

STEM Council Sub-committee on Informal STEM Learning Environments

Aaron Leifheit - Outside Las Vegas Foundation – Co-chair

Amy Page – Las Vegas Natural History Museum – Co-chair

Andy Hart – Southern Nevada Conservancy

Craig Rosen – Desert Research Institute

Jessica Snaman- Nevada Outdoor School

Judy Kraus – Clark County School District

Kris Carroll – Regional Professional Development Program – Southern Nevada

Sean Hill - Sierra Nevada Journeys

Brian Mitchell
Director, Governor's Office of Science, Innovation and Technology

Debra Jean Petrelli
Executive Assistant

Informal STEM Learning in Nevada

As Nevada diversifies its economy and improves its education system, there is an urgency to understand practices that promote STEM literacy. This document focuses on the intersection between STEM and a major STEM partner, the informal education community. Informal learning environments may include museums, zoos, aquariums, nature centers, science centers, public lands; and youth, community, and out-of-school programs. Many of these Informal learning environments provide opportunities that are designed, developed, and delivered specifically to support STEM disciplines.

An integrated approach to education is critical to growing Nevada's STEM-capable workforce, as well as achieving the broader goal of supporting a STEM-literate citizenry, capable of making informed decisions in the face of increasingly complex societal issues.

This paper presents a vision for informal STEM Education in Nevada. It provides a set of guiding principles and examples of informal STEM learning (ISL) experiences. It also defines informal STEM education by its strengths, especially in relationship to formal education. Intended for STEM providers, new partners and STEM advocates throughout our state, it is the hope that this information will communicate the necessity of coordinated, well-rounded informal STEM opportunities, and support the importance of funding for informal learning experiences which support STEM education in Nevada.

VISION

We envision a state in which informal STEM education is integrated into the system of public education in a thoughtful and systematic way. Whereby, high quality informal STEM experiences are incorporated into every child's education in Nevada.

We envision informal STEM providers who create programs and experiences based on the needs of the community and who pay close attention to underserved populations thirsty for science and STEM enrichment.

We endeavor to hold ourselves, as informal STEM providers in Nevada, to a high standard of excellence that includes high quality experiences created using relevant and expert content, contemporary evaluation strategies and program reflection and collaborative strategies whenever possible.

We know that using the guiding principles of good informal education, the strengths of our profession and the willingness to work in collaboration with formal educators, STEM literacy can be achieved. We believe that these efforts can contribute to an improved educational system with more access to STEM across the socio-economic spectrum leading to a society of informed decision makers who have the capacity to find solutions to the world's most pressing challenges.

ISL Guiding Principles

These guiding principles describe characteristics of informal STEM learning that benefit the learner participating in informal education environments. The guiding principles serve as a blueprint for providers when planning, implementing and evaluating experiences and programs.

- ***Learner-centered teaching practices:*** ISL values active, experiential, inclusive, and participatory pedagogies that incorporate scientific, mathematical and engineering practices while integrating technologies.
 - Example: A nature walk engages participants in a wide variety of ways that lets each learner experience the program according to their own abilities.
 - Example: Students examine school energy bills, perform mini energy audits of their school and analyze the data to create personal energy conservation plans, integrating all four STEM areas.
- ***Real-world application of disciplinary concepts:*** The resources and environments of ISL support student engagement in the context of the real world, which can be leveraged by formal educators tasked with including practice, skill development, dialogue and observation, as part of their classroom curricula.
 - Example: Learners explore ecological relationships by observing and mapping populations of threatened Desert Tortoises or Bighorn Sheep.

- Example: Project based student proposals focused on energy efficiency are presented to district administration and implemented at the schools.
- **Unique and Authentic experiences:** ISL supports learning through experiences contextualized within a resource that learners might not find in a formal or more traditional setting.
 - Example: Students are asked to observe and measure biodiversity within a small outdoor area, the content and diversity of these measurements are unique across time and location, and unique and authentic to that specific location.
 - Example: Students engage with STEM professionals by visiting specific places of business, speaking with them about their specific career paths and observing STEM principles in practice.
- **Rich experiential context:** ISL provides learners with the opportunity to gain information through experience and observation.
 - Example: After reading about water conservation and the Hoover Dam, students experience the true size and impact of Lake Mead by visiting the site, and begin to understand and contribute to regional water use issues, and gain context only available through first person experiences.
 - Example: Students build a school recycling program, and gather information and understanding through first hand experiences with recycling materials.

ISL and Formal Education

A strong ISL community provides rich experiences that strengthen classroom learning. ISL providers have the freedom to engage in different and often more context-rich and authentic learning experiences likely to capture student interest and provoke curiosity. ISL can also include opportunities for multi-generational and life-long learning experiences.

Although ISL is not bound by formal education goals or assessments, ISL providers can measure changes in knowledge, behavior, beliefs, and attitudes. Understanding how all these factors work together to influence student learning is important to both the formal and informal communities. Thus ISL education often results in experiences which are aligned with and responsive to formal education needs.

ISL Strengths

The ISL strengths are characteristics that informal education inherently has because of the nature of the profession. The strengths often set ISL apart from formal learning in the most profound and fundamental ways.

- **Sense of Place** -- ISL ties STEM concepts to specific locations, evoking memories and repeatable connections that strengthen community.
- **Content Specialists** -- Many ISL providers have specialized content experts in a variety of STEM fields. These professionals provide different perspectives and serve as career examples with a level of legitimacy about a place.
- **Inclusive** -- ISL is responsive to diverse interests, needs, populations, and experiences of learners (or students).
- **Flexibility** -- ISL programs are less-encumbered by prescribed and prioritized curriculum; they are nimble and able to take advantage of teachable moments, allowing participants to learn at their own pace and in their own way.
- **Collaborative** -- ISL providers and programs encourage shared learning experiences amongst professionals, classmates, families, friends and communities.
- **Engaging** -- ISL promotes learning through active engagement in authentic and enjoyable experiences that naturally encompass a variety of learning styles.

In conclusion, an integrated approach to education is critical to growing Nevada's STEM-capable workforce, and growing a STEM literate citizenry, capable of making informed decisions in the face of increasingly complex societal issues.

Informal STEM learning in Nevada is instrumental in supporting this vision. By providing a set of guiding principles and examples of informal STEM learning (ISL) experiences, and by defining informal STEM education strengths, this document seeks to communicate the necessity of Informal STEM learning opportunities, and support the importance of funding for informal STEM learning experiences which support STEM education in Nevada.