Practitioners at the Center: Catalyzing Research on Problems of Practice in Realistic Settings

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Abstract

SEERNet's goal is to enable alignment of research on digital learning platforms to the Institute of Education Sciences' Standards for Excellence in Education Research (SEER) and thereby make research more rigorous, transparent, actionable, inclusive, and focused on consequential impacts. While researchers have long aspired to study problems of value to the field, the conception of research questions rarely is in partnership with practitioners. Without voices from the field, researchers do not have the deep understanding of educator, student, and system needs that is essential for ensuring research will impact decision making. This paper will discuss a national call for involving practitioners in research question design, strategies for partnerships with practitioners, and SEERNet's guiding principles for practitioner engagement. It will also introduce how needs and research question ideas were developed through SEERNet's Office Hours.

Introduction

The SEERNet network of nonprofit organizations, universities, and platform developers is funded by the Institute of Education Sciences (IES), born out of IES's desire to advance beyond the status quo. Responding to IES' call for a network that would leverage digital learning platforms, our SEERNet team saw an opportunity to connect research to the platforms students are using at large scale. SEERNet's goal is to enable alignment of research on digital learning platforms to IES SEER Principles and thereby make research more rigorous, transparent, actionable, inclusive, and focused on consequential impacts. To learn more about SEERNet, visit our website, www.SEERNet.org.

A major hurdle involves rethinking how research relates to practice. So often when we think about research-to-practice, we think about the translation and generalization of results and insights. SEERNet takes a different approach by targeting research on exactly the tools students are using today and working with practitioners[1] to identify the most relevant problems of practice that might be answered by analyzing data in these platforms. It's a powerful strategy that will take years to fully realize.

A key challenge is this: While researchers aspire to study problems of value to the field, the conception of research questions rarely is in partnership with practitioners. Without voices from the field, researchers do not have the deep understanding of educator, student, and system needs that is essential for ensuring research will impact decision making.

In this report, we'll discuss the following:

- A national call for involving practitioners in your design

- Overall partnership approaches

- Guiding principles for practitioner engagement based on interviews with three SEERNet Digital Learning Platforms (DLPs)

- Practitioner needs and research question ideas with respect to specific platforms, developed through SEERNet's Office Hours

A National Call For Research That Starts in the Field

The recent report from National Academies, The Future of Education Research at IES: Advancing an Equity-Oriented Science suggests some reasons for the research-to-practice disconnect. First, there is a misunderstanding of how research is used by schools in decision making. The report states that while evidence-based research is a factor in decision making, it is only one of a variety of factors and rarely the primary resource. Educators, in particular, are more likely to turn to colleagues first and seek out already curated evidence. The report cautions, "expect[ing] post-facto decision making by practitioners otherwise divorced from the production of knowledge simply does not map onto the realities of knowledge use in public education" (National Academies, 2022, p. 172).

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1 We define practitioners as any educator impacting teaching and learning. While teachers are an obvious group that comes to mind, there are also good reasons to involve instructional/technology coaches, school administrators, and representatives from district-level staff from offices such as information technology, curriculum and instruction, and research and accountability.

> "The research process needs to begin in the field—in schools and other educational settings—and should involve exploring what current constraints, resources, and needs teachers, schools, and school systems face; the range of practices and policies they have already been developing and exploring; and the variety of contexts found in schools nationwide"
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> (National Academies, 2022, p. 80).

To compound this issue, ensuring that the problems addressed in research are important to practitioners is a challenge. Research foci, practitioner needs, and decision maker priorities may not be aligned. The report states, "The research process needs to begin in the field—in schools and other educational settings—and should involve exploring what current constraints, resources, and needs teachers, schools, and school systems face; the range of practices and policies they have already been developing and exploring; and the variety of contexts found in schools nationwide" (National Academies, 2022, p. 80).

Partnerships are essential to overcoming these challenges. By engaging with policymakers, practitioners, community members, and education technology companies, researchers can better understand what's most important to stakeholders and where they see a need for knowledge. In turn, researchers can provide insight into the feasibility of addressing these needs and share where there are gaps in the research.

