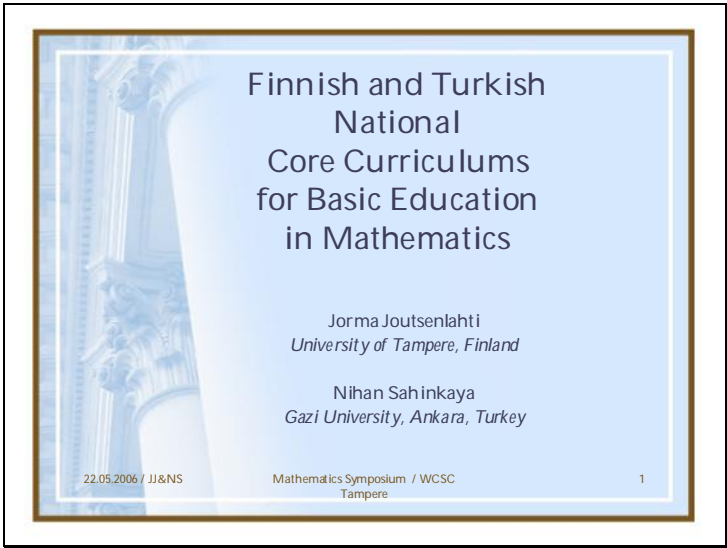


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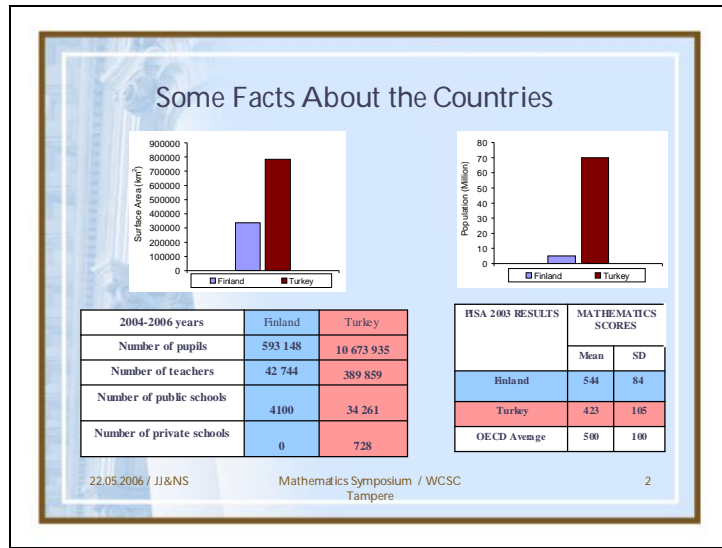
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**Finnish and Turkish  
National  
Core Curriculums  
for Basic Education  
in Mathematics**

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22.05.2006 / JJ&NS Mathematics Symposium / WCSC  
Tampere 1



CROSS CURRICULAR THEMES	
<b>FINLAND</b>	<b>TURKEY</b>
<ul style="list-style-type: none"> <li>• Growth as a person</li> <li>• Cultural identity and internationalism</li> <li>• Media skills and communication</li> <li>• Participatory citizenship and entrepreneurship</li> <li>• Responsibility for the environment, well-being and sustainable future</li> <li>• Safety and traffic</li> <li>• Technology and the individual</li> </ul>	<ul style="list-style-type: none"> <li>• Human rights and citizenship</li> <li>• Psychological guidance</li> <li>• Culture of Sport</li> <li>• Culture of health</li> <li>• Special education</li> <li>• Safety and life</li> <li>• Entrepreneurship</li> <li>• Development of career</li> </ul>
<b>Important values:</b> Human rights and democracy	
<b>View of learning</b> Social Constructivism	
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### The Structures of The Mathematics Curriculums

<b>Finland</b> For grade periods 1-2, 3-5 and 6-9 there are defined: <ul style="list-style-type: none"><li>Ø Objectives</li><li>Ø Core contents for domains of mathematics</li><li>Ø Description of good performance for domains of mathematics</li></ul>	<b>Turkey</b> <ul style="list-style-type: none"><li>Ø General objectives in mathematics</li><li>Ø Objectives and core contents for every grade 1-8</li><li>Ø General instructions for evaluation</li></ul>
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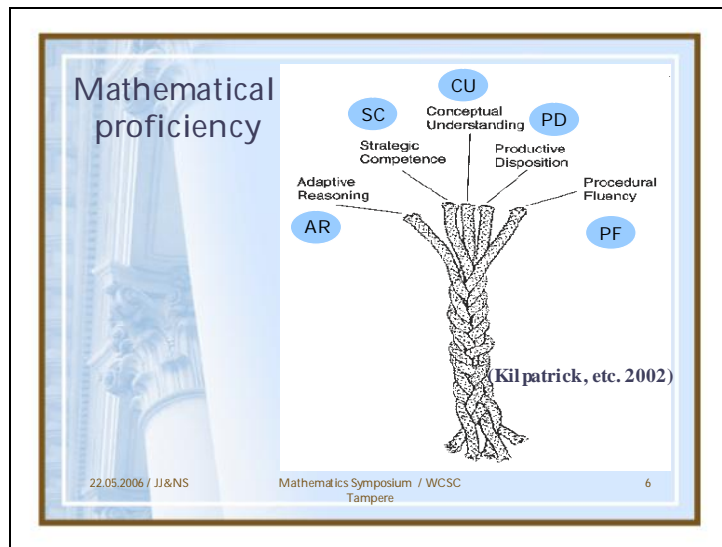
### Mathematics lesson hours

