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Research Committee

Positioning Mathematics Education Researchers to Influence Storylines

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In this commentary, we identify key influences on mathematics education that are largely outside the domain of the academic world in which most mathematics education researchers live. The groups that we identify—including the media, companies and foundations, and other academic domains—affect the public's perception of mathematics and mathematics education. Identifying this set of influences in particular is important because these groups often shape policymakers' viewpoints and decisions, but there is not always agreement between mathematics education researchers and these groups about the ways in which mathematics and mathematics education are framed. Whenever a conflict is brought to the foreground, it can be difficult to raise issues without appearing defensive or sounding querulous. It is helpful, then, to bring to bear a theory that can help us interpret this reality (Mewborn, 2005); theories can provide a way to encode, read, and examine a problem as well as offer insights into the design of new practices (Silver & Herbst, 2007). In this case, we use positioning theory to examine potential conflicts between mathematics education researchers and other groups because it offers interesting interpretive insights into the phenomenon and because it can lead to potential strategies for working toward different positionings for mathematics education researchers. We begin by explaining relevant ideas from positioning theory, including storylines, positions, and communication actions. We then use these ideas to highlight current storylines underlying communication by the above-mentioned groups about mathematics and mathematics education and trace some of their historical and contextual roots. We argue that mathematics education

researchers can intervene to shift these storylines and positionings and to have greater impact on policy, practice, and public perception in the future. Finally, we end by offering specific suggestions for beginning this work.

Positioning Theory

Researchers use positioning theory to explore the underlying presumptions that support misunderstandings, arguing that such an analysis can aid in understanding their origin. Positioning theory has been applied to analyze and interpret a range of types of conflicts, including intrapersonal and interpersonal conflicts between people and groups of various sizes (see Moghaddam, Harré, & Lee, 2008; Harré & Slocum, 2003). Positioning theory has also had a growing presence in mathematics education research in the past 10 years (e.g., Enyedy et al., 2008; Esmonde & Langer-Osuna, 2013; Herbel-Eisenmann & Wagner, 2010; Mesa & Chang, 2010; Pinnow & Chval, 2015; Turner, Dominguez, Maldonado, & Empson, 2013; Yamakawa, Forman, & Ansell, 2009).

Positioning theory draws on social psychology (Harré & Slocum, 2003)[1] and feminist studies (see Davies & Harré, 1999) to describe a way to study "local moral orders as ever-shifting patterns of mutual and contestable rights and obligations of speaking and acting" (Harré & van Langenhove, 1999, p. 1). It does not assume, however, that everyone in an interaction has equal access to rights and duties to perform any action (Harré, 2012). It relies on the analysis of three critical constructs: communication acts, positionings, and storylines. Communication acts account for a range of semiotic resources used in human communication (e.g., utterance, gesture, gaze, proximity, style of argument) to understand the meanings that are mutually constituted in interactions (Herbel-Eisenmann, Wagner, Johnson, Suh, & Figueras, 2015).

When people engage in communication acts, the meanings are shaped by "what the various people involved in a social episode believe that persons of this or that category are entitled to say and do" (Harré & Slocum, 2003, p. 102). These kinds of entitlements relate to the second key construct: *positionings*, or the types of rights and duties people draw on as they interact. A teacher, for example, has different rights and duties in a classroom than do students. Acts of positioning are immanent, reciprocal, contingent, and contestable (cf. Wagner & Herbel-Eisenmann, 2009). In many cases, participants who are interacting find the rights and duties that are construed in the interactions acceptable, and the interactions continue without recognition of the positioning. In other cases, however, there is a disagreement about the rights and duties, and the positioning comes under negotiation between participants.

The third key construct is *storyline*. Because every utterance and action can be

[1] This new social psychology has been described as focusing on "the systematic study of the creation and management of meanings" (Harré & Slocum, 2003, p. 100), as opposed to the version of social psychology that searched for "the conditions in which enduring cognitive states, such as attitudes or prejudices, come to exist" (Harré & Slocum, 2003, p. 101).

used to perform several different communication acts, their interpretations depend on the storyline that speakers take to be in use. A storyline tends to be a broad, culturally shared narrative that acts as the backdrop of the enacted positionings. The storyline that is invoked or called forth by the participants shapes and constrains the kinds of positions that can be enacted. Because there are multiple storylines and positionings at play in any interaction, the same communication actions can be interpreted in more than one way. These potential different interpretations can be a source of conflict. Harré and van Langenhove (1999) emphasized the fact that some people are more likely than others to introduce new storylines, based on capacity and power relationships. More recently, Harré (2012) stressed this further, pointing out:

> We can gain insight as to what role differences in positioning power play in the conflict. This may reveal why some of the storylines are more dominant (although not necessarily more persuasive) than others. (p. 201)

The three key constructs that we have outlined briefly here—communication acts, positionings, and storylines—are seen as an interacting triad. Because these three constructs are mutually interacting, changing one affects the others. For example, changing a storyline affects positionings and communication acts that may be conceived within the new triad. If we understand existing storylines and positionings, we can then work to change them to something else. In fact, when we consider changes to storylines and positionings, we may be able to find solutions to conflicts.

