Plato missed the point! The social and political flesh and blood of mathematics education

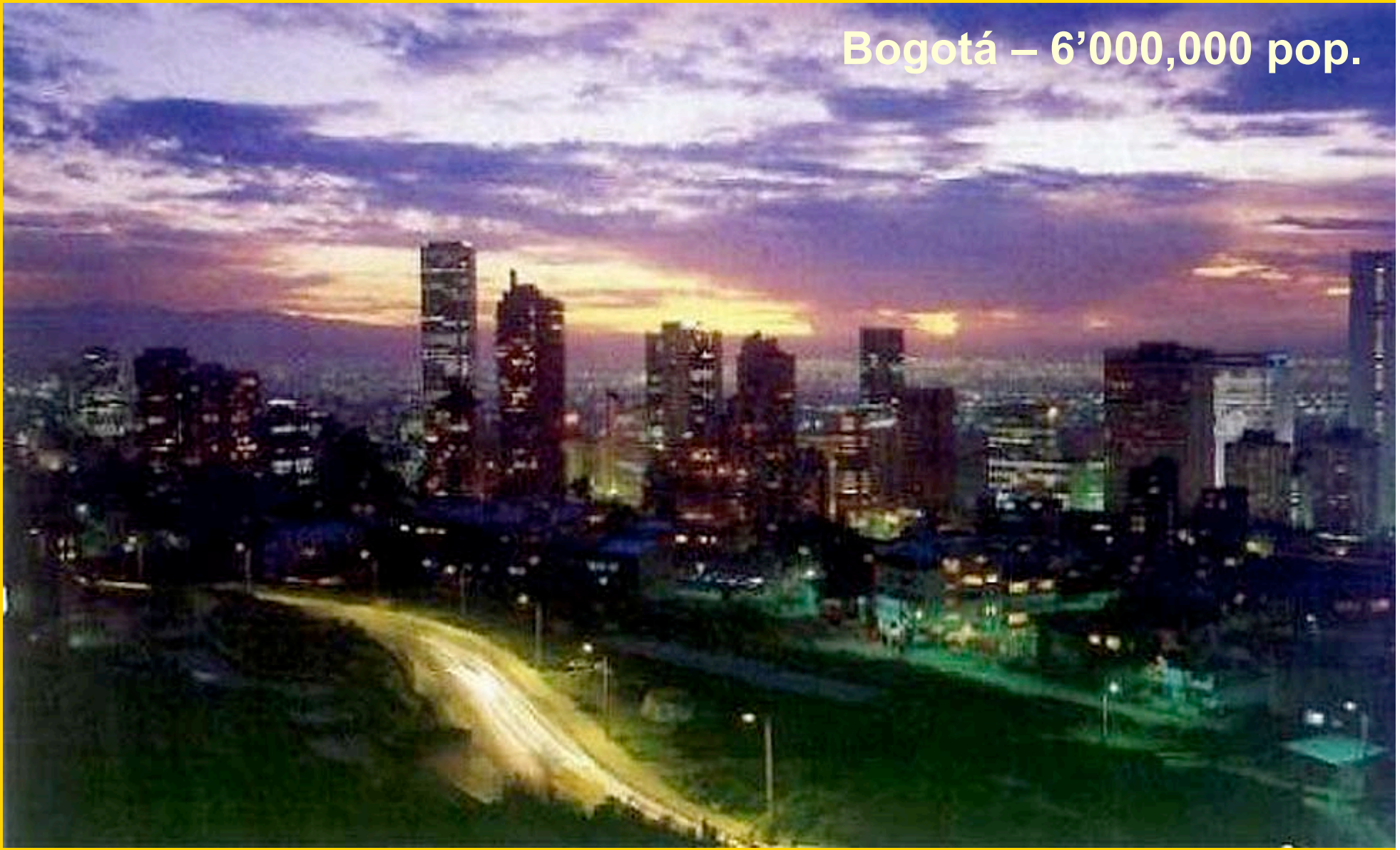
Paola Valero

Associate Professor

Department of Education and Learning
Aalborg University – Denmark
paola@learning.aau.dk

