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IMBES Pre-Conference: Using Insight From Research to Improve Education

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ABSTRACT— In September 2016, the International Mind, Brain, and Education Society (IMBES) biennial conference took place in Toronto, Canada. The pre-conference (organized by the Wellcome Trust) was designed to share new findings, lessons learned, and inspirational innovation within the field, and to encourage the community to not only identify current challenges, but to start planning potential ways to address them. This article provides a brief summary of the discussions from the day, and suggests steps that members of the community, conference organizers, and funders can take in helping to move the field forward. Finally, it outlines new work Wellcome has commissioned since the conference in response to some of the challenges defined on the day.

The Wellcome Trust (<https://wellcome.ac.uk/>) was invited by the International Mind, Brain, and Education Society (IMBES) to organize the pre-conference due to its aligned interest and developing work in this field. Here, we summarize the key discussions from the day, supplemented by additional commentary and scientific research from the wider field where relevant. We hope this article will be a useful outline of the day for both those who were present and those who were unable to attend, and we encourage all readers to consider the part they can play in progressing the wider MBE field through their own work.

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THE DELIVERY AND DESIGN OF THE PRE-CONFERENCE

The objectives set by Wellcome for the pre-conference included the following:

1. Supporting the sharing of new findings and lessons learned within the community.
2. Showcasing exciting innovation with respect to translation and collaboration.
3. Encouraging discussion on the vision and next steps for the field.

In addition to building an agenda designed to achieve the aforementioned aims, Wellcome also wanted to ensure that the program and approach was informed by the prior learning of others. As has been well documented within the literature, bringing together neuroscientists, psychologists, educational researchers and teachers (such as those registered for the pre-conference) to work together is not straightforward. Difficulties arise due to each field's different epistemologies, methods, and language, often attributing different meanings to the same words (Howard-Jones, 2010). With the event attracting 130 people from a variety of sectors and with a range of first languages, it was important to take positive action to try and ameliorate these challenges. In an attempt to make the day as accessible as possible, all delegates and speakers were asked to respect the following guidelines:

1. To use simple language, avoiding jargon and acronyms.
2. Not to assume a shared knowledge base.
3. To be proactive in asking for clarification where things were unclear.

Although the inclusion of such a diversity of disciplines can be challenging (for organizers who program the day, and speakers who must make their content accessible), it also presents an exciting opportunity for new discussions



and collaborations. Therefore it was a strategic decision to design the sessions to capitalize on all the expertise present in the room on the day, providing structured opportunities for discussion as part of the sessions, rather than relying on this to happen over coffee breaks.

STARTER: SETTING THE SCENE

The conference opened with a panel of four MBE experts (Daniel Ansari, Michael Thomas, Mary Helen Immordino-Yang, and Paul Howard-Jones), each giving their own short summary of progress in the field since the last IMBES conference. This introduction was intended to provide delegates with a base level of knowledge, so discussions could build on this shared understanding of the field.

Key developments included new journals such as the Nature Partner Journal *Science of Learning* and SAGE Journals' *Educational Neuroscience*. Funding developments highlighted were the IBRO/IBE-UNESCO Science of Learning Fellowships for neuroscientists to learn about international policymaking in Geneva, and the Education and Neuroscience Initiative funded by Wellcome and the Education Endowment Foundation (EEF). The high-profile paper from Bowers (2016) which challenged the field of MBE was mentioned as a useful prompt for bringing key experts together to revisit the shared understanding and goals of the field in response (Howard-Jones et al., 2016).

At the end of this session, everyone in the room was asked to write down their own personal vision of what they would like the MBE field to look like in 2 and 10 years' time. This activity was included as an attempt to encourage delegates to think about the MBE field as a whole, and how they might contribute to progressing toward that vision. Although some of the answers were shared on the day, with hindsight it would have been interesting to collect these answers so the information could be captured and revisited at the next IMBES conference to see how visions change over time.

SESSION 1: WHAT HAVE WE LEARNED FROM DOING MBE RESEARCH IN THE CLASSROOM?

In the first main session of the day, four projects funded by the Wellcome Trust were presented. These projects were part of the "Education and Neuroscience Initiative" in collaboration with the EEF. The two main aims of this initiative are as follows:

1. Build research and expertise at the interface between neuroscience and education.
2. Ensure that educators can make informed choices based upon the best available evidence.