Frameworks and Models For Practitioner Engagement

When considering how to bring practitioners into the work of SEERNet, we considered the research on participatory design, feedback loops, Research Practice Partnerships, and Research-Practice-Industry Partnerships. They are presented here in order from relatively discrete ways to work with practitioners (participatory design and feedback loops) to more comprehensive research models (RPP and RPIP).

Participatory design promotes iterative construction of emerging designs and generates research results as co-interpreted by the researcher and participants who will use the design. This method can be described as "explore, approximate, then refine" (Spinuzzi, 2005). Participatory design draws from various research methods, such as ethnographic observations, interviews, and analysis of artifacts, etc. The design method empowers a diverse group of participants as they share their lived experiences and context, which provides an opportunity for researchers to learn from the participants and accommodate user variability to design robust and accessible social systems (Robertson & Simonsen, 2012). Because of its focus on empowerment, participatory design is strongly committed to addressing problems of practice centering equity, including relevancy, suitability, and adequacy of the design, from a practitioner's perspective. As suggested by Pelle Ehn, "Theoretically the different approaches to social systems design have their origin in rationalistics systems thinking, but transcend this framework philosophically by including the subjectivity of the users" (Pelle Ehn, 1989).

Feedback loops are another helpful concept when considering practitioner engagement. While research on approaches to creating feedback loops is still emerging, the current descriptive analysis of feedback loops

in practice provides a useful definition: feedback loops are "an interaction between two or more parties that is purposeful, bidirectional, and interactive and transforms the knowledge, actions, or goals of the engaged parties" (Baker, Weisgrau, & Bristal Philyaw, 2022, p. 4). They are purposeful because they address problems of practice—the problems that are important to practitioners in the field. They are bidirectional and transformative because the information moves between and among all involved, and through that process, new knowledge is created, new actions are taken, or new goals for the work emerge. They are iterative because those interactions help shape the feedback loops themselves.

Research Practice Partnerships (RPPs) are a research approach that brings researchers and practitioners together to study problems of practice from the field. The idea of RPPs emerged in the No Child Left Behind era as a potential way to close the research-to-practice gap (Coburn, Penuel, & Geil, 2013). At that time, RPPs were defined as intentionally fostered, long-term partnerships focused on problems of practice and committed to mutual benefit between research and practitioner. A more recent definition adds an emphasis on equity, harnessing diverse forms of expertise in engagement with research for educational improvement or equitable transformation, and intentionally shifting power dynamics so that both researcher and practitioner have a voice (Farrell et al., 2021).

RPIP: An Emerging Partnership Approach

Emerging research from the Creativity Labs at UCI builds upon the foundations of participatory design and RPP and brings industry into a partnership built around feedback loops. Research-Practice-Industry Partnerships (RPIPs) bring together authentic problems of practice and the learning sciences together with the edtech development process. RPIP may be particularly relevant to SEERNet because the DLPs fit the role of industry in RPIPs.

RPIP offers a unique value proposition for each party. Edtech developers have been able to scale products but typically without practitioner feedback or foundations in learning sciences. Researchers using a design-based approach are knowledgeable in methods for analyzing user feedback, but very few research designs scale beyond niche audiences. Practitioners have first-hand knowledge of how technologies can improve learning but lack the time to gather that information or the avenues to share that with developers. An RPIP model ensures evidence of efficacy and impact can immediately inform the development process; thereby products are more likely to be used, used well, and have a positive impact (Pautz Stephenson, Banks, & Coenraad, 2022).

RPIPs give participants the opportunity to learn from others who view the same challenge from a different perspective. Digital Promise organized a Practitioner Advisory Board as part of our partnership with Merlyn Mind, a digital assistant tool for the classroom. In reflections from participants, we heard from a practitioner who said "In teachers' college, we talked about the difference between theory and practice. Theory is the pedagogy, what people say works well, and then practice, what does it look like. You can't just have the ideas, but you also can't just be practicing without having any research base to what you're doing" (Pautz Stephenson, Banks, & Coenraad, 2022, p. 12).