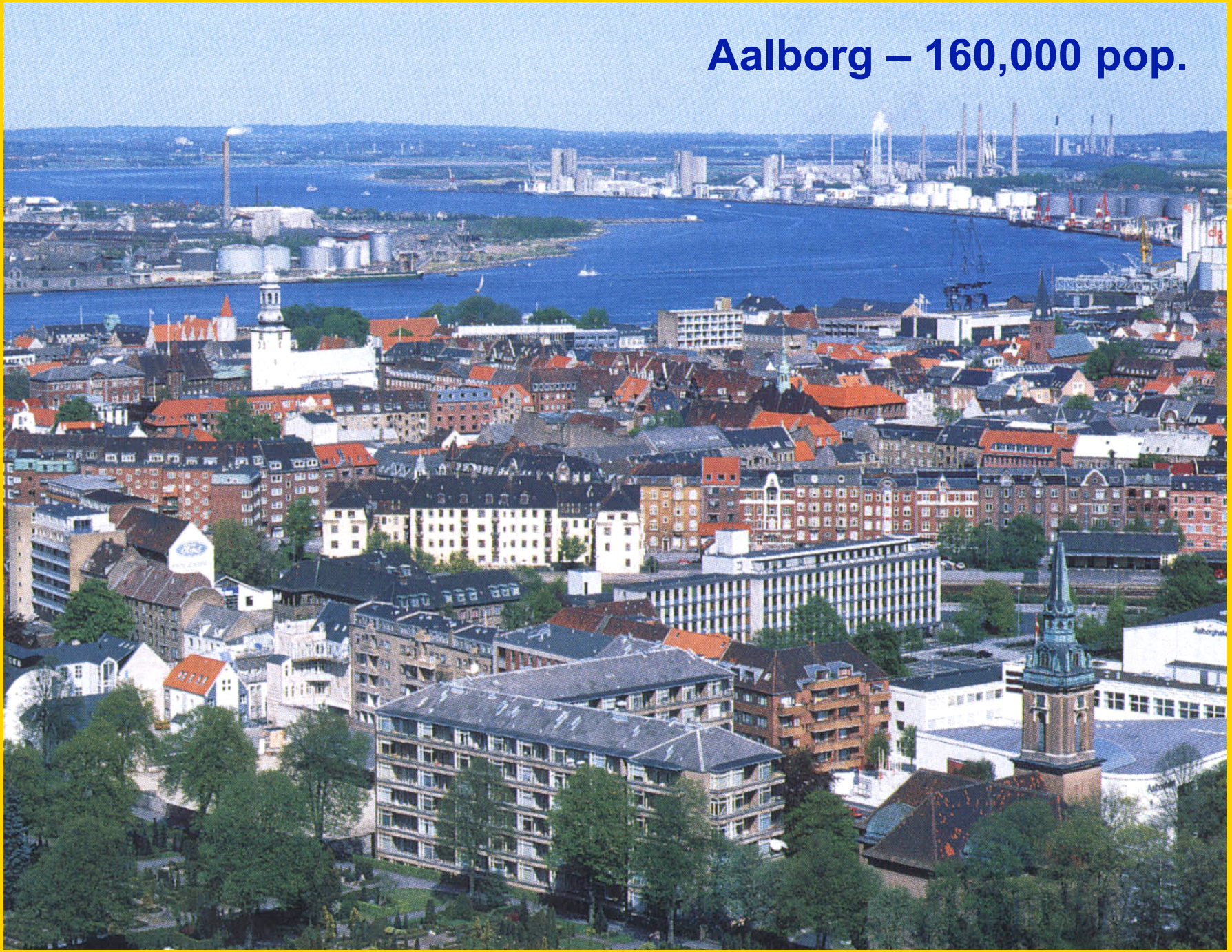
University of Malta, October 2007


Balsa Muisca


Bogotá – 6’000,000 pop.


Copenhagen – 1’200,000 pop.

Aalborg – 160,000 pop.



An introductory remark

Plato missed the point!

The *social* and *political*

flesh and blood

of mathematics education

My thesis

- The role of mathematics education and the constitution of the school subject mathematics change in different historical times according to the function they are given in a social organization
- Recent studies in the philosophy and the strong sociology of mathematics propose different assumptions about the ontology and epistemology of the generation of mathematical knowledge

My proposal for today

- Why Plato mised the point
- A socio-political perspective
  - Roots
  - What's the social
  - What's the political
    - Views of power in mathematics education
  - Implications
  - Examples

A snapshot of a classroom...

It is a hot summer day in the northern hemisphere. In a high school mathematics classroom, pupils are doing trigonometry and it's difficult. Only a few seem to engage with the assignments that have just been handed out by the teacher. He is waiting to see how they cope with them before throwing a helping hand to those in trouble. Most of the students are not making much progress. They are having a hard time dealing with the sine and cosine functions and actually only a fraction of them has really understood what the assignment demands. Instead, they are focusing on each other and on people that are not in the classroom right now…

Teacher (thinking): I have to remember to leave the car keys behind for Line, otherwise she won't be able to pick up the kids tomorrow…

Ali (a pupil) is on the verge of texting from his mobile phone….

Teacher: Ali STOP THAT right now or I will confiscate your mobile!

Ali (thinking but saying it all aloud with his eyes): Fuck you, man! Can't you see I'm busy? I have to find some way to join the party on Friday. I won't let Maria be there alone… another Ken will be thereguy will get her and…

Teacher (thinking): He is totally and utterly lost when it comes to mathematics. He will never pass the course no matter how much time we put into him from now on. He only disturbs the others. He will never be able to learn mathematics; he's just not got what it takes…

Meanwhile Louise (another pupil) is almost done with the assignment.

Teacher (thinking): But Louise… she has got it right as the first one once again. I should persuade her to do the advanced mathematics next year. Quiet unusual for a girl to put this effort into math…

Louise (thinking): Piece of cake! I can't believe the others are so lazy. They don't do anything and exams are just around the corner. I wonder if the exam will have this topic. It's easy!

Ali succeeds in sending his text to the proper destination. He still has no clue about the assignment. It doesn't even enter his mind that it would be possible to solve one single problem with a couple of minutes of hard effort because he tried that years ago and didn't succeed at all; he has never experienced a "well done" or "correct", only red ink on returned assignments that clearly reads *"you just can't do it"*.

Louise finishes, looks around at her classmates, most of whom are still not showing any signs of doing mathematics. She fiddles her pencil around and flips through her textbook to see if she could find some more entertainment. She is also thinking about the party on Friday and whether she will be able to persuade her mum to buy her that cool blue top she so desperately wants.

The teacher walks around and patiently assists the few students showing a bit of interest in the assignment. He then takes a look at Louise's assignment and is once again surprised at her precision and speed.

Later that summer Louise receives yet another set of top grades and decides to continue with advanced mathematics. She has a dream of becoming a medical doctor so she needs the good grades. She wants to be like her dad and continue the family tradition of going through university. Ali gets one of the lowest term grades in the class and it will only add to a number of grades that are equally low in other subjects reinforcing his experience of being incapable of learning anything. Just like his siblings and parents. This boy was definitely born with the wrong genes…

Taken from Christensen, O. R., Stentoft, D., & Valero, P. (2007). Power distribution in the network of mathematics education practices. In K. Nolan & E. De Freitas (Eds.), *In(ter)ventions in mathematics education*. New York: Springer.

Some questions...

- Is it likely that such an episode can actually take place in Malta?
- Why?

What is behind the episode?

Mathematics learning is an intrinsic capacity of individuals

A failure in learning is blamed on individual characteristics

The cards are, so to speak, dealt with even before children meet school mathematics

A link to Plato

All individuals have had a glimpse of the world of ideas —including the mathematical ideas— but not everyone has received the same skills from birth to explore it

Only those with gold in the soul are meant to have access to the world of the ideas and to mathematics

Mathematics education is a privileged means of making “the gold in the soul shine”

But the world has changed...

