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2nd Announcement

conference theme

Mathematisation
social process & didactic principle

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conference venue

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Mathematisation: social process & didactic principle

> Because mathematics is recognizable but not easily defined, we replaced it by a process or processes which can be made more tangible and that we named "mathematization". (Gattegno 1988, p. 1)

Introduction

The intention of CIEAEM 69 is to interrogate the concept of mathematisation which is commonly and undoubtedly accepted as a desirable outcome of formal mathematics education. One of the aims of the 69th CIEAEM conference is to make the mathematisation of social, economic, ecologic, etc. conditions explicit. The second aim of the 69th CIEAEM conference is to reflect on experience with curricular conceptions that pay particular attention to the relation of mathematical and everyday knowledge.

In this call for papers, mathematisation is used in its broadest sense. It may then include people's active use of some kind of mathematics, for example by interpreting notions (including mathematical objects) in the world mathematically, or by expressing one's ideas in a mathematical way. It may also include the way that people encounter mathematics as being used "on" them and their context, for example mathematics as being at the core of how a certain activity is described, or how decisions are made on a mathematically informed basis.

Mathematisation ––in its broad range–– is a concept that has received CIEAEM's attention for more than half a century. We can trace the occupation of CIEAEM and its members back to 1954, when Servais describes the global changes of society that he expects in the following words:

> Our time marks the beginning of the mathematical era. [...] This fact, whatever the reactions, the opinions and the judgments it may provoke, increases the responsibility of every teacher, who, no matter on which level, teaches mathematics. [...] If it befits to be worthy of a mathematical tradition, it is also important to allow the mathematization [of the world] to come. As much as it is true that he [sic] who devotes his life to teaching, accepts a mission of a world gone-by to build a world being born. The responsibility towards the future is greater than loyalty towards the past. (Servais 1954, p. 89; quoted in Vanpaemel, De Bock, & Verschaffel 2011)

This statement is informed by the prevailing optimism that by basing social and technological development on a mathematical tradition the future would be more prosperous than the past. Indeed, as Davis and Hersh show thoroughly 30 years later, "the social and physical worlds are being mathematized at an increasing rate" (1986, p. xv). The extent of the ongoing mathematisation makes Davis and Hersh warn us that "we'd better

watch it, because too much of it may not be good for us" (ibid.). Keitel, Kotzmann and Skovsmose substantiate this warning by describing a circular process:

> On the one side society becomes formalized and mathematized by the influence of the self-produced technological environment and economic structures respectively; on the other, mathematics is "naturally" a magnificent help in dealing with technological and quantified surroundings. Society, therefore, needs more and more techno-mathematical help. In this process, many structures of human activity are recognized as having formal character. Hence, one can use mathematics to control or change these structures. It is a characteristic of modern technology and science that not only the purpose determines the means but also the other way round: the means determine or create the ends. (1993, p. 249)

The mathematisation of social, economical and technological relations in the form of formal structures is a double-edged sword. On the one hand, it has proven effective and efficient in terms of developing more and more complex structures. As Fischer points out, "[t]he more mathematics is used to construct a reality, the better it can be applied to describe and handle exactly that reality" (1993, p. 118). On the other hand, once established as the standard (or only) way of describing, predicting and prescribing social, economic, ecologic, etc. processes, it severely reduces the possibilities of finding non-formal, non-quantifiable, non-mathematical solutions to the problems we face (Straehler-Pohl 2017).

Moreover, the mathematisation of social, economical and technological relations cannot be fully understood without taking into account a process occurring in parallel (Gellert & Jablonka 2007) -- the demathematisation of social practices, for instance, the fact that taxes are nowadays deducted automatically from salaries and no longer calculated in the historical form of labour or grain to be given to the authorities:

> The greatest achievement of mathematics, one which is immediately geared to their intrinsic progress, can paradoxically be seen in the never-ending, twofold process of (explicit) demathematising of social practices and (implicit) mathematizing of socially produced objects and techniques. (Chevallard 1989, p. 52)

For Keitel, mathematics-based technology as a form of implicit mathematics "makes mathematics disappear from ordinary social practice" (1989, p. 10). As a consequence, the (explicit) demathematisation of social practices leads to a devaluation of the mathematical knowledge involved in these practices. What kind of mathematical knowledge, then, is helpful so that citizens can do more than simply "obey" the structures which seem so "inseparably connected with our social organization" (Fischer 1993, p. 114)? A threat to the democratic character of our political fundament is thus posed, which Skovsmose translates into the relation between technological and reflective knowledge:

> Technological knowledge itself is insufficient for predicting and analysing the results and consequences of its own production; reflections building upon different competencies are needed. The competence in constructing a car is not adequate for the evaluation of the social consequences of car production. (1994, p. 99)

From a pedagogic point of view, in which democracy and critical citizenship are taken into consideration as the overarching aim of education, the mathematisation/demathematisation of social relations, of economic and technological development can count as a starting point for curricular reflection and imagination. However, what do we really know about the structures and effects of mathematisation and demathematisation? Taken to an extreme, might it even be necessary to actively work toward preserving the capacity and confidence to reject, at least some of the time, the "solv[ing of] problems of social significance by means of mathematics" (Straehler-Pohl 2017, p. 49)?

Turning from the discussion of making mathematisation explicit, we now consider the second aim.

The second aim of the 69th CIEAEM conference is related to a practice where, in most countries, school mathematics, particularly elementary school mathematics, is, and has historically been, constructed as a subject in which everyday knowledge and scientific knowledge are somehow brought together. In these practices it seems to be a commonplace assumption that mathematical knowledge may be useful in all kinds of professional and occupational contexts. See, for instance, an old German mathematics textbook for seventh-graders, on the cover of which mathematics is constructed as prevalent in manual work (Fig. 1). Examples like this abound. Keitel refers to a US textbook of 1937, in whose table of contents mathematics is overtly related to the supposed community needs, when arguing that "a trivial though dogmatic social-needs orientation" (1987, p. 398) is often the driving force for curriculum construction.

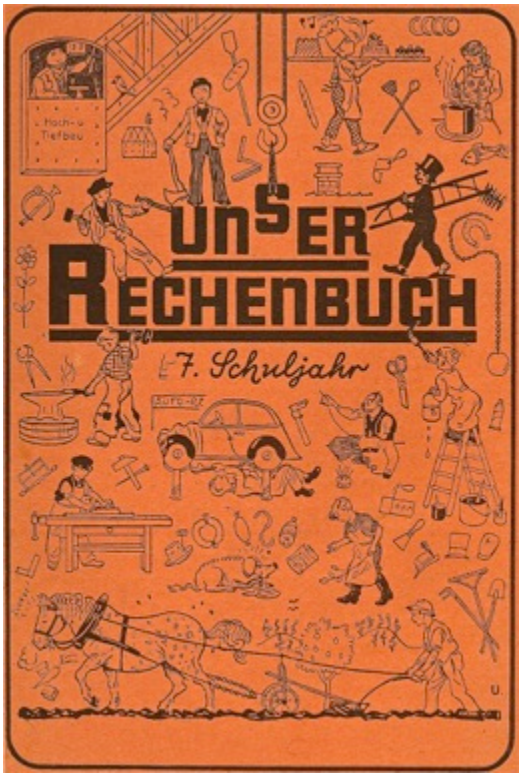

Fig. 1 Front cover of *unser Rechenbuch*, Baßler et al. (1949)

Non-trivial considerations on the relationship of mathematics and the everyday have served, and continue to serve, as the cornerstone of several curriculum conceptions in mathematics education (Jablonka 2003, Verschaffel, Greer, Van Dooren, & Mukhopadhyay 2009). In some of these conceptions, mathematisation is taken as a key didactic principle for the teaching and learning of mathematics.

An internationally influential example of a curriculum conception drawing explicitly on mathematisation(s) is Realistic Mathematics Education (e.g., de Lange 1996, Treffers 1987). RME distinguishes between a horizontal and a vertical mathematisation. A horizontal mathematisation denotes the students' activity of expressing mathematically a realistic everyday situation from which mathematical meaning can be developed. This can be interpreted as a sideways shift between discourses. However, the everyday situations are valued mostly for their didactic potential as a starting point for the mathematisation to occur. Their purpose is illustrative and motivational, and authenticity is not the main criterion for the design of the everyday situations. Once a mathematical formulation of the everyday situation has been arrived at, the next step is a vertical mathematisation, in which the organised structure of mathematical knowledge is the focus. The students get 'deeper' into the mathematics, or arrive at 'higher' levels of abstraction.

Mathematical Modelling (e.g., Blum, Galbraith, Henn, & Niss 2007, Stillman, Blum, & Salett Biembengut 2015) is another orientation for curriculum construction that attracts worldwide attention. Within Mathematical Modelling, the authenticity of everyday situations is of relevance. From these everyday situations a 'real world model' is generated and, further the 'real world model' is translated into a 'mathematical model', which can be used for calculation or other mathematical procedures. This translation is called mathematisation. In this curricular perspective, mathematics education is constructed as a didactically simplified version of applied mathematics.