Some Current Positionings and Storylines

In the following sections, we discuss three storylines about mathematics and mathematics education that are employed by groups that have wide audiences, including policymakers, practitioners, and parents. We focus on storylines that we have identified in the media and that relate to the positionings of mathematicians, companies, and the upper middle class. The goal is to show some of the ways that positioning theory can help us understand the nature of the conflict related to mathematics education, as seen in the media, and why mathematics education researchers are so infrequently referenced in the media. In any newspaper article, storylines are evoked (implicitly and explicitly) that frame the newsworthiness of the article and connect to the intended audience. There are also various types of positionings at play, including the positioning of the author as well as the people who are quoted as sources of information. In print media, the communication actions are normally in written form, though there can also be images (e.g., pictures, charts, maps), and in online media, the communication actions can include videos.

Storyline 1: There Are Two Dichotomous Ways of Teaching Mathematics

This storyline emerges repeatedly in a collection of 70 Canadian newspaper articles on mathematics education that were published between September 2013 and August 2014.[2] The two ways of teaching mathematics are the "basic" way and the "discovery learning" way. In a short video clip accompanying one of the

articles, which refers to a debate that is "pitting parents against the provinces that set math curriculum" (Alphonso, 2014), two journalists discuss these two models of teaching mathematics. These models are not only described verbally but are presented in written form in large bold letters: "memorization method" and "discovery method." This storyline fits well with the journalistic storyline in which there are two and only two conflicting sides to every story. This attempt for balance perpetuates a dualistic view of teaching mathematics.

These Canadian newspaper articles position mathematicians as being the most knowledgeable source about these views of teaching mathematics: They are cited in almost every article (approximately 90% of the sample of articles). Three mathematicians are mentioned, all of whom are quoted as partisans of the "basics" model. These mathematicians are described in terms of their institutional affiliation and rank as well as the work they are doing to increase the teaching of basic skills. Other people who are consulted for their viewpoints include the Provincial Ministers of Education, who either defend their provincial curricula or explain the changes that will occur in light of the slipping rankings and pressure from parents and the president of the Council of Canadian Chief Executives. Parents are mentioned in several articles, always in contexts in which they are lobbying for changes in the curriculum. In the accompanying video clip referred to above, one journalist explains that some parents, "not parents like you and I . . . these are parents who have a math background or are professionals in math" (Alphonso, 2014), are concerned about the lack of focus on basics. This kind of statement positions the rest of parents as not being qualified to participate in the debate and thus invites these parents to rely on people who are more powerfully positioned.

With respect to the main storyline, the two sides of the debate have their respective proponents. Mathematicians and some sector of parents are positioned to represent the basics side, whereas the Ministers of Education, as representatives of the current provincial curriculum approaches, are positioned to represent the discovery mathematics side. As mathematics education researchers recognize this dualistic storyline about the teaching of mathematics, they can shift or perturb it. A very different storyline might be: There are more than two ways of teaching mathematics. Such a storyline might change positionings and might also better capture the more subtle views that many mathematics education researchers have on the nature of teaching mathematics. For example, another way of teaching mathematics involves building conceptual understanding and then offering skill practice. We note that there are other possible storylines and positionings and invite mathematics education researchers to generate others and also to consider how they might have their own research co-opted into Storyline 1 (i.e., related to dichotomous ways of teaching mathematics).

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[2] A repository of the 70 Canadian newspaper articles on mathematics education can be found at https://sites.google.com/a/ualberta.ca/mathnewsrepository/. These articles were identified and collected by Lynn McGarvey (University of Alberta).

Storyline 2: Mathematics Education Research Is Not Trustworthy

In one of the newspaper articles, "Parents Turning to Private Tutors to Help With Math Deficit," educational research about the effects of discovery learning is described as being "mixed," whereas cognitive science research is described as being more trustworthy: "Cognitive scientists are now showing that without the basic foundations, discovery-based learning does not benefit young learners" (Alphonso, 2013, para. 4). Discovery learning and educational research are both positioned as fuzzy, whereas cognitive science provides certainty, much like basic facts. This certainty of cognitive science and basic facts becomes an implicit storyline in the newspaper articles. Indeed, the learning of basics co-occurs with fundamentals, memorization, facts, and multiplication tables. The way in which the storylines play out can be seen clearly in an article in which Canada is reported to have performed very well on the problem-solving portion of the PISA test (ranking 7th in the world). A mathematician is invited to comment and is quoted as saying that students are not getting adequate basic mathematical skills. A reading of this article based on positioning theory reveals that the author creates a storyline that the PISA results may be misleading and that perhaps problem solving itself may be part of the fuzzy approach. In a subsequent section, we discuss how mathematics education might have inherited this particular storyline; this understanding will help us better identify when this storyline is at play and how we might perturb it and perpetuate alternative storylines.