In ancient times:

- Education for the elite
- Education for developing thinking
- Mathematics as the essence of the natural world
- Mathematics for the selected few

In modern times:

- Education for all
- Education for training a working force
- Mathematics as a human activity like many others
- Mathematics a basic skill for the masses

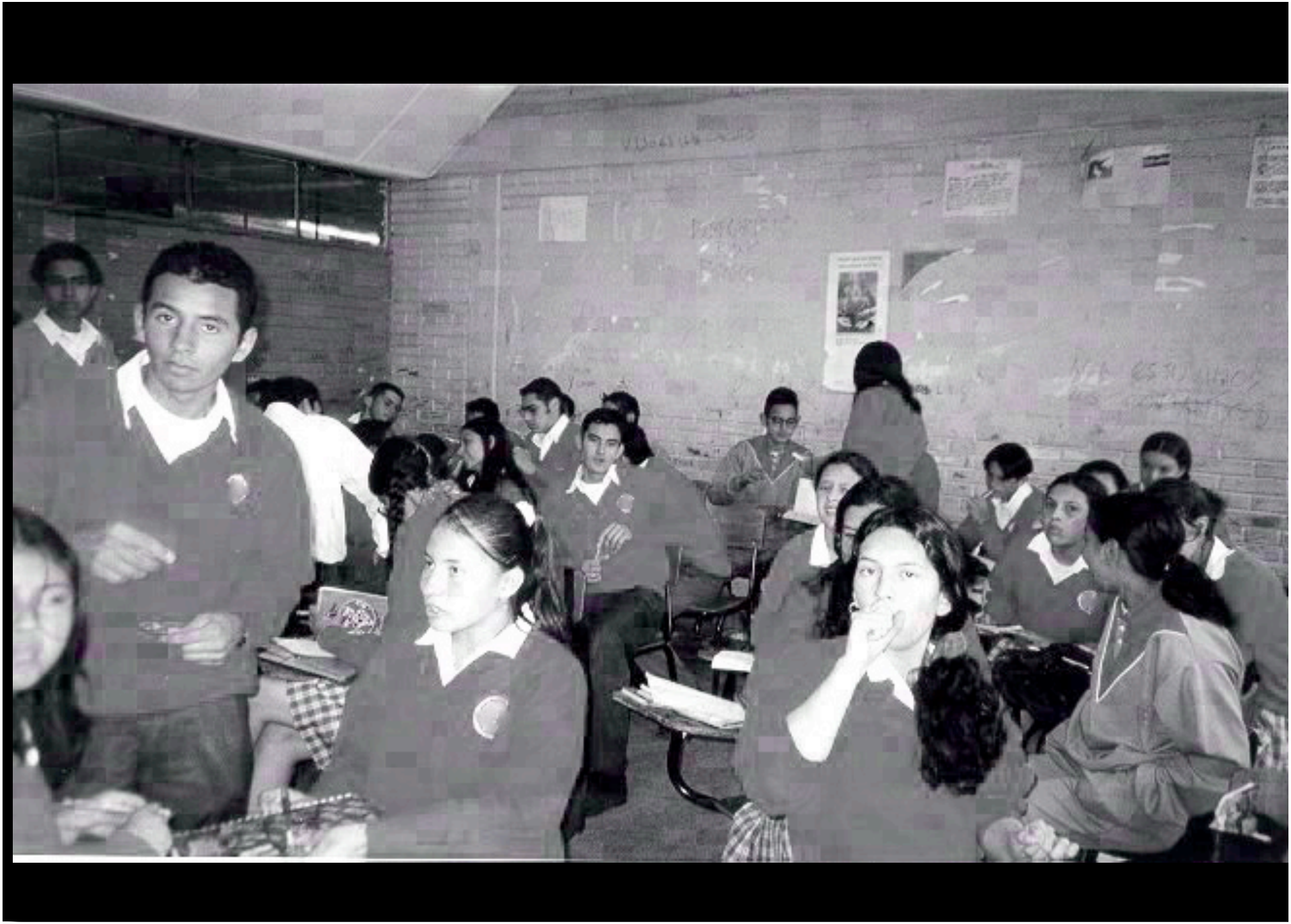
What does this mean?

- Mathematics cannot keep on being conceived as separated from human beings and from their social organization
- Mathematics education is immersed in the social world and not only in the world of the ideas

BUT then:

- What are (school) mathematics and mathematics education really about?

And why should I study if...



José said:

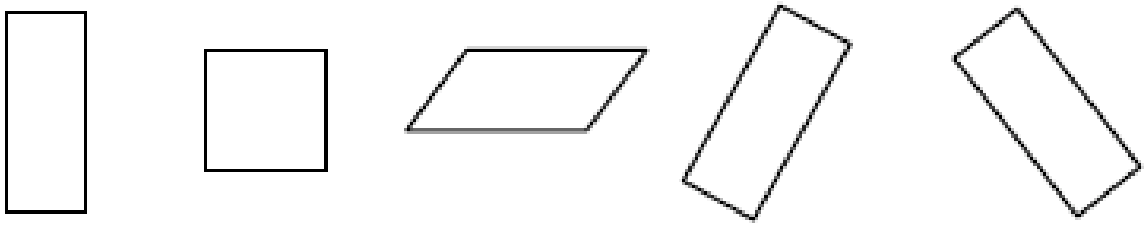
"The only class I would like to pay attention to is English because I want to get out of this fucking place and go to the USA. Though, I don't even manage to say 'Hello, good morning"

School mathematics and social class

Robyn Zevenbergen (In Lerman and Zevenbergen, 2004)

Suppose you had a garden this shape and you were in a helicopter right above your garden looking down on it.

Which of the following shapes would be like yours?



