Understanding Brokerage in Education
Forward Tracking from Research to Practice

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R4S
RETHINKING RESEARCH FOR SCHOOLS

CENTER FOR RESEARCH
USE IN EDUCATION

University of Delaware
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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 www.research4schools.org or follow us on Twitter at @UDCRUE.

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Executive Summary

There is increasing emphasis on the outcomes of educational research in terms of teaching and learning outcomes. However, the ways in which education research is used, discussed, shared, and applied in different settings is complex. This study set out to investigate the system of research brokerage, which we define as the network of actors, activities, and motivations within which education research is exchanged, transformed, and otherwise communicated. Specifically, we sought to increase our understanding about which individuals and organizations serve as knowledge brokers, the types of research-based products move through the brokerage system and how these products transformed within the system, and the paths information takes as it moves from research to practice. We completed four forward tracking case studies, documenting brokerage in relation to four research projects: (1) the evaluation and nationwide implementation of a STEM curriculum program package; (2) a research-practice partnership project to enhance teaching quality; (3) a REL coaching project to increase district capacity to collect and analyze student survey data, and (4) a randomized control trial showing the benefits of an informational intervention for students.

Data and Methods

The basic premise for forward tracking is to look for how research evidence makes its way into practice after the completion of research projects. In addition to interviewing research team members, forward tracking includes searching for and interviewing individuals who either shared or used the research. Interview data were supplemented with information from project documents. All data were qualitatively coded in NVivo utilizing both a prior and open coding strategies. Case data were read by the research team and used to create narratives describing significant components of the paths between research and practice, 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 reveal that research brokerage is a complex process, characterized by actors and motivations that interact dynamically over time. Our analyses examined:

- 50 brokers, who primarily engaged as Linking Agents (60%) and Information Managers (58%), but also in other brokering roles such as Capacity Builders (10%), Facilitators (8%), and Evaluators (6%). The brokers represented 45 diverse organizations, in terms of profit, size, scope of work, and target audience, which sometimes expressed commitments to knowledge mobilization (64%) or research/use (46%).

- 85 research products, categorized into 14 different product types. Presentation materials (n=35) were the most common product type found across cases. In looking across cases, we identified four patterns in the research products. First, actors developed products that communicated information to tailored audiences. Second, actors created multimedia content to encourage increased engagement with research products. Third, products were most likely to be associated with fees in Cases 1 and 2, while products were more likely to be available in Cases 3 and 4. Fourth, research products were most likely to be prescriptive in nature in Case 1, and descriptive in Cases 2, 3, and 4.
- 45 research product transformations, with research products often being summarized (51%) or synthesized (37%) into new products. However, even when transformed, many products did not undergo changes to product availability or format.
- 100 knowledge exchange events in which actors shared purposely prepared information. Boundary spanning most often occurred between the research and practice communities (31%) and was less common between the research and intermediary (15%) communities, and between the intermediary and practice communities (8%). In addition, interactions between actors were more likely to be 'push' (50%) and 'interactive' (44%)

What We Learned About Brokerage in Education

One of the clearest observations drawn from these analyses has been that as theorized, research brokerage is a complex process, characterized by actors and motivations that interact dynamically over time. In each case, the exchange, transformation, and communication of research was mediated by individuals and organizations located across the research, intermediary, and practice communities. We learned that actors positioned within the education ecosystem have a vital role to play in brokering knowledge across boundaries. Relatedly, researchers can engage in a variety of activities to encourage research brokerage and use. We also learned that actors' motivations were largely driven by organizational beliefs and values. In our previous backward tracking case studies, we learned that what information is shared, and how it is shared matters. The present study builds on this by spotlighting how various actors produced and presented research products to various audiences to generate awareness and increase the probability of research use. Finally, we found that even when transformed, products often did not undergo changes to product availability and format. This finding runs counter to what we learned in the backward tracking study, with products in the previous study often undergoing changes to both availability and format. We turn to literature from the health field to suggest the transformation of research outputs into actionable products is complex and may take time.

What Might This Mean for Education Stakeholders?

We offer recommendations for how different members of the larger education ecosystem in education can take action in advancing the movement of research into practice.

For *researchers,* identifying and partnering with brokers can help to extend capacity for mobilizing research findings into practice communities. Researchers can also leverage brokers' networks and abilities to facilitate connections and collaborations among diverse stakeholders in the education community. For example, researchers can attend brokers' events, such as talks, conferences, and workshops to connect with different education stakeholders.

Suggestions for *brokers* include continuing and increasing investments in and support of activities that promote interaction and knowledge exchange between researcher and practitioner audiences. In addition, they can proactively connect with researchers and practitioners to increase the visibility of research- and practice-based knowledge. Finally, they should examine the brokering roles they undertake in the larger evidence-use ecosystem and identify additional ways—particularly capacity building, facilitation, and evaluation activities—they can engage in brokering within their own contexts.

Policymakers, funders, and higher education institutions should engage in and/or develop initiatives that support research brokerage. This could include incentivizing and providing financial resources to support the mobilization of research into practice communities, directly engaging in brokering, and promoting the use of research-practice partnerships to encourage the movement of research into practice.

Introduction

In 2018, the Institute for Educational Sciences (IES) funded the Center for Research Use in Education (CRUE) to undertake a project to explore the system of research brokerage, which we define as the network of actors, activities, and motivations within which education research is exchanged, transformed, and otherwise communicated (Farley-Ripple et al., 2018). Findings from the project will increase the field's understanding of how research brokerage influences research use and how to leverage research brokerage to better support ties between research and practice.

Our project utilized backward and forward tracking studies to map the research brokerage process. For both studies we explored research brokerage through three areas of inquiry (AI):

AI 1. Understanding which individuals and organizations comprise the brokerage system and who within the system serves as knowledge brokers

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

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

For the backward tracking study, we traced research products from their use in schools back to their roots in educational research in four cases. To learn more about the backward tracking component of the project, see our 2022 report *Understanding Brokerage in Education: Backward Tracking from Practice to Research*. For the forward tracking study, we traced how findings from four education research projects were mobilized to encourage the use of the research. This report consists of five sections. First, we present literature in relation to the analytical framework that guided the study. Second, we describe the method we used to conduct the study and include the study's limitations. Third, we provide an overview of the cases included in the study. Fourth, we present findings from the study in relation to our three areas of inquiry. Finally, we conclude with recommendations for researchers, brokers, and for policymakers, funders, and training institutions.

Background and Analytical Framework

Many terms have been used to describe the processes and activities that facilitate the movement of research knowledge in practice contexts. For this report, we use the term 'knowledge mobilization' to describe this process. To date, much of the literature has focused on studying individual aspects of the knowledge mobilization (KMb) process. For example, Cooper et al. (2018) examined the KMb practices of educational researchers and concluded that "the levels of KMb in Canadian education research with non-academic audiences are modest" (p. 14). On the practice-side of the divide, much research has focused on measuring the use of research evidence in K-12 settings (e.g., for a review on the topic, see Lawlor et al., 2019), which has similarly found that use of research evidence by practitioners is modest (e.g., Farley-Ripple et al., 2022). Researchers have also focused their attention on knowledge brokers situated within the intermediary community. This set of literature has largely

described the types of activities in which individual knowledge brokers engage (e.g., Cooper, 2014; DeBray et al., 2014; Malin et al., 2018; Rycroft-Smith, 2022). Moving research into practice is an admittedly complex problem, and studying these components individually allows researchers to break down the knowledge mobilization process into manageable parts. However, studying these components individually ignores critical interactions between various factors, thus limiting our understanding of the multiple complexities relating to how knowledge is produced, transformed, shared, and used within the field of education.

The purpose of our project was therefore to increase our understanding of the larger *system* of actors, activities, and motivations within which research is exchanged, transformed, and otherwise communicated (Farley-Ripple et al., 2018). We define this system as research brokerage. We were interested in understanding three components of the research brokerage system: (1) what individuals and organizations comprise this system and who within the system serves as knowledge brokers, (2) what research-based products move throughout the system and how research products are transformed within the system, and (3) the paths by which information moves from research into practice. In the following subsections, we provide a brief introduction of the different components of the analytical framework employed in this study. For a more detailed discussion of these topics, see our 2022 report [Understanding Brokerage in Education: Backward Tracking from Practice to Research](#).

AI 1. Understanding which individuals and organizations comprise the brokerage system and who within the system serves as knowledge brokers

Understanding research brokerage requires understanding the different actors involved in producing, brokering, and using research knowledge. We were interested in understanding what communities' individuals and organizations belonged to (i.e., practice, research, or intermediary). We define the practice community as those individuals with a primary responsibility for instructional delivery to K-12 students (e.g., teachers, school administrators, central office staff) and the research community as composed of academics who produce research. The intermediary community, on the other hand, is in the nebulous space between the research and practice communities and is composed of actors that mediate connections between the different communities.

We were also interested in understanding what actors served as knowledge brokers. We use the term "knowledge broker" to describe the individuals or organizations that link actors, groups, or communities to facilitate the flow and uptake of research-based information (Long et al., 2013). Brokers can be found within the research community (e.g., Leino et al., 2018), practice community (e.g., Farley-Ripple & Grajeda, 2019), and intermediary community (e.g., Cooper & Shewchuk, 2015). We drew on the brokering literature to set out the constructs we would look at to drive our analysis and discussion regarding brokers. Specifically, we drew on literature describing the various functions of knowledge brokers. Ward and colleagues' (2009) seminal review of knowledge brokering originally identified three functions of knowledge brokers. First, knowledge brokers can serve as information managers by seeking, promoting access to, appraising, organizing, and sharing relevant research

with education professionals and context-specific knowledge (e.g., culture, processes, and barriers) with relevant stakeholders. Second, knowledge brokers can function as linking agents by connecting and fostering trust and relationships between research producers and research users. This includes coordinating interactions between research producers and research users to cultivate "shared agendas'' and information sharing and fostering stakeholder engagement in the research process. In addition to linking the research and practice communities, knowledge brokers can use interpersonal contacts to connect with other knowledge brokers in the education field. Third, knowledge brokers can serve as capacity builders by building the knowledge and skills required for research-informed decision-making. Knowledge brokers can also build capacity by addressing barriers to implement research evidence (e.g., individual, and organizational), enabling communication across sectors through the development of a common language, and increasing capacity of research to generate impact by leveraging network connections. A more recent review by Glegg and Hoens (2016) affirms the existence of these functions and adds two additional role domains—that of the facilitator and evaluator. As facilitators, knowledge brokers engage in activities to guide or support knowledge users in integrating research and contextual and experiential knowledge into decision-making at the practice level or research processes. As facilitators, knowledge brokers can also work to improve attitudes towards research use and enhance the practical applicability of research. Finally, brokers can act as evaluators by (a) assessing the local context to inform knowledge brokering activities; (b) integrating knowledge translation frameworks and evidence into evaluation processes; (c) evaluating linkage and exchange networks; and (d) evaluating knowledge brokering activities and outcomes.

In addition to these functions, we were interested in understanding the larger organizational contexts in which brokers are situated. We turned to Cooper's (2014) cross-case analysis of 44 brokering organizations for organizational constructs to guide our analysis and discussion. Particularly, we draw on Cooper's typology (not-for-profit, for-profit, governmental, and membership) and organizational features (mission statement commitments to KMb, target audiences, size, and scope) of brokering organizations to inform our work.

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

Understanding research brokerage also requires increasing our understanding about the form that research products need to take to encourage their use by practitioners. Literature on research products has focused on describing the type/category of research products produced as well as examining what product characteristics appeal to practitioners.

While researchers "are still pressurized to regularly publish their research outputs" (von Solms & Von Solms, 2016, p. 44) in peer-reviewed journals, conference proceedings, and books, there are an increasingly wide variety of different ways findings from research can be presented, including the sharing of datasets, code, software, news articles, twitter posts, blog entries, press articles, brochures,

school newsletters, handbooks, pedagogical guides, videos, professional journal articles, photography exhibits, and websites (Bornmann, 2014; Cooper et al., 2018). Findings from our center's Survey of Evidence in Education-Schools (Farley-Ripple et al., 2022) revealed that education practitioners are less likely to use traditional research products (e.g., peer-reviewed academic journal, research summaries, research reports); however, they were more likely to use professional resources (e.g., professional development resources, books) and media products (e.g., podcasts, videos, blogs).

Producing 'usable' research products requires targeted "dissemination towards a chosen audience, as well as a need to make the information attractive for non-academics" (Vanholsbeeck & Lendák-Kabók, 2020; p. 38). For example, from an instrumental use perspective (i.e., when research evidence has been used to impact direct action, such as making decisions about purchasing an educational intervention or program), Farrell et al. (2018) say research products must be actionable. In other words, research products must "not only shift from academic to 'friendlier' language, but also constructively interpret and communicate findings in ways that [are] both respectful to practitioners' contexts and actionable for their needs'' (p. 68). Previous research has also suggested that practitioners are more likely to utilize research when it is openly accessible to the practice community (Blamires et al., 2010; Carrier, 2017; Williams & Coles, 2003) and when different formats are used to increase engagement with research content, such as multimedia products (Cooper, 2014).

Research products can also undergo transformations on their way from research to practice. For example, in reviewing the paths of health research to its translation into products, policy, and practice, Hanney et al. (2015) found that research can be transformed through synthesis (e.g., findings from a study are combined with other studies in a literature review), summarized into policy documents, and translated into implementation guidelines. Therefore, to understand how brokerage works to link research and practice, we need to understand the nature and frequency of transformations along the path.

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

The paths from research to practice are indirect and uncertain (e.g., Gersten & Berngelman, 1996; Klingner et al., 1999; Speece et al., 1997), with research sometimes having several stops along the way before reaching its destination in practice communities. Louis et al. (1985) refers to these 'stops' as knowledge exchange events (KEEs), in which purposefully prepared information is communicated between actors in the research, practice, and intermediary communities. Louis (1988) found that actors involved in KEEs were more likely to employ indirect diffusion strategies (i.e., sharing with individuals/organizations who are situated to convey it to others), rather than direct diffusion strategies (i.e., sharing directly with targeted users). In a more recent study, Neal et al. (2015) found that researchers are "quite distant from the practice community" (p. 432), and as such, the number of KEEs between the two communities was highly variable—with information often flowing through long chains of actors linked together to form brokerage pipelines. Furthermore, the authors found

that some KEE chains concluded with dead ends where researchers and educators were never connected.

Actors involved in KEEs can engage in three basic types of communication: interactive communication, push communication, and pull communication (Sanghera, 2018). Interactive communication is a type of two-way communication, where a sender and receiver exchange information. Interactive communication can be performed via media like web conferencing or face to face contacts. Conference presentations and meetings (where the 'sender' presents, and the 'receiver' is able to ask questions about the content of the presentation) are examples of interactive communication. Pull communication is a type of one-way communication, whereby receivers must actively seek and obtain information (e.g., accessing research articles from a database). Push communication is also a type of one-way communication. In this approach, the sender undertakes efforts to disseminate information to receivers. This method of communication does not guarantee that information reaches the intended audience—it only makes sure it is distributed. Studies from outside of education have found that while interactive communication is more effective than one-way (i.e., push and pull) communication, a combination of approaches is essential for creating more of an impact on behavior (Levac & O'Sullivan, 2010).

An actor's motivation for engaging in KEEs can be broken into two categories, motivation *purpose* and *source*. The reasons for engaging in KEEs can based on separate sources: external motivation and internal motivation. Internal motivation is defined as motivation that comes from within a person, rather than relying on external pressure or reward, and is driven by internal factors such as a personal belief about the importance of connections between research, policy, and practice (Harris, 2010). Conversely, motivation can relate to external conditions, such as external accountability for brokering and using research (Yoshizawa, 2022). In addition, actors can have different purposes for engaging in KEEs. Findings from previous research suggests that actors may engage in KEEs to promote research and/or its use (Cordingley, 2016), to share or seek out information, and to support adoption or implementation (Honig & Venkateswaran, 2017).

Method

A case study approach was chosen as a method well suited to capturing the complex interplay of actors, relationships, and processes involved in the brokerage system.

Selection of Case Studies

Case selection is a critical step in any comparative case study analysis. Case studies may be used to develop hypotheses that can then be addressed in experimental research, or to provide a range of examples across various dimensions—in this instance, for example, the research brokerage processes associated with specific research projects. We identified cases by selectively sampling research projects that education researchers (n=341) had identified in the Survey for Evidence in Education-Researchers (Van Horne et al., 2023).

Our goal was to explore research brokerage in the context of projects that have put substantial effort into mobilizing knowledge, including engagement of practice and intermediary partners throughout the research process and targeted dissemination of research findings through channels valued by practitioners. Our starting point for identifying cases were survey respondents that engaged in one of these practices. Based on the SEE-R, we created a simple summative score capturing whether those stakeholders were engaged in problem identification, shaping research questions, conducting research, interpreting results, or disseminating findings. To capture the extent to which researchers mobilized knowledge through channels valued by practitioners as per Farley-Ripple et al. (2022), we created a simple summative score for reported dissemination in practitioner journals, practice-focused presentations, policy briefs, curriculum materials, and books (original items are presented in Appendix A). We generated a list of respondents whose score for engagement or dissemination was at least one standard deviation above the mean. We further reduced the sample to exclude surveys where the researcher indicated that (a) the focus of the research study was not on U.S., K-12 education (e.g., higher education, pre-school, methods study, international focus), (b) the research project they were reporting on was still ongoing during the time of the survey, (c) the individual completing the survey provided insufficient information on the project, or (d) the project was not a research study (e.g., a project to build researchers' capacity in a specific area). After this reduction, 48 researcher surveys remained in the sample. From this sample, we purposefully selected four cases that captured diverse areas of research (e.g., STEM, data-based decision making), different funding sources (e.g., IES, NSF), and varied research approaches (e.g., curriculum development and evaluation, RCT). Upon conducting interviews with the researchers involved in the four cases, we learned that three of the four cases were associated with research-practice partnerships. The preponderance of RPPs in our final sample is likely due to the sampling approach, which prioritized studies that engaged practice partners throughout the research process. To learn more about these cases see 'Overview of Cases.'

Data Collection

Each case study was examined using interviews with individuals who played an active role in conducting the research study, developing or sharing related research products, or using findings or research-informed products generated from the study, coupled with project document review.

Interviews

A snowball interview approach was used to identify 15 participants across the four case studies. Initially, interviews with member(s) of the research team were conducted to learn more about the research project, including what stakeholders were involved in the project and how findings from the project were shared and mobilized for practice communities. If a researcher explained that they worked with specific practice partners or relied on actors in the intermediary community to act as a broker among different stakeholder groups to facilitate the flow and uptake of research-based information, the researcher was asked to provide their contact information so that we could continue to trace the paths of evidence into practice. We also conducted interviews with actors in the

intermediary community to learn about their organization, their role and responsibilities, their connection to the research project, and how and why they mobilized findings from the project. Finally, interviews were conducted with school-based practitioners connected to the case and how they shared and used findings from the project. The interview protocols were semi-structured to allow for the exploration of topics and themes that might arise. Table 1 provides the number and types of participants interviewed for each case study. More information on these individuals can be found within 'Overview of Cases'

Table 1. Number and types of participants interviewed

Case	Actor in Research Community	Actor in Intermediary Community	Actor in Practice Community
One	1	1	2
Two	2	0	2
Three	1	0	3
Four	1	3	0

Project Documents

To the extent possible, the team obtained and reviewed a comprehensive set of project documents for each case study. The level of detail varied among cases depending on the complexity of the case (e.g., number of research products produced, number of actors and associated organizations). For all cases, we attempted to uncover different research products produced from the research, organizational details (e.g., mission statements, type of organization, annual revenue, target audience) of brokering organizations, and contextual information related to the each of the cases (e.g., statements from funders about funded projects). Interview participants were invited to provide documents outlining additional context to inform the study (e.g., research manuscripts, conference presentations, etc.). When possible, we collected information for organizations that participated in the paths between research and practice in each case. This information was obtained by downloading (through Print to PDF) publicly available web-based information. In total, we collected 346 documents.

Qualitative Coding and Analysis

We used the codebook developed from the backward tracking study (which was iteratively developed using a combination of a priori and open coding) as the basis of the codebook for the forward tracking analysis. We further developed the codebook using open coding based on close reading of interviews and documents. New product types were generated to reflect the different products we encountered throughout the cases that could not be described by a pre-existing code. For example, we needed to create a "software" code within the product type category to describe the different web applications that were developed in Cases 1 and 4. In addition, new transformation categories were also developed to reflect the different ways in which products underwent

transformations. For example, we created a "demonstration" code within the transformation category to describe how individuals developed new resources to provide a practical exhibition and explanation of how another research-based resource works or is performed (e.g., curriculum materials [product 1] transforms into conference presentation/materials on how to use the curriculum [product 2]). 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 2 shows code classifications and corresponding code labels. New codes are in bolded font. The coding framework is presented in Appendix B.