Meanwhile, Evan Lock, Merlyn's vice president of business development, recognized the value of educators' perspectives. "These teachers are in a world that is so different than the technology world. I think it's easy for a technologist to forget that. Getting involved with them early and often pays huge dividends. There's

such a wealth of experiential knowledge, and it's so foreign to someone who is not a teacher" (Pautz Stephenson, Banks, & Coenraad, 2022, p. 12).

A caveat to the RPIP dynamic is that such partnerships should be built and implemented thoughtfully. Ed tech organizations and researchers need to approach and engage educators with real curiosity and interest as well as respect for the others' participation.

Learning From DLPs Experiences

In addition to examining existing frameworks and models for practitioner engagement, we also spoke with the three DLPs within SEERNet who work with K-12 educators on how they have included practitioners in their processes and projects.

Terracotta

Ben Motz, who is leading the work at Terracotta, explained that he has been working on how to collaborate with practitioners in his research for the past 10 years. However, Motz also recognizes he hasn't done this systematically or programmatically. For example, his ManyClasses project was a collaborative research endeavor investigating the generalizability of educational interventions across diverse classes. It was his most ambitious effort to involve practitioners in research, and while the method borrowed from similar research in psychology, much of the engagement strategy was slow and late in the process, rather than anticipatory.

Through that process, he's learned that working with educators requires negotiating a balance between experimental control and instructional freedom, ethical concerns of bias due to treatment, student privacy and the need for open data, reasonable incentives for teacher participation in research studies, the extent of reasonable incursion into routine practice, and whether teachers are viewed as researchers in the IRB protocol. He's explored ways of exerting the fewest possible constraints on instructional practice and only controlling (in an experimental research sense) the minimum possible set of implementation variables to achieve fidelity.

Motz has also learned the importance of documentation and support. This documentation includes a detailed "research prospectus" prior to any actual practitioner engagement (shareable with teachers and administrators) that describes the purpose, benefits, and expectations of involvement in a study and an "instructor guide," which describes each step involved. In his experience so far, practitioner engagement involves a great deal of individual support and one-on-one meetings, which makes efficiency challenging and the method difficult to scale.

ASSISTments/E-Trials

The ASSISTments team has also worked directly with practitioners in research studies. For example, ASSISTments is in the What Works Clearinghouse, based on a randomized controlled trial in which ASSISTments was used to provide online math homework support (Roschelle, Feng, Murphy, & Mason, 2016). The focus on mathematics homework arose from interacting with practitioners: They expressed that "homework" is a perennial hot button issue in their schools and that research that showed how to make homework more productive would be especially valuable. Further, they provided detailed insights on how

ASSISTments would have to be configured to support its use as a homework tool (e.g. it would have to be easier to assign textbook homework in ASSISTments). Thus the fundamental research question in the study arose out of an interaction between the ASSISTments team and practitioners.

From their work with ASSISTments, the team is now developing E-Trials, which integrates with ASSISTments and was developed to reduce the time required to conduct an educational experiment. The creators of ASSISTments are two former math teachers and have remained sensitive to teacher needs. They have not only worked with teachers to implement studies but have also included those teachers as authors on the associated publications. Here are some examples:

- Estimating the Effect of Web-Based Homework

- Improving Learning from Homework Using Intelligent Tutoring Systems

- Tutored Problem Solving vs. "Pure": Worked Examples

- Feedback During Web-Based Homework: The Role of Hints (Study 1)

- Adding Teacher-Created Motivational Video to an ITS

Carnegie Learning

Carnegie Learning (UpGrade) has engaged practitioners in two different approaches: a research project working with specific school districts and a design thinking workshop series. They received positive feedback from practitioners in both projects, which they attribute to how they emphasized the goals of the research and how they authentically connected with participants' needs, made time commitments clear and lowered barriers of effort for teachers and administrators, and compensated practitioners for their participation.

