
Where do we start? Lessons learned from the PI, graduate research assistant, undergraduate researcher, and a community member starting their inter-institutional STEM-focused community-engaged project using PALAR

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There is no shortage of inspiration and devotion within Dr. Jessica Rush Leeker.

Fueled by her desire to deepen her knowledge and understand how she can leave a lasting impact on the world and the people around her, Dr. Rush Leeker has cultivated a rich educational background. Equipped with her undergraduate degree in Supply Chain and Information Systems from Penn University and her Ph.D. in Engineering Education and MBA in Sustainability and Operations from Purdue University, she is proud to currently share her expertise as an Engineering Professor at CU Boulder.

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Abstract

Academic institutions have always been seen as centers of education and knowledge production, but the information generated by each institution is usually siloed. To increase global competitiveness, especially in STEM, sharing knowledge across institutions is necessary. At inception, our central hypothesis was that an inter-institutional approach to educational transformation, one that was centered on democratizing the practice of innovation across institutional boundaries, would effectively prepare the next generation of innovators and engineers to address systemic and institutional racism and whiteness within STEM. One of the ways we wanted to tackle this was by community engagement. Community engagement in some phases of engineering projects is known worldwide. However, community engagement in all phases, including the grant writing process, is minimal.

This STEM-focused community-engaged project involves two institutions, including a predominately white institution (PWI) and Historically Black Colleges and Universities (HBCU). These institutions are working together for a common and beneficial goal of creating change in a community, a platform for collaboration and knowledge sharing to facilitate achieving profound change in undergraduate education. They are to achieve this by understanding and enacting tenets of anti-racism and decolonization through the four recurring stages of Participatory Action Learning and Action Research (PALAR), plan-act-observe-reflect.

This paper assesses the lessons learned from an active community engagement project from the initial stages of grant development to the first year of a four-year government-funded grant from a faculty member and two students' perspectives. **The lessons learned include investing time at the beginning of each phase to outline roles and responsibilities and make space for all voices.**

Project Summary

By design, this project is centered on the students involved, granting them autonomy and tangible contributions to the outcome. Faculty interviewed ten undergraduate students from a PWI and ten from an HBCU to create a cohort working together on a community engagement project. The students are of all diverse backgrounds and disciplines of study, and each commits to ten hours of work per week for one year. One graduate research assistant supports them, serving as a liaison for the students and various resources. The graduate student provides a connection to two faculty members, one each from the HBCU and PWI, as well as various community members. In addition, an undergraduate research assistant is dedicated to research, helping faculty to interpret the students' interactions and impacts on each other and the community.

The student cohort is working toward the ultimate deliverable of designing and building a living-learning laboratory. This laboratory will be created with maximum sustainability, with repurposed materials and architecture designed to work in tandem with the land on which it is built. The land is near the HBCU but not the PWI, generating a need for remote planning and collaboration. In addition, the laboratory will aim to benefit the local community by reflecting on the area's history and context and contributing via learning resources, sustainable agriculture, and accessible knowledge sharing.

Our lessons learned are divided into three fundamental areas: using a PALAR framework, intentional community engagement, and genuine inter-institutional relationships. In each area, indicated by a switch to italics, we include direct feedback from the project's principal investigator, graduate research assistant, undergraduate researcher, and a community member. Many people are involved in this project, and these four writers were chosen because they represent different levels of involvement. All were involved in the project both before and after the student cohort began meeting. Each reflection was written by the participants a few months after that cohort initiation, so it includes lessons learned about the extensive planning and preparation stages from launching the cohort. The varied perspectives provide insight into this layered, dynamic, and complex mission.

Lessons Learned

Use of PALAR

This inter-institutional project is built on the Participatory Action Learning and Action Research (PALAR) for Community Engagement theoretical framework through the four recurring stages of PALAR, plan-act-observe-reflect (Zuber-Skerritt, 2015). The PALAR-based model we developed involves an undergraduate-focused community engagement project geared towards effective, collaborative, innovative, and self-developed community engagement by faculty and students from different academic units and institutions through a four-year program.

PALAR combines participatory action research and action learning, incorporating related real-life concepts and values such as participation, collaboration, and communication. PALAR is regarded as both a paradigm and a theory of learning (Wood, 2019). PALAR is a project- and process-based paradigm for knowledge, research, and development that deals with emotions, communication, logical problem-solving, analytical and critical thinking, and social experiences. PALAR focuses on identifying and solving multifaceted problems for a specific community to expose a more meaningful understanding to practically improve and transform learning and society through case studies methodologies.

This paradigm supports the need to charge and develop skills to enhance social justice and sustainable development. In their research on action learning, Ortun Zuber-Skerritt (2012) states:

In these situations, worldwide, traditional research and development strategies alone are not sufficient for problem-solving and sustainable development. They need to be supplemented with human initiatives, creative innovations, and prompt action, all based on values that are grounded in pursuit of the common good through principles upholding non-hierarchical and democratic processes, personal courage, and a shared commitment to helping others—othercentredness instead of self-centredness. These strategies need to proceed from recognition that people on the ground are invaluable sources of local knowledge, wisdom and insight, which should be called upon for problem solving and new knowledge creation. (pp. 4–5)

PALAR allows the faculty researcher(s) to participate in action learning as a collaborator. A more 'equal' playing field is established through this relationship based on trust, accountability, and responsibility, which opens perspectives (Wood, 2019). In this model, the faculty

researcher(s) critically reflect also on their learning and assumptions. This process builds subjectivity and allows faculty researchers to learn more from other team members. It also establishes the researchers and community members to the student participants as resources and consultants rather than the authority figures of a traditional project or classroom.

