‘Re-sourcing’ mathematics teachers’ work? - the potential of curriculum materials and textbooks

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Structure of the presentation

- What are resources? - Mathematics resources in/for teaching
- Our interest: teachers' interactions with curriculum materials
- (Theoretical frameworks for investigations)
- Textbooks and mathematics teachers' work

What are 'resources' in mathematics education?

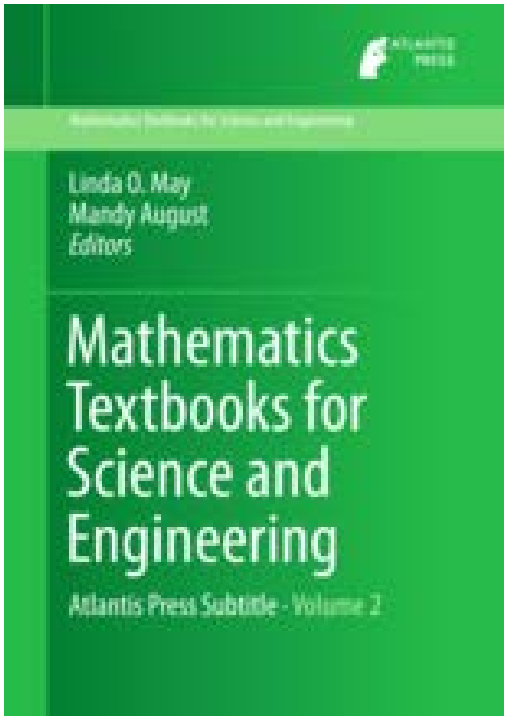
"We define mathematics teaching resources as all the resources which are developed and used by teachers (and pupils) in their interaction with mathematics in/for teaching and learning, inside and outside the classroom. Resources are essential for mathematics teachers, and teachers use different kinds of resources which shape the mathematical content presented to, and used by, pupils in their mathematics learning. Moreover, when appropriating resources, teachers adapt them to their needs and customs. This process of 'design' and interpretation of resources then continues 'in use'– hence transformation is seen here as 'design-in-use'."

(p. 1, Pepin, Gueudet & Trouche 2013)

