

Collaborations in Mind, Brain, and Education: An Analysis of Researcher–Practitioner Partnerships in Three Elementary School Intervention Studies

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ABSTRACT—A reciprocal relationship informing both research and practice is one of the primary goals in the emerging field of Mind, Brain, and Education (MBE), yet the field has little documentation and analysis of such collaborations. In this article, we present case studies of three research–practice partnerships taking place between scientists and educators. By comparing and contrasting these three partnerships we expect to illuminate common characteristics, challenges, and benefits that come with doing MBE work.

One of the primary goals in the field of Mind, Brain, and Education (MBE) is to join research from the biological and social sciences with education so that education will be more solidly grounded in research and research can be refined to have practical applicability (Coch, Michlovitz, Ansari, & Baird, 2009; Fischer, Bernstein, & Immordino-Yang, 2007; Fischer, Goswami, Geake, & the Task Force on the Future of Educational Neuroscience, 2010). Despite many articles discussing the importance of interaction between the research and practice

domains, there is a dearth of empirical evidence describing such collaborations (Coch & Ansari, 2009; Hinton & Fischer, 2008). In this article, we present three case studies of scientist–practitioner collaborations and identify attributes that have contributed to success, and strategies for mitigating challenges.

The partnerships discussed in this article were chosen because they are transdisciplinary in nature, drawn from neuroscience, developmental psychology, and education, and thus falling under the umbrella of MBE. To acquire multiple points of view on each partnership, both university researchers and educational administrators were interviewed. All three partnerships share several commonalities. First, they were all formed to test an educational intervention meant for eventual application in the classroom. Second, they were created in a laboratory setting based on findings from developmental, educational, cognitive, and neural sciences. Third, they all have been established on-site in elementary school classrooms. Fourth, all three interventions have been designed around validated and normed behavioral assessments (e.g., WASI, Woodcock Johnson Test of Cognitive Abilities) as measures of the impact of the intervention. Finally, each intervention has integrated brain imaging as a component of the study design.

CASE STUDIES

Reading Intervention

Developed and evaluated by Dr. Maryanne Wolf and colleagues at Tufts University's Center for Reading and Language

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Research, the RAVE-O (Retrieval, Automaticity, Vocabulary, Engagement with Language, Orthography) program is based on leading work from the developmental, linguistic, and neural sciences. This research-based reading fluency program was created as a pull-out program for use with students one-on-one and in small groups. The curriculum is designed to assist struggling second- and third-grade readers by teaching reading in a variety of ways. The program incorporates multiple linguistic components, and works systematically and simultaneously at the sub-word, word, and text levels.

The RAVE-O intervention has included strategic partnerships with multiple schools over the last several years, some of which have included both behavioral testing and brain imaging of students. Results from these studies have been positive, with students who completed the curriculum showing significant gains in both specific (e.g., phonological awareness, reading fluency, vocabulary) and overall reading skills (Morris et al., 2010; Wolf et al., 2009).

Executive Function Intervention

Tools of the Mind is a research-based early childhood program that aims to build strong foundations for school success in preschool and kindergarten children by promoting intentional, self-regulated learning. Out of the Metropolitan State College of Denver, Tools of the Mind builds on the work of Lev Vygotsky to help students master mental tools that promote success throughout the curriculum and learning.

Based on the research showing that Tools of the Mind has a significant impact on the executive functioning of preschool children (Diamond, Barnett, Thomas, & Munro, 2007), Dr. Clancy Blair, a psychologist at New York University, and the Tools of the Mind organization are in the middle of a large-scale multistate randomized control intervention study including partnerships with over 40 schools.

Reasoning Intervention

Developed by Allyson Mackey and Dr. Silvia Bunge of UC Berkeley, The STOMP (i.e., Structured Training of Mental Processes) program aims to improve reasoning and processing speed skills in elementary school-aged children using a variety of commercially available computerized and non-computerized games. In the study discussed, local third- and fourth-grade students played these games as part of an after school enrichment program, which took place 75 min a day on 2 days per week for 8 weeks (Mackey, Hill, Stone, & Bunge, 2010).

Before and after the intervention, students’ reasoning and processing speed skills were tested in separate groups using standardized measures. The group that completed the reasoning training showed significant gains on a transfer test of reasoning as well as working memory, but not processing speed. The speed of processing group improved significantly on processing speed, but not reasoning ability. This project is in the process of expanding and in the future will span multiple school sites, and will incorporate neuroimaging to investigate neural differences in reasoning abilities before and after intervention.