In relation to the second aim concerning curriculum, two things should not go unnoticed. First, from a psychological perspective on cognitive development mathematisation is strongly related to abstraction, or reflective abstraction, and decontextualisation. The issue

has been substantially developed by Vergnaud, who describes the process of dissecting mathematical concepts from sets of problems via concepts such as operational invariants, theorems-in-action, and schemes. Students' symbolic representations and processes of instrumentation represent a major focus in this field (e.g., Vergnaud 1999). It is of interest that Piaget's work, as a central reference for Vergnaud's theoretical developments, has been a long-time influence on discussions in CIEAEM. See for instance Servais (1968), in which a shift from mathematisation-of-the-world to mathematisation-of-a-situation is visible.

> The true involvement of students in mathematical work can only be assured by an adequate motivation at their level: pleasure of playing or of competition, interest for application, satisfaction of the appetite for discovery, the affirmation of themselves, a taste for mathematics itself. In order to learn mathematics in an active manner, it is best to present to the students a situation to be mathematized. So today's didactic is based, as far as possible, on mathematical initiations to situations easy to approach at the basic level and sufficiently interesting and problematic to create and sustain investigations by the students. They learn by experience to schematicize, to untangle the structures, to define, to demonstrate, to apply themselves instead of listening to and memorizing ready-made results. (p. 798)

Second, much of the conceptual work that draws on mathematisation as a didactic principle refers explicitly to the writings of Freudenthal. In *Mathematics as an Educational Task*, his point of departure is an analysis of what mathematisation, or mathematizing, might mean on different mathematical levels:

> Today many would agree that the student should also learn mathematizing unmathematical (or insufficiently mathematical) matters, that is, to learn to organize it into a structure that is accessible to mathematical refinements. Grasping spatial *gestalts* as figures is mathematizing space. Arranging the properties of a parallelogram such that a particular one pops up to base the others on it in order to arrive at a definition of parallelogram, that is mathematizing the conceptual field of the parallelogram. Arranging the geometrical theorems to get all of them from a few, that is mathematizing (or axiomatizing) geometry. Organizing this system by linguistic means is again mathematizing of a subject, now called formalizing. (Freudenthal 1973, p. 133)

In this quote, the RME-concepts of horizontal mathematisation (as mathematizing the unmathematical) and vertical mathematisation (as axiomatizing and formalizing) are already elaborately preformed.

Subthemes and Questions

The theme of the conference *Mathematisation: social process & didactic principle* aims to attract contributions based on experience and analysis of a diverse nature and broad variety. Four subthemes, which represent possible thematic foci and will thus be used as a basis for the composition of the working groups, help to orientate and to categorize the contributions.

- Subtheme 1 is concerned with the issue of mathematisation as a didactic principle. It collects research on, and experience with, the teaching and learning of mathematics by mathematisations and in the classroom (or kindergarten, university, …) and also considers curriculum development in this field.
- Subtheme 2, in contrast to Subtheme 1, is not directly related to the learning of mathematics. It engages with the ways in which society is mathematised, and with the recent mathematisations by which the current local and global social, environmental, etc. situation are modelled.
- Subtheme 3 tries to bring the topics of the subthemes 1 and 2 into fertile interaction. The value of such an attempt has been described in the CIEAEM Manifesto 2000:

> Mathematics education has to provide understanding of the processes of "mathematisation" in society. […] How can mathematics teaching and learning be presented not only as an introduction to some powerful ideas of our culture, but also as a critique of ideas and their application? Do we teach about how mathematics is used in our society? Do we sufficiently understand in what ways, society is becoming increasingly "mathematised"? (CIEAEM 2000, pp. 8–9)

- Subtheme 4 is dedicated to analysis of, and self-reflection on, the effects of mathematisation on pedagogy. At stake are the ways in which the recent political emphasis on standards, assessment and evidence, influence, impact or impair the daily practices of mathematics teachers and researchers in mathematics education.

In the final part of the discussion document of CIEAEM 69, we further develop the four Subthemes. The descriptions as well as the exemplary questions that are posed are intended to stimulate contributions and discussions. They provide a tentative structure to the general topic, while explicitly encouraging the exploration of issues that are located in their intersection or in the space between them.

