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FEATURES OF MATHEMATICAL THINKING AMONG FINNISH STUDENTS IN UPPER-SECONDARY SCHOOL

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- Introduction
- Theoretical framework
- Aim and perspectives
- Results

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Mathematics scale						
	Mean score	S.E.	Range of rank			
			OECD countries		All countries	
			Upper Rank	Lower Rank	Upper Rank	Lower Rank
Chinese Taipei	549	(4,1)			1	4
Finland	548	(2,3)	1	2	1	4
Hong Kong-China	547	(2,7)			1	4
Korea	547	(3,8)	1	2	1	4
Netherlands	531	(2,6)	3	5	5	8
Switzerland	530	(3,2)	3	6	5	9
Canada	527	(2,0)	3	6	5	10
Macao-China	525	(1,3)			7	11
Liechtenstein	525	(4,2)			5	13
Japan	523	(3,3)	4	9	6	13
New Zealand	522	(2,4)	5	9	8	13
Belgium	520	(3,0)	6	10	8	14
Australia	520	(2,2)	6	9	10	14
Estonia	515	(2,7)			12	16
Denmark	513	(2,6)	9	11	13	16
Czech Republic	510	(3,6)	10	14	14	20
Iceland	506	(1,8)	11	15	16	21
Austria	505	(3,7)	10	16	15	22
Slovenia	504	(1,0)			17	21
Germany	504	(3,9)	11	17	16	23
Sweden	502	(2,4)	12	17	17	23
Ireland	501	(2,8)	12	17	17	23
France	496	(3,2)	15	22	21	28
United Kingdom	495	(2,1)	16	21	22	27
Poland	495	(2,4)	16	21	22	27
Slovak Republic	492	(2,8)	17	23	23	30
Hungary	491	(2,9)	18	23	24	31
Luxembourg	490	(1,1)	20	23	26	30
Norway	490	(2,6)	19	23	25	31
Lithuania	486	(2,9)			27	32
Latvia	486	(3,0)			27	32
Spain	480	(2,3)	24	25	31	34
Azerbaijan	476	(2,3)			32	35
Russian Federation	476	(3,9)			32	36
United States	474	(4,0)	24	26	32	36
Croatia	467	(2,4)			35	38
Portugal	466	(3,1)	25	27	35	38
Italy	462	(2,3)	26	28	37	39
Greece	459	(3,0)	27	28	38	39
Israel	442	(4,3)			40	41
Serbia	435	(3,5)			40	41
Uruguay	427	(2,6)			42	43
Turkey	424	(4,9)	29	29	41	45
Thailand	417	(2,3)			43	46
Romania	415	(4,2)			43	47
Bulgaria	413	(6,1)			43	48
Chile	411	(4,6)			44	48
Mexico	406	(2,9)	30	30	46	48
Montenegro	399	(1,4)			49	50
Indonesia	391	(5,6)			49	52
Jordan	384	(3,3)			50	52
Argentina	381	(6,2)			50	53
Colombia	370	(3,8)			52	55
Brazil	370	(2,9)			53	55
Tunisia	365	(4,0)			53	55
Qatar	318	(1,0)			56	56
Kyrgyzstan	311	(3,4)			57	57

Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

Could we expect as good results in mathematics also in Finnish upper-secondary schools?

OECD PISA

Finland and Korea, and the partners Chinese Taipei and Hong Kong-China, outperformed all other countries/economies in PISA 2006.