We independently coded 20% of the data to establish inter-rater reliability at an agreement level of .80. We then utilized NVivo's matrix query feature to see coding intersections between cases and codes. We then exported the matrix query to Excel to continue our analysis by identifying similarities and differences within and across cases on the above dimensions.

Table 2. Case Classifications and Code Labels from Codebook

Case classification	Code Labels
Community Classification	Actors could exist within the practice, intermediary, or research communities
Brokers	Broker classification: actor (i.e., individual or organization) must act as a link between actors, groups, or communities to facilitate the flow and uptake research-based information.
	Activity domain: information managers, linking agents, capacity builders, facilitators, and evaluators
	Type: for profit, governmental, membership, non-profit, practice-level
	Mission statement: knowledge mobilization, research/use
	Organization characteristics: leadership and governance composition, annual revenue, reach of work, focus in field, size, and target audience
Research Products	Product types: blog post or web article, book, guidance from state or federal departments, informal summary, instrument, lesson plan or other instructional material, magazine article, mailing list/newsletter/email blast, model/ program/ intervention, news article, post from social media, presentation materials, professional learning, research or program evaluation report, research summary or brief, software, video.
	Format: written/text, verbal, media/multimedia
	Availability: publicly available, private or internal, associated with fees
	Target audience: community members, policymakers, practitioners, researchers
	Actionability: descriptive, prescriptive
Research Transformations	Transformation type: adaptation, demonstration, duplicate, summary, synthesis, translation
Knowledge Exchange Events	Interaction type: push, pull, interactive

Case classification	Code Labels
	Boundary spanning: within research, within intermediary, within practice, between research and intermediary, between intermediary and practice, between research and practice
	Motivation purpose: promoting research/use, information sharing/seeking, support adoption or implementation. Motivation source: intrinsic, extrinsic

Creating Visual Maps

Concurrent with the qualitative coding process, the research team created maps to visually represent the actors, activities, and knowledge exchange events within which research is exchanged, transformed, and otherwise communicated. To develop the maps, we first created narratives describing the significant components of the path between research and practice. These included people, organizations, timelines, events, research products, and contextual information. These narratives were then used to generate visual maps. We developed the visualizations iteratively by identifying (a) the actors involved in the case, including which of these actors served as knowledge brokers, (b) the activities of actors, (c) the research products associated with the case, (d) the different ways in which products were transformed, and (e) the different knowledge exchange events that occurred to support the mobilization of research evidence.

In Figure 1, we can see four different communities – Research, Intermediary, Practice, and Unknown. We have previously described what types of actors belong to the research, intermediary, and practice communities on page 2 of this report. In some instances, we lacked information about what communities to which communities belonged. In these situations, actors were assigned to the 'Unknown' community. In Figure 1, we also see the actors (yellow circles) involved in this path and the activities they engage in (black arrows) with each other and with research products (blue squares) in their work. Knowledge exchange events (KEEs)are shaded triangles and 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, green triangles represent interactive exchanges of information between actors, and gray triangles represent unknown interactions (i.e., we lacked sufficient information to categorize the KEE) among actors. In Figure 2, we can see how the various research products in this case are transformed in the path from research to practice.

Figure 1. Example of Case Map: Actors, Activities, and Knowledge Exchange Events
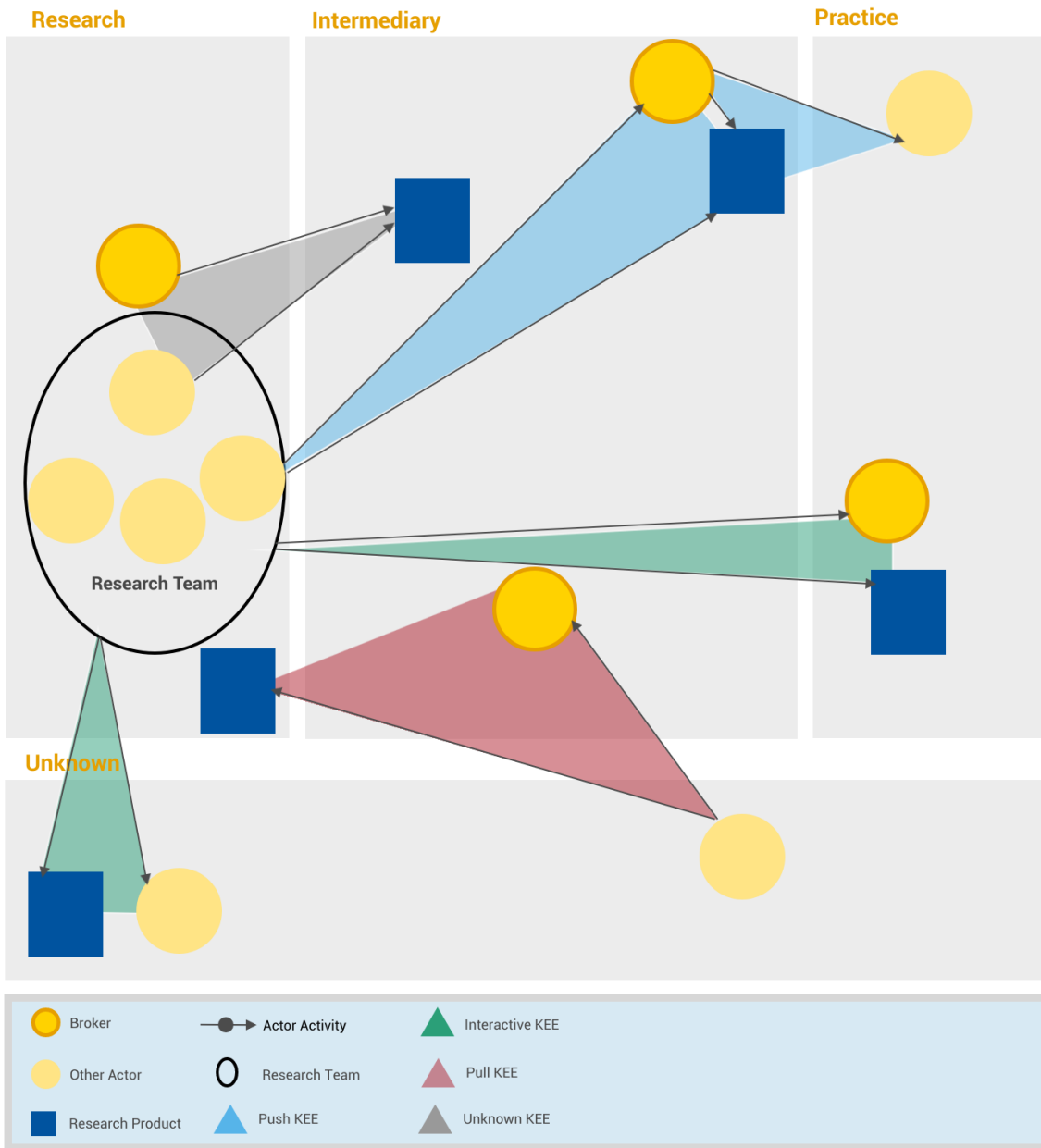
Figure 2. Example of Case Map: Research Products and Transformations
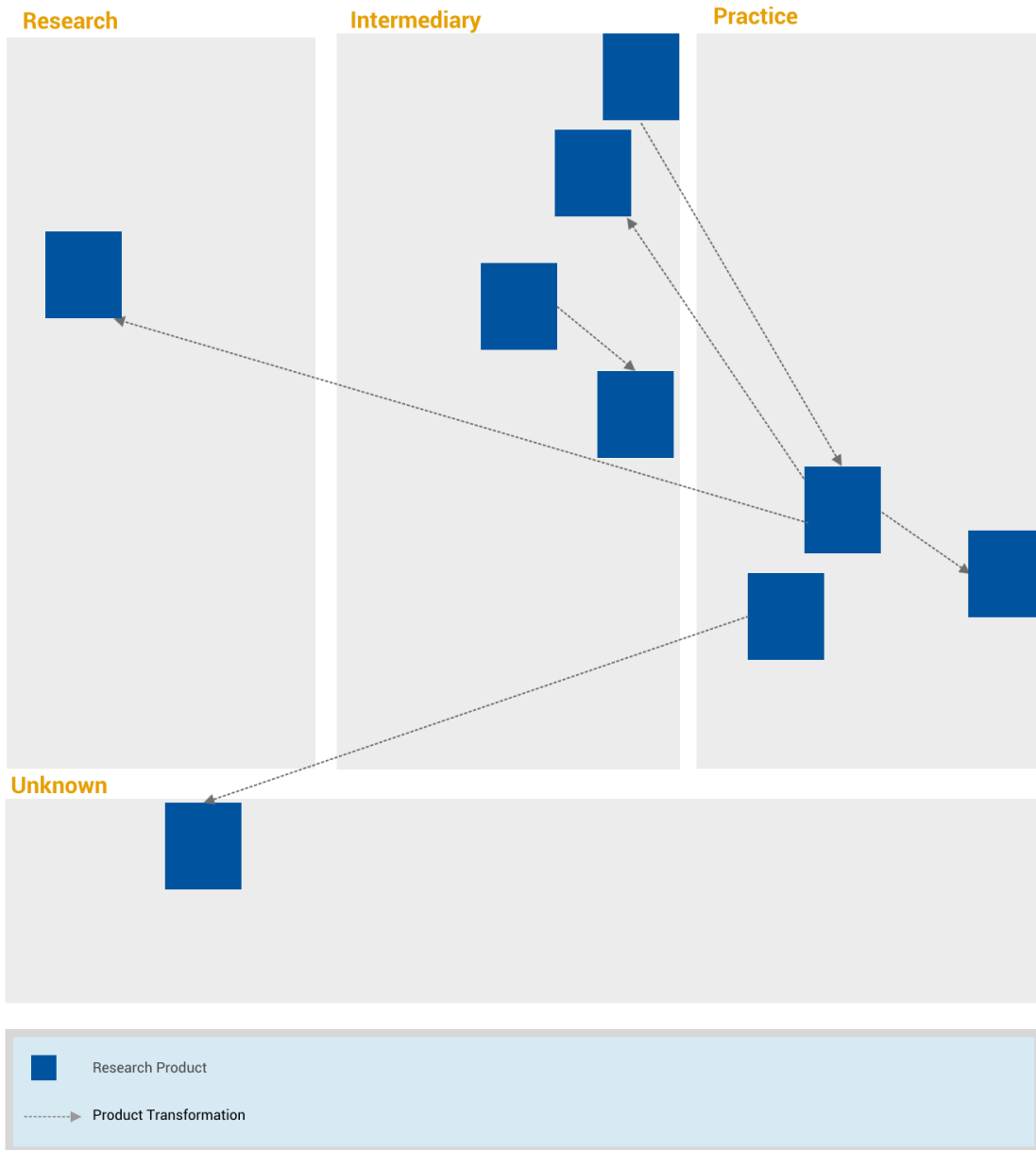
Data Validation

To identify potential inconsistencies, the lead author validated the data by cross-referencing the visual maps to the coded data. During the walk-through, the lead author checked whether: (a) all the components (i.e., actors, activities, research products, and KEEs) were represented; (b) the extent to which the case narratives and knowledge maps were consistent; and (c) whether the components were fully described. Discrepancies were addressed by returning to the data for clarification and making modifications where appropriate. For example, in one walk-through, the lead author

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 cases with strong potential for research to find its way into practice, with cases selected based on best practices for mobilizing research evidence into practice and policy. We are unable to confirm these as successful cases of brokerage nor to confirm that these cases were more successful than other projects not selected through our procedures. Further, our processes for selection may not result in representative cases of research finding its way into practice, and other cases may provide different insights. For example, as we reported in 'Selection of Case Studies,' upon conducting interviews with the researchers involved in the case studies, we learned that three of the four cases were associated with research-practice partnerships. We note that our sampling approach (which prioritized engagement with and dissemination to practitioners) may have disproportionately captured research projects that used partnership style approaches. In addition, our project's forward tracking focus (i.e., following research into practice) may obscure and omit how practice informs research. Lastly, we were unable to follow every lead identified in interviews. For example, we were unable to track audiences for work communicated at conferences, and not all potential participants in the path opted to participate in the study. Therefore, some aspects of brokerage may be underrepresented or missing in our analyses. For these reasons, the cases and analyses presented here are not intended to offer generalizable information about the full range of ways research finds its way into practice. Rather, like our backward tracking cases, these cases help to surface critical issues and potential levers in the path between research and practice to inform current research and policy discourse on evidence use in education.

Overview of Cases

We completed four forward tracking cases in which we tracked how research-based information from four education research projects was mobilized into policy and practice communities. In Case 1, researchers evaluated and engaged in a nation-wide implementation of a STEM curriculum. In Case 2, researchers created, piloted, and evaluated a professional development program in local school districts focused on data-driven decision-making. In Case 3, researchers from a Regional Educational Lab (REL) engaged in a coaching project to increase district capacity to measure, analyze, interpret, and use student survey data. Finally, in Case 4, researchers developed, implemented, and disseminated findings from a randomized control trial (RCT) showing the benefits of an informational intervention for students. As we described in the section 'Selection of Case Studies' (page 6), we purposefully selected cases to capture diverse areas of research, funding sources, and research approaches. However, upon engaging in data collection for the selected cases, we learned three of the four cases (Cases 2, 3, and 4) involved and/or leveraged research practice-partnerships to support the movement of research into practice. This observation may be due to our sampling approach (i.e., focus on engaging with and disseminating to practitioner audiences), which could have resulted in an overrepresentation of research-practice partnerships in our final sample.

Case 1: The Evaluation and Nation-wide Implementation of a STEM Curriculum Program Package

Case 1 is the first of two cases of program development and evaluation. In this case, a university-based researcher partnered with two STEM-focused organizations to evaluate and disseminate a STEM curriculum. We conducted interviews with the university-based researcher, a representative from one[1] of the KB organizations, and two educators from a school district who were involved in the study and shared and used findings from the study in their own practice. We collected and analyzed 134 documents for this case.

Prior to the evaluation study (which is the focus of Case 1), the university-based researcher (PI) had previously partnered with one of the STEM-focused organizations (Co-PI) to develop and pilot the STEM curriculum. The funder of this project hosted an event which allowed the PI and Co-PI to share their findings with other grantees. In addition, during this event, the funder hosted a networking opportunity for individuals with similar interests to talk together. The PI and Co-PI met the other STEM-focused organization at this networking event, which led to the third organization "coming aboard '' to support the evaluation and nationwide implementation of the STEM curriculum program package.

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[1] We sent three emails to a representative from the second KB organization inviting them to participate in the study, but we did not receive a response back.

In the evaluation study, the university researcher (PI) and the two STEM-focused organizations (Co-PIs) undertook different but complementary roles to contribute to the project. The university researcher was responsible for conducting the evaluation. The first STEM-focused organization, as described by a representative of the organization, was responsible for "making sure the curriculum and the science is correct, and how the curriculum is delivered." In addition, the organization also provided educator professional development on using the curriculum. The organization personally provided professional development by hosting workshops and webinars. In addition, the organization collaborated with a regional education support unit to host professional development workshops for educators. Finally, the second STEM-focused organization was responsible for teacher recruitment and was also involved in providing professional development to educators. The university researcher and STEM-focused organizations equally contributed to dissemination activities, such as developing articles (both researcher and practitioner focused) and presenting at practitioner and researcher-focused conferences that were hosted by a variety of brokering organizations. In addition, the research team participated in an annual video showcase event. The video showcase event was developed out of a grant provided by the funder to another research organization. The purpose of the event is for the funder's grantees to share findings of their research with a broad audience.

We were able to speak with two representatives of a school district that participated in the evaluation study. The practitioners highlighted a professional development event that was hosted by the second STEM organization. The purpose of the event was two-fold: (1) to build their capacity in using the STEM curriculum, and (2) to develop materials that they could use to disseminate findings from the study at local practitioner-focused events. The practitioners used the materials they developed during the master teacher training at several different events that were hosted by different brokering organizations, including multiple professional associations and the regional education support unit. The practitioners noted that the curriculum continues to be used by educators within their school district.

We note that due to the large number of actors, activities, and knowledge exchange events within this case, we have created two visual maps to capture this case data. This case included 10 brokering organizations that were professional associations, which are membership-based organizations who work or share an interest in a specific topic area. Due to the large number of this particular type of brokering organization, we chose to focus on the actors, activities, products, and KEEs that involved professional associations in Figure 3, and Figure 4 includes all of the actors, activities, products, and KEEs that were not connected to a professional association. The separation of actors, activities, and KEEs in Figures 3 and 4 were done for organizational purposes and should not be taken as a comparison of these components more generally. For example, in Case 1 there are 10 different professional associations – each professional association being assigned a number, 1 through 10. We depict the research products and their transformations in Figure 5. Products and Actors depicted in Figures 3, 4 and 5 (and all ensuing figures) follow a standard naming format. Where there is more than one type of the same actor or research product, these actors and products are numbered. To

see a detailed description of brokers and their work, research products and transformations, and KEEs that occurred in Case 1, see Appendix B.

It is also important to note that the visual maps for Case 1 look different than the maps in Cases 2, 3, and 4. In the other cases, we see found evidence of research-practice partnerships being leveraged to move research into practice. As such, for these cases we have placed the research and practice communities' side-by side. Underneath these two communities, we then have the 'intermediary and unknown' communities. However, in Case 1 we have put the research, intermediary, and practice communities' side-by-side to represent how university-based researchers worked together in partnership with key brokering organizations to share their research findings and build the capacity of educators to implement the STEM curriculum.

