A Bridge No Longer Too Far: A Case Study of One School’s Exploration of the Promise and Possibilities of Mind, Brain, and Education Science for the Future of Education

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ABSTRACT—Mind, brain, and education (MBE) science research continues to produce valuable results about brain development and the learning process—research that can and should inform education reform. Given the link between teacher efficacy and student learning outcomes, MBE is a discipline with considerable promise to help close gaps in school and teacher quality and student achievement. Yet, in our experience working with thousands of K-12 teachers, very few have been trained to adapt their instructional strategies in ways that are informed by MBE research. Research on what helps and hinders learning exists, but, as yet, effective and efficient ways to translate it into classroom practice are rare. This article presents a case study of how one school is bridging the gap between MBE research and its integration into the classroom, a gap that was once deemed “a bridge too far” to cross. It also suggests a series of steps that form a possible translational pathway for teachers, school leaders, and policymakers.

St. Andrew’s Episcopal School is an independent coeducational day school with 580 students, Grades PS-12, in Potomac, Maryland, in the suburbs of Washington, DC, United States. In 2007, we made an important decision. We commenced training 100% of our preschool through 12th-grade faculty in teaching and learning strategies informed by MBE science. We did so in answer to the following generative question that we had posed ourselves a year earlier: “What is the next frontier for teacher training in order to transform great teachers into expert teachers?” We now have 10 years of practical experience translating MBE research into practice. Our training of teachers and school leaders has expanded beyond St. Andrew’s, and we now collaborate with public, private, charter, and parochial schools across the country and abroad.

The question of “how do you make good teachers great and great teachers experts?” resonates across all school types, and we see an emerging willingness to accept and even embrace that there is a body of knowledge that can inform how we do this, and a plausible pathway to implement it. In 2016, we received the Mission Award from the International Mind, Brain, and Education Society (IMBES), and had the opportunity to speak at that year’s conference in Toronto on this topic. We were asked to write that talk up as a paper—a rare insight from a precollegiate school that, every day, is translating MBE research into classroom practices. To that end, we present a case study to illustrate that John Bruer’s (1997) infamous “bridge” is no longer too far. In addition, in reply to Stafford-Brizard, Cantor, and Rose (2017), we outline a series of steps for successful translation.
in the hope that our practical experience can shed some insights to further the field in this important direction.

**Why Did We Choose MBE Science?**
While there may be a number of approaches to the challenge of making good teachers great, MBE science seemed the most promising to us as it offered a broad multidisciplinary research base to draw from, gave the teachers a role in making the research work in the context of their own class rather than simply unpacking a purported magic box of great teaching, and suggested a role for teachers to gauge and reflect on their impact. We could envision a new professionalism for teachers where they might take ideas supported by research, operationalize them into courses of action that they think might work in their context, try them out, see if they work, reflect on what they find out, tweak what they do, and iterate—and do so in collaboration with other teachers. We saw MBE as a way to bring teaching and school leadership into alignment with other professions by connecting it to its research base.

In addition, MBE would allow us to simultaneously take a top-down and a ground-up approach to professional development which, from our experience in schools, is a magic combination to produce lasting change. Teachers could have an element of choice to work on projects that mattered to them, their class, and their kids. At the same time, they would be working within an MBE framework that could be aligned to the school’s mission and priorities so that there was some consistency of purpose, and so that students would experience “variations on a theme” during their days at school.

**What Does It Look Like?**
Imagine a ninth-grade biology teacher and a ninth-grade history teacher chatting about the challenges their students were having in their memory-intensive courses, a conversation that may happen in many schools. These two teachers at St. Andrew’s collaborated to do research on the spacing effect and retrieval practice, used this to develop classroom practices that worked for their particular context and their own voice as a teacher, then tested them out. Based on the feedback from this, they improved the practices and added new ones for use later in the year. They have continued iterating since then, and now share their story with other teachers both inside St. Andrew’s and beyond. They have also continued their own MBE journeys, and have worked on ways to build student metacognition, and how to give effective feedback. Thus, MBE Science offers a bottom-up model that empowers teachers, giving them a critical role in the education equivalent of “bench to bedside,” with a clear motivator that this is all about helping actual kids in actual classes that they see every day. This pathway from research principles, to professional practice and view of oneself as a professional, to real outcomes for real kids is one that we deliberately make when we work with teachers. Being able to successfully connect these three dots is crucial to making MBE translation work.

