

SCIENCES—Supporting a Community's Informal Education Needs: Confidence and Empowerment in STEM

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Introduction and Project Goals

SCIENCES—Supporting a Community's Informal Education Needs: Confidence and Empowerment in STEM is a four year *Full-Scale Development Project with Research* funded by the National Science Foundation Advancing Informal STEM Learning (NSF AISL) program.

The overarching project goal is to create a “STEM ecosystem” in a severely under-resourced urban community. The Chicago Zoological Society (CZS), which operates Brookfield Zoo, is expanding a community partnership with Eden Place Nature Center in Chicago's Fuller Park Neighborhood to offer a full suite of environmental science learning opportunities targeted at teachers, youth, families, and adults.

- This project identifies complementary elements in existing Brookfield Zoo and Eden Place program portfolios that can be **strategically aligned to increase the engagement** of this community in environmental science.
- Education programs will be woven into an “**ecosystemic**” learning model, providing large segments of the community with learning resources aligned across targeted sub-audiences (early childhood through adult) and settings (in-school and out-of-school).
- A **research component** led by the University of Illinois at Chicago will expand understandings of how a large informal science learning institution works with a community-based organization to support environmental scientific literacy and agency at all levels of the community.
- Broad dissemination** of lessons learned from this project includes the *SCIENCES National Amplification Network* accessed via the Association of Zoos and Aquariums Diversity Committee and the *Metropolitan Greenspaces Alliance*, which will allow others to adapt and transfer this “ecosystemic” environmental science learning model.

Program Offerings

Programs for *Students* include:

- School group classes – grades pre-K through 12 focusing on environmental conservation topics



Programs for *Professionals* include

- Teacher professional development in inquiry and environmental conservation topics
- Early childhood educator professional development in nature play



Programs for *PreK – Gray Public Audiences* include:

- Early Childhood – developmentally-appropriate, nature play enriched science learning experiences for young children and their families
- K through 12 – environmental conservation and science literacy classes and activities
- Age 13 and up – environment-focused community-based projects for teens and adults, including hands-on field stewardship and/or field trips
- Family programs – after school and on weekends, including nature-oriented field trips



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Theoretical Framework

The project theoretical framework at the intersection of four complementary research fields:

Conservation Psychology

- Relationships between humans and nature, focusing on environmental conservation (e.g., Kals et al., 1999; Saunders, 2003)

Informal Science Learning

- Strands of informal science learning (Banks et al., 2007; NRC, 2009)

Civic Ecology Education

- Scientific literacy as a civic community of practice (e.g., Tidball et al., 2010)

Urban Science Education

- Scholarship on scientific literacy and agency (e.g., Basu et al., 2009; Barton & Yang, 2000; NRC, 2009; NRC, 2011; NRC, 2012; NRC, 2014; Roth & Barton, 2004)

SCIENCES “Ecosystemic” model

Environmental science learning opportunities for school audiences (students and teachers) and public audiences (youth, families, and adults.)

Environmental science learning opportunities for all ages.

Each project year's educational programs are united by a common environmental science theme, such as pollinators and native gardens.

Dissemination and Broader Impacts

Through the development of the **SCIENCES National Amplification Network**, we will broadly disseminate results and engage informal learning and community-based stakeholders in key U.S. urban areas in dialogue about how to transfer the SCIENCES ecosystem model to other communities.

Two main *National Amplification Network* avenues:

- Association of Zoos and Aquariums (AZA) Diversity Committee
- Metropolitan Greenspaces Alliance (MGA).