Although these interventions are similar in structure and implementation, they differ in the cognitive constructs measured, grade range, student demographics, sample size, geographic location, stage of completion, and study design (see Table 1). They were also created with different goals in mind. The Reading Intervention was created with the aim of helping struggling early readers. The Executive Functioning Intervention was designed to help young children develop metacognitive skills with the hypothesis that developing these skills early on will also lead to improved executive functioning. The Reasoning Intervention was designed with the aim of helping students improve processing speed and problem-solving skills.

Table 1
Summary of Interventions

	<i>Intervention</i>		
	<i>Reading</i>	<i>Executive functioning</i>	<i>Reasoning</i>
Study goal	Improve reading fluency in struggling students	Improve cognition and emotion regulation	Improve cognitive functioning in traditionally disadvantaged populations
Grade range	Second and third grade	Kindergarten	Third and fourth grade
Demographic	Students with language-based learning disabilities	Urban, suburban, and English language learners	Urban, underperforming, and low-income students
Approximate sample size	30	1,000	20
Location	Massachusetts, suburb	Multiple urban and suburban locations in Massachusetts, Florida, and New York	California, urban
Stage of completion	Completed	In progress	Completed
Form of implementation	In class curriculum	In class curriculum	After school enrichment program

Forming Partnerships

These partnerships also differ in the way they originated. In the Reading Intervention, the partnership evolved over several years and began when the researcher visited the practitioner's school to give a speech about her research. The aims of both the school and the researcher were to improve outcomes in children with language-based learning disabilities, and so a collaboration easily formed between the research group and the school. The Executive Functioning Intervention partnership began with the researcher seeking out schools interested in using an established curriculum that he and his team were interested in testing. The schools the researcher partnered with had a previous interest in using the curriculum and he wrote a grant that would provide the funding necessary to implement the curriculum in the schools. Thus, the partnership was beneficial for both parties because the grant alleviated the financial burden of purchasing and applying the curriculum and the researcher was able to run his a large, high impact study. The Reasoning Intervention partnership initially began with the researcher sending e-mails and letters about implementing an afterschool enrichment program she had created for local schools in low-income regions. The school she partnered with welcomed her presence because they were in need of more after school support.

METHODS

We conducted interviews with a researcher and school administrator from each researcher-practitioner partnership. Interviews ranging from 30 min to 1 hr were audio-recorded and took place by phone or in-person. All interviewees provided answers to a set of five questions designed to capture the procedural aspects of the partnership (e.g., infrastructure, organization) as well as its rationale, the personal experiences of both individuals, and general lessons learned. The interview protocol was as follows:

1. How did the partnership form and how has it changed over the years?
2. What does each person gain out of the project (i.e., how does it improve the researcher's research and the practitioner's practice?)
3. What are key promoters and barriers to successful collaboration? What was done to mitigate the challenges? What would you like to try more in the future?
4. How does the relationship "work" (i.e., what does the communication process look like)?
5. What are the biggest lessons learned in fostering a successful researcher-practitioner partnership?

Additionally, those interviewed provided us with detailed descriptions of their respective research study and findings to aid us in our analysis.

RESULTS

The interviews produced several common themes in the set of responses from practitioners as well as the set of researchers. These are outlined in Table 2 and discussed below.

COMMON AND UNIQUE CHALLENGES

Connecting such varied contexts—a research lab and a live school—presents several challenges, many of which one would likely expect such as accessing classroom time and convincing teachers to participate. In addition, researchers in all three cases reported challenges such as the logistical issues of coordinating resources and research assistants across multiple school sites, and recruitment of students for brain imaging. This was particularly challenging in partnerships where multiple groups were collaborating, which ultimately required complex Institutional Review Board (IRB) protocols in order to ensure privacy of student data. One specific obstacle researchers reported was that of student attendance, which ultimately had a considerable impact on subject mortality. For example, in the Reasoning Study, the training period required that students be present twice per week after school for eight consecutive weeks. Because several students did not attend the sessions consistently as a result of parent schedules, illness, or forgetfulness, their data could not be used, thus limiting the sample size. Other common obstacles included acquiring parental consent (e.g., receiving permission slips back), finding time to test students (which often required pulling them out of class), and finally, receiving full support from all teachers assigned to adapt the new curriculum.

