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GUEST EDITORIAL

How Can the Learning Sciences (Better) Impact Policy and Practice?

"We hope, in this journal, to foster new ways of thinking about learning and teaching that will allow the cognitive sciences to have an impact on the practice of education," Janet Kolodner wrote in her inaugural editorial in the *Journal of the Learning Sciences* (Kolodner, 1991, p. 1). In subsequent decades, that emphasis has not changed. In fact, the current editors recently reminded us that this journal could be a leader in supporting real-world improvement in educational systems (Yoon & van Aalst, 2017). To nourish further growth in this area, the journal explicitly invites contributions that help us as a community understand how the learning sciences can (better) impact policy and practice.

WHAT KINDS OF CONTRIBUTIONS MIGHT HELP?

Although many studies in the learning sciences describe potential implications for policy or practice, few elaborate on how recommendations can be implemented. Even fewer studies yield theoretical understanding that can help us describe, explain, predict, or change everyday learning in light of the contexts in which it takes place. This is not entirely without reason: The field's focus is on learning. That focus could ostensibly be threatened with every surrounding layer being addressed (learning environments, teachers, schools, policies, etc.). At the same time, an isolated focus on learners and their learning would impoverish the scholarship—a fact well recognized by the

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learning sciences community. Indeed, publications in both this journal and the *International Journal of Computer-Supported Collaborative Learning* have demonstrated for two decades that the community places much value on ecologically valid research. This is a necessary but not sufficient condition for yielding societal impact.

If learning sciences research is to benefit learners beyond the scope of specific projects, then it is also necessary to attend to understanding and developing the ecologies that surround learners. As a field, we already consider variables that moderate and mediate learning in contexts based on what we know about how people learn. However, substantial social, historical, and economic factors can render our best research efforts inconsequential if we do not also attend to the factors that shape those settings. Specifically, we need to develop theoretical understanding—ranging from hypothesis generation to theory testing—that can help us understand implementation, scale, and research–practice interactions.

State of Practice Versus State of Art

Specific innovations may have the potential to yield deep learning or facilitate meaningful social experiences but will fail to reach many learners if they are not rendered practical for implementation. Those who support change (including researchers, developers, and educational leaders) are faced with an extreme challenge to create innovations within the zone of proximal implementation—that is, targeting what districts, schools, and teachers can implement realistically with sustainable amounts of guidance or collaboration (McKenney, 2013). And they must do so in ways that address their highly varied needs and circumstances as well as the diverse levels of human and material resources available.

We need research that can help us design for implementation in the here and now. This includes putting the investigation of what works, for whom, under which conditions into a broader perspective to help us understand, characterize, and attend to the highly varied needs of teachers and learners in diverse settings. For example, it has long been recognized that instructional materials that work well in one particular context (e.g., suburban schools with relatively homogeneous populations of students and a high percentage of certified teachers) may not work nearly as well in other (e.g., less supportive) contexts. We also need research to teach us how to render innovations supportive of productive adaptation (DeBarger, Choppin, Beauvineau, & Moorthy, 2014). Furthermore, better understanding of the policy implications of societal inequities that can be both reproduced and contested through learning opportunities in different kinds of settings is needed (e.g., Nasir & Vakil, 2017). Finally, doing this work requires implementation theories that can guide our analysis of the systems, resources, actors, and mechanisms that are relevant to the practicality and use of learning innovations.

Sample research questions related to this theme could be as follows:

- How is educational policy informed by research on learning, learning technology, and the complex interactions that take place in representative learning environments?
- How can learning sciences research contribute to informing major themes in current educational policy, like narrowing the gaps in educational attainment and skill levels between more advantaged and less advantaged students, notably those across racial groups and by socioeconomic status?
- To make high-quality resources available to all, how must we shape our design processes to help support learning in diverse settings?

Scale

Attending to practicality, as discussed previously, can increase the chances that new ideas and resources are taken up and used in ways consistent with intentions. Doing so at scale is not a consideration to be tackled after innovations are defined but rather an explicit goal that holds powerful implications for the designs themselves (Fishman, Marx, Blumenfeld, Krajcik, & Soloway, 2004). Yet learning at scale means more than adopting new approaches or reaching many users or regions (Dede, 2006). Ultimately, the learning sciences seek to offer high-quality learning opportunities for any learner in a given situation. In addition to studying the learning itself, this requires attending to factors that enable or inhibit that goal.

Coburn (2003) distinguished four dimensions of scale that are essential for a lasting impact on learners: (a) impact on teachers: goes beyond surface structures or procedures to alter teachers' beliefs, norms of social interaction, and pedagogy; (b) sustainability: the distribution of an innovation is only significant if its use can be sustained in adopted schools; (c) spread: expanding outward to more and more schools and classrooms but also spreading reform-related norms and pedagogical principles; and (d) shift in ownership: the reform becomes self-generative, under authority held by districts, schools, and teachers to sustain, spread, and deepen reform principles themselves. These dimensions of scale constitute critical features of implementation for both practice and policy. They are important for addressing long-term changes in approaches to learning, which learning sciences research has accomplished (e.g., Tatar, Roschelle, & Hegedus, 2014) but is rare.

Research that connects dimensions like those mentioned previously to learning processes and outcomes is severely limited yet urgently needed. Several challenges warrant tackling if that is to be changed. First, the field has developed far more theories, frameworks, and methods for studying teacher and learner outcomes than for investigating sustainability, spread, and shift in ownership. Second, learning sciences research must collectively build toward these dimensions, understanding that timelines of funded research are typically

too short for individual studies to address productively. And third, very few requests for proposals of efficacy studies appear to value dimensions other than teaching and learning outcomes. Although these dimensions of course warrant attention, conceptual, methodological, and empirical contributions are needed to help us understand and study dimensions like sustainability, spread, and shift in ownership as well as to help us lobby for research funding that explicitly targets these aspects of impact at scale. This seems crucial for influencing educational policy that can make a difference for all learners.