MBE now happens in small everyday moments all around St. Andrew’s. Three English teachers will work together to restructure the entire year’s grammar component with the spacing effect and interleaving in mind (Brown, Roediger, & McDaniel, 2014). A physics teacher at St. Andrew’s might show a 1-min goofy video of the principle of momentum to make students laugh, and hook them to engage in some deep thinking to come. A history teacher will have an 11th-grade student identify someone of their choice to interview as part of an oral history project. The empathy engendered by sitting down and teasing out someone’s amazing story, the strong desire to do right for them, plus the elements of choice, relevancy, and purpose, will provide the intrinsic motivation to write an 80-page report as a demonstration of their learning. A math teacher will use formative assessments routinely, telling their students that “I know this might look like a bit like a pop quiz, but it is not. It is for me to find out where you are, for you to find out where you are, and for us BOTH to do something different as a result.” Three sixth-grade humanities teachers who understand the link between emotion and cognition (Immordino-Yang, 2015) will work hard to make sure new middle school students will feel known and that they belong early in the year, because creating a positive emotional environment, underpinned by strong relationships, is crucial in allowing the rigor and challenge they want the year to contain. A science teacher, an English teacher and music teacher routinely have conversations about what effective scaffolding around cognitive load theory (Sweller, Ayres, & Kalyuga, 2011) looks like in their courses, and the common structure helps them gain insights to try new things out with their students. MBE translation is now astonishingly common. We would like to take the uncommon step in an academic article by extending an open invitation, if you are ever in the Washington area you are welcome to visit us to learn more.

**Extending the Model Beyond St. Andrew’s**
In 2011, St. Andrew’s created the Center for Transformative Teaching and Learning (CTTL), a research group embedded in a preschool through 12th-grade school, run by a small team who are also teachers, coaches, and academic advisors. The mission of the CTTL was to train 100% of the St. Andrew’s faculty on the latest research on what is great teaching, and what we should be doing to help students learn. Research tells us that teacher quality is a crucial factor in student learning outcomes (Hattie, 2012). In particular, pedagogical content knowledge and quality of instruction are significant factors (Coe, Aloisi, Higgins, & Elliot Major,
2014). We immediately saw that research existed that could help improve us in these areas, but we needed a group of people for whom this was their passion and focus at school to help translate this research into school, class, and student practices. We therefore created the CTTL with the dual aims of using research to become leaders in high-quality professional development, and to attract and retain the best and brightest educators.

With hindsight, several factors present at the inception of the CTTL have proven pivotal. First, we had an “all in” model where 100% of the faculty must be trained in and expected to use research to inform their practice. This may seem like a tough barrier, but we will discuss this later. Second, while the founding mission of the CTTL was to serve the teachers, students, and families of St. Andrew’s, we realized we must also have a public purpose to serve other schools and educators beyond our walls. Although we initially imagined this as “maybe some local schools,” it has taken us on an amazing global journey. For example, as we write this we just found out that we are going to be working with teachers in Botswana, China, and the United Arab Emirates. Third, we determined the CTTL must be self-funding. While initially daunting, it has proven to be a tremendous asset as it means that we have to engage with lots of people with interesting roles in interesting places. As we do so, we tell a story that a school can embed the translation of MBE research into everyday practices, and that both the teachers’ learning brains and the students’ learning brains can benefit when you do so.

