opportunities for learners to represent their ideas.

☐ **Weak linkage** to cultural relevance/sense-making — Learner sense-making strategies are not emphasized or there are few connections to their cultural experiences.

☐ **No linkage** exists to cultural knowledge, experiences, or ways of knowing for learners and their communities.

Reviewer

Suggestions for improvement?

5 Educator Connections

Record Criterion-based Evidence

Informal education activity or resource(s) include clear and compelling evidence of the following:

The informal education activity or resource background should include enough information so that the facilitator feels comfortable using the informal education activity or resource. Facilitation includes asking about prior knowledge to better meet the needs of the audience.

The product identifies what prior learning is expected for the identified dimensions and explains how the prior learning will be built upon. Common misconceptions are identified.

The product provides strategies for linking learner engagement to formal curriculum, helping educators connect related content and practices. Where possible, links to other resources that may form part of a longer learning sequence is suggested.

There may be opportunities for informal education activity or resources to be brought together in a learning sequence that extends and deepens the knowledge or skills of the learner.

Reviewer

What prior knowledge was identified; how was it built upon?

Does the informal education activity or resource include strategies to link to a formal curriculum?

Record Criterion-based Evidence

Evidence of quality? *(Check only one)*

- ☐ **Strong linkage** between prior learning, learning sequences, and existing NGSS learning — Prior learning is discussed fully with how that knowledge will be built upon. Opportunities exist for the informal education activity or resource, and formal lessons, to be brought together in a learning sequence that extends and deepens the knowledge or skills of the learner — and offers opportunities to link to formal NGSS curriculum.
- ☐ **Potential linkage** between prior learning, learning sequences, and existing NGSS learning — Prior learning is discussed and explained how it will be built upon. Links to other lessons or resources are not present or minimally referenced.
- ☐ **Weak linkage** between prior learning, learning sequences, and existing NGSS learning — Prior learning is discussed but there is little discussion about how it will be built upon, and/or there are no links to other lessons or curriculum resources.
- ☐ **No linkage** exists to other resources making connections to content and practices. Prior learning is not discussed; and there is little discussion about how prior learning will be built upon, and/or there are no links to other lessons or curriculum resources.

Reviewer

Suggestions for improvement?

IRRT Summary Table

THE 5 CRITERIA		Linkage				Evidence	Suggestions for Improvement
		Strong	Potential	Weak	None		
1. Phenomena and Designing Solutions		☐	☐	☐	☐		
2. Three Dimensions	SEP	☐	☐	☐	☐		
	DCI	☐	☐	☐	☐		
	CCC	☐	☐	☐	☐		
	Overall Linkage	☐	☐	☐	☐		
3. Three Dimensions Integrated into Instruction		☐	☐	☐	☐		
4. Cultural Relevance		☐	☐	☐	☐		
5. Educator Connections		☐	☐	☐	☐		

Additional comments not captured by the above 5 criteria: