Introduction to New Frontiers in Scaling Up Research

Marisa Cannata, Vanderbilt University

Stacey Rutledge, Florida State University

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305C10023. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

2017

This is an Accepted Manuscript of an article published by Taylor & Francis in Peabody Journal of Education on October 3, 2017, available at https://doi.org/10.1080/0161956X.2017.1368629.

Abstract:

Despite progress in the identification of effective programs and practices with rigorous evidence of effectiveness, there is growing awareness that large-scale improvement of student outcomes requires more than the identification and dissemination of highly effective programs and practices. Increasingly, there are calls for school systems—and the researchers and developers who work with them—to fundamentally change their approach to educational improvement at scale. While these new approaches to scaling up effective programs and practices take many forms, they involve four interrelated themes. One, there is a shift from thinking about implementation at scale to improvement at scale. Two, there is a shift from focusing on scale as outcome to the process of scaling itself. Three, there is a theme around how to deal with adaptation of reform. Four, there are tensions around defining the community of practice for reform. This article outlines current scholarship on scaling up educational reform through these themes and introduces the articles in this special issue, which offers additional theoretical and empirical perspective on scaling up.

Introduction to New Frontiers in Scaling Up Research

In 2002, Congress passed the Education Sciences Reform Act (ESRA), which created the Institute of Education Sciences and dramatically changed how the federal government funded education-related research. With its focus on "scientifically valid research," ESRA saw the goal of educational research to use rigorous methods to identify and evaluate "educational practices that support learning and improve academic achievement" and disseminate those practices to state and local school systems (ESRA, 2002, sec. 111). In particular, with an emphasis on experimental design in education research, "ESRA was almost entirely focused on the *production* of high-quality research rather than on its *translation for practice*" (Cohen-Vogel et al., 2015, p. 261). Since then, education research has prioritized the identification of effective practices through rigorous testing using experimental and quasi-experimental methods, and disseminating those findings to educators.

Practitioners have access to these findings through the over 10,000 studies in the What Works Clearinghouse database that presents programs that meet rigorous evidence standards and have demonstrated a positive impact on a variety of student outcomes. For example, there are over 40 programs with rigorous evidence of positive effects on literacy outcomes and fifteen programs with proven effectiveness in improving outcomes for students with disabilities. In addition, practitioners can filter to find research on these programs that match their student population. This emphasis on the need to identify programs and practices with evidence of improving student outcomes is also reflected in the 2016 Every Student Succeeds Act, which encourages states and districts to adopt evidence-based practices.

Despite this progress in the identification of effective programs and practices with rigorous evidence of effectiveness, there is growing awareness that large-scale improvement of student outcomes requires more than the identification and dissemination of highly effective programs and practices. Increasingly, there is a recognition that adopting a program found effective in one context, may face challenges including the building internal ownership and the capacity to implement and sustain in other contexts. Research on past efforts to scale up effective programs and practices have highlighted how complex this challenge is as implementers attend to building teacher support and participation, aligning with the organizational context, and building capacity among stakeholders across organizational levels (Berends, Bodilly, & Kirby, 2002; Datnow, Hubbard, & Mehan, 2002; Glennan, Bodilly, Galegher, & Kerr, 2004). These processes are important as educators may consider programs to be irrelevant for their own context or experience difficulty with implementation (Coburn & Turner, 2011; Fishman, Penuel, Allen, & Cheng, 2013). Despite this substantial research base on implementation and scale, new reform efforts often repeat the same challenges (Payne, 2008), leading to calls that school systems—and the researchers and developers who work with them—need to fundamentally change their approach to educational improvement at scale to incorporate continuous improvement and research-practice partnerships (Bryk, Gomez, Grunow, & LeMahieu, 2015; Cohen-Vogel et al., 2015).

This issue brings together research on these new approaches to scaling educational programs, polices, and practices. In the articles, authors focus on how organizational and social contexts shape how, and for whom, reforms work (Bryk, Gomez, Grunow, & Hallinan, 2011; Coburn, Honig, & Stein, 2009; Means & Penuel, 2005). These new approaches to scale have taken several overlapping forms, including bringing improvement science structures and

processes into education, design-based implementation research, and research-practice partnerships (Bryk et al., 2015; Coburn, Penuel, & Geil, 2013; Cohen-Vogel, Cannata, Rutledge, & Socol, 2016; Penuel, Fishman, Cheng, & Sabelli, 2011). What these efforts share is a focus on improvement at scale that requires researchers and educators to work in partnership to design, implement, and scale education innovations (Penuel et al., 2011).

While these new approaches to scaling up effective programs and practices take many forms, they involve four interrelated themes. One, there is a shift from thinking about implementation at scale to improvement at scale. Two, there is a shift from focusing on scale as outcome to the process of scaling itself. Three, there is a theme around how to deal with adaptation of reform. Four, there are tensions around defining the community of practice for reform. We examine each in turn.

Implementation—or Improvement—At Scale

Early research on achieving scale in educational reform focused on scaling individual programs, practices, or reforms. That is, there was an assumption that after the identification of a program or reform's effectiveness in one context, the main challenge was getting more districts, schools, and teachers to implement that same practice. Scale became synonymous with the number of schools or classrooms implementing the practice and scale-up research was focused on how to expand the reach of effective practices (Glennan et al., 2004; S. K. McDonald, Keesler, Kauffman, & Schneider, 2006). This is not to imply that researchers working under this banner saw scale-up as a simple process. Indeed, substantial research highlighted the challenges of getting large numbers of educators to implement the studied practice with depth and fidelity, including building internal support for the practice, building capacity among stakeholders, and negotiating local resources and politics for implementation (Berends et al., 2002; Glennan et al.,

2004; J. P. McDonald, Klein, & Riordan, 2009). For example, a comprehensive review of scale-up research outlined a framework of interactive supports that classroom teachers need from the school, district, and reform developer for effective implementation at scale (Bodilly, Glennan, Kerr, & Galegher, 2004).

As the conversation about scale began to recognize that current frameworks needed to move beyond program reach (Bodilly et al., 2004; Schneider & McDonald, 2006), Coburn (2003) further shifted the conversation by developing a framework of scale with four central features: depth, spread, shift in ownership, and sustainability. That is, achieving scale for Coburn required not only attending to how many schools or classrooms are implementing the practice, but investigating the extent to which those classrooms are enacting a deep and lasting change in core patterns of interactions and norms of engagement. Dede (2006) added evolution to this framework, to highlight how the practice that is being scaled can itself change through the scale-up process as the developers respond to adaptations enacted by educators.

Increasingly, scholars who study educational reform and scaling up recognize that the goal of reform is not to faithfully implement a given program, but to improve educational outcomes. For example, Sabelli and Harris call this a shift from transfer of specific practices to a transformation of practice and argue that "the ultimate goal of scaling up is sustainable educational improvement rather than to merely expand the use of a given educational innovation" (Sabelli & Harris, 2015, p. 14). With this shift comes the realization that scaling up an innovation requires a focus not only on concrete practices, but the powerful ideas and theory of change behind the practices (Bradach, 2003; Elmore, 2016). Elmore reflects on his decades of work trying to scale educational reforms by noting, "'scale' for its own sake is less important than demonstrating that powerful ideas work in diverse environments" (Elmore, 2016, p. 533).

When educators understand the theoretical and empirical foundations behind a program, their context-specific adaptations are more likely to enhance rather than detract from the theory of change. Sabelli and Harris write, "It is the set of ideas or principles behind the intervention and the process of implementing those principles that will allow new implementers to do justice to the intentions of developers and researchers" (2015, p. 27).

Researchers who study implementation and scale have long noted that educators adapt programs as they implement them (Datnow & Park, 2009; McLaughlin, 1976; Siskin, 2016). Shifting to a focus on improvement at scale involves a further shift to the goal of adaptive integration. That is, re-focusing on educational improvement at scale means recognizing that improvement comes from integrating new practices with existing systems, as educators take the effective practices, or standard work process, that are being scaled and "integrate a standard work process into new contexts" (Hannan, Russell, Takahashi, & Park, 2015, p. 496). This process of adaptive integration requires building collective knowledge about how practices lead to educational outcomes (Hannan et al., 2015; Lewis, 2015).

Shift from Outcomes to Process of Scale

A second key shift in research on scale in education is from a focus on the outcomes of scale to the processes of scaling. This shift is evident in research questions that move from "to what extent has a given program or practice achieved scale?" to "what supports, processes, and infrastructure contributed to the scaling of a particular program or practice?" For example, a recent special issue of the *Journal of Educational Change* focused on "Bringing Effective Instructional Practice to Scale" highlighted the processes established by six instructional reforms that were successfully scaled up. For example, a description of Ontario's decades-long improvement effort described how they evolved from a focus on professional development based

on the assumption of giving teachers knowledge they lack to a focus on professional learning that motivates change in teacher's instruction from close reflection on student learning (Gallagher, Malloy, & Ryerson, 2016). Across these case studies of improvement at scale, there is an emphasis on a deep change in the culture of learning, local ownership of the learning agenda, and a system of continuous improvement (Fullan, 2016).

Research on the process of achieving scale has emphasized the need for system infrastructure to support and sustain improvement efforts. Infrastructure is the "set of interconnected elements that facilitate integrated development of an initiative, provide a continuing narrative, create shared responsibility for its implementation, and facilitate sustainability" (Sabelli & Dede, 2013, p. 465). In short, infrastructure provides opportunities for practitioners at different levels of an organization to engage with and support each other (Scherrer, Israel, & Resnick, 2013). Infrastructure can include formal structures, frameworks or theories, policies, and culture in which the reform practices are enacted, and can both support and constrain improvement (Hopkins & Woulfin, 2015). When infrastructure is lacking or not aligned with the improvement effort, practitioners experience more challenges (Peurach, 2016). While specific structures to support the improvement work are needed to create a shift in the organization, the role of the structures become more complex once the shift has begun (Gallagher et al., 2016). School systems often lack sufficient infrastructure to support educational improvement and need the help of external partners (Peurach & Neumerski, 2015).

This focus on the process of scaling also draws attention to the relationship between the practice that is being scaled and the particularities of the contexts into which it is being scaled (Thompson & Wiliam, 2008). Cohen and colleagues (2013) emphasize that successes and challenges of school improvement come from interrelationships between the innovations that

would be scaled, the schools that would implement them, the organizations that created the innovations, and the environments in which the schools were situated. To be effectively scaled up, innovation designs need to accommodate implementation in school conditions that are less than ideal (Clarke & Dede, 2009). While past efforts to scaling up have taken a hierarchical approach, more recent efforts have a relational approach, where the goal is to engage practitioners as active participants rather than passive recipients of reform knowledge (Hartmann & Linn, 2008). Indeed, this need for active engagement and attention to context of improvement is critical to recent calls for research-practice partnerships, improvement science, and design-based implementation research (Bryk et al., 2011; Coburn & Penuel, 2016; Fishman et al., 2013).

Adaptation and Scale

With this focus on local context in the process of scaling, research on scale attends to questions of adaptation. Historically, reforms that achieved the most scale in terms of number of schools and classrooms are those that practitioners feel are very adaptable (Cuban, 1998). Yet traditional approaches to studying implementation and scale focus on fidelity to the innovation design. More recent scholarship on scaling up, however, recognizes that adaptations can succeed or fail, with the innovations themselves evolving as the designers revise the theory of change as they observe how the innovation is adapted into specific contexts (Dede, 2006). Literature on scaling in business also recognizes the power of adaptations, as innovations can be used in novel ways and the process of improvement is never finished (Furr & Ahlstrom, 2011; Sutton & Rao, 2014).

As scaling up shifts from the transfer of a specific program to the adaptive integration of effective practices into new contexts (Hannan et al., 2015), there is a greater need for improvement efforts to help practitioners understand not only the innovation itself, but the theory

behind the innovation (Thompson & Wiliam, 2008). By combining the "know-how" with the "know-why", practitioners can adapt reforms in ways that stay true to the underlying theory of change. Further, providing both the innovation and the theory of change can help practitioners achieve the right balance in adaptation and integrity to core innovation practices. The combination of innovation and theory of change helps to provide the specificity that provides clarity without being overly prescriptive (Fullan, 2016).

Communities for Scaling

A fourth theme in the recent scholarship on scale is a focus on developing communities or networks to achieve scale. Elmore (2016) suggests that since education is a people-oriented profession, large-scale educational improvement comes from establishing powerful learning communities that engage around central ideas of practice. Similarly, a culture of learning, participatory environment, and shared responsibility for success was central to Ontario's improvement (Gallagher et al., 2016). Indeed, all forms of new approaches to scale include some type of network or partnership (Coburn & Penuel, 2016; Cohen-Vogel et al., 2016; Fishman et al., 2013; LeMahieu, Grunow, Baker, Nordstrum, & Gomez, 2017).

One reason that networks and communities are important to achieving scale is that improvement requires addressing a problem from multiple angles. The problems that face our educational system are deep and complex, requiring diverse perspectives and types of expertise, to see whole systems (Bradach, 2003; Bryk et al., 2015). Partnerships allow individuals and organizations with different forms of expertise to align their efforts and increase the likelihood of success (Bryk et al., 2011). Further, organizational learning that facilitates adaptive integration requires continuously engaging multiple stakeholders in a process of ongoing feedback (Chambers, Glasgow, & Stange, 2013). Systemic improvement requires the engagement of both

top-down and bottom-up ways of interacting to engage all levels of an organization (Fullan, 2016).

Another reason that learning communities are important for achieving scale is that improvement work is hard and messy; many scaling up efforts involves muddling through (Elmore, 2016; Sutton & Rao, 2014). Navigating this uncertainty and complexity requires continuous collaboration and learning among practitioners and those developing the innovation (Peurach, 2016). Practitioners need to try new reforms, collect evidence on their effectiveness in that context, and iterate (Hannan et al., 2015; LeMahieu et al., 2017). By collecting and analyzing context-specific evidence, partnerships can improve both the innovation practices and the system that supports their implementation (Penuel et al., 2011). Communication through networks can feed back into the innovation itself (Dede, 2006), evolving and improving the innovation for all members of the network.

Frameworks and Empirical Evidence for Scale-up in This Volume

The articles in this volume bring together frameworks and empirical evidence from four different scale-up efforts, drawing attention to the process of scaling up. In the first two articles, authors present frameworks for understanding different elements of the complex work of scaling. In subsequent articles, the authors provide evidence of the processes and challenges relating to scale. Four of the six articles draw from the work of the National Center on Scaling Up Effective Schools, which use a similar scaling up model in two districts. All the articles emphasize, to different degrees, the four themes outlined here.

Cannata, Cohen-Vogel, and Sorum describe the role of network communities in the partnership between the National Center on Scaling Up Effective Schools and Fort Worth Independent School District (FWISD) to build student ownership and responsibility (SOAR).

They provide an in-depth look at a research-practice partnership that strives to both take advantage of local expertise and build local ownership to scale and sustain effective practice. They first situate their partnership in the research on networked improvement communities by identifying several types of improvement communities currently operating in educational systems and defining the key features of improvement communities. They then provide a specific example of the improvement community established in their partnership and describe the organizational structures, personnel, and roles of the individuals involved, highlighting how these structures help to enact the partnership.