These factors have led us to a point, the first decade into the life of the CTTL, where we have worked with thousands of teachers and school leaders, helping them find ways to use MBE research to transform their practice. In doing so, we have gained practical insights into how to make MBE translation work. Stafford-Brizard et al. (2017) proposed a strong case for MBE translation. In this article, we offer suggestions on how to make this work in schools.

**A PATHWAY FOR MBE TRANSLATION**

**Buy-In**
Teachers’ prior experiences, knowledge, and biases create barriers to behavioral change. In addition, “initiative fatigue” from a seemingly never-ending carousel of new ideas, coupled with a probable history of inadequate resources and time to carry out initiatives, creates additional barriers. How do you cut through this?

**Step 1: Essential Neuroscience for Educators**
We begin our work with a simple and playful introduction to neuroanatomy. We include things like the basics of how neurons function, an overview of the path from sensory inputs to the formation of memories, and the limbic system and how we react to stress. Present this well and it fascinates teachers. However, this neuroanatomy content knowledge is not actually that important for educators. What is important is where it leads. We use it as a set-up to the most crucial mindset shift that we need to instill in educators—a deep-seated belief in neuroplasticity and its transformative potential. Teachers are brain changers. Whether a teacher believes it or not, their students’ brains rewire as a consequence, in part, of what that teacher consciously chooses to do or not do. With this in mind, we should make sure we are as good at our craft of teaching as we possibly can be. It is an emotional ploy to appeal to a teacher’s desire both to do right for each child and to get better at his or her professional craft. These two points are intimately linked. Throughout our training, we continue to paint this path from MBE research, to a teacher’s sense of him- or herself as a professional, to the effects of real students—real faces that they can see in the mind as they work with us.

**Step 2: Neuromythbusting**
We tend to underestimate the lingering effects of so-called neuromyths (Dekker, Lee, Hoard-Jones, & Jolles, 2012). “Of course, everyone has heard the myth about learning styles,” says the presenter. The conference audience murmurs assent, and the talk moves on. The reality in classrooms everywhere is that these myths that we assume everyone now knows are very much alive. For example, a further generation of students is being told that they are kinesthetic learners by so many people that they believe it. As a result, when faced with nonkinesthetic tasks, they adopt a fixed mindset that they cannot do it. It breeds frustration with school and resentment and loss of credibility for teachers who are perceived to be not meeting their need. When we work with educators, we take time to dispel common neuromyths. Again, we make it playful to increase engagement and to disguise the uncomfortable moments when a long-held belief is shown to be wrong. For example, we are indebted to David Didau for his inspiration for the story of the dedicated math teacher who, to reach his olfactory learners, developed a smell-based trigonometry curriculum. But the play transitions to a serious side, because examining neuromyths helps teachers identify and empathize with real students whom they did not serve as well as they could. And they see that with a few simple changes they could have served them better. Doing neuromythbusting right, then, leads to epiphany moments that encourage the further work we need to do.

**Step 3: In What Ways Am I Already a Research-Informed Teacher?**
Before helping teachers find ways to use research to inform their practice, we have found an important step is to help
them identify some of their current practices that are supported by research. For all of us in the field of education, there are current practices that we really should stop or alter if we want to be fully focused on improving learning outcomes for our students. But before we work on shifting something a teacher has done for perhaps 20 years, the buy-in from having them see how research aligns and explains what they currently do is invaluable. One example that often resonates is that research suggests that there is still room for lecture, as knowledge is important and direct instruction done well can be an efficient and effective method for building it (Kirschner, Sweller, & Clark, 2006). But it should be used tactically, and as one of a variety of methods, and should lead to something else rather than be an end in itself. And when you have made this point, it leads to an interesting discussion to common deficiencies in project-based learning practices and what you can do about it (Menzies, Hewitt, Kokotsaki, Collyer, & Wiggins, 2016). An easy “in” with the audience leads to a significant challenge of current practice, but one that the audiences are more likely to engage with because of the route we have led them through.

