

WHAT RESEARCH SHOWS ABOUT MATHEMATICS TEACHERS' LEARNING NEEDS: EXPERIENCE FROM LATVIA

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THE CENTER FOR SCIENCE AND MATH EDUCATION



Dabaszinātņu
un matemātikas
izglītības centrs

L A T V I J A S U N I V E R S I T Ā T E



LATVIJAS
UNIVERSITĀTE
ANNO 1919

**Research in
Science and
Math Education**

**Teachers'
professional
development**

**Raising
students
interest**

**Science
communication**

Our background

The implementation of complex reforms in
Science and Math education
in Latvia 2005-2011 (grades 7-12)

The Center for Science and Math Education
University of Latvia; from the end of 2011

National network of innovative experience



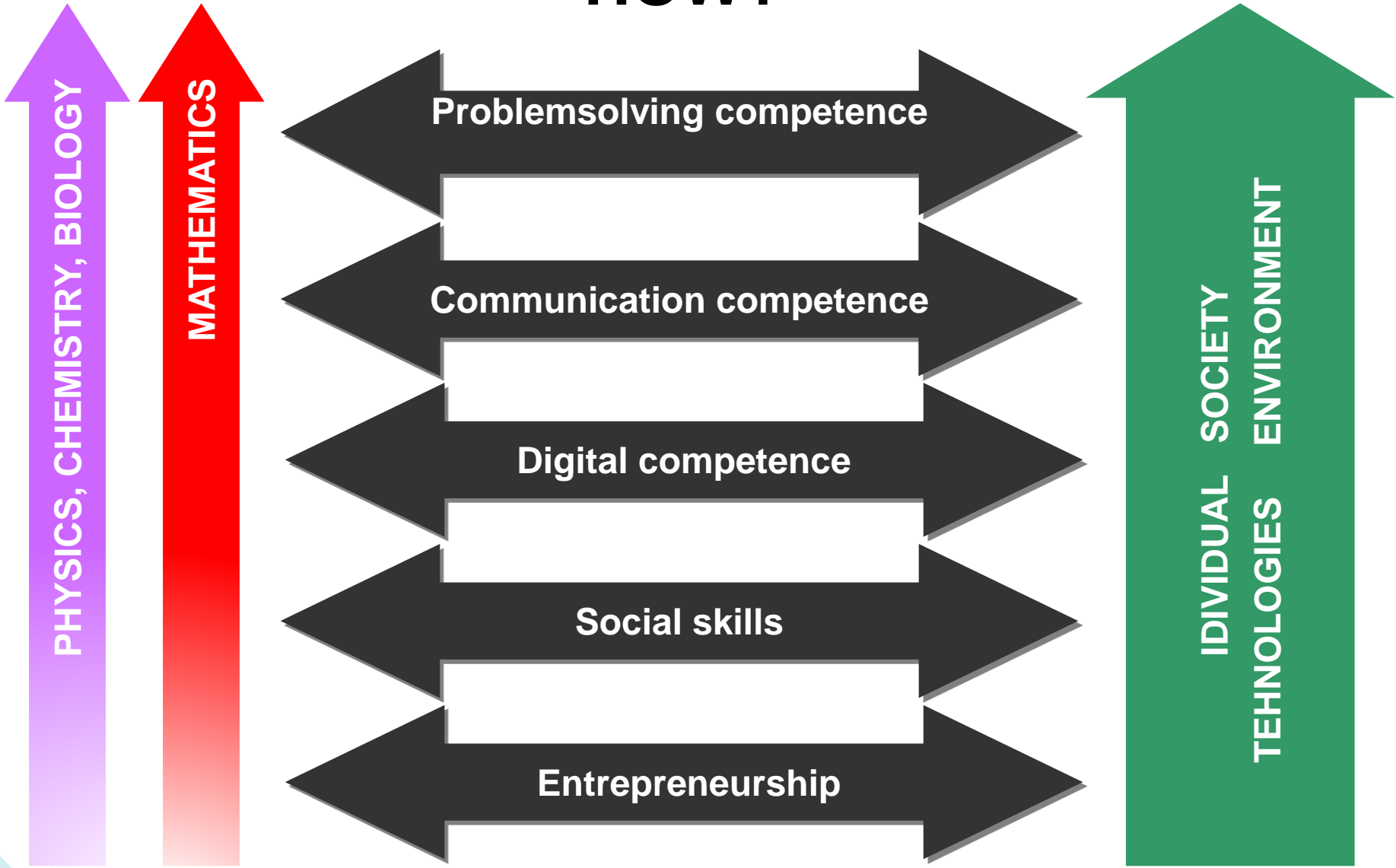
1998

**2006,
2008**

2015...