Mathematics resources in/for teaching

Mathematics resources in/for teaching

Text resources



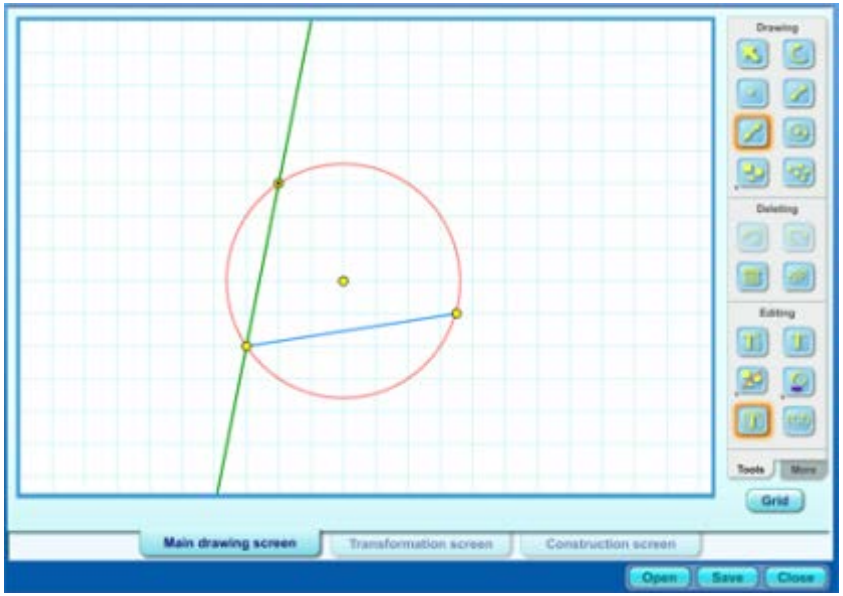
Mathematical tools

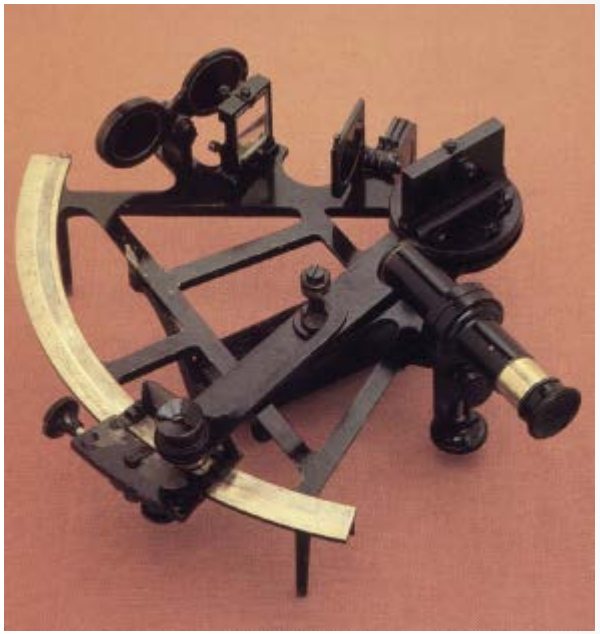
Designed and used by

teachers (& pupils)