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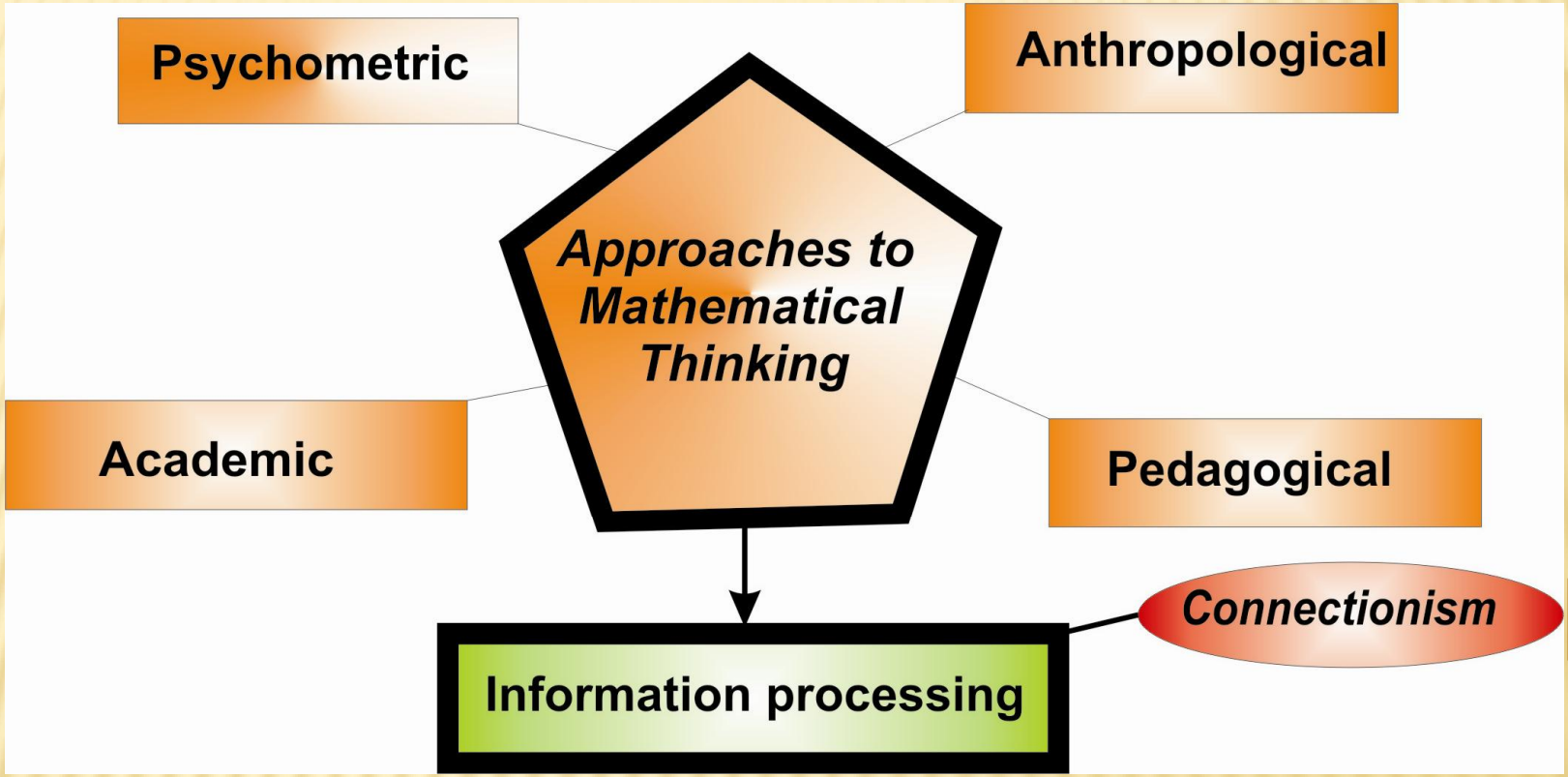
[1]



[2]