Storyline 3: The Main Goal of Mathematics Education Is to Produce a STEM Workforce

In recent years, a number of commentaries, articles, and blogs have questioned how much companies and foundations, which will remain nameless here, should influence or "control" education policy, research, and practice at federal, state, and national levels. These groups are well positioned with financial resources, connections to powerful people, and often market penetration with storylines that may conflict with the work of mathematics education researchers. One such storyline is that the main goal of mathematics education is to produce a STEM workforce. Although many researchers would not disagree with the importance of preparing an adequate STEM workforce, the storyline used by CEOs differs in its exclusion of other goals of education. Indeed, Labaree (1997) has identified three educational goals that have been "at the root of educational conflicts" (p. 39) in America because of their competing visions and, at times, contradictory implications: democratic equality, social efficiency, and social mobility, which he associated with the citizen, the taxpayer, and the consumer, respectively. The CEO storyline, which is framed economically around social efficiency, may gain its powerful positioning because parents and students interpret it as being about gaining social mobility, given that STEM careers so effectively enable status attainment. Mathematics education researchers who do research that pursues the democratic equality goal, which focuses on the collective benefits of schooling, may hold that a democratic society must prepare everyone with equal care so that

they become effective citizens. These researchers may not be heard because such research might conflict with the desire for individual ambitions and competitiveness that leads to social mobility.

The tension between collective benefits (democratic equality) and individual competitiveness (social mobility) plays out in an article that describes PISA results, showing that Canada is one of the most equal-opportunity educational systems in the world (because scores on the test are not predicted by geographic location or socioeconomic status). In this article, "Children of Chinese Janitors Outscore Wealthy Canadians in Global Exams" (Anderssen, 2014), the journalist points out that the children of doctors and lawyers in Canada fall even further behind the children of Chinese doctors and lawyers in the rankings. The message seems to be that parental education should make a difference and that the Canadian system is not sufficiently emphasizing the social mobility of its high-status workforce. Indeed, research has shown that such parents (e.g., upper middle class) often undermine equitable school change that results in more equal outcomes for students who have been historically marginalized in schools (Oakes & Rogers, 2006). How might mathematics education researchers offer storylines that position the voices of a broader group of parents as important stakeholders?

Inherited Positionings and Storylines

The socially constructed nature of positioning is contingent upon whom interactants take one another to be and how particular understandings of interactants' histories are invoked. These, in turn, influence the positions available in future interactions. Storylines are a particularly useful construct when examining interactions because they address the dynamic unfolding of social interactions that can make prior or new narratives available to interactants; they are also useful in examining situations in which the histories of interactions contribute to future narratives (Yamakawa et al., 2009). Thus, in this section, we discuss historical and contextual influences, including relationships with practitioners.

Roots of the "Mathematics Education Research Is Not Trustworthy" Storyline

Educational research began mainly with surveys and historical studies and was then transformed by the influence of psychologists, notably Edward L. Thorndike, to emphasize measures and statistical analyses (Lagemann, 1997). By about 1920, educational researchers were recognized as having jurisdiction in education (e.g., they increasingly populated educational committees). This represented a success in the contest for recognition, but educational researchers were not respected by those in other fields and thus were not positioned as important contributors. Further, communication and collaboration between researchers and practitioners have been limited by educational researchers' need to establish themselves and by many practitioners' objection to the notion of the "ivory tower." As an example of the community's zeitgeist in those years, Thorndike advised his students that any such communication with schools and teachers was not only unnecessary but a waste of their time (Lagemann, 1997).

Such struggles occurred for the nascent field of mathematics education research as well. Consider the two large influences on the field, psychology and mathematics, in turn. Psychological perspectives such as Thorndike's have always had a major influence on mathematics education research (Kilpatrick, 1992). Although mathematics education researchers have been concerned about the seeming indifference to or ignorance of mathematics as a discipline that has been evident in psychological research (e.g., studying thinking and learning as if it were identical across subject-matter domains or reductionist views of mathematical procedures alone as constituting "mathematical thinking"), they have continued to draw upon psychological research for theories, empirical results, and methods (Kilpatrick, 1992). The relationship is usually asymmetrical, however, with mathematics education researchers citing and using work in psychology more than the inverse (Clements & Sarama, 2009; Kilpatrick, 1992). This may reflect the lower status that education holds in universities and the battles over jurisdiction in the domain (Lagemann, 1997).

Multiple conferences and other activity seemed to create a "golden age of educational research" marked by a dramatic increase in the number of research studies, especially discipline-focused inquiries, such as those in mathematics education. Confidence in these studies, however, fell precipitously (Lagemann, 1997). The next century brought criticism of the lack of clear directions for mathematics education from educational research (Lester, 2007). Some questioned whether mathematics education research could, or should, be a science (Kilpatrick, 1992; Lester & Wiliam, 2002). However, others reacted by widening the view of scientific research framing, perspectives, methods, settings, and collaborations (Clements, 2007; Kilpatrick, 1992). The complexity of mathematics education research suggests that moving forward requires an end to jurisdictional battles (Lagemann, 1997).

Even when the storyline about the trustworthiness of mathematics education research is questioned, there is another related storyline that has emerged about whether mathematics education research is useful, which is often framed as the gap between research and practice. We investigate the context of this storyline in the next section, with a particular focus on teachers and district administrators.

