Understanding Brokerage in Education

Backward Tracking from Practice to Research

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April 2022

R4S
Rethinking Research for Schools

Center For Research Use In Education

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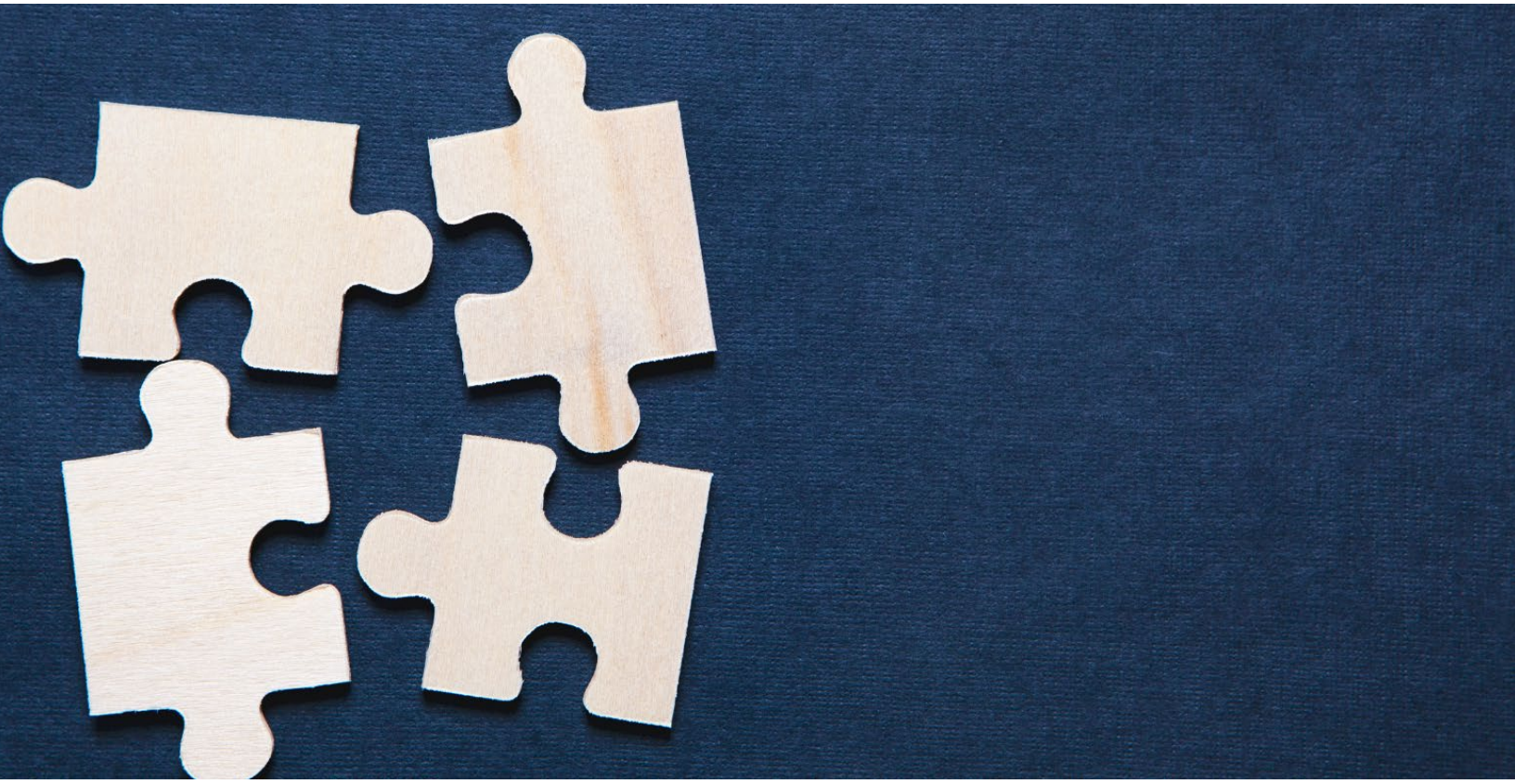

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305C150017 to the University of Delaware. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

Please cite this report as follows:

Shewchuk, S, & Farley-Ripple, E. (2022). *Understanding Brokerage in Education: Backward Tracking from Practice to Research*. The Center for Research Use in Education (CRUE), University of Delaware. Available from: http://crue.cehd.udel.edu

About the Center

The Center for Research Use in Education is an Institute for Education Sciences-funded knowledge utilization center focused on rethinking research for schools (R4S). Our mission is to expand the study of research use and produce a more holistic picture of what drives it, from the production of knowledge by researchers to the application of research in schools. We also seek to identify strategies that can make research more meaningful to classroom practice.

At our center, we believe that education research is an important part of the educational process. We further believe that rigorous evidence, whether qualitative or quantitative, can foster better opportunities and outcomes for children by empowering educators, families, and communities with additional knowledge to inform better decision-making. For this reason, we seek to support strong ties between research and practice.

To learn more about our center, visit http://crue.cehd.udel.edu and follow us on Twitter at @UDCRUE.

Acknowledgments

The authors wish to thank those that contributed to this work:

Dr. Karen Louis, whose expertise throughout this process was invaluable.

Dr. Henry May, Dr. Horatio Blackman, Dr. Sara Grajeda, Dr. Rui Wang, Kati Tilley, and Debbie Micklos for the design and implementation of the survey underlying the Center's work.

Dr. Joseph Tise, Dr. Kalyn McDonough, Layne Humphrey, and Dreisen Heath for their contribution to our conceptualization of brokerage.

Dr. Jenna Neal, Dr. Zachary Neal, Dr. Amanda Cooper, and Dr. Joel Malin for their expert review of this research and invaluable feedback on the report.

Jackie Kerstetter of Alessi Communication & Design Co., for her development of visual maps.

Akiko Yamagata of Graphite Editing, for her editorial contributions to this report.

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Executive Summary

Current research aiming to understand the gaps between research and practice in K–12 education often overlooks the importance of grasping the indirect relationships that develop between research and practice communities via the various people and organizations positioned to serve as knowledge brokers. The purpose of this study is to understand both how research brokerage by such individuals and organizations can lead to research use and how knowledge brokers can be leveraged to better support research use in practice. Specifically, this study aims to identify what happens in the space between research and practice by using qualitative methods to explore three areas of inquiry: (1) understanding which individuals and organizations serve as knowledge brokers, (2) understanding the types of research-based products that move through brokerage systems and how research-based products are transformed in that system, and (3) understanding the paths by which information moves from research into practice.

To better understand what occurs between the production of research findings and their ultimate use, we focus not on individual knowledge brokers and their activities but on the set of actors, activities, motivations within which research is exchanged, transformed, and otherwise communicated—that is, the dynamic and complex phenomenon of brokerage. This body of work utilizes backward tracking case studies and examines the brokerage process through a five-step approach to produce credible stories of what happens as research moves between research and practice.

Data and Methods

We completed four case studies, documenting brokerage in the following contexts: (1) supporting K–3 teachers in providing handwriting instruction; (2) using an instructional model to improve practice; (3) implementing a professional learning community within a school; and (4) developing common assessments across a school district. Data collection activities included using a snowball interviewing technique to identify individuals who played an active role using, developing, or sharing selected educational resources and obtaining documents relevant to each case. The data was then qualitatively coded in NVivo utilizing both a priori and open coding strategies. Case data were read by the research team and used to create narratives describing the significant components of the paths between practice and research, including people, organizations, timelines, events, research products, and contextual information. These narratives were then used to generate visual maps to represent the actors involved in the process and how they engaged with each other and with research products in their work.

Findings

Data from these cases highlight the complexity and diversity of the paths from research to practice. Our analyses examine:

- 23 brokers representing diverse organizations, in terms of profit, size, scope of work, and target audience, which all expressed explicit commitments to knowledge mobilization or evidence-based practice. These brokers all engaged in information management but also in other brokering domains such as capacity building (13%), evaluation (35%), facilitation (13%) and serving as a linking agent (9%).
- 42 research products, which often experienced multiple transformations on the paths between research and practice. Products were most often prescriptive (45%), and many were associated with fees (38%). Research was frequently summarized (63%) or synthesized with other sources (48%) as they found their way to practice.
- 37 knowledge exchange events in which actors shared purposely prepared information. These were characterized as push (35%), pull (30%), or interactive (35%). Knowledge exchange events took place most often between intermediary and practice spaces (35%) or within the practice space (27%).

What We Learned About Brokerage in Education

One of the clearest observations drawn from these analyses has been the critical importance of research brokerage in moving research-based ideas into practice. Yet the cases also highlight important issues related to understanding and leveraging the system of brokerage to strengthen the relationship between research and practice.

The role of brokers across cases was largely informal and not well leveraged. Across all cases, individuals and organizations assumed brokering roles to fill a perceived gap between research and practice. While the diversity of such brokers in these cases suggests that for every specific need, there is likely a resource tailored to it, the emergence of so many actors suggests that knowledge needs are not being met systematically—in other words, the infrastructure supporting educators' access to research is inadequate to their needs. Similarly, we found limited evidence of strategically coordinated efforts to mobilize research. Although the collective efforts of actors in our cases were ultimately successful (a design choice on our part), we find an element of serendipity in how the various brokers created paths from research to practice.

We need to expand our view of brokers. Our findings highlight a diverse set of brokers that were critical to the success of each case. Central in *all* cases are school- or district-based brokers—those members of the education community that influence the role of research in schools by mobilizing research-based information within school networks. Our cases also feature researchers that do not clearly fit the model of the traditional scholars whose work we are often concerned with in linking research and practice. Data suggest the need to reevaluate the priorities and incentives of the research enterprise so that the roles we see taken up here by researchers are more often the norm than the exception.

What and how information was shared, mattered. We found that the most used and valued resources were prescriptive about how to enact research. Of value were products such as books featuring frameworks that are accessible to broad audiences and can serve as guideposts for implementation. Multiple resources were often used to develop greater understanding and/or to inform practice. Synthesizing, summarizing, and embedding research into tools—considered adaptation of research for the local context—are therefore important skills for brokers. Relatedly, knowledge exchange events that feature interaction were particularly important in our cases, especially within practice spaces, consistent with prior studies that frame research use as a social process.

Motivation was important. Looking across cases, we found high *potential* for research use. Extrinsic motivation, such as explicit evidence-use missions or expectations for participation in school routines, created opportunities for research use *but did not require* engagement with research or evidence-based practice. We found more often that motivation for adoption or implementation of such practice may rely more on internal sources of motivation.

We need to better understand and plan for complexity. If we unpack the complexity of our cases, our findings seem to challenge normative assumptions about simple instrumental use of research and one-size-fits-all solutions to closing the research–practice gap, such as increasing access to research. Rather, the complexity and diversity presented here suggest that we may need stronger systems and infrastructure that facilitate a range of pathways and enable members of the research, practice, and intermediary spaces to effectively plan for knowledge mobilization and use.

What Might This Mean for Education Stakeholders?

We offer recommendations for how different members of the larger evidence-use ecosystem in education can act in advancing the use of research in practice.

For *educators and administrators*, prioritizing and formalizing research broker roles will establish important mechanisms for improving research use in schools. Furthermore, districts and schools can formalize the role of research in improvement work by establishing explicit guidelines for its use. Finally, they can identify and engage with brokering organizations with clear evidence-use priorities and establish them as trustworthy resources for school or district staff.

Suggestions for *researchers* include taking a more active role in identifying brokers that can put research in front of educators, participating in activities that create opportunities for interaction and knowledge exchange with education, and developing strategies for adapting work to be more prescriptive in implementation rather than descriptive of research findings.

Brokering organizations can assess current activities to determine what additional knowledge, skills, and activities can strengthen their own work. They should examine their role in the larger evidence-use ecosystem and identify ways to collaborate and coordinate to better promote evidence use in education. And they can also make their evidence-use commitments explicit.

Policymakers, funders, and training institutions should develop initiatives that encourage formalizing brokering roles for researchers, brokering organizations, and educators. They may also wish to incentivize work that demands communication, coordination, and collaboration across research, intermediary, and practice boundaries. Finally, by investing in structures aimed at mobilizing research in ways that are responsive to the needs of educators, policymakers can better implement system-wide supports for researchers to engage with practice and to adapt their work into useful products.

Introduction

Globally, education systems are increasingly expected to use research to drive improvement efforts. In the United States, beginning with the No Child Left Behind Act and reified through Every Student Succeeds Act, there are renewed and rising expectations not only for the use of research in decision-making but also regarding practitioners' understanding and application of evidence in particular ways. In this context, there has been increased attention to bridging or otherwise connecting research and practice communities, broadly construed.

Research use is often a function of the relationship between communities in both the production of research and in education decision-making (Cousins & Simon, 1996; Honig & Coburn, 2008; Honig & Venkateswaran, 2012; Huberman, 1983, 1990, 1994; Huberman & Miles, 1984). In efforts to create stronger links between research and practice, studies of evidence use (e.g., Cooper, 2014; Malin, 2020; Malin et al., 2018; J. W. Neal et al., 2015, 2019, 2021) recognize the importance of understanding the indirect relationships that develop between communities via various people and organizations positioned to serve as knowledge brokers (hereafter, brokers). For the purposes of this study, we define brokers as individuals or organizations that link actors, groups, or communities to facilitate the flow and uptake of evidence-based information (Braithwaite et al., 2013). While other definitions of brokering exist (e.g., see J. W. Neal et al., 2021), we use this definition to be as inclusive as possible of the different types of actors and organizations who play a role in moving research into practice. Brokers can be found embedded within research or practice contexts as well as in an intermediary space between research and practice. Further, literature suggests that certain roles and functions not inherent in the work of either educators or researchers may improve the use of research evidence—roles and functions that knowledge brokers may play (Huberman, 1990; Kochanek et al., 2015; Lomas, 2000; Louis, 1977; Ward et al., 2009, 2012). Although the literature on brokers and their contribution to research use is robust, limited attention has been given to tracing the specific use of research-based resources. Therefore, *the purpose of this study is to understand how research brokerage can lead to research use and how to leverage knowledge brokers to better support use of research in practice*.

This project is intended to answer the following overarching question: *What happens in the space between research and practice?* Specifically, we use qualitative methods, including knowledge mapping, to explore three areas of inquiry (AIs):

AI 1. Understanding which individuals and organizations serve as knowledge brokers

AI 2. Understanding the types of research-based products that move through brokerage systems and how research-based products are transformed in that system

AI 3. Understanding the paths by which information moves from research into practice

To explore these issues, we conducted backward tracking case studies of research use, tracing education resources cited as useful by practitioners back to their origins in the research community.

This endeavor extends the current literature in two ways. First, most research to date has tended to focus on *who* brokers are and what brokers *do*. Knowing brokers' identity and activities, however, paints only a partial picture of how their work links research and practice. Because connections between research and practice are often indirect, there may be points along the paths where research is exchanged among or transformed by different actors. These "stops," or interactions around research, are central to understanding how brokerage works as a mechanism for linking research and practice, making it also important for understanding the relationships that forge the paths and the ways research is translated, synthesized, or adapted along the way. We therefore argue that knowledge of what occurs between the production of research findings and their ultimate use cannot be learned by focusing on individual brokers (although they should not be ignored). Rather, the focus must be on the set of actors, activities, motivations within which research is exchanged, transformed, and otherwise communicated. It is this dynamic and complex phenomenon that we refer to as *brokerage* (Farley-Ripple et al., 2017; Farley-Ripple & Grajeda, 2019).

The second contribution of our work rests on its use of specific research products as the starting point, which is important for two reasons. First, real-life anchors (i.e., specific research products) are useful in obtaining accurate responses to questions about research-related practices. Asking individuals about a specific study or product helps to ground responses in *actual* work, as opposed to general perceptions or descriptions of work. Second, preliminary qualitative work from CRUE revealed that many individuals or organizations engaged in brokering activities do not self-identify as brokers. This means that nearly any strategy for sampling at the broker level will under identify who serves in that capacity and therefore provide an incomplete picture of research brokerage as a process. By following research along its various paths between research and practice communities, we can provide a more authentic and holistic view of brokerage.

Definitions

A particular challenge in the study of research use is the variety in language used to describe relevant activities, actors, and processes. This variation stems from differences in discipline, theory, and sector (e.g., education, health) and where the work is being conducted. We begin this paper with a set of definitions to clarify key concepts. These are presented in Table 1.

Table 1. Definitions

Term(s)	Definition
Research Brokerage	The system of actors, activities, and motivations within which research is exchanged, transformed, and otherwise communicated (Farley-Ripple et al., 2017; Farley-Ripple & Grajeda, 2019).
Knowledge Broker (also, Broker)	Individuals or organizations that link actors, groups, or communities to facilitate the flow and uptake of evidence-based information (Braithwaite et al., 2013).
Knowledge Mobilization	An umbrella term encompassing a wide range of activities relating to the production and use of research results, including knowledge synthesis, dissemination, transfer, exchange, and cocreation or coproduction by researchers and knowledge users (Social Sciences and Humanities Research Council, 2019).
Research	An activity in which people employ systematic empirical methods to answer a specific question (Penuel et al., 2016).
Research-based	Descriptor of products or practices that are informed by educational research, as defined above. This includes products or practices for which evidence of effectiveness on student learning has been established as well as those informed by theory or descriptive (noncausal) research.
Research Community	Those actors whose primary work is to engage in research and who work in a research organization, including an academic, private, or nonprofit research organization. Researchers may also be embedded in other contexts and are noted as such where applicable.
Intermediary Community	Those actors that operate between members of the research and practice community and on the paths between the two, reflecting elements of Honig's (2004) definition.
Practice Community	Those actors with a primary responsibility for instructional delivery to K–12 students. This includes teachers, other school staff, and members of the central office.

Brokerage in the Literature

A study of brokerage entails examining the actors, activities, and motivations for exchanging, transforming, or communicating research evidence (Farley-Ripple et al., 2017). Brokerage's

theoretical underpinnings stem from organizational and sociological theories of social capital, and the study of brokerage is prevalent in literature in the fields of organizational science (Fleming & Waguespack, 2007; Hargadon, 2002), health (Bornbaum et al., 2015; Braithwaite et al., 2013; Lomas, 2007; Mallidou et al., 2018; Ward et al., 2009), environmental science (Cvitanovic et al., 2016; Fazey et al., 2013; Posner & Cvitanovic, 2019), and public policy (Mitton et al., 2007; Rigby, 2005; Sebba, 2013). Moreover, the field of education has also made important contributions to the study of brokerage (e.g., see Cooper, 2014; Davidson & Penuel, 2019; Eaker & Huffman, 1982; Farley-Ripple et al., 2017; Figgis et al., 2000; Hopkins et al., 2018; Louis, 1981, 1983; Louis et al., 1985; Louis & Kell, 1981; Malin et al., 2019; J. W. Neal et al., 2019; Scott & Jabbar, 2014).

Our work is informed by recent studies and theoretical developments from education and other fields, although a comprehensive review is beyond the scope of this report. Rather, we focus here on the literature that specifically informs our work and which our work seeks to extend. The discussion is organized to support our three areas of inquiry, focusing on *who* serves as brokers, the types of *research products* found useful to education professionals as well as how research products are *transformed*, and what recent literature tells us about the *paths* between research and practice.

Understanding Knowledge Brokers and Their Work

We consider knowledge brokers, our first area of inquiry, to be individuals and organizations that link actors, groups, or communities to facilitate the flow and uptake of evidence-based information (Braithwaite et al., 2013). J. W. Neal et al. (2021) noted that brokers are further defined by the activities they engage in, and they pointed to Glegg and Hoens's (2016) five activity domains to conceptualize knowledge brokers.

First, brokers can act as *information managers* by accessing, translating, and sharing relevant education research with education professionals. They may also share context-specific knowledge (e.g., organizational culture, processes, and barriers) with stakeholders to inform decision-making processes (Jackson-Bowers et al., 2006). For example, previous research found that the products and venues created by brokers have greater value in reaching practitioners (Cooper, 2014; Cooper & Levin, 2010; Massell et al., 2012).

Second, brokers can function as *linkage agents* in several ways. They foster trusting relationships among stakeholders in the practice and research communities. They also coordinate interactions between research producers and research users and foster engagement with the research process. Finally, they connect with networks of other brokers to support knowledge mobilization and research use (Cooper; 2014; Davidson & Penuel 2019; Fullan, 1990; Scott et al., 2017; Spencer &

Louis, 1980). For example, Cousins and Simon (1996) found a third party helped to manage the researcher dominance that is often apparent even in sustained relationships.

Third, brokers can serve as *capacity builders* by enhancing individuals' knowledge and skills about research, addressing barriers to implement evidence-based practices (individual and organizational), enabling communication across sectors through the development of a common language, and by leveraging network connections to expand research capacity to address locally relevant challenges (Cooper; 2014; Huberman, 1990). For example, in a literature review of research–practice partnerships, Penuel et al. (2020) described how the University of Chicago Consortium on School Research played a critical brokering role by developing an indicator system, which Chicago Public Schools could use to track attendance and performance data.

