Teaching and Learning Practices in Mathematics: measuring teaching from students' perspective at different contexts and educational levels

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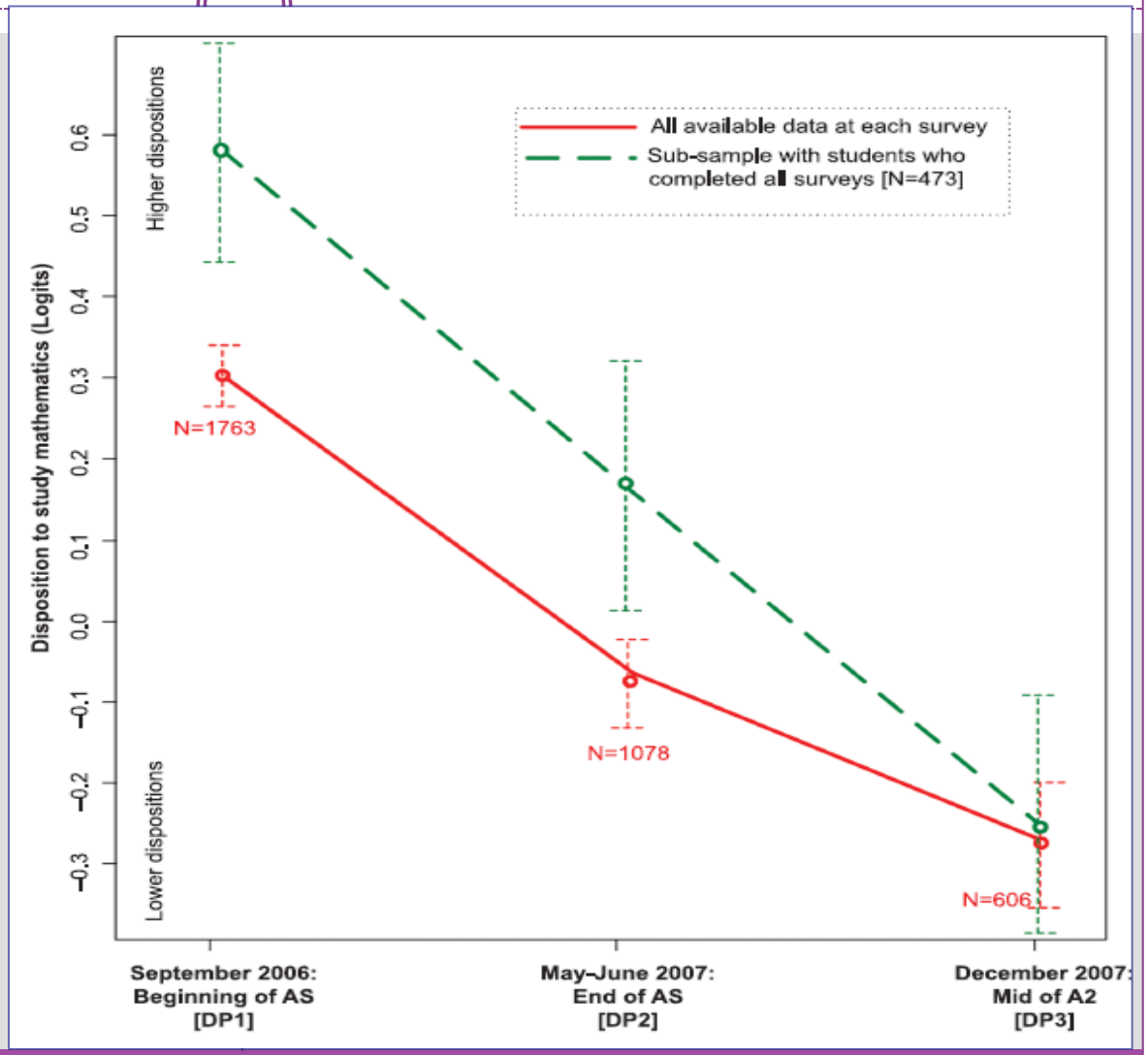
Outline of Presentation

- Introduction (STEM and Pedagogy)
- Background to the projects
- A common analytical framework and some results from two studies:
- Study 1 (Uni) - Students' reported perception of (pre) university pedagogical experience - UK and Norway
- Study 2- Pedagogy at Secondary school