Context of a Related Storyline: "Mathematics Education Research Is Not Used"

There is evidence that educational research has not influenced or informed practice on a broad scale and has not had a decisive impact on policy or practice (e.g., Levin, 2010). Exceptions exist, however. For example, policymakers have used research to guide current assessment policies when previous policy did not produce the improvements for which policymakers had hoped (Ferrini-Mundy & Floden, 2007). Research has also had an impact on early childhood education in both the United States and Canada (Levin, 2004). Additionally, findings from mathematics education research have shown improved teaching and learning at local or regional levels (e.g., Carpenter, Fennema, Franke, Levi, & Empson, 1999; Clements, Sarama, Wolfe, & Spitler, 2014; Cobb, Yackel, & Wood, 1993; Silver & Stein, 1996). Here we explore literature related to the lack of broad-scale use of

educational research. We focus on what research reports about who is not attending to research and two primary viewpoints about where the problem lies.

According to educational researchers, the various communities that do not seem to draw on research in their work include both teachers (Huberman, 1989; Richardson & Placier, 2001) and district administrators (Cooper & Levin, 2013). Although Cooper and Levin's (2013) large-scale survey of 188 district administrators across Canada found that district leaders were cognizant of the importance of using research, had some district capacity for the use of research, and offered many types of support for research-related activities, the findings also emphasized the minimal actual use of research in the districts. Referring to educational research in the United States, Sally Kilgore, the director of the Office of Research in the U.S. Department of Education in the 1980s, was quoted as saying, "'The thing that is most humbling about legislators on the Hill is that they carry with them a very strong conviction that research in education is irrelevant, that having been in school for twelve years, they themselves know what needs to be done'" (Kaestle, 1993, p. 28). Additionally, Levin (2004) drew attention to the fact that

> a website closely linked to the U.S. Department of Education (www.w-w-c.org/about.html) notes: "Our nation's failure to improve its schools is due in part to insufficient and flawed education research. Even when rigorous research exists, solid evidence rarely makes it into the hands of practitioners, policy-makers and others who need it to guide their decisions." (p. 3)

A second viewpoint seems to attribute the lack of research use to teachers. Generally, research has shown that people are more likely to draw on their own experiences and that of their colleagues than they are to draw on outside evidence (e.g., Cordingley, 2004). Practitioners, in fact, have been described as outwardly resistant to research (Levin, 2013). Some of the research about educators points to the following reasons for not using research: Educators have different perspectives than researchers about what constitutes research (Tseng, 2012), and teachers do not have the background to interpret research in the ways that researchers might hope and may not know where to find relevant research (Levin, 2013). This focus seems to draw on the storyline of teachers as mere implementers of research because they are not seen as knowledge generators (or thinkers).

Research that focuses on administrators has shown that research often is used after decisions have been made to provide support for those decisions (e.g., Honig & Coburn, 2008). Additionally, Spillane and colleagues (e.g., Spillane, 2000; Spillane & Zeuli, 1999) have highlighted the fact that many of these decisions about policies and practices are shaped by administrators' knowledge, beliefs, and values. Honig and Coburn (2008) included many examples of how administrators use research to get buy-in from others: for example, by presenting selective research that backs up their decisions for teachers and principals as well as for school boards. Thus, here the storyline that research is not used is overthrown, but a new storyline about research itself emerges, namely, research as a post-hoc rationale, which positions administrators as being opportunistic.

This example highlights how, in our collective and ongoing desire to bridge the gap between research and practice, we must consider how individual teachers and administrators are positioned in these efforts and be aware of the new storylines to which unanticipated uses of research may give rise.

Positionings, Storylines, and Communication Actions: Recommendations for the Field

Using positioning theory to examine storylines as well as inherited influences has provided opportunities for us to develop awareness and gain understanding. It has also challenged us to consider plausible action paths for mathematics education researchers, individually and collectively, so that ultimately mathematics education research will inform decisions, policies, and actions. We provide the following recommendations to illustrate possibilities but also, more important, to initiate a conversation within the field. We recognize that to influence the positionings of mathematics education researchers, we will need to be strategic, leverage existing infrastructure, learn from others, and develop new competencies. We organize our recommendations as follows: building understanding of storylines, communicating storylines to broader audiences, using additional communication mechanisms, establishing stronger relationships, and engaging strategically and collectively.

Building Understanding of Storylines

We need to identify and better understand historical, current, and pervasive storylines about mathematics education research. We have begun this work in our commentary, but there are many other venues in which positioning theory might be helpful. For example, in December 2014, a draft of new federal regulations regarding teacher education in the United States was released for public comment followed by the release of the final rule in 2015. Mathematics education researchers could be asking themselves questions such as: What research was cited in those regulations? Which fields were represented? Which storylines were prioritized?

An increased awareness about how meanings are created and maintained might also affect the way we disseminate our research. For example, for each research publication that mathematics education researchers produce, they could challenge themselves to consider the following questions: If this work were represented in the media or conveyed to policymakers, what storylines should be prioritized? How would such storylines feed into or disrupt existing ones? What are the messages and storylines that should be communicated to audiences such as teachers, administrators, and policymakers? In addition, as knowledge is accumulated and shared, we should consider what storylines best represent research syntheses.