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

Figure 4. Map of Case 1: Brokers, Activities, and Knowledge Exchange Events, pt. 2
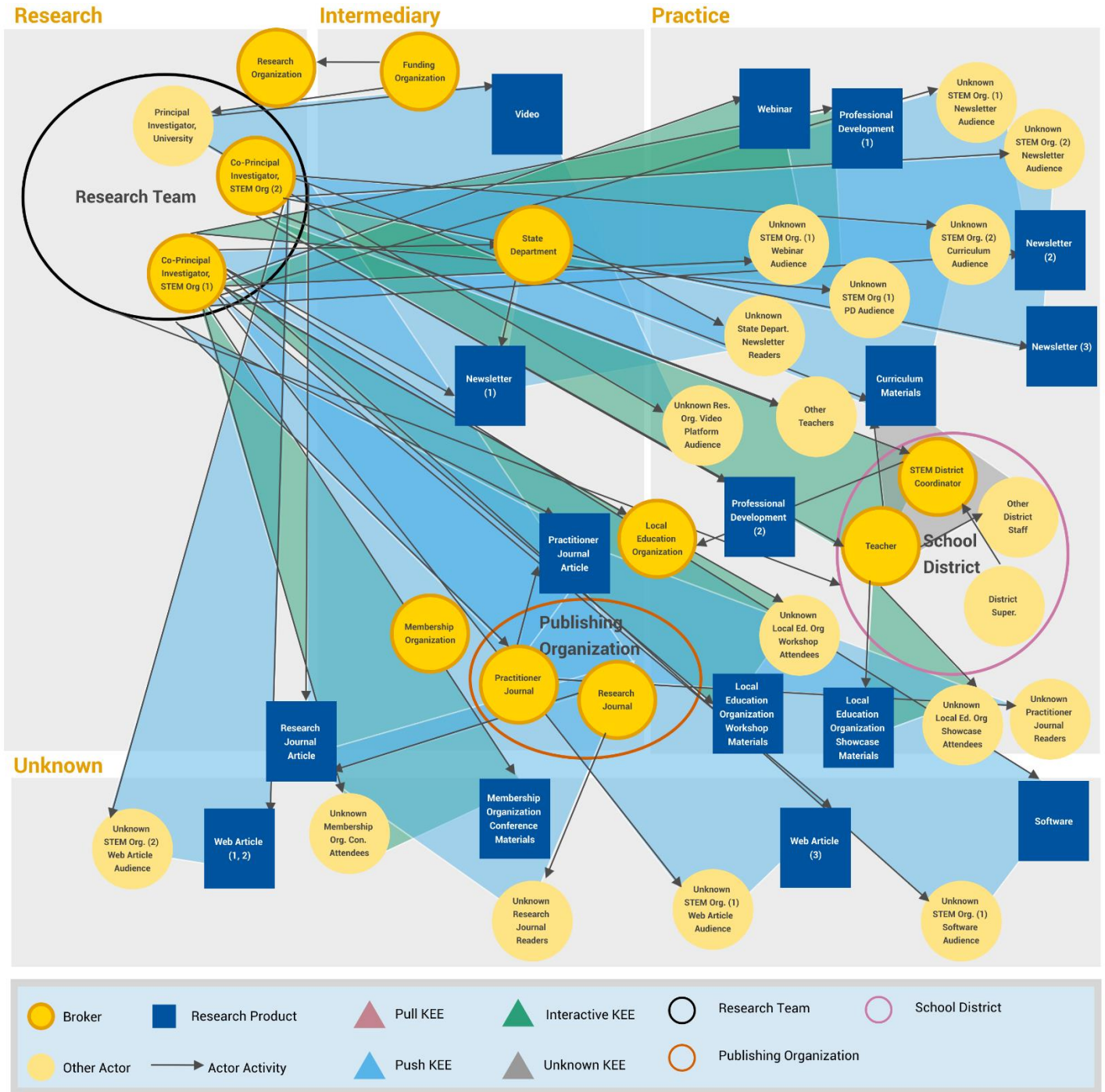
Figure 5. Map of Case 1: Research Products and Transformations
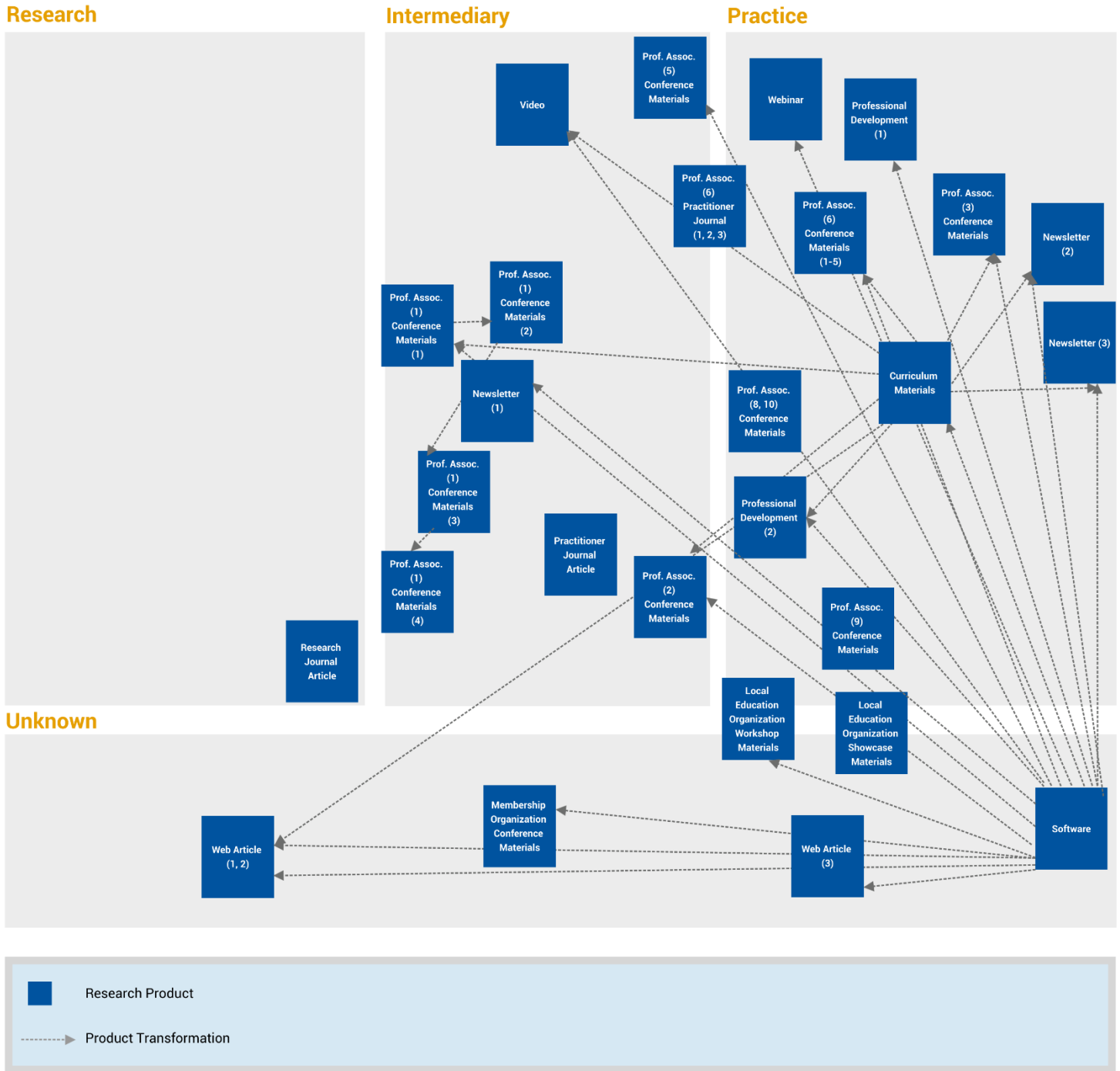
Takeaways from Case 1. This case is the most complex in terms of actors, activities, research products, transformations, and knowledge exchange events. Members of the research team engaged in numerous interactive KEEs to share the findings of their research with practitioners, often using conference presentations and professional learning opportunities as a way to share information. In

addition, we see the research team pushing written content out to practitioners and other audiences through practitioner journal articles, researcher journal articles, web articles, and newsletters. Many brokers were involved in this case, most of which were professional associations, whose events were leveraged to connect with practitioners. We also saw evidence of school-based practitioners acting as brokers in this case, with two individuals sharing information with other practitioners in their local context.

Case 2: A Research-Practice Partnership (RPP) Project to Enhance Teaching Quality

Case 2 is our second case of program development and evaluation. We conducted interviews with four individuals involved in the project and collected and analyzed 77 documents for this case. In this case, a long-standing partnership between a university center and several local school districts was leveraged to conduct a project focused on strengthening educators' capacity for data-based inquiry and decision-making. The partnership's strategic committee, composed of district leaders and a representative from the university center, identified the need to build educators' capacity to use data. The university's center representative reached out to a university researcher with expertise in the topic area. The researcher then worked in collaboration with one of the districts to write and submit a proposal to develop, implement, and evaluate a professional development model to promote data use practices in educators.

During the first year of the project, the members of the research team (comprised of university-based researchers) worked in partnership with the implementation team (comprised of school district staff) to learn about how its teachers were using data to inform their instruction and the types of barriers and facilitators to data use that they experience, and the types of resources that would support them in data-based decision-making. Findings from this phase of the study were used to create professional development (PD) for teachers. During the second year of the project, the PD was piloted and implemented. Findings from the study suggested that the professional development did support data use practices by teachers. Due to the PD's success, the district used the PD's model and resources to train its principals and administrators. When a change of leadership occurred in the school district, the district's partnership representative met with the new district leader to talk about the professional development and the research evidence in support of it. However, it was difficult to sustain momentum for the continued use of the PD due to the district leader's new goals and priorities for the district.

Outside of their work with the pilot district, the principal investigator engaged with another local school district (involved in the larger partnership) to use the PD's model and resources to train its teachers. To reach broader audiences, the research (university actors) and implementation (district actors) team engaged actors in the intermediary community in several ways, including attending different conference presentations and publishing findings from the project in a peer-reviewed journal. Finally, the university's college of education promoted the study and its findings in its newsletter.

In Figure 6 and Figure 7, we present the Case 2 visual maps. For a detailed description of the brokers and their work, research products and transformations, and KEEs that occurred in Case 2, see Appendix C.

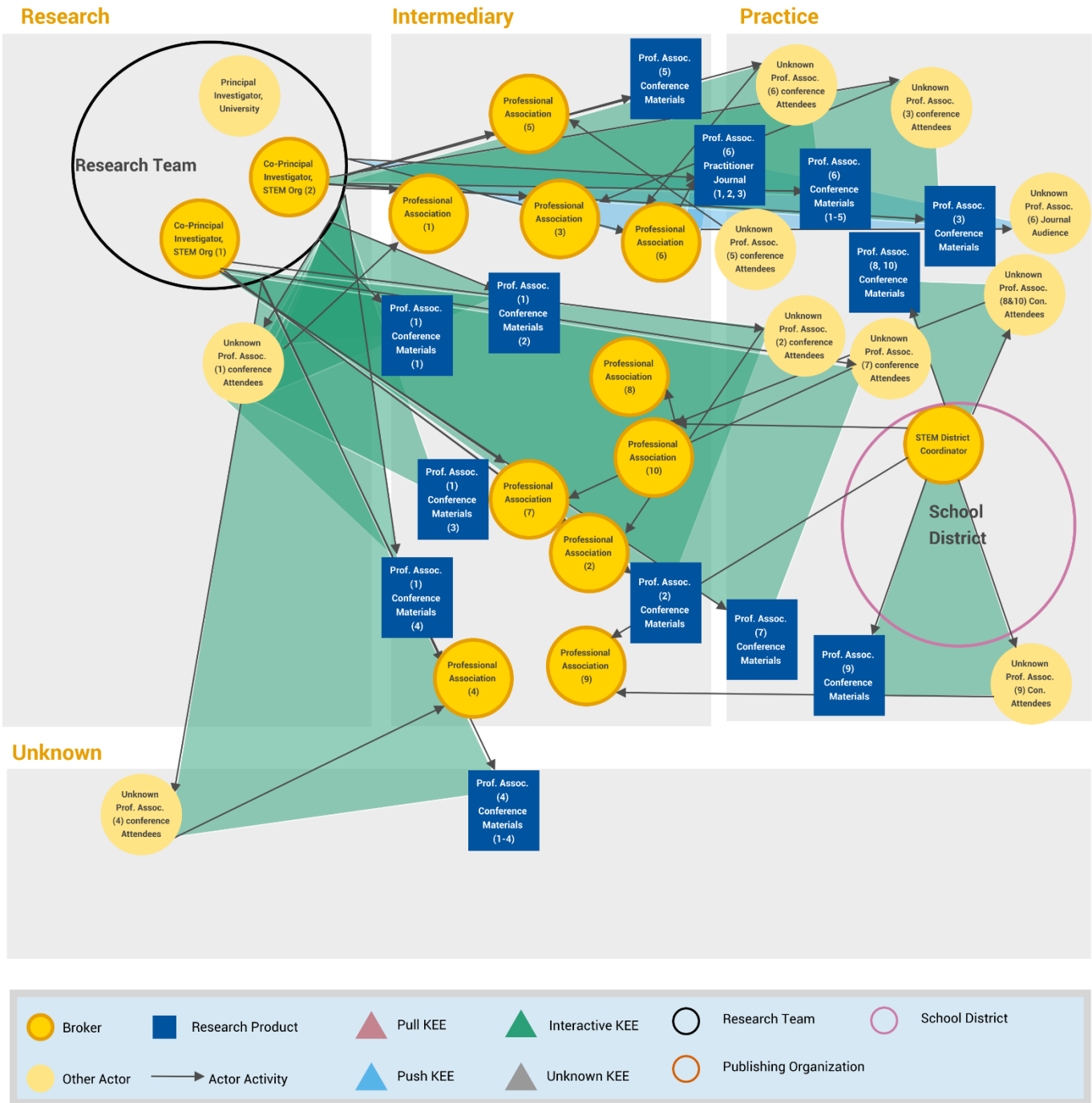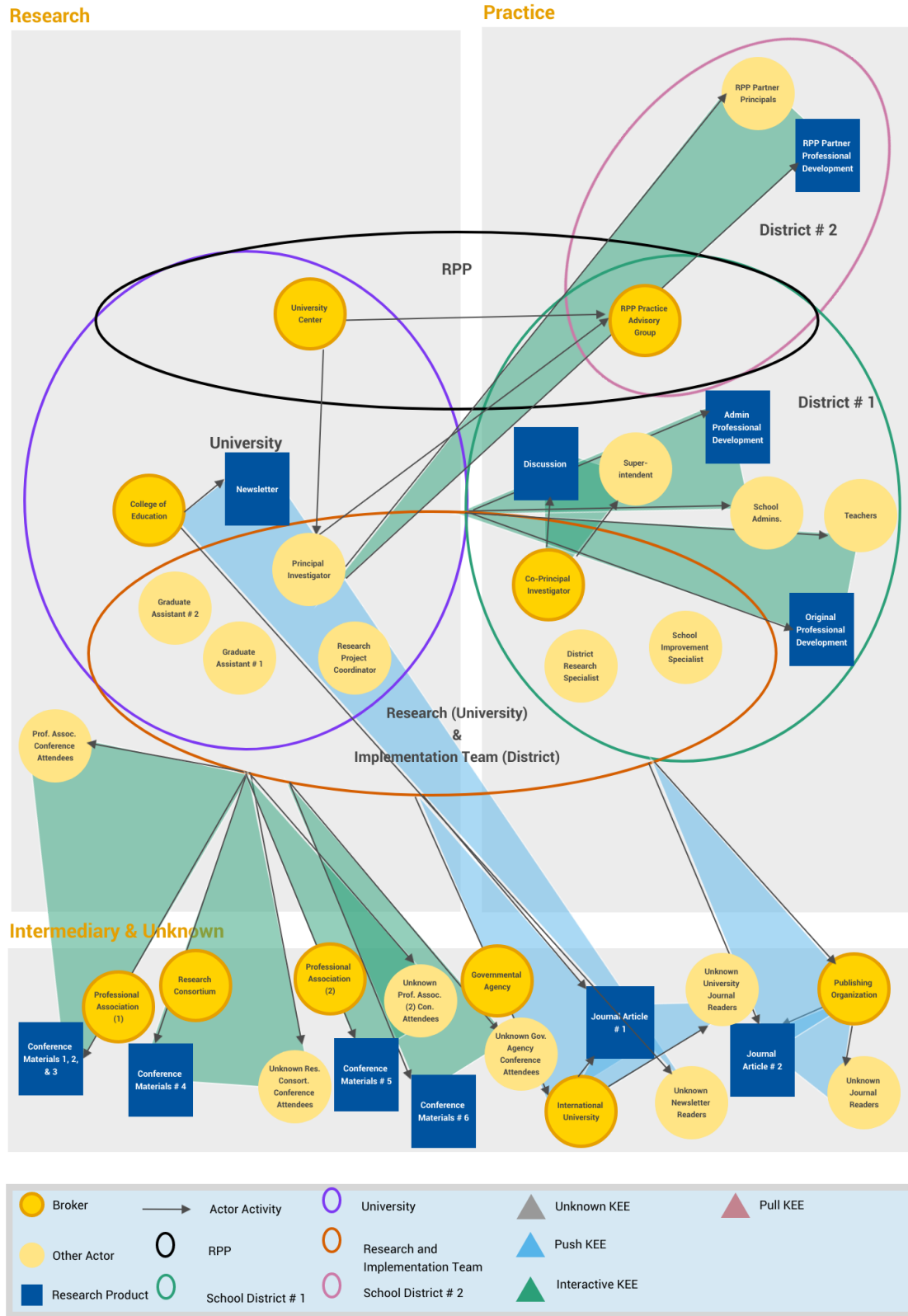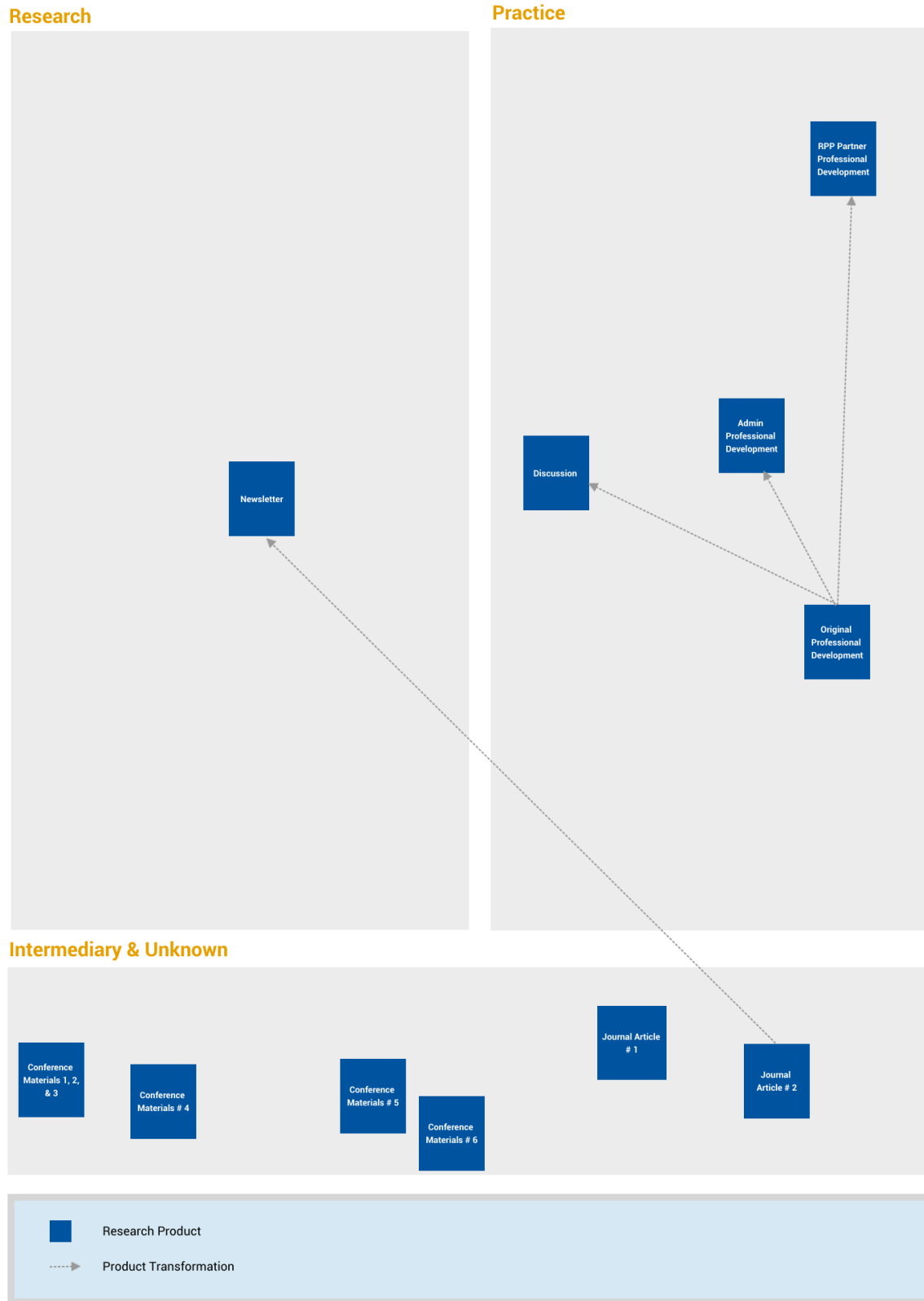*Figure 6. Map of Case 2: Brokers, Activities, and Knowledge Exchange Events*

Figure 7. Map of Case 2: Research Products and Transformations

Takeaways from Case 2. This case represents an effort to connect academic learning with the needs of educational practitioners using an RPP. Interactive KEEs, such as conferences, professional development activities, and in-person discussions were used by members of the research and implementation teams to share research-based information and interact with practitioners and other stakeholders. Relatedly, we see actors in the intermediary community being leveraged for their networks and capabilities to create interaction with practitioner audiences through conferences. A mix of different research products were uncovered in this case, including more 'traditional' products like peer-reviewed journal articles and conference presentation materials, as well as professional development materials that are based on research evidence.

Case 3: A REL Coaching Project to Increase District Capacity to Collect and Analyze Student Survey Data

In Case 3 we highlight how a Regional Educational Lab (REL) engaged in a coaching project to increase district capacity to measure, analyze, interpret, and use student survey data to make data-driven decisions regarding the development of tailored interventions to promote student well-being. The coaching sessions had five main goals: (1) adapt an existing survey (developed by an educational organization) to better reflect the district's needs, (2) develop and align survey items to available research, (3) validate the survey instrument for the local student population, (4) develop a survey index to evaluate students on several dimensions, and (5) build the capacity of district staff to analyze and interpret the findings to inform district decision-making.

The school district continues to use the adapted tool to survey its students on a yearly basis. Findings from the survey are used to inform decisions at the district and school levels. Furthermore, the district disseminates an annual report on the results to the wider community. In addition, a member of the school district wrote a blog about how they adapted the survey for local use. The blog was posted on the educational organization's website that developed the original survey.

The work of RELs takes place within structured, collaborative partnerships with education stakeholders (in this case, a school district) to address high-priority challenges through applied research, training, coaching, and technical support. The REL coaching team consisted of a knowledge manager and REL researchers. The knowledge manager acted as a broker by acting as a liaison between the school district and REL researchers. Members of the REL coaching team shared the results of the coaching project at conferences that targeted multiple community groups, including researchers, policymakers, and education practitioners. In addition, the REL coaching team shared the results with their REL's governing board, which includes practitioners, leaders, and policymakers - with the goal to leverage members' regional networks to amplify and disseminate results from the project.