Subtheme 1 Mathematisation as a didactic principle

The focus of the Subtheme 1 is on teaching experience with, and research studies on, conceptions of mathematics education that interrelate mathematics and the everyday world. The contributions can be aligned to well-established conceptions such as RME or Mathematical Modelling, can question them or can explore new ways of connecting mathematics and the world. We encourage the contributors to Subtheme 1 to analyse the challenges and the potential of mathematisation as a didactic principle, as we invite critical reflections on historical developments and educational policy. A further issue is the implication of mathematisation as a didactic principle for students' learning and identity formation.

Some questions to start with:

- What qualifies a real-world context as a point of departure and/or point of arrival of a didactic arrangement that builds on mathematisation?
- How relevant is the authenticity of everyday contexts for the learning of mathematics?
- What are specific cognitive, social or discursive processes that occur in learning environments that have mathematisation as a pivot?
- Do all students benefit equally from these conceptions of mathematics education?
- Which material arrangements support students' learning of mathematics by mathematisation (e.g. artefacts, physical experiences, learning spaces, etc.).
- Which epistemologies of mathematics are built into particular didactical principles of mathematisation?

Subtheme 2 Mathematisation of society

Subtheme 2 studies the models, in which mathematics is partly or largely adopted, by which social, economical, ecological, etc. processes may be described, predicted and prescribed. These models often inform social and environmental policy on issues such as refugee migration, water, energy, climate change (Hauge & Barwell 2015), health (Hall & Barwell 2015); or they may be used for legitimizing political decisions. Subtheme 2 is concerned with the recent developments at the interface of mathematics, technology and globalisation: big data, security, internet of things, mathematisation of urban spaces, etc.; keeping in mind that mathematisation is not a naturally occurring phenomenon that we cannot avoid. It is done

on purpose and it might be illuminative to ask whose intentions become realised (Davis 1989).

Some questions to start with:

- What do we know of and about the mathematical models in use? In what ways are they made public?
- Which experiences and practices are facilitated by mathematisation and would not have been possible without it? Are there experiences and practices that are made unlikely, or even impossible by such mathematisations?
- By comparing competing technologies that use different mathematical models/ algorithms for the same ends, what are or could be the unforeseen side effects?
- How is the mathematisation of society made an object of reflection in the media and popular culture (e.g. in advertisements, newspapers, novels, movies, documentaries)?
- How do mathematical models influence the fundamental conditions of life for particular social groups (e.g. by regulation of social welfare, supplies for refugees, or even transnational restrictions or sanctions for importing food or health supplies) (see, e.g., Alshwaikh and Straehler-Pohl 2017)?
- Considering the effects of mathematisation on mathematics education research: How does the increasing mathematisation affect the ways research is carried out? What counts as research? What are the "policy implications of developing mathematics education research" (Hoyles & Ferrini-Mundy 2013)?

Subtheme 3 Interconnecting mathematisation as a social process and as a didactic principle

It has been argued that we urgently need an "ethic of mathematics for life" (Renert 2011, p. 25) and that "the political and sociological dimensions of the relationship between mathematics, technology and society are fundamental" (Gellert 2011, p. 19). For such an ethic, it would be necessary to develop (classroom) activities that engage with this relationship, by not simply reducing mathematics to a remedy for and an answer to the problems we face, and by breaking with many myths about mathematics and its use.

Some questions to start with:

- "How are pupils to be enabled to criticise [and critique] models and modelling, including the formalised techniques that underpin so much the use or abuse of mathematics in society?" (CIEAEM 2000, p. 9)
- How can teacher education contribute to building up reflexive knowledge on mathematics necessary for pursuing this target?
- How do students and teachers balance the didactic fictionality and the reality of social, economical, environmental, etc. phenomena in mathematics education?
- What can we learn from examples of mathematics education practices that engage locally with social, environmental, etc. issues?
- How can we develop learning environments so that students learn to use mathematics as a tool of emancipation to question the social reality they live in?
- How can we develop learning environments so that students can emancipate themselves from mathematics, in order to assert agency over apparently mathematically validated necessities?

Subtheme 4 Mathematisation of pedagogy

Even when it is not intentionally used as a didactical principle or made an object of reflection, mathematisation does not remain out of school. It enters, for instance, in the form of standardised high-stakes testing and thus changes the "governing assessment dispositive" (Björklund Boistrup 2017). Sometimes directly, sometimes more indirectly, schools receive 'support', and teaching is 'improved', by evidence-based recommendations about what works in the classroom, and in education more generally (Biesta 2007). Randomised control experiments seem to be the gold standard for some policy makers and researchers in education (e.g., Slavin 2002). Once the impact of evidence-based recommendations is mathematised, interventions can be compared with each other, and moreover, measured against their monetary costs in terms of efficiency, promising policy-makers to find the "biggest bang for the buck", as Jablonka and Bergsten (2017, p. 115) critically capture. However, as Herzog (2011) asserts, "to expect that we would soon be able to control the education system more effectively and efficiently due to the politically motivated strengthening of experimental educational research, is naïve" (p. 134).