THEORETICAL FRAMEWORK 1/4

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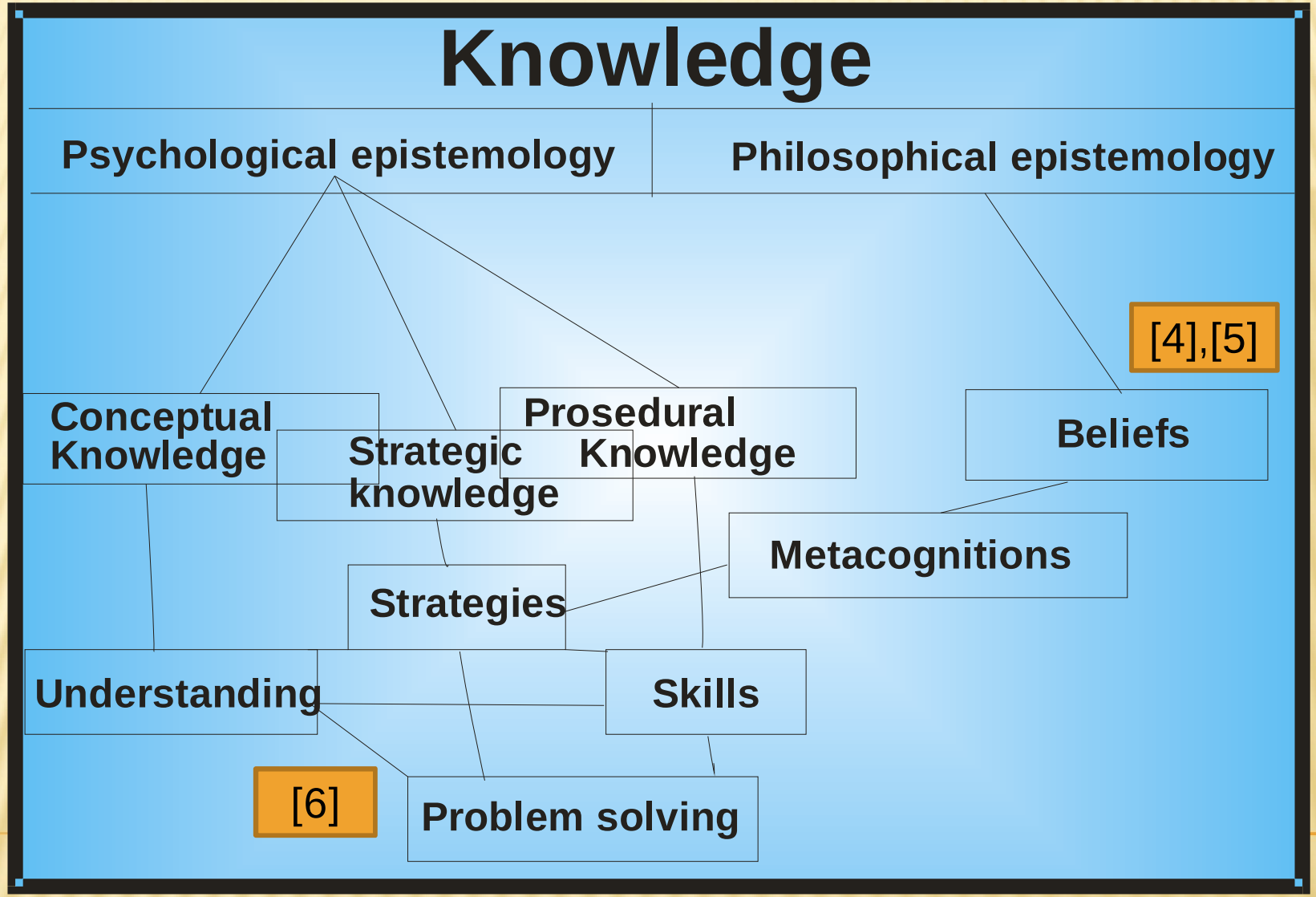

THEORETICAL FRAMEWORK 2/4

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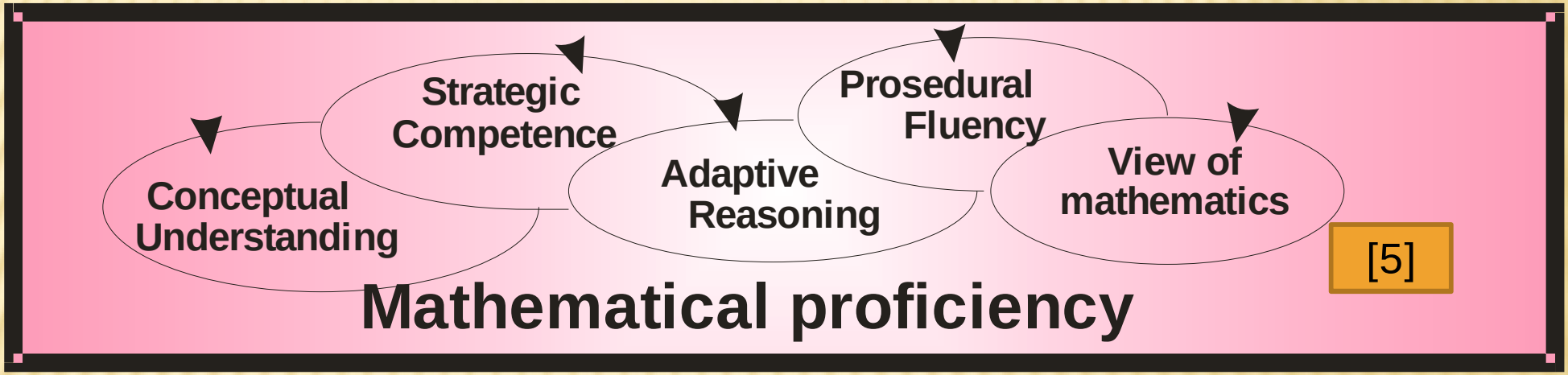