- The students who did not answer correctly were working-class students
  - My garden is not like this. It is a square.
  - There is no garden in my house. I live in an apartment block.
  - I’ve never taken a ride in a helicopter!
- Interpretation:
  - Students answers do not signal a lack of recognition fo geometrical shapes
  - Mismatch between the linguistic habits of working-class students at home and school’s linguistic habits

Looking for alternative views

- Which are the roots of socio-political research in mathematics education?
- What does it mean to adopt a socio-political approach?
  - Some central notions
  - Some methodological implications

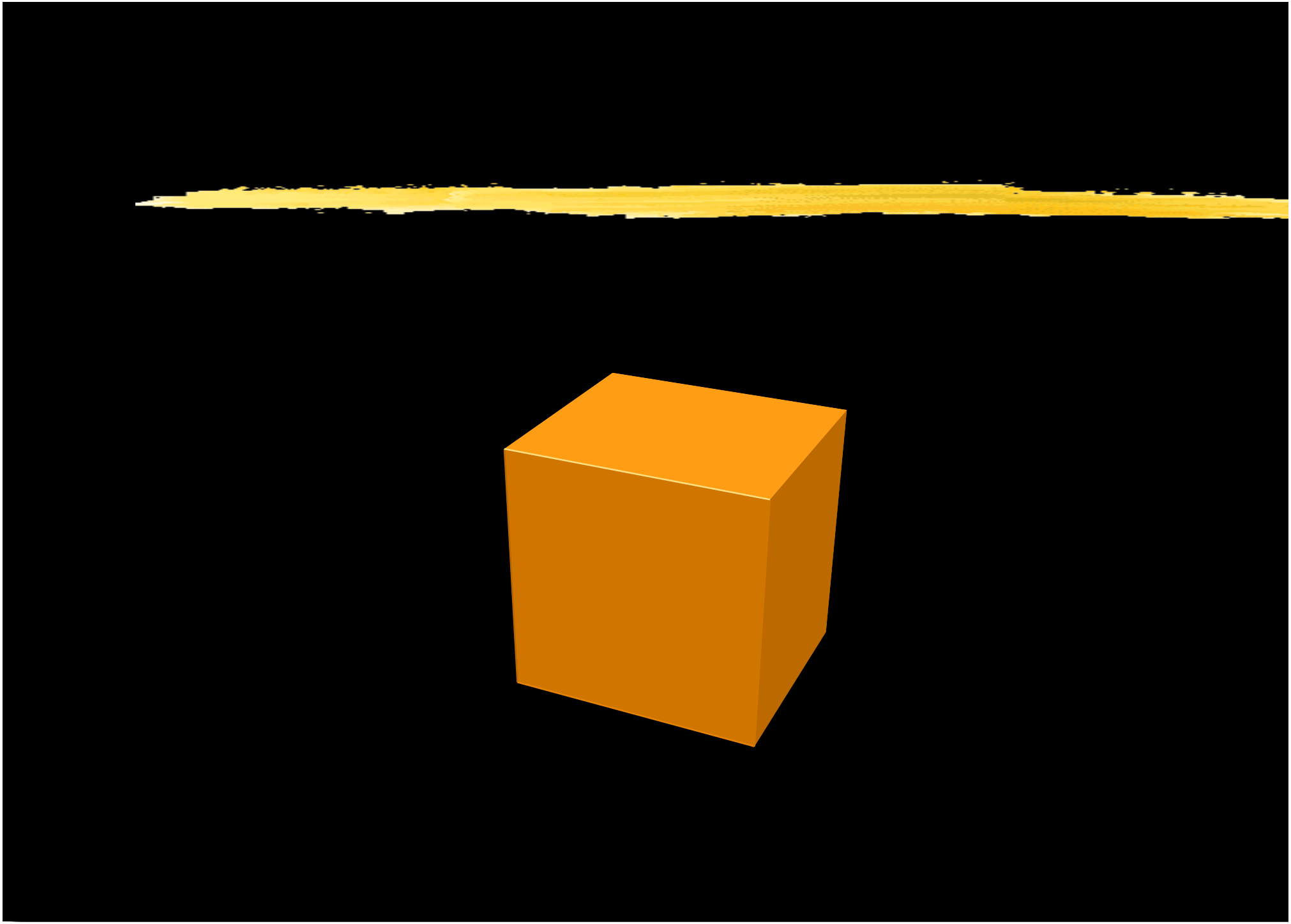
The roots

Steve Lerman (2000, 2006)

The “social turn” in mathematics education

- Is it a problem that many students don’t succeed in school mathematics?
  - Who does not succeed?
  - Why?
  - What are the consequences?
- Search of conceptual frameworks to “see” these phenomena

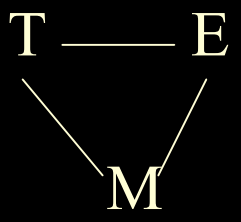
A dialectic relationship



Different perspectives

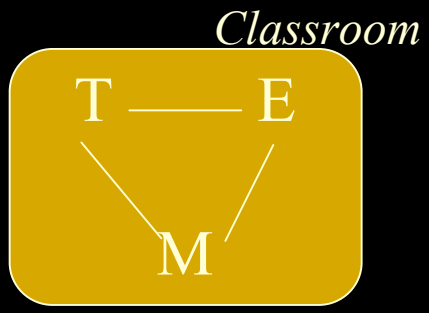
A *psychological–cognitive* perspective

Mathematics education studies the learning of mathematics and mathematical thinking processes between students and teachers as a result of instruction



A *socio–cultural* perspective

Mathematics education studies processes of transmission of mathematical culture and the processes of meaning construction around the content of mathematical activities in a classroom community



A socio-political perspective

Mathematics education studies the historically-situated, social processes through which concrete human being get involved in the creation and re-creation of diverse forms of knowledge and ways of reasoning related to mathematics