- Concluding remarks

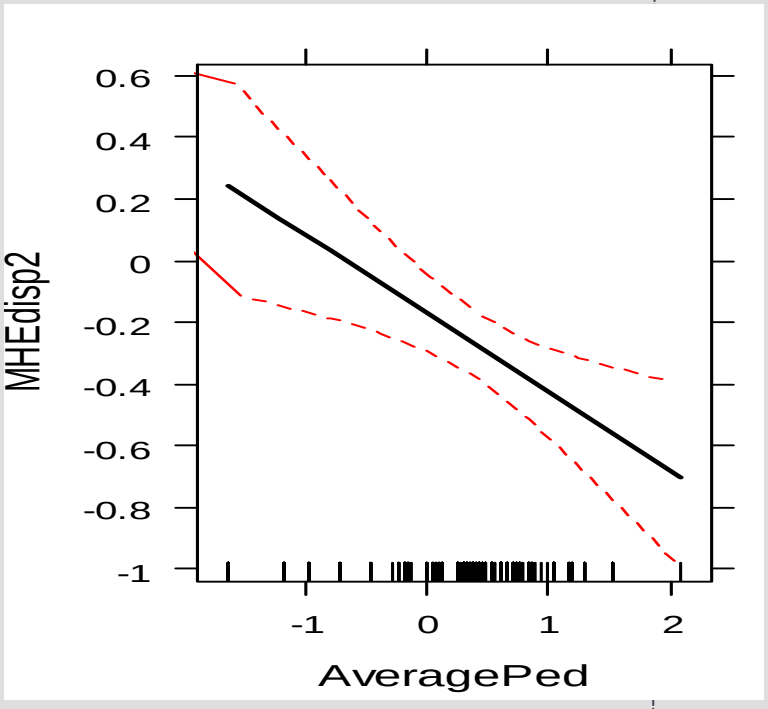
Introduction: The STEM 'issue'

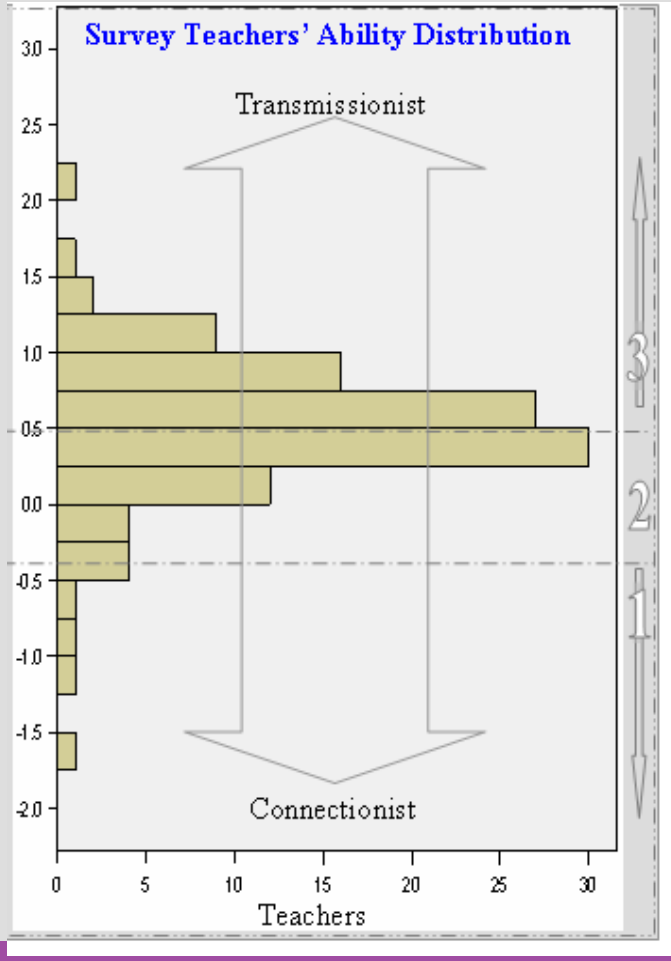
- STEM: Science Technology, Engineering and Mathematics
- Participation remains problematic
- Students dispositions are declining



Previous finding…

- Decline in dispositions (into college mathematics) is associated with transmissionist teaching