In relation to the first aim, six projects were funded to develop and evaluate the impact of educational interventions that had been informed by neuroscience (<https://wellcome.ac.uk/what-we-do/our-work/understanding-learning-education-and-neuroscience>). Researchers from four of these projects (Paul Howard-Jones, Catherine Wheatley, Christopher-James Harvey, and Iroise Dumontheil) described their experiences during session 1.

Rather than simply presenting their findings, the researchers were asked to discuss the challenges they had encountered and what they had subsequently learned through setting up these interdisciplinary MBE projects. We were keen to share such information so that it could help others in the field avoid similar pitfalls and understand the realities of large-scale educational projects including those using a randomized control trial (RCT) design. It was acknowledged by both Wellcome and the speakers that it was not easy to discuss such challenges so publicly, particularly as this is a rare occurrence (for a notable exception see Plummer et al., 2014). However, their openness was appreciated by those attending, as exemplified by multiple comments from the evaluation forms.

The key challenges emerging from this session included (a) recruitment and retention of schools (particularly when assigned to the "control" group); (b) the differing resourcing schools have access to, for example, availability of technology; (c) fidelity to study protocols; and (d) scaling up project delivery to the sizes needed to test interventions in robust RCTs.

One theme that a number of the researchers touched on was the importance of involving teachers as co-creators from the outset of the research. This was clearly illustrated by Catherine Wheatley from the *Fit to Study* project. She described how their initial approach to give teachers lessons plans that incorporated the intervention had been disliked by teachers for being too prescriptive. Teachers instead suggested that a list of guiding principles to incorporate into the lessons would be more suitable. Acting on this feedback the researchers trialed a new version, but this time the teachers reported back that they actually needed more guidance. This example clearly illustrates the importance of a collaborative and equal relationship between researchers and teachers, where both parties are supported to give the time required to design an intervention that tests a hypothesis while taking into account the practicalities of the school context and utilizing the expertise of teachers.

SESSION 2: HOW CAN WE CLOSE THE GAP BETWEEN MBE RESEARCH AND CLASSROOM PRACTICE?

This session began with talks from three innovative organizations showcasing how they support teachers in accessing

and using relevant MBE research to improve classroom practice. The three speakers were the following:

1. Christina Hinton from Research Schools International (<http://rsi.gse.harvard.edu/>), who discussed their work partnering researchers with schools around the globe to carry out research, professional development, and dissemination of findings.
2. Glenn Whitman from the Centre for Transformative Teaching and Learning (<http://www.thecttl.org/>), who described their school-led initiative to empower teachers and school leaders to integrate MBE research-informed strategies into their professional practice.
3. Karen Cator from Digital Promise (<http://digitalpromise.org/>), who presented their bibliometric map to connect teachers with research, and how they are using current research to direct personalized learning.

The session then continued with small-group discussions on topics selected by Wellcome in advance. These topics were chosen to provoke discussion on themes relating to closing the gap between MBE research and classroom practice. The topics and the resultant discussions are summarized below.

Teachers' Knowledge of Learning and the Brain

There were a number of aspects of learning and the brain that delegates discussed as being relevant to education. Key neuroscience concepts identified were: neuroplasticity (the brain's ability to create new connections); synaptic pruning (the elimination of unused neural pathways); and sensitive periods for learning (periods of development where neuroplasticity is heightened). Moving beyond a basic understanding of brain function, delegates highlighted the importance of understanding the established effects of external factors on learning including exercise, diet, and sleep. Delegates also emphasized cognitive functions they felt teachers should know about, including attention, memory, emotion, and motivation.

There was some disagreement about whether an understanding of some of these ideas could have a direct impact on teaching and learning, or simply enable teachers to better understand the behavior seen in the classroom (perhaps still a worthy goal). It was nonetheless suggested that teachers could devise and implement strategies taking into account this knowledge; strategies which might not have been considered by researchers. For instance, teachers might be aware of strategies or activities likely to engage sleepy adolescents early in the morning based on their experiences in the classroom.