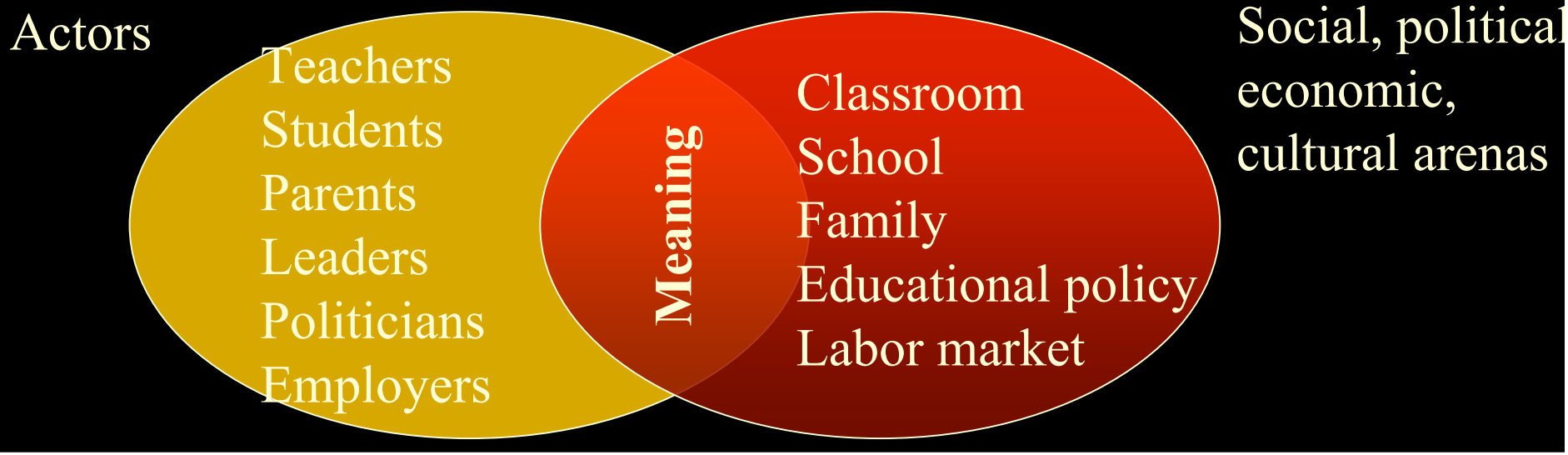
The social: question

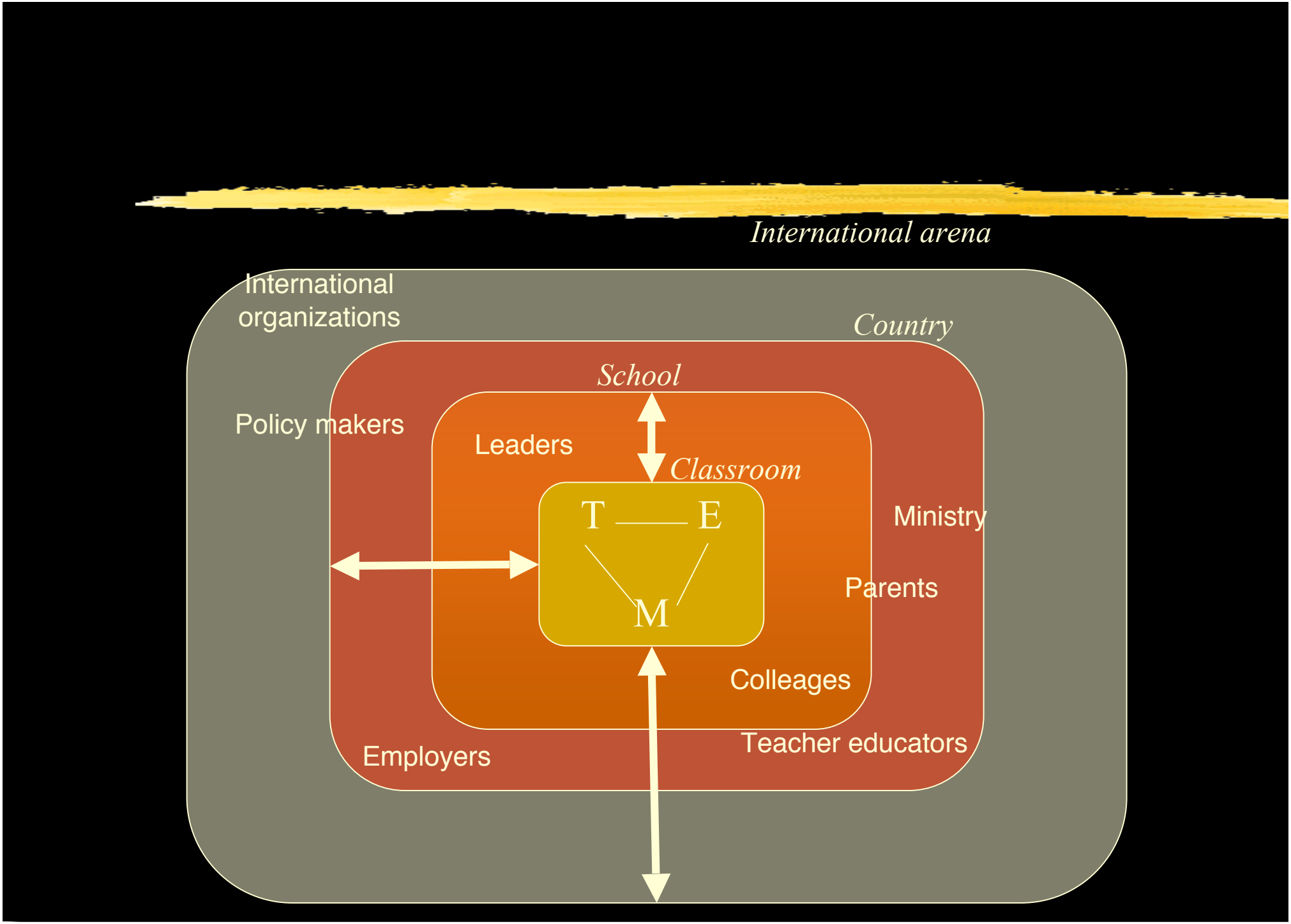
What is “the social”
in mathematics education?