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THEORETICAL FRAMEWORK 3/4

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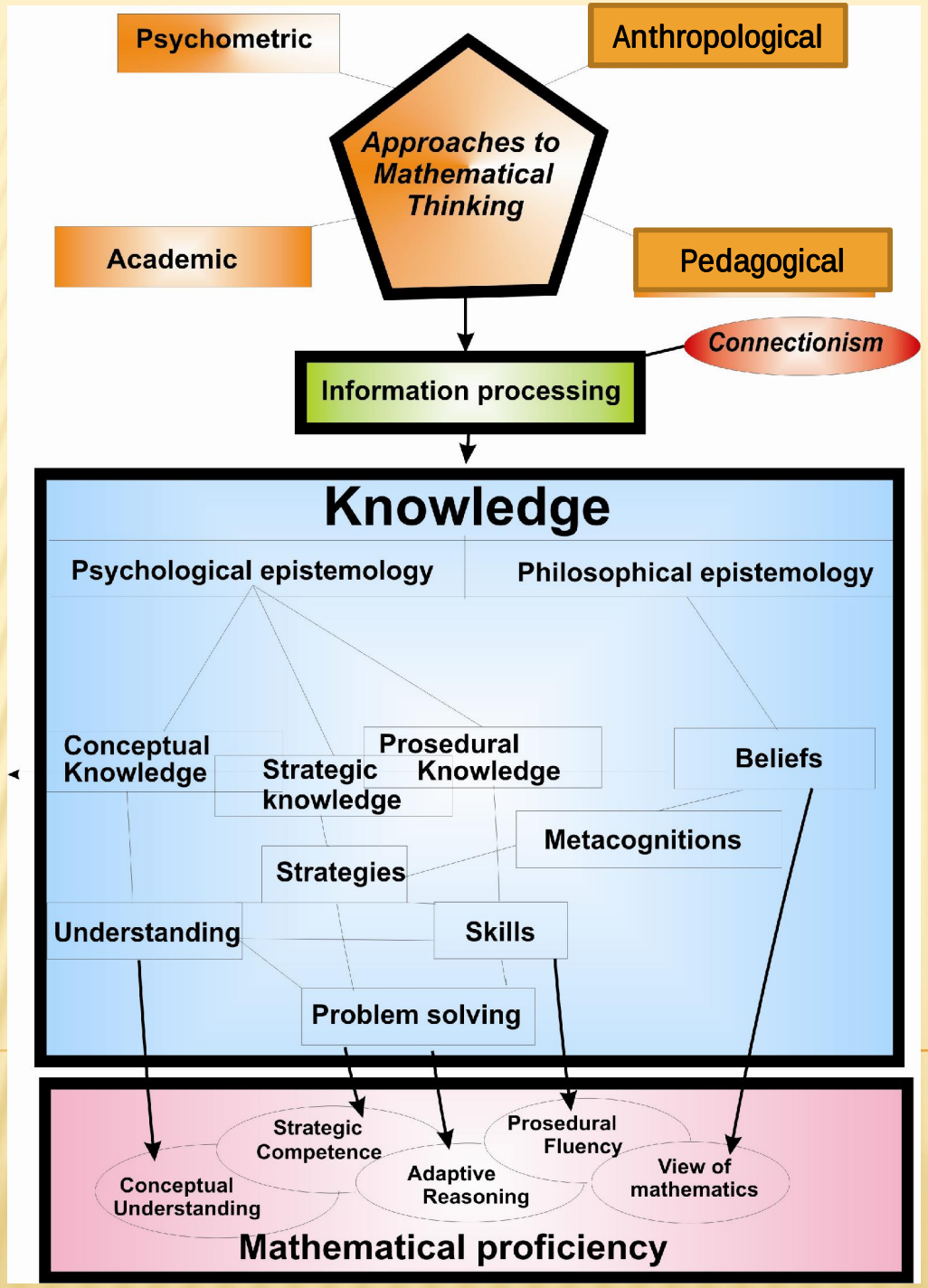
THEORETICAL FRAMEWORK 4/4