There was further dialogue about the merit of teachers sharing this knowledge with their students. Research

attempting to change habits purely through pupil education can raise awareness without causing change (Cain, Gradisar, & Moseley, 2011). However, teaching students to develop a growth mindset (the belief that intelligence is changeable) has yielded promising but mixed results on student outcomes (Blackwell, Trzesniewski, & Dweck, 2007; Rienze, Rolfe, & Wilkinson, 2015). Despite little evidence of behavior change caused by information dissemination, young people are taught about the impact of food, exercise, and drugs on their health. Arming them with information about factors affecting their learning may help them to make informed decisions in the future, even if there is no immediate behavior change.

Although some research has shown that greater neuroscience understanding does not guard against neuromyths (Dekker, Lee, Howard-Jones, & Jolles, 2012), recent research has indicated that educators are less likely to believe neuromyths than the general population (Macdonald, Germine, Anderson, Christodoulou, & McGrath, 2017). Although this is promising, future research is needed into how neuroscience training for teachers affects their understanding of the learning process and if this impacts on student learning.

Delegates also recognized two challenges of the education sector in facilitating this teacher learning (and researchers in supporting them): keeping up to date with rapidly advancing research, and the time required to engage. A number of teacher-focused solutions were put forward: introducing a book club to discuss the latest books on the science of learning, attending professional learning events, and collaborating with researchers.

Teachers' Utilization of Research

It was acknowledged that practicing teachers (who were a minority at the pre-conference) would be best placed to progress these conversations and suggest the knowledge they require and the mechanisms by which their professional knowledge is kept updated. Nonetheless, delegates considered how teachers might be supported to implement findings from MBE research into their teaching practices. Teachers need support in both physically and conceptually accessing findings of relevance to their practice. It was generally agreed that the answer was not for teachers to read journal articles. Rather, teachers should be involved in the production of accessible and digestible findings—their involvement helping to make sure that they are relevant and avoid miscommunications.

There was some discussion that training about the scientific process might support teachers in utilizing research in addition to helping them to be more discerning consumers of commercial teaching techniques or programs purporting to be “brain-based.” It was highlighted that in the United Kingdom there are research leads in some schools (as described

by Riggall & Singer, 2016) and a newly formed network of research schools that help to identify where new research is useful and applicable to the classroom, and work to embed it across networks of schools (see <https://researchschool.org.uk/>). Alternatively, hybrid professionals who bridge the gap between scientists and teachers could translate research to the classroom, and feed insights from educators back to researchers.

A similar concept of “neuroeducators” with expertise in both areas was first proposed in the 1980s and has been revisited since (Fuller & Glendening, 1985; Sheridan, Zinchenko, & Gardner, 2006). There are now postgraduate courses which are delivering such professionals, including master’s programs in educational neuroscience and mind, brain, and education. These programs aim to instill a critical appreciation of genetics, cognition, neuroscience, and psychology as they relate to education, and can lead to PhDs in MBE. Participants on these courses are often teachers who are keen to bring an evidence-based approach to their practice, or ex-teachers who can bring their experience and expertise to new research.

Researchers’ Understanding of the Classroom

There was consensus among delegates discussing this topic that researchers working in the field of MBE should develop an understanding of the classroom and the school context. It was considered that researchers should understand the whole school context and that this could be achieved by spending time in a local school, observing lessons, and speaking to teachers. Delegates noted that a better understanding of the challenges in the schools might help in the creation of innovative, collaborative research that might avoid some of the challenges the aforementioned projects encountered. It might encourage more research to be conducted that answers classroom-relevant questions and that is feasible in the school setting. One way this could be encouraged would be for funders to ensure research teams hoping to work with schools had adequate experience of this.

Setting the Research Agenda and Working Collaboratively

Delegates considered how to ensure that some MBE research is driven by the practical needs of teachers. Delegates thought that research questions should be developed collaboratively between schools and researchers, ensuring the outcomes of research are more immediately useable or transferable. A tangible idea suggested was that conversations between teachers and researchers should be regular and ongoing, rather than just at occasional conferences. This would allow ideas from the classroom to stimulate research questions, capturing the two-way goal of MBE: to enable the flow of information in both directions.

