Collaboration Between Formal and Informal Networks: Partnering Educators for Place-Based Learning Experiences

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Abstract: The Partnering Educators for Place-Based Learning Experiences (PEPLE) project develops the capacity of educators to contextualize classroom learning to the local community through professional learning opportunities that are co-facilitated by university staff and informal educators. The project aims to expand an existing school-university networked improvement community (NIC) to include educators and scientists from the local zoos, land trusts, Audubon, and other informal education organizations. Early data gathered through design-based implementation research (DBIR) strategies show how the co-facilitated workshops have been beneficial to the informal education, K-8 school, and university communities. In addition, the project is adding to NIC theories that collective expertise and resources provide greater benefits than the same expertise and resources implemented in isolation.

KEYWORDS: professional development, place-based education, networked improvement communities

NAPDS NINE ESSENTIALS ADDRESSED:
3. Ongoing reciprocal Professional Development for existing professionals

The Next Generation Science Standards (NGSS) call for teachers to involve students in investigating and explaining complex phenomena and solving local problems (Krajcik, 2015). Educators’ lack of preparation to implement the rigorous intentions of the NGSS, combined with the pervasive research findings that elementary teachers have poor attitudes, low self-efficacy, and a general lack of commitment to science and engineering education, exemplify the need for significant support that far exceeds what is typically offered to teachers (Brand & Wilkins, 2007; Levitt, 2002). Analysis within the networked improvement communities (NIC) showed fourth
Graders’ performance on a statewide science assessment was proficient at carrying out performance tasks but students struggled to transfer the skills and knowledge to life scenarios (Sweetman, 2014). The problem of contextualizing learning is not new. John Dewey remarked in his book *School and Society* more than 100 years ago:

From the standpoint of the child, the great waste in the school comes from his inability to utilize the experiences he gets outside the school in any complete and free way within the school itself; while, on the other hand, he is unable to apply in daily life what he is learning at school. That is the isolation of the school—its isolation from life. (Dewey, 1907, p. 89)

There is significant evidence that providing children with opportunities to apply their learning to their environment results in an increase in student engagement, student achievement, and civic responsibility (Gruenewald & Smith, 2014; Sobel, 2004). Yet most often, educational goals and learning outcomes for students’ formal and informal education experiences are designed and implemented independently (Bevan et al., 2010; Gupta, Adams, Kisiel, & Dewitt, 2010).

Research has shown that field trip experiences are rarely utilized as a true learning experience tied to the core science curriculum (Bevan et al., 2010; Griffin & Symington, 1997). Morag & Tal (2012) found that planning for the field trips typically includes little classroom preparation, limited coordination between the environmental educator and the classroom teacher, and few connections to the school curriculum.

The need to increase teachers’ knowledge of and skills regarding how to situate learning in local contextual phenomena prompted the NIC researchers to seek expertise from the local informal education community. Educators and scientists from the local zoos, Audubon, land trusts, environmental organizations, and museums would be able to relate the public schools’ core learning goals to problems and events occurring in the greater community, effectively increasing the use of place-based education (PBE) for schoolchildren. The purpose of the paper is to report on the preliminary findings from a design-based implementation research (DBIR) study exploring how to bridge the gap between the formal and informal education communities. The current paper shares the results from the initial implementation of co-facilitated professional development workshops. The workshops, co-facilitated by university staff and informal educators, are for teachers who are part of a school-university NIC.

**Relevant Literature**

**Place-based Education**

Place-based education (PBE) integrates the space, resources, and phenomena of the learner’s geographical area to achieve central learning goals (Woodhouse & Knapp, 2000). It has the capability to broaden our educational philosophy beyond the content that one must teach to
students to the greater goal of providing our children with skills and experiences that help them succeed as citizens and responsibly participate in the democratic process (Smith, 2007; Woodhouse & Knapp, 2000). PBE is multidisciplinary and experiential by nature and helps us to connect self and community within a place. After being introduced in the mid 1990s, PBE researchers have verified in small-scale case studies throughout the United States that the experiences support contextualized learning (King, 2013; Powers, 2004; Smith, 2007). Successful PBE projects most often include collaboration between the formal and informal education communities and originate from an educator or administrator who has a personal connection or commitment to the local environment with the goal of giving students a sense of agency in making real change (Smith, 2007). Unfortunately, PBE is still rare within public school systems and collaboration between the formal and informal education communities is not sufficiently supported (Morag & Tal, 2012; Smith, 2007).

**Professional Development**

Co-facilitation of professional development workshops by formal educators and informal educators can support teachers to bring lessons outdoors and into the community. Just as professional development is essential in preparing teachers to teach through constructivist pedagogies, professional development focusing upon PBE is necessary for teachers to pre-plan, participate, and help students reflect on learning outside the classroom (Dori & Herscovitz, 2005). Effective professional development includes a direct relationship between the content and materials to the application with students, a focus on student achievement, and an opportunity of continued support through classroom coaching and long-term open communication with colleagues (Blank, de las Alas, & Smith, 2007; Weiss & Pasley, 2009). Penuel, Fishman, Yamaguchi, and Gallagher (2007) reported that university-led professional development that afforded active learning environments with “proximity to practice” were essential for reform. The co-facilitated lessons provided opportunities for teachers to engage in PBE with informal educators as guides and university staff to help relate the experience to the teachers’ core curricula. Professional development to support science teachers in developing content knowledge has also been found to increase self-efficacy and use of reform-based instruction in the classroom (van Aalderen---Smeets & Walma van der Molen, 2015). Once teachers understand how to facilitate learning experiences outside the classroom, they will be more likely to engage in PBE activities (Tal & Morag, 2009). When the teachers value the field experience as an essential component of the students’ core learning, it is more likely that teachers will engage in the practice and that the lessons will impact student learning (Shireen, Desouza, & Czerniak, 2003; Desimone, Smith, & Phillips, 2013).
Networked Improvement Communities

Many recent publications, such as The Framework for Science Education (NRC, 2012), the Guide to Implementing the Next Generation Science Standards (NRC, 2015), and Translating the NGSS for Classroom Instruction (Bybee, 2013), claim that partnerships are needed to impact student learning, yet little research demonstrates how the collaborative process of the partnership affects teacher and student outcomes. While educational reform at scale presents challenges (Elmore, 1996; Fullan, 2009; Pinar, 2013; Tishkovskaya & Lancaster, 2012), it also includes more stakeholders and benefits more diverse populations of teachers and students. Built on the foundation of a sustained and stable school-university networked improvement community infrastructure, this project is positioned to improve collaborations and serve as a model to develop large-scale partnerships between multiple formal and informal education communities and a university (Henrick, Cobb, Penuel, Jackson, & Clark, 2017).

Networked improvement communities (NIC) are a type of research-practice partnership that: include a variety of stakeholders from a range of locations; incorporate a systematic cycle for feedback, evaluation, and improvement; assume flexible role assignments across education and research; and have systemic mechanisms to build capacity for collective improvement (Coburn, Penuel, & Geil, 2013). NICs were conceptualized in the early 1990s by a computer engineer who claimed organizations would be more effective when purposefully partnering individuals to collectively solve problems, expanding the group’s ‘collective IQ’ and iteratively improving systems and practice in innovative ways (Engelbart, 1992; Cornelissen et al., Daly, 2014). Positive outcomes in public health and education have encouraged the formation of NICs (Huerta, Casebeer, & VanderPlaat, 2006; Popp, MacKean, Casebeer, Milward, & Lindstrom, 2013; Tate, 2012; Yamada, H. 2014). Research on collaborations in education that use the resources and expertise from multiple stakeholders to focus on a shared goal is beginning to show effectiveness (Coburn & Penuel, 2016) and reveals challenges with organizational change in the education system (Bryk, Sebring, Allensworth, Easton, & Luppescu, 2010; Coburn, Russell, Kaufman, & Stein, 2012; Horn & Little, 2010; Weber & Khademian, 2008). Russell et al. (2017) identified a framework for initiation of NICs. They rationalize that success in sustainability and improvement of a NIC will increase if, at the start of the partnership, there is focus on: (a) developing a theory of practice improvement (p.17); (b) building a measurement and analytics infrastructure (p.20); (c) learning and using improvement research methods (p.23); (d) leading, organizing, and operating the network (p.25); and (e) fostering the emergence of culture, norms, and identity (p.31).
Research Methods

Two hypotheses drive the PEPLE project. First, by extending a partnership between a university and local K-8 schools to include the informal education community and through the continued use of design-based implementation research (DBIR) strategies, the new partnership can provide a systematic and scalable model of support and resources for educators to use PBE. Second, the implementation of PBE in learning and practice will improve educators’ understanding of three-dimensional learning described in Next Generation Science Standards (NGSS), and increase student proficiency on NGSS unit assessments. This paper is addressing the first stages of the research and beginning to describe: What are the affordances and challenges of integrating the informal education community into an existing school-university partnership?