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AIM OF THE STUDY

- The main problem in the study is to describe features of the student's mathematical thinking
- The sub problems consider what kinds of differences exist in the mathematical proficiency and in the view of mathematics between genders and between students who chose a compulsory test or an optional test in the matriculation examination.

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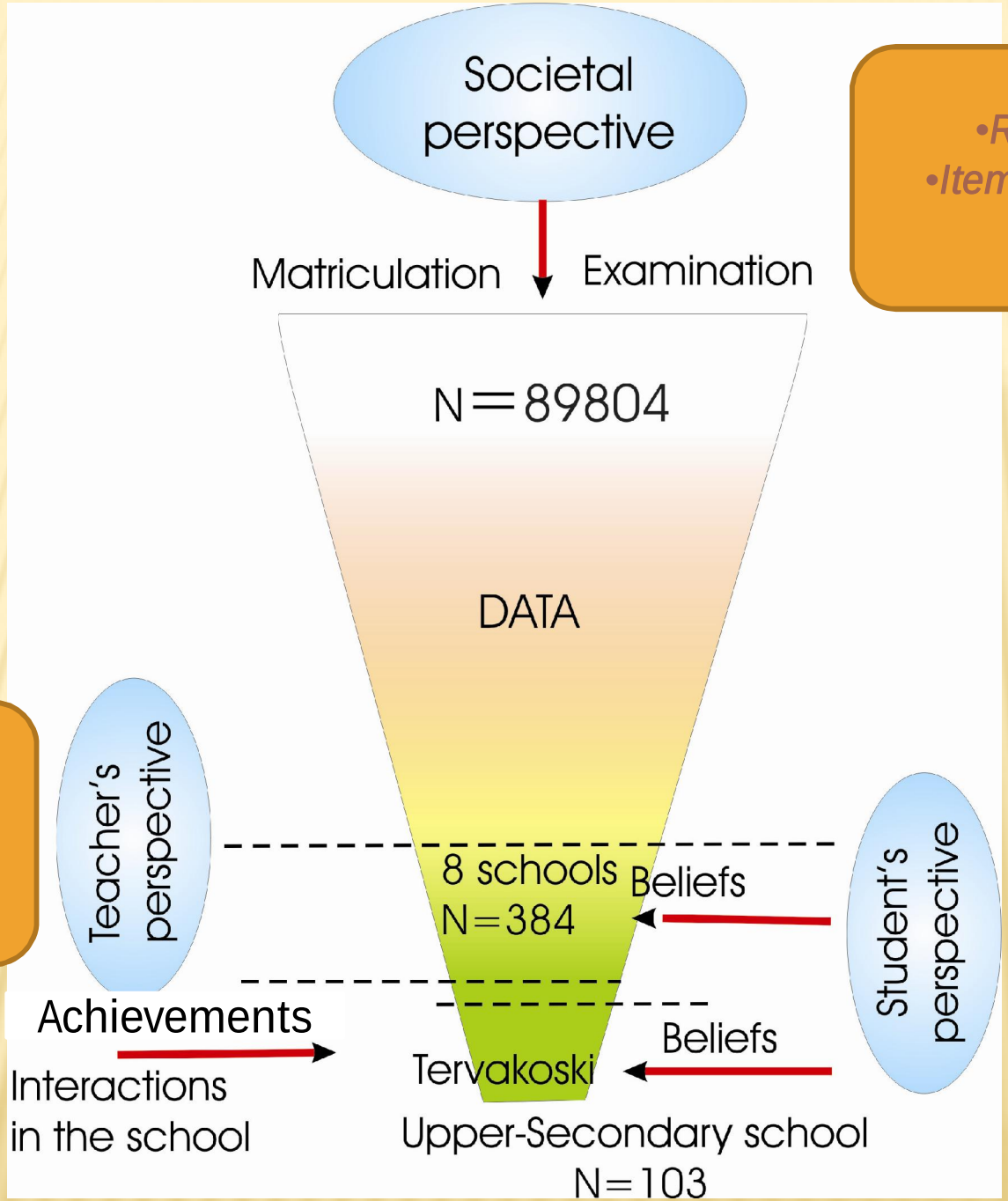