Principal Investigator

The PALAR framework encourages researchers to exercise little power by turning to guidance instead of authority (Metro-Roland, 2015). The PALAR model offers an alternative learning paradigm compared with other informal learning systems. PALAR, as a facilitation process, has included, among other processes, needs analysis, reflection diary or journal, mentoring, coaching, and learning by doing and critically reflecting on the self and others. Faculty members facilitate the process through a questioning (Socratic) approach and a system by which the learner decides the direction based on community needs. Faculty members are also process moderators who ensure that the learning for everyone is experiential, gradual, and systematic.

To support the project implementation, we leveraged a curriculum as the principal component of inter-institutional knowledge and teaching collaboration. The curriculum is built on the interdisciplinary Participatory Action Learning and Action Research (PALAR) model.

Graduate Research Assistant

One of the more nuanced aspects of working with a PALAR project was the establishment of roles and relationships. As the intermediary between faculty and students, the graduate research assistant has unique access to candid thoughts and interactions. Initially, the student cohort faced confusion, unsure whether to treat the graduate student or the faculty as an authority figure. They are accustomed to traditional classroom organizations and hierarchies, making establishing the students as their leaders difficult. Attempting to pass authority away from the faculty initially fell to the graduate student. From this, one of the biggest lessons learned is establishing roles before the students begin working and articulating those roles with the student cohort. It is also helpful to ensure the undergraduate cohort is familiar with PALAR and understands the autonomy they intend to wield.

Undergraduate Researcher

In contrast to the traditional undergraduate learning experience, the use of PALAR leads to accountability for learning and encourages initiative. Because the PALAR approach is so different from what we are used to, it initially creates an uncomfortable feeling of "What do we do?". This initial uncertainty leads to a deeper level of questioning of the project's goals, what everyone's strengths are, and what is the most effective way to learn and move forward. Additionally, because this project explores inter-institutional knowledge sharing, the growing pains of adjusting to a new learning system are an excellent opportunity for students to see how they approach a situation when they are not told what to do and what life experiences and biases guide their approach.

Community Member

We will have provided real-life opportunities for the students and the community to analyze and address various challenges across the ecosystem and how to promote cultural and educational exchange and build a global community conscious of ecological farming and sustainability

practices. We are the symbolic visionaries of rebirth, hope, renewal, progress, and transformation.

Intentional community engagement

While community engagement is not novel, it is rarely explained as anything other than "helping" a (usually) disenfranchised population. Chilisa, Major, and Khudu-Petersen (2017) states, "the engagement of communities in research also helps the researcher to understand different discourses that can be used to deconstruct some of the socially constructed beliefs" (p.335). Community Engagement projects with institutions, especially PWIs, often ignore the colonial power structure, achieve something for a community, and leave without following up on progress (Grande, 2018). To counter this, it is crucial to answer and be responsible to the communities with which we form a partnership (Sasson, 2019). In addition, students must first explore and think critically about the intersections of what is Western, modern, or Indigenous and establish a sense of self-awareness and understanding of their implicit biases. From there, students will be supported to engage community stakeholders and evaluate the community's needs. Students should recognize the value of knowing as much as possible about the community and context in which they are working while also recognizing that they will never achieve cultural "competence" - "a detached mastery of a finite body of knowledge" (p.1) - which is why we emphasize cultural empathy and humility. (Tervalon & Murray-Garcia, 1998)

Wood (2019) proposes community engagement that respects all forms of cultural making by learning human ways of knowing and doing. This method will allow students to understand existing cultures and move beyond empathy by acting with compassion. Using the PALAR framework, "both undergraduate and postgraduate, learn to become critically self-reflective and to embrace democratic forms of ontology and epistemology" (Wood, 2019, p.10).

Principal Investigator

A vital resource that will assist the research team in developing authentic relationships with the community is our primary community partner. The members of the local non-profit have been in the community for over one hundred years. To ensure a successful partnership, the research team will always come from a place of empathy and reverence to communicate with the community.

Graduate Research Assistant

A vital aspect of this project derives from the location. Only half of the project team is present in the area where the tangible aspects will be built. This detail requires much traveling, remote communication, and delegation. Off-location participants must learn and understand the local community and history to contribute and engage. Correspondingly, it is helpful to budget and plan trips to visit the location and speak with relevant community leaders.

Undergraduate Researcher

To develop a living-learning lab that meets the needs of community members, student participants must first identify gaps in their knowledge and seek out community perspectives to gain a complete understanding.