The research participants are formal educators from a long-standing school-university network improvement community and informal educators from a collaborative organization. Each partner is described individually. The methods describe the process for uniting the collaboratives into an extended research-practice partnership. Finally, the results and discussions share learning experiences from the diverse participants, demonstrating the mutuality of the collaboration.

Partner Participants

A sustained school-university network improvement community. The teachers and university staff who participated in the co-facilitated workshops were part of a sustained program called Guiding Education in Math and Science Network (GEMS-Net). The educators in the network of public school districts and university faculty commit to improving science education for elementary and middle school students through mandatory ongoing professional development and curricular work. The varied expertise of classroom teachers, school administration, and university faculty provides fertile ground for sustaining the program and continually renewing innovations to reflect public policy, research, and student needs. Presently, there are 12 partner districts, representing 49 schools throughout the state. Participating pre-service teacher candidates, classroom teachers, and district administrators total over 800 educators who enhance the learning experience for about 16,739 schoolchildren each year. The school-university partnership responds to the needs of the practitioners through research-based support systems and provides researchers with meaningful and abundant problems of practice.

GEMS-Net was originally funded by a National Science Foundation, Local Systemic Change grant in 1996 to address the need to improve science education in elementary school. The original partnership between the University of Rhode Island and three public school districts supported the implementation of a research-based, hands-on science program, including
professional development for all teachers and school administrators involved in the project. Since funding ended in 2001, the partnership has been funded directly by the school districts and a continued commitment from the university. Over the 22 years, the network has learned to hold fast to the project's core beliefs, while also building a flexible research infrastructure that evolves along with the dynamic and complex systems influencing the interactions between teacher and student.

GEMS-Net staff meet regularly with partners’ central office staff, school principals, teacher leaders, and university scientists and engineers to elicit feedback, hear about problems of practice, and evaluate the project. Teachers and students in the research-practice partnership are provided with the physical and conceptual tools to engage in and support constructivist instruction. During workshops teachers from different schools share their successes and challenges with the shared curriculum, and discuss examples of student work, while university staff challenge the teachers to continually shift their practices toward those that align with student needs, research, and current policy. All stakeholders participate in collaborative site visits and review student achievement data to consider the program’s next steps.

Surveys and workshop evaluation data are collected for continuous improvement and provide evidence as to teachers’ fidelity to the program and their emerging needs. This data inform the development of new professional learning opportunities. In addition, the data collected from state science accountability assessments show partnering districts have increased student proficiency by 15% at grade 4 and 24% at grade 8 from 2008-2013, compared to statewide growth of only 5% and 11%, respectively. Student assessment data provide evidence of success, creating a culture of confidence and pride in district decision-makers and ensuring the sustainability of the project.

Informal education collaborative.

The Rhode Island Environmental Education Association (RIEEA) is a collaborative network of the state’s informal education organizations working to support and help one another reach their professional and organizational goals by developing and sharing resources. The organization was established in the mid-1970s and provides access to the informal community through regularly-scheduled meetings, professional development, networking opportunities, and online resources and communication. Members of RIEEA include the local zoos, Audubon, land trusts, environmental organizations, and museums that offer field trips, after school programs, summer camps, and drop-in public activities. Informal educators from the member organizations provide expertise in local ecology, science content, and community involvement.
Data Collection and Analysis

GEMS-Net and RIEEA realized a common vision to increase PBE experiences for students as a means to support the knowledge and skill development described in the NGSS. It was clear in early informal conversations that both organizations felt teachers would need professional development to support PBE. With a shared goal and a clear understanding of the problems posed by the new standards, the organizations began working as a scientific learning community to coordinate a plan (See Figure 1). Through strategically-designed focus group meetings, partners were identified from the informal organizations and asked to attend and/or co-facilitate the already-scheduled mandatory workshops for Pre-K-8 teachers involved in the school-university networked improvement community (NIC).

Design-based implementation research (DBIR) strategies, such as involving practitioners in the research process, equally valuing all perspectives, and developing knowledge that is useful across a range of settings (LeMahieu, Nordstrum, & Potvin, 2017), were used to collect initial findings from group work artifacts and PD evaluations. Iterative evaluation cycles and blurred roles between practitioners and researchers are a core part of the established NIC and were applied to the improvement science plan for the newly expanded partnership. In this project, teachers, researchers, and informal educators meet regularly to engage in ongoing discourse and research processes. Summaries from the meetings were recorded and sent out for review by members. In addition, evaluations from the workshop were completed by teachers and informal educators. Everyone’s ideas and responses were equally valued in the research outcomes and were coded for common themes within and across partners.