By describing the organizational features of the partnership and roles of various partners, they provide several insights and implications for both researchers and practitioners who want to engage in this kind of formal collaboration. While the partnership created opportunities and benefits for participants, there were also a number of challenges, such as needing to adjust to new roles and work across institutional and organizational boundaries. Further, understanding the role of practitioners in this partnership highlighted the need for organizational infrastructure that engages them across levels. That is, their partnership highlights that there is no single "practitioner" role in a partnership, but a variety of roles that engage in districtwide improvement efforts in a different ways.

One challenge of new approaches to research on scaling up is that it is not clear where "implementation" ends and "scaling up" begins. That is, by defining scale as, partly, about achieving depth of change of practice, implementation and scale can be placed on a continuum that begins with the identification of effective practices and concludes when the reform is at scale. New conceptualizations of scale challenge traditional implementation frameworks, and thus ways to study implementation, when adaptive integration and continuous improvement

replace fidelity as a core goal. Redding, Cannata, and Taylor Haynes reconceptualize implementation with scale in mind. The conceptual framework in this article puts forward a model for continuous improvement that integrates design, development, and implementation.

Rubin, Goldring and Patrick examine initial implementation of the Center's teacher-driven school re-culturing program in two high schools in one partner district. They examine two distinct components to understand the extent of early implementation at the two schools: the nature of program practices, and how its goals and practices align with teachers' existing practices and pedagogical beliefs. Through this analysis, they reflect on research on the scaling process that emphasizes the interrelatedness of innovation practices and context in which it is implemented, as well as the challenges of adaptation. They highlight the tension between encouraging immediate uptake of program practices, and the long-term goals of school-wide institutionalization. In particular, they find that prescriptive practices, and those that are already aligned with teachers' beliefs and perspectives about teaching, can be implemented with little pre-existing capacity and may lead to more consistent and quicker initial implementation, but this type of implementation may not encourage sufficient understanding of the program goals, and may inhibit the diffusion of practices moving forward. Complex and abstract concepts require a greater degree of skills, knowledge and understanding on the part of teachers.

Also drawing from the experiences of the National Center on Scaling Up Effective Schools, Rutledge, Brown and Petrova analyze a reform intentionally designed with scale in mind in a large urban district in Florida. They explore the scaling of personalization for academic and social emotional learning (PASL), an initiative aimed at integrating academic and social emotional activities in high schools. They find that district and school administrators and teachers embraced the theory of action of PASL, illustrating a strong depth of belief as well as

sustainability and spread with the ideas of personalization. While each school integrated the components of PASL, adapting them to their own local needs and context, stakeholders were selective in their utilization of the specific routines and practices related to the reform, with schools either identifying previous initiatives as PASL or only engaging with reforms at a surface level. Engaging in the explicit and intentional practices of adaption through the quarterly plan-do-study-act helped school and district administrators and teachers build ownership and support for PASL, but leadership still had a strong role to play in the depth of implementation. Their findings suggest that intentional and iterative reform helps to build support and provides empirical insight into the process of adaptation and evolution in the scaling process.

Wilcox, Lawson and Angelis also describe the organization and processes of a research-practice partnership called COMPASS-AIM, which is focused on improving organizational, team, and individual competencies for school improvement through continuous improvement strategies. Their paper illustrates the central role that research-practice partnerships can play in scaling in reforms into schools and scaling up into other schools. It also describes the positive reception by school participants in a scaling out process using improvement science. They find that the individuals and teams at the schools embraced the continuous improvement processes and felt that the COMPASS-AIM efforts helped them meet their school improvement goals. They find that the scaffolding provided by COMPASS-AIM supported schools as they implemented new organizational routines. In turn, this enabled schools to be more open to organizational change as schools scaled in and out their chosen reforms. The paper provides specific strategies from research-practice partnerships implementing a research-utilization focus.

The last article, by Newman, Zacamy, Lazarev, and Lin, comes from an evaluation of an Investing in Innovation project focused on scaling up a Reading Apprenticeship program. This

empirical investigation of the school processes that promote the scaling-up of a high school academic literacy framework represents how research can both study the outcomes of scale (i.e., the extent to which a program was enacted in a large number of classrooms) with the processes that facilitate scaling up. By following four cohorts of schools implementing the program across multiple years, they saw variation in the extent to which schools gained or lost teacher engagement in the program. To understand what contributed to successful scale up, defined as gaining teacher engagement, they took advantage of this variation and information on school characteristics and implementation variables.