For this case, we interviewed one member of the REL research team and three central office administrators who work for the district. We collected and analyzed 41 documents for this case. In. In Figure 8 and Figure 9, we present the Case 3 visual maps. For a detailed description of the brokers and their work, research products and transformations, and KEEs in Case 3, see Appendix D. As noted

on page 17, the layout for the visual maps in Case 3 reflects the fact that this was a REL project—with the work of REL taking place within a structured, collaborative research-practice partnership. We have placed the research and practice communities' side-by-side and underneath are the intermediary and unknown communities. We note once again that the placement of the intermediary and unknown communities underneath the research and practice communities was done for organizational purposes only and should not be taken as an indication of a community's importance within the case.

Figure 8. Map of Case 3: Brokers, Activities, and Knowledge Exchange Events
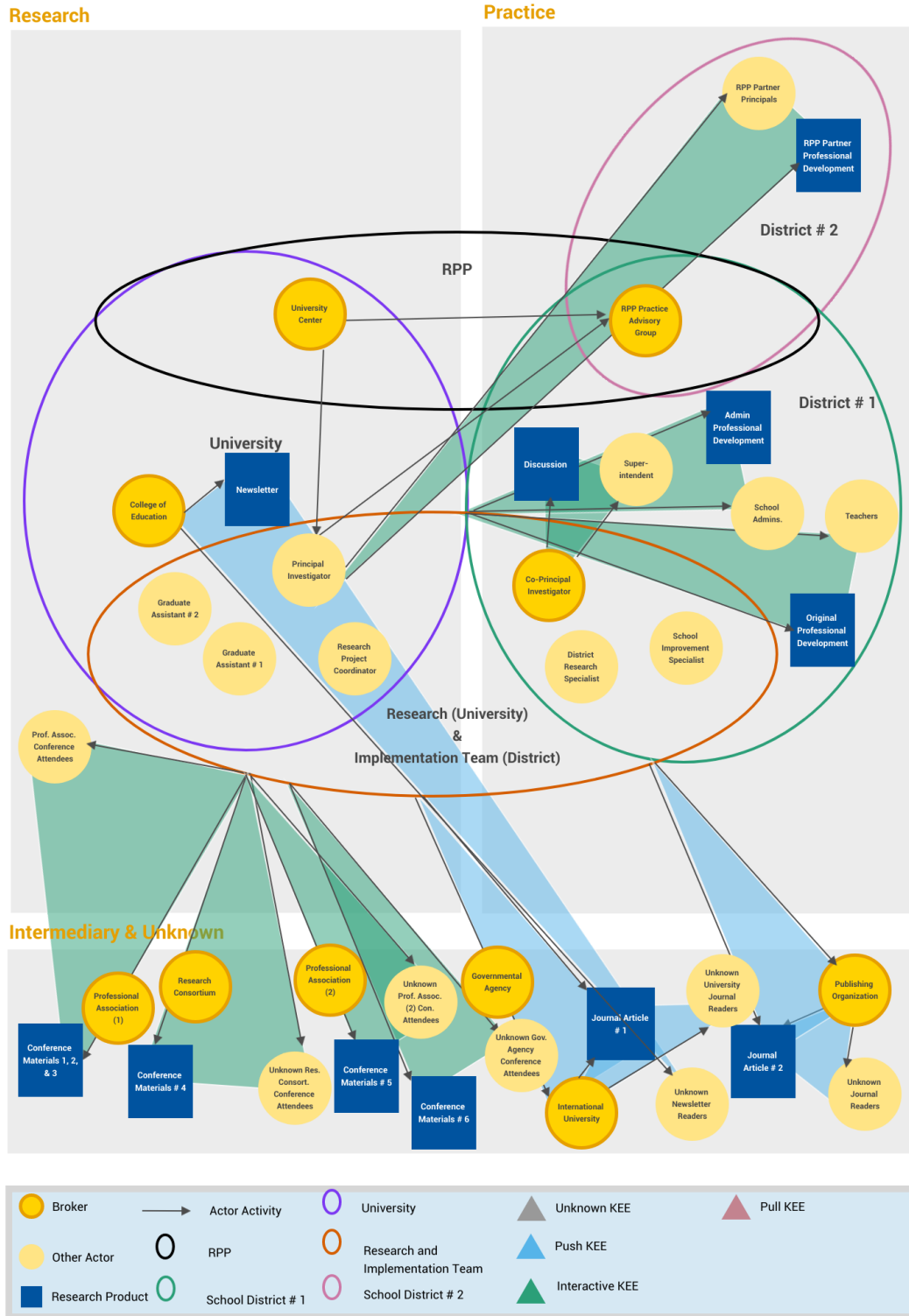
Figure 9. Map of Case 3: Research Products and Transformations
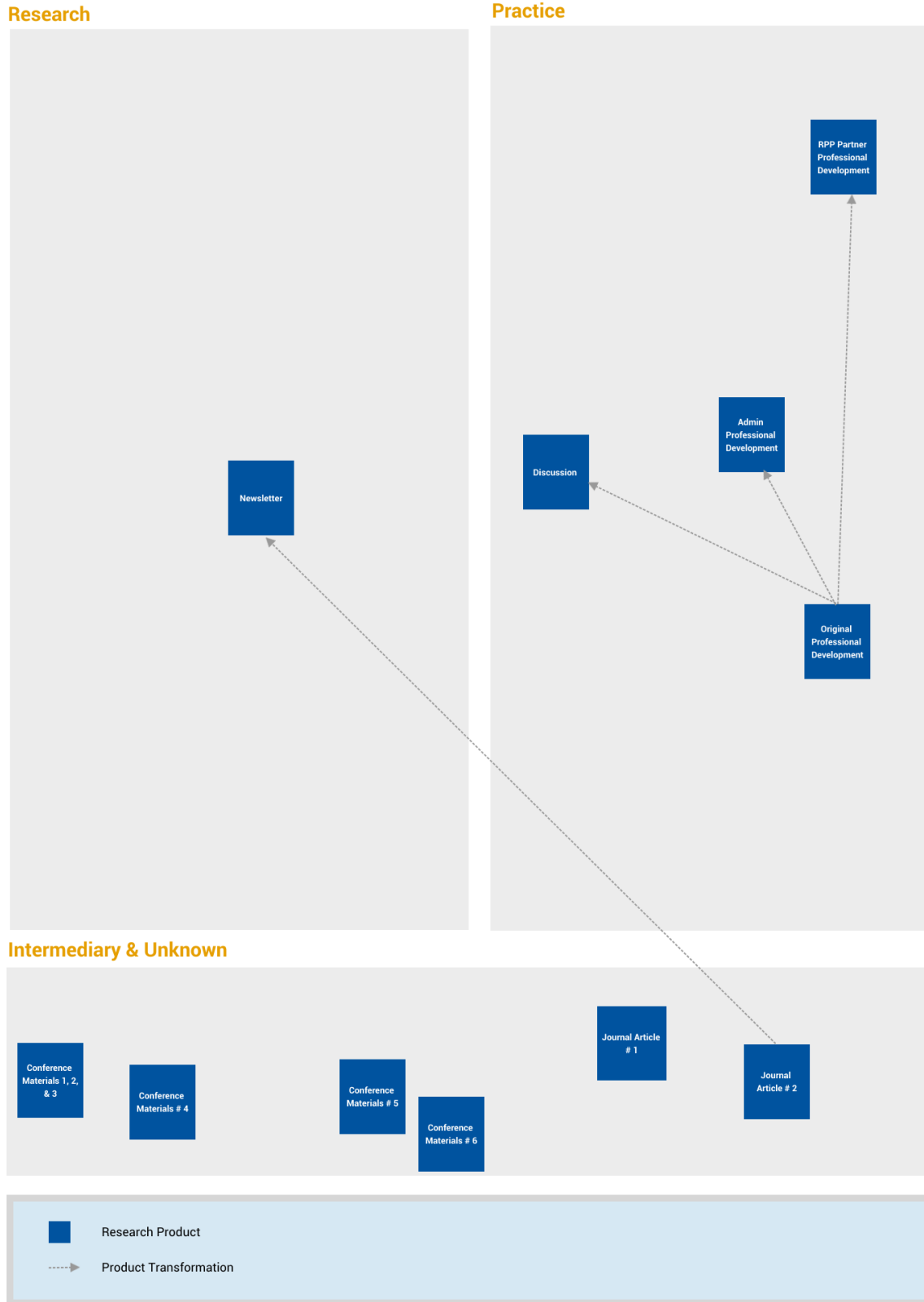
Takeaways from Case 3. This case focuses on a district-driven initiative in response to perceptions about student well-being. It represents a simpler path between research and practice, as the coaching project was targeted directly towards the needs of one district. As such, efforts to disseminate research findings more broadly (by both the REL coaching team and school district) were limited in nature. Brokering organizations were membership-based associations that hosted annual conferences where researchers, practitioners, and other members of the education community to come together to network and share information. The conferences hosted by these brokering organizations were leveraged by the research team to support the sharing of research-based information. Overall, findings from this case suggest tailored support for and partnerships with districts may be an especially powerful tool for promoting research use within partner districts. However, this may result in more limited uptake/spread beyond district.

Case 4: A Randomized Control Trial (RCT) Showing the Benefits of an Informational Intervention for Students

In case four, university-based researchers conducted an RCT to study the effects of an informational intervention on student outcomes. In this case, the principal investigator was affiliated with their local research practice partnership, which facilitated direct connections to district staff. The research team submitted a proposal to a school district describing the proposed study. The district reviewed, provided feedback on, and approved the study. The district also facilitated access to its schools. The research team conducted the study within the district, with some schools receiving the intervention (experimental group), and other schools engaging in business-as-usual (control group). The research team found that the informational intervention benefited both disadvantaged and advantaged students.

Schools that participated in the study continue to use the informational intervention with their students. In addition, a representative from the school district reported that findings from the study were used conceptually; findings were used to inform district administrators' opinions on the topic area.

The research team engaged in multiple strategies to mobilize research evidence to a variety of audiences. To influence local policy, the research team wrote and submitted a policy brief for decision-makers within the school district where they conducted the research. In addition, the research team presented findings from the study at an internal district event. To reach other members of the local community, the research team presented their findings to a community-based advisory group that meets regularly to discuss and advocate for ways to improve student outcomes.

To reach the research community, the research team wrote research reports and disseminated them through a membership-based organization (the principal investigator was a member of the organization) with a mission to disseminate research findings to academics, decision-makers, and the public. These research reports were also posted on an open-access repository. Findings from the project were also packaged and disseminated through peer-reviewed journal articles and researcher-focused conferences.

To reach the public, the research team wrote a blog post, opinion articles (submitted to national news organizations), and engaged in social media outreach. In addition, the research-practice partnership published a web article on the project.

The funder affiliated with the research project also engaged in dissemination activities. For example, the funder wrote multiple articles on the project and posted them on its website. In addition, a representative of the funding organization participated in a news interview, which was published in a national newspaper. The funding organization also wrote letters to local principals informing them of the study and urging them to make use of the informational intervention materials.

We interviewed one of the university-based researchers, a representative from the state department of education, and a staff member of the funding organization. We collected and analyzed 94 documents for this case. In Figure 10 and Figure 11, we present the Case 4 visual maps. Once again, we note here that the layout for the visual maps in Case 4 reflects that this project leveraged a pre-existing research-practice partnership. As such, the research and practice communities are located next to each other, and underneath are the intermediary and unknown communities. We used this layout purely for organizational purposes and the layout should not be taken as an indication of a community's importance within the case. For a detailed description of the brokers and their work, research products and transformations, and KEEs in Case 4, see Appendix E.

Figure 10. Map of Case 4: Brokers, Activities, and Knowledge Exchange Events
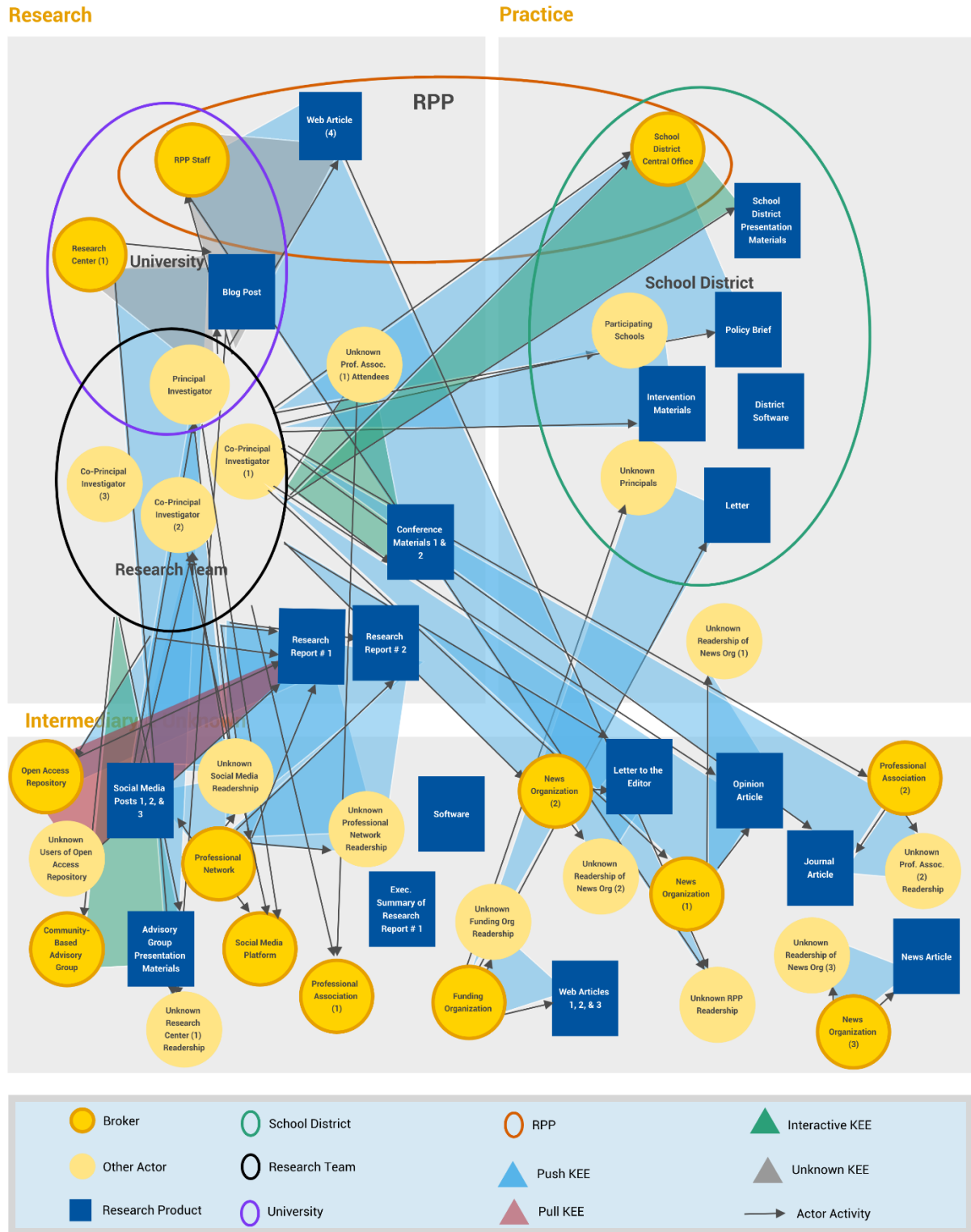
Figure 11. Map of Case 4: Research Products and Transformations
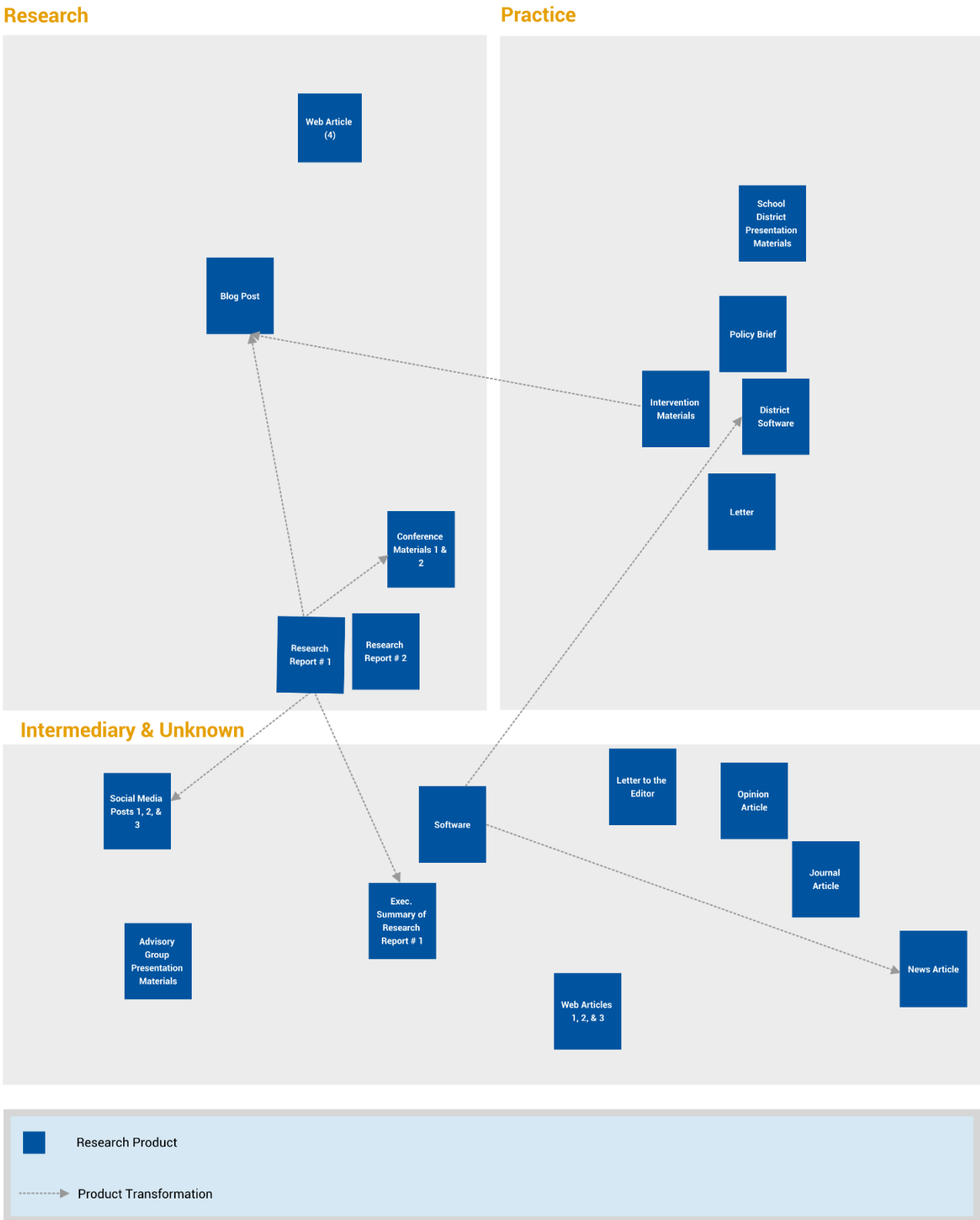
Takeaways from Case 4. Case 4 reflects a research project that uses RCT research methods, which aims to generate generalizable evidence of efficacy or effectiveness that can be extrapolated to a "target population." This type of intervention research is often what is envisioned in expectations for evidence use (i.e., research documenting evidence of effectiveness of an intervention being used to select programs) and is emphasized in evidence use initiatives such as the What Works Clearinghouse (WWC). While the research team engaged in some targeted mobilization to move findings from the study into practice, the research team engaged in much broader mobilization (as evidenced by the large number of 'push' KEEs to brokers in the intermediary community) to public audiences. In addition, this case highlights how brokering organizations with connections to the research team (e.g., funding organization, research center, research-practice partnership) engaged in additional mobilization efforts to support the movement of research 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 F.

Knowledge Brokers (AI 1)

Across the four cases, we identified 119 actors, of which 50 served as brokers. To be considered a broker, the individual or organization had to serve as a link between two actors, communities, or groups to facilitate the flow and uptake of new information. Brokers were largely found in the intermediary community (n=35) located in the nebulous space between research and practice. For example, in Case 1, a professional association served as a broker by hosting a conference that allowed members of the research team and other education stakeholders to connect. Less common were brokers found in the research (n=9) and practice (n=6) communities. This is because researchers who simply mobilized their findings to different communities were not considered brokers as they were the first link in the brokerage chain (e.g., researcher → practitioner). To be defined as a broker, researchers had to link two separate groups (e.g., education stakeholder →

> **Broker Spotlight (Case 1)**
> **STEM Education Organization**
>
> A university-based researcher partnered with a STEM education organization on a project that was focused on developing and evaluating a STEM curriculum. The education organization worked as linking agent by leveraging its network of educators which made "the recruitment of teachers easier…it helps with getting into schools and work[ing] collaboratively with them." In addition, the STEM organization acted as an information manager by housing the STEM curriculum on its website and distributing the curriculum to the educators within its network. Finally, the education organization acted as a capacity builder by hosting a hands-on training event for educators.

researcher → practitioner). For example, in Case 2, the co-principal investigator (who was the district's Director of Research) served as a broker by facilitating the university-based researchers' access to the district's principals to conduct focus groups. Likewise, practitioners who received

research-based information from a source and did not continue to share the information with others were not considered brokers. While non-brokers are important actors in the larger system of brokerage, we do not report on them in this section. For more information on different actors and their motivations for engaging in knowledge exchange events, see 'The Path from Research to Practice (AI3).'

