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Schools are embedded in a larger landscape of learning opportunities, some of them spontaneous and everyday, some of them occurring by design in community-based organizations, museums, clubs, and other organizations that are equipped to facilitate robust and enriching learning experiences. There are learning resources, opportunities, and organizational practices and structures that are unique to formal (school) and informal (out-of-school) learning contexts. In conceptualizing learning pathways it is important to understand the features of cross-context experiences that can enhance or disrupt learning for youth as they cross formal and informal learning boundaries. This entry identifies several ways to conceptualize linkages between in and out-of-school contexts, all of which are consistent with a learning ecology perspective, which recognizes that schools are not the only places where children and youth learn.

Ecological Perspectives on Learning

Learning can be described as life-long and life-wide, with the vast majority of learning across a lifetime taking place in settings outside of formal schooling and training. Out-of-school settings, such as libraries, museums, and non-profit organizations, play a major role in supporting public learning, and the demand for structured learning opportunities for learners ranging from early childhood to high school is rising.

Learning ecology frameworks, which have roots in Bronfenbrenner's ecological theory of human development, conceptualize learning as a dynamic process that occurs across multiple settings, each of which offers unique actors, materials, tasks, resources, and relationships that contribute to learning trajectories. Learning scientists have embraced the perspective that the development of interest and expertise spans the boundaries of formal (e.g. schools) and informal (e.g. out-of-school) settings.

Much of the research from an ecological perspective focuses on case studies of learners coordinating their learning across multiple contexts, pointing to the affordances associated with diverse learning settings. For example, Leah Bricker and Philip Bell conducted an ethnographic case study of 4th and 5th grade learners and observed them across settings, including home and out-of-school programs. They found that everyday moments experienced across multiple settings, social groups, and time points contributed to scientific learning, expertise development, and identity formation. Similarly, Brigid Barron's case study of learners seeking opportunities to acquire technological fluency demonstrated how diverse settings can trigger interest in a content area and how learners and their supporting adults use various strategies to engage in activities and support learning over time. This study illustrated how parents play an essential role as *learning brokers*; parental fluency in a child's interest area, knowledge of resources, and access to relevant social networks played a major role in effectively linking their children to settings that supported the development of interest and expertise.

These case studies also raise awareness of some of the challenges associated with managing different expectations, resources, and supports across contexts. Angela Calabrese Barton and colleagues conducted a longitudinal ethnographic case study of middle-school aged girls from non-dominant backgrounds in the sciences (i.e. young women from underrepresented racial, ethnic, or linguistic backgrounds and low-income homes) as they engaged in science-

related activities in school and out-of-school settings over three years. They found that identity development around science required social supports and expanded opportunities for engagement. Kara Jackson conducted a case study of a 4th grade learner as he navigated two settings (home and school) that had conflicting expectations, resources, and supports for his mathematics learning and illustrated how the gap between settings can be disruptive as a learner makes meaning of mathematics.

Research has also revealed stark social class and racial disparities in the amount of time children engage with informal learning environments, and while children from low-income communities may particularly benefit from participation in organized programs, there is evidence that participation is declining among learners from low-income backgrounds while participation rates increase for youth from higher-income homes. Barron's research on individualized learning pathways revealed the role of the parent as a learning broker in the development of their children's interest and fluency in technology. However, socioeconomic and environmental barriers, such as lack of access to financial resources or public transportation, places constraints on the abilities of many parents to enroll their children in out-of-school programs.

Learning Ecosystems and Organization/Network Level Research

Complementing and extending what we know about individual learners, there is increasing interest in the programmatic and organizational contexts that effectively support cross-context learning pathways. An emerging set of innovations in research and practice examine the diverse fields of organizations that support rich learning opportunities on a regional scale and highlight the importance of organizations and systems in supporting robust and interconnected learning experiences.

Partnerships that Bridge the Formal/Informal Boundary

Building better connections between learning opportunities in different settings can be facilitated by robust interorganizational collaborations, particularly those that focus on developing social and material supports for learners as they cross formal/informal boundaries. On school-field trips to museums, for example, teachers and museum educators often fail to recognize that the experience can be disconnected for their students unless the adults take specific steps to coordinate and align the material, learning approaches, and instructional goals. Research has shown a field-trip is best supported by pre- and post-visit activities, co-planning between teachers and museum educators, and coordinated inquiry approaches that recognize that the classroom is best suited to some learning objectives (e.g., declarative learning of scientific content) while the museum is best suited to others (e.g., student-directed inquiry and exploration of multiple objects and exemplars).