Communicating Storylines to Broader Audiences

Mathematics education researchers may consider disseminating their work to audiences beyond traditional outlets (e.g., research and practitioner venues). For example, others in the field have made the argument that researchers need to inform policy discussions: Ferrini-Mundy and Floden (2007) wrote, “Fundamental

research about mathematics teaching and learning alone stands little chance of influencing teaching and learning on a broad scale unless some mathematics education experts become deeply engaged in the policy arena and produce research about policy" (p. 1248). These authors also suggested that connections and collaborations among mathematics education researchers, mathematicians, and policy researchers are essential. Similarly, Boaler, Selling, and Sun (2013) argued that research results must be credible to policymakers. When legislative or other governmental education committees or authorities hold hearings on education or developing legislation, we need to have mathematics education researchers called upon to testify. When the media identifies controversial topics, such as curriculum, state testing, or teacher evaluation, mathematics education researchers should be invited to share their insights. When school boards are pursuing new initiatives related to mathematics education, mathematics education researchers need to be at the table informing the decisions.

Using Additional Communication Mechanisms

Not only do we have to be at the table, but we must also consider mechanisms for communicating (i.e., communication actions) that might be interpreted differently than the primary ways we currently communicate. In other words, considering how to talk about and frame our work is essential. For example, in a recent experience, one of the authors of this article was in a position to prepare to testify in a courtroom. The author had to learn new communication actions to engage in this type of discourse. She was advised, for example, to be prepared to respond to questions with a yes or a no rather than starting her responses with the phrase "It depends." In doing so, she was still able to follow with statements such as "These are some considerations to take into account." This communication act allowed her to be seen as an expert who knew the answer to the attorney's question but still provided an opportunity to convey some of the nuances associated with the issue at hand.

Making mathematics education research more prominent will require alternative forms of communication (Boaler, Selling, & Sun, 2013), including public scholarship. One can look at other academics who have done this successfully. For example, Jo Boaler's blog, use of Facebook, and course for parents and teachers (see http://joboaler.com/blog/); Samuel Otten's Math Ed Podcast: Conversations with Math Ed Researchers (see http://mathed.podomatic.com/) and YouTube videos (see https://www.youtube.com/watch?v=3UPT075rcNA); Ilana Horn's and Egan Chernoff's uses of Twitter (https://twitter.com/tchmathculture and https://twitter.com/MatthewMaddux, respectively) to curate mathematics education information; and Sol Garfunkel and David Mumford's use of an op-ed in the *New York Times* (http://www.nytimes.com/2011/08/25/opinion/how-to-fix-our-math-education.html?_r=0) represent examples of colleagues who have invested in alternative forms of communication to inform broader audiences but also to challenge storylines related to mathematics education research. These approaches are already beginning to have an impact, but such practices need to become more widespread in mathematics education.

Establishing Stronger Relationships

When we consider communication acts and mechanisms, we do not intend to imply that this communication should be one way (i.e., delivering our messages). Rather, we see communication as reciprocal. As a result, communication acts will be more productive when researchers establish strong relationships with expanded audiences. Therefore, more mathematics education researchers—as well as their professional organizations—need to establish stronger reciprocal relationships with audiences such as companies, foundations, media, policymakers, and practitioners. As companies and foundations fund and develop new initiatives and resources related to mathematics teaching, learning, assessment, curriculum, and technology, mathematics education researchers should be participating in the design process. How can these researchers establish credibility and stronger relationships with these audiences? Here we provide a few examples from one of the authors; however, we do not want to suggest that this will be easy or that it can be done quickly. One of the authors began to communicate with the governmental affairs representatives at her institution, including the representatives who work in her state and in Washington, D.C. When the proposed federal budgets for FY16 included significant funding cuts for educational research, she met with staffers of the federal education appropriations committee. This meeting included a teacher, a parent, and a student who had been influenced by federally funded research. At the state level, these governmental affairs representatives organized a meeting with all the legislative education committee chairs to discuss bills currently under consideration as well as ideas for future legislation. The author also offered to prepare future research briefs that could inform their efforts. By laying this foundation, policymakers or their staff members now have a resource to contact when they seek research. In the past, this author just answered reporter's questions when she "got the call." Now she recognizes that she needs to reach out to reporters with potential stories, engage them in conversations, and ask them questions about their experiences. These reciprocal actions have resulted in relationships that have influenced the development of storylines. For example, in a discussion with a journalist about using GPA to determine the qualifications of mathematics teachers, she asked, "Did you ever experience a mathematics teacher who clearly knew the content, but struggled to teach it?" Focusing on the journalist's own experiences helped make the case that GPA should not be the only indicator of identifying effective mathematics teachers.

