Mathematics Education Research Across the World

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Mathematics Education Research across the world

- As in other fields, research in mathematics education, is led by developed Western nations.
- However, there has been a trend of growing internationalization or globalization.
- The reasons and circumstances of this globalization are interesting.
- This will be my focus.
- Some trends in mathematics education research
- Organization of mathematics education and research

Globalisation of Mathematics Education Research – where do we see it?

- PME conferences since 1980 have been in several countries outside Europe/ North America/ Australia:

  Mexico (2), Japan (2), Brazil (2), South Africa, Israel (2), Korea, Turkey
- In East Europe: Hungary and Czech Republic, once in Finland.
- Holding a serious research conference like the PME is an indicator of a sizeable community of researchers in mathematics education

Growth in Graduate Programs in Mathematics Education – some examples

- South Korea has 18 universities offering a Ph.D. in mathematics education (as of 2008).
- It publishes at least two research journals in mathematics education, besides other types of journals in mathematics education.
- In the decade of 1990s there were 3214 master's and doctoral dissertations in mathematics education. (Choi and Song, 2000)
- Turkey has graduated 71 Ph.D.s in mathematics education in the last 10 years. 134 students are currently enrolled. (Presentation at PME, 2011)
- More than 50 doctoral dissertations in mathematics pedagogy defended in Russia since 1999. (Karp & Leikin, 2011)

Mathematics education research has a practical focus

- A definitive feature: mathed research is situated in particular contexts, and connected to questions of policy, planning and practice.
- Systematic, rigorous, critical and reflective study, using the methods of scientific inquiry, of problems of mathematics education and their possible resolution
- Not something that some countries need more or some less

Globalization of mathematics education research: external factors

- The role of ICMI and similar international organizations
- Ethos that welcomes diversity
- Supporting regional conferences
- Research journals that explicitly seek to represent the diversity of international perspectives
  - Zentralblatt für Didaktik der Mathematik (ZDM)
  - International Journal of Science and Mathematics Education

Globalization of mathematics education research: International comparisons

- TIMSS and PISA
- TIMSS held in 1994, 1999, 2003, 2007
- PISA in 2000, 2003, 2006 & 2009
- The most striking result was the consistent top performances of East Asian countries in both TIMSS and PISA.
- This led to a flurry of debates, reform efforts as well as research.

TIMSS Performance

Country	1999	2003	2007
Singapore	1	1	3
South Korea	2	2	2
Taiwan	3	4	1
Hong Kong	4	3	4
Japan	5	5	5
Finland	14	-	-
Netherlands	7	7	9
Belgium	6	6	-
Hungary	9	9	15
Russia	12	12	6
US	15	15	11
England	20	18	7
Australia	13	14	14

PISA Performance

Country	2000	2003	2006	2009
Singapore	-	-	-	6
South Korea	2	5	4	3
Taiwan	-	-	1	11
Hong Kong	-	1	3	4
Japan	1	9	10	9
Finland	4	3	2	2
Netherlands	-	2	5	12
Belgium	9	11	12	20
Hungary	22	25	27	27
Russia	23	33	34	38
U.S.A.	20	24	35	31
U.K.	8	-	24	21
Australia	5	8	13	15

Research following international comparisons

- What accounts for the superior performance of some countries?
- The TIMSS 1995 and 1999 video studies looked closely at classroom teaching in a variety of countries: Japan, U.S., Germany, Hong Kong
- Results of the TIMSS video study published in a book The Teaching Gap (1999) by James Stigler and James Hiebert.
- Followed up by closer analysis of the 1999 study

Classroom teaching comparison

- The classrooms in the high-ranking countries like Japan, Hong Kong, the Netherlands, Czech Republic, Australia follow different strategies and pedagogical approaches.
- What is common?
- Students are actively and intellectually engaged in the tasks.
- There is a focus on important mathematics by the teachers and the students.
- In countries like the U.S. teachers spoke about new pedagogy, but their understanding of mathematics was weak.

Studies of teacher knowledge

- Is there a difference in the teachers' knowledge of mathematics, and their attitude to mathematics?
- Brought out in a dramatic fashion by a study by Liping Ma published in 1999 in the book “Knowing and Teaching Elementary Mathematics”
- U.S. and Chinese teachers were compared, and the knowledge of Chinese teachers of elementary mathematics was profoundly deeper.
- Famous example: $1\frac{3}{4} \div \frac{1}{2}$
- Led to a flood of studies on subject knowledge needed for teaching mathematics

Studies of teacher development

- The Teaching Gap described in great detail a practice followed by Japanese teachers to improve their teaching called **“Lesson Study”**.
- Principles were simple: teachers would get together to plan a lesson in detail. One of them would teach it while the others sat at the back.
- After the lesson there would be a detailed discussion and critical analysis. The lesson would be polished and taught a second time by another teacher.
- It would then be written up and published.
- This practice was over 100 years old!