The 4 x 4 model for bridging the gap between formal and informal contexts developed by Fallik, Rosenfeld, and Eylon (2013) provides the descriptive design principles to substantiate and measure the change in relationships between the informal educators and practitioners. The model provides practical steps for implementing successful partnerships to increase student learning and research. It focuses on developing a mutual respect for, knowledge of, comfort with, and discussion around the partnership. Partners independently assessed the project using the 16
design principles and then these assessments were compared to determine congruency in the findings.

DBIR methods provided a frame for the current project and also the theoretical underpinnings for future implementation and development projects based on continuous feedback (Fishman, Penuel, Allen, Cheng, & Sabelli, 2013). A core principle of DBIR is to focus on methods to support and sustain systemic change. The trust developed between the university and the local school districts and the mechanisms for communication developed over two decades within the NIC are key factors in the success of the project and the project’s longevity (Henrick, Cobb, Penuel, Jackson, & Clark, 2017; Nelson, & Valikai, 2014).

Overall Results and Common Themes

The number of workshops that were co-facilitated between university staff and informal educators increased over time (See Table 1). Through the mechanisms of design based implementation research (DBIR) and the rapid-cycle improvement systems within the networked improvement communities (NIC), excitement around the initiative grew.

Table 1

| Informal educators’ participation in teacher professional development workshops |
|---------------------------------|------------------|-----------------|-----------------|
| Semester                        | Number of workshops | Number of informal educators | Percent of workshops |
| Summer/Fall of 2015             | 41                | 7                | 6               |
| Summer/Fall of 2016             | 22                | 11               | 50              |
| Winter/Spring 2017              | 27                | 18               | 67              |

Note. During initial discussion, 2015-2016 school year, the NIC facilitated the majority of the workshops in the Summer and Fall, whereas in 2016-2017 school year they were spread over the year.

Common themes across participants were identified from the evaluations and focus group meetings notes. All partners found an increased satisfaction in working collaboratively. This is
evidenced by the increase in willingness to co-facilitate workshops, transcripts from the focus group participants describing the value of co-facilitated workshops, and the majority of comments from the evaluations indicating a gratefulness about “others” being included. Additional themes across participants included a desire for aligned programming, a broadening of educational views and resources, and motivation for additional partnership opportunities. For example, an informal educator wrote, “It was great to see what lessons the third grade classes will be using this year! It will be helpful in making sure our programs are consistent with the curriculum used by the schools.” This illustrates the informal educator’s desire to align programs and expand their educational view. A kindergarten teacher wrote, “I want to look into inviting community members/agencies to support the learning in the classroom.” The awareness of each other as resources and the motivation for additional partnering opportunities was found among all participants.

Representatives from informal education and K-8 teaching were instructed to individually highlight the design principles from Falik’s 4 x 4 model they felt represented the new partnership. When the representatives from the informal education, K-8 school, and University communities met, they were discouraged by the amount of inconsistent perceptions on the strengths and weaknesses in the partnership. Discourse revealed the need to apply stages of implementation for each principle. Together the group used the levels of concern model from the Concerns-Based Adoption Model assessment (Hall, 2013) to determine if the partnership was at an early stage (awareness, informational, or personal), a mid-stage (management, consequence), or an advanced stage (collaboration, refocusing). The goal is to institutionalize all 16 constructs. Institutionalized projects are programs that sustain through implementation and become a regular part of the educational institution’s routines (Berman & McLaughlin, 1978).