We categorized broker activities in terms of five activity domains: 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 21 brokers in Case 1, 10 in Case 2, 6 in Case 3, and 13 in Case 4. Table 3 provides the case summary for broker activity domains. We illustrate the role of brokers in the Broker Spotlight at right of page 30. Here, we see a STEM education organization from Case 2 playing important roles as a linkage agent, information manager, and capacity builder.

Table 3. Case Summary of Broker Activity Domains

Role Domain	Case 1	Case 2	Case 3	Case 4	N_{total} (%)
Broker[a] (N_{case}=)	21	10	6	13	50 (100)
Capacity Builder	3	1	1	0	5 (10.0)
Evaluator	1	1	0	1	3 (6.0)
Facilitator	1	1	1	1	4 (8.0)
Information Manager	10	3	4	12	29 (58.0)
Linking Agent	16	7	3	4	30 (60.0)

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

Within each case, brokers engaged in multiple activity domains. Brokers most frequently served in two role domains – Linking Agent (60.0%) and Information Manager (58.0%). Brokers who served as Linking Agents often hosted conferences where multiple different communities (e.g., community members, policymakers, practitioners, researchers) could attend. Brokers who served as Information Managers typically shared information targeted towards different audiences. Brokers utilized several different methods to share research evidence, including using conference proceedings and working paper repositories, publication of peer-reviewed journal articles, publication of practitioner articles, and publication of news/social media. Brokers were less likely to serve as Capacity Builders, Evaluators, and Facilitators. All brokers engaging as Capacity Builders (n=5) focused on increasing the ability of school and district staff to engage in evidence-based decision-making / evidence-based practices. When serving as Evaluators, all brokers engaging in this function (n=3) assessed the local context to inform their knowledge brokering activities. For example, in Case 2, one broker explained how they reached out to local education service agencies to support their work in providing professional development to teachers.

> "Then the [education service agencies], I reached out to them when I arrived, and because they regularly do educator professional development also...So I reached out to the [education service agencies] and said let's partner, let's advertise together."

In two of the four instances of facilitation, brokers were funders who engaged in activities to enhance the practical applicability of research evidence. In Case 1, we see brokers serve as Facilitators when a funding organization funds a research organization to create an online, interactive video platform that grantees can use to showcase findings from their research projects. While in Case 4, a funder enhanced the practical applicability of research by taking findings from the research project and using them to inform the development of a web application. Facilitation in the third instance was the Co-Principal Investigator in Case 2 (who was a member of the district's implementation team and served as the district's Director of Research). This individual met with the district's superintendent to inform them to encourage the superintendent to integrate findings from the study into district decision-making. The last instance of facilitation comes from Case 3. In this case, a REL knowledge manager enhanced the practical applicability of research by making sure the REL described their data analysis *"in a way that makes sense...for our clients."* Our sense from these data is that while brokers engage in all the role domains as hypothesized in the literature, engagement in the different role domains is uneven. These findings might be interpreted as evidence that some activities or functions are preferred to others. This aligns with Cooper's (2014) finding that research brokering organizations were much more likely to engage in activities to increase the awareness and accessibility of research (Information Manager) and facilitate connections among diverse stakeholder groups (Linking Agent). However, it is unclear why brokers prefer to engage in these types of functions over others. Alternatively, like our backward tracking study, which also found uneven engagement in broker role domains, we note that these findings might suggest that broker roles are not "formalized or routine" (Newman et al., 2020, para. 1) and considerable variation may occur to allow brokers to apply different strategies as needed to move research into practice. In either case, more information is needed to know why brokers engage in specific functions (e.g., resource constraints, lack of capacity to engage in other functions) over others. In addition, more information is needed to understand in which cases or contexts brokers are most effective in moving research into practice.

Brokers are often embedded in varying organizational structures. As such, we categorized brokers by organizational type. The 50 brokers were located across 45 different organizations. In Table 4, we provide a case summary of broker organizational types.

Table 4. Case Summary of Broker Organization Types

	Case 1	Case 2	Case 3	Case 4	N_{total} (%)
Broker (N_{case}=)	19	9	4	11	45 (100)
Organization Type					
Membership	11	2	2	3	18 (40.0)
Non-profit	3	4	0	4	11 (24.4)
For-profit	1	1	1	4	7 (15.6)
Governmental	3	1	1	1	6 (13.3)
School district	1	1	1	0	3 (6.8)

These organizations were most likely to be membership-based organizations, followed by non-profit organizations, for-profit organizations, governmental organizations, and practice organizations. Membership-based organizations were most often professional associations that focused on facilitating connections between diverse community members with interests in particular education topics. Non-profit organizations were more diverse, ranging from research and development organizations, universities, news organizations, and funders. For-profit organizations were also diverse—including publishing companies, educational service companies, news organizations, and social media organizations.[2] Governmental organizations include state departments, educational service agencies, funders, and the REL program. We included a separate category for brokers found within 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. Brokers were found in districts in three out of the four cases. The districts were found in large suburbs (n=2) or large cities (n=1).[3] Two of the districts were large, with the National Center for Education Statistics (NCES) Common Core of Data reporting that the districts have over 10,000 students enrolled. The third district had between 2,500 and 9,999 students enrolled. Districts were diverse in terms of student academic outcomes (i.e., math proficiency ranging from 37% to 55%; English Language Arts Proficiency ranging from 40% to 60%), socio-economic status (i.e., families with income below the poverty level ranging from 7% to 24%), and student demographics (percentage of students of color ranging from to 19% to 63%). We note that the number of district-based brokers is much lower in the forward tracking study than in the backward tracking study. This is due to the different way we are tracking research in the current study (i.e., from research project → practice) as opposed to our earlier study (i.e., use in practice → research project). We were also interested in exploring the organizational characteristics of brokers within the intermediary and practice communities. In Table 5, we provide a case summary of organizational characteristics.

Table 5. Case Summary of Characteristics for Brokering Organizations

Characteristic	*n* (%)
Mission statement[a]	
Knowledge mobilization	29 (64.4)
Research / use	21 (46.7)
No data	8 (17.8)
Annual revenue	
Less than $1 million	6 (13.3)
Between $1 million and $50 million	17 (37.8)
Between $50 million and $1 billion	7 (15.6)
More than $1 billion	7 (15.6)

[2] Social media organizations were captured as brokers within our data as these organizations allow for the linking of different actors, which can facilitate the flow and uptake of research-based information.
[3] As described by the National Center for Education Statistics (NCES) Common Core of Data

Characteristic	n (%)
No data	11 (24.4)
Size (# of employees)	
Small (1–49)	16 (35.6)
Medium (50–249)	9 (20.0)
Large (More than 250)	17 (37.8)
No data	3 (6.7)
Leadership and Governance Composition [a]	
Community Members	33 (73.3)
Policymakers	7 (15.6)
Practitioners	19 (42.2)
Researchers	26 (57.8)
Focus in Field	
Broad	31 (68.9)
Narrow	14 (31.1)
Scope of Work	
Local	6 (13.3)
State	8 (17.8)
Regional	1 (2.2)
National	11 (24.4)
International	19 (42.2)
Target Audience [a]	
Community Members	32 (71.1)
Policymakers	16 (35.6)
Practitioners	30 (66.7)
Researchers	25 (57.8)

a Categories for mission statements, leadership and governance composition, and target audience are not mutually exclusive. Therefore, frequencies may be greater than n, and percentages may be greater than 100%.

The missions of many organizations clearly related to knowledge mobilization and promoting research/use. Commitments to knowledge mobilization were explicit in 29 of the 45 organizations and included statements such as *"advancing knowledge about education," "inform, support, and advocate for...teachers,"* or *"transform...education through professional learning, partnerships, and advocacy."* We also coded missions if they focused on research and/or research use (n=21). Missions related to research and/or use included statements such *as "[association] is dedicated to...fostering excellence in research analysis, and education,"* and *"increasing our schools' capacity to provide quality...practices that are scientifically researched, evidence-based, and culturally responsive."*

We found that brokers are situated in varied contexts, with organizations varying in size, scope, and focus. Leadership and governance committees were most likely to be composed of community members and researchers, while organizations' target audiences were most likely to be community members, practitioners, and researchers. The diversity of brokering organizations is also seen in our survey work, with educational researchers and practitioners citing thousands of different brokering

organizations that they turn to support their mobilization and utilization efforts (e.g., Farley-Ripple et al., 2022).

In looking at these data, the diversity of these organizations cannot be understated. This diversity has potential implications for future research as well as practice. First, while this study (as well as others, e.g., Cooper, 2013, Malin et al., 2018, Orphan et al., 2021; Sebba, 2013; Woulfin et al., 2018) have reported on the characteristics of different brokering organizations, we have a more limited understanding of why brokering organizations are structured the way they are, why they behave in the way they do (e.g., through understanding their origins and evolution), and any and all relationships among them (see Scott et al., 2017 for an exploration of intermediary networks). Second, the diversity of brokering organizations in the education system affects the diversity of career lines available to individuals interested in pursuing careers related to connecting research and practice. As such, it is important that higher education institutions have information about job market needs and adapt their curricula to such needs.

Products and Transformations (AI 2)

Products

Throughout our cases, we identified research products that resulted from the selected research projects. In addition, we traced how products were transformed into different derivatives as they moved between the research, intermediary, and practice spaces.

Across the four cases, 85 products were categorized into 14 different product types, described in Table 6. Presentation materials (n=35) were, by far, the most common research product found across cases. This included a mixture of both researcher-focused presentations and presentations focused on more policy and practice communities. Comparatively, products (e.g., research reports, blog posts, mailing lists) developed to be held electronically on websites or in paper format were less likely to be found across the cases. This shows that many case actors preferred communicating directly with different stakeholders rather than through more passive approaches.

Table 6. Summary of Product Types

Product type	Product description	Illustrative examples	Frequency of products in cases *n* (%)
Blog Post or Web Article	A blog post is published within a blog on a website. Blog posts are posted in reverse chronological order (most recent first). A web article is a story that is written on a	A web article describing the instructional materials developed from a research project.	9 (10.6)

Product type	Product description	Illustrative examples	Frequency of products in cases n (%)
	website about a particular topic.		
Informal Summary	A product that contains a shortened version of other research-based materials using someone's own words.	A central office administrator talked to their superintendent about the strength and research behind a professional development program.	1 (1.2)
Instrument	A tool used to collect, measure, and analyze data related to a specific research interest.	A research-backed tool that a school district used to collect student survey data.	2 (2.4)
Mailing List, Newsletter, or Email Blast	A mailing list is a list of people who are subscribed to a particular publication. A newsletter is a bulletin issued periodically to the members of an association or organization. An email blast is a single email message sent to a mailing list.	A university published a newsletter article detailing the findings from a research project.	5 (5.9)
Model, Program, or Intervention	A packaged set of practices, curricula, strategies, etc. that are ready for educators to use.	A STEM curriculum that has been developed and evaluated by researchers.	2 (2.4)
News Article	An article published by a news organization	An opinion piece written by a researcher that references findings from a study.	3 (3.5)
Post from Social Media	Content shared on social media through a user's profile	A tweet storm by a researcher that	3 (3.5)

Product type	Product description	Illustrative examples	Frequency of products in cases *n* (%)
		details findings from a research report.	
Practitioner Journal Article	Materials from a practitioner journal are often peer-reviewed and are aimed at a particular professional market (e.g., educators)	A peer reviewed journal article that describes an evidence-based STEM curriculum.	4 (4.7)
Presentation Materials	Materials associated with presenting to a group of people, such as PowerPoint presentations, abstracts, handouts, or conference proceedings. These materials may be presented at a conference or during a meeting.	A conference proceeding that details the findings from a research study.	35 (41.2)
Professional Learning	An event or activity and its accompanying resources that is intended to train educators on a particular issue or practice; professional learning code should apply to not just the passive receipt of information (for which other product categories would apply) but rather a focused, active learning session	A workshop that trains STEM teachers on an evidence-based curriculum	7 (8.2)
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	A peer reviewed journal article that describes findings from a research project.	7 (8.3)
Research Summary or Brief	A research summary/brief is a piece of writing that summarizes research on a specific topic. Its primary goal is to offer the reader a non-	An executive summary of a research report.	3 (3.5)

Product type	Product description	Illustrative examples	Frequency of products in cases *n* (%)
	technical overview of the study with the key findings.		
Software	A computer program designed to carry out a specific task	A web-based app that STEM teachers can use alongside the STEM curriculum.	3 (3.5)
Video	A video is a recording of moving visual images made digitally or on a videotape	A video that provides a brief overview of a research project.	1 (1.2)

Note. N = 85.

We were also interested in other product characteristics, including format (multimedia, verbal, and written), availability (fees, private/internal, or publicly available) and actionability (descriptive versus prescriptive). To learn more about each of these categories, see Appendix F. Across all domains, we coded "no data" if there was not enough information to accurately code the product. In Table 7, we provide a summary of research product characteristics.

Table 7. Case Summary of Research Product Characteristics

	Case 1	Case 2	Case 3	Case 4	N_{total} (%)
Target Audience					
Community Members	8	4	2	18	32 (37.6)
Policymakers	5	3	3	8	19 (22.4)
Practitioners	32	7	8	8	55 (64.7)
Researchers	13	9	2	6	30 (35.3)
No data	2	0	0	1	3 (3.5)
Format					
Multimedia (contains verbal, written, and/or visual elements)	26	7	3	3	39 (45.9)
Written only	10	3	6	18	37 (43.5)
Verbal only	0	1	0	0	1 (1.2)
No data	2	2	0	4	8 (9.4)
Availability					
Associated with fees	23	6	2	6	37 (43.5)
Private or internal	1	4	3	5	13 (15.3)
Publicly available	11	3	4	13	31 (36.5)
No data	2	0	0	2	4 (4.7)

	Case 1	Case 2	Case 3	Case 4	N_{total} (%)
Actionability					
Descriptive	18	10	6	0	55 (64.7)
Prescriptive	19	3	2	3	27 (31.8)
No data	2	0	1	0	3 (3.5)

Note. N = 85.

In looking across cases, we identified four patterns in the research products. First, actors developed products that communicated information to tailored audiences. Products developed for education practitioners were prominent in most cases, but products targeted towards researchers and community members (i.e., the public) were still relatively common. Products targeted towards community members include conference materials (where attendees include community members), web articles, videos, reports, and news articles. Products targeted towards researchers include conference materials (where attendees include researchers), research reports, journal articles, videos, software, newsletters, and blog posts. Less common were materials targeted towards policymakers, which may be related to our study's focus on school and district practice. A product could be targeted to more than one group. For example, there were multiple target audiences for a report from Case 4 that was disseminated to "*academics…decision makers, and the public*" by a brokering organization.

Second, we found that actors in Cases 1 and 2 most often created multimedia content to encourage increased engagement with research products. Multimedia approaches were often tied to the use of presentation materials (e.g., verbal discussion by actors coupled with the use of slide decks); however, multimedia content was also used for professional learning, video, and software products. In Cases 3 and 4, products were more likely to be written to support the dissemination of information to different audiences. While only occurring once in our data, we also note the use of verbal communication to share findings from research. This occurred in Case 2 when a district's Director of Research met with their district's superintendent to share findings from the research study and encouraged the use of the findings to inform district decision-making. This instance highlights the informal and socially dynamic ways that research knowledge can be spread within practice communities. Furthermore, as evidenced by our data, this informal sharing of research information through educators' professional networks may be difficult to identify and may result in under-identification of the different ways in which research knowledge is shared between individuals within organizations.

Third, depending on the project, products were most likely to be associated with fees - for example, in Cases 1 and 2, many products were associated with conferences that had registration fees. Publicly available documents were also present across all the cases and were more dominant in Cases 3 and 4. Less common in our data were 'private or internal' documents (i.e., documents that were created and stored within organizations). While others have noted that research evidence can be embedded into these types of documents (Coburn et al., 2020), we note that organizational access restrictions may make it difficult for external parties to identify how research evidence is packaged, shared, and used within organizations.

Fourth, research products were most likely to be prescriptive in nature in Case 1, and descriptive in Cases 2, 3, and 4. 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. Products from Case 1 were largely prescriptive as the purpose of the project was to develop a research-based STEM curriculum which could then be implemented by teachers. As such, many products focused on showing teachers how to use the curriculum in their own practice.

Patterns identified in our study suggest that actors communicate research through different mediums often going beyond traditional academic publishing. Our analysis demonstrated the potential of novel products (e.g., videos, software, social media posts, blogs) to communicate to audiences beyond academia. However, in terms of the development and sharing of novel products, many questions remain unresolved. For example, future research in this area is needed to provide more evidence of the mobilization of different research products and their impact.

Transformations

In addition to exploring the different characteristics of products, we were interested in the evolution of products over time as well as the relationship among products across the cases. We identified 45 transformations in the data, which include occasions in which multiple products were transformed into a single product. Transformations included adaptations, demonstrations, duplications, summaries, syntheses, and translations. Adaptation (n=6) 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. For example, in Case 2, professional learning originally targeted towards educators was adapted and turned into professional learning that was targeted towards school administrators. Demonstrations (n=15) occurred if a new product was created that showed how to use another research product. We note that demonstrations only occurred in Case 1 and focused on encouraging teachers to use the curriculum materials and associated software developed because of the study. For example, several different conference presentation materials and professional development workshops were developed to demonstrate the curriculum and associated materials to teachers. Products were duplicated (n=1) if a research product is an exact copy of another resource but was used for a different purpose. In Case 3 (our only instance of duplication), two different conference presentation materials used the exact same wording to describe findings from the research project. Products were summarized (n=23) if a new product was created that captured the main messages more briefly than an original product. Summaries were found across all the cases. One example of a summary transformation is found in Case 4 when a research report was transformed into a blog post that briefly described key findings from the report. Finally, synthesis (n=17) occurred if products were combined with multiple other sources of information. In our data, synthesis and summaries often co-occurred and were found in Cases 1 and 4. For example, turning back to our Case 4 example, information from the research report and intervention materials were combined to develop the blog post.

Figure 12 illustrates the transformations in Case 1. Here, we see that the primary objective of the research team was to promote their curriculum and associated software to educators. They were then transformed into useful information and educational and outreach products such as videos, professional development, conference presentation materials, and other educational and promotional materials.