The social

Mathematics education is seen as a *network of social practices*

The meaning of learning and teaching mathematics is constructed in the relationship between:




International arena
International organizations
Country
School
Policy makers
Leaders
Classroom
T
E
M
Ministry
Parents
Colleages
Teacher educators
Employers

The political: question

What is “the political”
in mathematics education?

The political

In a modern social organization, mathematics is a power resource

- Knowledge created and used by social agents
- Resource to act upon the world, in relation to other knowledge resources (science) and other forces (economy, technology)
- Generation of products that allow constructing and and transforming the social world, relations and even risk structures

Mathematics education is political

- There are worldviews underlying teaching and learning (ideology)
- There are models about ways of thinking and acting within and outside the school that determine what is legitimate/illegitimate
- Social actors position themselves in more/less influential roles in relation to other actors
- There are possibilities to open/deny access to the use of mathematics as a resource for social action

Views of power and math education

- What does mathematics education research say about “mathematics and power”?
- Which concepts of ***power*** are behind these formulations?
- Which implications have those concepts for the constructions of views about what mathematics education practices are?

Three main views

Power is seen and defined from 3 viewpoints:

- Intrinsic capacity view
- Structural imbalance view
- Distributed positioning view

The intrinsic capacity view

"Mathematics is a *powerful* knowledge in our society, then many students have to get *empowered* through good math teaching"

- Math is powerful
  - Math can "do"---> math has agency
- Math education empowers
  - Capacities are transferred from math to the teachers to students

- Classic liberal view of power

A ----------> B

  - Power is a capacity which A possesses on virtue of authority or charisma
  - A influences the behavior of B and the results of it
  - B accepts the influence of B
  - A can transfer his/her capacity

The structural imbalance

"Mathematics is implicated in the creation of unequal social structures. Different students have different access to mathematical knowledge according to their position in those structures"

- Mathematics is a powerful knowledge in social action
  - Math is a resource used in the production of social and technological risk structures (Ole Skovsmose, 1994; 2005)

- Math education can empower people to realize their position in society, recognize inequity and combat it.
  - Math education gives a critical capacity to see the effects of math in use in society and to understand unequal structures (Frankenstein).
  - Teachers can empower students through mathematics teaching.

- Marxist conception of power
  - Power is embedded in the productive and class organization of society
  - Power is a capacity related to the control of means of production or ideological apparatus
  - Power is expressed through the tension between possessors and dispossessed

The distributed positioning

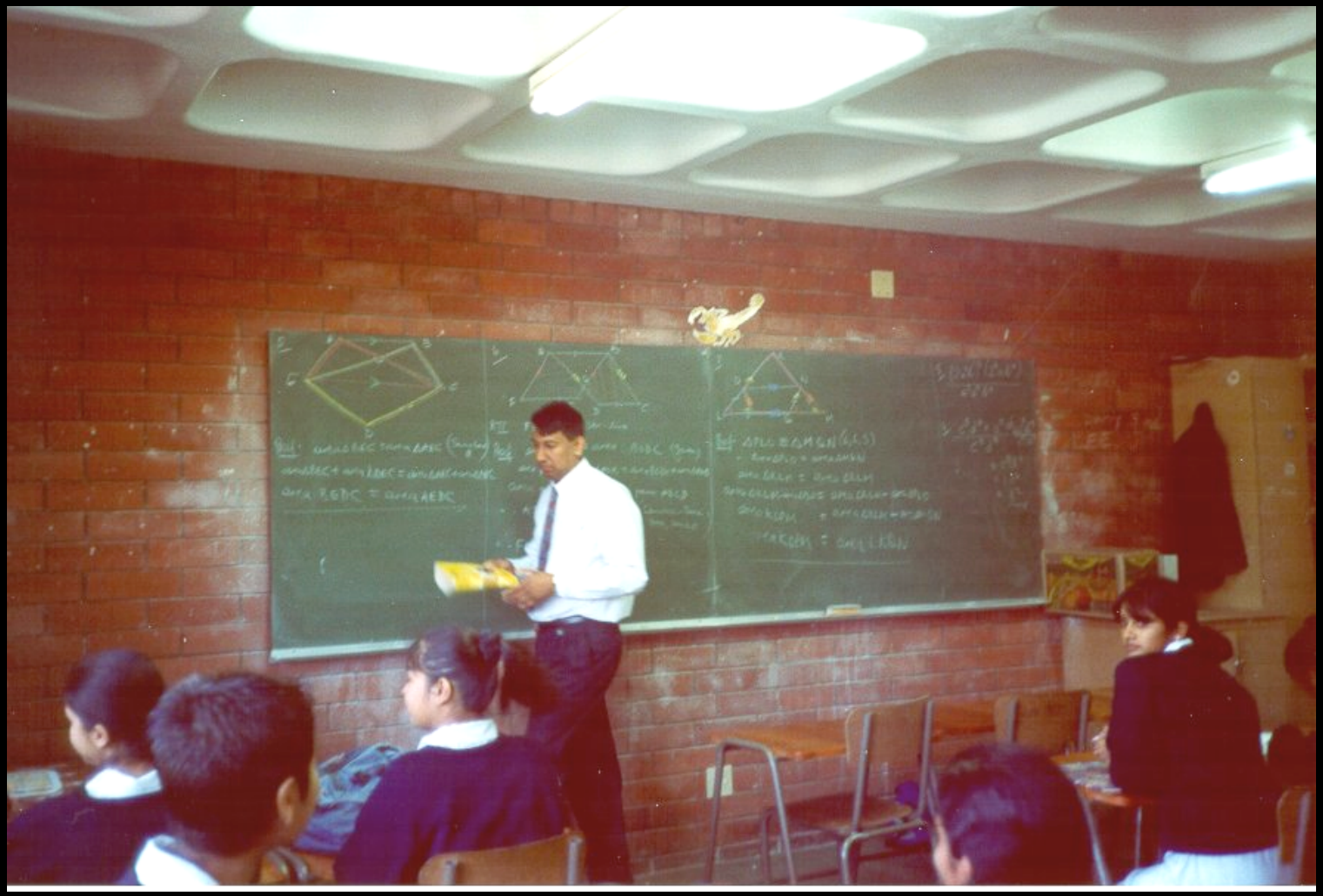
"The mathematics curriculum embodies rules and standards of reason that order how judgments are made, conclusions drawn, rectification proposed, and the fields of existence made manageable and predictable" (Popkewitz, 2002)

- (School) math is a knowledge bounded to cultural practices
  - Knowledge/power creates systems of reason that regulate individual and social action

- Students are being dis/empowered in their participation in those practices
  - Students learn more than math, they learn what is accepted.
  - The teacher positions him/her self in relation to students with respect to the norms and meanings of math education practices.
  - Students may adopt powerful/powerless positions in different situations.