Fourth, brokers can act as *facilitators* by guiding and supporting individuals' use of research, improving attitudes toward research, or enhancing the practical applicability of research. For example, Penuel et al. (2020) further described how the Consortium played a critical brokering role by developing reports to aid leaders in decision-making and by facilitating conversations related to the data among school leaders across the district.

Fifth, brokers can serve as *evaluators* by assessing the local context to inform brokering activities, evaluating the outcomes of brokering activities, and evaluating the broker's own performance. For example, Cooper (2014) found that brokering organizations may aid other organizations in building strategic knowledge mobilization plans and processes or evaluating existing programs and practices.

Knowledge brokers may engage primarily in one of these activity domains, while others may engage in all five to facilitate knowledge mobilization processes. Further, knowledge-brokering activities can be undertaken formally (i.e., as a part of a job description or organizational mission) or informally (e.g., engaging in ad hoc brokering activities but not as a part of a job description or organizational mission). The role of brokers can also change over time, depending on the needs research, practice, and policy communities. Additionally, several recent studies highlight the importance of organizational context, including relationships and networks, to knowledge brokering activities and effectiveness (Fitzgerald & Harvey, 2015; Hacker et al., 2017; Hammami et al., 2013; Palinkas et al., 2017; Young et al., 2014).

Knowledge brokers include people and organizations across research and practice communities and the intermediary community between them. Within research communities, brokers' work is focused on connecting researchers and government, community, and media organizations to support the development of research partnerships and dissemination of research results (Campbell et al., 2017; Davidson & Penuel, 2019; Hopkins et al., 2018; MacGregor & Phipps, 2020). Those serving in practice-based brokering positions have been found to make important contributions to

schools' use of research by building skills, facilitating knowledge translation and transfer, and strengthening the culture of research use (Davidson & Penuel, 2019; Farley-Ripple & Grajeda, 2019; Shewchuk & Farley-Ripple, 2020, 2021). In addition to working on either side of the practice–research divide, knowledge brokering organizations are often found in the intermediary community, including think tanks, advocacy organizations, foundations, textbook publishers, media organizations, and membership organizations (Cooper, 2014; Scott et al., 2017; Sebba, 2013). These organizations vary in terms of their target audience, membership composition, scope, and financial and human resources, which may influence how they engage in brokering activities.

Understanding Research Products and Their Transformations

Our second area of inquiry focuses on the characteristics of research, specifically the kinds of research products that are brokered and created along the paths between research and practice. Studies of research use in education frequently show that educators rarely engage directly with original research (e.g., empirical reports, peer-reviewed journal articles) but rather prefer formats that are relevant, useful, and usable for their purposes (Cordingley, 2008). Cordingley (2008) explained, "practitioners need to connect intellectually, practically, and emotionally with [research] knowledge they are offered . . . if they are to take it on board and use it in their practice" (p. 37). In addition, Cooper et al. (2011) noted that research uptake and utilization increases when research-based products are customized to specific audiences. Customizing research products for education professionals increases their usefulness and likely leads to increased utilization (Boardman et al., 2005; Cordingley, 2008; Figgis et al., 2000). Farley-Ripple (2012) and Finnigan et al. (2013) offered lists of frequently utilized sources and their characteristics. Penuel et al. (2018) found that district leaders most frequently cite research resources that include conceptual, theoretical, and advocacy pieces with how-to guides and often presented as books, magazine articles, or frameworks. Research has suggested that accessibility to resources is perceived as a benefit to educational professionals (Blamires et al., 2010; Carrier et al., 2017; Williams & Coles, 2003). In addition, educational professionals have reported that they prefer "practical resources" (e.g., lesson plans) that provide information on what they should do or how to do it, rather than simply describing research findings or theories (Penuel et al., 2018). These studies suggest that original research frequently undergoes transformation as it moves between research and practice. However, when, and how original research is transformed into the formats ultimately used in practice is not well understood.

Understanding the Paths from Research to Practice

Our third area of inquiry focuses on the chain of events that constitutes the paths between research and practice. Because connections between research and practice are often indirect, along the way there may be several "stops," or what Louis (1985) and Meehan and Wiersma (1995) termed "knowledge exchange events" (KEEs), in which purposively prepared information is

communicated to a set of recipients. Neal et al. (2015) found that the number of KEEs along the paths between research and practice is highly variable; it is also often much longer than anticipated and, in many cases, concludes with dead ends in which educators were never connected with researchers. Another perspective on KEEs shows how chains of brokers can link research and practice. For example, Malin and Paralkar's (2017) study of the influential resource the *Marshall Memo* showcased how a brokering organization often draws on *other* brokering organizations for research information.

KEEs support interactions around research and are central to understanding how brokerage works as a mechanism for linking research and practice. Therefore, it is important to understand more about how and why KEEs come to be and what happens during them. Literature to date suggests that a wide range of relationships lead to interaction around research, including client or consultant relations, memberships within the same association, research–practice partnerships, and professional learning networks (Brown, 2019; Cooper & Levin 2010; Hopkins et al., 2018; Kochanek et al., 2015;). Several studies have highlighted trust or trustworthiness as a critical factor (Braithwaite et al., 2013; Cooper 2014; Drill et all, 2012; Sebba, 2013; Weiss 1978; Weiss & Bucuvalas, 1977) and indicated that physical proximity can support interactions (Daly et al., 2014; Sebba, 2013). Further, KEEs may differ in the extent to which they support interaction. For example, KEEs may describe traditional dissemination, in which a resource published by an intermediary is sought out by an educator; alternatively, a KEE might entail a rich discussion in which research ideas are shared and debated. Lavis et al. (2003) categorized distinctions among these relations as producer pushed (e.g., dissemination), user pulled (e.g., active search by users), and exchange (e.g., interaction between users and producers during key processes). In our research, we seek to better understand what kinds of KEEs appear in the paths between research and practice.

Our three areas of inquiry—understanding which individuals and organizations serve as knowledge brokers, the types of research-based products that move through brokerage systems and how they are transformed in that system, and the paths by which information moves from research into practice—are informed by the literature described above. This literature guided our decisions about what aspects of brokerage we examined as well as decisions about the data we collected and how we approached their analysis. In the following section, we describe the research methods used to study brokerage in education.

Methods

The purpose of the present study is to better understand, through multiple case studies, the network of actors, relationships, and processes as research moves between research and practice. Morton (2015) along with many others (Boaz et al., 2009; Davies & Nutley, 2008; Donovan, 2008; Grant et al., 2000; Meagher et al., 2008) has pointed to case studies as an appropriate method to

explore the "context specific and variable nature" (p. 406) of how research evidence makes its way into policy and practice. Further, Morton outlined three main approaches to assessing how knowledge flows between research and practice: forward tracking, backward tracking, and evaluating knowledge exchange toward increased research use. Forward tracking approaches take a specific research project as their point of departure and trace forward into policy or practice settings to investigate research-related contributions to action (Kok & Schuit, 2012; Morton, 2015). Backward tracking approaches move in the opposite direction, starting with research users and tracing backward to their roots in educational research (Figgis et al., 2000). Specific knowledge exchange activities can also be assessed. For example, Louis et al. (1985) identified how purposively prepared information is communicated to a set of recipients, which we defined earlier as KEEs. All three approaches rely on qualitative data collection techniques, such as snowball interviewing and document analysis, to provide answers to key questions about how research evidence moves between research and practice communities.

Mapping the Paths between Research and Practice

In a recent scoping review, Newson et al. (2018) highlighted that using visual methods, such as mapping, to describe the paths between research and practice can provide "a realistic picture of research influence" (p. 19). We point to contribution mapping, developed by Kok and Schuit (2012), as an example of this approach. The authors used snowball interviewing techniques, coupled with document analysis, to examine the impacts of specific research projects on policy and practice. Using the gathered data, the authors developed a process map for each case that included the main actors and activities during research formulation, production, and knowledge extensions phases. These maps were then used to clarify or describe possible inconsistencies within the data. The authors noted that these maps can be shared with relevant stakeholders for learning, improvement, and accountability.

Using the above approaches as a guide, the research team utilized backward tracking studies to examine the brokerage process. We used a five-step approach to produce credible stories of what happens to research as it moves from research to practice. First, we selected a purposeful, stratified sample of cases for the study. We used the *Survey of Evidence in Education–Schools* (*SEE–S*; May et al., 2018) to identify evidence-informed resources used in schools.[1] The SEE-S was administered to more than 4,000 educators nationwide and included items related to the role of research in organizational and classroom decision-making, perspectives on educational research, and other dimensions of capacity to use research. Second, we conducted case-based data collection. Our data collection activities included using a snowball interviewing technique to identify individuals who played an active role in using, developing, or informing the development of the selected

[1] *SEE–S* respondents were informed at beginning of the survey that CRUE members may contact them to learn more about their survey responses.

educational resources (i.e., school-based practitioners, brokers, and researchers) and obtaining documents relevant to each case. Third, we qualitatively coded the data in NVivo, utilizing both a priori and open coding strategies. A priori codes included the actors (individuals and organizations), research products and transformations, and KEEs in each case. Fourth, we created case maps that visualized actors, research products and transformations, and KEEs. Last, we validated our data using the maps to identify potential inconsistencies.

Method for Backward Tracking Case Studies

As noted earlier, case study is an appropriate methodology for exploring brokerage processes that enable movement of research into practice. We utilize a multiple case study design for exploratory purposes (Mills et al., 2009) to generate initial insights and advance theory about how brokerage can support use of research. Accordingly, we focus on *successful* cases—that is, specific instances in which we already know that research has been used in practice—to better understand the dimensions of brokerage (as per our conceptual framework) that contributed to the use of research in educational decision-making. Below, we provide a detailed account of the five-step method for this set of cases.

Step 1: Identify Cases

Merriam and Tisdell (2015) explained that identifying and describing the unit of analysis is a key component of case study approaches. A unit is a clearly bounded entity, set of participants, or activity. We bounded each case in terms of the actors, activities, interactions, and products that contributed to the movement from original research to practice as reported by participants. We identified cases by selectively sampling education resources that school-based practitioners had identified in the *SEE–S* (May et al., 2018). The survey included open-ended questions that asked school-based practitioners to identify an education resource (e.g., articles, reports, books, or summaries based on research or program evaluation) used to inform an organizational or school-based decision in their school or district. At the time of case selection, 1,852 resources had been identified by school-based practitioners.

Our first step in delineating the sampling frame was to select every response to this open-ended question. A member of the research team pulled the open-ended responses and coded them for usability. Responses were included if they provided the name or link of the resource and were excluded if the information provided was insufficiently detailed (defined as the inability to ascertain what the resource was). Usable information was provided by 282 respondents for 365 educational resources that influenced a recent school or classroom decision. A member of the research team coded the 365 open-ended responses according to the content area addressed, as shown in Table 2.

Table 2. Educational Resources Identified in SEE-S by Content Area

Content Area	# of Resources
Instructional Strategies	78
Literacy	69
Student Assessment	53
Classroom Management	34
Mental Health and Behavior	33
STEM	22
System[2]	20
Student Centered Supports	9
Metacognition and Student Engagement	8
Special Education	8
English Language Learners	6
Technology for the Classroom	6
High Academic Expectations	5
History	3
Music / Art	3
Youth Leadership	3
Health	2
Parent Engagement	2
Physical Education	1

Note. N = 365.

We further reduced the sample to exclude resources from content areas with fewer than 10 resources to avoid focusing on areas with so few resources our ability to explore brokerage processes would be limited. After this reduction, 309 resources remained in the sample. In addition, we excluded resources if they did not meet at least two of the following three criteria:

- The resource says it is evidence/research based.
- The resource has a reference list that includes peer-reviewed journal articles.
- The resource or author is frequently (more than 10 times) cited in Google Scholar.

We used these criteria to narrow our sample as it was not feasible to check each of the 309 resources against their potential evidence bases. These criteria allowed us to differentiate between the numerous resources and make decisions about which would best support our research needs. Table 3 provides two example resources—one that met the inclusion criteria and one that did not.

[2] Focuses on issues related to structure of the school day or logistics regarding the operation of the school.

Table 3: Examples of Resources that Met and Did Not Meet Inclusion Criteria

Resource	Met Criteria	Did Not Meet Criteria
	Understanding By Design	*Teasing, Tattling, Defiance, and More*
Resource says it is evidence/research based.	"Readers will learn why the familiar coverage- and activity-based approaches to curriculum design fall short and how focusing on the six facets of understanding can enrich student learning. With an expanded array of practical strategies, tools, and examples from all subject areas, the book demonstrates how the research-based principles of Understanding by Design apply to district frameworks as well as to individual units of curriculum." (Wiggins & McTighe, 2005)	"This practical guide offers simple, effective techniques for addressing listening and attention challenges; teasing; cliques and exclusion; tattling; defiance; disengagement; silliness and showing off; too much physical contact; dishonesty; and frustration and meltdowns. Veteran educator and Responsive Classroom consultant Margaret Berry Wilson helps you understand why students sometimes misbehave and how a positive, respectful approach to discipline can transform your classroom." (Wilson, 2013)
Resource has a reference list that includes peer-reviewed journal articles.	Referenced peer-reviewed journal articles include the following: Ruiz-Primo, M. A., Shavelson, R. J., Li, M., & Schultz, S. E. (2001). On the validity of cognitive interpretations of scores from alternative concept-mapping techniques. *Educational assessment 7*(2), 99–141. Stepien, W. J., Gallagher, S. A., & Workman, D. (1993). Problem-based learning for traditional and interdisciplinary classrooms. *Journal for the Education of the Gifted*, *16*(4), 338–357.	The Table of Contents does not state that there is a reference list or bibliography.
Resource/ author is frequently cited in Google Scholar.	Cited over 10,000 times (as of winter 2019).	Cited fewer than 10 times (as of winter 2019).

Note. Wiggins, G.P., & McTighe, J. (2005). Understanding by design [Abstract]. Pearson Education. Wilson, M. B. (2013). Teasing, tattling, defiance and more: Positive Approaches to 10 common classroom behaviors. Center for Responsive Schools.

Eliminating duplicate responses yielded 127 unique resources from 167 survey respondents. Of these, 102 survey respondents were in school districts from which we were unable to obtain board approval to contact participants. The remaining 65 school-based practitioners were invited to participate in an interview. Potential participants were recruited by email. Eight of the invited

practitioners agreed to an interview. Because of false starts (i.e., the next person in the brokerage chain declined to participate in the study), four of the original eight cases were terminated after the initial practitioner interview. In total, we completed four case studies.

Step 2: Gather Evidence

Two strategies were used to gather data for each case. First, a snowball interview approach was used to identify 22 participants across the four case studies (Z. P. Neal & Neal, 2022). Interviews with school-based practitioners were conducted to learn how the resource had been found, what actions had been undertaken to put the information in the resource into practice, and the practitioners' relationship, if any, with the individual/organization that shared or created the resource. If a school-based practitioner explained that they had received a resource from an individual/organization, the practitioner was asked to provide their contact information so that the research team could continue to trace the paths of research into practice. We also conducted interviews with brokers to learn about their organization, their role, responsibilities, how and why the resource had been conceptualized/developed and mobilized, and their relationship with the school-based practitioner, other brokers, or researchers connected to the case. Finally, interviews were conducted with research producers to learn their relationship, if any, with the school-based practitioner or brokers connected to the case and how and why the research project had been conceptualized, undertaken, and disseminated. The interview protocols were semi-structured to allow for the exploration of topics and themes that might arise.

Second, we obtained the resources that were the focus of each case. Interview participants were also invited to provide documents that provide additional context to inform the study (e.g., research manuscripts, conference presentations, etc.). Finally, when possible, we collected information for organizations that participated in the paths between research and practice in each case. This information was obtained, when possible, by downloading (through Print to PDF) publicly available web-based information. In total, we collected 86 documents.

Step 3: Qualitative Coding and Analysis

A codebook was iteratively developed to reflect the emerging dimensions of each case. We used a combination of a priori coding (i.e., based on the elements of the conceptual framework) and open coding (i.e., our own codes developed based on close reading of interviews and documents). Each code in the codebook was given (a) a case classification; (b) a label; (c) a definition; and (d) how to know when the code is applied. Table 4 shows code classifications and corresponding code labels. The coding framework is presented in the Appendix.

Table 4: Case Classifications and Code Labels from Codebook

Case Classification	Code Labels
Brokers	Broker determination: Actor (i.e., individual or organization) must act as a link between actors, groups, or communities to facilitate the flow and uptake evidence-based information. Membership in research, intermediary, or practice community Activity domain: information managers, linking agents, capacity builders, facilitators, and evaluators Organization type: For profit, governmental, membership, non-profit, practice-level Organization characteristics: mission statements, annual revenue, size, membership composition, focus in field, target audience
Research Products	Product categories: PD materials, conference presentations, book, news, magazine, blog, multimedia, social media, peer-reviewed article, research summaries/brief, evaluation report, reviews of studies Format: written/text, verbal, media/multimedia Availability: publicly available, private or internal, fee-based Target audience: research, practice, other Actionability: descriptive, prescriptive
Research Transformations	Transformation type: adaptation, summary, synthesis, translation Product change in format: written to multi-media, multi-media to written, no change Change in availability: 'publicly available' to 'associated with fees', 'publicly available' to 'private or internal', 'associated with fees' to 'private or internal', no change
Knowledge Exchange Events	Interaction type: push, pull, interactive Boundary spanning: within research, within intermediary, within practice, between research and intermediary, between intermediary and practice, between research and practice Motivation purpose: promoting evidence-based practice, information sharing/seeking, support implementation Motivation source: intrinsic, extrinsic

We independently coded 20% of the data to establish inter-rater reliability at an agreement level of .80. During and after the reliability check, we further refined the codebook. We then utilized NVivo's matrix query feature to identify similarities and differences within and across cases on the above dimensions.

Step 4: Creating Visual Maps

Concurrent with the qualitative coding process, the research team read the case data and used it to create narratives describing the significant components of the paths between research and practice. These included people, organizations, timelines, events, research products, and contextual information. These narratives were then used to generate visual maps. Following this approach, we were able to develop maps such as the one shown in Figures 1 and 2.

In Figure 1, we can also see the actors (yellow circles) involved along the paths between research and practice and how they engage (black arrows) with each other and with research products (blue squares) in their work. We also can see KEEs (shaded triangles). Note that we used different colors to describe kinds of interaction: blue triangles represent research pushed to another actor, red triangles represent research being pulled by an actor, and green triangles represent interaction among actors. In Figure 2, we can see how the various research products in this case are transformed in the paths from research to practice. At left, we can see the earliest iterations of research products—dissertations and evaluations—and as we move right, we can see grey arrows indicating the transformation of research into research products as it moves through the brokerage system. These visualizations help us "see" the process unfold and differentiate along parts of the path.

Figure 1. Example of Case Map: Actors, Activities, and Knowledge Exchange Events.