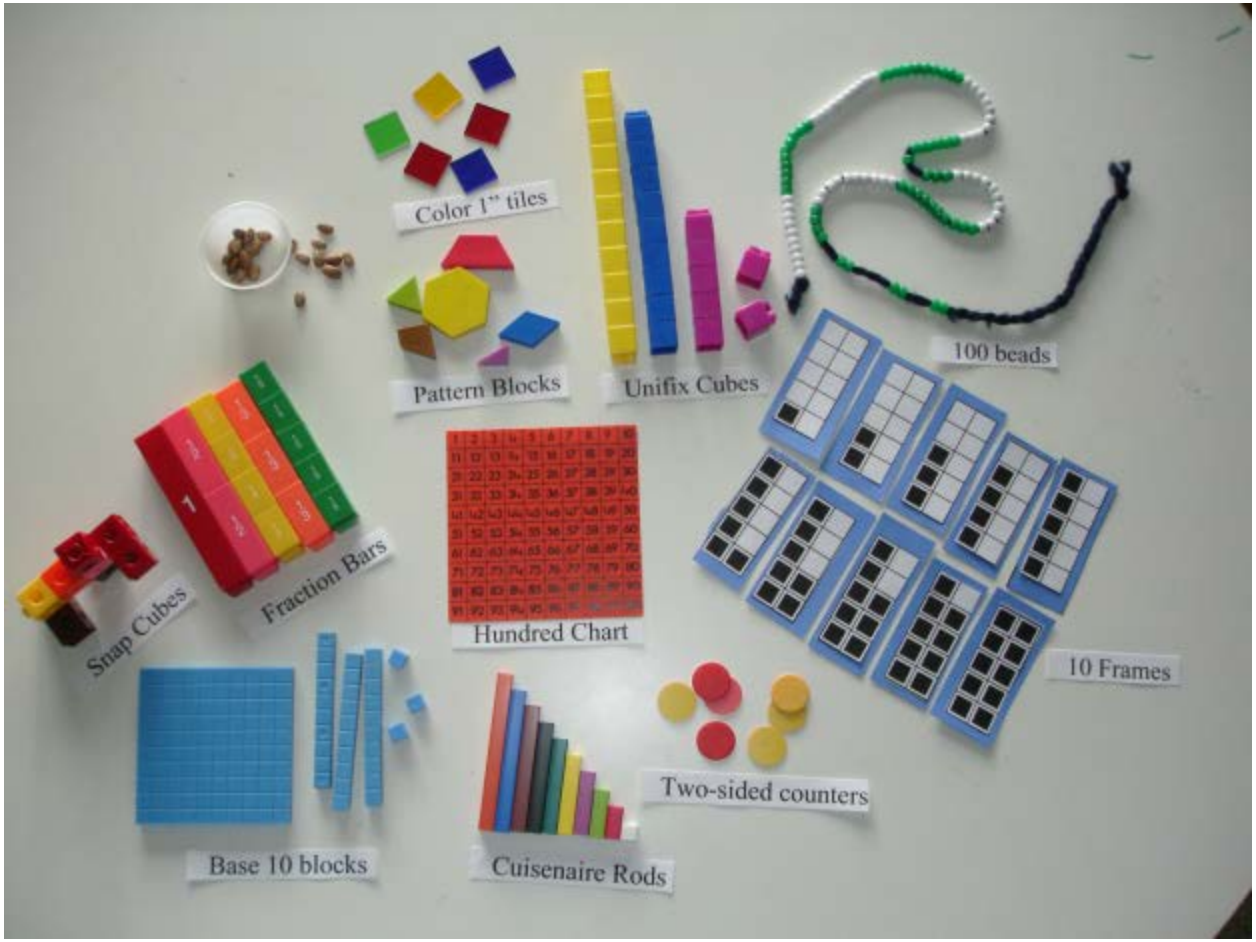
Developing resources …

Digital/ICT resources

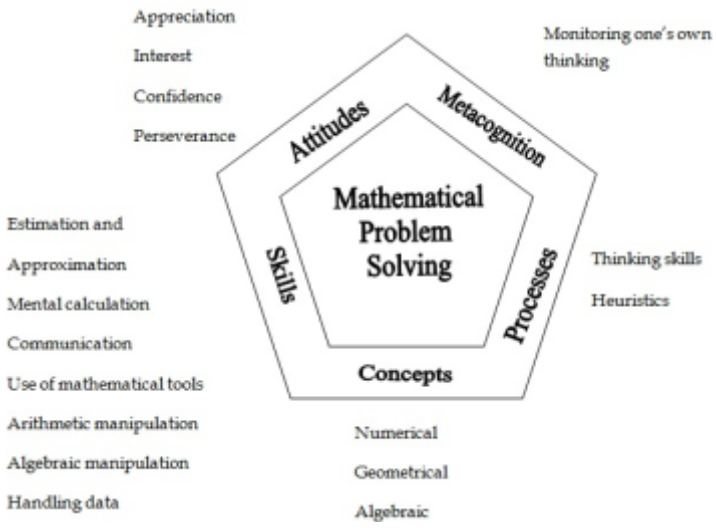




… manipulatives and representations



… 'personal' resources



Our interest:

teachers' interaction with curriculum materials

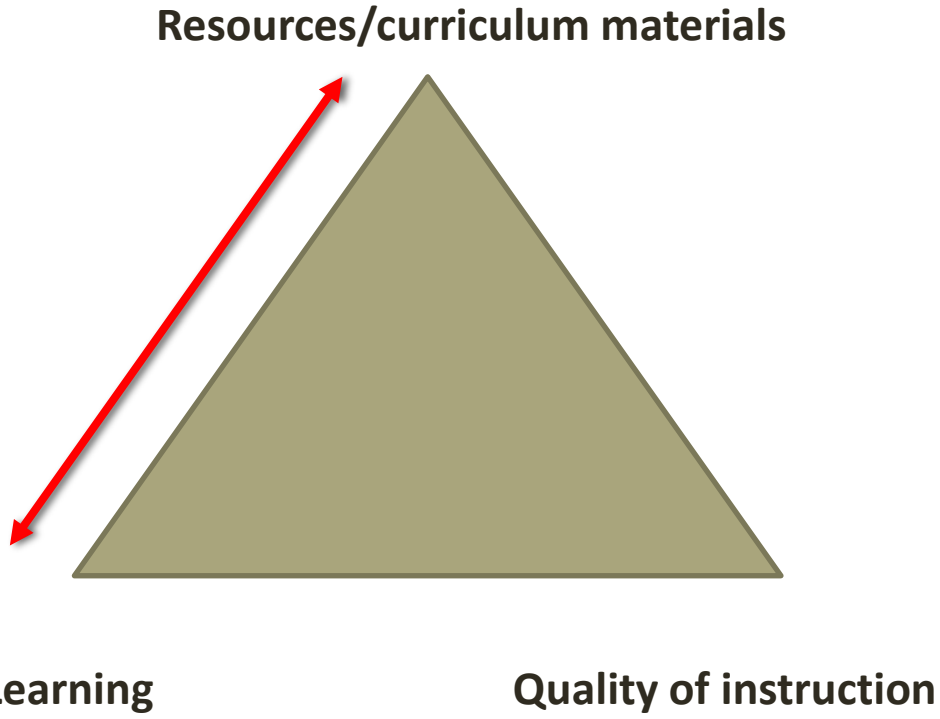
Interaction/s between teachers and resources:

Teachers work with resources all the time:
creating; changing; sharing them in and out-of-class.