Figure 12. Transformation Spotlight (Case 1)
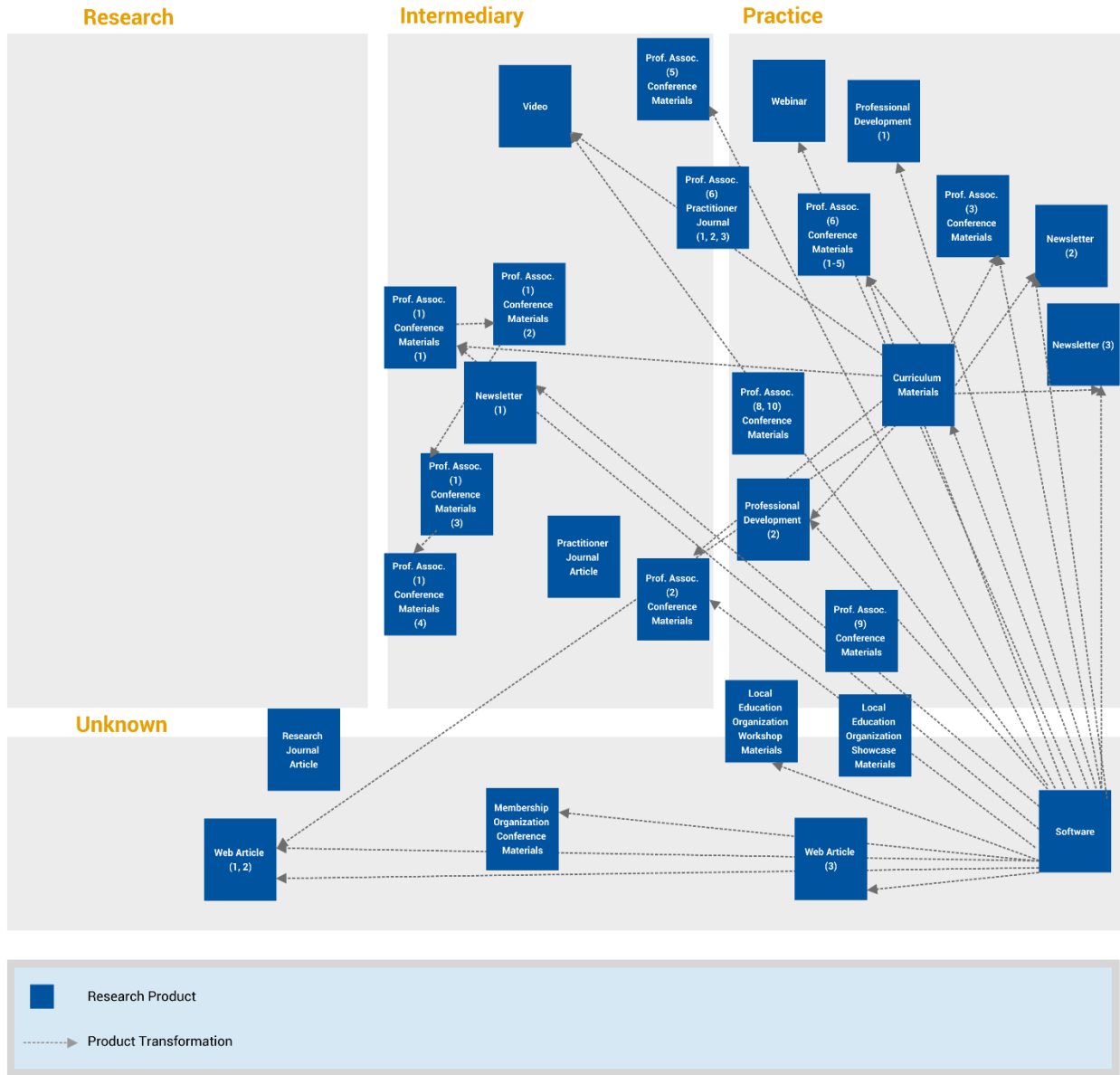
Across all cases, products underwent changes in format and availability 58 times. In Table 8, we provide a case summary of changes in product availability, while in Table 9, we provide a case summary of changes in product format.

Table 8. Case Summary of Changes in Product Availability

	After transformation...		
Before transformation	Publicly available	Associated with fees	Private or internal
Publicly available	19	24	3
Associated with fees	1	3	0
Private or internal	4	0	4

Table 9. Case Summary of Product Format Transformations

	After transformation...			
Before transformation...	Written	Multimedia	Verbal	No data
Written	11	2	0	0
Multimedia	12	28	1	2
No data	1	0	0	1

Many products remained or turned into publicly available products after undergoing transformations, and where publicly available products turned into products associated with fees, this was almost always due to publicly available products being transformed into conference presentation materials. For example, in Case 1, the STEM curriculum and associated software are freely available. However, the STEM curriculum and software were synthesized into a conference presentation, which required individuals to pay a registration fee to attend. Similarly, products associated with fees were likely to remain associated with fees after undergoing transformations. In Case 2 we see the only instance of a product that transitioned from being associated with fees (i.e., pay to access peer-reviewed publication) to a product that was publicly available (i.e., summary of article in publicly accessible newsletter). Private or internal documents were equally likely to remain private or transition into publicly available products. Three instances of private→public occurred in Case 3 when a school district took their validated survey instrument and index and transformed it into two different reports and a blog. The fourth instance of private→public occurred in Case 4 when intervention materials (private) were synthesized with findings from a blog post. Products also typically remained the same type of format, with written products largely being transformed into other written products, while multimedia products remained as multimedia products.

Findings from the current study suggest that even when transformed, many products did not undergo changes to product availability or format. This finding is different from what we observed in our backward tracking study, with most products in the previous study changing in both availability (i.e., products often transformed into private or internal document) and format (i.e., written products

often transformed into multimedia products). One explanation for this difference is that products are more likely to undergo changes to product availability and format the further in time the products are from the original research project.

Our data also indicate that actors perceived conference presentations as a key resource for sharing information about other (often publicly available) research products. Previous research (Malin et al., 2019) has suggested that research products associated with fees can serve as a barrier to research use. Conferences have many fees associated with them, including travel, registration fees, accommodation, and workplace support, thus this approach may not effectively contribute to research use in policy and practice. Alternatively, previous research (Penuel et al., 2020) has also found that educators often obtain research evidence from their professional networks, including professional associations to which they belong. In our cases, research products were often transformed into conference presentation materials for professional associations. As such, conferences may be an important driver of research use. Due to this conflicting evidence, further research on conferences as a strategy for encouraging engagement and use of research evidence is necessary.

The Paths from Research to Practice (AI 3)

Our last area of inquiry focuses on the paths that research takes on its way to practice. We use 'knowledge exchange events' (KEEs) to understand the relationship between the type of dissemination approaches chosen by actors, the "stops" along the path between research and practice, and the eventual use of research by practitioners. In total, there were 100 KEEs across the four cases. We were interested in examining the extent to which there was boundary spanning between the research, intermediary, and practice communities. The direction of boundary spanning could be from research (R) to intermediary (I) communities, from research (R) to practice (P), from intermediary (I) to practice (P), or the reverse of each (I to R, P to R, or P to I, respectively). KEEs could also occur within the research, intermediary, or practice communities, respectively.

We explored the type of interaction in each of the KEEs. Push interactions occurred when there was one directional exchange of information, with the sender being 'active' and the receiver being 'passive'. Pull interactions similarly occurred when there was one directional exchange of information, however in these instances, the receiver is 'active,' and the sender is 'passive.' Finally, interactive KEEs occurred when both sender and receiver actively engaged in the exchange. Actors within all communities could serve as both senders and receivers of information. However, across our cases, we found that actors within intermediary community were more likely to serve as both a sender and receiver. This is perhaps due to their positionality between the research and practice communities. For example, in Case 4 a professional network received a report from the research team (i.e., professional network was a receiver in the KEE). After which, the professional network disseminated the report to other researchers, decision-makers, and members of the general public who belonged to the network (i.e., professional network was sender in the KEE). Table 10 presents a case summary of the KEE boundary spanning and interaction type.

Table 10. Case Summary of the KEE Boundary Spanning and Interaction Type

Characteristic	*n* (%)
Boundary spanning	
Occurs within the research community	11 (11.0)
Occurs within the intermediary community	0 (0.0)
Occurs within the practice community	6 (6.0)
Spans the research–intermediary boundary	15 (15.0)
Spans the intermediary–practice boundary	8 (8.0)
Spans the research–practice boundary	31 (31.0)
No data	29 (29.0)
Interaction type	
Interactive KEE	44 (44)
Pull KEE	1 (1.0)
Push KEE	50 (50.0)
No data	5 (5.0)

Note. N = 100.

First, we note the large number of boundary spanning occurrences where we have 'no data.' These instances of boundary spanning occurred when we did not have data to confirm what community to which a particular actor (participating in a KEE) belonged. For example, across all our cases, most senders were focused on disseminating to a broad audience, such as at a conference. In many of these instances, we were unable to determine who received the information or what community they belonged to (e.g., a researcher presented at a conference that was targeted to researchers and practitioners).

Where we do have data, we found that boundary spanning most often occurred between the research and practice communities. This type of direct interaction between researchers and practitioners occurred in three ways. First, members of the research team directly shared research findings with district/school decision makers who were connected to the study. Second, members of the research team leveraged brokering organizations' pre-existing networks to disseminate research findings more broadly to the practice community (e.g., opportunities to publish and present at conferences). Third, in Cases 1 and 3, we have evidence of researchers co-designing research products with practitioner audiences. Previous research has shown that direct interactions with academic researchers are one of the most significant correlates of research utilization by policy and practice audiences (e.g., Crona & Parker, 2011). The findings from this study suggest that researchers can directly engage with practitioner audiences in different ways, with practitioners assuming the role of a responsive audience or integral partner. However, we need more information to establish how knowledge exchange should be structured or organized to enhance the effectiveness of researcher-practitioner interactions in all phases of research.

Less common was boundary spanning between the research and intermediary communities. In this type of boundary spanning, researchers shared research products (i.e., peer-reviewed journal articles,

practitioner articles, policy briefs, research reports, news articles) with brokers within the intermediary community so that the broker could then disseminate the research product through its communication channels. We note that not all research-intermediary relationships are captured here, due to the nature of KEEs. Specifically, for a KEE to occur, a research product must be communicated to a recipient. Therefore, activities in which a research product is not communicated, such as leveraging an brokers' network to recruit research participants (Case 1), are not captured by the KEEs. Likewise, activities in which the broker serves as the channel of communication (e.g., brokering organization hosts a conference in which a researcher shares presentation materials with a practitioner audience) between a researcher and a receiver are also not captured. The use of brokering organizations to make research results broadly available appears to be limited by the researchers in our cases, in favor of direct interactions between researchers and practitioners. In line with other research (e.g., Cooper et al., 2018), we suggest that brokering organizations are an underutilized and untapped opportunity to communicate research evidence to practice communities. As noted by Cooper and colleagues (2018), these organizations can "alleviate the tension between time-sensitive research and KMb commitments…rather than putting the onus on researchers to build new networks…. researchers can build communication mechanisms with intermediaries who are better suited to translate research in innovative ways and already have strong networks…with policymakers and practitioners" (pp. 14-15).

Interactions were more likely to be 'push' and 'interactive,' as we saw only one instance of a pull KEE (Case 4). This is likely due to the direction in which we are tracking (i.e., forward), as we identified a larger number of 'pull' KEEs in our previous backward tracking study. Examples of push KEEs in our data include publishing research reports, peer-reviewed articles, newsletters, blog posts, social media posts, news articles, policy briefs, and other written products. In these KEEs, there is an assumption that the intended audience will receive the information contained in the research product. On the other hand, examples of interactive KEEs in our data include sharing research information at conferences with other attendees, providing professional development to education practitioners, co-developing research products, and sharing research findings through direct interaction (e.g., via meetings) between case actors.

Figure 13 illustrates some of the KEEs in Case 4. Here, we see multiple types of boundary spanning, including research to intermediary (i.e., research team shares research report # 1 with open access repository), research to practice (i.e., research team shares presentation materials with school district central office), research to research (i.e., research team shares web article # 4 with RPP staff), and intermediary to practice (i.e., funding organization shares letter with unknown principals). In addition, we also see all types of KEEs. For example, we found evidence of the research team *pushing* (represented by a blue triangle) the research report to the open access repository by submitting it through the repository's online system. We similarly found evidence of the funding organization engaging in a *push* KEE when they mailed letters to principals. Evidence of a *pull* KEE was only found in Case 4. Evidence for this type of KEE came from the open access repository's publicly available information on the number of individuals who downloaded research report # 1. Finally, Figure 13

illustrates an *interactive* KEE between the research team and school district. In this instance, the research team and school district both attended a meeting in which the research team presented study findings.

Figure 13. Knowledge Exchange Event Spotlight (Case 4)
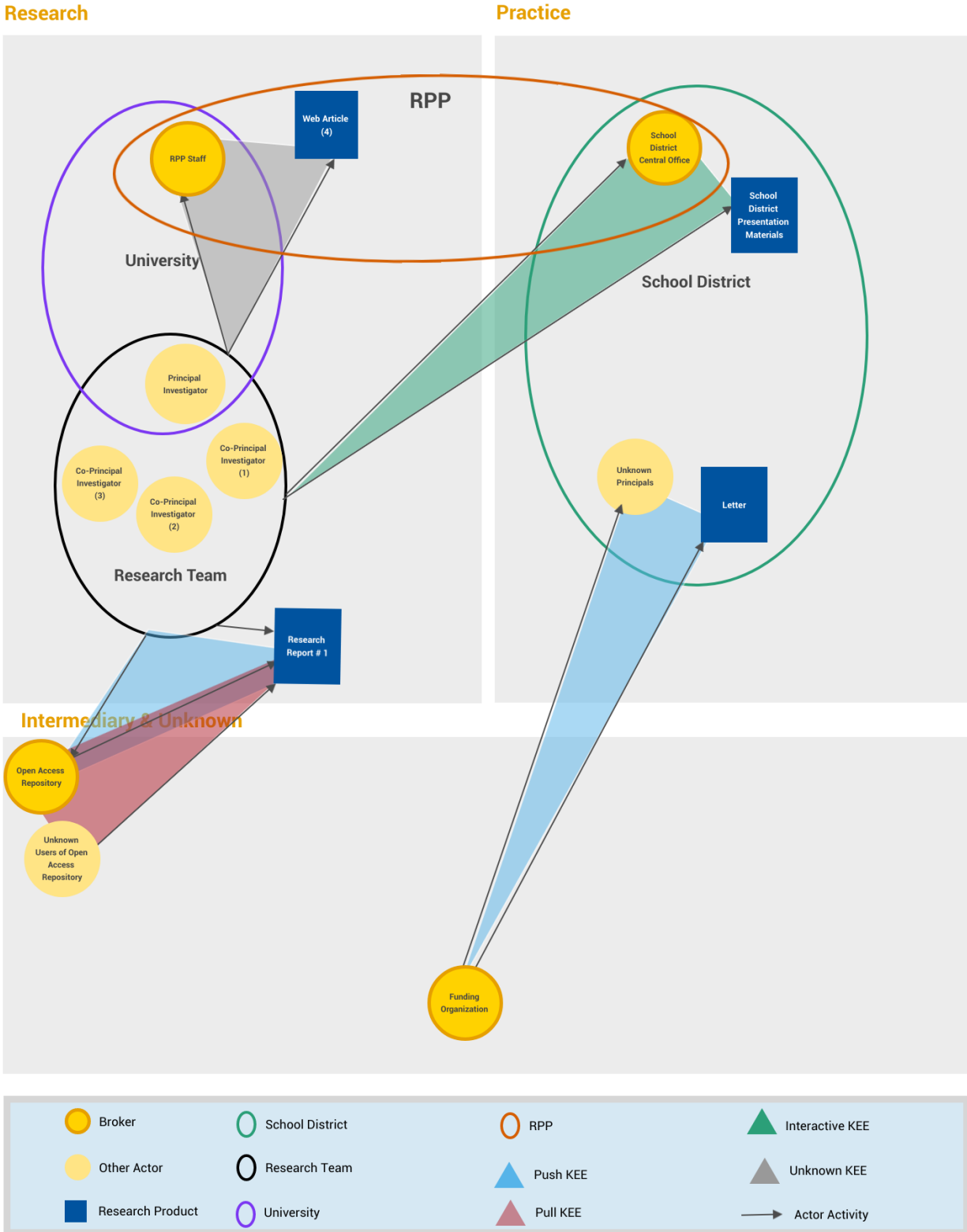
A third dimension of KEEs includes the motivations of the sender and receiver. We categorized actors' motivations into three groups (which were not mutually exclusive): Information sharing, promoting research/use, and supporting adoption or implementation. We further categorized actors' motivations as being internally or externally motivated. Table 11 provides a case summary of KEE motivations.

Table 11. Case Summary of KEE Motivations

Characteristic	*n* (%)
Sender motivation purpose[a]	
Information sharing	32 (32.0)
Promoting research/use	60 (60.0)
Supporting adoption or implementation	25 (25.0)
No data	5 (5.0)
Sender motivation source[a]	
Intrinsic	23 (23.0)
Extrinsic	43 (43.0)
No data	41 (41.0)
Receiver motivation purpose[a]	
Information seeking	5 (5.0)
Promoting research/use	15 (15.0)
Supporting adoption or implementation	5 (5.0)
No data	79 (79.0)
Receiver motivation source[a]	
Intrinsic	0 (0.0)
Extrinsic	17 (17.0)
No data	82 (81.0)

Note. N = 100.

a Senders and Receivers could have more than one motivation purpose and could both be intrinsically and extrinsically motivated. Therefore, percentages may not add to 100%.

Once again, we note the large number of instances where we have 'no data,' this time for receivers' motivation purpose and source. As we explained above, we often lacked data for receivers when senders were involved in KEEs to mobilize research products to broad audiences (e.g., at conferences or publishing journal articles). Due to the limited data on receivers, we are unable to identify themes related to receivers' purpose and source of motivation.

Sender purposes for participation largely focused on promoting research/use. Promoting research/use was expressed as a purpose when individuals explained that they participated in KEEs because they wanted to share research findings and/or encourage the use of research evidence. For example, in Case 3, a member of the school district explained how they shared information about the validation of their survey with their community members:

> *"And in our reports, for that year and subsequent years, I know that [the] validation of the scales was included as a reference in our reporting on the survey results… to say…, these scales were analyzed by an external researcher, and they produce these results."*

Sender purposes also commonly focused on sharing information. Sharing information was expressed as a purpose when individuals explained that they wanted to share information (e.g., advertise, reach an audience) that was not in relation to promoting research/use or adoption and implementation. For example, in Case 1, the Co-PI of the project (who is a representative of a research organization) explained:

> *"But we do also always include a few slides… if we're in recruiting mode for… trying to get more teachers for the next school year cohort."*

Senders were less likely to focus on supporting adoption or implementation of specific practices. For example, this could include providing resources to help practitioners understand what the practice looks like and or providing resources to help someone decide about whether to use a particular program or practice. For example, in Case 4, a funding organization wrote a letter to middle school principals informing them of a software program and urged them to make use of it in their schools.

> *"Well, I think we tried to promote usage of it…I think there were letters sent to all the middle school principals describing and urging them to make use of it in their schools"*

Comparing the present case data to findings from our survey of school practitioners suggests that there may be misalignment between senders' motivations and the motivations of education practitioners. Specifically, we highlight data from the SEE-S survey that revealed that education practitioners nearly unanimously prefer "resources…that are concise and actionable" (p. 55). In other words, education practitioners desire research products that provide instructions on how to adopt or implement findings into practice contexts. However, as previously mentioned, senders in our study were least likely to report motivations centered around promoting adoption and implementation. This brings into question how the education field can generate actionable research and whose responsibility it is to package and share research in ways that are useful for practitioners.

We also characterized actors' motivations as extrinsic (i.e., actions are driven by external factors, such as incentives, requirements, or organizational expectations) or intrinsic (i.e., actions are driven by 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. Senders were also more likely to be externally motivated. This suggests that extrinsic motivation is a crucial tool that organizations use to influence workers to perform various activities related to communicating research evidence. In Case 1, we found evidence of external motivations (i.e., through promotion and tenure structures that promote practitioner publications) supporting an actors' internal motivations to communicate research evidence to practitioner audiences. Interestingly, this case included the

most research to practice community boundary spanning. This may further suggest that alignment of intrinsic and extrinsic motivations may be an important factor in supporting the movement of research between research and practice communities. Analyses of forward tracking data revealed that the nature of KEEs varied by the nature of boundary spanning. Table 12 provides an overview of the various dimensions of KEEs across all cases (rather than for each case) for each boundary-spanning category.

Table 12. Knowledge Exchange Event Domains by Boundary Spanned

Knowledge Exchange Event Domain	Events by Boundary Spanned (*n*)					
	Occurs within the Practice Community (N=6)	Occurs within the Research Community (N=11)	Spans Intermediary and Practice (N=8)	Spans Research and Intermediary (N=15)	Spans Research and Practice (N=31)	No Data (N=29)
Interaction type						
Push	0	0	7	15	10	18
Pull	0	0	0	0	0	1
Interactive	5	9	0	0	20	10
No data	1	2	1	0	1	0
Sender motivation purpose[a]						
Information sharing	2	0	3	3	12	12
Promoting research/use	2	11	4	11	14	18
Supporting adoption or implementation	1	0	4	0	20	0
No data	1	0	1	1	1	1
Sender motivation source[a]						
Intrinsic	0	4	0	5	7	7
Extrinsic	1	0	6	7	16	13
No data	5	7	2	8	9	10
Receiver motivation purpose[a]						
Information seeking	0	0	0	5	0	0
Promoting research/use	0	2	0	9	3	1
Supporting adoption or implementation	0	0	0	4	1	0
No data	6	9	8	0	28	28
Receiver motivation source[a]						
Intrinsic	0	0	0	0	0	0
Extrinsic	0	2	0	13	2	0
No data	6	9	8	1	29	29

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

Note again the large number of 'no data' KEEs (n=29). As reported previously, this largely comes from the receiver side of KEEs. For example, we may have had data that a research organization pushed a newsletter article out to an audience, but we were unable to ascertain what community the audience belonged to.