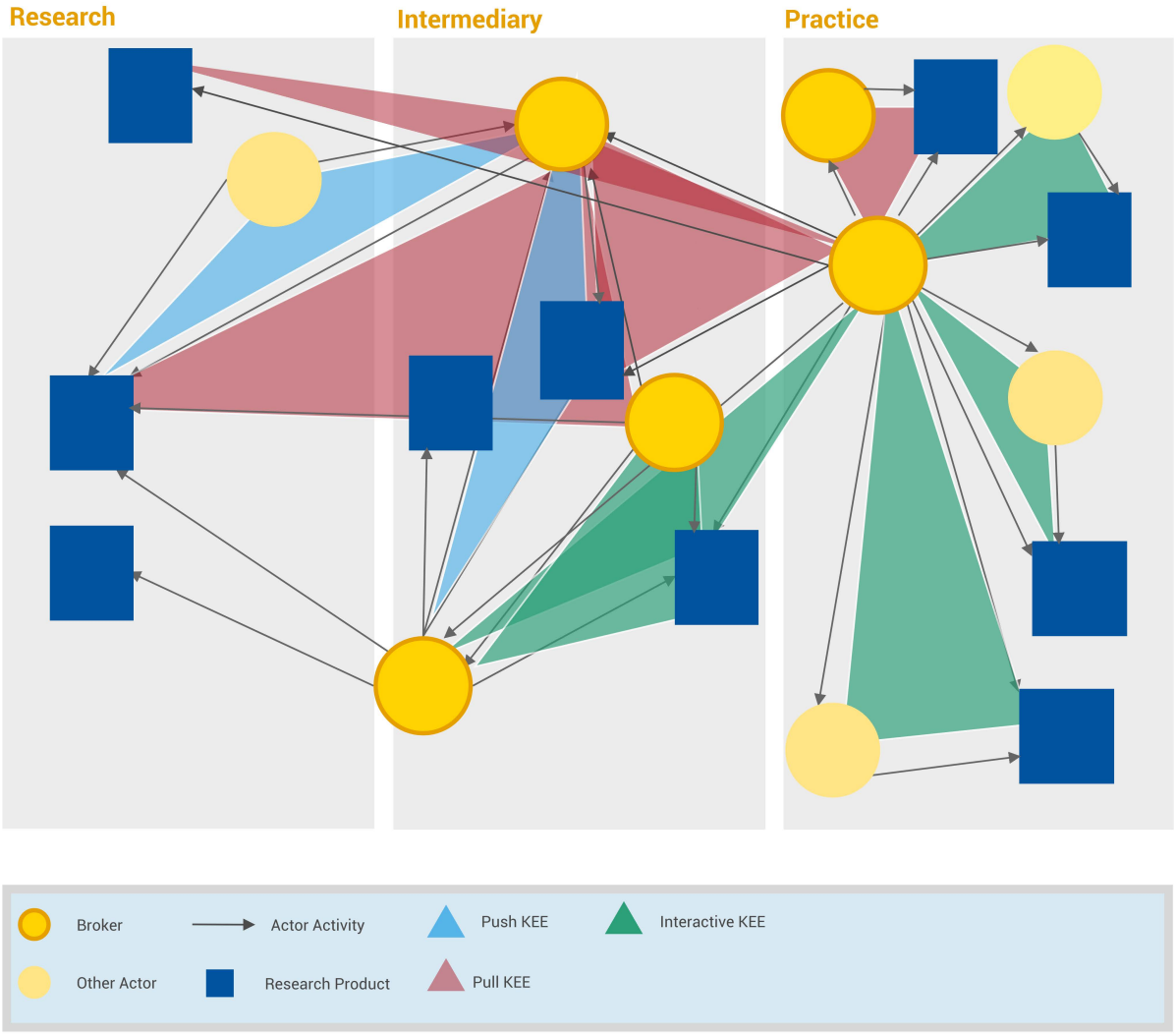
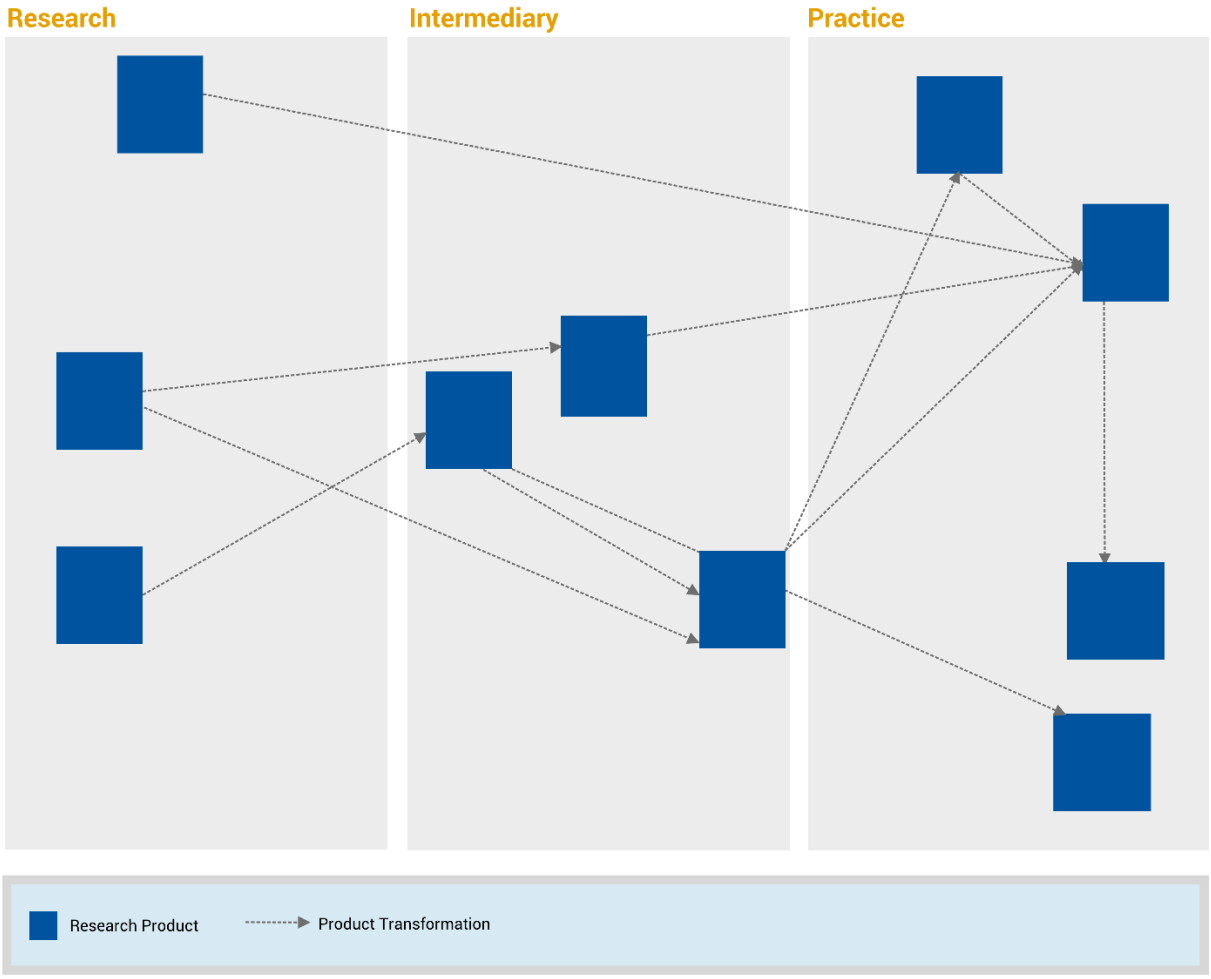


Figure 2. Example of Case Map: Research Products and Transformations.



Step 5: Data Validation

To identify potential inconsistencies, we validated our data by cross-referencing our visual maps to our coded data. During our team walk-through, we asked the following questions: (a) Are all of the components (i.e., actors, activities, research products, and KEEs) represented?; (b) Are the case narratives and knowledge maps consistent?; and (c) Are all of the components fully described? We addressed discrepancies by returning to the data for clarification and making modifications where appropriate. For example, in one walk-through, the research team identified a missing KEE, which should have reflected an interaction among the respondent, a broker, and a research product.

Case-Based Analysis

A final step in the research process entailed analyzing maps and their underlying qualitative data using within-case and cross-case approaches. Within-case analysis examined the three areas of

inquiry by looking at codes within each area and developing observations about the relationships among codes in each case. This led to a narrative that captured key elements of each case in terms of brokers, research products and transformations, and KEEs. Cross-case analysis examined patterns of codes in each of the three areas of inquiry across cases, surfacing similarities and differences. These similarities and differences were then used to develop cross-case interpretations about the role of brokerage in linking research and practice.

Limitations

This study design purposefully focuses on *successful* cases of research finding its way into practice. This type of survival bias has the effect of highlighting best-case scenarios rather than typical phenomena. There are likely many more cases in which research enters the intermediary space but does *not* find its way into practice, and these can offer additional insights about brokerage.

Further, our processes for selecting cases, coupled with low response rates to participation requests, mean that these cases are not likely representative of other "successful" cases of research finding its way into practice. In fact, participation may be biased toward those predisposed to supporting or engaging in use of research evidence.

For these reasons, the cases and analyses presented here are not intended to offer generalizable information about how research finds its way into practice. Rather, these cases help to surface critical issues and potential levers in the paths between research and practice to inform current research and policy discourse on evidence use in education.

Overview of Cases

We completed four backward tracking cases. In other words, we were able to track how four research-informed resources (cited as being used by educators in the Survey of Evidence in Education) made their way into practice. In Cases 1, educators used research-informed resources to inform the adoption of programs and instructional models within classrooms. While in Cases 3 and 4, educators used research-informed resources to develop school-wide professional learning and to implement common assessments. In the following sub-sections, we provide more detail about each case.

Case 1: Supporting K–3 Teachers in Providing Handwriting Instruction

Case 1 is the first of two cases of adoption. In this case, a school-based occupational therapist (OT) identified the need to support K–3 teachers in providing handwriting instruction in their classrooms. To achieve this, the OT found an evidence-based program and supported K–3 teachers in adopting it. During our interview with the OT, we learned that she relied on many resources to guide her decision, including a conference presentation by the program developer, her colleague's notes from the presentation, and articles from her professional association's research journal. However, in the *SEE–S*, the OT originally cited a different resource: a research poster (also obtained from the professional association) detailing the results of an efficacy study of the program. The OT shared the information she learned with multiple people in her district, including other school-based OTs (to increase knowledge about the research on handwriting and the program) and her principal (to gain support for adopting the program). Finally, she worked with K–3 classroom teachers to implement the program in their classrooms.

In this case, the research team conducted additional interviews with an employee from the professional association, the conference coordinators, the university-based researcher who conducted the efficacy evaluation, and the developer of the handwriting program. Across all cases, we considered the original *SEE–S* respondent as the case "starting point" and tracked backward from the respondent. Consequently, we did not interview the OT's colleagues (i.e., the other OTs, principal, and classroom educators with whom she shared information). We collected and analyzed 22 documents for this case. In Table 5, we provide an overview of brokers and their work, research products and transformations, and KEEs that occurred in Case 1. We also depict this information in visual maps in Figures 3 and 4.

Table 5. Case 1 at a Glance.

Brokers and Their Work	Research Products and Transformations	Knowledge Exchange Events
Program developer • Conducts and writes dissertation • Creates handwriting program • Uses journal article to inform development of research poster and conference presentation materials • Creates research poster • Shares research poster with professional association • Creates and delivers conference presentation/materials State conference coordinators • Seek out journal article • Invite program developer to conference • Host conference Professional association • Publishes journal article • Publishes research poster • Publishes additional research articles Occupational therapist • Attends conference presentation • Seeks out research poster • Seeks out additional research articles • Seeks out colleague's notes • Creates professional learning presentation • Provides professional development presentation to other occupational therapists (OTs) • Has discussion with and provides materials to school principal • Creates classroom demonstration • Provides classroom demonstration to educators Colleague • Attends conference with OT • Writes notes on conference presentation • Provides notes to OT	Journal article • Becomes part of research poster and conference presentation/materials Dissertation • Becomes handwriting program Handwriting program • Becomes part of conference presentation/materials • Is used in classroom demonstration Research poster • Is synthesized with additional research articles, conference presentation and materials, and notes into professional learning presentation Conference presentation and materials • Is summarized into notes • Is synthesized with research poster, notes, and additional research articles into professional learning presentation Additional research articles from professional association • Is synthesized (with other products) into professional learning presentation Professional learning • Is summarized into discussion and materials Discussion and materials • No transformation Classroom demonstration • No transformation	Researcher sends article to association Program developer sends research poster to association State conference coordinators seek out journal article from professional association State conference coordinators and program developer plan conference presentation OT attends presentation by program developer at state conference OT gets research poster and additional articles from the association journal OT gets additional notes from colleague OT discusses conference presentation and research evidence during internal district professional learning with other OTs OT has discussion with and provides professional learning materials to principal OT conducts classroom demonstration with teachers

Figure 3. Map of Case 1: Brokers, Activities, and Knowledge Exchange Events.

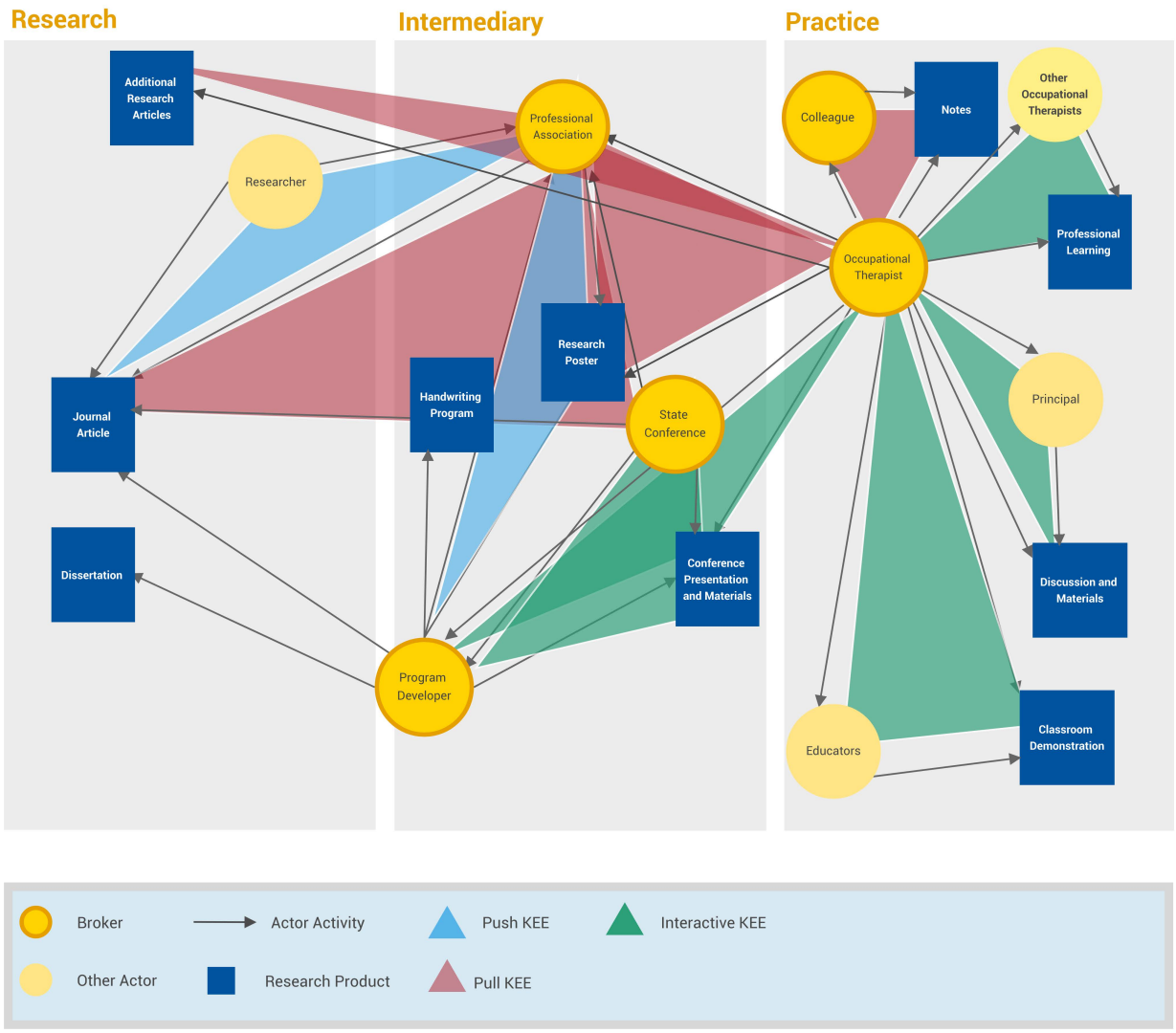
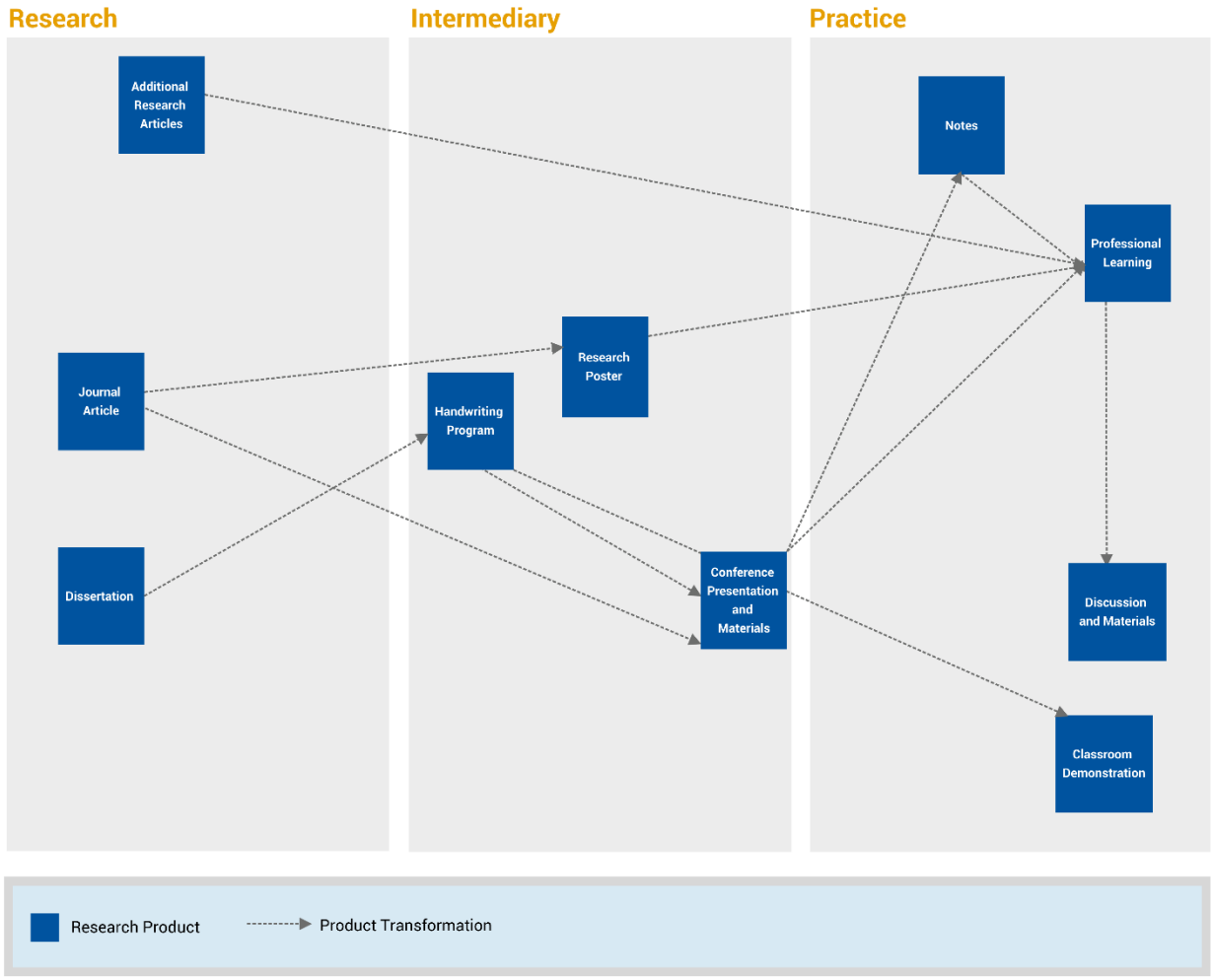


Figure 4. Map of Case 1: Research Products and Transformations.



Takeaways from Case 1. Efforts to seek out and synthesize research and other information were led primarily by the OT as a response to expectations for the staff's continued professional development and professional beliefs about the importance of evidence-based practice. Brokers who facilitated linking research and practice existed within the research, intermediary, and practice communities and engaged in a wide range of activities that often-spanned boundaries. Of note is the state conference, which sought to identify and share research at the event with the aim of engaging the profession in evidence-based practices. The OT also played a critical role in mobilizing the handwriting program and the associated materials they collected within their district, largely by transforming those resources into presentation materials and professional development. Overall, this case illustrates (a) how research is translated, synthesized, and adapted into a wide range of research products; (b) the importance of active engagement by researchers,

intermediaries, and practitioners with commitments to evidence-based practice; and (c) KEEs that facilitate practitioner engagement with research.

Case 2: Using an Instructional Model to Improve Practice

Case 2 is our second case of adoption. In this case, a science teacher identified the need to address a wide range of student engagement in her classroom. To achieve her instructional goals, the teacher adopted an evidence-informed instructional model that would structure and organize her lessons. In the *SEE–S*, the teacher originally cited an article obtained from a professional association's (1) practitioner journal that detailed components of the instructional model and provided a sample lesson plan. However, during our interview with the teacher, we learned that she relied on multiple resources to guide her decision, including a book (obtained for a university course during preservice training) that provided an overview of the model, a standards document (obtained from her state's department of education) that encourages teachers to use the model in their lessons, an article published by media organization based on findings of a research project funded by a research organization, information from members of another professional association (2), and other resources obtained from a search engine. In addition to adopting the model in her own classroom, the teacher shared information about the model with a colleague who taught the same subject.

In this case, the research team conducted additional interviews with an employee from the state department of education, a researcher who wrote the book used by the teacher, a representative from professional association (2), a representative from the media organization, and another researcher who wrote a practitioner journal article. We were unable to interview the university instructor who provided the book, a representative from professional association (1), or a representative from the search engine. In addition, as in Case 1, since our starting point was the teacher, we did not interview the colleague with whom she shared information on the model. We collected and analyzed 34 documents for this case. In Table 6, we provide an overview of the brokers and their work, research products and transformations, and KEEs that occurred in Case 2. In Figure 5 and Figure 6, we present the Case 2 visual maps.

Table 6. Case 2 at a Glance.