Teachers work with/on resources
-> **Interaction between teacher/s and the resource/s**

Teacher/s <- > Resource/s

In order to understand the relationship between …



Pepin, B., Gueudet, G., & Trouche, L. (2013).

Re-sourcing teachers' work and interactions: a collective perspective on resources, their use and transformation. *ZDM, The International Journal on Mathematics Education, 45*(7), 929-943.

Gueudet, G., Pepin, B., & Trouche, L. (2012).

From text to 'lived' resources: curriculum materials and mathematics teacher development. New York: Springer.

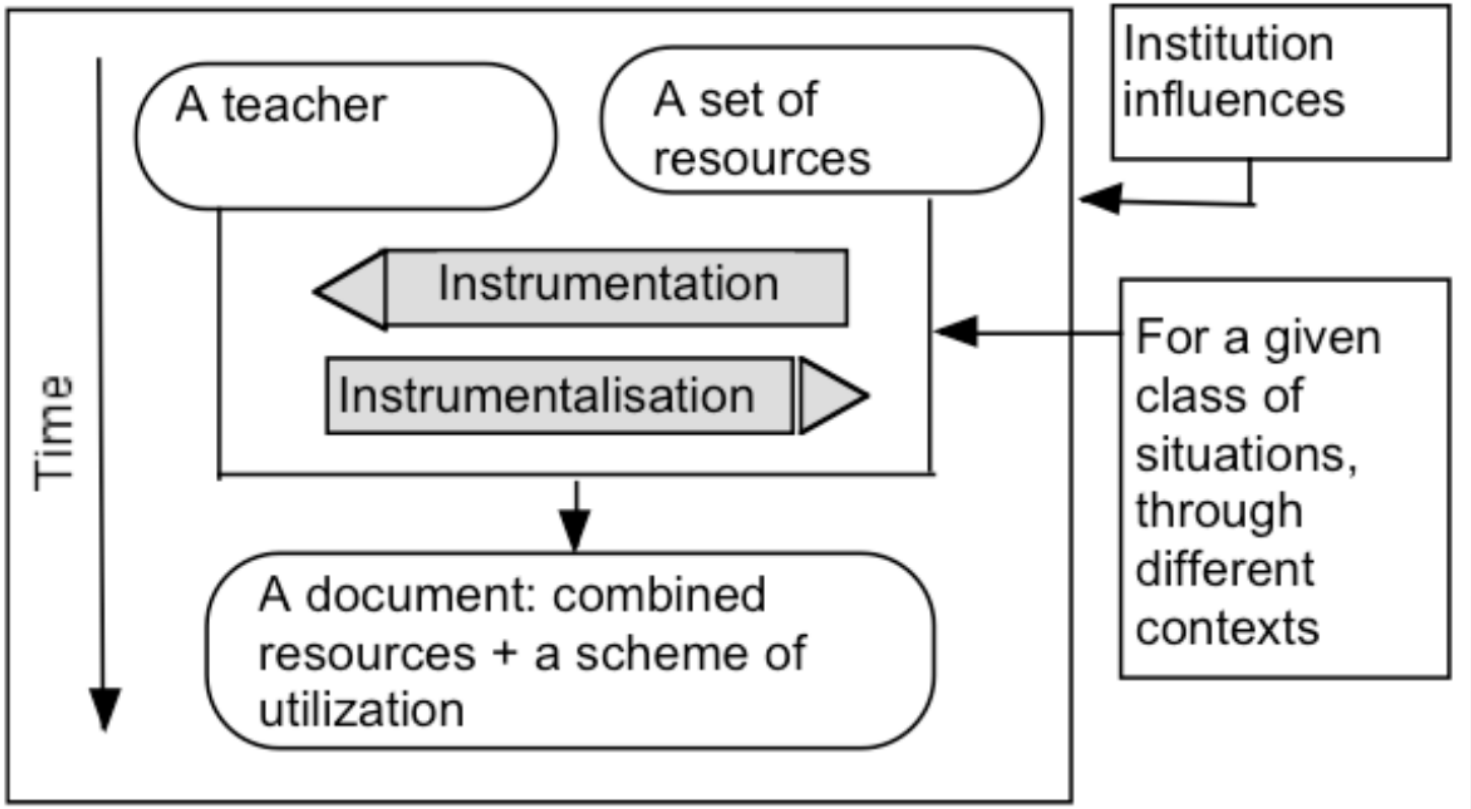
Section 1: Teacher resources

Section 2: Text and Curriculum resources

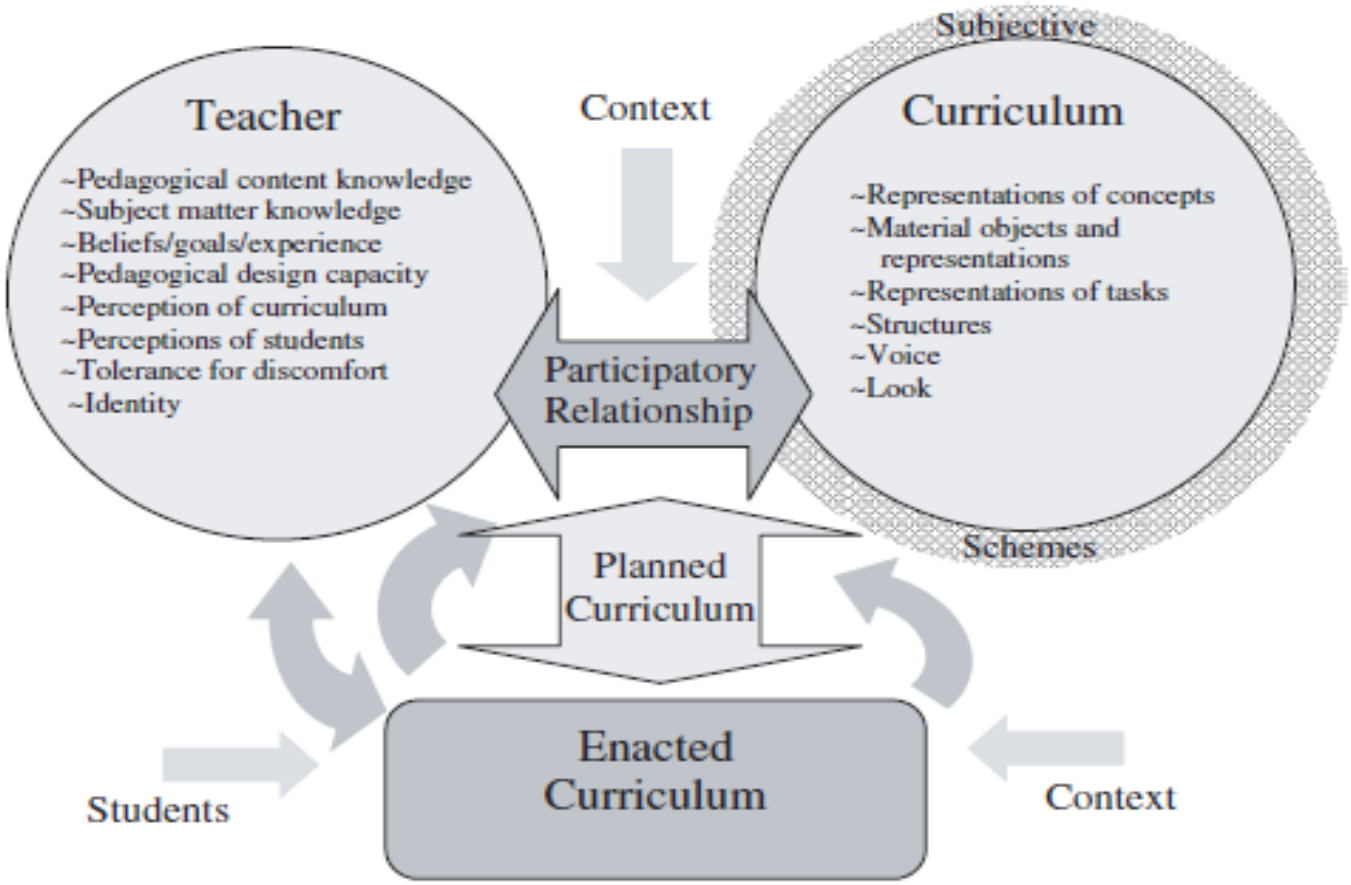
Section 3: Use of resources

Section 4: Collaborative use

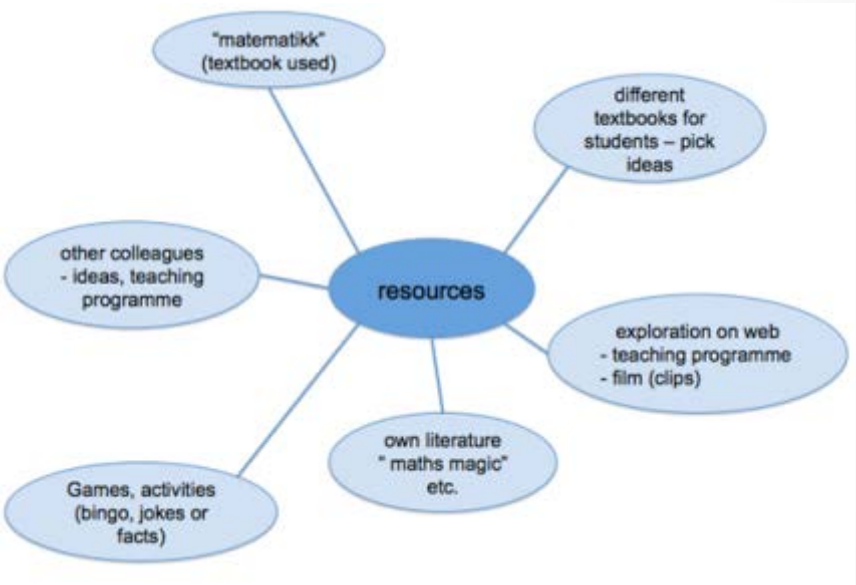
Documentational genesis – Gueudet & Trouche 2009



Interpretation of/participation with resources – Remillard 2005
Teachers' *design capacity* – Brown 2009



Example: a comparison of two teachers' resource systems – Inga (Norway) and Vera (France)