The PALAR approach is an excellent tool in that once students recognize biases and gaps in knowledge, they must take steps to listen, learn, and reflect on biases. This cycle of identifying

knowledge gaps and reflecting, combined with the lack of hierarchical structure, leads to self-initiated accountability.

Community Member

This STEM-focused community-engaged project is committed to the community's long-term health, social, economic, and environmental well-being. The rural low-income and underserved communities are open to the students creating and designing value-added products to share the ways of knowing and doing things that will improve their long-term health and well-being. This project is expected to democratize innovation, increase global competitiveness, and effectively prepare the next generation of innovators and engineers for community engagement and empowerment.

Genuine Inter-institutional Relationships

While the project is led by faculty at a predominately highly resourced White R1A university, the PI is a Faculty of Color (FOC). Authentic relationships are crucial for this project. Because of this, mentor and dialogue training is an essential tool for all faculty. In this project, faculty are seen not as instructors but instead as enablers and co-facilitators for students, as it is crucial to building a connection between two individuals that promotes student growth by offering guidance, inspiration, and structure while permitting the student to be the agent of their growth (Dubois & Rhodes, 2006).

One dynamic through which systemic racism occurs is white supremacy in STEM curriculum and culture (Vakil, Sepehr & Ayers, 2019). There are countless examples of STEM pioneers who are not white. By connecting PWI students with curricula, pedagogies, and colleagues at an HBCU, we intend to disrupt these aspects of white supremacist STEM culture that can exist at both institutions (Higgins, Wallace, & Bazzul, 2018).

In addition, faculty will complete a dialogues workshop to facilitate dialogues that generate open discussion of difficult or complex topics, encourage engaged learning, and empower participants to obtain a greater awareness of all perspectives. This proposed model facilitates conversation on a specific issue or topic, encouraging students to share their experiences and speak from their perspectives while challenging them to understand why they hold a particular perspective (Aiken, Ellen, and Ramirez, 2014). Through dialogue, individuals understand all perspectives and consider differing viewpoints side-by-side (Desai, Ramirez, and Prostko, 2014). Dialogue is not an argument; while conflict does arise, the facilitator asks participants to disagree with curiosity to understand rather than attack an unfamiliar perspective. A dialogue sparks engaged learning and supports inclusive practices.

Principal Investigator

This section is fundamental for us as scholars and people who critique this very problematic aspect of so much engagement work. Our modification of the PALAR framework situates participants from both schools (students, staff, faculty) as equal partners in the co-design, co-facilitation, and co-implementation of the work. This collaborative design, facilitation, and implementation occur throughout the awarded project's life cycle, including curriculum design, pedagogy design, community engagement, publication, and recognition (e.g., any awards received). The ongoing critical reflection component of the project (i.e., student, faculty, and community reflections and ethnographic field-note writing) will be co-facilitated by partners at

both schools. We are cognizant of equitably distributing not only the work of the project but also various forms of power in the project between participants from both schools. Finally, equitable redistribution of power in this project will be a core segment of our evaluation of project success and an anticipated theme of focus in our publications.

Graduate Research Assistant

Time spent in full company is vital in the establishment of meaningful relationships. Group activities that are seemingly mundane, like icebreakers and team-building exercises, are vital in identifying common ground and building mutual respect. It is also essential to establish relationships between the project cohort and community members rather than just among participating students. Finally, we found value in beginning the year with discussions on positionality. While the project's researchers and faculty are familiar with positionality statements, many of the undergraduate students in the cohort have never written one before, and its articulation helped address bias and check privilege from the start.

Undergraduate Researcher

As with any collaborative effort, accountability is crucial. By doing individual reflection work to identify biases and showing a willingness to engage in genuine conversation with peers, students communicate to each other that they can be trusted to bring their ideas and understand the bias and privilege behind them.

Community Member

The community engagement project is built off the legacy of the Seventh Generation Principle whereby the generations before made collective decisions that would teach and protect the three generations that had come before it, its own, and the next three. One hundred years later, we continue the legacy of teaching and protecting through grit and determination. Providing a spatial response to elevate team-based interdisciplinary knowledge and stimulate ideas that promote sustainable architectural prototypes and indigenous permaculture growing practices that will also address climate change is critically necessary. The STEM-focused project design will be balanced with the Laws of Nature and in Harmony with Mother Earth. Thus, the opportunity to share the vision with two (2) higher learning institutions and participate in all critical phases of the education transformation will be an inspiring and enlightening partnership.

Conclusion

This project contains many moving pieces with nuanced relationships and dynamic goals. The PALAR framework adds another layer of complexity, establishing undergraduate students as the leaders and putting faculty in the background. Communication is a common challenge with interdisciplinary participants, varying levels of involvement, and cross-country location. Establishing roles, expectations, and goals must be articulated from the start, with equal feedback and contribution from each institution. Beyond the institutions, local community members should also receive and welcome feedback. This process will help to ensure the project results in relevant, significant contributions, and this communication will produce tangible results, meaningful community engagement, and authentic interinstitutional relationships. The lessons learned articulated in this paper are meant to provide varied perspectives of a deeply involved and complex project. While here we focus on the planning and initiation stages, future lessons learned will also include ongoing perspectives from the undergraduate students.

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