Outdoor Educator Resources to Support Phenomena-Based Education

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Iowa Science Phenomena Guide for Outdoor Educators

The Iowa Science Phenomena project is a collaboration between Iowa PBS, Iowa organizations, and Iowa educators to curate and share a growing collection of Iowa-specific phenomena, particularly those that represent locally relevant or unique concepts.

- Make science personal for students by connecting it to their own environments.
- Use the provided related resources to promote student inquiry.
- Capture and share your own local science phenomena!

How Can Outdoor Educators Contribute?

Iowa's outdoors educators are experts in the natural phenomena that can be experienced throughout Iowa! Share that wonder with educators and students by capturing and submitting those phenomena to the Iowa Science Phenomena project. Here's how you can get started:

- Wondering what "phenomena" is? Learn more about it!
- Have a phenomena in mind, but not sure if it is a good fit for submission? Use the resources to help evaluate your phenomena.

How to Capture Phenomena

When you are ready, capture or gather your phenomena. Explore the Science Phenomena Project: Identifying and Capturing Your Phenomena document for tips and support for how best to capture and edit your phenomena via photo, video, or publicly available news articles.

How to Submit Phenomena

To submit your phenomena you will need to complete the Iowa Science Phenomena template. This template provides fields to identify all necessary information regarding your phenomena. Submit this information by emailing your completed Google Doc template to phenomena@iowapbs.org.

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More Ideas for Getting Started

Not sure how you will find the time to capture and submit your phenomena? Does aligning your phenomena seem confusing or overwhelming? We have you covered! Below are a few ideas to help you as you identify, capture, align, and submit your phenomena:

- **Contact Iowa PBS**: We offer scheduled professional development sessions to help introduce the project and help walk you through the process for identifying, capturing, aligning, and submitting your phenomena. All sessions are FREE and based on your schedule. Contact us at phenomena@iowapbs.org.
- **Form a Team**: Form teams to create and submit phenomena. Pairing with someone more comfortable with standards alignment is a great way to learn from each other!
- **Who has Time?** Now more than ever, schedules are at capacity. Participating in the Iowa Science Phenomena project doesn't have to be time-intensive. Keep your eyes open to opportunities. Phenomena are all around you! Keep your camera - or your mobile device - handy to take advantage of serendipitous moments. When it comes to editing, less is more! Fancy on-screen text, narration, or editing are not required. We want to see your great phenomena occurring in the natural world!

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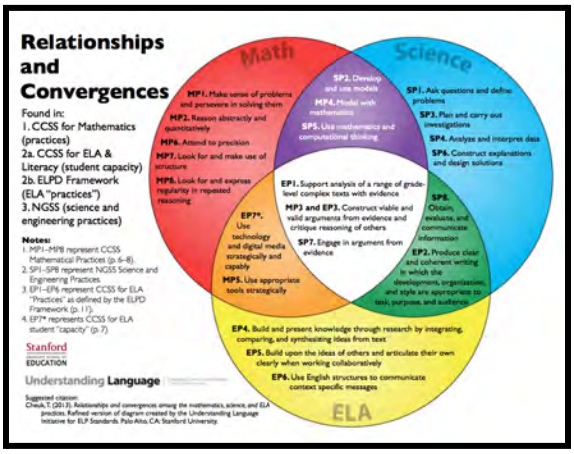
Iowa Science Standards and Interdisciplinary Connections for Outdoor Education

Designing and offering programming that connects to Iowa Science Standards across multiple disciplines can be a critical strategy for ensuring teachers and administrators understand the importance of outdoor education. Below are a few ideas and strategies for identifying and strengthening the Iowa Science Standards and interdisciplinary connections in your programming.

Relationships and Convergences Among the Mathematics, Science, and ELA Practices (2013)

This venn diagram visualizes the intersections between math, science, and english language arts (ELA) practices. Identify ways in which your existing programming connects with intersecting practices. Identify intersections where your programming does not connect to determine opportunities for growth when developing new programming.



Implementation Map for Administrators, Coaches, and Teachers (IMpACT) for Science (2020)

Created by the Iowa Department of Education, the Implementation Map for Administrators, Coaches, and Teachers (IMpACT) is a tool designed for self-reflection to assist in determining the level of Implementation of the Iowa Science Standards and the five innovations of the Next Generation Science Standards (NGSS). These innovations include: the use of relevant phenomena, three-dimensional learning, coherence of instruction, integration of math and ELA, and a focus on addressing inequalities. The IMpACT can also serve as a guide for those entities that support teachers and science education in informal environments. The criteria presented are good reminders of the expectation of the Iowa Science Standards with regard to how science instruction and learning should look. Informal educators and professional development providers are encouraged to weave the IMpACT into their work, making both implied and explicit connections when able.