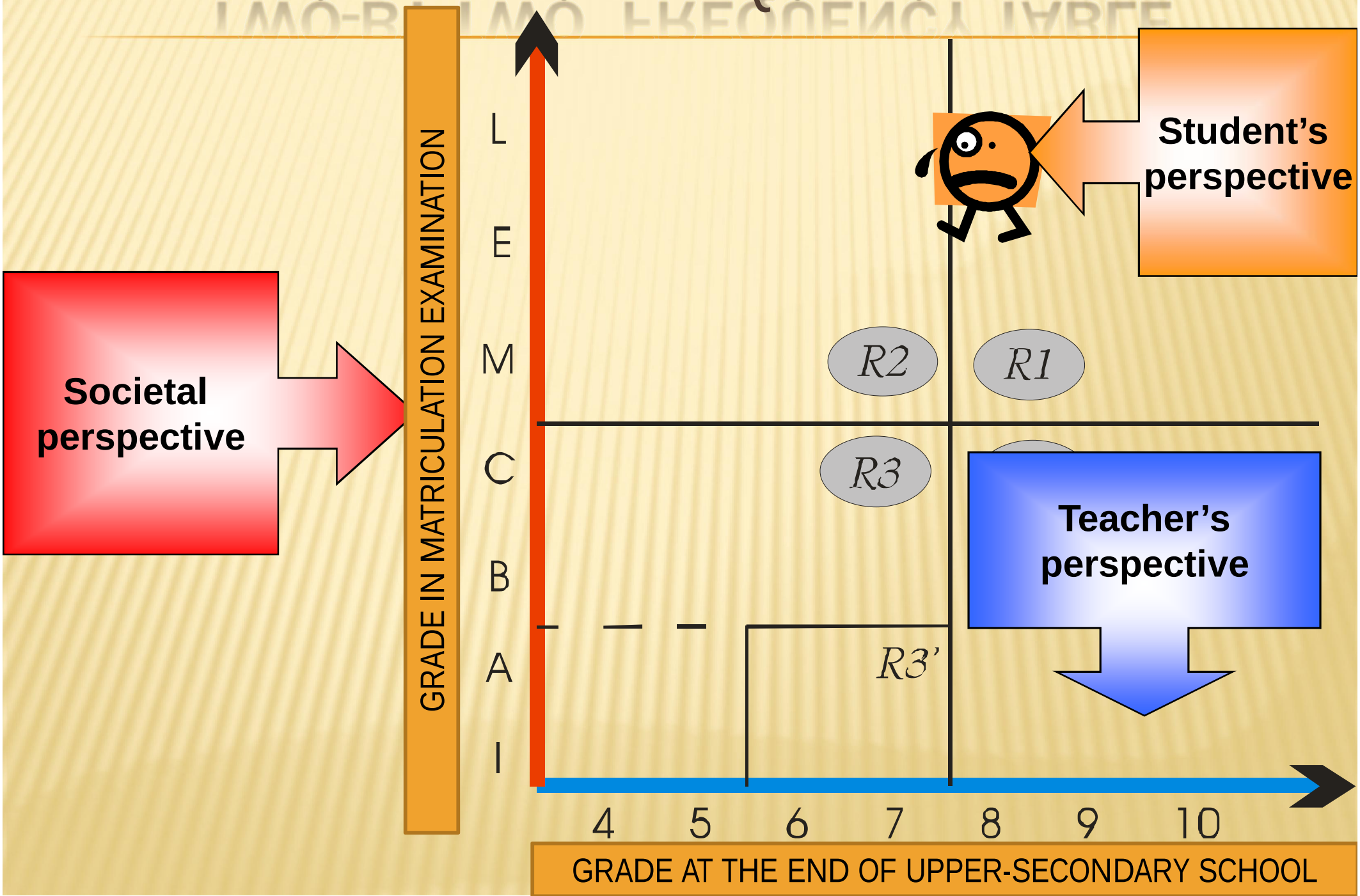
- *Results*
- *Item analysis*

Three perspectives

- *Test analysis*
- *Backround knowledge*

- *Questionary*
- *Interviews*

TWO-BY-TWO FREQUENCY TABLE



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