Towards a conceptual framework for pedagogic practices

- Research on learning environments
- Classroom Practices: teacher centred Vs learner-centred

- Widely accepted that effective maths teaching should be connectionist, in two ways:
  - connecting teaching to students' mathematical understandings, and productions
  - connecting teaching and learning across mathematics' topics, and between mathematics and other (e.g., scientific) knowledge

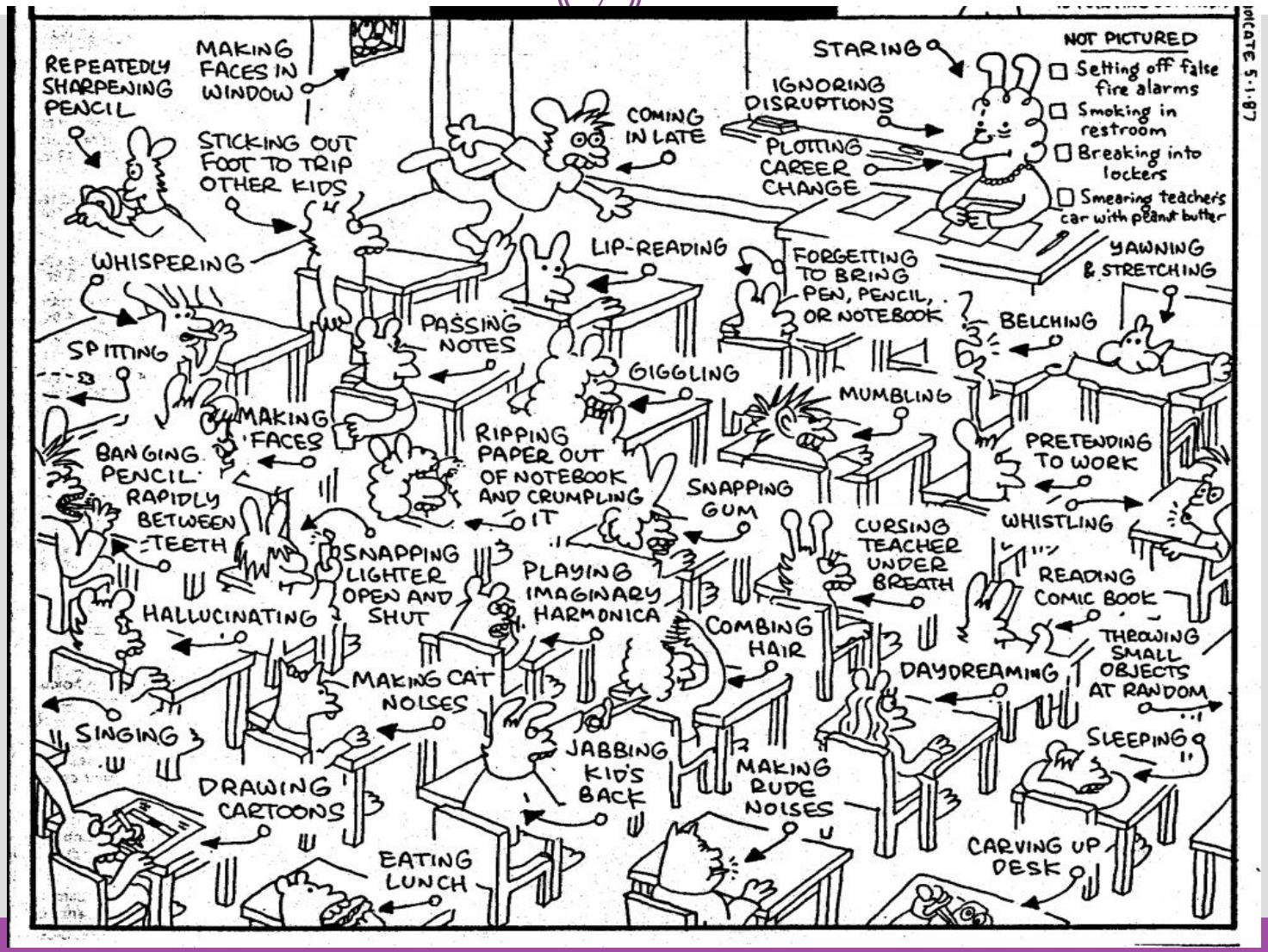
Towards a conceptual framework: the gap

Missing from the debate:

- informed analysis of teachers' pedagogy and the impact that this has on student outcomes
- in terms not only of attainment in, but also developing dispositions towards, mathematics and mathematically demanding subjects.