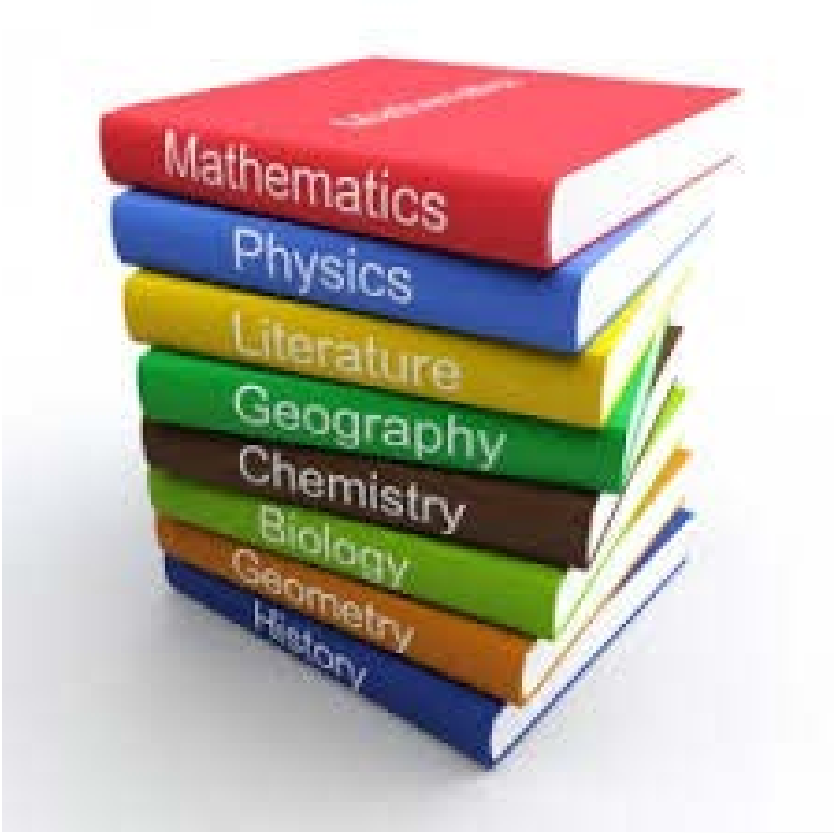


Gueudet, G., Pepin, B., & Trouche, L. (2013). Collective work with resources: an essential dimension for teacher documentation. *ZDM, The International Journal on Mathematics Education 45*(7), 1003-1016.

Textbooks and mathematics teachers' work

International textbook research

According to TIMSS,
mathematics textbooks,
for better or for worse,
are the main resources
used in mathematics
classrooms around the world.



Different aspects of textbook research

At the developmental level:

What are the approaches and practices in developing school mathematics textbooks? e.g. in China: Li, Zhang & Ma 2009

At the systemic level:

Where are textbooks situated in terms of the intended and enacted curriculum, between policy and practice? e.g. Pepin, Gueudet & Trouche 2013

At the classroom level, their role in teaching & learning:

Can mathematics textbooks cultivate shallow teaching,

or promote (deep) learning?

e.g. Vincent & Stacey 2008; Shield & Dole 2012;

Different aspects of textbook research

Textbook evaluation:

How do textbooks conceptualise and organise

- particular mathematical content? e.g. Li, Chen & An 2009
- particular mathematical 'notions' (e.g. reasoning)?

e.g. Stacey & Vincent 2009

Values in textbooks:

What are the mathematical and mathematics educational values conveyed in textbooks? e.g. Seah & Bishop 2000; Pepin & Haggarty 2001.

Different aspects of textbook research

Textbook use
(by teachers or pupils):

How do teachers
use textbooks?
e.g. Pepin & Haggarty 2001;
Remillard 1999;
Zhu & Fan 2002;
Nicol & Crespo 2006

How do pupils use
textbooks? e.g. Rezat 2006

Example: A comparison of the design and conceptualization of two very different French lower secondary (6th grade) mathematics textbooks

Gueudet, G., Pepin, B., & Trouche, L. (2013). Textbook design and digital resources. In A. Watson & M. Ohtani (Eds.). Designing and using tasks for learning mathematics, 22nd ICMI study.

- Helice 6ème

www.editionsdidier.com/article/helice-6e-livre-cd-rom/

- Sésamath 6ème

http://www.sesamath.net/

Example: An investigation of 'quality' and 'coherence' in mathematics e-textbooks, related to design and use of e-textbooks

"… we can define an e-textbook as an evolving structured set of digital resources, dedicated to teaching (and learning), initially designed by different types of authors, but open for re-design by teachers, both individually and collectively. "

(Pepin, Gueudet, Yerushalmy, Trouche & Chazan 2015)

Pepin, B., Gueudet, B., Yerushalmy, M., Trouche, L. & Chazan, D. (2014) E-textbooks in/for Teaching and Learning Mathematics: A Disruptive and Potentially Transformative Educational Technology. In L.English & D. Kirshner (Eds.) *Handbook of Research in Mathematics Education*, 3rd Edition. Taylor & Francis.

Example: the design of an e-textbook by teachers - a developmental process

The development of the Sésamath textbook for grade 10: Mathematics teachers and ICT specialists working together.

Gueudet, G., Pepin, B., Sabra, H. & Trouche, L. (2015) Resources, task design and mathematics teachers' collective engagement: towards e-textbooks as shared living resources. *Journal of Mathematics Teacher Education*.

Thank you!