Some questions to start with:

- What are the effects of the mathematisation of research on mathematics pedagogic activity in school?
- What are officially stipulated strategies and instructions to implement evidence-based research results in mathematics education?
- How do teachers and students deal with the new regime as it affects mathematics education? How do they enact or resist it?
- What are the effects of the mathematisation of pedagogy on mathematics teacher education?

References

Alshwaikh, J., & Straehler-Pohl, H. (2017). Interrupting passivity: Attempts to interrogate political agency in Palestinian school mathematics. In H. Straehler-Pohl, N. Bohlmann, & A. Pais (Eds.), *The disorder of mathematics education: Challenging the sociopolitical dimensions of research* (pp. 191–208). Cham: Springer.

Baßler, E., Bäurle, K., Heberle, E., Moosmann, E., & Ruffler, R. (1949). *Unser Rechenbuch* (7. Schuljahr). Stuttgart: Ernst Klett.

Biesta, G. (2007). Why 'what works' won't work: Evidence-based practice and the democratic deficit in educational research. *Educational Theory, 57*(1), 1–22.

Björklund Boistrup, L. (2017). Assessment in mathematics education: A gatekeeping dispositive. In H. Straehler-Pohl, N. Bohlmann, & A. Pais (Eds.), *The disorder of mathematics education: Challenging the sociopolitical dimensions of research* (pp. 209–230). Cham: Springer.

Blum, W., Galbraith, P. L., Henn, H.-W., & Niss, M. (Eds.). (2007). *Modelling and applications in mathematics education: The 14th ICMI study*. New York: Springer.

Chevallard, Y. (1989). Implicit mathematics: Its impact on societal needs and demands. In J. Malone, H. Burkhardt, & C. Keitel (Eds.), *The mathematics curriculum: Towards the year 2000: Content, technology, teachers, dynamics* (pp. 49–57). Perth: Curtin University of Technology.

CIEAEM (2000). 50 years of CIEAEM: Where we are and where we go: Manifesto 2000 for the Year of Mathematics. [http://www.cieaem.org/?q=system/files/cieaem-manifest2000-e.pdf]

Davis, P. J. (1989). Applied mathematics as social contract. In C. Keitel, P. Damerow, A. J. Bishop, & P. Gerdes (Eds.), *Mathematics, education, and society* (pp. 24–28). Paris: UNESCO.

Davis, P. J., & Hersh, R. (1986). *Descartes' dream: The world according to mathematics*. San Diego, CA: Harcourt Brace Jovanovich.

de Lange, J. (1996). Real problems with real world mathematics. In C. Alsina, J. M. Álvarez, M. Niss, A. Pérez, L. Rico, & A. Sfard (Eds.), *Proceedings of the 8th International Congress on Mathematical Education* (pp. 83–110). Sevilla: S.A.E.M. Thales.

Fischer, R. (1993). Mathematics as a means and as a system. In S. Restivo, J. P. van Bendegem, & R. Fischer (Eds.), *Math worlds: Philosophical and social studies of mathematics and mathematics education* (pp. 113–133). New York: SUNY Press.

Freudenthal, H. (1973). *Mathematics as an educational task*. Dordrecht: D. Reidel.

Gattegno, C. (1988). *The science of education: The awareness of mathematization*. New York: Educational Solutions Worldwide.

Gellert, U. (2011). Now it concerns us! A reaction to sustainable mathematics education. *For the Learning of Mathematics, 31*(2), 19–20.

Gellert, U., & Jablonka, E. (Eds.). (2007). *Mathematisation and demathematisation: Social, philosophical and educational ramifications*. Rotterdam: Sense.

Hall, J., & Barwell, R. (2015). The mathematical formatting of obesity in public health discourse. In S. Mukhopadhyay & B. Greer (Eds.), Proceedings of the 8th international Mathematics Education and Society conference (pp. 557–579). Portland, OR: MES8 [http://www.mescommunity.info/MES8ProceedingsVol2.pdf].

Hauge, K. H., & Barwell, R. (2015). Uncertainty in texts about climate change: A critical mathematics education perspective. In S. Mukhopadhyay & B. Greer (Eds.), Proceedings of the 8th international Mathematics Education and Society conference (pp. 582–595). Portland, OR: MES8 [http://www.mescommunity.info/MES8ProceedingsVol2.pdf].

