

What Can We Learn from Research?

OFTEN research is looked to for answers to questions regarding teaching practice. Understandably so—with schools looking to ensure that *all* students succeed in mathematics—educators want to know what curriculum or teaching strategies will ensure students' success, and they want the research to tell them. With the vast number of research studies available, the task of understanding what research says and how to apply it in classrooms can be daunting. The goal of this brief is to provide some guidance on how research can be helpful in guiding practice.

When the goal is to apply research to practice, the tendency is often to just look at the results. For example, someone might look across several studies with attention focused on whether using a particular curriculum raises students' test scores. It is important to look for more than just outcomes such as whether or not a program raises student achievement. Research is most useful when it provides an understanding of why a particular program works (Hiebert 2003). The results of the study—that test scores improved—do not help us understand the important details surrounding the implementation. For example, if the research is about a particular curriculum, do we know if the teachers received professional development before using it in the classroom? Did all teachers use the materials in the same way? Did some teachers supplement it with other materials? These types of details, as well as factors about the context of the school and the students are important to understand, especially if the goal is to take the program and implement it in a particular school.

There are other parts of studies that can guide practice as well. Silver (1990) noted that inquiry methods used and tasks given to participants in research studies can be adapted and used in classrooms as well. The tasks used in studies are carefully chosen and tested by researchers to ensure that the tasks assess what is intended to be measured in the study (Sowder 2002). These tasks, carefully constructed to measure students' understanding in a research study, can be used by teachers to assess their students' learning. General research techniques can be useful for the classroom as well. Silver (1990) points out that although teachers might not have the time to conduct the types of detailed interviews found in research studies with each of their students, they

can use general inquiry methods. For example, teachers can ask probing questions, similar to those used by researchers, to uncover what students understand and misunderstand, as well as to encourage students to discuss their thinking out loud.

Research can also shed a new perspective on mathematics education. Theoretical ideas that provide foundations in research studies for understanding the teaching and learning of mathematics eventually influence the classroom (Silver 1990). For example, the influence of constructivism, a theory of learning that suggests that students “actively and personally construct their own knowledge” (Silver 1990, p. 7), can be seen in today's mathematics curriculum, standards documents, and classrooms. More specifically, research findings can shed a new light on a problem of practice for teachers. Research on student learning can be of great use to teachers especially when the findings offer teachers ways of helping students who struggle with particular concepts. For example, becoming proficient with multidigit operations is an important part of elementary school. In a longitudinal study of students' use of invented strategies for these operations (Carpenter et al. 1998), results showed that when students invented strategies before learning the standard algorithm, they had a deeper understanding of multidigit operations and were less likely to make errors (Jacobs 2002). These findings suggest to elementary school teachers the benefit of encouraging students to explore invented strategies before introducing the standard algorithms.

One criticism of research is that it is often inconclusive. This makes it truly difficult for practitioners to apply research to practice. We do know quite a bit from research about mathematics teaching and learning. This knowledge does not come from looking at one or two studies on a topic. Instead, it comes from looking across many research studies on an issue of practice and finding convergence in the findings. By looking at multiple studies and finding patterns in the findings, we can be confident in applying the results to practice (Hiebert 2003).

Syntheses of research or literature reviews such as those found in the *Second Handbook of Research on Mathematics Teaching and Learning* (Lester 2007) or in *A Research*

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Companion to “Principles and Standards for School Mathematics” (Kilpatrick, Martin, and Schifter 2000) do this work for us. Literature reviews analyze a breadth of studies on a particular topic and summarize the findings. However, they are most often written for the researcher audience and not the practitioner audience. Practitioners as well as researchers need to know what research says, and therefore benefit from summaries of research. For example, NCTM’s research briefs and clips provide such syntheses of research and are written concisely for practitioner audiences (these can be found at www.nctm.org/researchbriefs.aspx).

Research is a useful tool for practitioners in that it can furnish insight into what is happening in the classroom. Research can help guide decisions made about curriculum, instructional practices, and what students should learn. With so much research available through the Internet, professional journals, and the media, it is important to make good informed decisions on what to read and how to apply it.

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