HOW DOES COGNITIVE DEMAND IN OBSERVED LESSONS AND NATIONAL DIAGNOSTIC TESTING COMPARE TO PISA SCIENCE RESULTS IN LATVIA?

Dr. paed. Dace Namsone
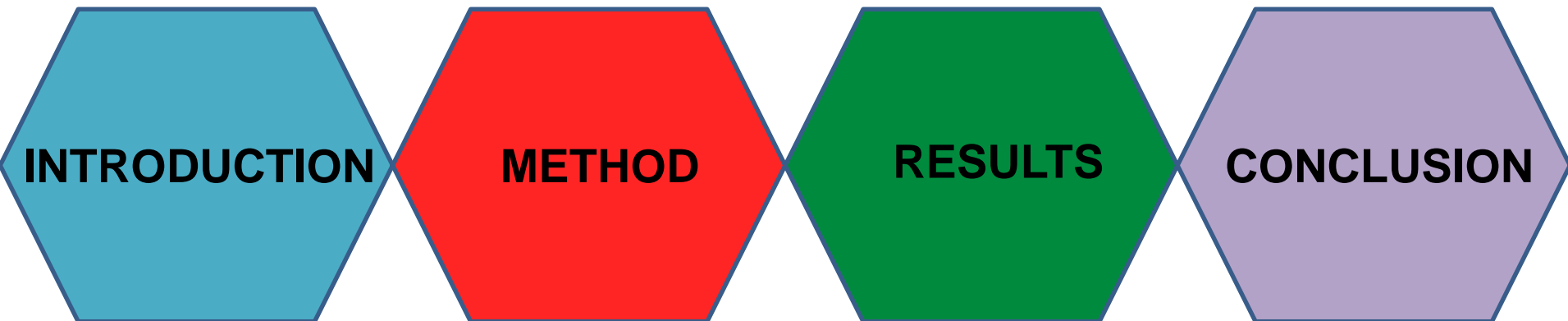**Mag. math. Līga Čakāne**
The Interdisciplinary Center for Educational Innovation of the University of Latvia
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The Structure of the Presentation

INTRODUCTION

METHOD

RESULTS

CONCLUSION

- Major reforms in Latvia were begun in 2006.
- Latvian students` performance in the science portion of PISA have remained consistent.
- The government of Latvia has made it a priority to increase scores on PISA assessment.
- Science education in Latvia must be improved.

Table 1
Latvian Student Performance PISA Science Assessment 2006 - 2015

	2006	2009	2012	2015
Latvia mean score	490	494	502	490
Top performers (% of students at level 5 & 6)	4.1	3.1	4.4	3,8
Low performers (% of students below level 2)	17.4	14.7	12.4	17,4

The following research questions are addressed:

1) What cognitive demand level is present in the typical Latvian science lesson? How is the cognitive demand level of the lessons compared to the PISA proficiency levels?

2) What is the cognitive demand level of the national diagnostic tests? How do the cognitive demand levels compare to PISA proficiency levels?

- 53 physics, chemistry, biology and general science lessons.
- 9 different schools were observed.
- Grades 5th to 12th.
- A team of trained experts from the University of Latvia.
- A lesson observation form.
- 0-3 point cognitive demand rubric.
- Used R 3.1.2 software.

- National diagnostic testing in science is done in 6th and 9th grades.

- The aim is to measure skills and competencies students have developed.

- Analysis is done using the Iteman and WinsSteps Rasch.

- Results are made public and used to make informed decisions about curriculum.

- Each question was assigned a cognitive level using the SOLO taxonomy.

- The assessment levels of the various instruments used to describe student performance are compared

Table 2
Levels of Cognitive Demand Scales

Level of cognitive demand	PISA proficiency level	PISA cognitive level	National testing	Lesson observation	SOLO taxonomy
High	5, 6	High	High	3	Extended abstract
Medium	4, 3	Medium	Medium	2	Relational
Low	2	Low	Low	1	Multi-structural
	1a			0	Uni-structural
Under low	1b				Pre-structural

RESULTS

- 81% of the material was at level 1 or 0.
- Only 5% of lessons observed were at the high cognitive level.
- similar low levels of cognitive demand.

Table 3
The Levels of Cognitive Demand in Science Tests

Grade	Uni-structural	Multi-structural	Relational	Extended abstract
6	52%	39%	9%	0
9	32%	60%	8%	0

- In the sampled classrooms level of cognitive demand required of students is low.
- There is a tendency for teachers to choose activities that do not challenge students to develop the deeper, complex thinking.
- Lower levels of cognitive demand in the 6th and 9th grade levels.
- 60% of 9th grade items require medium cognitive demand, which amounts to an increase of 21% compared to 6th grade.
- High level cognitive demand questions need to be included on the national test.

- The low levels of teaching may be attributed to the low levels of assessment on the national test.
- The design and implementation of teaching strategies that enhance higher-order thinking among students are not a simple endeavour.
- Teachers need to become familiar with and understand what high cognitive demand tasks require and develop teaching strategies to be effective.
- Latvian teachers do a good job in preparing students in learning requiring middle level cognitive demand.
- Latvian teachers fall short in preparing students for tasks requiring high cognitive demand.

Thank you for your attention!

We would like to answer your questions!

THE INTERDISCIPLINARY CENTER
FOR EDUCATIONAL INNOVATION

THE UNIVERSITY OF LATVIA

For more information please do not hesitate to contact us:

dace.namsone@lu.lv
liga.cakane@lu.lv