Our research was/is trying to deal with this under-researched association

Capturing what's happening during maths lessons



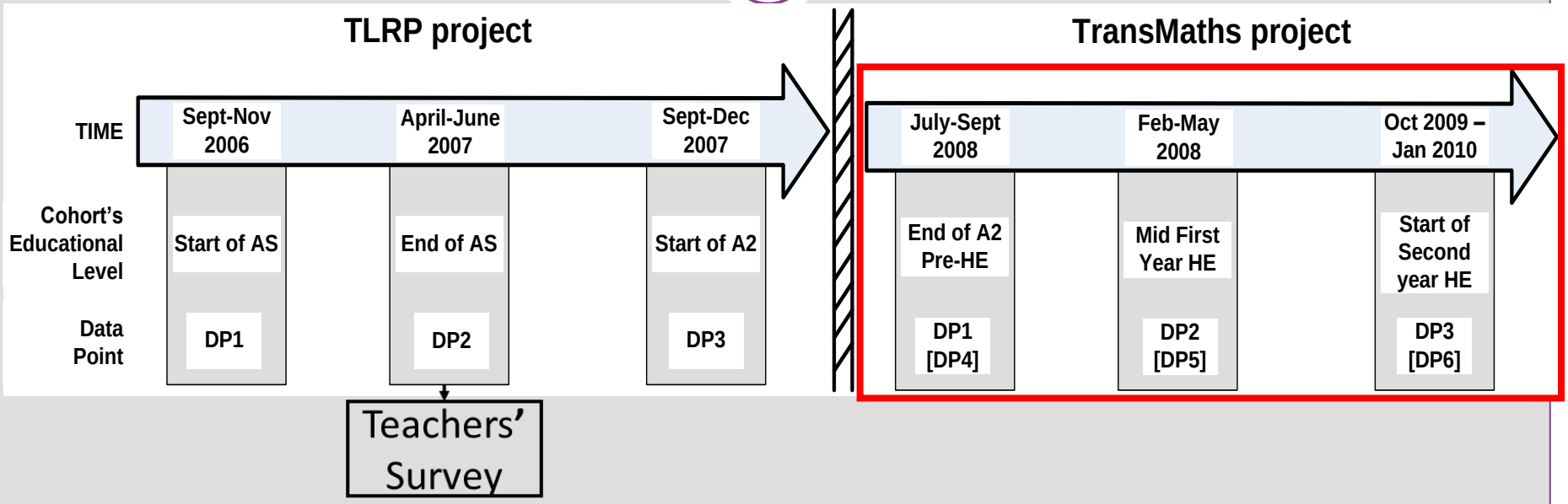
Research Questions

- How can we measure students' perceptions of the teaching they receive at pre-university and university courses?
- How can we test the comparability of these measures across different educational contexts (e.g. UK and Norway) and levels (different secondary year groups, pre-university and university)?
- To what extend are these measures associated with other learning outcomes and dispositions of students during their educational progression?