KEE interactions that occurred across the research and practice communities (n=31) were most likely to be considered interactive (n=20). In these KEEs, actors within the intermediary community were instrumental in the path between research and practice, serving as a critical touchpoint for different actors to exchange and communicate information. For example, researchers often attended conferences hosted by brokering organizations to share their findings with practitioners. Senders (i.e., researchers) participating in KEEs across research to practice boundaries were more often motivated to engage in KEEs to achieve organizational goals (i.e., extrinsically motivated). For example, a representative of a research organization in Case 1 stated that they "usually take a lead on [topic] ones a bit more, but that's more of where we're at as an... organization." We lacked information on receivers in many instances; this tended to happen when we knew that the researcher engaged with practitioners at an event, but we didn't have data on why practitioners attended the event.

As we previously explained (p. 46), actors within intermediary community were more likely to serve as both a sender and receiver. In KEE interactions that occurred across the research and intermediary (n=15) communities, researchers served as "senders," while intermediary actors were "receivers." While in KEE interactions that occurred across the intermediary and practice communities (n=8), intermediary actors were the "senders" and practitioners were "receivers." In both types of boundary spanning, "push" type interactions were most frequent. Our data indicates that intermediary actors where often leveraged for their ability to disseminate research widely, with researchers *pushing* research products to an intermediary actor, followed by the intermediary continuing to *push* the research product out to different audiences. Intermediary actors (as both receivers and senders) (i.e., were more likely to have extrinsic motivations that were related to organizational beliefs about the importance of obtaining and sharing research evidence. Organizational beliefs (expressed through mission statements) often drove the actions of brokers involved in KEEs. Many mission statements focused on sharing information, resources, and research evidence to inform and support practitioners and others that are actively engaged in the field.

> *[Name of journal] is a... peer-reviewed, practitioners' journal... detail[ing] innovative... activities and strategies that demonstrate current research.*

> *[Name of organization] supports the work... educators do statewide. We hope [name of newsletter] will help you discover...resources that may be helpful.*

> *[Organization] helps researchers and... professionals advance science and improve...outcomes.*

> *[Organization]...disseminates research findings to academics... decision-makers, and the public.*

> *[Organization] is devoted to the...dissemination of research.*

> *[Organization] is an expert source of…research and analysis… and offers actionable resources.*

Researchers that sent information to intermediary actors were both extrinsically (n=7) and intrinsically (n=5) motivated to engage in KEEs. For example, in Case 1 the Principal Investigator reported that *"the idea of sharing—that's really important"* (intrinsic motivation). However, the same actor also reported extrinsic motivation vis-a-vis tenure requirements that promote publications *"So I'll get as much… for a practitioner article as…a research article."* Researchers were also more likely to support research/use. We had no data on practitioners that received information from intermediary actors.

KEE interactions that occurred within the research community (n=11) were more likely to be considered interactive (n=9). Once again, in these KEEs brokers were instrumental in the movement of research between actors. For example, researchers attended researcher-focused conferences hosted by brokering organizations to share findings from their studies with the broader academic community. All senders were motivated to engage in these types of activities because they wanted to support research/use. Once again, we lacked information on receivers (e.g., what the motivations were of the individuals who attended the conference presentations).

KEE interactions that occur within the practice community were all interactive (n=6). Once again, we found the use of brokering organizations as a way in which to support the movement of research between practitioners outside of district contexts (e.g., practitioners sharing research findings with other practitioners at a conference). In addition, we also found evidence of practitioners using different approaches to move research evidence within district contexts, including the use of professional development and informal discussions with colleagues. Motivation purposes were supporting research/use (n=2), information sharing (n=2), and supporting adoption and implementation (n=1). We had limited data on sender motivation source, as well as no data on receivers for this set of KEEs.

The main takeaway from our data is that brokers serve an integral function in knowledge exchange events, regardless of what boundaries are crossed. This has implications for research, intermediary, and practice actors. First, in line with other studies (e.g., Penuel et al., 2020), we recommend that researchers seeking to connect with practice communities leverage brokers to share information with relevant stakeholders. Oftentimes in our data, we found evidence of researchers relying on membership organizations (e.g., professional associations), but we also found evidence of researchers leveraging for-profit, non-profit, funding organizations, and governmental organizations to share information. Further we found evidence of researchers using actors in the intermediary community in different ways to share their research. As such, researchers attempting to move research into practice communities should consider what type of brokering organizations they will use and how they will leverage the mechanisms of these organizations. Relatedly, as external motivation outweighed internal sources of motivation for researchers, organizational incentives (e.g., tenure and promotion guidelines) regarding academic and practitioner conferences and publications should be equally weighted. Second, we suggest that practitioners should leverage brokering

organizations by attending subject-specific conferences in which there are opportunities to connect with researchers. Relatedly, we encourage schools and districts to support educators' participation in these activities. Finally, brokering organizations seeking to build connections between the research and practice communities should examine the different functions that they engage in to identify what strategies are most effective in this task.

What We Learned About Brokerage in Education

One of the clearest observations drawn from these analyses has been that as theorized, research brokerage is a complex process, characterized by actors and motivations that interact dynamically over time. In each case, the exchange, transformation, and communication of research was mediated by individuals and organizations located across the research, intermediary, and practice communities. 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.

Actors positioned within the education ecosystem have a vital role to play in brokering knowledge across boundaries. This is well established in the wider brokering literature (e.g., Rycroft-Smith, 2022). Our study adds to this by emphasizing that brokers can be found across the education ecosystem, within research, practice, and intermediary communities. We further found that brokers played an important role in linking different communities together for the purpose of connecting and engaging with varied members of the educational community. In addition, brokers filtered, vetted, and shared information with others in their networks. We were less likely to see other types of roles. This may indicate that knowledge brokers prefer to engage in these types of roles over others. Conversely, it may indicate a general lack of understanding of the importance of capacity building, facilitation, and evaluation roles. We also learned that knowledge brokers work in many organizational contexts, including membership, not-for-profit, for profit, governmental, and practice-based organizations. Membership-based organizations (such as professional associations) that hosted events to connect individuals and foster learning were often used by case actors to share research-based information. Moreover, we also saw instances of funding organizations (categorized as not-for-profit or governmental organizations in our data) acting as knowledge brokers. This finding draws attention to the role that funding agencies can play in connecting actors across the research and practice communities, and to research evidence that is generated from its grant programs.

Researchers can engage in a variety of activities to encourage research brokerage and use. Academic researchers in our cases were dedicated to bridging the gap between research and practice by creating conditions that are favorable to the integration and use of research by practitioners. Across our cases, favorable conditions included engaging in direct interactions with practitioners through face-to-face meetings to share research findings and co-designing research products with practitioners involved in their research studies. Direct connections between researchers and practitioners were often facilitated through pre-existing research-practice partnerships. In addition,

we found evidence of researchers supporting and encouraging practitioners to engage in activities to share research findings with other practitioners, thereby converting practitioners into brokers of research evidence. Likewise, we found evidence of researchers strategically coordinating efforts with brokering organizations to achieve project goals (e.g., support recruitment). Researchers also leveraged events hosted by brokering organizations, such as conferences, to share research findings with a broader subset of the practitioner community. To a lesser extent, brokering organizations were leveraged by researchers to push research products to broader audiences. This included journals published by for-profit publishing organizations, journals published by professional association journals, the use of print and social media, and open-access repositories.

What information is shared, and how it is shared, continues to matter. In our backward tracking case study, we learned that what information is shared and how, matters. The present study builds on this by spotlighting how various actors produced and presented research products to various audiences to generate awareness and increase the probability of research use. We found that a wide range of products were developed, which were inclusive of 'traditional' research products such as research reports and peer-reviewed journal articles, but went beyond this, with research results often being published in formats that are accessible to non-academics. In our cases, this was evidenced by the production of executive summaries or other written products, such as policy briefs or writing about findings in a blog. However, written communications, particularly for practitioner audiences, were not an end in themselves, and were used alongside other influencing and engagement activities. For example, research products were often in multimedia formats designed to increase engagement with research content through making it appeal to more of our senses. In addition, actors often chose to share their findings via interactive knowledge events at conferences, meetings, and professional development to encourage research use. For direct dialogue with practitioners, actors engaged in face-to-face meetings with stakeholders who were often directly involved in the research projects. To tap into a wider set of practitioners and influence research use by a less direct route, actors participated in several different subject-specific conferences and led professional development opportunities that brought together a diverse group of stakeholders to provide awareness and research knowledge of educational issues.

The transformation of research outputs into actionable products is complex and may take time. Across all cases, products were repackaged and transformed in numerous ways. We found evidence of products being summarized, adapted, duplicated, synthesized, and translated. We also found evidence of products being repackaged into demonstrations that described how to use existing products (e.g., curriculum materials and software transformed into professional learning materials). However, findings from our study suggested that even when transformed, products often did not undergo changes to product availability and format. This finding runs counter to what we learned in the backward tracking study, with products in the previous study often undergoing changes to both availability and format. While we do not have evidence for why this variation exists, we turn to research in the health field which suggests that transforming research evidence into actionable products takes time (sometimes years) after the conclusion of research projects. This aligns with the

realities of the two sets of case studies. In the forward tracking case studies, all projects had been completed within the last five years. While in the backward tracking case studies, the original research projects were often decades removed from the actionable products that educators reported using in their work.

Actors' motivations were driven by organizational beliefs and values. Across our cases, we found evidence that organizational beliefs and values guided how actors engaged with each other. Many brokering organizations' mission statements centered on sharing information with different actors, and many also included explicit commitments to promoting research and its use. These mission organizational beliefs often drove actors' motivations to engage in knowledge exchange events for the purpose of sharing information, promoting research/use, and encouraging adoption and implementation. In addition, we also found tentative evidence from Case 1 which suggests that when intrinsic (i.e., personal motivation to share research evidence) and extrinsic (i.e., tenure and promotion requirements that treat practitioner and researcher publications equally) motivations align, actors may be more likely to engage in activities to encourage research brokerage.

What Might This Mean for Education Stakeholders?

In this study we explored the system of research brokerage through four cases. In these cases, we tracked forward from a diverse set of research projects to better understand the network of actors, activities, and motivations in which education research is exchanged, transformed, and otherwise communicated in the broader education system. The strength of case studies is their "flexibility and ability to assemble a comprehensive array of…data to provide rich analysis and valuable insight" (Martinson & O'Brien, 2015); however, a limitation of the approach is that it focuses on cases which cannot be construed as representative of the larger population. As such, we can only make tentative conclusions about the phenomena under study. While findings from the study are not generalizable, we offer suggestions for researchers, intermediary actors, and policymakers, funders, and training institutions to consider in light of our increased understanding of research brokerage.

For Researchers

All researchers leveraged brokers within the intermediary community to mobilize findings from their research projects. Other education researchers can leverage brokers in similar ways. For example, researchers may want to consider partnering with brokering organizations from the onset of their research projects to leverage brokers' networks (e.g., to support study recruitment), and to extend their capacity to mobilize research findings. Researchers can also take advantage of brokers' opportunities to create interaction and knowledge exchange with practitioner audiences through conferences. We note that researchers across the cases often turned to conferences hosted by professional associations to connect with education stakeholders. Similarly, over two-thirds (n=232, 68%) of education researchers (n=341) who completed the SEE-R (Van Horne et al., 2023) reported disseminating their findings via presentations at practitioner conferences and/or professional

development workshops. Therefore, practitioner conferences may be an effective strategy for supporting connections between researchers and education stakeholders with similar interests.

For Brokers

Findings from our study suggest that researchers used brokering organizations to connect with practitioners and other education stakeholders through events such as conferences. As such, actors within the intermediary space should continue to invest in/support activities that promote interaction and knowledge exchange between researcher and practitioner audiences. For example, this may look like proactively connecting with those doing policy or practice relevant research to support knowledge mobilization efforts in general or with specific constituents they support. In addition, brokering organizations can proactively connect with researchers and practitioners to increase the visibility of research- and practice-based knowledge. Few brokers in the cases engaged in activities to build capacity, evaluated knowledge broker work, or facilitated the integration of research-based knowledge into decision-making. These strategies are recognized in the literature (e.g., Ward et al., 2009, Neal et al., 2023) as strategies for linking research and practice; therefore, brokers should consider how they might engage in these functions within their own contexts.

For Policymakers, Funders, and Higher Education Institutions

We encourage policymakers, funders, and higher education institutions to engage in and/or develop initiatives that support research brokerage. For example, in our cases, we found evidence of funders providing financial resources to support research brokerage, as well as directly engaging in brokering. In addition, three out of four cases included research-practice partnerships with local education stakeholders, while we recognize this finding may be a byproduct of our sampling approach – we suggest the dominance of partnerships across our cases indicate that RPPs are a "strategic way to pursue locally driven, collaborative approaches to research" (Farrell et al., 2021) and better encourage the movement of research into practice. As such, policymakers, funders, and higher education institutions should continue to support the development and sustainment of these types of partnerships. Incentivizing the mobilization of research knowledge to practice communities is another way in which policymakers, funders, and higher education institutions can support research brokerage, as our evidence suggests that more practitioner-focused products may be mobilized when extrinsic motivation (e.g., tenure and promotion criteria) and intrinsic motivation (e.g., desire to share research with practitioner audiences) are aligned.

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Appendix A:
SEE-R Items Used to Identify Case Study Sample

Were any of the following involved in any aspects of the research process? For example, this could include shaping the research question(s), interpreting results, etc.

Stem Option	Response Option
School-based practitioners	Yes / No
District-level administrators	Yes / No
PTA or parents/guardians	Yes / No
State/Federal staff	Yes / No
Education program developers, researchers, or consultants	Yes / No
Education public interest organizations	Yes / No
Funding organizations	Yes / No
Community organizations	Yes / No
Other	Yes / No
Other (please specify) - Text	Yes / No

In which aspects of the research process did these individuals participate?

Stem Option	Response Option (selected or not selected)
School-based practitioners	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know
District-level administrators	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know
PTA or parents/guardians	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know
State/Federal staff	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know
Education program developers, researchers, or consultants	Problem identification; Shape research questions; Conduct research; Interpret results;

Stem Option	Response Option (selected or not selected)
	Reporting and disseminating results; I don't know
Education public interest organizations	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know
Funding organizations	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know
Community organizations	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know
Other (Piped Text)	Problem identification; Shape research questions; Conduct research; Interpret results; Reporting and disseminating results; I don't know

Which of the following strategies did you use to disseminate the research findings?

Stem Option	Response Option
Books/book chapters	Yes / No
Peer-reviewed academic journals	Yes / No
Peer-reviewed practitioner journals/periodicals	Yes / No
Presentation at an academic conference	Yes / No
Presentation at a practitioner conference or professional development workshop	Yes / No
Other scholarly products (e.g., research/evaluation reports)	Yes / No
Targeted government/policy materials (e.g., policy briefs)	Yes / No
Curriculum materials	Yes / No
Interview with the media (or response to written inquiry)	Yes / No
Social media posts	Yes / No
Audio/Visual Products	Yes / No
Popular press, written products	Yes / No
Email/Mailing lists	Yes / No
Other	Yes / No
Other - Text Entry	Text Entry

Please select the ways through which people can currently access the findings from your research study: (check all that apply).

Stem Option	Response Option
A general web search (e.g., Google, Yahoo)	Checked / Not Checked
The What Works Clearinghouse	Checked / Not Checked
A library or research database	Checked / Not Checked
A Regional Education Lab or Comprehensive Center	Checked / Not Checked
My organization's or my own professional website	Checked / Not Checked
The funding organization's website (please specify)	Checked / Not Checked
The funding organization's website (please specify) - Text	Checked / Not Checked
Another foundation's website	Checked / Not Checked
Another foundation's website - Text	Text Entry
Another research organization's website (please specify)	Checked / Not Checked
Another research organization's website (please specify) - Text	Text Entry
A public interest or advocacy group	Checked / Not Checked
A publisher, program, or professional development provider	Checked / Not Checked
An undergraduate course for pre-service educators	Checked / Not Checked
A graduate course for practitioners	Checked / Not Checked
A professional organization	Checked / Not Checked
Federal or State departments of education	Checked / Not Checked
A school-district (e.g., website, staff, program, or curriculum materials)	Checked/Not Checked
Other (please specify)	Checked / Not Checked
Other (please specify) - Text	Text Entry
I'm not sure	Checked / Not Checked

Appendix B:
Case 1 at a Glance

Brokers and their work	Research products and transformations	Knowledge exchange events
Co-Principal Investigator, STEM Org (1) ● Shares conference materials with unknown attendees at membership organization's conference	Curriculum Materials ● Is summarized, synthesized, and demonstrated in multiple products.	● Research Team exchange Prof. Assoc. (1) Conference Materials (1) with

Brokers and their work	Research products and transformations	Knowledge exchange events
- Shares conference materials with unknown attendees at Professional Association's (2) conference - Shares conference materials with unknown attendees at Professional Association's (7) conference - Identified local education organization as key provider of teacher PD - Connected with local education organization to host workshop - Writes newsletter article for STEM Org (1) and shares it with newsletter subscribers - Hosts webinar - Writes web article and posts to STEM Org (1) website - Hosts professional development at STEM Org (1) for local educators - Writes and submits newsletter article for state department newsletter - Publishes software - Is part of the research team and participates in sharing conference materials with unknown attendees at Professional Associations (1, 4, 6) conferences - Is part of the research team and participates in writing and submitting the research journal article - Is part of the research team and participates in writing and submitting practitioner journal articles (1, 2, 3) to Professional Association (6) - Is part of the research team and participates in writing and	- Professional Association (1) Conference Materials - Professional Association (3) Conference Materials - Professional Association (6) Conference Materials (1-5) - Web articles (1 & 2) - Professional Development (2) - Newsletter (2 & 3) - Video - Prof. Assoc. (6) Practitioner Journal (1, 2, 3) Software - Is summarized, synthesized, and demonstrated in multiple products - Professional Association (1) Conference Materials - Professional Association (3) Conference Materials - Professional Association (5)	Unknown Prof. Assoc. (1) conference Attendees - Research Team exchange Prof. Assoc (4) Conference Materials (1) with Unknown Prof. Assoc. (1) conference Attendees - Research Team exchange Prof. Assoc. (6) Conference Materials (1) with Unknown Prof. Assoc. (6) conference Attendees - Research Team exchange Prof. Assoc. (6) Conference Materials (2) with Unknown Prof. Assoc. (6) conference Attendees - Research Team exchange Prof. Assoc. (6) Conference Materials (3) with Unknown Prof. Assoc. (6) conference Attendees

Brokers and their work	Research products and transformations	Knowledge exchange events
submitting practitioner journal article to Practitioner Journal Co-Principal Investigator, STEM Org (2) ● Shares curriculum materials with unknown individuals ● Hosts professional development, which is attended by the teacher and STEM District Coordinator ● Shares conference materials with unknown individuals at Professional Association (3)'s conference ● Writes and publishes newsletter article for STEM Org (2)'s newsletter ● Writes and publishes two web articles that are hosted on STEM Org (2)'s website ● Is part of the research team and participates in sharing conference materials with unknown attendees at Professional Associations (1, 4, 6) conferences ● Is part of the research team and participates in writing and submitting the research journal article ● Is part of the research team and participates in writing and submitting practitioner journal articles (1, 2, 3) to Professional Association (6) ● Is part of the research team and participates in writing and submitting practitioner journal article to Practitioner Journal Research Organization	Conference Materials o Professional Association (6) Conference Materials (1-5) o Web Articles (1, 2) o Web Article (3) o Membership Organization Conference Materials o Local Education Organization Workshop Materials o Local Education Organization Workshop Materials o Newsletter (1) o Newsletter (2) o Newsletter (3) o Professional Development (1) o Professional Development (2) o Webinar o Prof. Assoc. (6) Practitioner Journal (1, 2, 3) o Video Web Article (1) ● No transformations Web Article (2)	● Research Team exchange Prof. Assoc. (6) Conference Materials (4) with Unknown Prof. Assoc. (6) conference Attendees ● Research Team exchange Prof. Assoc. (1) Conference Materials (2) with Unknown Prof. Assoc. (1) conference Attendees ● Research Team exchange Prof. Assoc (4) Conference Materials (2) with Unknown Prof. Assoc. (1) conference Attendees ● Research Team exchange Prof. Assoc (4) Conference Materials (3) with Unknown Prof. Assoc. (1) conference Attendees ● Research Team exchange Prof. Assoc. (6) Conference