Sample research questions related to this theme could be as follows:

- Given that most efficacy and impact studies measure learning outcomes with less attention to the changes that enable them, how might we investigate long-term, large-scale effects on the quality of learning processes?
- How can we reliably measure sustainability, spread, and shift in ownership as outcomes of designs to support learning at scale?
- By examining the learning outcomes of large-scale initiatives, how can we inform policymakers about the effects of their funding priorities?

Research–Practice Interactions

A robust body of knowledge now exists to describe how policymakers and educators access, value, and use research (e.g., Vanderlinde & van Braak, 2010); various modes through which knowledge is generated and shared (e.g., Bauer & Fischer, 2007); and what aspects of evidence-based practice and research utilization in other fields can be applied to education (e.g., Thomas & Pring, 2004). Building on this as well as both recent and classic scholarship specifically on research–practice relationships (Coburn, Penuel, & Geil, 2013; Wagner, 1997), three broad models of research–practice interactions are well described yet undertheorized: linear, clinical, and collaborative. Each of these models plays a unique and important role in the production and use of scientific understanding worldwide. Each model could potentially serve as the basis for powerful research–practice partnerships (RPPs) that can improve stakeholder interaction and the flow of new knowledge in and across educational systems. Although practical guidelines for creating RPPs and coping with common challenges exist (Penuel & Gallagher, 2017), research is urgently needed to unpack how RPPs actually work and the mechanisms by which they foster educational improvement (Coburn & Penuel, 2016).

Linear models, also known as *science push models* (Landry, Amara, & Lamari, 2001), emphasize the primarily unidirectional flow of knowledge from research to practice (Nutley, Walter, & Davies, 2007). Central to these models is the need to make research conceptually and physically accessible to educators through various translation and dissemination efforts. Often referred to as

research development diffusion, this kind of work is responsible for most research-based curricula, assessments, and teacher professional development programs (e.g., Posner, 2004). In the past decade, the tasks of research and development have become increasingly integrated. And although the Internet has made it possible for some researchers or developers to disseminate directly, the vast majority of educational resources reach schools through commercial networks (e.g., publishers). Given the involvement of professionals and organizations with specialized skills for tackling the challenges of application and dissemination, research development diffusion is a viable mechanism for yielding impact at scale.

Clinical models, also known as *demand pull models* (Landry et al., 2001), focus on educator needs and on the contextual factors that shape the uptake and use of research-based insights and interventions. Although clinical models allow for interaction between researchers and practitioners, this interaction is sometimes limited (e.g., identification of needs and research problem, dissemination; e.g., Bauer & Fischer, 2007). Researcher and practitioner roles are retained. That is, researchers are responsible for inquiry (e.g., they collect and analyze data), and it is the work of practitioners that is the focus of inquiry. Much design-based research could be characterized as clinical, given its iterative and context-focused work. Here researchers and practitioners cooperate to design, test, and understand interventions and why they work (or not) in specific settings. The field is only just beginning to explore ways of engaging in this kind of work across multiple settings and to discern how the needs of diverse teachers and learners can be met.

Finally, collaborative models emphasize the multidirectional flow of knowledge between researchers and practitioners, each of whom brings his or her own values and perspectives while working on a shared goal (Nutley et al., 2007). Educators are actively involved in inquiry into their own practice (Bauer & Fischer, 2007), which may or may not lead to intervention design and testing. Design-based implementation research, formative interventions (Sannino, Engeström, & Lemos, 2016), and networked improvement communities, as well as some forms of lesson study and professional learning communities, are characterized by this model, which is founded on collaboration between educators, facilitated by researchers, aiming to improve practice. Although collaborative models hold promise, they seem challenging to scale because they are labor intensive and rarely benefit others besides those directly involved.

As mentioned previously, each model serves a different and important purpose and could provide a foundation for RPPs. Yet despite the fact that each model can be described, theories and methods to help us understand and optimize the workings of each are severely lacking. We may do well to leverage lenses and approaches from sister fields such as sociology, public administration, and science communication to help us better understand and improve learning-focused research–practice interactions.

Sample research questions related to this theme could be as follows:

- What enables and sustains a productive focus on how people learn within RPPs?
- Which policies productively support learning-focused knowledge sharing in different kinds of research–practice interactions?
- Based on investigation of the mutual learning processes in design-centric partnerships, how can policymakers attune requests for funding to help applicants maximize potential benefits and mitigate potential risks?

OUR SOCIETAL RESPONSIBILITY

The past two decades have witnessed a blurring of traditional distinctions between science and society. This is happening though increased societal participation in the mechanisms that guide research, including the many panels set up to assess the relevance of government-funded educational initiatives. There is also a stronger climate of accountability. Furthermore, society's voice is being heard through the increase in researcher engagement with practice. This includes gradual, yet steadily increasing funding to support more clinical and collaborative modes of research–practice interaction. But influencing policy and eventually impacting practice requires becoming extremely clear about the changes that need to be brought about (Kalil, 2017).

By encouraging scholarship on learning sciences research that can serve policy and practice, we as a community can devote even more attention to society's needs. Submissions relating to the aforementioned themes of implementation, scale, and research–practice interactions are encouraged, yet readers may also identify areas that help learning scientists realize their added value for society. Consistent with the rich tradition of the learning sciences, manuscripts are especially welcome when they spark dialogue, develop theory, or offer methodological reflections.

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