A barrier to the involvement of schools in research is the lack of time that school staff have to dedicate to projects outside of normal school business. The suggestion was therefore that funding models need to incorporate funding for schools, enabling teachers to participate fully in projects not only by buying them out of other school commitments, but also in the development of research grant applications.

Delegates also considered the involvement of parents in collaborative research, which is rarely discussed in this field. Including parents in the process might help to allay any concerns about the participation of their children, and increase rates of consent to participation. It could also bring a new perspective to research questions and their implementation, considering that, although many interventions target classroom practice, most of a student’s time is spent outside of school.

The Language of Learning

The final issue discussed was that teachers can lack the language needed to accurately describe learning when talking to students, colleagues, or parents. This led into a discussion of whether it would be beneficial to identify and promote a simple yet accurate vocabulary teachers could use when talking about learning. In schools, discussion about “teaching and learning” is common. However, Watkins (2003) suggested that too often discussions about “teaching and learning” are hijacked by discourse pertaining only to the teaching, or to achievement, omitting arguably the most important outcome: student *learning*. It was suggested that arming teachers with such vocabulary to describe learning could support them to understand and explain why certain practices may or may not work, and enable them to more easily engage in greater professional dialogue with colleagues and also researchers. For example, it would be more compelling for students if their teachers were able to simply explain the mechanisms and reasons for advising specific study strategies, such as that testing yourself or quizzing (the act of attempting to retrieve some knowledge) improves the likelihood of successful later retrieval over and above other practices.

SESSION 3: WHERE DO WE WANT MBE TO BE IN TWO YEARS, AND WHAT DO WE NEED TO DO TO MAKE THAT HAPPEN?

The expert panel from the opening of the workshop regrouped to give their snapshot view on the big MBE challenges still to address. Then each table of delegates was tasked with picking a challenge to define, and working together to start planning an approach to address it. The challenges (14 different ones) picked by the delegates ended up revolving around the four main themes described below.

Ensuring Research Findings Are Useable and Used

Some delegates focused on solutions to the issues raised earlier in the day relating to summarizing and sharing research. Top-down approaches included an online “what works?” database, teacher training courses, and an online space where teachers and researchers could rate these resources. Establishing the value of these materials for teachers might be particularly useful in the design of further resources, and gathering researcher ratings might help teachers to assess the evidence presented. A second group reiterated the need for a basic understanding of neuroscience, and felt that pre-service and ongoing professional development with certification could help to embed this research as an integral part of teachers’ professional knowledge.

What Research Is Relevant and What Counts as Robust Evidence?

Three groups were particularly interested in what counts as evidence of learning. An example focused on math anxiety: Should a researcher’s suggestions of what might reduce math anxiety be shared with teachers, or should a range of approaches to alleviate math anxiety be tested and evaluated before encouraging schools to implement any suggestions? Two groups suggested that a working group drawing on multiple perspectives could develop a set of guidelines to help teachers to assess the strength of the evidence. As one of the aims of IMBES is to “create and develop resources for scientists, practitioners, public policy makers, and the public,” the question of what counts as evidence is clearly an action that the MBE community should take a lead on.

How to Build Effective Research Collaborations Allowing Teachers to Test Ideas in Their Own Context

Extending previous discussions about working collaboratively, some delegates considered how teachers could help build the research base not only by feeding into researchers’ agendas, but by carrying out their own practitioner-led research. Given that each teacher might only be able to conduct a research study with a very small group of participants (making results too low-powered to draw firm conclusions), one group of delegates suggested using a citizen science type model. The idea suggested was that a teacher and researcher could together develop a simple protocol to address a common classroom-relevant question or problem. Teachers nationally or internationally could then run the study in their own context and feed the results into a central system. The results from many small studies from real classrooms would provide large data sets for researchers to analyze. In addition, teachers could provide further data, such as their school and classroom context, which could be of use to other teachers or researchers. A different group that considered a similar challenge suggested a “data dating” website

to connect schools and researchers with similar research interests.

Informing and Influencing Policy to Support Teachers

The challenge of informing policy emerged throughout many discussions, but for one group addressing this was their main focus. It was suggested that by raising awareness of the field of MBE with policymakers, relevant research could be used to inform policies in areas such as curriculum design, teacher training, and assessment. Since few researchers and teachers have expertise in policy, this is another area which requires closer collaboration before the outcomes can be fully realized. However, the first five IBRO/IBE-UNESCO Science of Learning Fellowship holders might be ideally placed to contribute towards this goal, following their additional training in advocacy and policymaking.