Herzog, W. (2011). Eingeklammerte Praxis – ausgeklammerte Profession: Eine Kritik der evidenzbasierten Pädagogik. In J. Bellmann & T. Müller (Eds.), *Wissen was wirkt: Kritik evidenzbasierter Pädagogik* (pp. 123–145). Wiesbaden: VS.

Hoyles, C., & Ferrini-Mundy, J. (2013). Policy implications of developing mathematics education research. In M. A. Clements, A. J. Bishop, C. Keitel, J. Kilpatrick, & F. K. S. Leung (Eds.), *Third international handbook of mathematics education* (pp. 485–515). New York: Springer.

Jablonka, E. (2003). Mathematical literacy. In A. J. Bishop, M. A. Clements, C. Keitel, J. Kilpatrick, & F. K. S. Leung (Eds.), *Second international handbook of mathematics education* (pp. 75–102). Dordrecht: Kluwer.

Jablonka, E., & Bergsten, C. (2017). Installing "good mathematics teaching": Hegemonic strategies and alliances of researchers. In H. Straehler-Pohl, N. Bohlmann, & A. Pais (Eds.), *The disorder of mathematics education: Challenging the sociopolitical dimensions of research* (pp. 107–120). Cham: Springer.

Keitel, C. (1987). What are the goals of mathematics for all? *Journal of Curriculum Studies, 19*(5), 393–407.

Keitel, C. (1989). Mathematics education and technology. *For the Learning of Mathematics, 9*(1), 103–120.

Keitel, C., Kotzmann, E., & Skovsmose, O. (1993). Beyond the tunnel vision: Analysing the relationship between mathematics, society and technology. In C. Keitel & K. Ruthven (Eds.), *Learning from computers: Mathematics education and technology* (pp. 243–279). Berlin: Springer.

Renert, M. (2011). Mathematics for life: Sustainable mathematics education. *For the Learning of Mathematics, 31*(1), 20–26.

Servais, W. (1954). Éditorial du Journal de la Société Belge de Professeurs de Mathématiques. *Dialectica, 8*(1), 88–91.

Servais, W. (1968). Present day problems in mathematical instruction. *Mathematics Teacher, 61*(8), 791–800.

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

Slavin, R. E. (2002). Evidence-based educational policies: Transforming educational practice and research. *Educational Researcher, 31*(7), 15–21.

Stillman, G. A., Blum, W., & Salett Biembengut, M. (Eds.). (2015). *Mathematical modelling in education research and practice: Cultural, social and cognitive influences*. Cham: Springer.

Straehler-Pohl, H. (2017). De|mathematisation and ideology in times of capitalism: Recovering critical distance. In H. Straehler-Pohl, N. Bohlmann, & A. Pais (Eds.), *The disorder of mathematics education: Challenging the socio-political dimensions of research* (pp. 35–52). Cham: Springer.

Treffers, A. (1987). *Three dimensions: A model of goal and theory description in mathematics instruction – the Wiskobas project*. Dordrecht: D. Reidel.

Vanpaemel, G., De Bock, D., & Verschaffel, L. (2011). Modern Mathematics: Willy Servais (1913–1979) and mathematical curriculum reform in Belgium. Paper presented at the Second International Conference on the History of Mathematics Education, Lisbon, October 2–5, 2011 [https://lirias.kuleuven.be/bitstream/123456789/406129/1/12 HRP26.pdf].

Vergnaud, G. (1999). A comprehensive theory of representation for mathematics education. *Journal of Mathematical Behavior, 17*(2), 167–181.

Verschaffel, L., Greer, B., Van Dooren, W., & Mukhopadhyay, S. (Eds.). (2009). *Words and worlds: Modelling verbal descriptions of situations*. Rotterdam: Sense.

The programme of the conference includes several activities: plenaries, semi-plenaries, working groups, oral presentations, forum of ideas, panels, and meeting the plenary speakers.

Plenary and Semi-plenary Presentations

The programme includes plenary and semi-plenary sessions where invited speakers will focus on aspects of the conference theme. The plenaries and semi-plenaries provide a shared input to the conference and form a basis for discussions in the working groups.