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Iowa Core Aligned Programs for Naturalists (2016-2017)

The Iowa Conservation Education Coalition (ICEC) is supporting an effort to align and enhance programs of naturalists and other non-formal educators so they will directly support the new grade-specific standards. During the summer of 2016, groups of naturalists, teachers, and Area Education Agency (AEA) science consultants collaborated to develop examples of this work and it is shared in the Iowa Core Aligned Programs for Naturalists.

NGSS Resources

How to Read the Next Generation Science Standards (NGSS) (2013)

The Next Generation Science Standards (NGSS) are distinct from prior science standards in three essential ways: performance, foundations, and coherence. Created by NGSS, this resource describes how these three unique characteristics are embodied in the format of the standards.

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Strategies for Formative Evaluation

Formative or "in the moment" evaluation can be a powerful tool for determining if your programming is meeting your objectives. Below are a few strategies[1] that are easy to implement into your instruction to help determine how students are progressing towards meeting the goals you have identified.

Strategy	Overview	Examples
Exit Ticket	Exit tickets: • Can pose 1-5 questions that are multiple choice, short answer, or a couple of sentences in response to a question. • Are not a test, but a way to understand students' comprehension of a particular topic. • Collect feedback on students' understanding at the end of a class and provide the students with an opportunity to reflect on what they have learned. • Allow you to quickly see where the gaps in knowledge are, what misunderstandings need to be corrected, what students have mastered, and what can be enriched. • Can be answered on a piece of scratch paper, a digital device, or a prepared hand out. • Are most effective when linked to the objective of the lesson and focused on one particular skill or concept that students should have understood that day. • Should be able to be completed in just a few minutes at the end of a class period or program.	• Name one important thing you learned in class today. • Write/ask one question about today's content - something that has left you puzzled. • The three objectives for today were A, B, and C. Which of these three do you think you were most successful at achieving? • Draw a picture of one thing you learned today. • In 60 seconds, write as many new words you learned today as you can.
Quick Write/"One Minute Paper"	A quick write or "one-minute paper": • Is a very short writing activity (taking one minute or less to complete) in response to an instructor-posed question. • Prompts students to reflect, summarize, and synthesize the day's lesson and provides the instructor with useful feedback.	• Ask students to write for one minute on the most meaningful thing they learned. • What are three things you learned, two things you're still curious about, and one thing you don't understand?

[1] Adapted from Edutopia. Gaining Understanding on What Your Students Know. June 23, 2015. edutopia.org/practice/exit-tickets-checking-understanding; The Harriet W. Sheridan Center for Teaching and Learning brown.edu/sheridan/teaching-learning-resources/teaching-resources/course-design/classroom-assessment/entrance-and-exit/sample

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		• What I found interesting about this work was... • Right now I'm feeling... • Today was hard/fun because...
Strategy	**Overview**	**Examples**
Drawing/Art Creation	• Ask students to draw a sketch to visually represent new knowledge. • Can be used at any grade level, but may be particularly suited for younger grades.	• Ask students to draw one thing they learned. • Create a model of the new concepts they learned.
Red Card/Green Card	• Using red, yellow, and green cards, students can indicate their understanding of the presented material as it happens. • Can distribute cards by student or by groups of students. • Can substitute colored craft sticks or other objects for cards.	• Ask students to hold up a red card when they need assistance or have questions. • Pause after a key point and ask students to hold up a card to represent their learning. • Have students create a diagram of processes they learned.

Additional Resources:

- **Reading Rockets: Exit Slips**: https://www.readingrockets.org/classroom/classroom-strategies/exit-slips
- **Edutopia. 7 Smart, Fast Ways to Do Formative Assessment:** edutopia.org/article/7-smart-fast-ways-do-formative-assessment
- **William and Mary School University Research Network: Designing Formative Assessment - A Workshop for K-12 Teachers:** education.wm.edu/centers/sli/events/designing-formative-assessment/handout.pdf
- **The Art of Education: 20 Quick Formative Assessments You Can Use Today:** theartofeducation.edu/2013/10/18/20-quick-formative-assessments-you-can-use-today
- **Iowa Association of Naturalists (IAN):** For additional information or ideas about your programming, IAN is happy to offer assistance to local naturalists. iowanaturalists.org

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Outdoor Education Survey Ideas

Evaluation is an important part of strengthening your program's connections with classroom educators. Use the following survey questions as is or customize to evaluate how well you are reaching your programming goals. These questions can be used across any survey tool (i.e. Google Forms, Survey Monkey, etc.) and shared with classroom teachers after they have completed an event with you.