Brokers and Their Work	Research Products and Transformations	Knowledge Exchange Events
Professional association (1) • Publishes practitioner journal article • Publishes book Professional association (2) • Provides access to information on instructional model University professor • Uses book in course • Uses article in course Research funding organization • Funds original research • Shares research findings with media organization Media organization • Seeks out supporting research to inform development of article with embedded media Search engine • Provides access to lesson plans State department of education • Uses instructional model in state standards • Seeks out research findings and uses findings to inform development of state standards • Engages with advisory committee to develop state standards Educator • Shares practitioner journal article and lesson plans with colleague	Original research (1) • Is adapted into instructional model Instructional model • Is adapted in original Research (3) • Is translated into lesson plans • Is transformed into information on instructional model • Is synthesized into a book with supporting original research (1) • Is translated into standards • Is the basis for adapted model Original research (2) • Used in standards document Original research (3) • Is summarized in article with embedded video Original research (4) • Is synthesized in adapted model Adapted model • Is summarized in practitioner article Supporting research (1) • Is summarized and synthesized with instructional model to create book Supporting research (2) • Is incorporated into the article with embedded videos Practitioner journal article • Is synthesized in informal discussion Lesson plans • Are synthesized with the practitioner journal article in informal discussion Article with embedded video Book Standards document Informal discussion	Researcher (1) publishes book with professional association (1) Researcher (2) publishes article in professional association (1) practitioner journal University professor requires the educator to read the book and practitioner journal article during a course Research funding organization shares findings from a funded research project with a media organization State department of education pulls research findings from a research organization State department of education engages with an advisory committee to develop their state standards document State department of education pulls research from a research organization to inform development of state standards Educator finds article with embedded videos on media organization website Educator uses search engine to find lesson plans based on instructional model Educator obtains more information about the instructional model from professional association (2) Educator has conversation about the model with colleague

Figure 5. Map of Case 2: Brokers, Activities, and Knowledge Exchange Events.

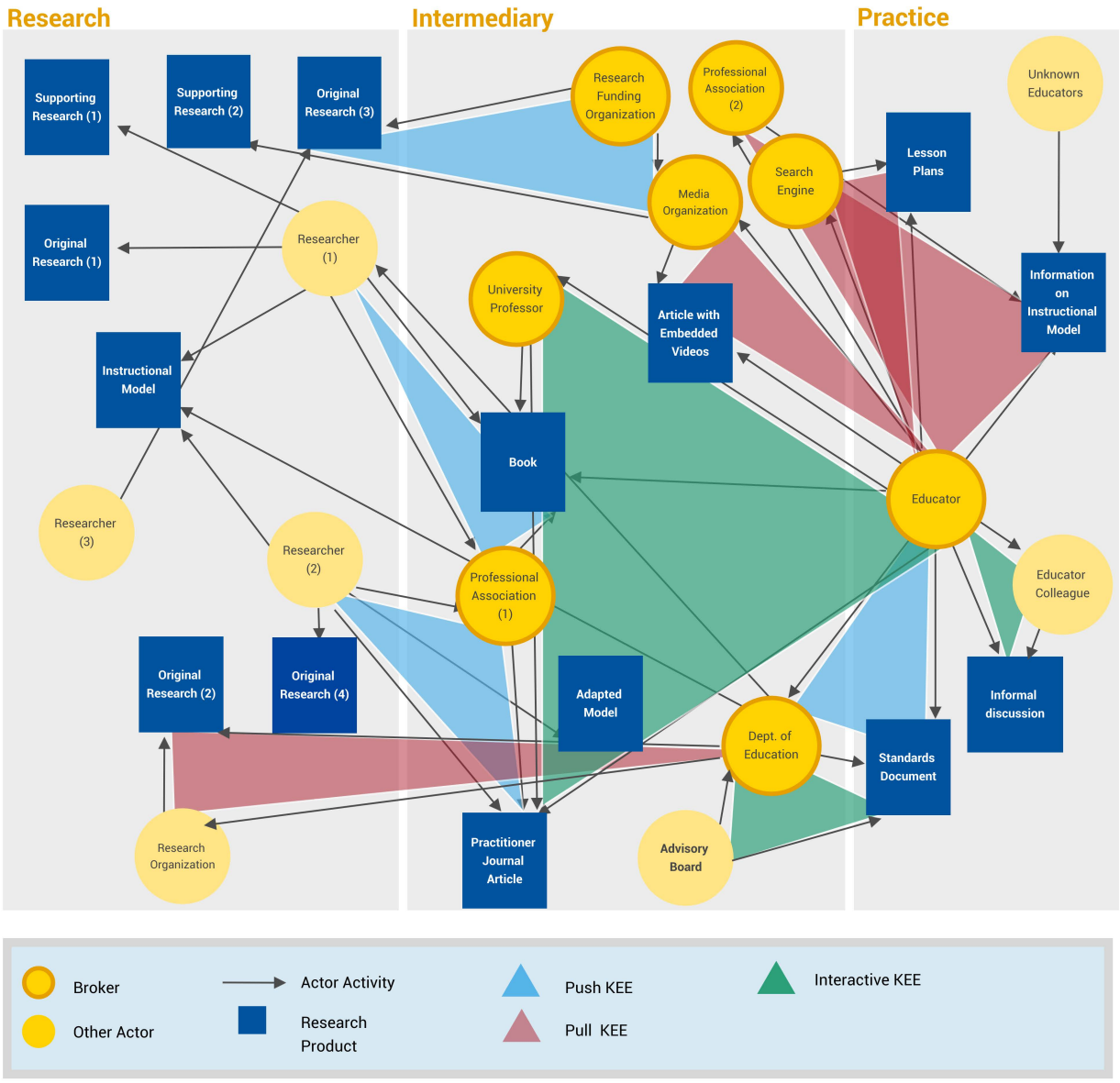
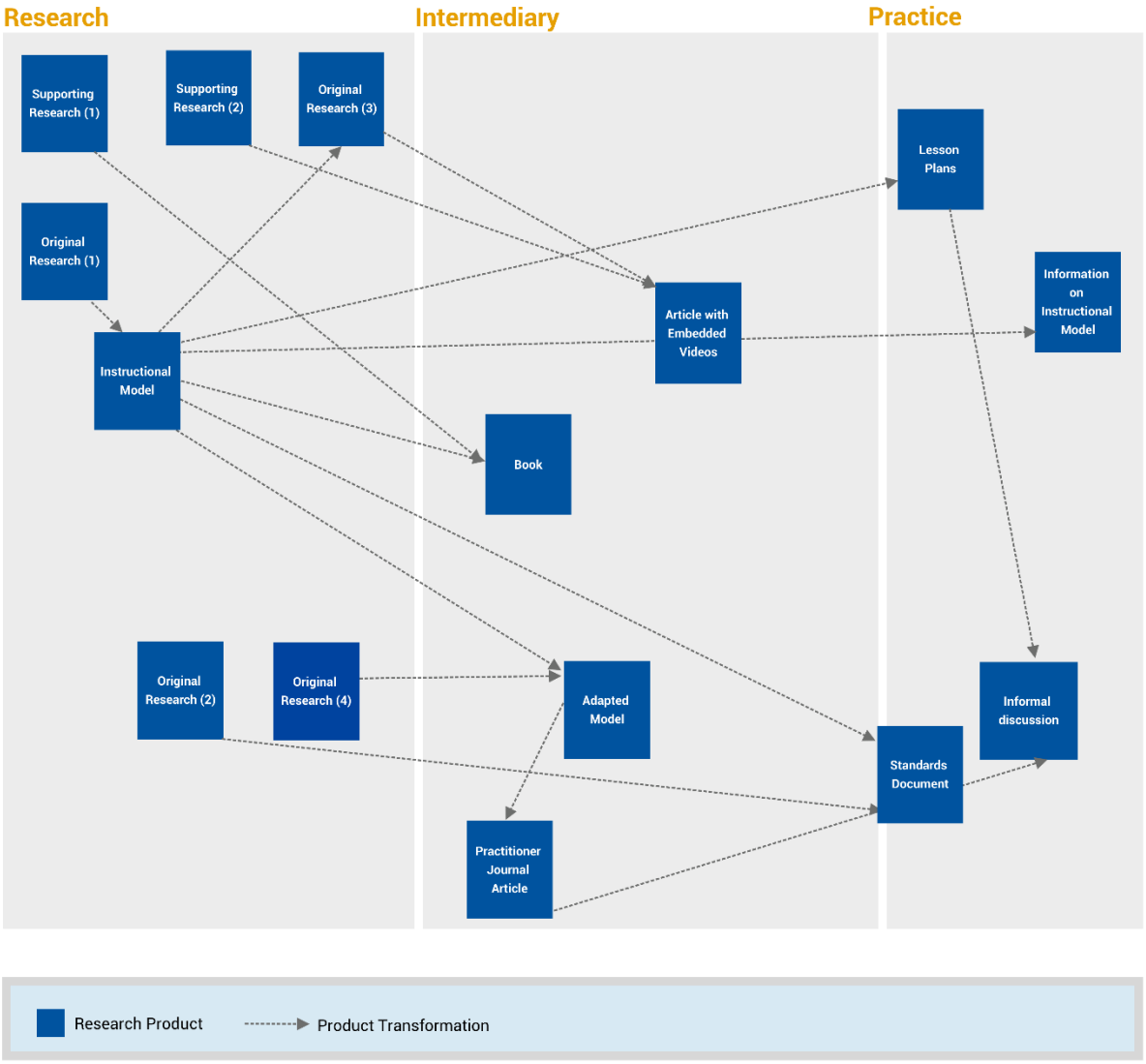


Figure 6. Map of Case 2: Research Products and Transformations.



Takeaways from Case 2. This case reveals a complex set of information and search activities largely driven by the science teacher, motivated by her interest in improving student engagement through evidence-based practices. As in Case 1, brokers facilitating the linking of research and practice existed within the research, intermediary, and practice communities. They engaged in a wide range of activities and research transformations that ultimately resulted in a diverse set of practitioner-focused resources, all informed by the original instructional model. The science educator both sought out and received resources, ideas, and strategies from which she integrated to inform her own practice, and she felt strongly enough about the work to try to persuade her colleague to use the approach. Overall, this case illustrates again how research is translated, synthesized, and

adapted into a wide range of research products, some of which are used to drive adoption of new practices and others which support implementation. The case also provides insight into how educators' search strategies and own sense-making may shape the uptake of evidence-based practice. In doing so, the case also highlights the importance of both push and pull knowledge-sharing processes in the educator's use of research.

Case 3: Developing a Professional Learning Community within a School

Case 3 is a case of school-wide professional learning. In this case, a principal identified the need to connect teacher practice to student outcomes. To achieve his goal, the principal worked with the school's instructional team to institute professional learning communities within the school. The resource originally cited by the principal in the *SEE–S* was an evidence-informed book (obtained from a professional learning company) that provides guidance and actionable steps for implementing professional learning communities. During our interview with the principal, we learned that he also had his school staff visit an outside school district well known for its successful use of professional learning communities. During this site visit, the principal and teachers attended presentations on how to implement professional learning communities. These presentations referenced the book used by the principal.

The research team conducted additional interviews with employees from the outside school district, an employee from the professional learning company, and the book's author. Once again, because we did not "forward track" how resources were shared past the original survey respondent (i.e., the principal), we did not interview other members of the instructional team or the school's educators. We collected and analyzed 15 documents for this case. In Table 7, we provide an overview of brokers and their work, research products and transformations, and KEEs in Case 3. In Figure 7 and Figure 8, we present the Case 3 visual maps.

Table 7. Case 3 at a Glance.

Brokers and Their Work	Research Products and Transformations	Knowledge Exchange Events
Professional learning company • Publishes book (1) • Creates videos based on book (1) • Publishes books (2) and (3) Professional association • Publishes book (4) School-based nonprofit • Creates presentation and materials • Shares presentation and materials with school's leadership team and teachers School leadership team • Seeks out books (1), (2), (3), and (4) • Creates school handbook • Shares school handbook with school teachers	Original research • Original research and supporting research (1) is summarized and synthesized in book (1) Supporting research (1) • Supporting research and original research is summarized and synthesized in book (1) Book (1) • is summarized in video • Is summarized in school-based nonprofit professional learning presentation and materials • Is synthesized with books (2), (3), and (4) to create school handbook for implementation Supporting research (2), (3), and (4) • Are summarized and synthesized into books (2), (3), and (4) Books (2), (3), and (4) • Is synthesized with book (1) to create school handbook for implementation Videos • No transformation Presentation and materials • No transformation School handbook • No transformation	Researcher publishes book (1) with professional learning company Researcher publishes book (2) with professional learning company Educator publishes book (3) with professional learning company Professional association publishes book (4) with executive director of consulting firm School leadership team obtains books (1), (2), and (3) from the professional learning company School leadership team obtains book (4) from professional association School leadership team shares school handbook and videos with teachers during professional development School-based nonprofit hosts conference and provides presentation and materials to school leadership team and teachers.

Figure 7. Map of Case 3: Brokers, Activities, and Knowledge Exchange Events.

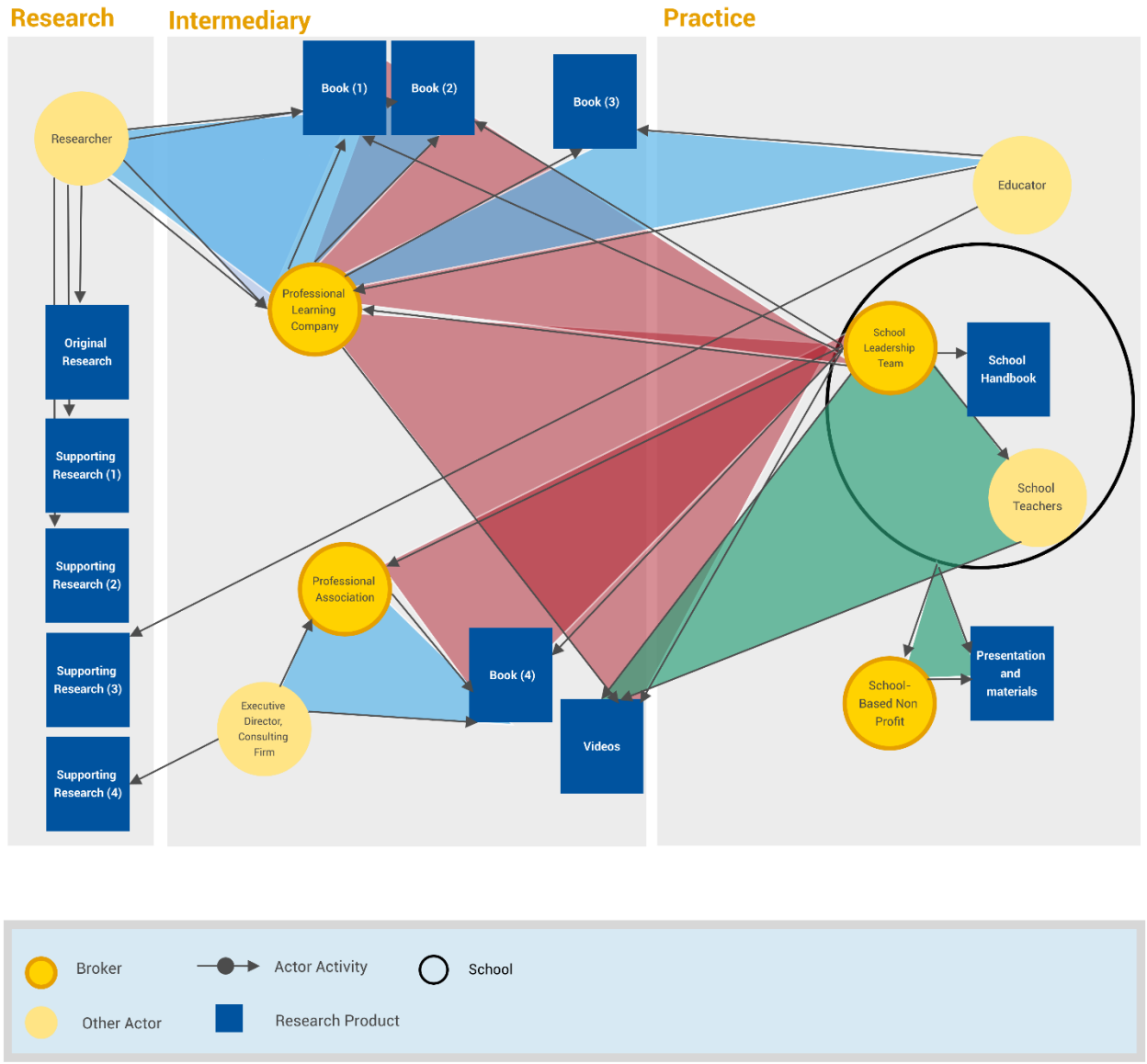
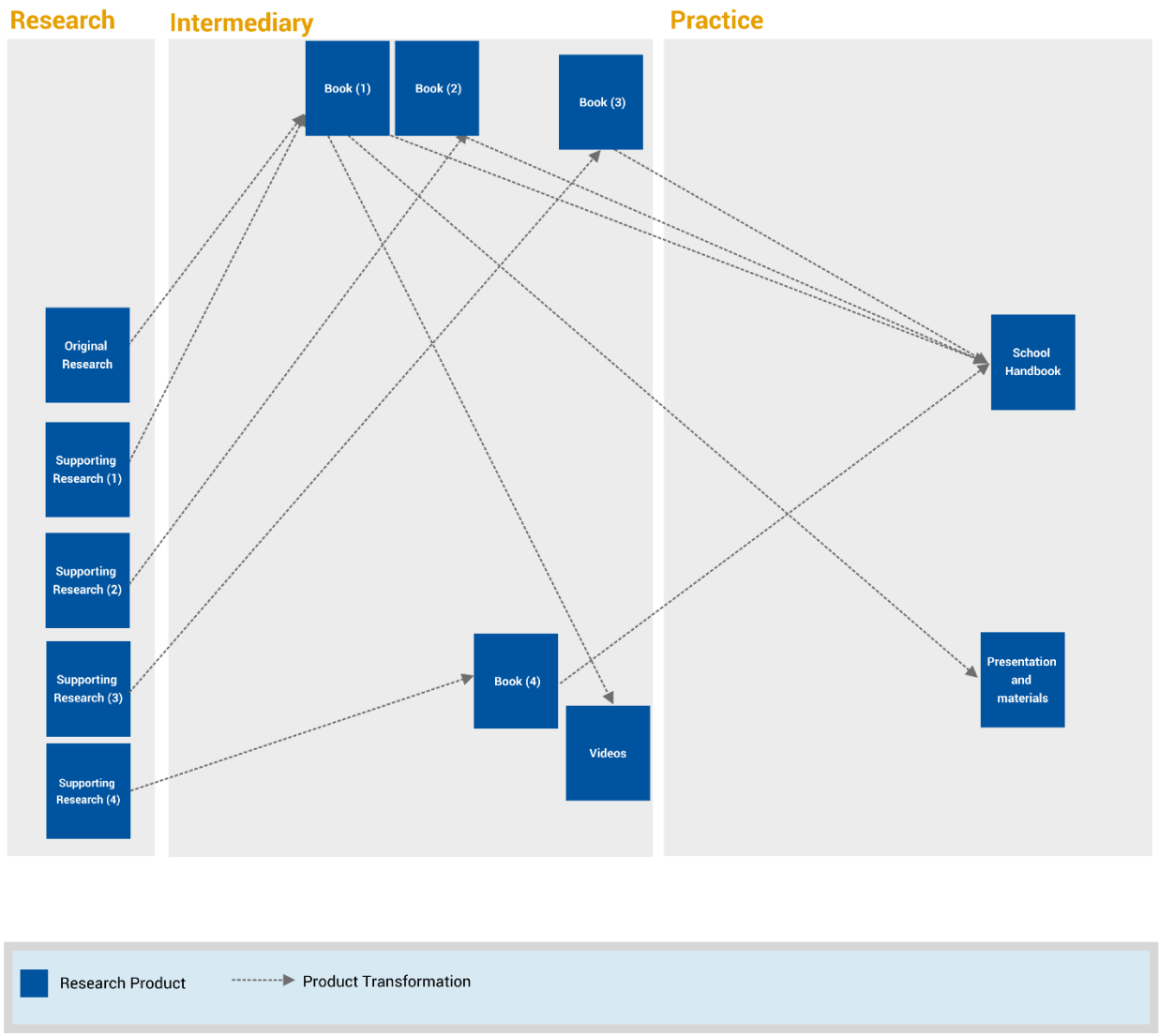


Figure 8. Map of Case 3: Research Products and Transformations.



Takeaways from Case 3. This case focuses on a district-driven improvement initiative in response to perceptions about student performance. It presents a simpler path between research and practice, with three key inte linking the two communities. The practice side of the map is particularly important, showing how organizational structures such as school leadership teams actively sought out research-based resources to shape implementation of their initiatives. Overall, this case highlights the roles of KEEs that occur within the practice space and of the practice-based brokers that facilitate evidence use. Like other cases, it also features practitioner-focused research products that can guide implementation.

Case 4: Implementing Common Assessments across a School District

Case 4 is a case of implementation. A school district identified the need to raise student achievement. To achieve this goal, the district implemented common assessments to monitor and improve student learning. In this case, the same district that implemented professional learning communities also implemented common assessments. Through interviews, we learned that the school district's leadership team led and coordinated the district initiative. The director of teaching and learning (a member of the district leadership team) sought out a book (obtained from a professional association) that focused on the research base on common assessments and provided actionable guidance for practice. The director of teaching and learning shared the book with a school-based instructional team and worked with the team to develop plans to implement common assessments within each school.