HOW?



How to achieve changes in math classroom? What are math teachers' learning needs?

INTRODUCERS OF CHANGES

TEACHERS

- Deliver classroom instruction with the focus on learning outcomes
- Effectively use various teaching strategies and modern technologies
- Collaborate with colleagues to share and develop the best teaching and learning practice
- Engage students' parents

SCHOOL

SCHOOL LEADERS

- Define and draw school improvement strategy
- Provide instructional and administrative leadership
- Involve the communities of schools in reaching the school improvement goals

EDUCATION ADMINISTRATION

- Provides targeted support to schools
- Encourages communication between the school and Ministry of Education and Science
- Facilitates cooperation among schools in cities, regions
- Encourages the understanding of the community regarding changes in the school

MUNICIPALITY

NATIONAL EDUCATION CENTRE, "SCIENCE AND MATHEMATICS"

- Implements unified methodological system of science and mathematics
- Provides necessary support to teachers
- Informs and forms the understanding of the community regarding the changes
- Continuously increases professionalism of the field experts

STATE

Expectations from teacher

- Different teaching and learning strategies
- Use of modern technologies
- Relationships focused on co-operation
- Planning, realising outcomes



What understanding should the teachers possess

It is important to emphasize that the constructivist opinion about learning allows the teacher to implement the priorities specified in education regulations on a professional level in the classroom

(Cobern & Loving, 2008, Niaz 2011 etc.)



Constructivist-oriented instruction in the classroom emphasizes

- inquiry based learning,
- collaborative support,
- improvement of problem-solving and critical thinking,
- support to help students to construct mental models and experience conceptual change,
- use of technology,
- impact of students and teachers' beliefs

In student centered math lesson:

- Content
relevant
- Students
are getting actively involved in the learning process
(inquiry - ask questions, solve problems..., discuss,
cooperate...)
- Teacher
clear goals for the students; lesson is meaningful;
acts as consultant, manages the process to expected
learning outcomes



MATERIAL EQUIPMENT
CHANGE OF APPROACH
CHANGE OF BELIEFS

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MATERIAL EQUIPMENT
CHANGE OF APPROACH
CHANGE OF BELIEFS





Lesson Observations



Lesson observation

- is one of the ways that helps teachers acquire new knowledge and skills, learn about new techniques and improve the teaching process
- has the most direct impact on teachers' professional development
- is also used as a research tool



Research questions

What do lesson observations reveal about the approach of students' learning in mathematics lessons?

Do teachers demonstrate the necessary skills to organize students' learning?

What are the learning needs expressed by teachers and concluded by experts?



Data collection and analysis

lesson observation and analyses,

teachers' questionnaires,

analyses of experts' conclusion,

analyses of documents.



Data collection and analysis

57 math lessons (grades 5-12; 10 schools representing all school types; 2013) were observed and analyzed

e-observation sheet for transcript and analysis, the specified criteria using a Likert scale (0-3), content analysis was used

a teachers' needs questionnaire adapted from PROFILES project (2013; 27 respondents)

The numerical data were processed using R 3.1.2. software.