Conversely, for the practitioners, complete engagement in a complex research study elicited several challenges. All practitioner interviewees reported challenges because of the constraints associated with being a part of a research study, such as a lack of time for professional development and preparation/planning in order to implement the intervention into their existing program. The nature of each of the interventions had varying degrees of barriers to their integration into practice (Groff & Mouza, 2008). For example, whereas teachers participating in the Reading Intervention used the intervention as only a part of the total curriculum, the Executive Functioning Intervention required teachers to integrate an entirely new methodology into their teaching approach. The process of adapting to a new curriculum and approach to teaching naturally led to growing pains (e.g., reframing traditional curricular approaches, challenging unstated beliefs about pedagogy) and required much planning and dialogue between the researchers and practitioners in order to successfully integrate the intervention into the school context. The research design also posed a challenge in the Executive Functioning Study. As the intervention was created

Table 2
Challenges, Outcomes and Advantages of MBE Researcher–Practitioner Partnerships

	Challenges	Outcomes/Gains
Researchers	<ul style="list-style-type: none"> • IRB compliance and creating an agreement to share data across sites • Permission Slips (difficulty getting all returned) • Finding sites willing to engage in <i>active</i> partnership • Accessing teachers' time • Teacher willingness • Project management logistics (getting research assistants to the school sites, managing student volunteers, etc.) • Subject mortality (scanner breakdowns, student attendance, etc.) 	<ul style="list-style-type: none"> • Able to make a larger impact beyond just lab-based research and academic publishing • Improved study and intervention design by formative feedback and bidirectional communication from teachers, which also informed future research work • Access to more desirable population conditions (larger numbers, heterogeneous and/or homogeneous sample selection—depending on what was desirable for the intervention)
Practitioners	<ul style="list-style-type: none"> • Student recruitment for scanning/brain imaging • Extensive training/professional development time needed • Modification of existing curriculum and school structures • Devoting class time to the intervention • Students leaving class for testing • Managing politics when a school climate is a control school and does not receive the intervention • Administrators having to serve as mediators between the research group and the teachers 	<ul style="list-style-type: none"> • Provided professional development to teachers, which gave access to more materials and research-based information • Teachers gained a more robust understanding of the mind–brain–education connection • Enrichment and access to more resources and potentially better interventions • Provoked institutional reflection and discussion of current practices

MBE = Mind–Brain–Education; IRB = Institutional Review Board.

as a randomized control study, half of the schools interested in adapting the intervention were assigned to be control schools, meaning they would have to wait at least a year until they could access the curriculum. Control groups are often a necessity to produce clear results in a scientific study. Yet, they can be an obstacle when implemented in a school setting, especially when schools aim to improve outcomes for their students in a more immediate time frame. Both the researcher and practitioner interviewed from the Executive Functioning study mentioned this constraint as an initial challenge to work through. This dynamic often required the administrator to serve as a mediator for communication around the importance of control groups and why some teachers were able to implement the intervention and others were not. The researcher cited the preparation and coaching of both administrators and research assistants on how to effectively communicate this.

Benefits and Successful Strategies

Successful collaborations between researcher–practitioner groups go beyond effective data collecting and intervention analysis; both groups reported significant advantages and outcomes of the partnership. Researchers not only gained access to a larger target subject demographic, they also received critical feedback that led to the iterative growth of the project design, the school context, and even the intervention itself. This bidirectional communication was essential to such successful partnerships. Often the intervention served as a vehicle for

school-wide discussion and analysis of current approaches and practices, and the collaborative effort in analysis of the intervention frequently facilitated the growth of individual and school-wide practice. Additionally, intervention designs were impacted by real-time teacher feedback which researchers incorporated, ultimately producing better interventions. In these partnerships, transdisciplinary liaisons greatly facilitated the work by serving as translators and bridges to support the connection between researchers and practitioners. These outcomes are explored more deeply in the discussion section.

According to nearly unanimous descriptions by all interviewees, the element that was at the core of these fruitful and enduring partnerships was the target toward *mutual beneficality of the collaboration*. When the work benefited the school in a long-term and impactful way, a context was created where there was engagement and buy-in of all participants. In that vein, practitioners cited the greatly valued co-construction of the work, rather than a top-down, “researcher knows best” stance, and that this positioning was a considerable factor in what led to such fecund partnerships.

DISCUSSION

Although each of these case studies demonstrates the unique ecology of variables and contexts that converge in any researcher–practitioner partnership, critical themes emerged from all interviewees that illuminate areas for careful consideration when designing future researcher–practitioner

partnerships. As noted earlier, there were challenges reported by both researchers and practitioners that revolved around the constraints of working within the other's domain. However, two other themes emerged that illuminated critical elements to successful partnerships: an emphasis on bidirectional communication as a method of working through challenges, and the importance of the partnerships being mutually beneficial. These themes are discussed below.