In addition to establishing stronger relationships with audiences such as policymakers and media representatives, mathematics education researchers need to also consider relationships with practitioners. Krainer (2014) contended that the kinds of deficit portrayals of teachers that appear in the research literature do not contribute to building better relationships and stronger links between research and practice:

> In contrast to teachers' lack of knowledge etc., often researchers are seen as the ones where the knowledge is situated. This characterizes a view where knowledge transfer is a one-way street from researchers to teachers. To put it more crudely: Teachers have problems, researchers have solutions; and the latter (and we might

> include representatives of educational policy and administration) also know the way(s) to disseminate innovations to teachers by means of curricula, standards, tests, material, lectures, seminars etc. (p. 53)

One reason for considering these issues about the relationships between practitioners and researchers is that educators at all levels have a strong interest in accessing and using research (see Cooper & Levin, 2013; Honig & Coburn, 2008; Levin, 2013). As mathematics education researchers engage with practitioners and write publications for and with practitioners, they might consider their communication acts, how they position practitioners and themselves, and what storylines they convey to practitioners in order to avoid the reciprocal deficit positioning of practitioners. In such a perspective, learning happens in both directions: Researchers learn from teachers, and teachers learn from researchers. The storyline suggested by such a shift is similar to the storylines created by action research, participatory action research collaborations, and transdisciplinary approaches. Such a storyline positively positions teachers as knowledge generators, contributors, and systematic problem solvers.

Engaging Strategically and Collectively

Building understanding of storylines, communicating storylines to broader audiences, using additional communication mechanisms, and establishing stronger relationships take a significant investment in time and cannot be done in isolation. Thus, our final recommendation involves purposeful strategy and collaboration. Engaging in political and public discourse using alternative forms successfully will require equipping more mathematics education researchers with specialized knowledge and competencies related to these genres and their audiences. As Cottom (2012) cautions, there are risks involved in this work, so it should not be entered carelessly. This effort will need coordination so that mathematics education researchers are not duplicating efforts and trying to learn these competencies in isolation. The field should develop an infrastructure to coordinate and sustain efforts. For example, professional organizations such as the National Council of Teachers of Mathematics, the National Council of Supervisors of Mathematics, and the Association of Mathematics Teacher Educators can create professional development materials (e.g., the National Council of Teachers of Mathematics Advocacy Toolkit) and webinars related to strategic communication for researchers or offer sessions at professional conferences. Representatives from these organizations who have an active presence and extensive experience with government officials can share their expertise with a larger group of mathematics education researchers. Topics can include handling the media, using social media, and testifying at the state level (Chval et al., 2015). Mathematics education doctoral programs should begin to include some preparation with these alternative types of communication rather than focusing only on writing for researchers and practitioners. Identifying key mathematics education researchers who have experience and expertise influencing policy, practice, and public perception to serve as more experienced others to mentor other researchers can also contribute to developing

this infrastructure. Moreover, resources such as the publication written by Sommer and Maycroft (2008) that identifies 15 characteristics of effective op-eds can support mathematics education researchers as they embark in developing this new knowledge base. Every university campus likely has offices related to strategic communication, legislative affairs, and legal counsel that can equip mathematics education researchers for context-specific encounters.

When Stephan et al. (2015) introduced the idea of grand challenges in mathematics education, they wrote,

> Currently people outside of education are setting agendas about what is valued and what might get funded. In the process, our voices have not always been heard in some political and economic arenas. If we do not set forth an agenda as a community, certainly others will. (p. 144)

Pursuing grand challenges with researchers from a variety of fields will facilitate opportunities to address the historical influences discussed above but will also:

- Help shape priorities in critical-need areas;
- Facilitate collaboration among researchers and practitioners;
- Build a knowledge base that is storable, shareable, and cumulative (Hiebert et al., 2002);
- Facilitate collaboration across fields;
- Influence policy and public opinion; and
- Secure resources to establish infrastructure that supports research efforts over time. (Stephan et al., 2015, p. 144)

Engaging in coordinated multidisciplinary, interdisciplinary, and transdisciplinary research to pursue grand challenges may provide new opportunities for mathematics education researchers to strengthen relationships and to shift positionings, storylines, and communication acts.

If mathematics education researchers are strategic and leverage existing infrastructure and power to prepare scholars to develop reciprocal relationships with expanded audiences, equip them to communicate effectively using a variety of mechanisms, and collaborate as they pursue important research agendas, we can only imagine the potential influence and impact that our field can have. Will you make the investment and engage in the conversation with us?

References

Alphonso, C. (2013, September 19). Parents turning to private tutors to help with math deficit. *The Globe and Mail*. Retrieved from http://www.theglobeandmail.com/life/parenting/why-discovery-based-learning-doesnt-add-up/article14402103/ - dashboard/follows/

Alphonso, C. (2014, March 25). Parents push Alberta curriculum back to math basics. *The Globe and Mail*. Retrieved from http://www.theglobeandmail.com/news/national/parents-push-alberta-back-to-math-basics/article17654746/#dashboard/follows/

Anderssen, E. (2014, February 18). Children of Chinese janitors outscore wealthy Canadians in global exams. *The Globe and Mail*. Retrieved from http://www.theglobeandmail.com/life/parenting/the-children-of-chinese-janitors-outscore-wealthy-canadian-students-in-international-exams-heres-what-should-change/article16943978/

Boaler, J., Selling, S. K., & Sun, K. (2013). Where are the foxes in mathematics education? In K. R. Leatham (Ed.), *Vital directions for mathematics education research* (pp. 189–199). New York, NY: Springer. doi:10.1007/978-1-4614-6977-3_9

Carpenter, T. P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (1999). *Children's mathematics: Cognitively guided instruction*. Portsmouth, NH: Heinemann.