The Projects and Team

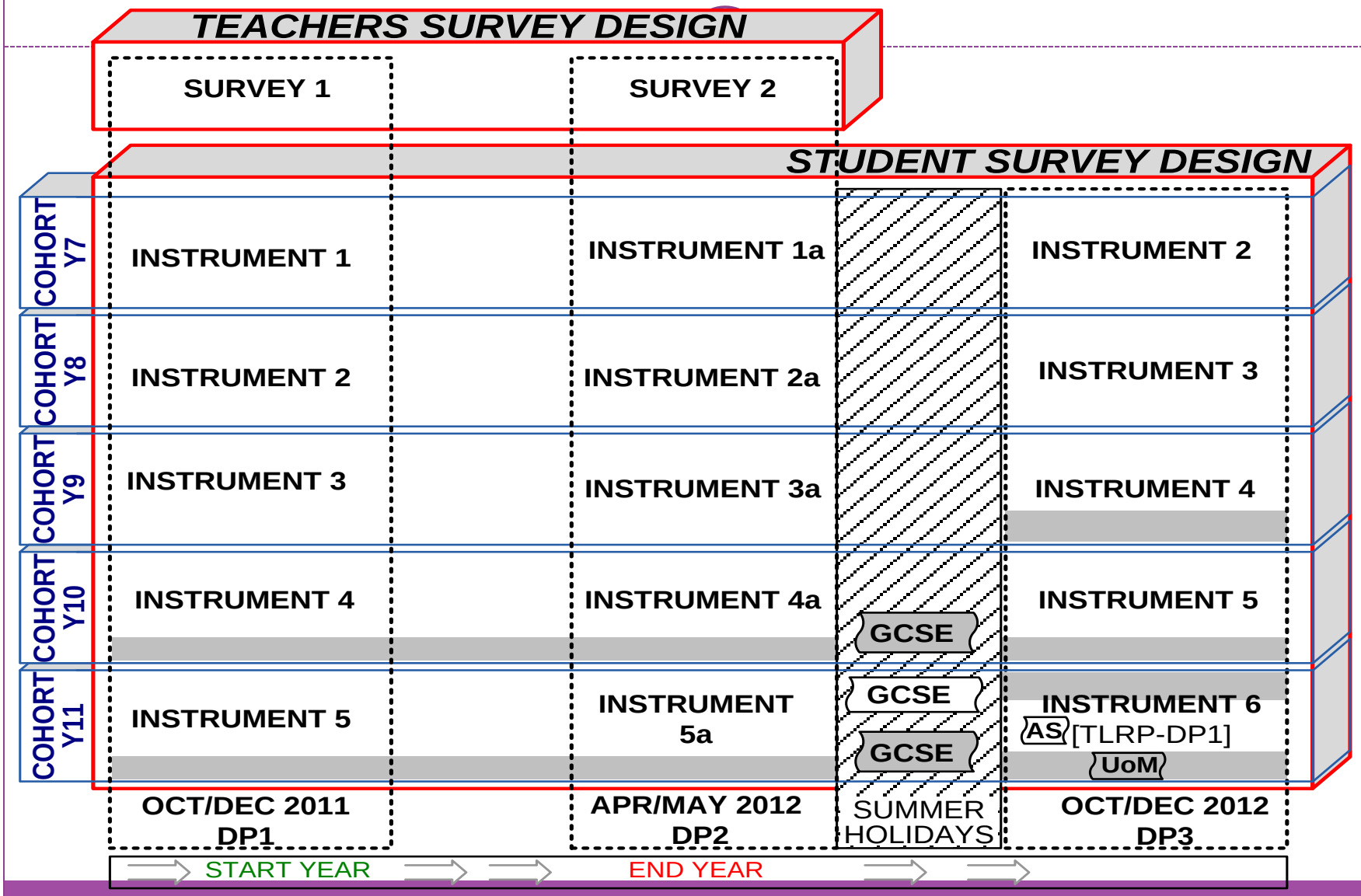
- ESRC funded projects on transition to mathematically demanding subjects in UK Higher Education (HE): TransMaths
  - **TLRP: "Keeping open the door to mathematically demanding F&HE programmes" (2006 – 2008)**
  - **TransMaths: "Mathematics learning, identity and educational practice: the transition into Higher Education" (2008-2010)**
  - Lead PI: Prof Julian Williams
  - Other PIs, and colleagues: Black, Davies, Farnsworth, Harris, Hernandez-Martinez, Hutcheson, Pepin, Wake
  - www.transmaths.org
- An extension of this work in Norway: TransMaths-Norway
  - Lead PI: Prof Birgit Pepin
- Ongoing ESRC funded study of teaching and learning secondary mathematics in UK (2011-2014): Teleprism (www.teleprism.com)
  - PI: Dr Maria Pampaka

The TransMaths Project(s) Design



- Mixed Methodology: Case studies, Interviews (Students, teachers, lecturers), Surveys
- UK 1778 students (5 universities, various STEM/nonSTEM courses)
- TransMaths-Norway: University Transition in Norway (Started 2010) - 720 students (2 Universities)

The Teleprism Survey Design



Participating Schools

Age range	Boys only	Girls only	Mixed	Total
11-16	0	2	13	15
11-18	1	5	19	25
Total	1	7	32	40