In addition to using the book shared by the school district leadership team, instructional team members individually searched for research-based materials to support their work. In particular, the vice principal found a blog article using a research database (the resource originally cited in the *SEE–S*) that provided research-based arguments as to why common assessments should be used by teachers and schools. The blog article was originally published by a professional learning company. The instructional team discussed the article and subsequently used it to develop professional learning materials to use with the school's educators.

The research team conducted interviews with two members of the school-based instructional team (instructional coach [survey respondent] and vice principal), a member of the school district leadership team (director of curriculum and instruction), the author of the book used by the district leadership team, an employee from the professional association, and an employee from the professional learning company. We did not interview the school's educators. We collected and analyzed 15 documents for this case. In Table 8 we provide an overview of brokers and their work, research products and transformations, and KEEs that occurred in Case 4. In Figure 9 and Figure 10, we present the Case 4 visual maps.

Table 8. Case 4 at a Glance.

Brokers and Their Work	Research Products and Transformations	Knowledge Exchange Events
Professional learning company • Publishes blog by researcher (1) Professional association • Publishes book by researcher (2) Research database • Acts as a repository for blog Director of teaching and learning • Obtains book from professional association • Shares book with school leadership team Vice principal • Obtains blog from research database • Shares blog with other school leadership team members School leadership team • Creates professional development and materials • Provides professional development and materials to schoolteachers	Original research • Is summarized into book Book • Is summarized and synthesized into professional development and materials along with blog Research literature • Is summarized into blog Blog • Is summarized and synthesized into professional development and materials along with book Professional development and materials • No transformation	Researcher (1) publishes blog with professional learning company Researcher (2) publishes book with professional association Director of teaching and learning obtains book from professional association Director of teaching and learning shares book with school leadership team Vice principal obtains blog from research database Vice principal shares blog with other school leadership team members School leadership team provides professional development and materials to schoolteachers

Figure 9. Map of Case 4: Brokers, Activities, and Knowledge Exchange Events.

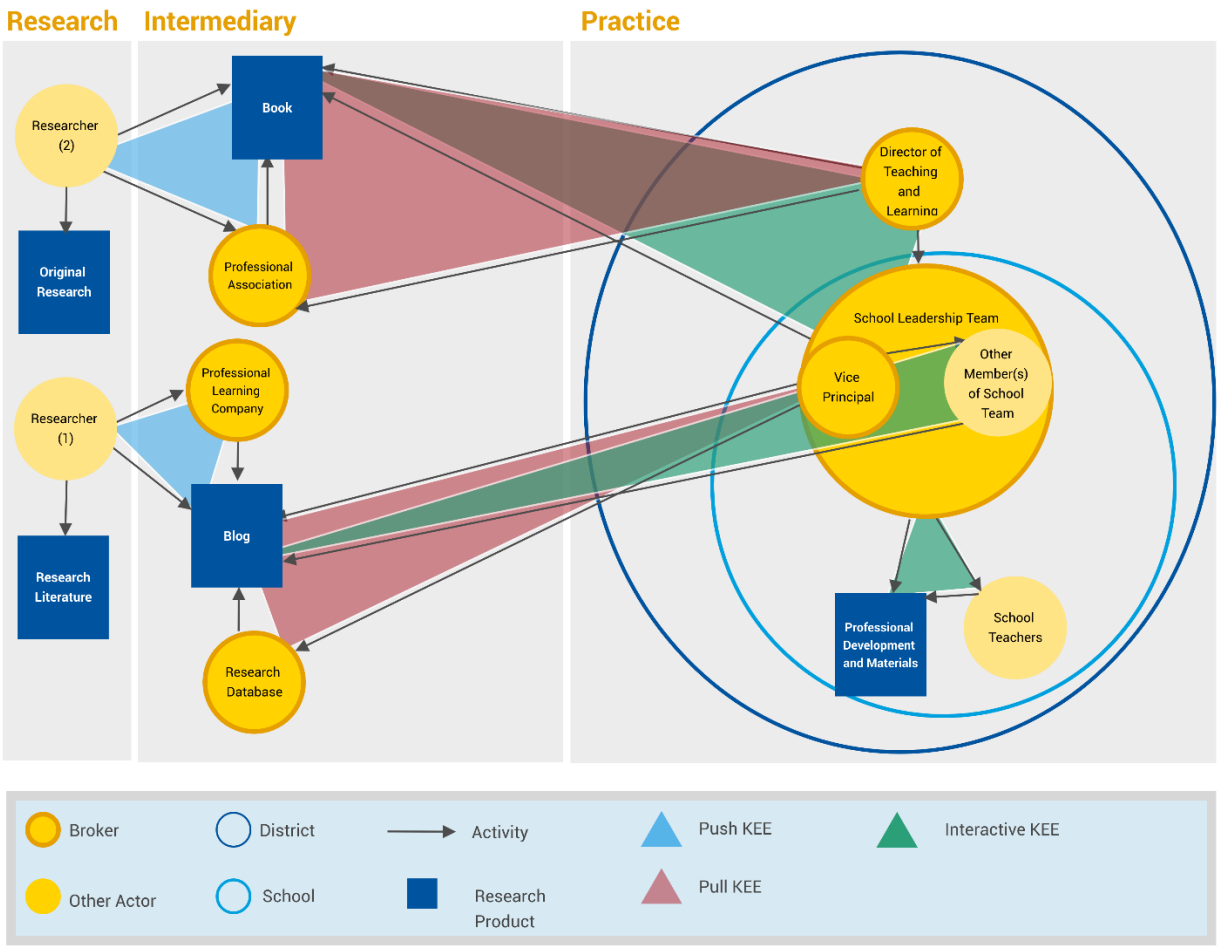
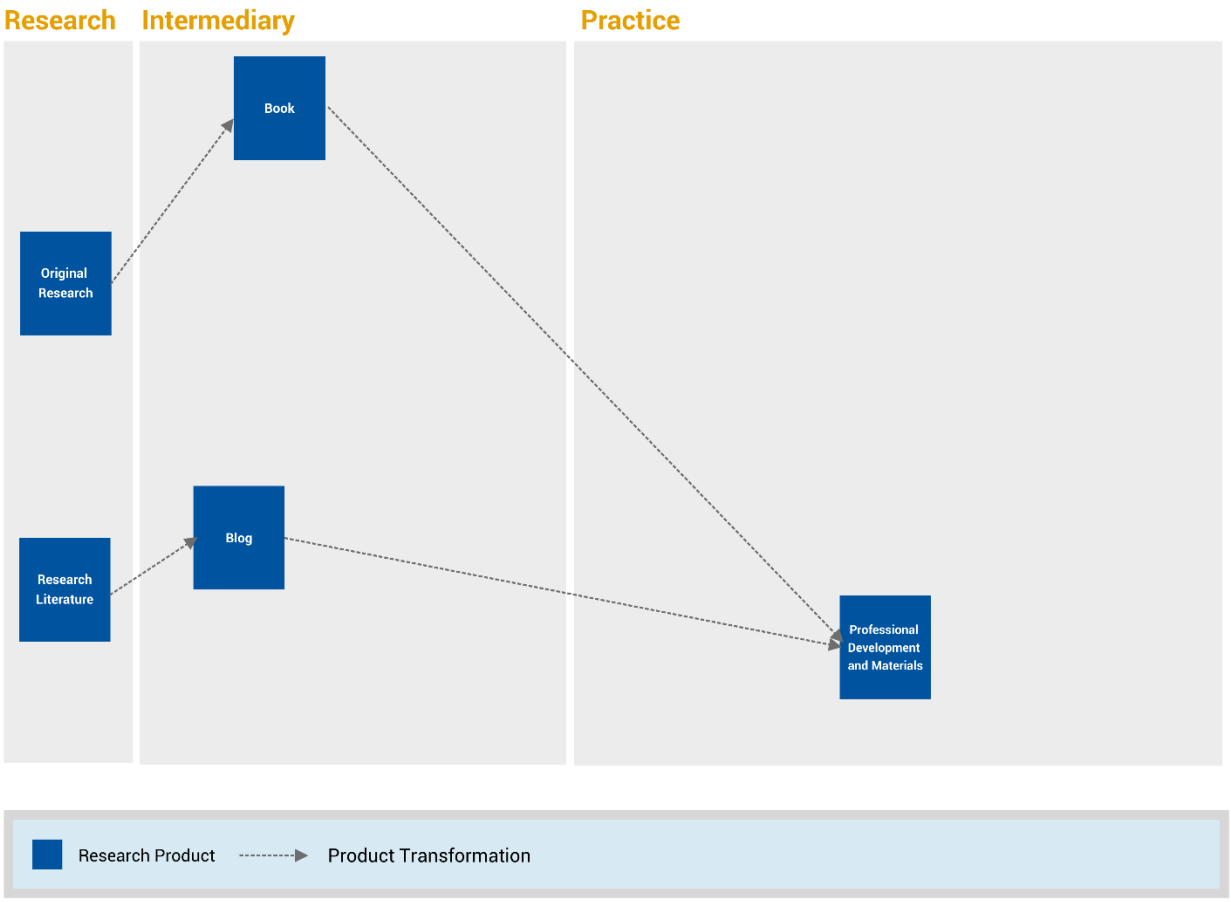


Figure 10. Map of Case 4: Research Products and Transformations.



Takeaways from Case 4. Case 4 extends Case 3, focusing on the selection and implementation of a related district improvement initiative to improve student learning and performance. This case also presents a simple path between research and practice, with two research-based practitioner resources (i.e., the book and blog) moved by key brokers. The director of teaching and learning played a critical broker role, not only seeking out information about the district-selected strategy that would support implementation but also facilitating engagement with that research across levels of the system (district and school). Within the school, the vice principal leveraged his access to a research database to find additional relevant resources. This case highlights the important role that district, and school leaders played in facilitating the use of evidence-based resources within team meetings and in developing resources shared with educators in the school. Synthesizing information from the book and the blog into resources for educators in the school, they thus embedded research into professional learning and, ultimately, into practice.

Findings

Findings are presented in relation to our three areas of inquiry. For information on how we defined and operationalized concepts, see Appendix, to which we have linked throughout the document for readers interested in learning more about the concept in question.

Knowledge Brokers (AI 1)

The central focus of AI 1 is understanding the individuals and organizations through which research passes—termed knowledge brokers throughout this report—and the characteristics of those individuals and organizations. In our four cases, the concept of knowledge brokers is operationalized as actors that link individuals, groups, or communities to facilitate the flow and uptake of evidence-based information. In the data, engagement in such activities was evidence that the actor is a broker within the specific case. Across the four cases, we identified 23 brokers. It is important to note that not all actors in our data served as knowledge brokers. Some were starting or ending points in the paths between research and practice; and others played key roles but were not points through which research flowed. We acknowledge these actors as important, but their roles and contributions fell outside the scope of our inquiry. They may, however, be important directions for future research.

We categorized broker activities in terms of the five activity domains described by Glegg and Hoens (2016): information managers, linking agents, capacity builders, facilitators, and evaluators. In the data, we looked for activities that were specifically designed (or described) to do any of these activities. We identified five brokers in Case 1, eight in Case 2, four in Case 3, and six in Case 4. Table 9 provides the case summary for broker activity domains. We illustrate the role of brokers in the Broker Spotlight at right. Here, we see Heather Habashi and Gabriella Garcia playing important roles as linking agents, evaluators, and information managers.

Broker Spotlight (Case 1)

State Conference Coordinators Heather Habashi and Gabriella Garcia

Heather and Gabriella decided to create their own yearly event where school-based occupational therapists (OTs) could listen to presentations on current research and treatment strategies, participate in facilitated discussion groups and breakout sessions, network with other OT professionals, and earn professional development credits.

To ensure the conference would be responsive to the needs of school-based OTs, Heather and Gabriella asked attendees to share the topics they would like to learn more about. They used this information to find speakers specializing in those areas. To be invited to the conference, speakers had to (a) produce research, (b) develop/promote/sell research-based programs and practices, or (c) develop research-based policies.

Heather and Gabriella invited Janice (program developer) to attend the 2018 conference. All presenters were required to submit copies of their presentations electronically so that PowerPoint slides could be made available to all conference attendees. All presenters were also invited to bring hard copies of any additional materials and resources they wanted to share with attendees.

Table 9. Case Summary of Broker Activity Domains.

Role Domain	Case 1	Case 2	Case 3	Case 4	N_{total} (%)
Broker *(N_{case} =)*	5	8	4	6	23 (100%)
Capacity Builder	0	0	1	2	3 (13.0%)
Evaluator	2	1	3	2	8 (34.8%)
Facilitator	2	0	0	1	3 (13.0%)
Information Manager	5	8	4	6	23 (100%)
Linking Agent	1	1	0	0	2 (8.7%)

Note. N = 23.

[a] Broker domains are not mutually exclusive; therefore, percentages add up to more than 100%.

Within each case, brokers engaged in multiple activity domains. All brokers (*N* = 23) served as information managers. This reflects our approach to identifying individuals for study participation: they had to have been a source of research information to another study participant. Of the brokers identified in the study, eight served only as information managers in the cases in question (i.e., did not engage in any other brokering activities). The next most common role, though far less frequent, was evaluator (*n* = 8). Brokers who served as evaluators often focused on evaluating knowledge mobilization activities and outcomes; but we also saw brokers assessing the local context to inform knowledge mobilization activities. For example, Heather Habashi (see Broker Spotlight) in Case 1 explained how conference topics were determined based on participant input:

> *Yes, first and foremost, at the end of our conference, we have our attendees fill out surveys… A lot of times, we can tell by those topics that they write down or when we have an open mic discussion group, it's the topics that keep coming up that seem to be relevant [and these] are the topics that we try to include in future conferences. The general topics we try to include and then we try to find speakers who specialize in those areas or have done research or are working off programs that are based on research.*

The remaining roles—capacity builders, facilitators, and linking agents—were limited within the cases in our study. Capacity building was evidenced by the creation of organizational structures to facilitate the research-based practices they were implementing, such as building professional learning communities in Case 3 to support more collaborative work among teachers. We note, however, that the three brokers who fulfilled capacity-builder roles were located within school-based organizations. Instances of facilitation, in which brokers supported the integration of research into decision-making, improved attitudes toward research, or enhanced the applicability of research to practice, were also less common in our cases. Only three instances were noted. For example, in Case 4, one district leader noted, *"What we try to do is whenever we either bring in new*

ideas or when we try to convince teachers of the validity of things that they're already doing, we try to rely on research as best we can." Last, we observed brokers acting as linking agents in two ways: by linking research and practice and by convening experts and other stakeholders. One example, in Case 2, occurred when the state department of education worked to develop standards by engaging researchers and practitioners on an advisory board (Table 6).

Findings across these case studies indicate that brokers engage in all domains hypothesized by Glegg and Hoens (2016). However, each broker in each case did not take up *all* those roles, nor did each case reflect all activity domains across brokers. Our sense from these data is that all role domains matter for linking research and practice, but their importance is not universal across cases. These findings might be interpreted as evidence that knowledge brokerage is a bit of an art—requiring brokers to understand when and how to apply strategies that contribute to the progression of research into practice. Alternatively, these findings might suggest, in line with those of others (e.g., Newman et al., 2020), that broker roles are not "formalized or routine" (para. 1) and therefore, the paths from research to practice are somewhat serendipitous, with success dependent on the combination of actors and activities that constitute the paths. In either case, more information is needed to understand *when* in the brokerage chain and *in which cases or contexts* each of these roles is most effective. This knowledge can then be leveraged to enhance brokers' knowledge and skills and to design knowledge mobilization initiatives that streamline the paths from research to practice. However, the limited roles assumed by each broker in this study invite further questions about the other activities in which these individuals and organizations are engaged. As we describe later in this section, many of these brokers are not focused exclusively on linking research and practice but have broader missions to which resources are also dedicated, and this may influence the roles and positions they take up in the larger brokerage system.

We were also interested in categorizing brokers by the community in which they were situated. Brokers were classified as located within the research community if actors stated they conducted research and/or worked in a research organization. No brokers within the research community were identified in this study. Brokers were classified as located in the practice community if actors stated that their primary responsibility was to provide or support instruction for K–12 students. Seven brokers were identified within the practice community. Finally, brokers were classified as members of the intermediary community if actors operated between members of the research and practice communities and on the paths between the two, reflecting elements of Honig's (2004) definition. The remaining 16 brokers were in the intermediary community.

To clarify the organizational contexts of brokerage in education, we categorized brokers by organizational type. We classified organizations into five types: for profit, governmental, membership, nonprofit, and practice level. For-profit organizations were represented most often by program or professional learning providers, whereas nonprofit organizations were more diverse, ranging from small service providers to philanthropically funded web-based resources to

universities. Membership organizations were defined as any organization that allows people to subscribe to receive services and/or information, and they included professional associations. Governmental organizations included state and federal education agencies. Finally, we included a separate category for districts, as they are distinctly practice-level organizations—places where school practitioners (e.g., educators, principals, and district staff) provide instruction to K–12 students. In Table 10, we provide a case summary of broker organizational types.

Table 10. Case Summary of Broker Organization Types.

	Case 1	Case 2	Case 3	Case 4	N_{total} (%)
Broker (N_{case} =)	*5*	*8*	*4*	*6*	*23 (100%)*
Organization Type					
For-profit	1	1	1	2	5 (21.7%)
Governmental	0	1	0	0	1 (4.3%)
Membership	1	2	1	1	5 (21.7%)
Non-profit	1	3	1	0	5 (21.7%)
School District	2	1	1	3	7 (30.4%)

Note. N = 23.

The 23 brokers were located across a variety of organizations. These organizations were most likely to be school districts (located within the practice community, which reflects our starting point for data collection in each case), followed by for-profit, nonprofit, and membership-based agencies (located in the intermediary community). Brokers in school districts had many roles within the district (e.g., classroom teacher, instructional coach, principal, central office administrator). This finding highlights that school- and district-based practitioners are instrumental in moving research within their organizations. Consequently, we argue that greater attention needs to be paid to these roles when designing knowledge mobilization initiatives, building capacity for evidence use, and planning for implementation of evidence-informed practices.

Governmental agencies were rare in our data, however, appearing only once in Case 2. We suggest that this uneven distribution of brokers across governmental and other organizations may be because of limited governmental infrastructure to support decision makers at the school and district levels.[3] As a consequence, schools and districts often turn to for-profit, membership, and nonprofit organizations for their research needs. This aligns with other findings from the research center (CRUE) in which this work is housed, which indicate the diffuse nature of the resources to which educators turn for research (Farley-Ripple, 2021). This also presents challenges for system-wide change, absent more coordinated, common mechanisms for linking research and practice.

[3] We recognize the existence of Regional Education Laboratories (and Comprehensive Centers; however, we argue that these organizations generally cater to state-level decision makers instead of those decision makers located at the school and district levels.

We were also interested in exploring the organizational characteristics of brokers within the intermediary and practice communities. For intermediary organizations, we examined seven features of nonprofit, for-profit, membership, and governmental organizations: (1) whether the organization's mission statement mentions concepts related to knowledge mobilization or evidence-based practice; (2) annual revenue; (3) size (small, medium, large); (4) membership composition (general public, practitioners, policymakers, researchers); (5) focus in field (narrow, broad); (6) scope of work (local, state, national, international); and (7) target audience (general public, practitioners, policymakers, researchers). In Table 11, we provide a case summary of characteristics for non-practice-based organizations.

Table 11. Case Summary of Characteristics for Broker Organizations.

Characteristic	N (%)
Mission Statement[a]	
Knowledge Mobilization	15 (93.8)
Evidence-based Practice	6 (37.5)
No Data	1 (6.3)
Annual Revenue	
< $1 Million	1 (6.3)
> $1 Million and < $50 Million	6 (37.5)
> $50 Million and < $1 Billion	2 (12.5)
> $1 Billion	2 (12.5)
No Data	5 (31.3)
Size (# of Employees)	
Small (1–49)	5 (31.3)
Medium (50–249)	5 (31.3)
Large (> 250)	2 (12.5)
No Data	4 (25.0)
Membership Composition	
General Public	1 (6.3)
Practitioners	4 (25.0)
Policymakers	1 (6.3)
Researchers	0 (0.0)
Researchers and Practitioners	4 (25.0)
Researchers and General Public	1 (6.3)
Researchers, Practitioners, and General Public	1 (6.3)
No Data	4 (25.0)
Focus in Field	
Broad	11 (68.8)
Narrow	5 (31.3)

Characteristic	*n* (%)
Scope of Work	
Local	0 (0.0)
State	2 (12.5)
National	3 (18.8)
International	8 (50.0)
No Data	3 (18.8)
Target Audience	
General Public	1 (6.3)
Practitioners	11 (68.8)
Policymakers	0 (0.0)
Researchers	1 (6.3)
Practitioners and Researchers	3 (18.8)

Note. N = 16.