Chval, K., Beckmann, S., King, K., Luebeck, J., Mays, M., Silver, E., & Strutchens, M. (2015, February). *AMTE's advocacy toolkit: Building a voice for mathematics teacher educators.* Discussion session presented at the annual meeting of the Association of Mathematics Teacher Educators, Orlando, FL.

Clements, D. H. (2007). Curriculum research: Toward a framework for "research-based curricula." *Journal for Research in Mathematics Education, 38*(1), 35–70.

Clements, D. H., Sarama, J., Wolfe, C. B., & Spitler, M. E. (2014). Sustainability of a scale-up intervention in early mathematics: A longitudinal evaluation of implementation fidelity. *Early Education and Development, 26*(3), 427–49. doi:10.1080/10409289.2015.968242

Clements, D. H., & Sarama, J. (2009). *Learning and teaching early math: The learning trajectories approach*. New York, NY: Routledge.

Cobb, P., Yackel, E., & Wood, T. (1993). Theoretical orientation. In T. Wood, P. Cobb, E. Yackel, & D. Dillon (Eds.), *Rethinking elementary school mathematics: Insights and issues* (pp. 21–32) *Journal for Research in Mathematics Education* monograph series (Vol. 6). Reston, VA: National Council of Teachers of Mathematics.

Cooper, A., & Levin, B. (2013). Research use by leaders in Canadian school districts. *International Journal of Educational Policy & Leadership, 8*(7), 1–15. Retrieved from http://journals.sfu.ca/ijepl/index.php/ijepl/article/view/449

Cordingley, P. (2004). Teachers using evidence: Using what we know about teaching and learning to reconceptualize evidence-based practice. In G. Thomas & R. Pring (Eds.), *Evidence-based practice in education* (pp. 77–90). Maidenhead, Berkshire, England: Open University Press.

Cottom, T. M. (2012, December 9). Risk and ethics in public scholarship [Web log post]. Retrieved from https://www.insidehighered.com/blogs/university-venus/risk-and-ethics-public-scholarship

Davies, B., & Harré, R. (1999). Positioning and personhood. In R. Harré & L. van Langenhove (Eds.), *Positioning theory: Moral contexts of intentional action* (pp. 32–52). Oxford, England: Blackwell.

Enyedy, N., Rubel, L., Castellón, V., Mukhopadhyay, S., Esmonde, I., & Secada, W. (2008). Revoicing in a multilingual classroom. *Mathematical Thinking and Learning, 10*(2), 134–162. doi:10.1080/10986060701854458

Esmonde, I., & Langer-Osuna, J. M. (2013). Power in numbers: Student participation in mathematical discussions in heterogeneous spaces. J*ournal for Research in Mathematics Education, 44*(1), 288–315. doi:10.5951/jresematheduc.44.1.0288

Ferrini-Mundy, J., & Floden, R. E. (2007). Educational policy research and mathematics education. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (Vol. 2, pp. 1247–1279). Charlotte, NC: Information Age.

Harré, R. (2012). Positioning theory: Moral dimensions of social-cultural psychology. In J. Valsiner (Ed.), *The Oxford handbook of culture and psychology* (pp. 191–206). New York, NY: Oxford University Press. doi:10.1093/oxfordhb/9780195396430.013.0010

Harré, R., & Slocum, N. (2003). Disputes as complex social events: On the uses of positioning theory. *Common Knowledge, 9*(1), 100–118. doi:10.1215/0961754X-9-1-100

Harré, R., & van Langenhove, L. (1999). The dynamics of social episodes. In R. Harré and L. van Langenhove (Eds.), *Positioning theory: Moral contexts of intentional action* (pp. 1–13). Oxford, England: Blackwell.

Herbel-Eisenmann, B., & Wagner, D. (2010). Appraising lexical bundles in mathematics classroom discourse: Obligation and choice. *Educational Studies in Mathematics, 75*(1), 43–63. doi:10.1007/s10649-010-9240-y

Herbel-Eisenmann, B. A., Wagner, D., Johnson, K. R., Suh, H., & Figueras, H. (2015). Positioning in mathematics education: Revelations on an imported theory. *Educational Studies in Mathematics, 89*(2), 185–204. doi:10.1007/s10649-014-9588-5

Honig, M. I., & Coburn, C. (2008). Evidence-based decision making in school district central offices: Toward a policy and research agenda. *Educational Policy, 22*(4), 578–608. doi:10.1177/0895904807307067

Huberman, M. (1989). The professional life cycle of teachers. *Teachers College Record, 91*(1), 31–58.

Kaestle, C. F. (1993). The awful reputation of education research. *Educational Researcher,* 22(1), 23, 26–31. doi:10.2307/1177303

Kilpatrick, J. (1992). A history of research in mathematics education. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 3–38). New York, NY: Macmillan.