Facilitating Bidirectional Communication

In an article surveying 189 teachers on the role of the brain in education, two-way communication between scientists and educators was rated as one of the most important factors in efforts to link education and scientific research (Pickering & Howard-Jones, 2007). In another article on forming the most successful collaborations between education and laboratory science, McCandliss, Kalchman, and Bryant (2003) suggested a "dialogue in search of common ground, rather than as a unidirectional transfer of information from 'research-to-application'" (p. 15). Researchers and practitioners of all three interventions discussed here relayed the benefits of bidirectional communication. The researchers of the Reading and Executive Functioning interventions found teacher feedback about "what works" in the curriculum especially valuable. Also as a result of this collaboration, teacher feedback and reflective discussion with the research team also informed future versions of the curriculum and future approaches to teaching it. In another example of bidirectional communication, the researcher in the Reading Intervention explained that in order to assuage the concern of implementing the intervention in a consistent way across teachers and classrooms, they built multiple check-ins, classroom visits, and teacher discussions into their research design. As a result of this approach, they felt more confident in the results they were collecting.

In addition to teacher feedback and incorporation of teacher discussions into research design, another suggested method for encouraging bidirectional communication is to foster a new group of transdisciplinary liaisons who serve to translate and facilitate communication between researchers and practitioners (Goswami, 2006). As reported by both members of the Executive Functioning partnership, liaisons have played a major role in the implementation of their intervention. Every week, the liaisons would relay the benefits and challenges of the intervention, as reported by the teachers, to the research team. The liaisons were also well versed in the theories behind the curriculum and could provide in-depth explanations to teachers and administrators with questions and concerns.

Mutually Beneficial Partnerships

A mutually beneficial relationship was essential to the perceived success of all three of these partnerships and mentioned in all interviews. During the interviews each collaborator was

asked how they benefit from the collaboration and how they feel the other partner benefits. In the Reading Intervention, the practitioner explained that compared to another study where a researcher might come to the school a few times, collect data, and then publish the results in an academic journal to the benefit mainly of the academic community, this study had wide-reaching benefits to the teachers, parents, and students of the school. In addition to improving students' reading abilities, interviewees cited that teachers gained new knowledge and techniques on how to improve reading abilities from the multiple training sessions in which they took part, and that the collaboration had many longstanding benefits for the overall professional development of the school, as it facilitated reflection and analysis by the faculty on new methods and techniques to improve their teaching. Teachers received score reports, which aided in better monitoring of the individual progress of students, which pleased many parents who felt that more in-depth information about their children's strengths, weaknesses, and progress was valuable. The Reading Intervention researcher said that her team benefited because the intervention had not yet been applied on a classroom level and by partnering with this particular school, they were able to quantitatively test their intervention in an environment on a larger scale than a lab or tutoring center. Furthermore, the researcher reported that because this intervention study was so successful it paved the way for future collaborations with the school.

The researcher from the Reading Intervention also said that what made this partnership so successful was that from the outset, concrete expectations about what each group would gain from the partnership were established. Echoing a similar experience, the researcher in the Reasoning Study underscored the importance of establishing clear expectations at the outset about how each member of the partnership would benefit. In this instance, the researcher benefited as the project gave her the experience needed to run the study on a larger scale and with different populations; the practitioners benefited because they received much needed afterschool programming in a resource-poor school that was drawn from carefully researched work in the cognitive sciences.

In the Executive Functioning Intervention, the practitioner reported that teachers enjoyed learning new strategies to improve their teaching and noticed improvements in their students. When asked how these partnerships most benefit him the researcher said, "I do it because of impact. I do occasionally wish that I was running a traditional study with undergrads in a controlled setting and publishing papers but what I want to do is take the ideas that I have been working with for a long time and apply them to a setting that can help people."

CONCLUSION

Researcher-practitioner partnerships between scientists and educators represent MBE work in action—they embody the

central purpose for the creation of this integrated, interdisciplinary field. The need for and benefits of these types of collaborations have been established (Coch & Ansari, 2009; Hinton & Fischer, 2008; Pickering & Howard-Jones, 2007). Yet actual instances of these partnerships are few. In analyzing three real-world researcher–practitioner partnerships, it is clear with careful planning and implementation, there is considerable benefit to both researchers and practitioners—and most critically, to producing better knowledge in the field overall. Given these outcomes and impact on the field, our wish is that by illuminating common challenges and best practices in researcher–practitioner partnerships, future collaborations will be encouraged; and those leading the development of the collaboration will be mindful of facilitating a co-constructed partnership by cultivating fruitful conditions like bidirectional communication and explicitly defined mutual benefits.

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