[a] Missions can include references to both knowledge mobilization and evidence-based practice. Therefore, frequencies may be greater than *n*, and percentages may be greater than 100%.

The missions of most organizations clearly related to knowledge mobilization and evidence-based practice. Commitments to knowledge mobilization were explicit in 15 of the 16 organizations and included statements such as *"sharing new ideas," "develops and produces the high-quality resources that science teachers need,"* or *"spreading good practice."* Not all of these, however, were as explicit about promoting evidence-based practice. Some omitted the evidence-based part; for example, the mission of the professional learning company (Cases 3 and 4) is *"to advance the work of our authors and our vision is to transform education worldwide to ensure learning for all."* This is not to say that the work promoted is *not* informed by research evidence, but rather, the organizational mission does not explicitly promote evidence-based practice. On the other hand, some organizations omitted the practice part; for instance, the mission of the research database (Case 4) is to serve as a *"provider of research databases, e-journals, magazine subscriptions, e-books and discovery service to libraries of all kinds."* Overall, six of the 16 missions promoted evidence-based practice.

Other characteristics of these organizations reveal that brokers are situated in diverse contexts, from small to large and varied in the scope and focus of their work. Organizations were most likely to be composed of practitioners (n = 4), such as the coordinators of the OT conference in Case 1, or of practitioners and researchers (n = 4), such as the professional association in Case 2. Organizations were more likely to have a broader focus (n = 11). In addition, where the school/district was addressing a more specialized issue, it was more likely that the broker organization would have a narrow focus. Notably, but not unsurprisingly, we see that organizations in which brokers were situated in the study were targeted mostly toward practitioners (n = 11).

The diversity of organizations serving in broker roles is also evident in other dimensions of CRUE's research, which identified several thousand organizations and media sources that educators turn to when connecting with research (Farley-Ripple & Yun, 2021). Varied scopes of influence and foci for the work, and nearly all seeking to reach educators, suggest that the intermediary sector is responding to a high level of demand for a wide range of resources and support. This may reflect a lack of formal or common infrastructure for linking practitioners to research information as well as an opportunity to improve coordination and collaboration among these organizations. However, because we focused on four cases, we were unable to ascertain the extent to which such coordination and collaboration may be underway. We believe this would be a ripe area for further study.

In addition to the many organizations located in the intermediary space between research and practice, seven brokers were housed in practice-based organizations—specifically, schools and districts. To gain a sense of their contexts, we examined six features of districts: (1) location (rural, suburban, city), (2) size (small, medium, large), (3) average math proficiency, (4) average reading proficiency, (5) families with income below the poverty level, and, (6) student demographics. Data were obtained from the National Center for Education Statistics (NCES) Common Core of Data and from state department of education websites. In Table 12, we provide a case summary of the characteristics for practice-based organizations (i.e., school districts).

Table 12. Case Summary of the Characteristics for Practice-based Organizations.

	Case 1	Case 2	Cases 3 and 4
Location	City: Mid-size	Suburb: Large	Suburb: Large
Size (# of students)	> 10,000	2,500–9,999	2,500–9,999
Math Proficiency	35%	28%	72%–82%[a]
Reading Proficiency	46%	28%	59%–80%
Families with Income Below Poverty Level	15%	17%	7%
Student Demographics			
White	38%	53%	78%
Black/African American	11%	38%	2%
Hispanic or Latino	32%	5%	17%
Asian	15%	2%	2%
Multiracial	3%	3%	1%
Native American/Alaskan	< 1%	< 1%	< 1%
Pacific Islander	< 1%	< 1%	< 1%

[a] Performance is reported at the school level in the district for Cases 3 and 4; data represent the range of percentage proficient across schools.

We recognize that brokers are situated in all schools and districts and that the characteristics of these districts are not necessarily indicative of contexts that promote knowledge brokerage. However, it is helpful to understand the features of these organizations in our cases as they add additional context to the processes we observe in subsequent sections.

Products and Transformations (AI 2)

At the core of AI 2 is understanding what research-based resources move through brokerage systems and how research-based resources are transformed along the way. Across the four cases, we identified both the research products that were used, and we traced changes in those products as they moved between the research, intermediary, and practice spaces.

We defined research products as all the research outputs and derivatives that communicate findings or implications. Specifically, we were interested in research products' category (i.e., type of product), format (i.e., form of communication), availability (i.e., ease of access), and actionability (i.e., ease of use). In total, there were 12 different product categories, described in Table 13.

Products could also be classified into three formats—multimedia, verbal, and written. Products were in a written format if the product contained only pieces of writing. Products were in a verbal format if the information was delivered only face to face, using words. Products were in a multimedia format if the information was delivered in more than one medium (e.g., conference presentation with written and verbal formats).

Table 13. Summary of Product Types.

Product Type	Product Description	Illustrative Example	Frequency of Products in Cases N (%)
Research or Program Evaluation Report	A document that contains recorded data from a research project or evaluation prepared by researchers or evaluators. May or may not be peer reviewed.	Paper describing outcomes of an intervention published in a journal for occupational therapists (Case 1).	16 (38.1)
Model, Program, or Intervention	A packaged set of practices, curricula, strategies, etc. that is ready for educators to use.	An instructional approach to teaching science that is based in research (Case 2).	3 (7.1)
Conference Presentation	Materials associated with presenting at a conference, such as PowerPoint presentations or handouts.	Poster presentation made at a national conference (Case 1).	2 (4.8)
Professional Learning Resources	An event or activity and its accompanying resources that are intended to train educators on a particular issue or practice.	Resources gathered by staff attending a site-based professional learning workshop on professional learning communities (Case 3).	4 (9.5)
Informal Summary	A product that contains a shortened version of other research-based materials using someone's own words.	Teacher holds planning meeting with a colleague and explains instructional model and its benefits (Case 2).	5 (11.9)
Lesson Plans or Another Instructional Tool	Products that are prepared for educators to use in their school or classroom; similar to model/program/intervention but at a smaller grain size or scope.	Lesson plans found from online search of teacher community that uses instructional model (Case 2).	1 (2.4)
Practitioner Journal Article	Materials from a practitioner journal aimed at a particular professional market (e.g., educators).	Article published by the professional association (Case 2).	1 (2.4)
State / Federal Guidance	Materials created and disseminated by federal or state departments of education (e.g., learning standards, model curricula).	State Department of Education guidance for implementation of science standards (Case 2).	1 (2.4)

Product Type	Product Description	Illustrative Example	Frequency of Products in Cases *n* (%)
Publication with Embedded Media	A formal piece of writing meant to inform, with supplemental materials embedded (e.g., video or infographic).	Research summary with embedded video developed by media organization (Case 2).	1 (2.4)
Book	A written or printed piece of work produced for the mass market.	A practice-focused publication from professional association which supports building professional learning communities (Case 3).	6 (14.3)
Blog	A brief narrative commentary posted on a website.	Blog from leading author on common assessments (Case 4).	1 (2.4)
Video	A recording of moving visual images made digitally or on a videotape.	Online videos made available from professional learning company accompany a practice-focused book (Case 4).	1 (2.4)

Note. $N = 41$.

In addition, products were classified according to their availability. Products were coded as associated with fees if an individual or organization was required to pay to access to it (e.g., a book or journal subscription). Products were coded as private or internal if the document was created and stored within an organization (e.g., lesson plans). Products were coded as publicly available if the resource was freely available to the public.

Last, products were classified according to their actionability. Products were coded as descriptive if they simply reported the details of research findings, while products were considered prescriptive if they provided information on what people should do or how to do it. For example, the book from Case 3 contained strategies, tools, and tips to support educators. Descriptive products, on the other hand, simply report the details of something. For example, in Case 1, a conference presentation provided information on the efficacy of a program.

Across all domains, we coded "no data" if there was not enough information to accurately code the product. In Table 14, we provide a summary of research product characteristics.

Table 14. Case Summary of Research Product Characteristics.

	N (%)
Format	
Multimedia (contains verbal, written, and/or visual elements)	11 (26.2)
Written Only	26 (61.9)
Verbal Only	0 (0.0)
No Data	5 (11.9)
Availability	
Associated with Fees	16 (38.1)
Private or Internal	8 (19.0)
Publicly Available	6 (14.3)
No Data	12 (28.6)
Actionability	
Descriptive	13 (31.0)
Prescriptive	19 (45.2)
No Data	10 (23.8)

Note. N = 41.

In looking across cases, we identified three patterns in the research products (N = 42). First, research reports were the most prevalent product category (n = 16), followed by books (n = 6), informal summaries (i.e., products containing a shortened version of other research-based materials in an educator's own words; n = 5), professional learning and resources (n = 4), and models (n = 3). While lesson plans (n = 1), blogs, (n = 1), practitioner journal articles (n = 1), and videos (n = 1) were not common products, when taken together with informal summaries, professional learning, models, and books, we see that products developed by and for educators overshadowed research and program evaluation reports and conference presentation categories (i.e., products commonly disseminated at the conclusion of a research project). This finding suggests research use may be more widespread than is typically recognized.

Second, over half (n = 26) of products were provided in a written format, while over a quarter (n = 11) were in multimedia formats. Just under 40% of products were associated with fees. This finding draws attention to the long-standing argument that lack of accessibility is a barrier to research use by practitioners. While cost and open access may matter for individuals seeking specific resources, across our cases, we found that research accessed and used through organizational routines or activities was not constrained by fees and other barriers. In other words, when engagement with research was sanctioned by school or district policies, such as participation in conferences or implementation of a district-wide professional learning community initiative, access may be less of a barrier.

Third, in terms of actionability, the products were largely prescriptive (*n* = 19) rather than descriptive (*n* = 13). These findings support our early findings from CRUE, which suggests traditional methods of dissemination (e.g., peer-reviewed journal articles, research reports) do not link well with the needs and communication approaches that resonate with educators (e.g., books, popular media, instructional materials; Shewchuk, 2019). Rather, across these cases, we found that education professionals were most likely to choose research products that described *why*, *what*, and *how* to implement research-based practices. Finally, across all cases, practitioners are not relying solely on one resource. Instead, they rely on many different products to inform their thinking and decisions.

Our observations of research products in each case are closely connected to the transformation of research as it moves along the paths to practice. We defined research transformations as all the ways a research product changed form, nature, or function into a new product (e.g., a research report transformed into a conference presentation and materials). We identified 24 transformations in the data, which include occasions in which multiple products were transformed into a single product. Specifically, we were interested in the type of transformation that the product(s) underwent. Products could be translated, adapted, synthesized, or summarized. Products underwent translation when the product moved from descriptive to prescriptive (e.g., research report to evidence-based program). Adaptation occurred if a new product was created that adjusted the content or message of a previous product to fit the needs or purpose of a particular context or organization (e.g., materials to inform local implementation). Synthesis occurred if products were combined with multiple other sources of information (e.g., findings from multiple research projects synthesized into a media publication). Products were summarized if a new product was created that captured the main messages more briefly than an original product. Figure 11 illustrates some of the transformations in Case 2. Here, original research moved into an instructional model, which was then packaged as curricular materials, books, practitioner articles, standards, and classroom resources, among other things. As illustrated here, it is important to note that research products can undergo more than one type of transformation; therefore, the transformations are not mutually exclusive. In Table 15, we provide a case summary of research transformations.

Figure 11. Transformation Spotlight (Case 2).

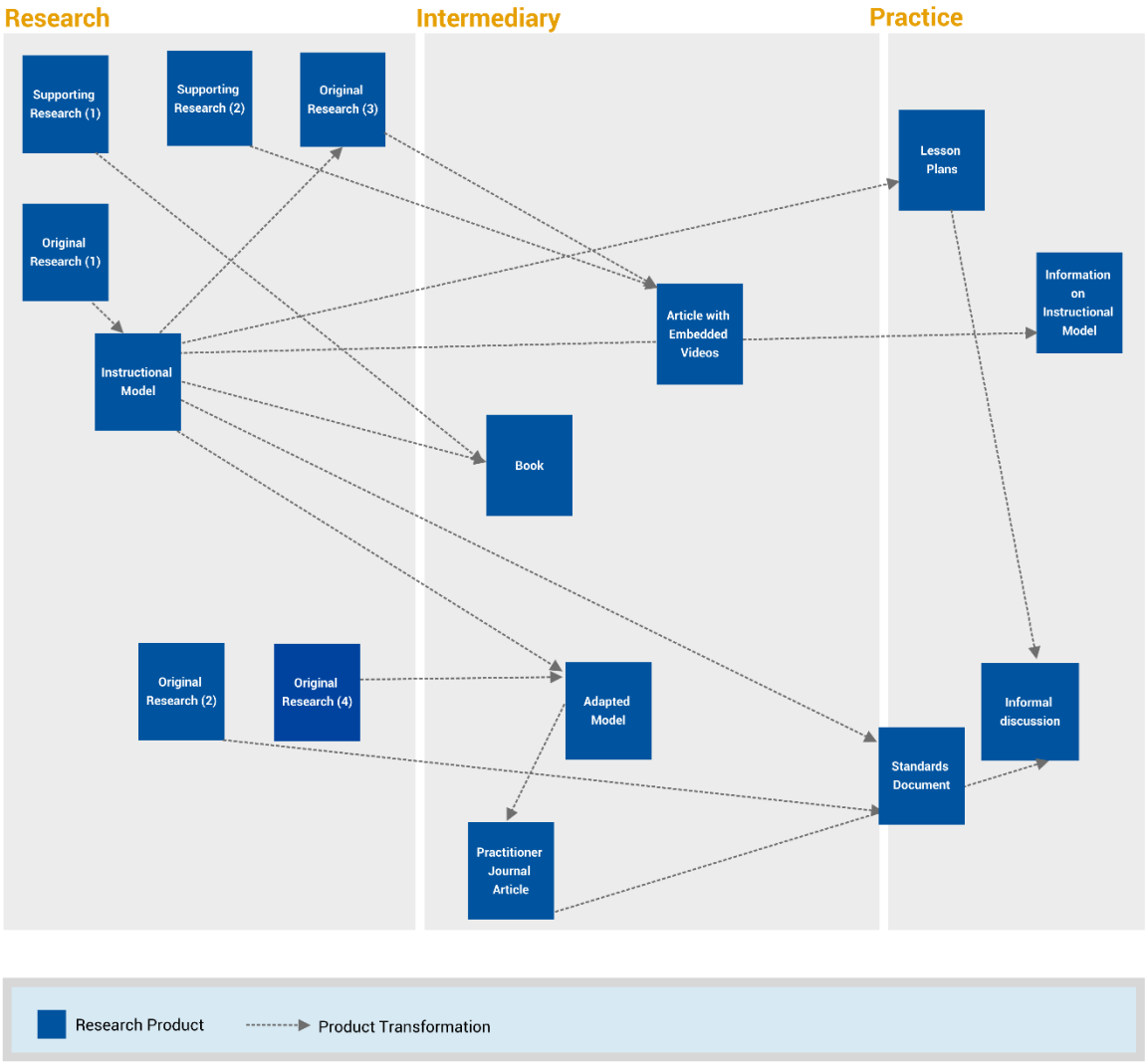


Table 15. Summary of Research Transformations.

Transformation	N (%)	Illustrative Example
Adaptation	3 (11.1)	Going into the classroom of the teachers that I worked with . . . I just kind of adapted it [the handwriting program] and presented it to teachers, and then, you know, they took whatever they needed to from it.
Summary	17 (63.0)	That material is curated to [shorten it], and those are sound bites of, or video bites of, about three to five minutes… So, for instance, [in the book], there is a curated video list that goes chapter by chapter.
Synthesis	13 (48.1)	I spoke with my colleague who teaches physical science with me. I told her, oh, there's a model that we can use to engage kids. So, I was kind of explaining that to her. And I gave her some lesson plans that used the model.
Translation	3 (11.1)	I started to develop my concepts, formalize [them]. Then when I went back to [university]… I wanted to research what is everybody doing about handwriting across the country, across the world… My conclusion was the people that were having the most success was those who were teaching it. You can't get around teaching it. You can work on a gazillion other things—but you must teach it. You got to have specific instructions, [and] there must be a lot of feedback… So, all the features of this program were very deliberate in being developed. I know it's best practice. It supports research on so many levels.
No data	2 (7.4)	n/a

Note. $N = 27$.

Summaries ($n = 17$) were the most prevalent transformation category, followed by syntheses ($n = 13$), translation ($n = 3$), and adaptation ($n = 3$). Moreover, syntheses were found across all cases. Adaptations and translations were found only in Cases 1 and 2 and were not evident in Cases 3 and 4. However, we note that Cases 1 and 2 started with more traditional research-based resources (i.e., dissertation and theory-based model), while Cases 3 and 4 both began with books. This suggests three possible conclusions that warrant further exploration: (1) descriptive and theory-based products need translation, (2) translation is important, and (3) we can shorten the research-to-practice timeline if descriptive and theory-based products are translated into books (that are prescriptive in nature) for practitioners.

In addition to examining the type of transformation, we coded whether the product changed in accessibility (e.g., "publicly available" to "associated with fees") or changed formats (e.g., written to

multimedia). Across all cases, products underwent changes in format and availability 41 times. In Table 16, we provide a case summary of changes in product availability, while in Table 17, we provide a case summary of changes in product format.

Table 16. Case Summary of Changes in Product Availability.

	After Transformation			
Before Transformation	*Publicly Available*	*Associated with Fees*	*Private or Internal*	*No Data / Unclear*
Publicly Available	1	2	0	0
Associated with Fees	2	6	11	4
Private or Internal	0	0	2	0
No Data / Unclear	2	8	2	1

Across cases and transformations (N = 41), many products were transformed into private or internal documents (n = 15). In line with findings from the National Center for Research in Policy and Practice (Coburn et al., 2020; Penuel et al., 2016), we found that as research was transformed and became embedded in internal documents, it becomes both harder to trace and potentially more widely used. It is important to acknowledge that transformations leading to embedded use may be a common way that research informs practice—a form of evidence-informed practice rather than evidence-based decision-making (Hood, 2003)—a distinction rarely discussed in the larger dialogue around evidence use in education.

We also note that nearly all products were private/internal or associated with fees. While this may reflect barriers to research use associated with accessibility, our data do not suggest that brokers and practitioners seeking research could not access it. Rather, they often sought out and utilized resources that are not as easily available. One explanation is that participants are willing to expend resources (time, money) for products they value—i.e., more prescriptive, actionable products. Or there may be resources to support use of research in organizational initiatives, such as in Cases 3 and 4. Accessibility may be a greater factor in individual use of research, such as in Case 2, in which a science teacher sought out research to support practice.

We also point to examples of information becoming more accessible. For instance, in Case 2, resources that were associated with fees were transformed into resources that were publicly available. In this case, an instructional model, and associated publications available for a fee were incorporated into publicly available resources such as state standards documents. On the other hand, in Case 1, publicly available research was transformed into a fee-based resource. This occurred when the dissertation, a freely available piece of research, was transformed into a

packaged program with associated resources, available for a fee. While unique in our data, much evidence-based programs have (often significant) costs associated with them. Thus, transformations along the paths to practice do not necessarily improve accessibility.

Table 17. Case Summary of Product Format Transformations.

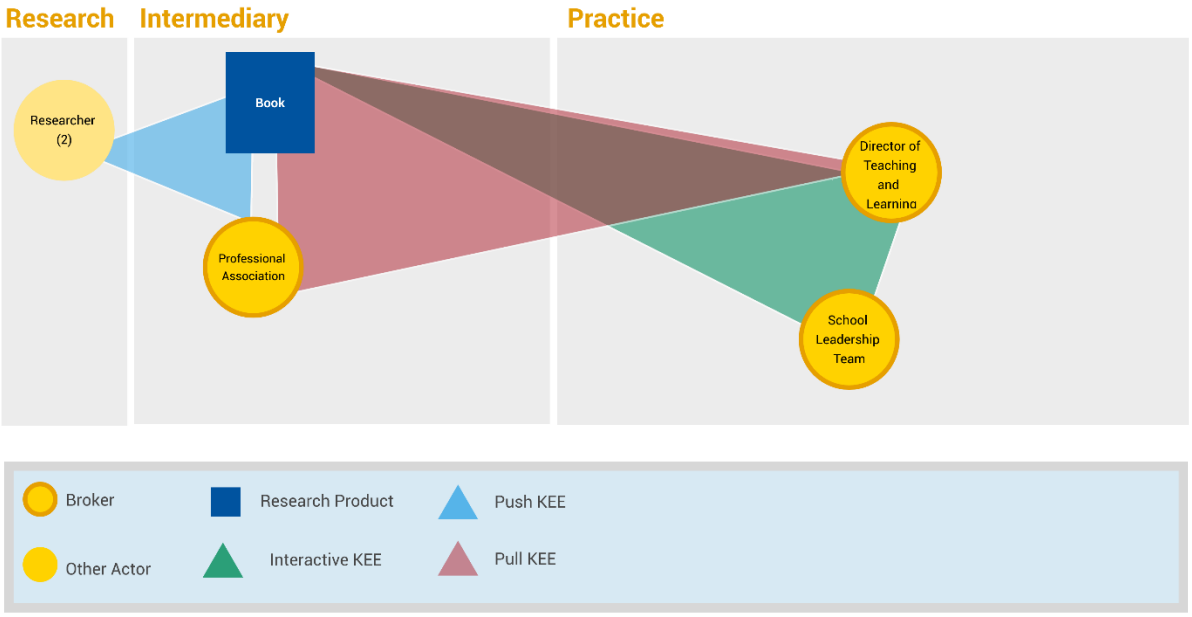
	After Transformation...			
Before Transformation...	*Written*	*Verbal*	*Multimedia*	*No Data / Unclear*
Written	16	0	10	5
Multimedia	1	0	5	0
No Data / Unclear	1	0	3	0

Across all cases, written research products were transformed into multiple formats, combining verbal, written, and sometimes visual elements (n = 18). For example, in Case 1, the program developer used the results from a journal article (showing the effectiveness of her program) and transformed it into a conference presentation using multiple formats (i.e., visual, writing, verbal). In addition, in Case 4, the school district leadership team took a written book and blog and transformed them into school-based professional development using multiple formats (i.e., writing, verbal). This suggests that education professionals appreciate having research communicated in multiple formats or, conversely, that multiple formats are needed to reach practitioner audiences. This offers a strong indication that parallel approaches to dissemination are important. Traditional academic dissemination (i.e., publishing) coupled with incorporation into various media sources may expand audience reach through new channels, resulting in more visibility and greater engagement with educators.