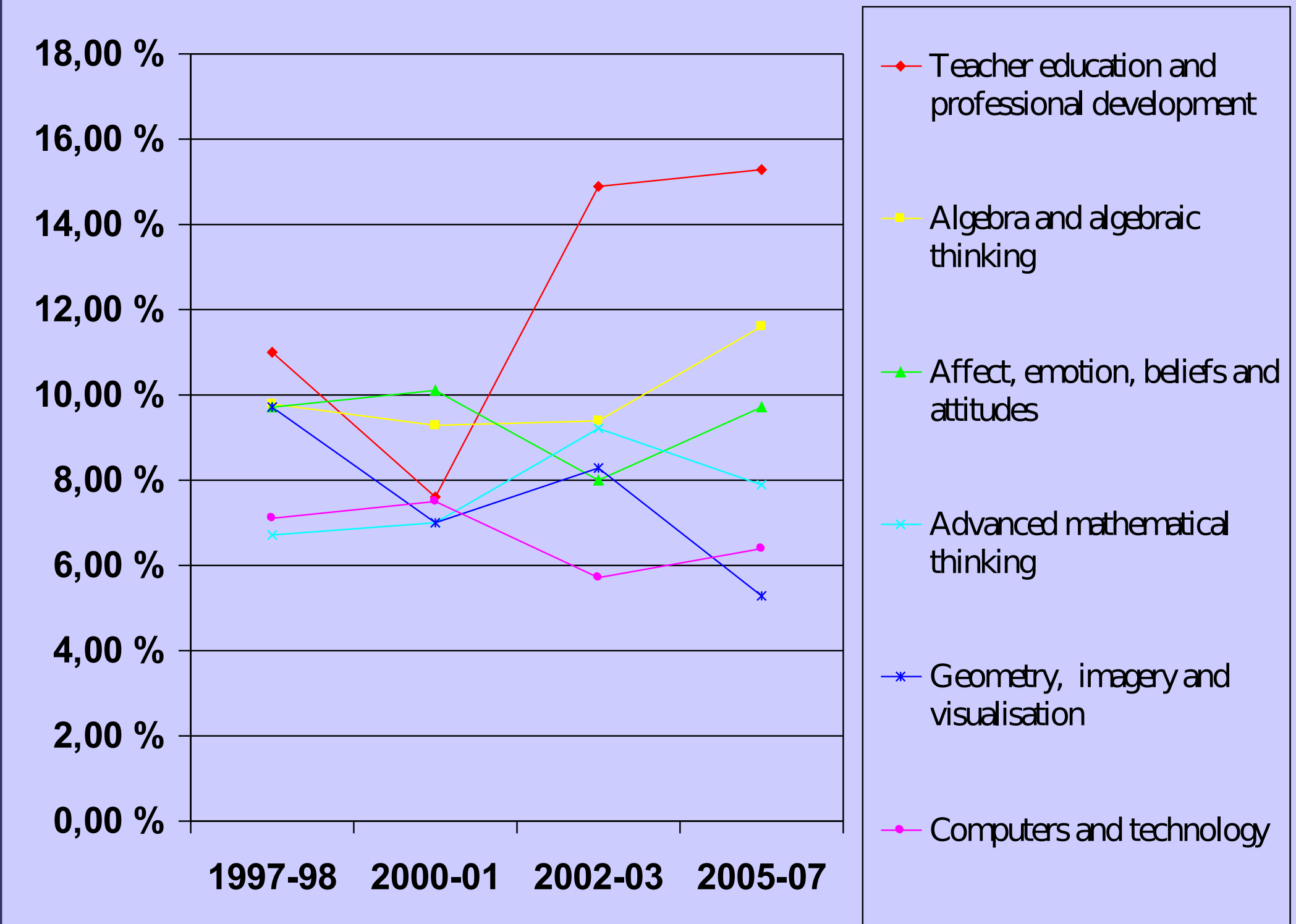
Response to International comparisons by East Asian researchers

- There is much variation in the curriculum and pedagogy in the East Asian countries.
- There is also a dynamic tradition of curriculum reform, of changing the organization of teacher preparation, influence of ideas from the West.
- East Asian researchers identify cultural and social factors as being very important in accounting for the high performance.
- A tradition that highly values learning, high status of teachers, competitive culture, etc.
- Leung & Li (eds.) Reforms and Issues in School Mathematics in East Asia