The 4 x 4 model (see Appendix A) divides the 16 principles into four aspects, including: “1. Mutual recognition of the importance of bridging by both educational staff groups; 2. Mutual acquaintances with the two curricula by both staff groups; 3. Preparation of students to reduce the ‘novelty space’ regarding the informal learning context; and 4. Ongoing dialogue between both staff groups” (p. 84). In addition, each aspect is organized under four headings including organizational, cognitive, affective, and social-environmental. As expected for early implementation, the group collectively determined that the partnership is in the early stage on the majority of the indicators. The organizational and social-environmental principles are primarily just emerging as partners become aware of the systems needed to support the partnership and the extension of work that can be done across formal and informal boundaries. However, the partnership is moving towards the mid-stage in the cognitive and affective design principles described as shared discussions, activities, and curricula and a mutual respect and familiarity across formal and informal educators. In some cases, individual teachers and informal educators may be addressing constructs at higher levels of implementation, such as informal educators coteaching lessons in the classroom, which addresses the design principle “presenting activities
to students by both educational staff groups” (Falik et al., p 84). This is illustrated in video data captured by university researchers of a co-taught schoolyard lesson (see Appendix B). The PEPLE project is currently working toward institutionalization across the first two aspects, while it is only beginning to address those principles focused on student preparation. The research project is moving toward the investigation of the partnership on student outcomes. Even at this early stage, the collaboration had greater success in bridging the gap between the formal and informal education communities than reported in other research (Griffin & Symington, 1997; Morag & Tal, 2012; Tal & Steiner, 2006). The collective group attributes successful collaboration to the established infrastructures associated with the two sustained networks, GEMS-Net and RIEEA. The advantage of well-functioning communication structures and trusted relationships has allowed the groups to bypass some administration and management factors to focus on meaningful implementation.

**Benefits to Informal Education Community**

The informal educators who have participated in the workshops have expressed an increase in their own professional development, ultimately improving their teaching practices and their programming. Informal educators who attend or facilitate workshops have expressed an increase and deepening of their understanding of NGSS. One informal educator wrote, “This workshop was a great way to bolster my knowledge of NGSS standards and hear what classroom teachers are doing to include science in their daily routines. I also love the investigation ideas and language to use with students.” Many informal educators found they were better able to align their programming to classroom activities and to support teachers in developing their understanding of specific natural history and ecological concepts and in outdoor teaching strategies. Another wrote that she had “gained a better perspective on the opportunities and challenges that teachers face when facilitating inquiry-based science in their classrooms” and that participation “has been a wonderful way for environmental educators to engage with teachers, share our passion for nature with them and learn from their expertise.” Opportunities to connect with formal classroom teachers outside of their regular programming has helped informal educators forge new and deeper relationships with schools. One informal educator wrote, "Hooking teachers on bird watching and then having them then invite you to take their Kindergartners birding is the best!" Nationally, field trip experiences are declining due to pressures associated with accountability and funding (Behrendt & Franklin, 2014). Yet the informal education organizations who participated in the co-facilitated PD have been invited to provide environmental education programming to schools they have not served before. More organizations reported they were now “filling the quiet season” of fall and winter with field trips, gaining access to more students throughout the year. Furthermore, the informal educators reported that the increase in knowledge and awareness of the policies and practices in the school education.
day have prepared them in their work as advocates for legislation that supports and improves environmental education.

**Benefits to the K-8 School Community**

Teachers’ busy daily schedules sometimes prohibit the type of reflective practice that has been associated with effective outcomes (Beauchamp, 2015). Many professional development teacher participants claimed they had not thought about the opportunities that learning outside the classroom walls would afford their students. One teacher wrote on her evaluation, “I learned today that a lot of instruction and learning can take place outside.” The addition of the outdoor components to the professional development was met with enthusiasm: “I feel excited about having students go outside and investigate plants and animals in our schoolyard. The hands-on activities will help them [students] better understand and make connections to concepts taught in class.” Teachers expressed the need for support with outdoor classroom management and content around the local ecology: “Support with outdoor learning would be helpful. Maybe some additional workshops on identification of the leaves and trees would be helpful.” The participation of the informal educators during workshops is beginning to address these concerns, giving teachers additional resources and contacts for questions along with strategies to keep students engaged in lessons situated in the natural environment. Following a co-facilitated workshop, one teacher commented, “I learned a variety of strategies to get the kids outside and observing weather details, both big and small.” Another stated, “I loved having the other scientists and people from RIEEA [informal education organizations]. Super resources!” The co-facilitated workshops allowed open conversations to discuss some of the perceived barriers to place-based education (PBE) in the public school setting and provided time to brainstorm solutions. A group of teachers from one school wrote, “We would love support regarding outside science time at our school. Our administration has strict guidelines for outside recess time in the winter. We need to get outside all year long to complete the investigations.” From this request, the university staff were able to discuss the importance of incorporating PBE into the school day throughout the year with the administration of the school. A co-facilitated professional development was then provided at the school site. The participating teachers, all of the PreK-2 teachers in the school, spent time in the schoolyard on a snowy day. This experience provided cohesion amongst the teachers and administration, prioritizing PBE as an important aspect of the science program that aligns to the goals of the Next Generation Science Standards (NGSS). Teachers learned about the resources that informal education organizations could provide, including co-teaching within the classroom, in the schoolyard, and at their educational sites. This information was beneficial in opening communication and building relationships that made PBE more accessible. This is evidenced in the video of a co-taught schoolyard lesson (See Appendix
B). The teacher reported that the informal educator brought an expertise to the lesson that would otherwise be missing and helped to build self-efficacy in teaching outdoors.

