Portable Pedagogy: Teaching Computer Science Across Institutions

Lauren Herckis
CGFNS International, Inc.
Philadelphia, Pennsylvania, USA
Carnegie Mellon University (On Leave)
Pittsburgh, Pennsylvania, USA

Judeth Oden Choi
Carnegie Mellon University
Pittsburgh, Pennsylvania, USA

Abstract

We identify barriers to successful cross-sector educational research partnerships and describe effective, evidence-based strategies for overcoming challenges. We developed educational interventions and deployed them at higher education institutions. Significant challenges arose in the research-practice partnership between faculty at a research institution and a local community college. We successfully implemented strategies to advance research, co-design educational interventions, and implement them in diverse contexts. We share insights gleaned that may be useful for others forging cross-institutional research partnerships, particularly between faculty at research institutions and partners at community colleges.

CCS Concepts

• **Human-centered computing** → **Field studies**; • **Applied computing** → **Computer-assisted instruction**;

Keywords

Pedagogy; Education research; Educational technology

ACM Reference Format:
Lauren Herckis and Judeth Oden Choi. 2025. Portable Pedagogy: Teaching Computer Science Across Institutions. In *Proceedings of the 56th ACM Technical Symposium on Computer Science Education V. 2 (SIGCSE TS 2025), February 26-March 1, 2025, Pittsburgh, PA, USA.* ACM, New York, NY, USA, 2 pages. https://doi.org/10.1145/3641555.3705229

1 Background

Designing technology-enhanced teaching tools (edtech) for real-world uses is a known challenge. Most postsecondary educators create solutions to their problems. Teaching methods, tools, and approaches (collectively called pedagogies) require modification to be effective in other contexts [5]. Edtech may improve student learning but need specialized knowledge to develop [4]. Edtech that is impactful and scalable is rare because it is context-dependent. Edtech developed by technologists is less useful to naïve educators [9]. A research-practice team set out to develop edtech using cognitive tutors, collaborative learning tools, and other emerging technologies and which can support educators. As we developed edtech for community colleges, professional education, and other contexts, we faced challenges typical of cross-institutional collaborations. We overcame them with community-engaged strategies. We share challenges, strategies, and recommendations for developing complex, portable pedagogies. We contribute to the literature on research-practice partnerships in education [6].

SIGCSE TS 2025, February 26-March 1, 2025, Pittsburgh, PA, USA

ACM ISBN 979-8-4007-0532-8/25/02
https://doi.org/10.1145/3641555.3705229

2 Challenges

The research team identified skills to target with new edtech and classes where students learn those skills. The team did not have existing relationships with faculty teaching those classes. Building collaborative relationships was hard. Challenges included imbalances in power; misconceptions; poor communication; and misalignment of incentives, hierarchies, and timelines due to a lack of mutual understanding or power sharing. Community-engaged research, a democratic approach to identifying and solving problems meaningful within a community [10], eased challenges.

2.1 Imbalances in power and resources

Holden et al [6] describe "limitations in our field of view" as a significant challenge to collaboration in "lopsided" relationships. Faculty at well-resourced institutions have administrative support, institutional repositories, reliable hardware, and new software. They may also have prestige, funding, or relationships with luminaries. Collaboration strategies were not well-conceived, but the team did not know because of these limitations of perspective.

2.2 False assumptions

This limited field of view is described as "positionality" [7] in the social science literature. People make sense of their world through the lens of identity, position, and experience, and cannot easily grasp other perspectives. Project personnel held misconceptions about one another. Misconceptions about time, academic freedom, rights, and responsibilities resulted in damaged relationships.

2.3 Insufficient communication

Communications began as unidirectional: the research team invited participation, and did not find receptive partners. The research team received only coerced or perfunctory responses.

2.4 Misalignment of incentives, hierarchy, and timelines

Higher education institutions vary widely, and organizational leadership, reward structures, differences in roles of individuals with the same title can pose significant barriers to effective collaboration [1]. Teaching loads at community colleges may be heavier, and

expectations for promotion and tenure may be qualitatively and quantitatively different.

3 Evidence-Based Strategies

The challenges in community-engaged research collaborations are well-documented [3] and have been explored in postsecondary research, teaching, and service [2]. We re-envisioned the project as a community-engaged effort. We committed to (a) developing effective communication channels, (b) centering our collaborators voices and prioritizing collaborator perspectives, (c) taking time to build trust, and (4) building shared processes and power.

3.1 Clear, consistent, authentic communication

Communication is central to collaboration, but preferred modes, content, and frequency of communication are different from one context to another [6]. Partners worked together to find effective, accessible, and clear communication channels. This included more voice telephone and face-to-face conversations, fewer emails, and less asynchronous collaborative editing of documents. Frequent, personal, authentic communication is time consuming but invaluable. Communication strategies should be easy for everyone and promote open sharing of diverse forms of information.