The research project involved testing whether personalizing math word problems would improve students' sense of belonging in their math class and their academic outcomes. In this study, they worked directly with three school districts from Carnegie Learning's customer base. In their recruitment meetings with districts, they described the project as work they may already be interested in by making connections to other research and asking them to share insights from their own experiences. For example, Carnegie Learning shared emerging evidence that many students feel personally disconnected from their math classroom, which impacts their sense of themselves as competent math learners. One district administrator expressed strong interest in the topic, sharing a homegrown data dashboard summarizing survey measures of students' sense of belonging. This strong resonance of the research with their interests led to a remark-ably quick turnaround of required documentation, data sharing, and more generally strong enthusiasm for the project. They also discussed how participation would benefit teachers and students, in particular how outcome measures and data might be helpful, and how the only work on the part of the teachers and administrators at the school was distributing and collecting opt-out forms from parents. Additionally, they offered a tangible incentive for participation—scholarships to Carnegie Learning's annual math practitioner conference, The National Institute (TNI). April Murphy, senior learning engineer at Carnegie Learning, said, "We realize how incredibly overburdened and challenged teachers are, so we were happy to offer a reward just for them."

In the design thinking workshops, practitioners oriented to a common approach to design thinking and then collaborated with researchers in developing prototypes of A/B testing experiments on topics such as improving motivation and engagement in math or how to address cultural relevance when teaching and learning math. To make it as easy as possible for practitioners to participate, the workshops were held either as an additional session at TNI or as online-only digital workshops. Practitioners in both types of workshop were paid a stipend for their participation, and expenses were covered for those in person. As with the research project, Carnegie Learning engaged the educators by asking them about their own experiences with students' motivational challenges and challenged them to think about cultural differences among their own students. The practitioners developed personas based on their experiences, which were used to help constrain the possible ways that A/B experiments could address the theme topics. Practitioners were thus motivated to work toward addressing these challenges in a way that was relevant to their own classroom experience and had a substantive role in creating the solution rather than positioning them as mere "helpers" to the researcher team.

SEERNet's Guiding Principles For Practitioner Engagement

Based on what we learned as described above, we have identified six principles that will guide SEERNet's strategies for centering practitioners:

1. Include practitioners with diverse backgrounds, experiences, and expertise.

2. Empower practitioners and intentionally shift power dynamics so that they have a voice, especially in research questions—as the research questions become the guiding light for the remainder of the study design.

3. Value practitioners' lived experiences; they are content and context experts and can tell you what they'll need to make a new approach work or to customize it for particular student groups.

4. Surface problems of practice and make connections between research goals and those problems, especially when designing the implementation of contrasting conditions in the study.

5. Structure feedback loops that transform the knowledge, actions, or goals of all involved as the study moves from an abstract research design into detailed project plans.

6. Consider how to disseminate findings in ways that lead to digital learning platforms being widely used, used well, and have a positive impact.

As researchers are considering these guiding principles and how they might leverage partnerships with practitioners to strengthen their studies, one important consideration is the type of research being conducted. The models we present in this paper work well in research about iterative, agile, comparative improvement as that is a major goal for SEERNet. Practitioner involvement could look different in an effectiveness or scale-up study or if the purpose of the study was primarily fundamental scientific advances. Regardless of the type of research, practitioners should help define research questions and objectives for the end result to be useful in practice.

We do not have space here to fully discuss another important issue, which is ensuring that the process leading to a partnership between researchers and educators is conducted with equity considerations front and center. In short, partnerships with practitioners and researchers often arise from particular kinds

of districts, and there are some districts that are approached by researchers more often than others. It is important that partnerships are not perpetuating some of the equity issues we see in the research field and instead are broadening participation within the education community.