Krainer, K. (2014). Teachers as stakeholders in mathematics education research. *The Mathematics Enthusiast, 11*(1), 49–60.

Labaree, D. F. (1997). Public goods, private goods: The American struggle over educational goals. *American Educational Research Journal, 34*(1), 39–81. doi:10.3102/00028312034001039

Lagemann, E. C. (1997). Contested terrain: A history of education research in the United States, 1890–1990. *Educational Researcher, 26*(9), 5–17. doi:10.3102/0013189X026009005

Lester, F. K., Jr. (2007). Preface. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (Vol. 1, pp. xi–xiv). New York, NY: Information Age.

Lester, F. K., Jr., & Wiliam, D. (2002). On the purpose of mathematics education research: Making productive contributions to policy and practice. In L. D. English (Ed.), *Handbook of international research in mathematics education* (pp. 489–506). Mahwah, NJ: Erlbaum.

Levin, B. (2004). Making research matter more. *Education Policy Analysis Archives, 12*(56), 1–20. doi:10.14507/epaa.v12n56.2004

Levin, B. (2010). Leadership for evidence-informed education. *School Leadership & Management, 30*(4), 303–315. doi:10.1080/13632434.2010.497483

Levin, B. (2013). To know is not enough: Research knowledge and its use. *Review of Education, 1*(1), 2–31. doi:10.1002/rev3.3001

Mesa, V., & Chang, P. (2010). The language of engagement in two highly interactive undergraduate mathematics classrooms. *Linguistics and Education, 21*(2), 83–100. doi:10.1016/j.linged.2010.01.002

Mewborn, D. S. (2005, October). Framing our work. In G. M. Lloyd, M. Wilson, J. L. M. Wilkins, & S. L. Behm (Eds.), *Proceedings of the 27th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, Roanoke, VA. Retrieved from http://www.pmena.org/proceedings/PMENA%2027%202005%20Proceedings.pdf

Moghaddam, F. M., Harré, R., & Lee, N. (Eds.). (2008). *Global conflict resolution through positioning analysis*. New York: Springer. doi:10.1007/978-0-387-72112-5

Oakes, J., & Rogers, J. (with Lipton, M.). (2006). *Learning power: Organizing for education and justice*. New York, NY: Teachers College Press.

Pinnow, R. J., & Chval, K. B. (2015). "How much you wanna bet?" Examining the role of positioning in the development of L2 learner interactional competencies in the content classroom. *Linguistics and Education, 30*, 1–11. doi:10.1016/j.linged.2015.03.004

Richardson, V., & Placier, P. (2001). Teacher change. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed., pp. 905–947). Washington, DC: American Educational Research Association.

Silver, E. A., & Herbst, P. G. (2007). Theory in mathematics education scholarship. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (Vol. 1, pp. 39–67). New York, NY: Information Age.

Silver, E. A., & Stein, M. K. (1996). The Quasar project: The "revolution of the possible" in mathematics instructional reform in urban middle schools. *Urban Education, 30*(4), 476–521. doi:10.1177/0042085996030004006

Sommer, B., & Maycroft, J. R. (2008). Influencing public policy: An analysis of published op-eds by academics. *Politics & Policy, 36*(4), 586–613. doi:10.1111/j.1747-1346.2008.00122.x

Spillane, J. P. (2000). Cognition and policy implementation: District policymakers and the reform of mathematics education. *Cognition and Instruction, 18*(2), 141–179. doi:10.1207/S1532690XCI1802_01

Spillane, J. P., & Zeuli, J. S. (1999). Reform and teaching: Exploring patterns of practice in the context of national and state mathematics reforms. *Educational Evaluation and Policy Analysis, 21*(1), 1–27. doi:10.3102/01623737021001001

Stephan, M. L., Chval, K. B., Wanko, J. J., Civil, M., Fish, M. C., Herbel-Eisenmann, B., . . . Wilkerson, T. L. (2015). Grand challenges and opportunities in mathematics education research. *Journal for Research in Mathematics Education, 46*(2), 134–146. doi:10.5951/jresematheduc.46.2.0134

Tseng, V. (2012). The uses of research in policy and practice. *Social Policy Report, 26*(2), 1–16.

Turner, E., Dominguez, H., Maldonado, L., & Empson, S. (2013). English learners' participation in mathematical discussion: Shifting positionings and dynamic identities. *Journal for Research in Mathematics Education, 44*(1), 199–234. doi:10.5951/jresematheduc.44.1.0199

Wagner, D., & Herbel-Eisenmann, B. (2009). Re-mythologizing mathematics through attention to classroom positioning. *Educational Studies in Mathematics, 72*(1), 1–15. doi:10.1007/s10649-008-9178-5

Yamakawa, Y., Forman, E., & Ansell, E. (2009). Role of positioning: The role of positioning in constructing an identity in a third grade mathematics classroom. In K. Kumpulainen, C. M. Hmelo-Silver, & M. César (Eds.), *Investigating classroom interaction: Methodologies in action* (pp. 179–202). Rotterdam, the Netherlands: Sense Publishers.