Bronwyn Bevan and colleagues examined informal-formal collaborations between science institutions and school districts, detailing examples of how informal-formal partnerships can facilitate experiences that help learners connect classroom learning and real-world contexts. By bridging the divide between classroom content and out-of-school learning experiences, organizations can coordinate and align institutional assets in ways that deepen learning, facilitate the development of individual interests, and strengthen students' science identities. Collaborations can leverage the structural properties of schools that afford the time, sequencing, and consistency that is necessary for learners to develop conceptual foundations, while informal

settings and activities offer social properties and resources that afford deeper learning experiences including collaborative learning and task flexibility that encourages imaginative thinking and risk-taking.

But collaboration across the formal/informal boundary is rarely easy and only sometimes successful. In their study on collaborations between out-of-school arts organizations and schools, Jennifer Russell and colleagues investigated conditions that enable and constrain collaborations, as well as the potential costs and benefits of engaging in informal-formal partnerships. They found that factors embodied by a regional learning ecosystem, such as competition among programs to attract learners, and broader institutional contexts, such as the narrowing of the curriculum in schools to focus on tested subjects, shaped the nature of collaboration between formal and informal learning organizations.

Learning Pathways, Networks and Ecosystems

While partnerships may be a promising strategy for bridging the formal/informal divide, they are only one way to think about connecting learning opportunities in a region. Others have sought to conceptualize these connections at a broader scale evoking images of learning pathways, networks and ecosystems. The pathways notion calls attention to the development of youth interest and participation over time, and can be expanded to describe opportunities for engagement in learning opportunities across programs and organizations both within schools and out-of-school settings. One can imagine designing and studying intentional pathways that connect programs and learning opportunities so they productively expand student interest and expertise.

One example of a networked approach supporting cross-context learning and equitable access to learning experiences is the Hive Learning Networks. The Hives are comprised of organizations (e.g., libraries, museums, and schools) and individuals (educators, designers, and community catalysts) working together to create opportunities for youth to learn within and beyond the confines of traditional classroom experiences by designing innovative practices and contributing to the professional development of providers. Conceptualizing regional learning opportunities as networks calls attention to the connections among people, programs, places, and resources in service of expanding learning opportunities for children and youth.

Another way to conceptualize connections among formal and informal learning opportunities is the notion of a learning ecosystem, which consists of the organizations and programs that support the development of interest and expertise in a particular content area (e.g., environmental sciences). Stacy Kehoe, Jennifer Russell, and Kevin Crowley conducted a landscape study of informal learning opportunities for environmental education to better understand the dimensions of program diversity and interconnectedness that are assumed in conceptualizations of learning ecosystems. While the study revealed a landscape rich with learning opportunities that are facilitated both in the classroom through informal-formal partnerships and outside of school, analysis of learner access across organizational partnerships found patterns of disparity in access to more intensive programs and fragile links between informal learning providers and schools that depend on individual teachers.

Research on organizational collaborations and regional ecosystems is necessary to inform the designing an infrastructure that supports learner movement across the formal/informal divide. During the course of their study on the environmental education learning landscape, Kehoe, Russell and Crowley collaborated with the Pittsburgh Parks Conservancy to design embedded

social supports along the pathway between their school-year and summer programs for high school students. Findings from the landscape study revealed that informal learning programs had a hard time recruiting underrepresented students, even when those organizations had partnerships with urban schools. Informed by these findings, the researchers and partner practitioners designed a recruitment process that positioned classroom teachers as learning brokers who identified students who would be a good fit and supported them during the application process. The summer program successfully drew participants from multiple partner high schools (which enroll students from diverse communities across the region) and this group of learners took a deep dive into naturalist and conservation learning not only during the program, but also after it formally ended. Strategic social supports were also put in place to support their movement into informal learning opportunities offered by other organizations.

Conclusion

Supporting the development of interest and expertise of our young people requires investing in learning ecosystems, designing learning pathways that support movement across and access to diverse contexts, and continuing to examine the development of interest, engagement, learning and motivation across settings and over time. Recent research on out-of-school learning has revealed rich examples of learners engaging in content areas (such as math or science) in out-of-school programs in ways they cannot or do not engage in school. Yet schools have easier access to youth, particularly those from backgrounds underrepresented in out-of-school learning environments (students of color, students growing up in poverty) and more readily support the coordination of successive learning opportunities over time. As our field continues to explore the “intertidal zones” between in and out of school learning we are reminded that learning is not isolated to school settings, and that the resources and opportunities that richly support learning are distributed across regions, as well as physical and technical spaces. The story of 21st century learning requires researchers and practitioners to collaborate on maximizing the strengths of all aspects of learning ecologies and creating new knowledge to design learning environments and ecosystems that extend beyond the formal classroom.

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Cross-References

Collaboration; Ecological Perspectives on Learning; Educational Equity; Learning Pathways; Networks; Out-of-School Time;

Further Readings

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