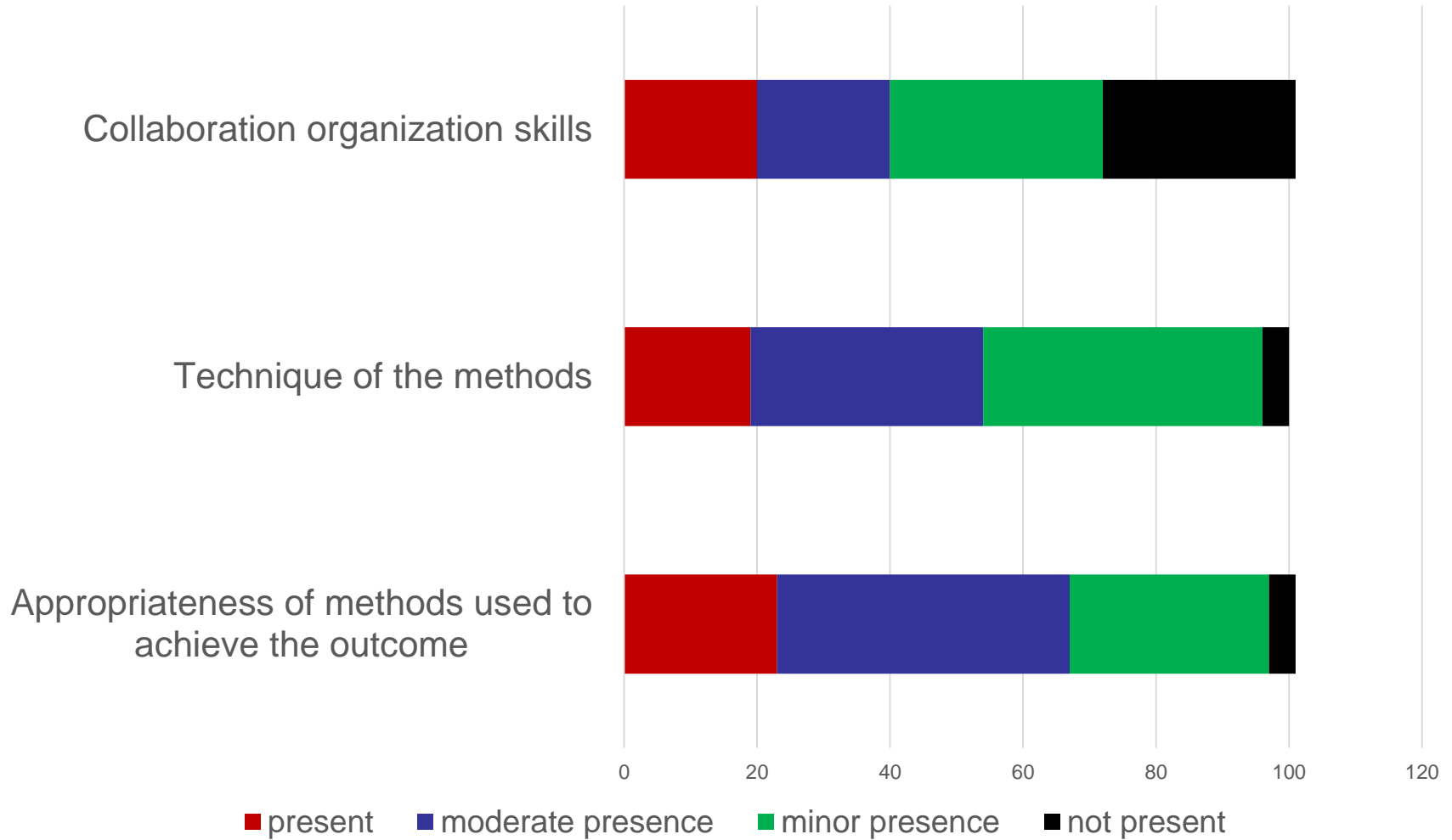


Results

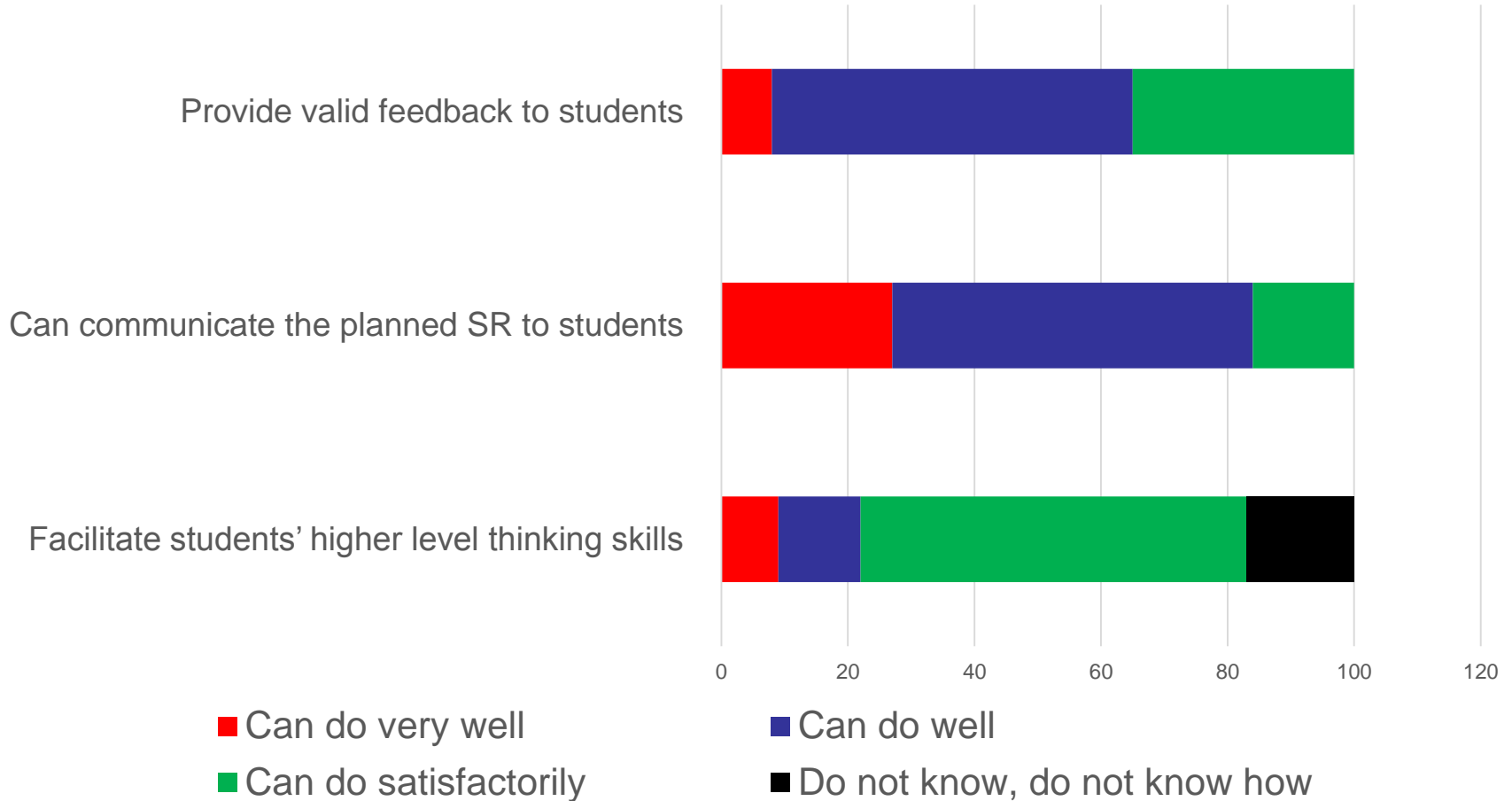
- Only 29% of the lessons indicated the use of HOCS on an acceptable level (2-3 in scale)
- In 54% of the lessons was observed successful student collaboration
- In 52% of the lessons teachers failed to communicate the learning outcomes



Teachers' skills demonstrated to organize learning (% of the observed lessons)



Teachers' self-evaluation (% of teachers)



Comparison of the information from observation and conversation

From lesson transcript

The new content is being explained. The teacher is speaking and asking questions to the students. Three students are answering. The teacher begins the sentence and expects one student to answer; then she goes on saying the next word of the answer herself until the definition is completed. The students write down the definition; they copy it from the board.

From experts conversation with the teacher after the lesson:

The teacher was telling me that she had planned that the students would create their own rotary spheres definitions. The teacher was pleased because the students had accomplished the task. However when asked what allows her to conclude that the students had really managed to create their own definitions, the teacher failed to answer the question.

Conclusions

- quite frequently teaching in the classroom is performed as transmitting information with including separate elements of scientific inquiry or collaboration;
- dominating low level cognitive activity and frontal work with the whole class of students



Conclusions

- the existence of a gap between the priorities described in the education policy resolutions from 2006 and the reality in the classroom in 2013;



Conclusions

- the need for improving teachers' reflection skills and also points to the deep -- controversy between teachers' performance in the classroom and their understanding of what they are doing



Implementation of a new philosophy means changing people's beliefs about a different understanding of learning on the whole and about an efficient lesson.



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More information
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