Brokers and their work	Research products and transformations	Knowledge exchange events
● Received funding from the funding organization to develop a video platform ● Hosts an annual video showcase that highlights findings from grantees of the funding organization Funding Organization ● Provided funding to research organization for the development of the video showcase platform State Department ● Published a newsletter article written by Co-Principal Investigator, STEM Org (1) Membership Organization ● Hosted a conference Local Education Organization ● Hosted workshop ● Hosted district showcase ● The organization's professional network was leveraged by the STEM Curriculum Coordinator for study recruitment Practitioner Journal ● Published article written by research team	● No transformations Web Article (3) ● No transformations Local Education Organization District Showcase Materials ● No transformations Local Education Organization Workshop Materials ● No transformations Membership Organization Conference Materials ● No transformations Professional Association (1) Conference Materials (1) ● Adapted into Professional Association (1) Conference Materials (2) Professional Association (1) Conference Materials (2) ● Adapted into Professional Association (1) Conference Materials (3)	Materials (5) with Unknown Prof. Assoc. (6) conference Attendees ● Research Team exchange Prof. Assoc. (1) Conference Materials (3) with Unknown Prof. Assoc. (1) conference Attendees ● Research Team exchange Prof. Assoc. (1) Conference Materials (4) with Unknown Prof. Assoc. (1) conference Attendees ● Research Team exchange Prof. Assoc (4) Conference Materials (4) with Unknown Prof. Assoc. (1) conference Attendees ● Research Team push Research Journal Article to Research Journal ● Research Journal push Research Journal Article to Unknown Research

Brokers and their work	Research products and transformations	Knowledge exchange events
Research Journal ● Published article written by research team Teacher ● Participated in professional development event hosted by Co-Principal Investigator, STEM Org (2) ● Shared materials with unknown individuals at workshop hosted by local education organization ● Shared curriculum with other staff within their district STEM District Coordinator ● Participated in professional development event hosted by Co-Principal Investigator, STEM Org (2) ● Shares presentation materials with unknown individuals at conference co-hosted by professional associations 8 and 10 ● Shares presentation materials with unknown individuals at conference hosted by Professional Association 9 Professional Association (1) ● Hosts conference Professional Association (2) ● Hosts conference	Professional Association (1) Conference Materials (3) ● Adapted into Professional Association (1) Conference Materials (4) Professional Association (1) Conference Materials (4) ● No transformations Professional Association (2) Conference Materials ● No transformations Professional Association (3) Conference Materials ● No transformations Professional Association (8, 10) Conference Materials ● No transformations Newsletter (1) ● No transformations Newsletter (2) ● No transformations	Journal Article Readers ● Co-Principal Investigator, STEM Org (2) push Curriculum Materials to Unknown STEM Org. (2) Curriculum Audience ● Co-Principal Investigator, STEM Org (1) exchange Prof. Assoc. (2) Conference Materials with Unknown Prof Assoc. (2) Conference Attendees ● Co-Principal Investigator, STEM Org (1) exchange Local Education Workshop Materials with Unknown Local Ed. Org Workshop Attendees ● Teacher exchange Local Education Organization Workshop Materials with Unknown Local Ed. Org. Showcase Attendees ● Teacher shares (unknown KEE type) Curriculum

Brokers and their work	Research products and transformations	Knowledge exchange events
Professional Association (3) ● Hosts conference Professional Association (4) ● Hosts conference Professional Association (5) ● Hosts conference Professional Association (6) ● Hosts multiple conferences ● Publishes practitioner journals Professional Association (7) ● Hosts conference Professional Association (8) ● Co-hosts conference with Professional Association 10 Professional Association (9) ● Hosts conference Professional Association (10) ● Co-hosts conference with Professional Association 8	Newsletter (3) ● No transformations Professional Development (1) ● No transformations Professional Development (2) ● No transformations Research Journal Article ● No transformations Practitioner Journal Article ● No transformations Professional Association (6) Practitioner Journal Article (1) ● No transformations Professional Association (6) Practitioner Journal Article (2) ● No transformations Professional Association (6) Practitioner Journal Article (3) ● No transformations	with Other District Staff ● Co-Principal Investigator, STEM Org (2) exchange Professional Development (1) with Teacher and STEM District Coordinator ● Co-Principal Investigator, STEM Org (2) exchange Prof. Assoc. (3) Conference Materials with Unknown Prof. Assoc. (3) Conference Attendees ● Research Team exchange Prof. Assoc. (5) Conference Materials with Unknown Prof. Assoc. (5) Conference Attendees ● Co-Principal Investigator, STEM Org (2) push Newsletter (3) to Unknown STEM Org. (2) Newsletter Audience ● Co-Principal Investigator, STE< Org (1) push Newsletter (2) to

Brokers and their work	Research products and transformations	Knowledge exchange events
	Video ● No transformations Webinar ● No transformations	Unknown STEM Org (1) Newsletter Audience ● Research Team push Prof/ Assoc. (6) Practitioner Journal (1) to Prof. Assoc. (6) ● Professional Association (6) push Prof. Assoc (6) Practitioner Journal (1) to Unknown Prof. Assoc. (6) Journal Audience ● Research Team push Prof/ Assoc. (6) Practitioner Journal (2) to Prof. Assoc. (6) ● Professional Association (6) push Prof. Assoc (6) Practitioner Journal (2) to Unknown Prof. Assoc. (6) Journal Audience ● Research Team push Prof/ Assoc. (6) Practitioner Journal (3) to Prof. Assoc. (6) ● Professional Association (6) push Prof. Assoc (6) Practitioner Journal (3) to Unknown Prof.

Brokers and their work	Research products and transformations	Knowledge exchange events
		Assoc. (6) Journal Audience • Co-Principal Investigator, STEM Org (1) exchange Prof. Assoc. (7) Conference Materials with Unknown Prof Assoc. (7) Conference Attendees • STEM District Coordinator exchange Prof. Assoc. (8, 10) Conference Materials with Unknown Prof Assoc. (8 & 10) Con. Attendees • STEM District Coordinator exchange Prof. Assoc. (9) Conference Materials with Unknown Prof. Assoc. (9) Conference Attendees • Co-Principal Investigator, STEM Org (2) push Web Article (1) to Unknown Web Article Audience • Co-Principal Investigator, STEM Org (2) push Web

Brokers and their work	Research products and transformations	Knowledge exchange events
		Article (2) to Unknown Web Article Audience • Co-Principal Investigator, STEM Org (1) push Web Article (3) to Unknown Web Article Audience • Co-Principal Investigator, STEM Org (1) exchange Membership Organization Conference Materials with Unknown Membership Org. Con. Attendees • Research Team push Practitioner Journal Article to Practitioner Journal • Practitioner Journal push Practitioner Journal Article to Unknown Practitioner Journal Article Readers • Co-Principal Investigator, STEM Org (1) exchange Professional Development (1) with Unknown STEM Organization (1) Audience • Co-Principal Investigator, STEM Org (1) exchange

Brokers and their work	Research products and transformations	Knowledge exchange events
		Webinar with Unknown STEM Organization (1) Audience • Co-Principal Investigator, STEM Org (1) push Newsletter to State Department • State Department push Newsletter to Unknown Audience • Principal Investigator push Video to Unknown Research Org Video Showcase Attendees • Co-Principal Investigator, STEM Org (1) push Software to Unknown Software Audience

Appendix C:
Case 2 at a Glance

Brokers and their work	Research products and transformations	Knowledge exchange events
University Center ● Meets with RPP Practice Advisory Group to identify professional development needs **RPP Practice Advisory Group** ● Builds capacity of staff in partner districts by identifying districts' needs and participating in study on professional development **Co-Principal Investigator** ● Facilitates access to district teachers ● Shares findings from research study with superintendent **Professional Association (1)** ● Hosts conference that research team shares conference presentation materials (1, 2, & 3) with unknown attendees **Research Consortium** ● Hosts conference that research team shares conference presentation materials (4) with unknown attendees **Publishing Organization** ● Publishes and disseminates journal	**Original Professional Development** ● Summarized into discussion (for superintendent) ● Adapted into professional development for administrators ● Adapted into professional development for RPP Partner **Administrator Professional Development** ● No transformations **Discussion** ● No transformations **RPP Partner Professional Development** ● No transformations **Journal Article # 1** ● No transformations **Journal Article # 2** ● Summarized into newsletter **Newsletter** ● No transformations **Conference Materials 1, 2, & 3** ● No transformations **Conference Materials 4** ● No transformations	● Research Team exchange Conference Materials # 1, 2 & 3 with Professional Association Conference Attendees ● Research Team exchange Conference Materials # 4 with Unknown Research Consortium Conference Attendees ● Research Team exchange Conference Materials # 5 with Unknown Professional Association Conference Attendees ● Research Team exchange Conference Materials # 6 with Unknown Government Agency Conference Attendees ● Co-Principal Investigator exchange Discussion with Superintendent ● Research Team push Journal Article to International University ● International University push Journal to Unknown Audience ● Research Team push Journal to Publishing Company ● Publishing Company push Journal Article # 2 to Unknown Readers ● Research Team EXCHANGES Principal Professional Development

Brokers and their work	Research products and transformations	Knowledge exchange events
article (1) to unknown readers Professional Association (2) ● Hosts conference that research team presents conference presentation materials (5) Governmental Agency ● Hosts conference that research team presents conference presentation materials (5) International University ● Publishes and disseminates journal article (2) to unknown readers College of Education ● Publishes and disseminates newsletter	Conference Materials 5 ● No transformations Conference Materials 6 ● No transformations	with School Administrators ● Research Team EXCHANGES Original Professional Development with Teachers ● Principal Investigator exchange District Professional Development with RPP Partner Principals College of Education PUSHES Newsletter to Unknown Readers

Appendix D:
Case 3 at a Glance

Brokers and their work	Research products and transformations	Knowledge exchange events
REL Knowledge Manager ● Acts as a liaison between the school district and REL researchers Education Organization ● Creates original survey tool ● Publishes blog post written by the district on how the survey tool was adapted ● Disseminates blog post to blog readers Public Policy Organization ● Hosts conference that is attended by the REL coaching team and other conference attendees Professional Association ● Hosts conference that is attended by the REL coaching team and other conference attendees REL Governing Board ● Attends internal REL presentation. Purpose of attendance is so that stakeholders can bring back research-based information to	Original Survey Tool ● Adapted and becomes validated survey and index Validated Survey and Index ● Summarized in Annual report of survey findings ● Summarized in blog post for Education Organization ● Used in follow-up research project report Professional Association Presentation Materials ● Materials are duplicated and used again as presentation materials for the Public Policy Association conference Public Policy Association Presentation Materials ● No transformation Quarterly Summaries ● Summarize in Internal REL Presentation Materials	● School district obtains original survey tool from educational organization ● REL coaching team exchange quarterly summaries with school district ● REL coaching team exchange validated survey and index with school district ● REL coaching team exchange internal REL presentation materials with REL governing board ● REL coaching team exchange public policy association presentation materials with unknown conference attendees ● REL coaching team exchange professional association presentation materials with unknown attendees ● Educational organization obtains blog post from school district ● Educational organization pushes blog post to unknown blog readers

Brokers and their work	Research products and transformations	Knowledge exchange events
their professional networks (no proof of associated KEE)	Internal REL Presentation Materials ● No transformation	● School district pushes annual report to unknown district community members

Appendix E:
Case 4 at a Glance

Brokers and their work	Research products and transformations	Knowledge exchange events
Research Center (1) ● Has principal investigator write blog post ● Publishes blog post for unknown researchers **RPP Staff** ● Has research team write web article (4) ● Publishes web article (4) for unknown readers **Professional Association (1)** ● Hosts conference that research team presented conference materials (1 & 2) to unknown attendees **Professional Association (2)** ● Publishes and disseminates research team's journal article to unknown readers **Professional Network** ● Disseminates research reports 1 & 2 to unknown readers ● Writes and disseminates social media post to unknown readers	**Research Report (1)** ● is summarized into executive summary of research report ● is summarized into conference materials (1 & 2) ● is summarized into social media posts (1, 2, & 3) ● is summarized and synthesized with intervention materials into blog post **Executive Summary of Research Report (1)** ● No transformations **Conference Materials (1 & 2)** ● No transformations **Social Media Posts (1, 2, & 3)** ● No transformations **Blog Post** ● No transformations **Journal Article** ● No transformations	● Research Team exchange Conference Materials (1 & 2) with Unknown Attendees of Professional Association (2) ● Research Team exchange Presentation Materials with School District Central Office ● Research Team exchange presentation materials with Community Advisory Group ● Funding Organization push Web Article (1, 2 & 3) to Unknown Readers of Funding Organization ● Funding Organization push Letter to Unknown Principals ● Research team pushes Intervention Materials to Participating Schools ● Research Team push Research Report # 1 to Research Network ● Research Team push Research Report # 2 to Research Network ● Research Network push Research Report # 1 to Unknown Readers

Funding Organization	Intervention Materials	• Research Network push Research Report # 2 to Unknown Readers

Funding Organization

- Writes and disseminates web articles 1, 2, & 3 and disseminates to unknown readers
- Writes and disseminates letter to school principals promoting software

Social Media Platform

- Allows professional network, principal investigator, and co-principal investigator (2) to share information through the building of virtual networks

News Organization (1)

- Publishes and disseminates opinion article written by co-principal investigator (1) to unknown readers

News Organization (2)

- Publishes and disseminates Letter to the Editor written by research team to unknown readers

News Organization (3)

- Writes news article on software and disseminates to unknown readers

Open Access Repository

Intervention Materials

- Summarized and synthesized with research report (1) into blog post

Software

- Adapted into district software
- Summarized into news article

District Software

- No transformations

News Article

- No transformations

School District Presentation Materials

- No transformations

Research Report (2)

- No transformations

Web Articles (1, 2, & 3)

- No transformations

Web Article (4)

- No transformations

Advisory Group Presentation Materials

- Research Network push Research Report # 2 to Unknown Readers
- Research Network push Social Media Post # 1 to Unknown Readers
- Principal Investigator push Social Media Post (2) to Unknown Readers
- Co-Principal Investigator (2) push Social Media Post (3) to Unknown Readers
- Research Team push Research Report # 1 to Open Access Repository
- Unknown Readers pull Research Report # 1 from Open Access Repository
- Research Team push Research Report # 2 to Research Network
- Research Team push Letter to the Editor to News Organization (2)
- News Organization (2) push Letter to the Editor to Unknown Readers
- Research Center (1) obtains Blog Post from Principal Investigator
- Research Center (1) push Blog Post to Unknown Readers
- Co-Principal Investigator (1) push

● Stores research report # 1 in an online database that can be accessed freely by unknown individuals. School District Central Office ● Facilitates connections between the research team and the district's schools ● Hosts internal event where research team presents findings from study Community Based Advisory Group ● Brings researchers and community members together to discuss problems of practice	● No transformations Letter to the Editor ● No transformations Opinion Article ● No transformations Policy Brief ● No transformations Letter ● No transformations	Opinion Article to News Organization (1) ● News Organization (1) push Opinion Article to Unknown Readers ● Research Team push Journal Article to Professional Association (2) ● Professional Association (2) PUSHES Journal Article to Unknown Readers ● Research Team push policy brief to School District Central Office ● Research Center (2) obtain web article from Research Team ● Research Center (2) push web article to unknown readers ● News Organization (2) push News Article to Unknown Readers

Appendix F:
Codebook

Community Classification

Term	Definition
Practice	Actors are classified as located in the practice community if actors stated that their primary responsibility was to provide or support instruction for K–12 students.
Intermediary	Actors are classified as members of the intermediary community if actors operated between members of the research and practice communities and on the path between the two, reflecting elements of Honig's (2004) definition.
Research	Actors are classified as located within the research community if actors stated they conducted research and/or worked in a research organization.

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 of new 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 research evidence; (b) address barriers to implement research evidence (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

Term	Definition
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.
Not-for-profit	Not-for-profit organizations are types of organizations that do not earn profits. All the money earned by or donated to a not-for-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 that the practice organization does not conduct supplementary activities outside of the "core" teaching and learning requirements of schools.

Organizational Mission Codes

Term	Definition
Mission	The organization's self-imposed objective or purpose either formally stated (e.g., website, published materials) or informally described.
Research/use	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."

Organizational Characteristics Codes

Term	Definition
Leadership and governance composition	Leadership and governance composition refers to the types of stakeholders that are members of the organization
Community members	Community members means individuals who are not specifically described as policymakers, practitioners, or researchers. Individuals in this group might be parents, students, or employees of educational organizations.
Policymakers	Policymakers are individuals who are responsible for making policy, especially in government
Practitioners	Practitioners are individuals who work within schools or districts (e.g., superintendents, principals, teachers)
Researchers	Researchers are individuals who carry out academic research. These individuals are often affiliated with universities and independent research organizations.
Annual revenue	The total amount of money an organization makes during a given 12-month period.
Less than $1 million	The organization earns less than $1 million dollars annually.
Between $1 million and $50 million	The organization earns more than $1 million and up to $50 million annually.
Between $50 million and $1 billion	The organization earns more than $50 million and up to $1 billion annually.
Greater than $1 billion	The organization earns more than $1 billion annually.
Reach of work	The reach of the brokering organization.
Local	Only individuals in one city or local area belong to and/or use the resources created by the brokering organization.
State	Only individuals in one state belong to and/or use the resources created by the brokering organization.

Term	Definition
Regional	Only individuals belonging to one geographic area (e.g., southwest U.S.) belong to and/or use the resources created by the brokering organization.
National	Only individuals belonging to one nation belong to and/or use the resources created by the brokering organization.
International	Individuals from multiple nations belong to and/or use the resources created by the brokering organization.
Focus in field	The brokering organization's center of interest.
Narrow	A brokering organization that selectively focuses on one part of the field.
Broad	A brokering organization that focuses on a number of elements related to the field.
Size	The size of the organization has to do with the number of employees working for the brokering organization
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 brokering organization interacts (community members, policymakers, practitioners, researchers)

Research Product Type Codes

Term	Definition
Research product	An item developed as an outcome of a research project.
Category	The distinct groupings to which research products belong
Blog post or web article	A blog post is published within a blog on a website. Blog posts are posted in reverse chronological order (most recent first). A web article is a story that is written on a website about a particular topic.
Book	A written or printed piece of work produced for the mass market.

Term	Definition
Guidance from federal or state depts. of education	Materials created and disseminated by federal or state departments of education (e.g., learning standards, model curriculums).
Informal summary	A product that contains a shortened version of other research-based materials using someone's own words.
Instrument	A tool used to collect, measure, and analyze data related to a specific research interest
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.
Magazine article	An article published in a magazine
Mailing list, newsletter, or email blast	A mailing list is a list of people who are subscribed to a particular publication. A newsletter is a bulletin issued periodically to the members of an association or organization. An email blast is a single email message sent to a mailing list.
Model, program, or intervention	A packaged set of practices, curricula, strategies ready for educator use.
News article	An article published by a news organization
Post from social media	Content shared on social media through a user's profile
Practitioner journal article	Materials from a practitioner journal are often peer reviewed and are aimed at a particular professional market (e.g., educators).
Presentation materials	Materials associated with presenting at a conference, such as PowerPoint presentations, abstracts, handouts, or conference proceedings.
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.
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.
Research summary or brief	A research summary/brief is a piece of writing that summarizes research on a specific topic. Its primary goal is to offer the reader a non-technical overview of the study with the key findings.

Term	Definition
Software	A computer program designed to carry out a specific task
Video	A recording of moving visual images made digitally or on a videotape.

Research Product Attribute Codes

Term	Definition
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 (i.e., community members, policymakers, practitioners, and 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
Adaptation	Adjusts content/message to fit needs or purposes of particular context or organization. Look for: Use of materials to inform local implementation.
Demonstration	A new product is developed to provide a practical exhibition and explanation of how a research-informed resource works or is performed.
Duplication	A research-informed resource that is an exact copy of another resource but was used for a different purpose. For example, the conference presentation materials for one event may be the same materials used for another event.
Summary	Captures main messages more briefly than original product.
Synthesis	Integrates multiple sources of information.
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.

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 within the research community.
Occurs within the intermediary community	Both sender and receiver are actors within the intermediary community.
Occurs within the practice community	Both sender and receiver are in the practice community.
Spans the research/intermediary boundary	Sender and receiver represent actors within the research and intermediary communities.
Spans the intermediary/practice boundary	Sender and receiver represent actors within the intermediary and practice communities.
Spans the research/practice boundary	Sender and receiver represent actors within the research and practice communities.
Interaction type	The type of interaction between individuals involved in the case.
Knowledge push	Sender actively engages receiver (e.g., publishing) but receiver is primarily passive.
Knowledge pull	Receiver actively engages sender (e.g., seeking something from a static resource—like a publication, book, or website) but sender is primarily passive.
Knowledge exchange	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.

Term	Definition
Information sharing	Information sharing was defined as passing information from one to another generally; that is, not in relation to promoting research/use 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 research/use	Promoting research/use was defined as a specific intent to promote the flow and uptake of research knowledge both within and beyond academia. Examples include finding out what the research says, disseminating research findings, translating research for actionable use or sharing research-based education practices, strategies, models and concepts.
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.

Term	Definition
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 research/use	Promoting research/use was defined as a specific intent to promote the flow and uptake of research knowledge both within and beyond academia. Examples include finding out what the research says, disseminating research findings, translating research for actionable use or sharing research-based education practices, strategies, models and concepts.
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 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.
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.