FINLAND	6		12			14				32
GRADES	1	2	3	4	5	6	7	8	9	Sum
TURKEY	4	4	4	4	4	4	4	4	4	32

Divisions of The Core Contents of Mathematics

Domain of Mathematics	FINLAND			TURKEY	
	1-2	3-5	6-9	1-5	6-8
Numbers and calculations					
Geometry					
Measurement					
Algebra					
Data processing and statistics					
Probability and statistics					
Functions					
Thinking skills and methods					

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Important concepts in the framework of our study.

Kilpatrick and Swafford (2002) have used concept "mathematical proficiency". Mathematical proficiency consist of five strands. Those five strands are interwoven and independent.

The five strands and our interpretations of them are:

**ADAPTIVE REASONING (AR)** : Using logic to explain and justify a solution to a problem or to extend from something known to something not yet known. For example applying mathematical knowledge and languaging mathematics – it means express or communicate mathematical thinking – are typical for adaptive reasoning.

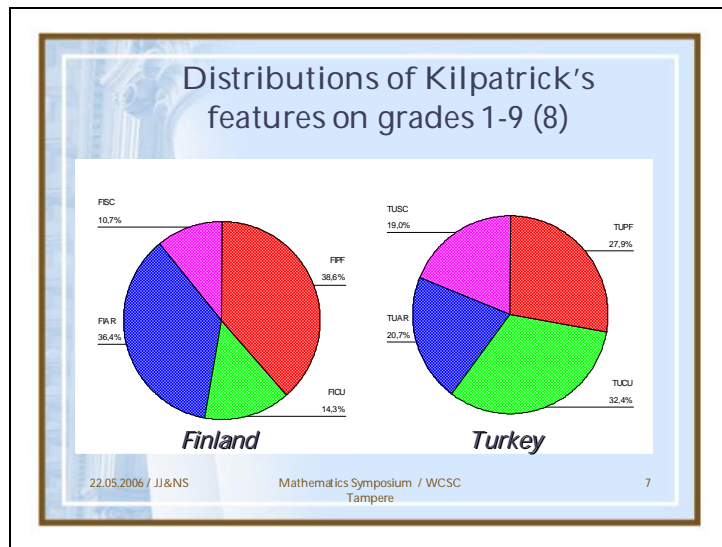
**STRATEGIC COMPETENCE**: Being able to formulate problems mathematically and to devise strategies for solving them using concepts and procedures appropriately. Polya's problem-solving is the kernel of this feature.

**CONCEPTUAL UNDERSTANDING**: Comprehending mathematical concepts, operations and relations – knowing what mathematical symbols, diagrams and procedures mean.

**PRODUCTIVE DISPOSITION**: Seeing mathematics sensible, useful, and doable. This feature represents affective domain, to which belong for example pupil's beliefs, attitudes, view of mathematics etc.

**PROCEDURAL FLUENCY**: Carrying out mathematical procedures, such as adding, subtracting, multiplying, and dividing numbers flexibly, accurately, efficiently and appropriately. Typical for this feature are mechanical counting, managing algorithms and procedures etc.

We have studied how these features are emphasized in the Finnish and Turkish Curriculums. Those five features are central for mathematical thinking in that sense that mathematical thinking is understood as knowledge processing.

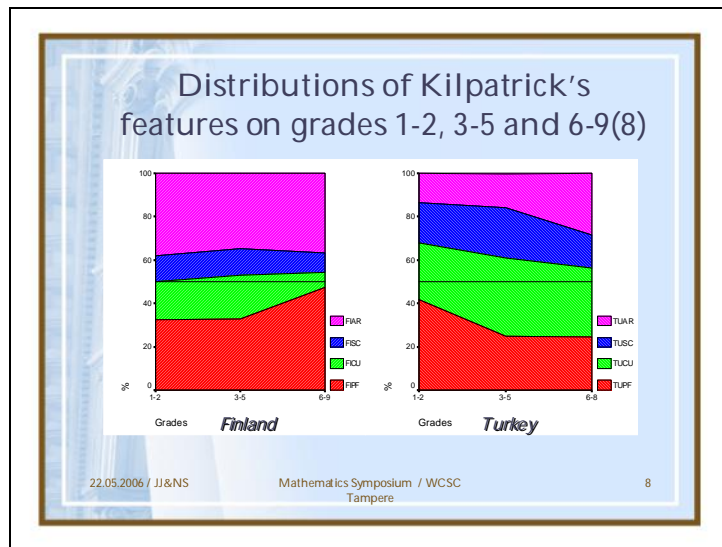


We have analyzed objectives and descriptions of good performance in Finnish curriculum and objectives in Turkish curriculums. We have used four categories and count frequencies.