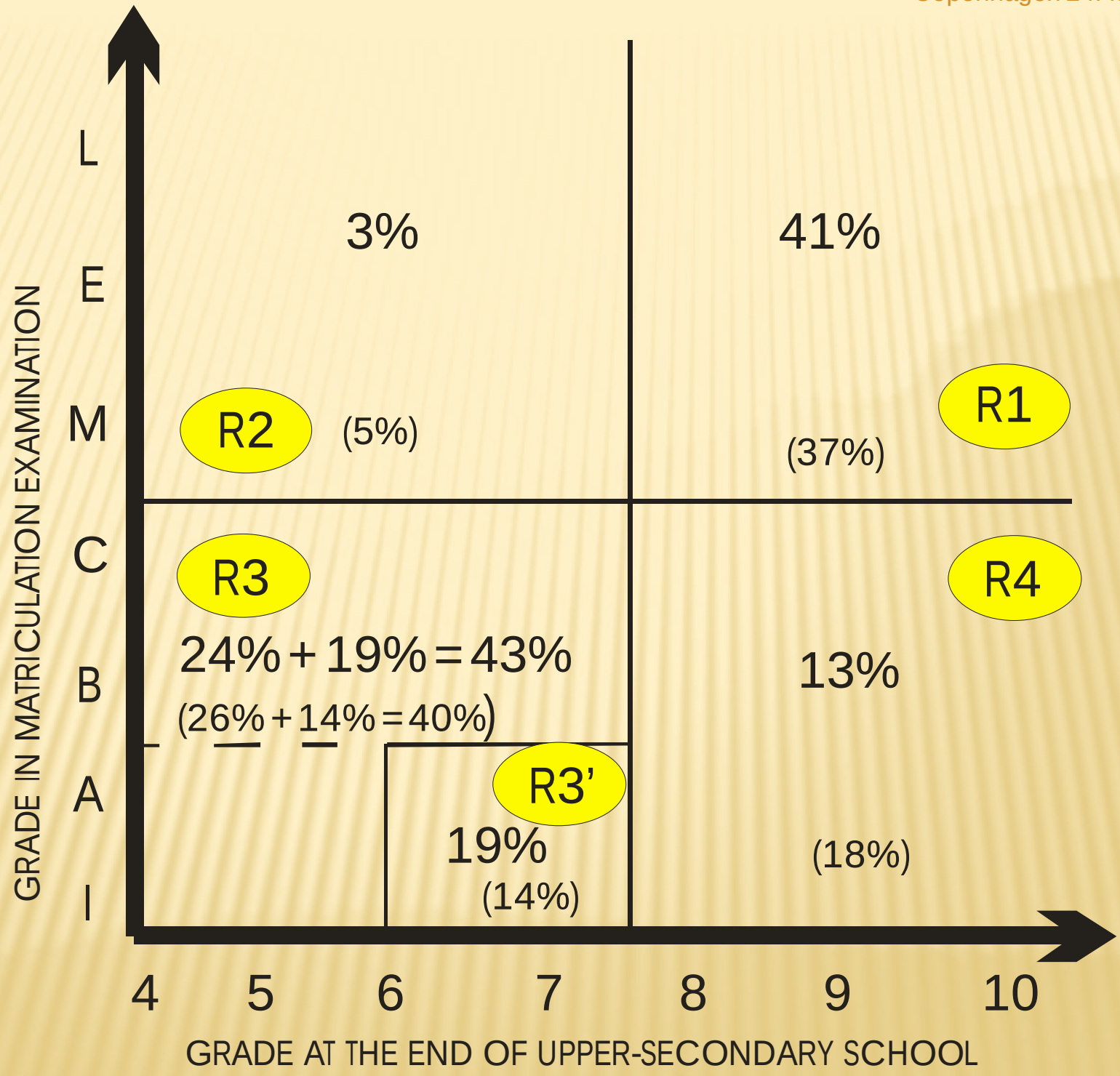
GRADE IN MATRICULATION EXAMINATION
L
E
M
C
B
A
I
3%
41%
R2
(5%)
(37%)
R1
R3
R4
24% + 19% = 43%
(26% + 14% = 40%)
13%
R3'
19%
(14%)
(18%)
4
5
6
7
8
9
10
GRADE AT THE END OF UPPER-SECONDARY SCHOOL

