

## **DG 2: The Relationship Between Research and Practice in Mathematics Education**

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### **Aims and focus**

The theme for the discussion group was intended to focus on how different practices in preparation for learning are related to influence teachers' view on learning of mathematics, and how these views are related to theoretical aspects of mathematics education. Research in this tension between theory and practice will develop more knowledge about favourable approaches to education in school and to pre-service and in-service education of teachers.

We were interested in paper that articulated issues or dilemmas that would help the DG to organize the following three themes:

1. What kind of research has led to changes in practice?
2. Where and how should the interaction between practitioners and researchers take place and be organized?
3. What are the forces that govern the evolution of mathematics education research and what are the ultimate goals of mathematics education research?

In response to the call, two papers were sent and accepted as a base for the discussion.

### **Linking Research and Practice: What are the Research Needs of US Practitioners**

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Over the past several years, the National Council of Teachers of Mathematics (NCTM) has been committed to making contributions to strengthening the link between research and practice. As part of this initiative, NCTM has commissioned "Research Briefs and Clips", a set of online tools developed with the intent of communicating research findings to practitioner audiences. This paper suggests some of the topic areas in which practitioners are most interested and offers reflections on providing practitioners such answers. The practitioners are most interested in research about mathematics programmes, mathematics textbooks and research-based teaching strategies related to curriculum. Which particular curriculum program is the best to use? A lack of research on curriculum mentioning goals for student learning is one indication of a disconnect between research and practice.

### **The Research in Mathematics Education, the Researchers and the Mathematics**

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This article is a part of doctorate research which investigates the relationship between research and classroom in mathematics education with special attention to documenting processes related to the following questions. What is the impact of mathematics education research in the classroom? How do research and researchers relate to the classroom? What do researchers have to say about the mathematics classroom, and what has it shown them? The paper describes the introduction to the study object, theoretical underpinnings, methodology and data collection and some partial results in progress and conclusions. The conclusion of this research indicates that the relation between research and classroom in mathematics education is a very complex phenomena with multiple perspectives.

The Discussion group met on three occasions, twice in smaller subgroups and once in a larger group. As a result of the discussion this report is under two headings.

## **1. Relationship between researchers and practitioners in different countries**

Each member of the group contributed their thoughts on the relationship between researchers and practitioners in their country. Below is a summary of the reports from the countries present.

*Taiwan:* There is a definite hierarchy with researchers at the top and teachers below. This is in a large part due to the status of education in the country. Researchers have more education and as such their work is valued by teachers. In Taiwan, teachers are required to participate in professional development, and it is researchers who conduct this professional development. Teachers typically do not do much research, but the national government has sponsored a competition for teachers to present their action research. Researchers are the evaluators. Also, a federal funding agency encourages schools to enter proposals to conduct research in conjunction with researchers. The schools solicit researchers to help them conduct the research.

*Brazil:* There is a large disconnect between researchers and practitioners. The major issue is that practitioners do not understand research, and, in particular, they are not able to understand the language with which research results are reported. Researchers see their work as a way of contributing to practitioners.

*Puerto Rico:* Mathematics education in this country is tied very closely to USA which means that research is in English while most teachers speak Spanish. In order for teachers to make sense of the research, it has to be translated. This causes a major disconnect.

*Sweden:* The National Center for Mathematics Education in Gothenburg, has a large impact on the relationship between researchers and practitioners. Under the direction of this center, researchers work with districts and schools to improve mathematics education at a local level. They work together to develop research questions and to investigate them with the goal of improving education. The center facilitates the organisation of researchers and practitioners to collaborate.

*Finland:* Researchers writing in English makes the relationship between research and practice a difficult one. However, writing in English for an academic audience is necessary for tenure purposes.

*United States:* As with other countries, tenure requirements and researchers writing in an academic language make it difficult for practitioners to connect to research. In addition, many teachers view research as a “fad”. Thus they do not pay it much attention and see it as something that they can wait out. Hence they do not change their practice based on the research. One group that is often left out of this discussion are mathematicians—practitioners and teachers of students at the university level. This group also needs to connect to the research on mathematics teaching and learning.

*Germany:* Teachers are not typically involved in research unless they are working on a doctoral degree where they tend to focus on everyday questions with little emphasis on theory. In other cases, teachers are involved if they are the subject of a study.

*Portugal:* The academic language used by researchers is a problem for teachers. Thus, it is difficult to find articles that can be used with teachers. It is possible to find pieces of articles that are helpful but never a whole article that could be used.

## **2. What should the interaction between researchers and practitioners look like?**

The Math-Science Partnership model funded by the US National Science Foundation funds teams of researchers to work with districts in focusing on solving problems with the goal of making improvements to teaching and learning. This is a good model because the researchers and practitioners (in the best case scenario) form a team to look closely at the particular issues of practice in the district. However, the success of this model has depended on the people involved. There are some similarities between this model and the one described by the participant from Sweden.

A second idea was that there is a lot of the disconnect between the questions practitioners want answers to, and the questions researchers see as researchable. Teachers are often more focused on student performance while researchers are focused on learning or teaching detail.

In the US, there has been concerted effort to publish documents on research for practitioners. One example is a recent publication from the Mathematical Association of America (MAA) to provide research ideas for the undergraduate mathematics professor.

Designed-based research projects that focus on intervention in school districts are promising collaborative efforts. The teams of researchers from different areas (mathematics education, mathematics, and cognitive science) with practitioner partners provide a different expertise and contribute to the success of the project.

A suggestion was made that research should be a bigger part of curriculum materials—and should be included in the teacher materials—to make clear to practitioners the research supporting choices in the textbook. This suggestion led to a discussion that we should move beyond focusing on practitioners as consumers of practice, only. Linking research and practice should mean more than just providing practitioners with large-scale studies focusing on student achievement. Practitioners can also benefit from looking at case-study research. This might be more meaningful.

In several of the countries, masters degrees are required for all teachers either as part of the pre-service education or as part of their continued education. It was suggested that a masters degree culminating with the writing of a thesis might provide teachers with more appreciation and understanding of research.

## **Summary**

The relation between research and classroom in mathematics education is a very complex phenomena. Practitioners are looking for definitive answers to questions and it is difficult for a researcher to provide definitive answers. The research is often geared towards the research community and the research text is written in ways difficult for teachers to understand. The research results are mostly used in national curriculums, teacher education, and in textbooks.