**Research-Informed Teaching and Learning**

**Step 1: Begin With Easy Successes**

MBE research suggests many teaching and learning strategies that, if implemented well, should improve student learning outcomes. It does leave the professional development deliverer with a “where do I start?” conundrum. For example, cognitive load theory (Sweller, 2016) has immense potential to transform classrooms. We help teachers see how it can explain how some of their current teaching strategies seem to work, and this in turn gives them insights into what else they could try. Making the research work in your context and with your personal voice as a teacher is always the crucial trick, and this is an example of how we go about it. However, cognitive load theory is not a great starting point for a teacher’s first foray into research-informed practices. Better starting points are the use of retrieval practice, spaced learning, and formative assessment (Brown et al., 2014; Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013; Pashler et al., 2007). These principles meet three important criteria:

1. They are robustly supported by research.
2. If implemented by the teacher, they are likely to improve student learning outcomes.
3. The benefits of successful implementation are likely to be worth the time, energy, and cost of doing so.

This latter point is important, because implementing any new technique requires a cost of a teacher’s finite time and energy that cannot then be spent elsewhere. These three principles also require effort from the teacher to make them work in their context and with their voice as a teacher. This step is vital in all MBE translation. We need to provide scaffoldings initially to help teachers do it, and begin by giving them tasks that are likely to result in success.

**Step 2: Help Teachers With Needs Assessment**

As teachers learn about MBE research-informed teaching and learning strategies, there tends to be a certain magpie effect: teachers often rush to implement strategies that appear shiny and alluring. It is helpful to slow them down by thoughtfully leading them through a needs assessment. First, what are the needs in my school or class? What are the problems? What are the opportunities for growth? Second, what would success look like if I addressed this need? Third, what MBE principles could help me bridge the gap from need to success? Fourth, can I rank these possible strategies based on practicality (am I likely to be able to implement them with the time, material, financial, and human support resources at my disposal?), potential size of impact, and likelihood of success?

**Step 3: Turning a Research Principle Into a Classroom Practice**

The most important point here is to create a culture where teachers are not frozen into inaction by worries of it not working, or being unsure exactly what to do. To help with this, we counsel teachers to begin with easily translatable principles, such as retrieval practice, spaced learning, and formative assessment. We also encourage teachers to model exactly the behaviors and mindsets you would like to see in your students when faced with such challenges. Having teachers work in groups of two or three also seems to help. The important thing is simply to begin, because the next stage is “iterate over time.” MBE research suggests good starting points—then play. We mentioned earlier that at St. Andrew’s, we have an “all in” model where 100% of the faculty receive ongoing training and are expected to use MBE research to inform their practice. The reason this works is that we have created a culture where faculty have choice. To some degree, it is the professional development equivalent of being presented with a brunch menu. However, there is the added step of personalization: having chosen the research-to-practice translational topic that speaks to your needs and opportunities in your class, you then have to tailor it to work in your context. Faculty members are working at different speeds and different depths, but all are engaged in making some aspects of research-informed teaching and learning work for them. And, in this regard, the nature of MBE research helps facilitate this layered approach. For example, formative assessment is easy to work on, feedback is a step harder, and cognitive load theory a step harder still. Our trick is to present MBE research in a way where
it feels accessible to all teachers—and bear in mind that we started our process by also making it feel **very necessary** for all teachers.

**Iterate Over Time**

A review of research on effective professional development commissioned by the Teacher Development Trust (Cordingley et al., 2015) suggests that professional development must be informed by research, be focused on helping real students, be sustained over time, and be iterative. Our method is definitely informed by research, and when working with teachers to turn research principles into classroom practices we work hard at making sure that the focus is on how this work will help real students in the teacher’s class. We work with teachers and school leaders to create a culture of teachers trying things out and iterating over time. For example, many teachers at St. Andrew’s across different disciplines and grade levels are working on how to use research to improve the feedback they give students. Feedback takes so much of a teacher’s time and has great potential to improve learning (Hattie, 2008; Hattie & Timperley, 2007). For teachers, there is an allure of both spending less time on individualized feedback, which is essentially one-on-one instruction, and getting better learning outcomes. This project will take most of this year, and will involve a lot of trying something out, seeing how it works, and refining based on these insights. One added benefit of using an MBE research lens for this work is that the common language and research bases helps teachers in different disciplines and divisions have fruitful conversations on a common goal.