The plenary speakers are:

Lisa Björklund Boistrup, *Stockholms universitet, Sweden*
Corinne Hahn, *ESCP Europe, France*
Eva Jablonka, *Freie Universität Berlin, Germany*
Ewa Swoboda, *Uniwersytet Rzeszowski, Poland*

Working Groups

Each participant is invited to be a member of one of the working groups that will meet several times. Working groups will focus on a specific subtheme (see the description above) or on a number of interrelated themes. This will provide opportunities both for in-depth discussions and for the linking of experiences. These are planned as interactive sessions and are the heart of the conference. Oral presentations are included in these sessions, and discussions and exchange of experiences and ideas are the essential aspects of this activity. Each group will be coordinated by two "animators".

Oral Presentations within the Working Groups

Individuals or small groups of participants are encouraged to contribute to the conference through an oral presentation, thus communicating and sharing with others their ideas, research work or experiences. Relevant case studies are particularly welcome. Presentations should be related to the theme of the conference in general or to the subthemes. There will be between 15 and 20 minutes available for each presentation (depending on the organisation of the working group) followed by approximately 10 to 15 minutes for discussion.

Workshops

Individuals or small groups of participants are also encouraged to prepare and organise workshops. These are a more extended type of contribution which should focus on concrete

activities and encourage the active involvement of the participants through working on materials, problems or questions relating to the subthemes. A workshop will last for about 90 min.

Forum of Ideas

The Forum of Ideas offers an opportunity to present case studies, learning materials and research projects, as well as ideas that are not directly related to the theme. There will be a specific time for contributors to explain and discuss their work with fellow participants.

Special Sessions

There will be two special sessions that will enrich the discussion. In one of these sessions, which is a panel, tribute is paid to Christine Keitel, former president of CIEAEM, by revisiting Mathematics (Education) and Common Sense.

Official Languages of the Conference

The official languages of the conference are French and English. The speakers need to prepare their slides in both languages, but, of course, each speaker chooses the language of presentation. We rely on and appreciate the help of those who can translate, to assist their colleagues within each working group. Animators in most cases are able to help in both languages.

Conference Programme

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A & B</td><td>Plenary 4</td><td>Special Session</td></tr>
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<tr><td>10.00 - 10.30</td><td rowspan="2">Plenary 3</td><td>Coffee Break</td><td>Coffee Break</td><td rowspan="3">Working Group
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(Education) and
Common Sense
Revisited</td><td rowspan="3">Working Groups
(Session 2)</td><td>Coffee Break</td></tr>
<tr><td>12.00 - 12.30</td><td rowspan="2">Round Table:
Feedback to the
Conference</td></tr>
<tr><td>12.30 - 13.00</td></tr>
<tr><td>13.00 - 13.30</td><td rowspan="3">Lunch
(incl. Book Launch)</td><td rowspan="3">Lunch</td><td rowspan="3">Lunch</td><td rowspan="3">Lunch</td><td>Closing Ceremony</td></tr>
<tr><td>13.30 - 14.00</td><td rowspan="15"></td></tr>
<tr><td>14.00 - 14.30</td></tr>
<tr><td>14.30 - 15.00</td><td rowspan="4">Working Groups
(Session 1)</td><td rowspan="3">Workshops</td><td rowspan="6">Excursion</td><td>Meeting the Plenary
Speakers 3 and 4</td></tr>
<tr><td>15.00 - 15.30</td><td rowspan="3">Forum of Ideas
(incl. Coffee)</td></tr>
<tr><td>15.30 - 16.00</td></tr>
<tr><td>16.00 - 16.30</td><td>Coffee Break</td></tr>
<tr><td>16.30 - 17.00</td><td>Coffee Break</td><td rowspan="2">Meeting the Plenary
Speakers 1 and 2</td></tr>
<tr><td>17.00 - 17.30</td><td rowspan="2">Plenary 1</td><td rowspan="4"></td></tr>
<tr><td>17.30 - 18.00</td><td rowspan="3"></td></tr>
<tr><td>18.00 - 18.30</td></tr>
<tr><td>18.30 - 19.00</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>19.00 - 23.00</td><td>Dinner & Dance</td></tr>
</table>

We hope that all participants will contribute actively to the conference by sharing with others their experiences and views in the various sessions, particularly in the working groups. Moreover, you are encouraged to send a proposal for an oral presentation or a workshop, or to bring a contribution to the Forum of Ideas.

Proposals for **ORAL PRESENTATIONS** and **WORKSHOPS** can be made by sending a FOUR PAGE text (about 1800 words or 12000 characters with spaces), **BEFORE FEBRUARY, 15, 2017**, including:

- Title, authors' names (please underline the presenting author) and affiliations,
- Aim and main idea of the reported study, methodology and the expected conclusions,
- References.