- Post-structuralist, Foucaultian view of power
  - Power is a characteristic of social relationships (not a property of actors)
  - Power is distributed
  - Power is productive (constructs/obstructs)
  - Power is expressed in the way in which, through practice, discourses and systems of regulation of social action are constructed

Challenges for math educators



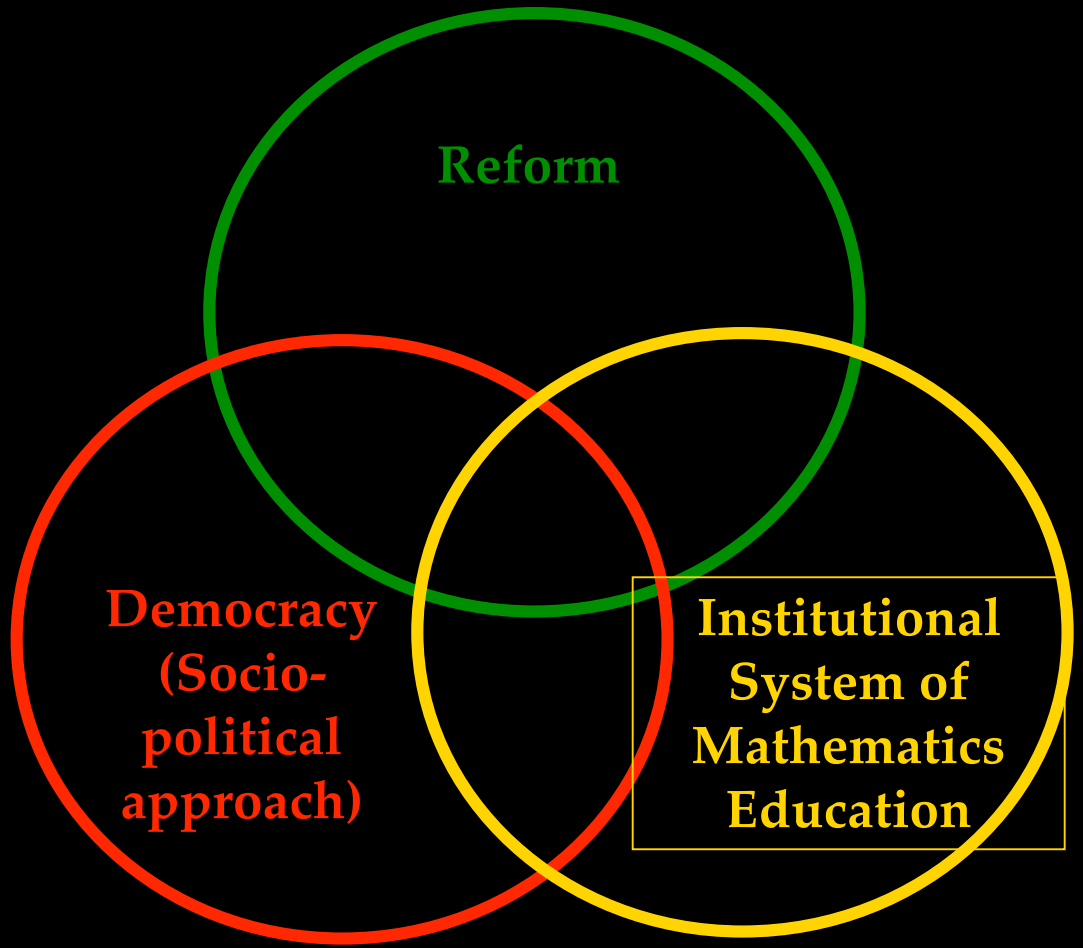
- Mathematics is not a neutral knowledge, but rather a knowledge/power which human beings use as a resource in social action to achieve certain goals and promote certain worldviews
- Mathematics are not a body of well defined, delimited knowledge, but rather a set of many different mathematical ways of knowing associated to different socio-cultural and political practices (The ethnomathematical postulate)

- Mathematics education practices are not only cognitive, but also and specially social and political. Teaching and learning mathematics are historically constructed, collective processes through which forms of acting and thinking are valued as valid, legitimate and desirable (while other forms are excluded).
- The problems of mathematics education are to be located at an individual as well as in a collective level in a multiplicity of social arenas.

- Researching those practices demands a detailed analysis of power; that is an analysis of how social actors use mathematical resources to position themselves in influential positions, and in the exclusion of others
- A socio-political research tackles the complexity of the network of mathematics education practices. It does not restricted to individuals or the classroom

Examples of research

Reform, democracy and mathematics education. Towards a socio-political frame for understanding change in the organization of secondary school mathematics


Reform
Democracy (Socio-political approach)
Institutional System of Mathematics Education