In Finland there are about 40 % mentions which belong to procedural fluency. In curriculum history – 1974-1985 in Finland -there was period that we called “Back to basics”. After that came Problem –solving period. The newest period is perhaps the period of standards. Mechanical counting and applying are seeking balance every time in curriculums.

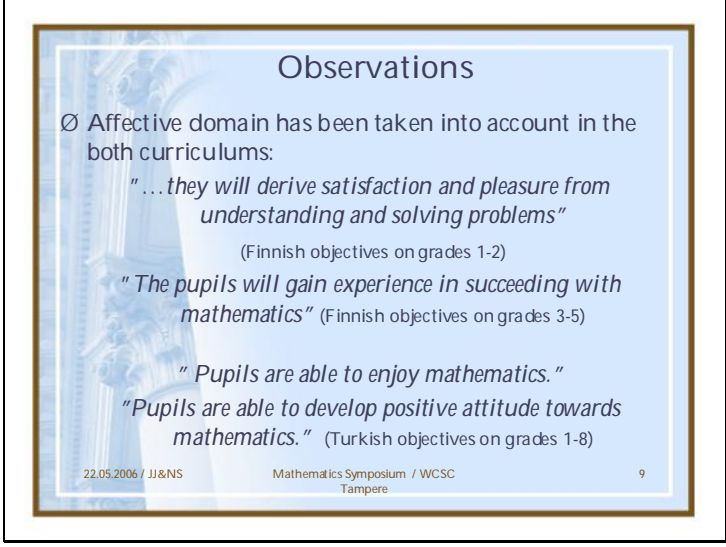
In Turkish curriculum strategic competence is stronger than in Finnish curriculum. Problem- solving is mentioned quite often.

If we study conceptual understanding and adaptive reasoning, we notice that they are about 50 % together in the both curriculums. So in written curriculums it seems that understanding and applying mathematics are seen important and counting skills are tools for solving problems.



When we look at distributions of those four features among grades 1-2, 3-5 and 6-9, we notice in Finnish curriculum that the portion of procedural fluency grows up in the last period 6-9. This not surprise, because during this period there are a lot of new procedures – for example equation solving- , which are more emphasized than new concepts. It seems that in Finnish curriculum adaptive reasoning is strongly emphasized. PISA 2003 survey measured mostly this feature.





**Observations**

Ø Affective domain has been taken into account in the both curriculums:

*"...they will derive satisfaction and pleasure from understanding and solving problems"*  
(Finnish objectives on grades 1-2)

*"The pupils will gain experience in succeeding with mathematics"* (Finnish objectives on grades 3-5)

*"Pupils are able to enjoy mathematics."*

*"Pupils are able to develop positive attitude towards mathematics."* (Turkish objectives on grades 1-8)

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Yet Some observations from affective domain in curriculums.

It's interesting and I think that also very important, that in new curriculums have been taken account of pupil's beliefs and feelings about mathematics and themselves as mathematics learners. Pupil's beliefs could be obstacle to learning mathematics.

In Finnish mathematics curriculum there are mentioned in the beginning of every grade period some objectives of affective domain.

Also in Turkish curriculum there many objectives of affective domain.

**Observations**

- Ø Concept "Mathematical thinking" is emphasized in Finnish Curriculum:  
*"The core tasks of mathematics instruction in the third through fifth grades are to develop mathematical thinking, introduce the learning of mathematical models of thinking..."*
- Ø Concept "Problem-Solving" is emphasized in Turkish Curriculum:  
*"Problem-solving is important part of mathematics lesson and mathematical activities ..."*  
*"Pupils are able to develop high level thinking skills using problem-solving."*
- Ø Tension between the written curriculum and learning materials (at least in Finland)

More information in <http://www.Joutsenlahti.net>

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Concept 'mathematical thinking' has been important in several Finnish mathematics curriculum. Especially expression 'develop pupil's mathematical thinking' is important. Mathematical thinking is connected to adaptive reasoning and strategic competence, which need conceptual understanding and procedural fluency.

Concept 'problem-solving' is emphasized in Turkish curriculum.

I have studied also Finnish learning materials in mathematics. Learning materials emphasize more procedural fluency than the curriculum. In Finland learning books in mathematics guide strongly working in classrooms. That's why there is conflict between written curriculum and reality in classrooms.