They found that initial teacher engagement and school-wide commitment predicted "scaling-in" within schools. This reflects the importance of communities and building local ownership in the scaling process. In particular, the main predictor of gaining teacher engagement in future years is early teacher ownership to making the program successful in their school, even more than fidelity to practices in their own classroom. The program developers had a theory of change that involved using a site-based team work to extend professional development impact and thus the innovation included processes to empower local teams. Ultimately, having teachers across disciplines engaged in the program and the support provided by school-based teacher leaders were critical in scaling the Reading Apprenticeship program.

Together, the articles in this issue provide theoretical and empirical perspectives on the emerging approaches to scaling up educational reform. They point to the importance of both the scaling process itself and the enactment and specification of new organizational routines. Ultimately, it is integrating these two components—learning communities focused on enacting specific change ideas—that are necessary for effective improvement at scale.

References

Berends, M., Bodilly, S., & Kirby, S. N. (2002). *Facing the challenges of whole-school reform: New American Schools after a decade*. Santa Monica, CA: RAND. Retrieved from http://www.rand.org/pubs/research_briefs/RB8019/index1.html

Bodilly, S., Glennan, T. K., Kerr, K. A., & Galegher, J. R. (2004). Framing the problem. *Expanding the Reach of Education Reforms: Perspectives from Leaders in the Scale-up of Educational Interventions. Santa Monica, CA: Rand Corporation*.

Bradach, J. (2003). *Going to Scale: The Challenge of Replicating Social Programs* (Stanford Social Innovation Review). Stanford, CA: Stanford University. Retrieved from https://ssir.org/images/articles/2003SP_feature_bradach.pdf

Bryk, A. S., Gomez, L., Grunow, A., & Hallinan, M. T. (2011). Getting Ideas into Action: Building Networked Improvement Communities in Education. In *Frontiers in Sociology of Education*. Springer Publishing.

Bryk, A. S., Gomez, L. M., Grunow, A., & LeMahieu, P. G. (2015). *Learning to Improve: How America's Schools Can Get Better at Getting Better*. Cambridge, MA: Harvard Education Press.

Chambers, D. A., Glasgow, R. E., & Stange, K. C. (2013). The dynamic sustainability framework: Addressing the paradox of sustainment amid ongoing change. *Implementation Science*, *8*, 117.

Clarke, J., & Dede, C. (2009). Design for Scalability: A Case Study of the River City Curriculum. *Journal of Science Education and Technology*, *18*(4), 353–365.

Coburn, C. E. (2003). Rethinking Scale: Moving Beyond Numbers to Deep and Lasting Change. *Educational Researcher*, *32*(6), 3–12. https://doi.org/10.3102/0013189X032006003

Coburn, C. E., Honig, M. I., & Stein, M. K. (2009). What's the evidence on districts' use of evidence? In J. D. Bransford, D. J. Stipek, N. J. Vye, L. M. Gomez, & D. Lam (Eds.), *The role of research in educational improvement* (pp. 67–88). Cambridge, MA: Harvard Education Press.

Coburn, C. E., & Penuel, W. R. (2016). Research–Practice Partnerships in Education Outcomes, Dynamics, and Open Questions. *Educational Researcher*, *45*(1), 48–54. https://doi.org/10.3102/0013189X16631750

Coburn, C. E., Penuel, W. R., & Geil, K. E. (2013). *Research-Practice Partnerships: A Strategy for Leveraging Research for Educational Improvement in School Districts*. New York, NY: William T. Grant Foundation.