The organizational construction of mathematical disability

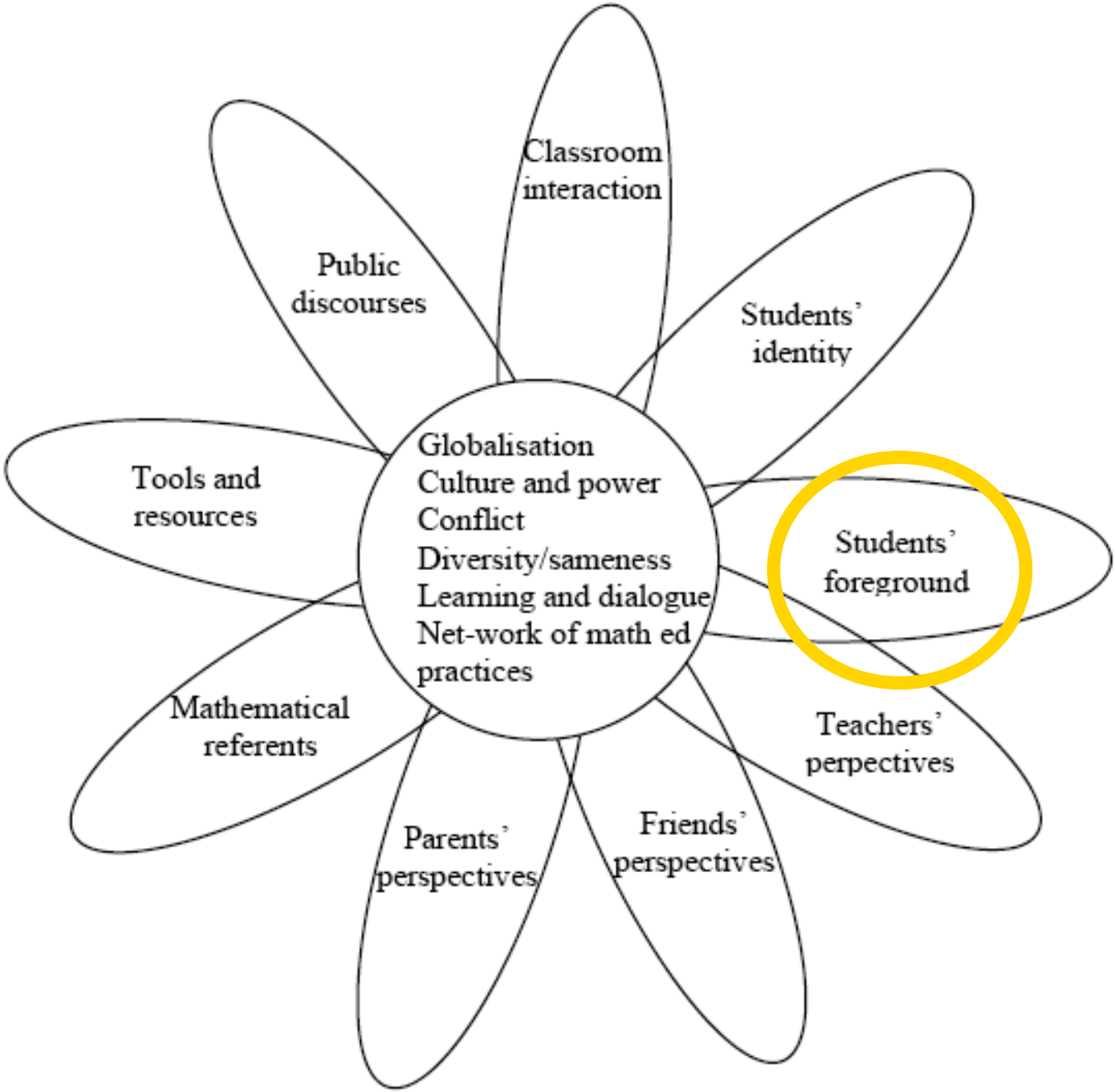
Valero, P. (2007). A socio-political look at equity in the school organization of mathematics education. *Zentralblatt für Didaktik der Mathematik. The Intentional Journal on Mathematics Education*, *39*(3), 225-233.

Communication and conflict in the multicultural mathematics classroom

Alrø, H., Skovsmose, O. & Valero, P. (2007). Landscapes of learning in a multicultural mathematics classroom. In Proceedings of the V CERME.

Alrø, H., Skovsmose, O. & Valero, P. (2005). Culture, diversity and conflict in landscapes of mathematics learning. In M. Bosch (Ed.), Proceedings of the IV CERME. Http://cerme4.crm.es/Papers%20definitius/10/wg10listofpapers.htm

Alrø, H., Skovsmose, O. & Valero, P. (2003). Communication, conflict and mathematics education in the multicultural classroom. In Proceedings of the III CERME. Bellaria. http://www.dm.unipi.it/~didattica/CERME3/proceedings/Groups/TG10/TG10_list.html


Classroom interaction
Public discourses
Students' identity
Tools and resources
Globalisation
Culture and power
Conflict
Diversity/sameness
Learning and dialogue
Net-work of math ed practices
Students' foreground
Mathematical referents
Teachers' perpectives
Parents' perspectives
Friends' perspectives

References

Christensen, O. R., Stentoft, D., & Valero, P. (2007). Power distribution in the network of mathematics education practices. In K. Nolan & E. De Freitas (Eds.), In(ter)ventions in mathematics education. New York: Springer.

Lerman, S. (2000). The social turn in mathematics education research. In J. Boaler (Ed.), *Multiple perspectives on mathematics teaching and learning* (pp. 19-44). Westport (USA): Ablex Publishing.

Lerman, S. (2006). Cultural psychology, anthropology and sociology: The developing 'strong' social turn. In J. Maasz & W. Schloeglmann (Eds.), *New mathematics education research and practice* (pp. 171-188). Rotterdam: Sense.

Lerman, S., & Zevenbergen, R. (2004). The socio-political context of the mathematics classroom. Using Bernstein's theoretical framework to understand classroom communications. In P. Valero & R. Zevenbergen (Eds.), *Researching the socio-political dimensions of mathematics education: Issues of power in theory and methodology* (pp. 27-42). Boston: Kluwer Academic Publishers.

Skovsmose, O. (2005). Foregrounds and politics of learning obstacles. *For the Learning of Mathematics, 25*(1), 4-10.

Skovsmose, O. (1994). *Towards a philosophy of critical mathematics education*. Dordrecht: Kluwer.