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

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THE CENTER FOR SCIENCE AND MATH EDUCATION

- 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
HOW?

Problemsolving competence
Communication competence
Digital competence
Social skills
Entrepreneurship

PHYSICS, CHEMISTRY, BIOLOGY
MATHMATICS

ENVIRONMENT
TEHNOLOGIES
IDIVIDUAL
SOCIETY
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 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

Schraw et al., 2006
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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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)

Collaboration organization skills

Technique of the methods

Appropriateness of methods used to achieve the outcome

Legend: present, moderate presence, minor presence, not present
Teachers’ self-evaluation ( % of teachers)

- Provide valid feedback to students
- Can communicate the planned SR to students
- Facilitate students’ higher level thinking skills

- Can do very well
- Can do well
- Can do satisfactorily
- Do not know, do not know how
### Comparison of the information from observation and conversation

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<tr>
<th>From lesson transcript</th>
<th>From experts conversation with the teacher after the lesson:</th>
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<td><strong>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.</strong></td>
<td><strong>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.</strong></td>
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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.
References


More information
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