The Paths from Research to Practice (AI 3)

Our third area of inquiry (AI 3) seeks to understand the paths between research and practice, including the nature of the events through which information is exchanged and the number of those points along the paths. As described earlier, we conceptualize these as KEEs. These events occur when purposively prepared information is communicated to a set of recipients. Our data permit us to understand multiple dimensions of KEEs, including the sender and recipient, the information shared, and the context of the event, which is instrumental in better comprehending the paths between research and practice. In Figure 12, we illustrate three types of KEEs: knowledge push, knowledge pull, and knowledge exchange. In Table 18, we provide a detailed overview of KEEs.

Figure 12. Knowledge Exchange Event Spotlight (Case 4).



First, we examined boundary spanning by observing who was involved in these events and whether actors involved in the KEE communicated across the traditional boundaries associated with research, intermediary, and practice communities. The direction of boundary spanning could be from research (R) to intermediary (I) sectors, from research to practice (P), from intermediary to practice, or the reverse of each (I to R, P to R, or P to I, respectively).

Second, we investigated the type of interaction between individuals involved in a case. 'Push' interactions occurred when the sender actively engaged the receiver, but the receiver is primarily passive (e.g., in publishing). Conversely, interactions were considered 'pull' if the receiver actively sought information from the sender, but the sender is primarily passive (e.g., searching for a publication, book, or website). Finally, KEEs were defined as interactive when there is multidirectional communication between the sender and receiver (e.g., conference, meeting, conversation).

Third, we were interested in the motivations of the sender and receiver. One way we explored motivation was by categorizing the purpose for their work in terms of information sharing/seeking, promoting evidence-based practice, and/or supporting implementation or adoption. For receivers, information seeking was about accessing new ideas and information. The science teacher in Case 2 is an example:

> *And if I did search it online, I might search it with the content that we're teaching. So, if I was teaching parts of the atom, I would search… "5E parts of the atom lessons." I try to see what other people have done.*

For senders, information sharing reflected goals for communicating those new ideas or practices. Continuing our example from Case 2, the teacher explained her interactions with a colleague:

> *Yeah, I spoke to [her]. She teaches physical science with me. We were talking [because] we co-plan a lot for physical science. She does a lot of the traditional model of teaching, with lectures and things like that. And I told her, oh, there's a 5E model that we can use to engage the kids in it. So, I was kind of explaining that to her. I gave her some lesson plans I made that used the 5E model. I don't know if she used them, though.*

Promoting evidence-based practice was also expressed as a purpose when individuals explained why they participated in KEEs that were explicitly tied to using research evidence. For example, in Case 1, the program developer explained they were "*going to national conferences, state conferences, sharing the research, and informing people so that they know this is an evidence-based program.*" On the receiver side in the same case, the OT state conference coordinator made clear (as shown in the quote given in full earlier) that they sought out presentations from speakers who *"have done research or are working off of programs that are based on research."*

The final category of purpose was supporting implementation. This emerged as distinct from promoting or seeking information about evidence-based practice because it moved toward adoption and implementation of those practices. For example, in Case 3, the school-based nonprofit offered on-site professional learning:

> *Because then people can come to the school. When they come to a site visit, they have an opportunity to see the way a PLC works in total so that they're not just looking at one piece. If you have, say, our social emotional learning coordinator speak to you, she will reference the other areas of the school that work with her. When you come here, you get to see the way it really works.*

Perhaps not surprisingly, the school implementing professional learning communities attended this learning opportunity to build capacity among staff and used these resources to support implementation.

Extrinsic and intrinsic motivations were also coded. Extrinsic motivations were identified as those originating outside of the individual—incentives, requirements, and expectations that were established by the organization or by policy. Intrinsic motivations were identified as those reflecting personal or professional goals, values, and beliefs. We note that motivations are not mutually exclusive; participants in KEEs may have had multiple reasons for their engagement.

Table 18. Case Summary of Knowledge Exchange Events.

Characteristic	N (%)
Boundary Spanning	
Occurs Within the Research Community	0 (0.0)
Occurs Within the Intermediary Community	6 (16.2)
Occurs Within the Practice Community	10 (27.0)
Spans the Research – Intermediary Boundary	8 (21.6)
Spans the Intermediary – Practice Boundary	13 (35.1)
Spans the Research – Practice Boundary	0 (0.0)
Interaction Type	
Push	13 (35.1)
Pull	11 (29.5)
Interactive	13 (35.1)
Sender Motivation Purpose[a]	
Information Sharing	16 (43.2)
Promoting Evidence-based Practice	21 (56.8)
Supporting Adoption or Implementation	18 (48.7)
No Data	5 (13.5)
Sender Motivation Source[b]	
Intrinsic	13 (35.1)
Extrinsic	21 (56.8)
No Data	5 (13.5)
Receiver motivation Purpose[a]	
Information Seeking	16 (43.2)
Promoting Evidence-based Practice	18 (48.7)
Supporting Adoption or Implementation	16 (43.2)
No Data	6 (16.2)
Receiver Motivation Source[b]	
Intrinsic	7 (18.92)
Extrinsic	26 (70.3)
No Data	8 (21.6)

Note. N = 37.

[a] Senders and receivers could have more than one motivation purpose. Therefore, percentages may not add to 100%.

[b] Senders and receivers could be both intrinsically and extrinsically motivated. Therefore, percentages may not add to 100%.

KEEs (N = 37) were most likely to occur between the intermediary and practice boundary (n = 13), followed by within the practice community (n = 10). Findings from our analysis reveal that most KEEs did not involve researchers, and when they did, they interacted with members of the

intermediary community (n = 8) rather than practitioners (*n* = 0). Conversely, most KEEs involved members of the intermediary community, with these actors interacting with both members of the research (*n* = 7) and practice (*n* = 13) communities. Interactions were most likely to be considered push (*n* = 13) and interactive (*n* = 13), followed by pull (*n* = 11). We also noticed patterns with respect to motivation. Sender and receiver purposes for participating in KEEs were evenly spread across information seeking, promoting evidence-based practice, and supporting adoption or implementation. Finally, both the sender (*n* = 21) and receiver (*n* = 26) were more likely to be extrinsically motivated.

Summary statistics offer only a partial view. We were also interested in exploring the relationship between KEE characteristics and the boundaries being spanned. For example, do KEEs between research and intermediary actors differ from those between intermediaries and practitioners? Table 19 provides an overview of the various dimensions of KEEs across all cases (rather than for each case) for each boundary-spanning category.

Table 19. Knowledge Exchange Event Domains by Boundary Spanned.

Knowledge Exchange Event Domain	Events by Boundary Spanned (N)				
	Research–Intermediary (n = 8)	*Research – Practice (n = 0)*	*Within Intermediary (n = 6)*	*Intermediary – Practice (n = 13)*	*Within Practice (n = 10)*
Interaction Type					
Push	7	0	3	2	0
Pull	1	0	1	9	1
Interactive	0	0	2	2	9
Sender Motivation Purpose[a]					
Information Sharing	4	0	2	8	2
Promoting Evidence-based Practice	7	0	4	8	2
Supporting Adoption or Implementation	6	0	1	4	7
No Data	0	0	2	2	1
Sender Motivation Source[b]					
Intrinsic	6	0	2	1	4
Extrinsic	2	0	3	10	6
No Data	0	0	2	2	1
Receiver Motivation Purpose[a]					
Information Seeking	4	0	3	8	1
Promoting Evidence-based Practice	8	0	5	4	1
Supporting Adoption or Implementation	4	0	1	8	3
No Data	0	0	0	0	6
Receiver Motivation Source[b]					
Intrinsic	0	0	2	4	1
Extrinsic	7	0	5	9	4
No Data	0	0	0	2	6

[a] Senders and receivers could have more than one motivation purpose. Therefore, the sum of all *n* values may exceed the total number of knowledge exchange events.

[b] Senders and receivers could be both intrinsically and extrinsically motivated. Therefore, sum of all *n* values may exceed total.

KEE interactions that occur *within the practice community* (*n* = 10) were most likely to be considered interactive (*n* = 9). Senders participating in KEEs were more often to be extrinsically motivated (*n* = 6) and were more likely to support adoption or implementation (*n* = 7). We had limited data about receivers in this category because our design centered on the survey respondent and backward tracked to research rather than forward tracked to additional use in practice.

KEE interactions that occur *across the intermediary and practice communities* (*n* = 13) were most likely to be considered knowledge pull (*n* = 9). Senders—here, members of the intermediary community—were most often participating in KEEs to share information (*n* = 8) and promote evidence-based practice (*n* = 8). They were also more often extrinsically motivated (*n* = 10), in part because they were often organizations with knowledge mobilization missions driving their work. Receivers, or practitioners, most often participated in KEEs to seek information (*n* = 8) or to adopt/implement a practice (*n* = 8). They were more likely to be extrinsically (*n* = 9) than intrinsically (*n* = 4) motivated. In contrast, KEE interactions that occur *across the intermediary and research communities* (*n* = 8) were most likely to be considered knowledge push. Senders were equally likely to participate in KEEs to promote evidence-based practice (*n* = 7) or adoption/implementation (*n* = 6) of a practice. Senders were more likely to be intrinsically (*n* = 6) than extrinsically (*n* = 2) motivated.

Looking at patterns across KEEs and across cases, we find several patterns emerge. First, our data suggest that in these four cases, members of the intermediary community appear to be holders of information. That is, researchers push knowledge into the intermediary space, and practitioners pull knowledge from that space. This is not to imply members of the intermediary community are not engaged in activities associated with linking research and practice, but that those activities are not directly associated with KEEs. It may appear to confirm a widely held concern that the system of brokerage we observe in these data relies primarily on researchers as pushers and practitioners as pullers—roles that historically have not been primary activities for either community.

Second, we notice that motivation is important in KEEs. Specifically, our data suggest that researchers' intrinsic motivation may matter for mobilizing or pushing out research knowledge, whereas extrinsic motivation is important for actors engaging in KEEs in which they pull or seek out research. For example, all the researchers we spoke with referenced a strong desire to positively impact practice through their work, even though they were not clearly required or expected to do so. These goals and values appear to have contributed to their engagement in KEEs that moved research toward practice. In contrast, those engaged in KEEs to seek (pull) information may have done so, at least in part, because of the requirements and expectations of their role. Members of the practice community often participated in routines and activities as part of their job, such as attending professional development or leadership team meetings. They may also have been required to participate in KEEs to maintain their professional license, as was the case with the OT in Case 1, who needed 24 hours of professional learning every two years and attended the conference to fulfill that requirement. We note that these external motivations ensured educators' participation in KEEs but that those motivations did not explicitly require engagement with research or evidence-based practice. For intermediary organizations, external motivation often reflected their mission or core components of their work, which we describe earlier in our discussion of broker organization characteristics. These almost always included knowledge mobilization goals but only sometimes included explicit goals for promoting evidence-based practice. Our findings

regarding motivation therefore suggest that motivation for *participating* in KEEs may be externally motivated. However, we see that motivations associated with promoting evidence-based practice or supporting adoption or implementation of such practice may rely more on internal sources of motivation, which often reflect professional responsibilities and ethics. We see this internal motivation, for example, in a conference coordinator in Case 1 who noted a professional rationale for seeking out the research-based program:

> *First and foremost, we want OTs and schools to be able to perform best practice. Um, and we want people to have information to back up the things they're doing—and the decisions that they're making and the recommendations they're making.*

While it may be difficult to leverage intrinsic motivation, it is helpful in understanding which research finds its way to practice. On the other hand, it is possible to leverage the influence of extrinsic motivation by creating policies that either create opportunities for interaction or promote engagement in KEEs. But it may also be possible to create policies that better support engagement with research specifically.

Third, data about the purposes that motivate KEEs are instructive. For practitioners pulling information from intermediary actors, support for implementation was a frequent purpose, which signals the needs for which research is being sought. This information can be useful to researchers and brokering organizations when planning knowledge mobilization activities. Further, researchers saw themselves as pushing out information to support adoption or implementation, which may be a reason these cases are successful instances of linking research and practice. Intermediary actors, however, largely saw their work in the KEEs as promoting evidence-based practice—which is itself a signal of coherence across these systems; they did not, however, necessarily see their work as supporting adoption or implementation. This may be a missed opportunity in these cases or may reflect a disconnect in the larger system of brokerage.

What We Learned About Brokerage in Education

One of the clearest observations drawn from these analyses has been the critical importance of research brokerage in moving research-based ideas into practice. In every case, the use of research was mediated by individuals and organizations that spanned boundaries between the research, intermediary, and practice spaces. Further, we find support for brokerage as originally conceptualized for this project: as a system of actors, activities, and motivations, rather than as a set of individuals and organizations. In this section, we elaborate on what our data suggest about the system of brokerage and how that system might be leveraged to strengthen the relationship between research and practice.

The role of brokers across cases was largely informal. Across all cases, we see actors taking up brokering roles to fill a perceived gap between research and practice. In Case 1, educators saw

the need to create a conference to meet the specific knowledge demands of their profession; and in Cases 3 and 4, national associations leveraged their membership to promote research-based products at scale. The diversity observed here—and confirmed in other parts of CRUE's work—has both advantages and disadvantages. On the one hand, for every specific need, there is likely a resource tailored to it: a conference for OTs, an online network for sharing science lesson plans, or a school-turned-nonprofit to model implementation. On the other hand, the emergence of so many actors in this space suggests that knowledge needs are not being met systematically. In other words, the infrastructure supporting educators' access to research is inadequate for their needs.

The intermediary community was not well leveraged. Similarly, we found limited evidence of strategically coordinated efforts to mobilize research. There are, however, strategic efforts within each intermediary organization. In addition, in Case 2, we saw that a research funding organization and media organization worked together to achieve goals for evidence use. However, this strategic coordination was not found between other brokering organizations. We noted earlier that all brokers served as information managers, but few of the other roles were taken up by individual brokers. Although, across cases, we see those other roles emerge but with no clear pattern, echoing other researchers' findings that roles are neither formalized nor routine (Newman et al., 2020). If the work of these brokering organizations were intentionally coordinated, we would expect to see roles taken up in more predictable ways or to find educators reporting common approaches to finding research a common set of organizations to which they turn. Although actors in our cases were ultimately successful in their collective efforts (a design choice on our part), we find an element of serendipity in how the various brokering organizations functioned to create paths from research to practice.

Relatedly, in these cases, the burden of finding and reconciling information generally fell on the user—the school-based brokers that *pulled* ideas into practice. We see this in the ways they synthesized and adapted research-based resources to fit their unique contexts. We also see that in our KEEs, interactions that spanned the research and intermediary space were often driven by researcher *push*, suggesting a less than systematic approach to the mobilization of research knowledge. Both findings suggest the success of these cases depended on researchers and practitioners as drivers—which historically has not led to systematic uptake of research in practice.

We need to expand our view of brokers. Recognizing the informal system of brokers and their role in linking research and practice, our findings highlight a diverse set of brokers that are critical to the success of each case. Central in *all* cases were school- or district-based brokers—those members of the education community that influence the role of research in schools by mobilizing research-based information within school networks. These individuals supported not only access to and dissemination of research-based information (as per Daly et al., 2014; Finnigan et al., 2021) but also the interpretation and uptake of that information, often by embedding it in resources and tools.

At the other end of this process are research producers. We note here that our successful cases feature researchers that do not clearly fit the traditional academic scholar profile. Rather, in three of our four cases (Cases 1, 3, and 4), the original research comes from those in nonacademic settings who have centered practice or practitioners in their work. Although few studies have examined researchers' practices and motivations, extant research suggests that such broker roles are not typical (Cooper et al., 2018; Fischman et al., 2018; Sa et al., 2011). Coupled with our prior point about the system's dependence on researcher push, we echo others in voicing the need to reevaluate the research enterprise's priorities and incentives so that the roles taken up by researchers in our cases become the norm than the exception.

What information was shared and how it was shared, mattered. The products featured in our cases are informed by evidence, but rarely did educators engage with original research or rely on a single research-based product. We found that educators valued prescriptive resources indicating how to enact research. Of value were products such as books featuring frameworks that are accessible to broad audiences and can serve as guideposts for implementation (Penuel et al., 2018). A district leader made this point in describing the book used in Case 4: "*It was organized in a way that made it relatively easy to follow for—for me and for the other teachers and whatnot who were involved.*" Yet even so, we note that as research made its way to practice, multiple resources were often used to develop greater understanding and/or to inform practice. The act of synthesizing, summarizing, and embedding research into tools—considered adaptation of research for the local context—is an important skill (Yoshizawa, 2020).

This notion of adapting research for the local context also relates to interaction around research. KEEs featuring interaction are particularly important in our cases, especially within practice spaces. This is consistent with prior studies that frame research use as a social process in which educators must collectively make sense of information within their local context (e.g., district and/or school capacity, student characteristics, etc.).

Motivation was important. Looking across cases, we find high *potential* for research use. Most brokering organizations in our study have missions that center knowledge sharing, and several made explicit commitments to supporting evidence-based practice. Further, we saw these commitments translated into KEEs, driven by information, evidence-use, and implementation purposes. Where do those motivations come from? We found evidence of intrinsic motivation—including beliefs about improving teaching and learning, as well as goals for themselves as professionals. Intrinsic motivation is hard to leverage, but as we saw in Case 2, in which an educator turned to evidence-based resources shared in a university course, there are opportunities to shape perspectives on the value of research to practice. In terms of extrinsic motivation, we note that establishing explicit evidence-use missions, and alignment of roles and activities to the mission, may have influenced intermediary engagement in KEEs that ultimately led to research use. For educators, organizational routines in which participation was expected created KEEs that often-

featured exchange-centered interactions around research. These routines were central for research engagement within the practice community across cases and were sites within which research was also adapted for local use and adaptation. We noted, however, that extrinsic motivation created opportunities for *but did not require* engagement with research or evidence-based practice. In other words, our findings suggest that motivation for *participating* in KEEs may be externally motivated, but we see that motivations associated with promoting evidence-based practice or supporting adoption or implementation of such practice may rely more on internal sources of motivation.

We need to better understand and plan for complexity. Across multiple dimensions of analysis, Case 1 and 2 appear to be the most complex. With a small sample, we cannot conclude exactly why, but the differences between cases provide insight, which, coupled with others' findings, offer potential explanations. For example, Case 1 and 2 feature greater numbers of brokers, KEEs, and products and transformations, and they make greater use of empirical research derived from academic publications. These two cases also most closely mirror the idealized version of instrumental use featured in education policy—the adoption of an evidence-based program. Alternatively, Cases 3 and 4 are the simplest and represent something much closer to what we would consider conceptual and tactical use—finding and using research-based frameworks to guide implementation and build buy-in for the work as evidence-based.

Cases 1 and 2 were also led by an *individual* working to promote organizational uptake. Cases 3 and 4 took place in the context of district- and school-wide initiatives, with *many active participants* engaged in accessing and using research to implement new practices. Thus, another explanation for the complexity of Cases 1 and 2 is that their research-informed organizational change relied on a single leader. In Cases 3 and 4, organizational-level routines were useful for accessing research products, sense-making in the context of district and school initiatives and adapting resources to achieve local goals. Both individual and organizational capacity were leveraged.

If we unpack the complexity of our cases, our findings seem to challenge normative assumptions about simple, instrumental use and one-size-fits-all solutions to closing the research–practice gap, such as increasing access to research. Rather, the complexity and diversity presented here suggest that we may need stronger systems and infrastructure that facilitate a range of pathways and enable members of the research, practice, and intermediary communities to effectively plan for knowledge mobilization and use.

What Might This Mean for Education Stakeholders?