1. This naturalist programming is directly connected with the curriculum I'm teaching in my classroom. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

2. The program provided opportunities to explore local natural phenomena. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

3. My students have a more positive attitude towards the concepts the naturalist taught. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

4. My students have more interest and/or concern in issues related to the natural environment as a result of the program. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

5. The program was relevant to my students' interests. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

6. The program provided opportunities for meaningful, authentic learning. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

7. The activities provided opportunities for students to engage in critical thinking. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

8. The activities provided opportunities for students to ask content-related questions. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

9. I am building on and applying the instruction from the program in my own classroom. (Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

10. What do you think students gained from participating in the program? (Open-ended)

11. Would you recommend the program to another teacher? (Yes, No)

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Additional resources:

- Measuring the Success of Environmental Education Programs
  macaw.pbworks.com/f/measuring_ee_outcomes.pdf
- Environmental / Conservation Education Survey – Iowa Conservation Education Coalition (ICEC)
  iowaee.org/wp-content/uploads/2020/01/CESurveyReport_Final_7February2020.pdf

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Glossary of Terms for Outdoor Educators

A shared vocabulary is critical for collaboration between outdoor educators and classroom teachers. The transition to new Iowa Science Standards includes a variety of new terminology for all educators. This resource contains many of those new terms, relationships to related terms that may have been used for previous educational initiatives, as well other education-related terms and concepts.

- **Asynchronous Learning/Teaching:** education, instruction, and learning that do not occur in the same place or at the same time.

- **Cross-Cutting Concepts (CCC):** One of the three dimensions of the NGSS. These are concepts that hold true across the natural and engineered world. Students can use them to make connections across seemingly disparate disciplines or situations, connect new learning to prior experiences, and more deeply engage with material across the other dimensions. The NGSS requires that students explicitly use their understanding of CCCs to make sense of phenomena or solve problems.

- **Disciplinary Core Idea (DCI):** One of the three dimensions of the NGSS. The fundamental ideas that are necessary for understanding a given science discipline. The core ideas all have broad importance within or across science or engineering disciplines, provide a key tool for understanding or investigating complex ideas and solving problems, relate to societal or personal concerns, and can be taught over multiple grade levels at progressive levels of depth and complexity.

- **Formative Assessment:** Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes.

- **Inquiry-Based Learning:** Instead of only presenting the facts, use questions, problems, and scenarios to help students learn through their own agency and investigation.

- **Iowa Core:** The Iowa Core Standards describe what students should know and be able to do from kindergarten through 12th grade in math, science, English language arts and social studies. The Iowa Core also sets learning goals for 21st century skills in areas such as financial and technological literacy. The Iowa Core is a set of common expectations for school districts across

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the state. It is not a curriculum, so decisions about how to help students meet learning goals remain in the hands of local schools and teachers.

- **Learning Management System (LMS):** Any type of online software platform where students and teachers can share lesson materials, assessments, or collaboration. Examples include Canvas, Moodle, Google Classroom, Schoology.

- **Learning Objective:** Also called "learning outcome" or "objective." This is the primary content, concept, and/or skill that students are expected to learn and/or demonstrate as a result of a lesson.

- **Phenomena:** Observable events that students can use the three dimensions to explain or make sense of.

- **Project-Based Learning (PBL):** A teaching method in which students learn by actively engaging in real-world and personally meaningful projects.

- **Rigor:** Instruction, schoolwork, learning experiences, and educational expectations that are academically, intellectually, and personally challenging.

- **STEM/STEAM:** Acronym for Science, Technology, Engineering, Art, Mathematics.

- **Science and Engineering Practices (SEP):** One of the three dimensions of the NGSS. The practices are what students DO to make sense of phenomena. They are both a set of skills and a set of knowledge to be internalized. The SEPs reflect the major practices that scientists and engineers use to investigate the world and design and build systems.

- **Summative Assessment:** The goal of summative assessment is to evaluate student learning at the end of an instructional unit by comparing it against some standard or benchmark.

- **Synchronous Learning/Teaching:** education, instruction, and learning that occur at the same time, but not in the same place.

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- **Three Dimensions:** These are the three strands of knowledge and skills that students should explicitly be able to use to explain phenomena and design solutions to problems. The three dimensions are the Disciplinary Core Ideas (DCIs), Cross-Cutting Concepts (CCCs), and Science and Engineering Practices ("the Practices" or SEPs).

Sources:

- **NGSS Glossary**: nextgenscience.org/glossary
- **Education Glossary**: edglossary.org
- **Edutopia:** edutopia.org/topic/inquiry-based-learning
- **PBLWorks:** pblworks.org

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