**How Can We Create Usable Knowledge in MBE: A Case Study with Number Sense**

**Discussion Item: What do you hope to gain from MBE?**

* Teachers want what has been researched and they want to understand why a “researched” program does not work for their particular students.
* Researches want to share what they are doing in their labs with the people who will apply it (teachers). They want to know: the limitations in a classroom setting; if what they are doing in labs is translated to the real world; and what questions teachers have so they can take those back to their lab. Quote: “I feel it’s my avocation to have this connection between the lab and the real world.”

**Action Item:** Teachers and researchers need a means to continually and openly dialogue.

**Discussion Item: What is MBE all about?**

* MBE is “about” student learning; however, neuroscience and cognitive science tries to describe student learning, while educationalists try to prescribe student learning. The whole goal of MBE is to create better explanatory models in the mind of educationalists.
* The Connell Application Loop describes a model of MBE with iterative and adaptive cycles that include a research question and research, both in labs and in classrooms, via neuroscience, cognitive psychology, and other sciences. The model implies, but does not explicitly include, educational researchers, or teacher researchers.

**Action Item:** Connell Application Loop model of MBE could include another box which

explicitly includes Educational Researcher to the MBE pipeline.

**Action Item:** Agreed upon model for MBE

**Discussion Item: Where do educational researchers fit in?**

* Teachers could be the connection point between theory and practice. Teachers are a major factor in the process.
* Teachers want a say in how to teach, not just apply what they have been told works; they feel they are the ones interacting with students on the ground.
* Teachers want a shared vocabulary between fields that are interested in the process of education.
* Some school districts try to limit the effect of neuroscience on education; one participant stated their district said, "we should take back education from psychology.” Some districts do not allow research to occur in their schools. Some districts are afraid of what research means in the classroom.

**Action Item:** Need a shared vocabulary/definitions

**Action Item:** Address conflicting ideas at the administration level regarding application/

intersection of neuroscience, cognitive science, behavioral science, and pedagogy.

**Action Item:** More teacher researchers; more direct dialogue between educational researchers

and “other sciences” related to MBE

**Discussion Item - Building curriculum, validating curriculum, marketing curriculum and building scope and sequence.**

* Looked at research behind one particular math curriculum. The original researched intervention showed an increase number sense in early elementary. A published curriculum was created after the research. It took 20 years to create and 8 years to the first revision.  The commercial product now states it is for grades K-8; the original research was not tested across those grades.
* In terms of scope and sequence, we don’t know what sequences work or for how long those sequences should be taught. Teachers are concerned not only about what to teach, but when to teach it and how to deliver it to students.
* Teachers do not have the time to test products/curriculum, yet they need a curriculum that has been tested and proven to work so that they can try to apply in their own class.
* Context is important. What works in one setting might not work in another. There are many good ideas, but not all good ideas work in all contexts.

**Action Item:** A research validation step is important in the MBE pipeline.

**Action Item:** Research in scope and sequence across many contexts**.**

**Discussion Item: Looking at an Educational App Based on Learning Science**

* Presenter explained and showed how the app "Native Brain" works. App begins with mapping numerical vocabulary to a “rod” that correlates in size to that specific number word. One participant asked why the rods were solid with no lines to divide these into blocks. Another participant replied that she had this same concern but that when she used it in her class, students did not have any problem with it; so she asked her students about this. One student said they looked at it as a water bottle that increases in amount when you pour water in it, so that means it has more water in the bottle. Teacher said this showed a transfer that she did not expect and that what seems to happen is that we look at things from an adults’ perspective, one that has already mastered a concept, and not from a student’s perspective. A second teacher who had used this app concurred. Another participant said that we might have to test the idea that adding a bar to the solid blocks might help with student understanding. A researcher stated they wondered the same thing when they looked at the app.

**Action Item:** Research is needed on how children map numerical vocabulary to magnitude

using objects such as rods (with and without lines)

**Discussion Item: Empowering The Teacher – “Assessment and Classroom Learning"**

* The dashboard in "Native Brain" shows live data to the teacher so he can see where his students are in their app, their progress, if they need help.
* One participant stated that products coming from the research side are “too fancy” and that teachers are feeling these products are trying to substitute their job, because the interaction is mainly between the student and the product. Another participant suggested that apps are like games to kids and that kids like to help each other. Second participant stated she wondered about the aspect of learning being social and how this relates to apps, but that she did not think it removed the social part of learning because students still interact with each other by providing help to each other, or asking for help; and the teacher provides help and assistance too.
* Presenter continued showing various dashboards and discussed how various students have different needs in terms of how many hours were needed. One student spent 128 hours and still did not finish all the activities. They also discovered that some teachers were not providing intervention when the dashboard showed a student was struggling. A participant asked what they provided in professional development. One participant stated she had dialogued with a doctoral student who used the app and but did not understand some of the aspects. Presenter discussed the nature of text books and the amount of time and effort it takes for teachers to read through the pedagogy included in single lesson plans.
* The goal of all educational apps/products is to ensure students who use them show significant success compared to those who have not used them. The difficulty is in measuring/validating this. One participant asked about transfer effect of this app**.** Presenter replied they have tried, unsuccessfully, for two years; for one because they have no funding.A participant stated that she had tried for two years, too, but that in two different school districts the research was denied as it did not align with their current goals.
* This participant stated she was able to conduct pilot studies, but found that finding a validated screener to look for convergent validity proved unsuccessful, mainly because the screeners are too broad. One researcher stated that one particular screener mentioned was good, but that it had limited use; and another screener was designed specifically to measure a particular curriculum. One participant stated that perhaps we need to look at “scaling down” research as had been discussed throughout the conference.
* One participant asked, “What would transfer look like for understanding of numbers from 1-9?” No one had a reply. One researcher stated that these things should be researched. The participant then stated, “There is a room full of researchers, which one of you is going to research this?” One researcher said they would look at it; the same participant said, “Ok, I will e-mail you in six months to ask how that research is going.” Researcher said, “Do! I can’t promise we will have started anything because we all have other things going on, but do check on us.”
* Another participant stated that tracking students who used the app as they grow and take the state mandated test could be the next project, and some of their district curriculum staff been approached to do this.

**Action Item**: Research is needed on how students learn on apps vs learning through teacher

led instruction and should include the social aspects of learning.

**Action Item**: Professional development is needed for elementary teachers in teaching math

Apps and software can provide this too.

**Action Item:** Find researchers willing to research already developed educational interventions.

**Action Item:** Develop understanding of transfer for number sense of numbers less than ten.

**Action Item:** Longitudinal research of students using this app, or similar, and their scores on

state mandated tests.

**Discussion Item: Format of Session**

* Conversation and dialogue did not exactly follow time frame assigned, but was free flowing based on presenter’s points and participants’ questions and comments. After briefly mentioning that session had digressed, all participants agreed they preferred this free flowing dialogue. Researchers stated they liked hearing from teachers and teachers stated they liked the access to researchers to discuss their concerns.

**Action Item:** Need for less "lecture" type sessions and more small informal sessions to

generate dialogue and action items