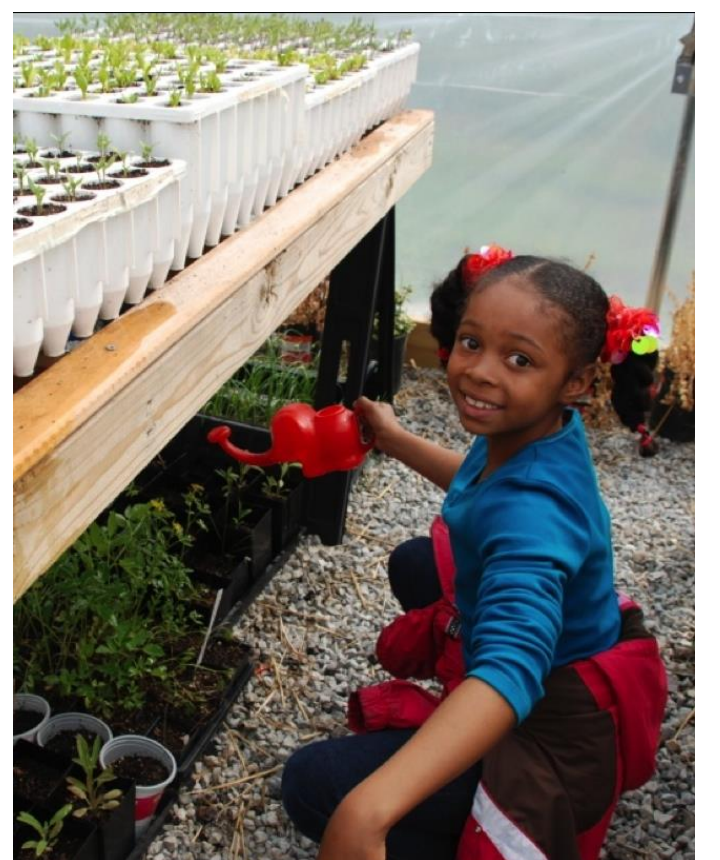
We envision that this project's innovative model of sustained, relevant community engagement in environmental issues will be adaptable to organizations throughout AZA and MGA. Findings also will be presented in the Fuller Park Community with the goal of sharing lessons learned and stimulating dialogue.

Research

Research question: How does a large informal science learning institution work with a community-based organization to support environmental scientific literacy and agency at all levels of the community?

- Research methodology: Case study (Stake, 1995; Yin, 2013)
- Core sub-case categories:
 - Community adults
 - Community youth
 - School personnel
 - CZS and Eden Place personnel

Research team led by University of Illinois at Chicago in collaboration with the Chicago Zoological Society.



Evaluation

Front-end, process, formative, and summative evaluation conducted by ExposeYourMuseum, LLC.

- Includes professional development for local community data collectors



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Advancing Informal STEM Learning Program

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References

- Banks, J.A., Au, K.H., Ball, A.F., Bell, P., Gordon, E.W., Gutiérrez, K.D., Heath, S.B., Lee, C., Lee, Y., Mahiri, J., Nasir, N.S., Valdés, G., & Zhou, M. (2007). *Learning in and out of school in diverse environments: Life-long, life-wide, life-deep*. Seattle, WA: The LIFE Center and the Center for Multicultural Education.
- Barton, A.C., & Yang, K. (2000). The culture of power and science education: Learning from Miguel. *Journal of Research in Science Teaching*, 37(8), 871-889.
- Basu, S.J., Barton, A.C., Clairmont, N., & Locke, D. (2009). Developing a framework for critical science agency through a case study in a conceptual physics context. *Cultural Studies of Science Education*, 4(2), 345-371.
- Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and Behavior*, 31(2), 178-202.
- National Research Council. (2009). *Learning science in informal environments: People, places, and pursuits*. Washington, DC: The National Academies Press.
- National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.
- National Academy of Engineering and National Research Council. (2014). *STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research*. Washington, DC: The National Academies Press.
- Roth, W-M., & Barton, A.C. (2004). *Rethinking scientific literacy*. RoutledgeFalmer: New York, NY.
- Saunders, C.D. (2003). The emerging field of conservation psychology. *Human Ecology Review*, 10(2), 137-149.
- Stake, R.E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Tidball, K.G., & Krasny, M.E. (2010). Urban environmental education from a social-ecological perspective: Conceptual framework for civic ecology education. *Cities and the Environment*, 3(1), article 11, 20 pp.
- Yin, R.K. (2013). *Case study research: Design and methods* (5th ed.). Los Angeles, CA: Sage.