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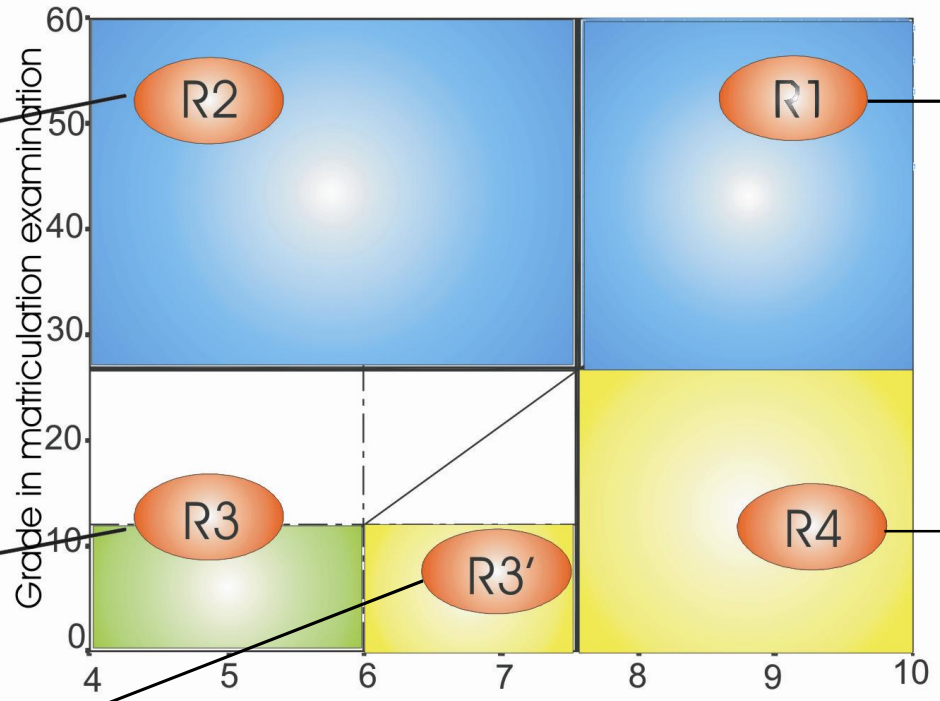

R2

R1

R3

R4

R3'

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R1 "SUCCESSFUL STUDENTS"

- Five features of their mathematical proficiency are well developed.
- appreciate mathematics as an important and pleasent subject.
- have perseverance to struggle with complex mathematical problems.
- broad mathematical thinking

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R2 "MATURE STUDENTS"

- They had difficulties in mathematics courses, but they studied hard and their mathematical proficiency developed just before matriculation examination. (especially procedural fluency)
- They have perseverance to struggle with complex mathematics problems.
- Broad mathematical thinking

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R3 "´JUST DOING´ STUDENTS"

- concentrated on procedural fluency.
- felt that there was too fast tempo in mathematics lessons and therefore they didn’t understand new concepts deeply.
- self-confidence in mathematics was weak
- Narrow mathematical thinking

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R3' "LOSERS"

- Most students ín the "losers" –group choiced mathematics as an optional test and they had concentrated on compulsory tests (calculation: optimize result, minimize work)
- quite good base (grade 6 or 7) in mathematics to develope their mathematical proficiency if they just had studied more systematically
- self-confidence in mathematics was weak
- narrow mathematical thinking

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R4 "DISAPPOINTED STUDENTS"

- have to know in advance for successful solving to what area of mathematics the problem belongs (undeveloped metacognitive skills in mathematics)
- managed well in courses which consist of specific area of mathematics and they feel themselves good in mathematics (before matriculation examination)
- contents bound mathematical thinking

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