**Gauge Impact**

In the words of David Weston (2016), Chief Executive of the Teacher Development Trust, we believe that “teachers are more likely to have an impact if they are aware of the impact they are having.” To this end, we carry out action research projects at St. Andrew’s. The methodology is beyond the scope of this article. However, we believe that the most important result of this may not be the research projects themselves. It is our hypothesis, untested so far, that being a teacher who at times carries out action research, or even being in a school culture where teachers do action research, creates a residual mindset to be more aware of gauging the impact of what you are trying out even when you are not actively measuring data. We are very interested in testing this.

As Dylan Wiliam (2015), Emeritus Professor of Educational Assessment at University College London, put it, “Changing what teachers do is more important than changing what they know.” There is definitely a “changing what teachers know” component to our work—this is still important. But our focus is on getting teachers to change their practice in a series of often small incremental ways, and with very real effects. The motivational driving force we emphasize is the pathway from MBE research, to how a teacher views his or her own professional practice, to improving learning outcomes for actual students in their class. We lower the barriers and the fear factor around being a research-informed teacher. We help educators discover how they are research-informed teachers or school leaders already. We help them find new ways to use research to inform their work. And we give them a pathway to **evolve credibly** over time (Daniel, 2017). In our school, at least, the translational bridge from research to practice most definitely exists. But how do we build capacity?

**CHALLENGES AND SOLUTIONS**

**Initiative Fatigue**

Many educators feel that a vast parade of initiatives is parading past their classroom door—too many to invest in any particular one, even if it sounds worthwhile, because they know it will be replaced soon. Moreover, if they do not like a particular initiative, they just have to wait it out knowing that it will soon be gone. St. Andrew’s MBE initiative is now in its 11th year. How many schools undertake initiatives that last this long? Its longevity is due in part to how flexible it is—our MBE initiative also evolves credibly as the field of MBE, and our understanding of it, evolves. Second, it is also due to the fact that it is, in the eyes of the faculty, so evidently linked to improved learning and school experience outcomes for students, to the point that we can all name MBE-informed practices we tried and how this helped students whose names and faces we can recall. Third, MBE has become an umbrella initiative that helps bring organization and clarity to other initiatives. For example, like many schools, we are working hard on multicultural education, using new technologies effectively, global citizenship, design thinking, service learning, and some version of “educating students for the jobs of tomorrow,” among others. All these can be viewed with an MBE lens, and are better for doing so. This also means that different people in the faculty can specialize in different aspects of the school’s MBE initiative while sharing a common language, framework, and guiding principles. This helps us with our 100% buy-in model. Two recent examples that illustrate this are our initiatives to redo our daily schedule and improve homework—two issues that are probably on many schools’ radar. In both cases, when we came to the inevitable stumbling blocks of competing interests that often sink such initiatives in schools, viewing them with an MBE lens gave clarity as to how to proceed. For example, when designing a schedule, the research on the link between emotion and cognition helped us create a schedule with sufficient down time and pacing to aid...
A Bridge No Longer Too Far: A Case Study

How Do We Begin Our School's MBE Journey?
This is a daunting prospect to do from scratch. The CTTL has a language and framework, and we now work with other schools, both public and private, to help them begin their own sustainable MBE journey, and support them through its growth. To help expand the number of teachers and schools we can work with, we have created the Science of Teaching and School Leadership Academy, a 5-day summer workshop that first ran in the summer of 2017 with 150 teachers and school leaders from 20 states and 6 countries. We are also creating a novel online professional development tool that is designed to be engaging and doable by busy teachers, and we offer microcredentialing in association with Digital Promise. We are, we believe, what David Daniel (personal communication, December 1, 2017) described as a “translational hub.” Maybe the answer to really bridging the gap between research and practice in a large-scale way is an international network of translational hubs. We can begin to suggest possible features of such a network:

- Hubs must be based in a precollegiate state, public, charter, or private school.
- Hubs will have a designated Research Lead or Head of Research.
- Hubs ensure that 100% of its teachers and school leaders have foundational training in MBE science through a recognized program, such as the Brain Targeted Teaching Model, the CTTL’s Science of Teaching and School Leadership Academy, or other such models that may need to be developed.
- Hubs must have a public purpose to help schools and teachers within their region.
- Hubs must have a collaboration or partnership with a local university.
- Hubs agree to share information and work as much as possible toward a common framework, language, and action research protocol.

Translational hubs may not be necessary, but it is possible that the gap between MBE research and classroom practices really is too great, and so an intermediary body might help. It takes particular knowledge and skills to lead this work, and while this may not be the job of choice for many in education, either on the academia side or the school side, we believe there are some extraordinary people out there for whom this would be a wonderful job. It is a worthy subfield in its own right, and we are hoping to see it get populated and, most importantly, funded so it can chart its own extraordinary evolutionary pathway as such subfields tend to do.

It is very likely that the translational hub subfield will include people with a variety of talents, but with enough crossovers to understand each other. In essence, this is a very contemporary way of problem solving, akin to a venerable credit card company now creating teams that include anthropologists, psychologists, and people with MBAs to design better products. What skills do we need to have at the table to best address this problem? It appears we need Aristotle’s episteme (“scientific” knowledge) and phronesis (practical wisdom) to make translation work. We have far too few places where episteme and phronesis hang out together and chat over coffee. Translational hubs, physical spaces occupied by real people, might help. Remember, the pipeline is from academic research, to teachers’ professional practice, to learning outcomes of actual kids. Where does this best take place? Who makes it happen? And, on practical terms, where does the funding come from to make it both a sustainable initiative for schools and a credible career path for talented professionals?

CONCLUSION

It is possible that the gap between academic research and everyday class and school practices is, in general, too far. Nevertheless, some precollegiate schools, through a combination of determination, connections, resources, and talent, will make it work. In part, we write this article, and share this case study, as a beacon and as an inspiration to others. It is possible. But we have to go further: the achievement gap remains too large, and too many children do not end up

A Need for Translational Expertise
Who is the point person for this MBE initiative? Who helps individual teachers and school leaders in their translation tribulations? Who helps guide what teachers are working on so it fits both the current state of the field of MBE research and the greater mission and initiatives of the school? Who guides teachers to try implementing strategies that are both doable and likely to have a significant positive impact? Who has sufficient MBE research knowledge, sufficient practical expertise in translating research into practice, and sufficient knowledge of research methodology to gauge impact? Who can converse with credibility with both teachers and researchers? Who makes sure the foot is not taken off the gas for this initiative in the school? At St. Andrew’s, we call this person our “Head of Research.” In the United Kingdom, it is more commonly referred to as the “Research Lead.” Bror Saxberg calls them learning engineers (Saxberg, 2015). We believe that this novel position is critically important. Recent experience in the field of MBE has shown us that translation is a major stumbling block. We need to find, train, and support people to be masters of translation.

student well-being because we know we need to intentionally scaffold well-being in order to set an appropriately high level of challenge and support to help each student succeed.
achieving their greatest potential, so we have to find reproducible ways to make translation happen. We hope that our 11 years of field experience in this work offers some insights into possible steps for an MBE translation pathway. One way to extend the reach of this work is to form a network of translational hubs, and we hope to inspire you to think more about this idea. The goal is to help all students learn by making MBE translation a more common everyday occurrence in all school types, regardless of student population or geographic location.

REFERENCES