Practitioner Engagement in SEERNet

Since its inception, the SEERNet team has consulted advisors who hold broad experiences and perspectives on learning research. In several instances, the work of these advisors explicitly reflects the importance of educator voice and participation in research. One advisor, Joshua Rosenberg, published a practitioner-friendly educational data science book (Estrellado et al, 2020). Another advisor, Andy Krumm, specializes in collaborative research (e.g. Edelson et al, 2020). Norma Ming, an advisor who works for San Francisco Unified School District, expressed her enthusiasm for SEERNet "because of the opportunity to shape how research is conducted to be more useful to practitioners and to build stronger networks between and across the research and practice communities" (N. Ming, personal communication, February 18, 2021).

Subsequent conversations with Rosenberg and Lauren Goldenberg, SEERNet advisor and a senior director at the NYC Department of Education, emphasized the innovative nature of educators, acknowledging that many practitioners are eager to contribute to the conversation around research. They emphasized the importance of bringing individuals to the table who are not currently involved in research, the need for mechanisms by which educators could have a voice without stifling the research process, and the need for opportunities for researchers and practitioners to work together to build relationships and improve understanding between the groups.

Based on these discussions, SEERNet plans to implement practitioner engagement strategies. We are beginning with an office hours initiative.

Learning From Practitioners Through Office Hours

Office Hours: A Conversational Series was SEERNet's first endeavor to apply the guiding principles for practitioner engagement with the network. The strategy, grounded in a participatory design approach, aimed to identify problems of practice relevant to emerging technology tools and systems. Engaging practitioners with diverse backgrounds and experience was a priority. We strategically advertised the opportunity to engage with K-12 Title I school districts, and part of registration included an interest form where participants shared their interest and expertise.

Through a series of meetings, we convened a community of practitioners and researchers to work with representatives from the five DLPs to co-design research questions based on problems of practice. Participants engaged in informal conversation to envision the future of digital learning platforms and improve equity in research and learning. Practitioners and researchers were provided with opportunities to learn about the DLPs and to share their experiences, goals, challenges, and vision for the future.

A SEERNet team researcher then synthesized each conversation to develop a draft of the research questions. A feedback loop with the participants was then implemented to refine the questions into viable research questions. The research questions will inform the community on the diverse and equity-centered research currently possible using a DLP, as well as more future-oriented research.

For example, the meeting among practitioners, researchers, and E-TRIALS representatives yielded a meaningful and engaging conversation. The conversations focused on personalization, student privacy, culturally responsive feedback and hints, and teacher support among other topics. Several research questions, based on the Common Guidelines for Education Research and Development , were generated. A sample of the research questions is listed below:

- What is the impact of individualized feedback and hints on student learning outcomes?

- What is the impact of feedback and hints on students' growth mindset?

- How does the system provide recommendations to the educator to guide their teaching and support students?

- What reward system should be implemented in the learning platform to support a diverse set of learning skills such as persistence, good study habits, and grit?

This initiative provided a dedicated space and structure to include diverse voices, envisioning that these interactions will enable platform developers to acknowledge students' diversity and accommodate learner variability. The resulting resources are available at www.seernet.org.

Conclusion

This report is the first step in a bigger conversation about how practitioners will engage in SEERNet. We believe that partnerships between researchers and policy makers, practitioners, community members, and education technology companies will lead to knowledge production that is both relevant and impactful.

We encourage researchers to consider how they might center practitioner voice in their research. This report discussed why it's essential that research begins in the field and presented four models for including educators in research: participatory design, feedback loops, RPP, and RPIP. Researchers submitting an application to join SEERNet might cite the national call for research to start in the field as reason for including practitioners and describe practitioners' involvement using one or more of the partnership approaches.

We've also shared SEERNet's guiding principles for practitioner engagement, which could be discussed in a research application. They include considerations for designing research questions, methods, data collection, and dissemination. Researchers can begin learning about practitioner needs and research question ideas with respect to specific platforms through resources generated by SEERNet's Office Hours. We encourage researchers to follow @SEERNet_org on Twitter to stay informed about the RFA and forthcoming resources.

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