This report provides rich insight into four cases of research use and the ways brokerage links research and practice. We understand and have noted the limitations of the work—notably that the cases may not be representative of how brokerage works across the entirety of our education system. Additional studies are needed to explore other cases, especially "unsuccessful" cases to

help us hone in on what makes brokers and their work effective in linking the research and practice communities. At the same time, we understand that many initiatives are underway across the larger evidence-use ecosystem to improve the role of research in practice; and we believe that the findings presented here can be useful in informing those activities. Therefore, we conclude this report with recommendations for how different members of the larger evidence-use ecosystem in education can act on these findings.

For Educators and Administrators

Prioritize and formalize research broker roles. Here and in other areas of CRUE's work (Farley-Ripple & Grajeda, 2019), we have found that school- and district-based research brokers are important mechanisms for improving schools' use of research. These roles, however, are often informal and not explicitly part of job descriptions. One strategy for building capacity to use research is to make that work more explicit. This could include requiring certain roles (e.g., coaches, leaders) to find and share research, hiring staff with the background knowledge and dispositions to serve in broker roles, and supporting professional learning opportunities that intentionally incorporate engagement with and sharing of research (e.g., opportunities to attend a conference coupled with school-based professional development on what was learned).

Make evidence-use expectations explicit in organizational routines and policies. Our cases illustrate many opportunities for engaging with and using research, but they rarely exhibit requirements or expectations to do so. Districts and schools can formalize the role of research in improvement work by establishing explicit guidelines for research use. For example, such guidelines could include requiring professional learning to be based on evidence-informed practices, requiring that evidence about programs or practices be shared as part of decision-making processes, or using school routines such as professional learning communities or faculty meetings to discuss research related to current improvement initiatives.

Identify and engage with brokering organizations with clear evidence-use priorities and establish them as trustworthy resources for school or district staff. Brokers in these cases all had knowledge mobilization missions, and many also focused on promoting evidence-informed practice. Yet data from CRUE show that educators access information and resources from a wide range of sources (Farley-Ripple, 2021), which may not be informed by the best available evidence. Further, many studies confirm educators turn to organizations they trust. Educators can strengthen the flow of high-quality information into school and district decision-making by identifying brokering organizations with clear commitments to supporting evidence use and by encouraging the use of those resources in policy and practice. Educators can also share their evidence-use commitments with trusted organizations to encourage greater incorporation of research into the work and into products created by those sources.

For Researchers

Be proactive in identifying brokers that can put research in front of educators. In the cases examined here, researchers actively sought out means of moving their research into the intermediary or practice spaces, beyond academic dissemination. Researchers may improve the reach of their work by better understanding the key brokers that educators turn to (which may differ from the ones with which researchers are familiar) and by developing relationships with those that can better connect them with their intended audiences. This can also help brokers to better grasp the available research and to be more effective in seeking out and mobilizing research for their audiences.

Participate in activities that create opportunities for interaction and knowledge exchange with educators. We have noted above that opportunities for interaction around research are particularly useful for improving uptake of evidence-informed practices. However, interactions among researchers and practitioners remain rare, if promising. Through these interactions, researchers and practitioners can learn from each other in ways that allow for greater understanding than through passive activities such as reading a paper. Strategies for improving interaction include attending and presenting at practice-focused conferences, engaging in participatory models of research, or creating opportunities for practitioner input on research questions, interpretations, and products, as is often suggested in the knowledge mobilization literature.

Develop strategies to adapt work from descriptions of research findings to prescriptions for implementation. Deriving strategies for implementing evidence-informed policies or practices from academic research products is challenging, even if researchers offer clear implications in their work. Data presented here confirm that educators value prescriptive resources that help them move from research findings to change in their practice. Books appear most widely used, suggested both here and elsewhere in the literature. While this is a time-consuming strategy (with sizable impact), simpler products featured here are tools such as lesson plans, frameworks to guide action, professional learning materials based on research, and multimedia presentations and demonstrations. These strategies may demand that researchers develop new capabilities and may require additional support, which may come from the prior action steps—collaboration with educators or relationships with brokers.

For Brokers

Assess current activities to determine what additional knowledge, skills, and activities will strengthen knowledge mobilization. Few of the brokers in our cases engaged in activities that built evidence-use capacity, evaluated knowledge broker work, or facilitated direct relationships between research and practice. These strategies are recognized in the literature as effective in linking research and practice and may help intermediaries to achieve their goals. One starting point might be to

implement formal evaluation of knowledge mobilization work, which may surface additional roles or activities to strengthen this work.

Examine role in the larger evidence-use ecosystem and identify ways to collaborate and coordinate with other parts of that ecosystem to promote evidence use in education. None of the actors in our cases acted in isolation, but rather, their work was situated in a larger, albeit uncoordinated, system. Brokers can help reduce the complexity of the brokerage space and simplify the paths between research and practice by working together and leveraging each organizations' advantages. Regional organizations could work with national organizations to promote resources and opportunities, and national organizations could coordinate agendas to better cover the range of needs or even reduce redundancy and inefficiencies in their work. Such activities may also curb the emergence of brokers that duplicate existing efforts and direct attention to areas where new organizations or initiatives are needed.

Make your evidence-use commitments explicit. Our recommendation to educators to identify brokers with evidence-use commitments can be extended to brokers: they can make those commitments, and how they are enacted, clear to their audiences. Doing so can be a signal to educators and to researchers seeking to strengthen the connection to practice. Evidence-use commitments can appear in mission statements and in descriptions of products and initiatives, as well as in explicit references to research in those activities.

For Policymakers, Funders, and Training Institutions

Develop initiatives that encourage formalizing brokerage roles for researchers, brokering organizations, and educators. The roles and activities of actors in our cases were often shaped by external influences— accountability policy, research funding, even higher education. That influence could be used to build additional capacity for brokerage across the system, including by creating knowledge mobilization training programs and funding new positions related specific to research brokerage. Efforts to formalize these roles within the research, intermediary, and practice communities can be enhanced by external pressure or incentives.

Incentivize work that demands communication, coordination, and collaboration across research, intermediary, and practice boundaries. Many programs and policies target work within a single community—research, intermediary, or practice—in isolation. Shifting incentives and expectations toward activities that span those boundaries can expand opportunities for the kinds of productive interaction that facilitated research use in the cases presented here.

Invest in structures aimed to mobilize research in ways that are responsive to educators' needs. The informality of the brokerage space as described here presents a ripe opportunity for building infrastructure to support sustained pathways between research and practice. Structures such as the federal Regional Education Laboratory system are an example and perhaps a starting point. But

other innovations are needed. Our data point to networks and associations that bring communities together, system-wide supports for researchers to engage with practice and to adapt their work into useful products, and technical assistance to support implementation of evidence-informed practice. Solutions must be user-centered and demand engagement from all parts of the evidence-use ecosystem.

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Appendix: Codebook

Knowledge Broker Determination

Term	Definition
Knowledge broker	Brokers are individuals or organizations that act as links between actors, groups, or communities to facilitate the flow and uptake evidence-based information. In the data, actors that engaged in these types of activities would be evidence that the actor is a broker within the specific case.

Broker Activity Codes

Term	Definition
Capacity Builder	As capacity builders, knowledge brokers can do four things: (a) build the knowledge and skills required of education professionals to access, appraise, and apply evidence; (b) address barriers to implement evidence-based practices (e.g., individual and organizational); (c) enable communication across sectors through the development of a common language; and (d) increase capacity of research by leveraging network connections. Activities that are specifically designed (or described as such) to do any of these four tasks in the specific case of brokerage would be evidence that the broker is a capacity builder.
Information Manager	As information managers, knowledge brokers seek, promote access to, appraise, organize, and share relevant research with education professionals and context-specific knowledge (e.g., culture, processes, and barriers) with relevant stakeholders. Activities that are specifically designed to do any of these in the specific case would be evidence of serving as an information manager.
Linking Agent	As linking agents, knowledge brokers do four things: (a) connect and foster trust and relationships between research producers and research users; (b) coordinate interactions between research producers and research user to cultivate "shared agendas" and information sharing; (c) foster engagement in the research process; and (d) connect with a network of knowledge brokers. In the data, activities that are specifically designed (or described as such) to do any of these four tasks in the specific case of brokerage would be evidence that the broker is a linking agent.

Evaluator	As evaluators, knowledge brokers do four things: (a) assess the local context to inform knowledge brokering activities; (b) integrate knowledge translation frameworks and evidence into evaluation processes; (c) evaluate linkage and exchange networks; and (d) evaluate knowledge brokering activities and outcomes. Key to this definition is that evaluation is an active rather than passive process. For example, while tracking the number of views or downloads can be a part of evaluation, it cannot be the only aspect. In the data, activities that are specifically designed (or described as such) to do any of these four tasks in the specific case of brokerage would be evidence that the broker is an evaluator.
Facilitator	As facilitators, knowledge brokers do three things: (a) guide or support evidence-informed practice processes to assist knowledge users to integrate research and contextual and experiential knowledge into decision-making at the practice level or research processes; (b) improve attitudes towards research use; and;(c) enhance the practical applicability of research. In the data, activities that are specifically designed (or described as such) to do any of these three tasks in the specific case of brokerage would be evidence that the broker is a facilitator.

Organizational Type Codes

Term	Definition
For Profit	A for-profit organization exists primarily to generate a profit, that is, to take in more money than it spends. Examples include textbook publishers, instructional program vendors, research consulting companies, and media.
Governmental	A governmental organization is a permanent or semipermanent organization that is run, staffed, or funded by the federal or state government. Examples include federal or state departments of education, and funding agencies.
Membership	A membership organization is any organization that allows people to subscribe and often requires them to pay a membership fee or subscription. Membership organizations typically have a particular purpose that involves connecting people together around a particular profession, industry, activity, interest, mission, or geographical location.
Non-profit	Non-profit organizations are types of organizations that do not earn profits. All the money earned by or donated to a non-profit organization is used in pursuing the organization's objectives and in keeping it running. Examples include University research centers, advocacy groups, issue-based organizations, and think tanks.
Practice-based Organization	A place in which school practitioners (e.g., educators, principals, district staff) work to provide instruction to K-12 students. Key to this definition is

Term	Definition
	that the practice organization does not conduct supplementary activities outside of the "core" teaching and learning requirements of schools.

Organizational Characteristics Codes (Intermediary Community)

Term	Definition
Membership Composition	Membership composition refers to the types of stakeholders that are members of the intermediary organization (researchers; practitioners such as teachers, principals, district-level administrators; parents; policymakers; community members, the general public).
Mission	The organization's self-imposed objective or purpose either formally stated (e.g., website, published materials) or informally described.
Evidence-based practice	The organization's mission statement includes objectives related to promoting research and its use.
Knowledge mobilization	The organization's mission statement includes objectives related to sharing information with members of the practice community, developing resources for the practice community, or spreading "best practice."
Annual Revenue	The total amount of money an organization makes during a given 12-month period.
< $1 Million	The organization earns less than $1 million dollars annually.
> $1 Million and < $50 Million	The organization earns more than $1 million and up to $50 million annually.
> $50 Million and < $1 Billion	The organization earns more than $50 million and up to $1 billion annually.
> $1 Billion	The organization earns more than $1 billion annually.
Scope	Scope refers to the spread of the intermediary's work (local, state, regional, national, international) or focus in the field (e.g., narrow or broad focus).
Spread of Work	The reach. of the broker.
Local	Local brokers operate in one city or local area.
State	State-level brokers operate throughout an entire state.
Regional	Regional brokers cover a larger geographic area than state but do not cover an entire nation (e.g., Regional Education Laboratory Southeast).
National	National brokers operate throughout a country.
International	International brokers operate in more than one country.
Focus in Field	The broker's center of interest.
Narrow	A broker that selectively focuses on one part of the field.

Term	Definition
Broad	A broker that focuses on a number of elements related to the field.
Size	The size of the organization has to do with the number of full-time employees working for the broker.
Small	Small is 1–49 people.
Medium	Medium is 50–249 people.
Large	Large is 250+ people.
Target Audience	The specific groups with which the broker interacts.
Knowledge Mobilization	A wide range of activities relating to the production and use of knowledge (e.g., research), including knowledge synthesis, dissemination, transfer, exchange, and cocreation or coproduction by researchers and knowledge users.
Evidence-based Practice	Practice that has been established as effective through scientific research or the use of current best evidence in making decisions.

Organizational Features of School Districts

Term	Definition
Location	Location consists of four basic types (city, suburban, town, and rural). Data are taken from NCES Common Core of Data website.
Rural	U.S. Census-defined rural territory. Data taken from NCES Common Core of Data website.
Town	Territory inside an urban cluster. Data taken from NCES Common Core of Data website.
Suburban	Territory outside of a principal city and inside an urbanized area. Data taken from NCES Common Core of Data website.
City	Territory inside an urbanized area and inside a principal city. Data taken from NCES Common Core of Data website.
Size	Number of students within the school district.
Small	Less than 2,500 students.
Medium	Between 2,500 and 9,999 students.
Large	10,000 or more students.

Term	Definition
Student Demographics	Ethnicity and racial information for students. Categories include White, Black, Hispanic or Latino, Asian, American Indian/Alaskan Native, Hawaiian and other Pacific Islander, some other race alone, and two or more races. Data taken from NCES Common Core of Data website.
Average Math Proficiency	The percentage of students within a school district that scored at or above proficient levels during the 2018–2019 school year. Data taken from state department of education websites.
Average Reading Proficiency	The percentage of students within a school district that scored at or above proficient levels during the 2017–2018 school year. Data taken from state department of education websites.
Families with Income Below the Poverty Level	The percentage of families within a school district with income below the poverty level. Data taken from the NCES Common Core of Data website.

Research Product Codes

Term	Definition
Research Product	An output or derivative of research in which findings or implications are communicated.
Category	
Research or Program Evaluation Report	A document that contains recorded findings from a project prepared by researchers or evaluators. May or may not be peer reviewed.
Model, Program, or Intervention	A packaged set of practices, curricula, strategies ready for educator use.
Conference Presentation	Materials associated with presenting at a conference, such as PowerPoint presentations or handouts.
Professional Learning	An event or activity and its accompanying resources intended to train educators; code should apply to not just the passive receipt of information but a focused, active learning session.
Informal Summary	A product that contains a shortened version of other research-based materials using someone's own words.
Lesson plans or Another Instructional Tool	Products that are prepared for educators to use in their classroom; similar to model/program/intervention but at a smaller scope.
Practitioner Journal Article	Materials from a practitioner journal are often peer reviewed and are aimed at a particular professional market (e.g., educators).
Guidance from Federal or State Departments of Education	Materials created and disseminated by federal or state departments of education (e.g., learning standards, model curriculums).

Term	Definition
Publication with Embedded Media	A formal piece of writing meant to inform, with supplemental materials embedded (e.g., video, infographic).
Book	A written or printed piece of work produced for the mass market.
Blog	A blog post is published within a blog on a website.
Video	A recording of moving visual images made digitally or on a videotape.
Format	The way in which the research product is presented (i.e., written, verbal, written/verbal, media/multimedia).
Written	A product that contains letters or words.
Verbal	Presenting information in the form of spoken words.
Media or Multimedia	Media are considered to be videos, music, and photographs. Multimedia is a broad term for combining multiple formats. When text, audio, images, and/or video are combined, the result is multimedia.
Availability	The ease with which a research product can be used or obtained.
Publicly Available	Materials that are published for public consumption and are free to use.
Private or Internal	Materials created and stored within an organization.
Associated with Fees	Materials that cost money to obtain (e.g., membership, subscription).
Targeted Audience	Specific group most likely to be interested in the product.
Practitioner	A person who is actively engaged in a profession (e.g., educators).
Researcher	A person who carries out scientific research.
Practitioner and Researcher	Both practitioners and researchers would be interested in the product.
Other actors	Persons who would not be considered practitioners or researchers.
Actionability	How ready the research product is to be put into action; readiness for use.
Prescriptive	Reports specific actions to be taken and/or how to do it.
Descriptive	Reports on the process, findings, or implications of research.

Transformation Codes

Term	Definition
Translation	Transformation in which findings from research are used to develop practices or policies (e.g., movement from descriptive to prescriptive); not merely re-representing material in accessible language but actually transforming it into an actionable product (e.g., research to program, NOT report to PowerPoint). Look for: New programs or practices that are created based on original product.
Adaptation	Adjusts content/message to fit needs or purposes of particular context or organization. Look for: Use of materials to inform local implementation.
Synthesis	Integrates multiple sources of information.
Summary	Captures main messages more briefly than original product.
Change in Accessibility or Availability	Whether the ease with which a research product can be used or obtained changed because of the transformation; can be fees to public, fees to private, private to public, private to fees, public to private, public to fees, or no change.
Format Change	Whether the way information presented in the transformed product changed. Key to this definition is that the way information is presented must be altered. For example, a research report to research poster is not a format change because the approach still uses text. However, a research report to a video is considered a format change because the product changed from being text based to using media.

Community Codes

Term	Definition
Research	Actors were classified as being located within the research community if actors stated they conducted research and/or worked in a research organization.
Intermediary	Organizations that operated between researchers and practitioners that influenced roles and practices for either community.
Practice	Actors were classified as being located in the practice community if actors stated that their primary responsibility was to provide instruction to K–12 students.

Knowledge Exchange Event Codes

Term	Definition
Boundary Spanning	Boundary spanning is a term to describe individuals who link an organization's internal networks with external sources of information.
Occurs Within the Research Community	Both sender and receiver are researchers.
Occurs Within the Intermediary Community	Both sender and receiver are intermediaries.
Occurs Within the Practice Community	Both sender and receiver are in the practice community.
Spans the Research / Intermediary Boundary	Sender and receiver represent researchers and intermediaries.
Spans the Intermediary / Practice Boundary	Sender and receiver represent intermediaries and practitioners.
Spans the Research / Practice Boundary	Sender and receiver represent researchers and practitioners.
Interaction Type	The type of interaction between individuals involved in the case.
Push	Sender actively engages receiver (e.g., publishing) but receiver is primarily passive.
Pull	Receiver actively engages sender (e.g., seeking something from a static resource—like a publication, book, or website) but sender is primarily passive.
Interactive	Active interaction between the sender and receiver.
Sender	The individual or organization that sent/disseminated the research product.
Sender Motivation Purpose	The reason for which the sender did something.
Information Sharing	Information sharing was defined as passing information from one to another generally; that is, not in relation to promoting evidence-based practice or supporting adoption or implementation. Examples: reach an audience, increase awareness, provide service, learn more/follow up, make information accessible, to see what others do, connect people, share ideas, advertise, 'following on social media.
Promoting Evidence-Based Practice	Promoting evidence-based practice was defined as the specific intent to find/integrate the best available evidence to guide education practice. Examples include seeking out evidence-based practice, finding out what the research says, translating research for actionable use, or sharing

Term	Definition
	evidence-based practices to support adoption or implementation of the practice.
Support Adoption or Implementation	This code captures motivations where the sender or receiver is seeking/sending information with the express intent of supporting the adoption or implementation of a program or practice. This could be providing resources to help understand what the practice looks like and to facilitate uptake or providing resources to help someone make a decision about whether or not to use the particular program or practice. Adoption has been defined as the decision of an organization or a community to commit to and initiate an evidence-based intervention, whereas implementation involves the process of putting to use or integrating an evidence-based intervention within a setting. Example of adoption: generating buy-in. Example of implementation: executing a new evidence-based program within a school.
Sender Motivation Source	Whether motivation arises from outside (extrinsic) or inside (intrinsic) the sender.
Extrinsic	A motivation source coming from outside of the sender. Examples: mandate, part of organizational routine, mission driven.
Intrinsic	A motivation source coming from inside of the sender. Examples: professional responsibility, personal/professional goals, be helpful, want to learn.
Receiver	The individual or organization that received or obtained the research product.
Receiver Motivation Purpose	The reason for which the receiver did something.
Information Seeking	Information seeking was defined as the act of attempting to obtain general information that is not in relation to promoting evidence-based practice or supporting adoption or implementation. Examples: seek out, learn more/follow up, see what others do, connect people, follow on social media.
Promoting Evidence-based Practice	Promoting evidence-based practice was defined as a specifc intent to find/ integrate the best available evidence to guide education practice. Examples include seeking out evidence-based practice, finding out what the research says, translating research for actionable use, or sharing evidence-based practices to support adoption or implementation of the practice.

Term	Definition
Supporting Adoption or Implementation	This code captures motivations where the sender or receiver is seeking/sending information with the express intent of supporting the adoption or implementation of a program or practice. This could be providing resources to help understand what the practice looks like and facilitate uptake or providing resources to help someone decide about whether to use the particular program or practice. Adoption has been defined as the decision of an organization or a community to commit to and initiate an evidence-based intervention, whereas implementation involves the process of putting to use or integrating an evidence-based intervention within a setting. Example of adoption: generating buy-in. Example of implementation: executing a new evidence-based program within a school.
Receiver Motivation Source	Whether motivation arises from outside (extrinsic) or inside (intrinsic) the receiver.
Extrinsic	A motivation source coming from outside of the receiver. Examples: mandate, part of organizational routine, mission driven.
Intrinsic	A motivation source coming from inside of the receiver. Examples: professional responsibility, personal/professional goals, be helpful, want to learn.