The language of the proposal should be the same as that of the oral presentation (English or French). Once your proposal is accepted you will need to prepare an abstract or summary in the other official language together with slides in both languages. Members of the Commission can assist the participants in translating their transparencies if they ask for help ahead of time.

Please note that each author can present only one oral presentation. If an author submits two or more papers, one of the co-authors needs to present the second, third etc. oral presentation.

Proposals for the **FORUM OF IDEAS**, can be made by sending a ONE PAGE text (about 450 words or 3000 characters with spaces), **BEFORE MARCH, 15, 2017**, including:

- Title, authors' names and affiliations,
- Short description of the content, including information about the type of material to be presented (poster, models, video, …).

The language of the proposal should be the same as that of the oral presentation (English or French). Once your proposal is accepted you will need to prepare an abstract or summary in the other official language together with one single Power Point or other presentation in both languages. Members of the Commission can assist the participants with translations if they ask for help ahead of time.

The **Conference Proceedings,** which will be published as a special supplement of the journal *Quaderni di Ricerca in Didattica / Mathematics* (QRDM), will be edited by electronic typesetting of the submitted papers. For uniformity and the good quality of the edition, it is necessary to keep to the following specifications:

- The page size will be A4 with margins 4cm right and left, 5.3cm top and down. The text alignment will be justified, except the title and the author's names that will be aligned centred.
- The first page will contain in order:

1. The title of the paper, in bold font and size 16.
2. One blank line.
3. The authors' names, affiliation and email, in font size 12.
4. Two blank lines.
5. Abstract of the paper: this will not exceed 15 lines, in font size 12.
6. Two blank lines.
7. The main text, in font size 12.

- All text fonts will be Times New Roman.
- Pictures, tables, graphs, that are included in the text, must also be saved in separate files submitted with the paper.

Please send us your computer file by using **Microsoft Word** (saved as .docx) with your proposal to the following e-mail address: cieaem69@ewi-psy.fu-berlin.de

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Registration

Please register online on the website:

http://www.ewi-psy.fu-berlin.de/en/einrichtungen/arbeitsbereiche/grundschulpaed/3_mathematik/CIEAEM69_n/index.html

Conference Fee

Participant (before April 30, 2017)	320,00 €
Quality-Class Student	200,00 €
Student (before April 30, 2017)	200,00 €
Accompanying Person (before April 30, 2017)	200,00 €
Participant (after April 30, 2017)	360,00 €
Student (after April, 30, 2017)	240,00 €
Accompanying Person (after April 30, 2017)	240,00 €

The fee includes all documents for the conference, coffee breaks, social activities, lunches, excursion and conference dinner. For accompanying persons, lunches, excursion, social activities and conference dinner are included.

You may offer extra 10 € (or more) for the Braithwaite Fund (in order to support participants in difficult circumstances).

Please pay the conference fee by money transfer. The bank details (IBAN etc.) will be announced at the conference website by January 15, 2017. Once you have paid by money transfer, please immediately send a copy of the transaction document with your name on it to the Conference Secretariat:

cieaem69@ewi-psy.fu-berlin.de

Please note: **All bank charges must be covered by the participant.**

Important Dates

Proposals for oral presentations and workshops	February, 15, 2017
Proposals for the Forum of Ideas	March, 15, 2017
Reply from the International Programme Committee (Proposal Reviews)	April, 15, 2017
Payment of conference fee	April, 30, 2017
Submission of the final paper	May, 15, 2017
Third Announcement (Final Programme)	June, 15, 2017

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Accommodation and other Information

Accommodation

Participants book a hotel or other accommodation by themselves. For an overview, we provide a list of hotels and hostels on the conference webpage. Please book your hotel in advance if you wish to have a nice place!

Information for Visitors

Time	Germany is one hour ahead of Greenwich Mean Time (GMT+1).
Currency	The official currency in Germany is EURO (€). Major credit cards are widely accepted, although cash is preferred in most shops, especially the smaller ones.
Smoking	The conference is a non-smoking event. In Germany smoking is not allowed in public buildings, restaurants, most liquor establishments (bars) and cafeterias.
Liability & Insurance	The organisers cannot be held responsible for accidents to conference participants or accompanying persons, for damage, or loss of their personal property, or for cancellation expenses, regardless of cause. Participants are advised to carry out their own insurance arrangements during their stay in Germany.
Special Needs	Participants and accompanying persons with disabilities are invited to advise the Conference Secretariat of any special requirements.
Phones & Mobile Phones	The international dialing code of Germany is +49. Please consult your cell provider about roaming rates for Germany.




For further information: http://www.cieaem.org