CLOSING THE DAY

To end the day, all delegates were asked to complete an evaluation form designed to capture their views of the pre-conference and their intended actions following the day. Below we share a brief summary, and some anonymized quotes where the feedback could be informative for planning similar MBE events. These quotes are not representative of the sample; rather, they are particularly useful comments that highlight tangible aspects of the day that were appreciated or could have been improved.

Features of the day which delegates appreciated included working together to address current challenges—“[Session 3] was very useful in terms of thinking about ‘how’ to actually move forward as a field”; and the composition of the working groups—“I think that our table was effective in [Session 3] because we had people with teaching, research, and policy experience. We disagreed a lot and this was helpful. I think it would be useful for panels and discussion groups to deliberately include these perspectives.”

Two related aspects which a few delegates suggested would have improved the day were an overview of the background of the field—“I would have liked knowing a bit about IMBES history and vision to put things into context” and the provision of prior reading in advance of the day—“it could have been accompanied with a paper to read.” Although the starter session aimed to provide a shared level of understanding, even more could have been done to ensure the varying backgrounds of those present were accounted for. This is something that future conferences in this field, or indeed any field bringing together those with differing backgrounds, might consider including.

The most common themes to emerge from asking the delegates about their intentions following the conference revolved around building wider networks of connections;

developing further or more effective collaborations between the diverse fields; sharing learning with colleagues not in attendance; and incorporating MBE content into home workshops, courses, and professional development. An encouraging theme mentioned by a few delegates was about the nature of their research: One wrote “I intend to ask more educationally relevant scientific questions,” while another wrote “I intend to work on keeping a balance between basic research and creative application in practice.”

TAKE HOME MESSAGES

In summary, the pre-conference hosted many in depth discussions of how to take the MBE field forward. Below, we summarize these ideas in the hope that they will be useful directions for MBE community members, funders, and conference organizers.

MBE Community Members

1. On-going conversations between researchers and teachers are essential, so that the MBE field can get a sense of which areas of research are of most use and interest to the education sector, and to ensure educators are supported with this.
2. Establishing a common language between researchers and educators will help to close the gap between research and practice.
3. Failures should be shared, as well as successes, so that we continue to build knowledge and move forward in the most productive manner possible.

Funders

1. When funding research that will be taking place in a school context, ensure there is funding to support teachers to be able to fully feed into the research design, perhaps even at the stage of application writing.
2. Ensure that research teams planning to carry out research in a school context have sufficient experience or knowledge of this setting.

Conference Organizers

1. Carefully consider what participants should gain from attending the conference and use this aim to guide the approach and agenda for the conference.
2. Think carefully about what and how you will capture the discussions from the day and what would be the most useful outlet following the conference.

3. Take an inclusive approach that acknowledges the differing backgrounds of a multidisciplinary audience and ensures the programming and content is accessible to all.
4. Adopt more practically led, discussion-based approaches that encourage delegates to share their expertise and to think about future directions of the field.
5. Where a conference aims to include educators, ensure the program is relevant and accessible, and make efforts to invite teachers, offering financial help if possible.

FOLLOWING THE CONFERENCE: MOVING THE FIELD FORWARD

The discussions that took place at the pre-conference were important in shaping a Wellcome funding call which resulted in six new projects that aim to address some of the suggested challenges of supporting teachers with the science of learning. The projects include the development of a massive open online course (MOOC) for teachers; two projects developing and testing content to be included in primary and secondary teacher training courses; an online event taking place over 6 months, which will allow teachers, neuroscientists, psychologists, and educational academics to discuss and engage with each other on topics relating to learning; the development of podcasts and Facebook live events as another route to engage teachers on this topic; and a project where teachers will be supported to lead their own RCTs based on science of learning content. In addition, seeing the absolute importance of having a strong input from the education sector, further educational funding from Wellcome is currently considering how best to support schools, teachers, and researchers in our shared endeavor of using insight from research to improve education.

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