Coburn, C. E., & Turner, E. O. (2011). Research on Data Use: A Framework and Analysis. *Measurement: Interdisciplinary Research and Perspectives*, *9*(4), 173–206. https://doi.org/10.1080/15366367.2011.626729

Cohen, D. K., Peurach, D. J., Glazer, J. L., Gates, K. E., & Goldin, S. (2013). *Improvement by Design: The Promise of Better Schools*. Chicago ; London: University Of Chicago Press.

Cohen-Vogel, L., Cannata, M., Rutledge, S., & Socol, A. R. (2016). A Model of Continuous Improvement in High Schools: A Process for Research, Innovation Design, Implementation, and Scale. *Teachers College Record*, *116*(13), 1–26.

Cohen-Vogel, L., Tichnor-Wagner, A., Allen, D., Harrison, C., Kainz, K., Socol, A. R., & Wang, Q. (2015). Implementing Educational Innovations at Scale Transforming Researchers Into Continuous Improvement Scientists. *Educational Policy*, 0895904814560886.

Cuban, L. (1998). How Schools Change Reforms: Redefining Reform Success and Failure. *Teachers College Record*, *99*(3), 453–77.

Datnow, A., Hubbard, L., & Mehan, H. (2002). *Extending Educational Reform: From One School to Many* (1st ed.). Routledge.

Datnow, A., & Park, V. (2009). Conceptualizing policy implementation: Large-scale reform in an era of complexity. In G. Sykes, B. Schneider, & D. N. Plank (Eds.), *Handbook of Education Policy Research* (1 edition, pp. 348–361). New York : Washington, D.C.: Routledge.

Dede, C. (2006). Scaling up: Evolving innovations beyond ideal settings to challenging contexts of practice. In R. K. Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences* (pp. 551–566). Cambridge, UK: Cambridge University Press.

Elmore, R. F. (2016). "Getting to scale…" it seemed like a good idea at the time. *Journal of Educational Change*, *17*(4), 529–537. https://doi.org/10.1007/s10833-016-9290-8

ESRA, Pub. L. No. 107–3801, § 111 (2002).

Fishman, B. J., Penuel, W. R., Allen, A.-R., & Cheng, B. H. (2013). *Design-based implementation research: theories, methods, and exemplars*. New York: National Society for the Study of Education.

Fullan, M. (2016). The elusive nature of whole system improvement in education. *Journal of Educational Change*, *17*(4), 539–544. https://doi.org/10.1007/s10833-016-9289-1

Furr, N. R., & Ahlstrom, P. (2011). *Nail It then Scale It: The Entrepreneur's Guide to Creating and Managing Breakthrough Innovation* (First Edition, June 2011 edition). United States? NISI Institute.

Gallagher, M. J., Malloy, J., & Ryerson, R. (2016). Achieving excellence: Bringing effective literacy pedagogy to scale in Ontario's publicly-funded education system. *Journal of Educational Change*, *17*(4), 477–504. https://doi.org/10.1007/s10833-016-9284-6

Glennan, T. K., Bodilly, S. J., Galegher, J. R., & Kerr, K. A. (2004). *Expanding the Reach of Education Reforms: Perspectives from Leaders in the Scale-Up of Educational Interventions* (1st ed.). Rand Publishing.

Hannan, M., Russell, J. L., Takahashi, S., & Park, S. (2015). Using Improvement Science to Better Support Beginning Teachers: The Case of the Building a Teaching Effectiveness Network. *Journal of Teacher Education*, *66*(5), 494–508. https://doi.org/10.1177/0022487115602126

Hartmann, A., & Linn, J. (2008). *Scaling Up: A Framework and Lessons for Development Effectiveness From Literature and Practice* (No. Working paper 5). Washington, D.C.: Wolfensohn Center for Development at Brookings. Retrieved from https://www.brookings.edu/wp-content/uploads/2016/06/10_scaling_up_aid_linn.pdf

Hopkins, M., & Woulfin, S. L. (2015). School system (re)design: Developing educational infrastructures to support school leadership and teaching practice. *Journal of Educational Change*, *16*(4), 371–377. https://doi.org/10.1007/s10833-015-9260-6