**Benefits to University Community**

The researchers involved in the project also benefited from the expanded research practice partnership. The inclusion of the informal communities has brought new problems of practice in need of investigation, which are expanding collaborations among the researchers. For example, in one workshop, the university staff overheard an educator from a nature preserve complaining that teachers were having children watch an inaccurate “scary” movie about ticks before coming on a field trip. She commented that the children were so afraid to walk on the trails in the woods that she was unable to meet her objectives. This problem led the researchers to engage in literature review and investigations with biology professors and resulted in a more informed newsletter about tick safety that is currently under investigation for effectiveness and publication. The university staff gained a heightened awareness of problems of practice, and the sources of data collection increased. *A Framework for the Initiation of Networked Improvement Communities* (Russell et al., 2017) states, the wider your networked community is, the more diverse ways and places you have to implement your research and to uncover what works, for whom, when, and where. In addition to the variety of venues added to the NIC, the informal settings provide a broader range of populations, including multi-generational families, homeschoolers, and preschoolers.

This project is building on the current knowledge of PBE and of expanding sustained NICs to new partners. The researchers were concerned about the lack of recent literature associated with connections between formal and informal education. Of the 48 articles cited in Behrendt & Franklin’s 2014 review of the literature on the educational impacts of field trips, only seven of them were from 2010 or later. This project will add to the knowledge base on NIC’s and collaboration between formal and informal educators in professional development and for PBE.

**Conclusion**

In contrast to a current push to improve education through competition (Spring, 2017), this project develops and shares a model for collective capacity to leverage resources and human capital (Penuel, Allen, Coburn, & Farrell, 2015). Through developing partnerships between university researchers and K-8 practitioners, and building means for collaboration between formal and informal educators, we can weave a more equitable and seamless education for all students. The project is based on the belief that schooling is more than memorizing facts and reciting ideas. Students need to feel confident in applying their formal learning to living well and being prepared for democratic participation in their communities. The students in our elementary
classrooms today must be guided to develop an understanding of and a commitment to their local communities. Experiential place-based education has the potential to build competencies, including critical thinking and problem solving, creativity, communication and collaboration, in our students (Gruenewald & Smith, 2014; Sobel, 2004; Woodhouse & Knapp, 2000).

Partnerships between formal and informal educators can bridge the gap between school and life, ultimately providing a more meaningful, engaging, and effective education for students. Co-facilitated workshops by formal and informal educators benefit many stakeholders. Teachers build awareness and capacity for teaching outside the classroom and receive support to apply school learning to real-life scenarios. Informal educators develop better-aligned programming and become more accessible, resulting in a greater impact on their educational goals. University faculty are presented with additional problems to investigate and solutions to disseminate and grounds PBE research in practice.

The data collected from the first years of this research project demonstrate that an established NIC may provide the infrastructure to better support a collaboration between formal and informal education communities. In *A Framework for the Initiation of Networked Improvement Communities*, the authors identify five domains that effective NICs have in common (Russell et al., 2017). Around the outer edge of the model is the domain of leading, organizing, and operating the network. The ease and success of expanding an already-established NIC in this project is partially explained by structures in place for leading, organizing, and operating a network. This research will continue to investigate the theory that collective expertise is needed to address the complex ideas and pedagogies described in the science and engineering standards and that networked communities’ expertise and resources are exemplified by collective power that stems from the interactions between partners.

The partnership will continue to explore how relationships between formal and informal educators develop and sustain over time. A successful network improvement community creates a culture where member identities and collaborative participation are valued and represent a true learning community (Russell et al., 2017). Pressures from policy changes, reallocation of resources, and leadership changes often stop projects from becoming institutionalized (Berman, & McLaughlin, 1978; Fixsen, Blase, Duda, Naoom, & Van Dyke, 2010). To sustain the project, research methods will be anchored in a continuous improvement cycle, such as developing plans to address problems of practice, implementing those plans, then reflecting on the work to develop new plans (Byrk, Gomez, Grunow, & LeMahieu, 2015). This continuous cycle should mature and evolve over time to respond to changes in culture, policy, resources, and leadership, increasing the impact of place-based education on educators and their students.
References


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