3.2 Recognize, value, and center partner voices

Making time to communicate consistently and frequently with community partners enabled the project team to center community voices [3]. Taking into consideration the interests, constraints, perspectives, and priorities of all parties enabled the team to communicate and collaborate more effectively.

3.3 Build trust

Building a shared understanding, co-designing a research collaboration, and co-creating knowledge required that we first built trust. Trust takes time, but requires the obvious: Show up, follow through, be consistent and trustworthy. It is vital that project leaders invest time and effort in relationship-building.

3.4 Collaborate to build process and share power

Sharing power, co-designing processes, and targeting mutually beneficial outcomes are at the core of community-engaged work [8]. The team worked hard to equalize power, share resources, and make plans that would enthusiastically engage all collaborators.

4 Insights and Recommendations

The literature on community-engaged work is deep, but is not common knowledge in the CS research and education community. We hope to raise awareness of these approaches, and recommend that projects that work across contexts employ these strategies. While your project may not call for the specific strategies we employed, we have identified four recommendations that can be applied in cross-institutional research-practice partnerships.

4.1 Create structure

Develop clear, consistent, mutually agreeable communication channels. Develop culture-centered research strategies and project plans, including an explicit plan for communication and power-sharing. Discuss opportunities, barriers, and possible pathways and identify best paths forward together.

4.2 Collaboration is bilateral

Articulate values, share stories, listen actively. Interrogate your positionality and build in positive feedback loops. Collaboration may be dependent on cultural, organizational, and relational contexts in which individuals are situated. Power imbalances require empowerment in order to enable bilateral collaboration.

4.3 Foster agency

Ensure that everyone involved has the power and resources, or agency, to advance the shared effort in ways that are meaningful to them. This may mean extending additional resources to community partners. Take the time to listen and understand collaborators perspectives, and to build deep understanding and mutual support.

5 Conclusion

Our research-practice partnership only succeeded because we have incorporated community engaged practices. We recommend that all efforts to design portable pedagogies and scalable edtech make use of these critical strategies to foster effective collaboration and center community voices.

Acknowledgments

This work was funded in part by NSF grant DSES 2222762.

References

[1] Carey Borkoski and Sherri K Prosser. 2021. Developing faculty identity as a community engaged scholar: An unexamined barrier to promoting the public mission. *Re-Envisioning Higher Education's Public Mission: Global Perspectives* (2021), 77–95.

[2] Lauren Brinkley-Rubinstein, Bernadette Doykos, Nina C Martin, and Allison McGuire. 2016. *Academics in action!: A model for community-engaged research, teaching, and service.* Fordham Univ Press.

[3] Cynthia Gordon Da Cruz. 2018. Community-engaged scholarship: Toward a shared understanding of practice. *The Review of Higher Education* 41, 2 (2018), 147–167.

[4] Manfred Geiger, Lena Waizenegger, Tamsin Treasure-Jones, Christina Sarigianni, Ronald Maier, Stefan Thalmann, and Ulrich Remus. 2017. Not just another type of resistance–towards a deeper understanding of supportive non-use. (2017).

[5] Lauren Herckis. [n. d.]. PASSING THE BATON: DIGITAL LITERACY AND SUSTAINED IMPLEMENTATION. *Current Issues in Emerging eLearning, Volume 5, Issue 1: Special Issue on Leveraging Adaptive Courseware* ([n. d.]), 28.

[6] Michael Holden, Mairi McDermott, Barbara Brown, and Sharon Friesen. 2022. What Is It Like to Do Community-Engaged Research? Lessons Learned From University Researchers' Perspectives. *Journal of Community Engagement & Scholarship* 15, 1 (2022).

[7] Adrianna Kezar. 2002. Reconstructing static images of leadership: An application of positionality theory. *Journal of Leadership Studies* 8, 3 (2002), 94–109.

[8] K Schwartz, CZ Levkoe, NA Changfoot, P Ballamingie, and P Andrée. 2023. Building action research partnerships for community impact: Lessons from a national community-campus engagement project. (2023).

[9] Joel Smith and Lauren Herckis. 2018. Understanding and overcoming institutional roadblocks to the adoption and use of technology-enhanced learning resources in higher education. *Pittsburgh, PA: Carnegie Mellon University* (2018).

[10] Aaron S Zimmerman and Shirley M Matteson. 2020. Designing a Course for the Development of Community-Engaged Researchers in a College of Education. In *Preparing Students for Community-Engaged Scholarship in Higher Education*. IGI Global, 84–104.