LeMahieu, P. G., Grunow, A., Baker, L., Nordstrum, L. E., & Gomez, L. M. (2017). Networked Improvement Communities: the discipline of improvement science meets the power of networks. *Quality Assurance in Education*. https://doi.org/10.1108/QAE-12-2016-0084

Lewis, C. (2015). What is improvement science? Do we need it in education? *Educational Researcher*, *44*(1), 54–61. https://doi.org/10.3102/0013189X15570388

McDonald, J. P., Klein, E. J., & Riordan, M. (2009). *Going to scale with new school designs: Reinventing high school*. New York: Teachers College Press.

McDonald, S. K., Keesler, V. A., Kauffman, N. J., & Schneider, B. (2006). Scaling-up exemplary interventions. *Educational Researcher*, *35*(3), 15–24.

McLaughlin, M. W. (1976). Implementation as Mutual Adaptation: Change in Classroom Organization. *Teachers College Record*. Retrieved from http://www.eric.ed.gov/ERICWebPortal/detail?accno=EJ135285

Means, B., & Penuel, W. R. (2005). Scaling Up Technology-Based Educational Innovations. In C. Dede, J. P. Honan, & L. C. Peters (Eds.), *Scaling Up Success : Lessons Learned from Technology-Based Educational Improvement* (1st ed., pp. 176–197). Jossey-Bass.

Payne, C. M. (2008). *So Much Reform, So Little Change: The Persistence of Failure in Urban Schools* (Third Printing, 2010 edition). Cambridge, Mass: Harvard Education Press.

Penuel, W. R., Fishman, B. J., Cheng, B. H., & Sabelli, N. (2011). Organizing Research and Development at the Intersection of Learning, Implementation, and Design. *Educational Researcher*, *40*(7), 331–337. https://doi.org/10.3102/0013189X11421826

Peurach, D. J. (2016). Innovating at the Nexus of Impact and Improvement: Leading Educational Improvement Networks. *Educational Researcher*, *45*(7), 421–429. https://doi.org/10.3102/0013189X16670898

Peurach, D. J., & Neumerski, C. M. (2015). Mixing metaphors: Building infrastructure for large scale school turnaround. *Journal of Educational Change*, *16*(4), 379–420. https://doi.org/10.1007/s10833-015-9259-z

Sabelli, N., & Dede, C. (2013). Empowering design-based implementaiton research: The need for infrastructure. In B. J. Fishman, W. R. Penuel, A.-R. Allen, & B. H. Cheng (Eds.), *Design-based implementation research: theories, methods, and exemplars* (pp. 464–480). New York: Teachers College, Columbia University.

Sabelli, N., & Harris, C. J. (2015). The Role of Innovation in Scaling Up Educational Innovations. In C.-K. Looi & L. W. Teh (Eds.), *Scaling Educational Innovations*. Singapore: Springer.

Scherrer, J., Israel, N., & Resnick, L. B. (2013). Beyond classrooms: Scaling and sustaining instructional innovations. In B. J. Fishman, W. R. Penuel, A.-R. Allen, & B. H. Cheng (Eds.), *Design-based implementation research: theories, methods, and exemplars* (pp. 426–442). New York: Teachers College, Columbia University.

Schneider, B., & McDonald, S.-K. (Eds.). (2006). *Scale-Up in Education: Ideas in Principle*. Rowman & Littlefield Publishers.

Siskin, L. S. (2016). Mutual Adaptation in Action. *Teachers College Record*, *118*(13), 1–18.

Sutton, R. I., & Rao, H. (2014). *Scaling Up Excellence: Getting to More Without Settling for Less* (1 edition). New York: Crown Business.

Thompson, M., & Wiliam, D. (2008). Tight but loose: A conceptual framework for scaling up reforms. In E. C. Wylie (Ed.), *Tight but loose: Scaling up teacher professional development in diverse contexts* (pp. 1–44). Princeton, NJ: ETS.