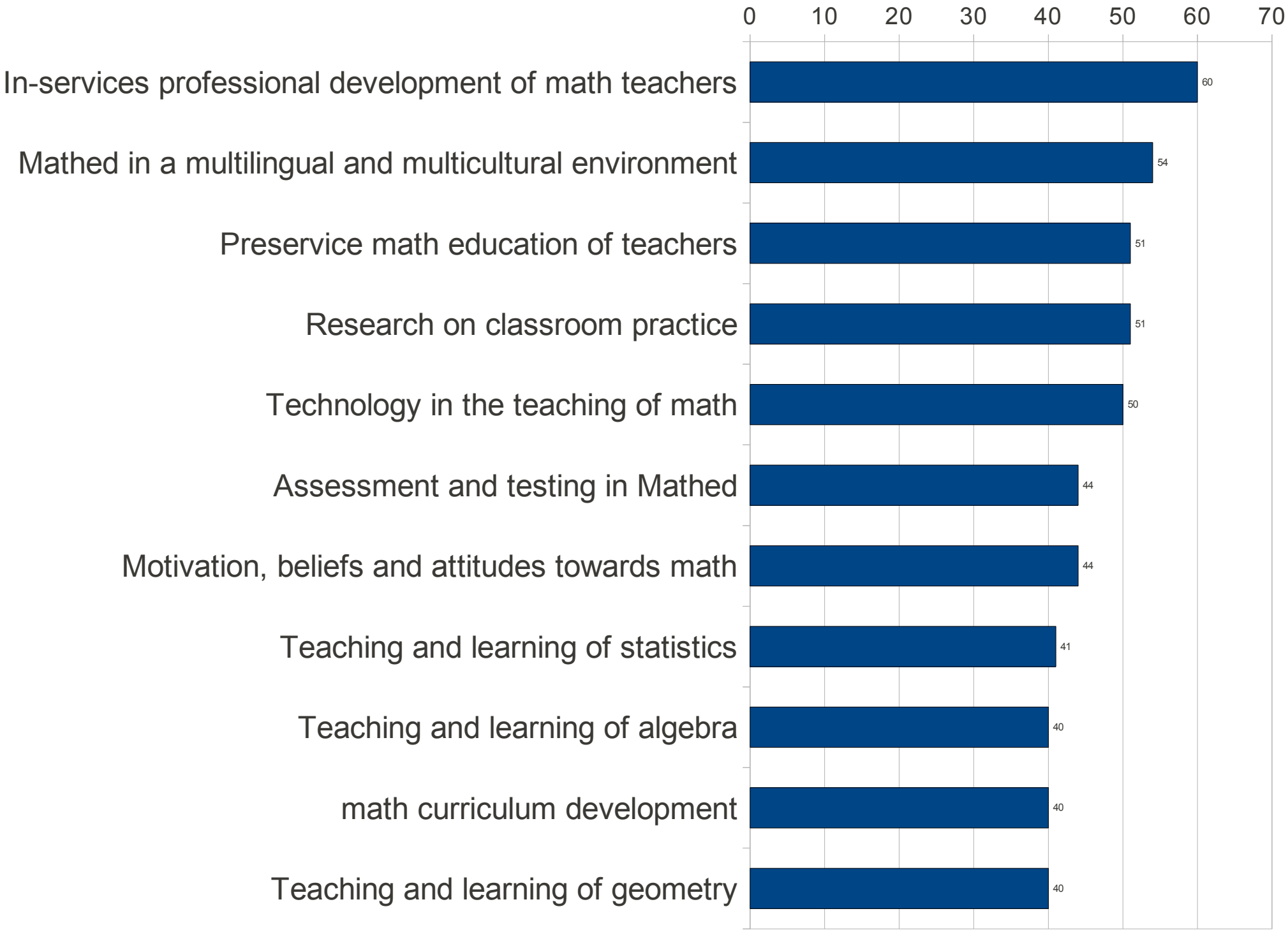
What trends do we see in mathematics education research now?

Place PME handbook cover here

From Hannula, 2009



ICME-12 Topic Study Group submissions



Theoretical frameworks and methods

- Psychology and mathematics education: errors, alternative conceptions, beliefs about mathematics
- Large scale assessment
- Co-relational studies of process and outcomes
- Experimental studies
- Design experiments
- Classroom studies; discourse analysis
- Case studies
- Studies of affect
- Wide range of theoretical perspectives

Location of research in mathematics education

- Universities
- Departments and colleges of education
- Scientific research institutes

Thank you !