Students

Year 7	3884
Year 8	3025
Year 9	2668
Year 10	2145
Year 11	1794
Total	**13516**

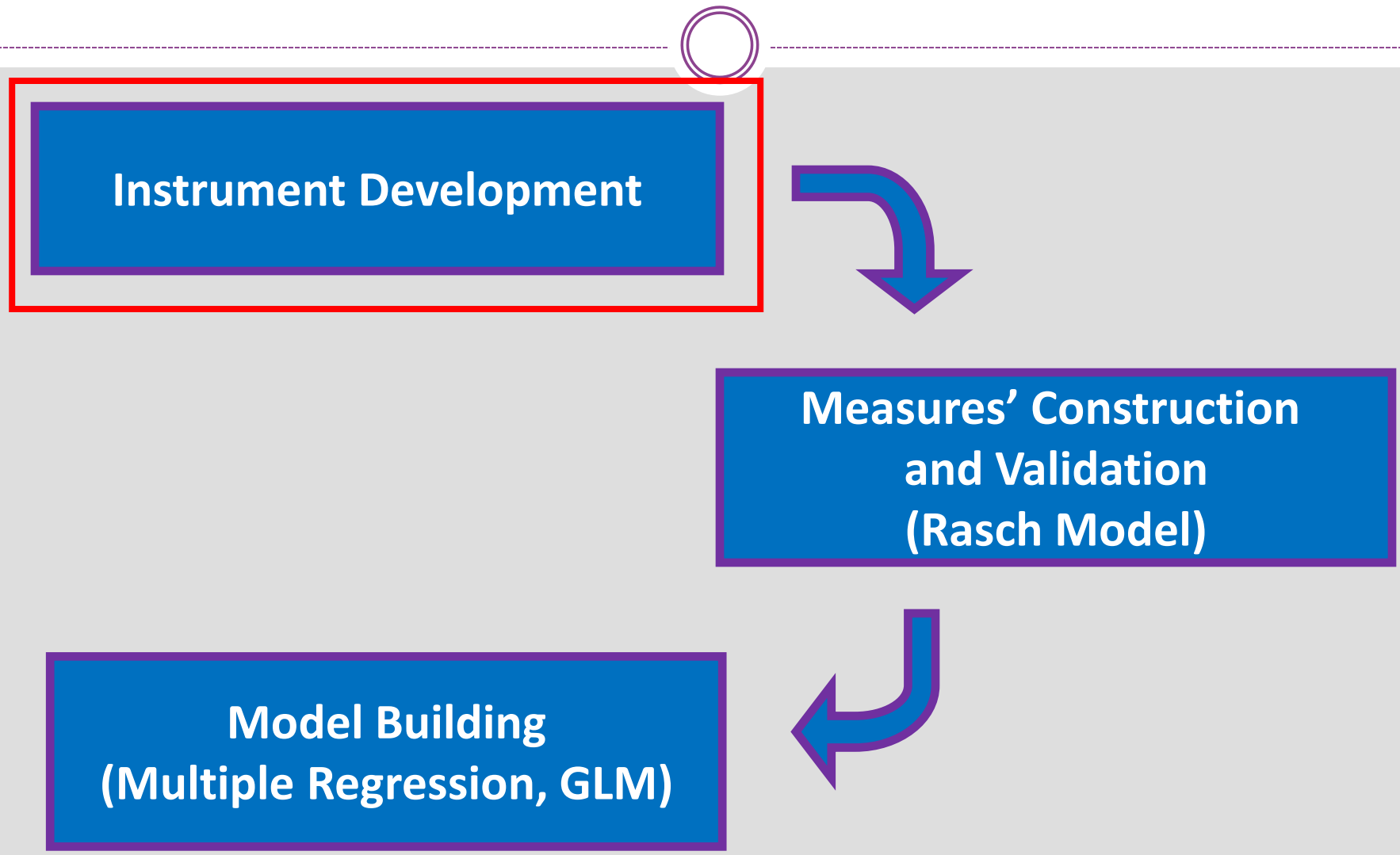
Issues arising

- **How are we measuring teaching practices in secondary mathematics?**
- **From students' and teachers' point of view**

- **Agreement between the two?**
- **In different contexts: e.g. Norway vs UK**
- **Differences between Year Groups?**

- **How are these 'measures' of pedagogy associated with other variables (students' dispositions)**

A Common Analytical Framework



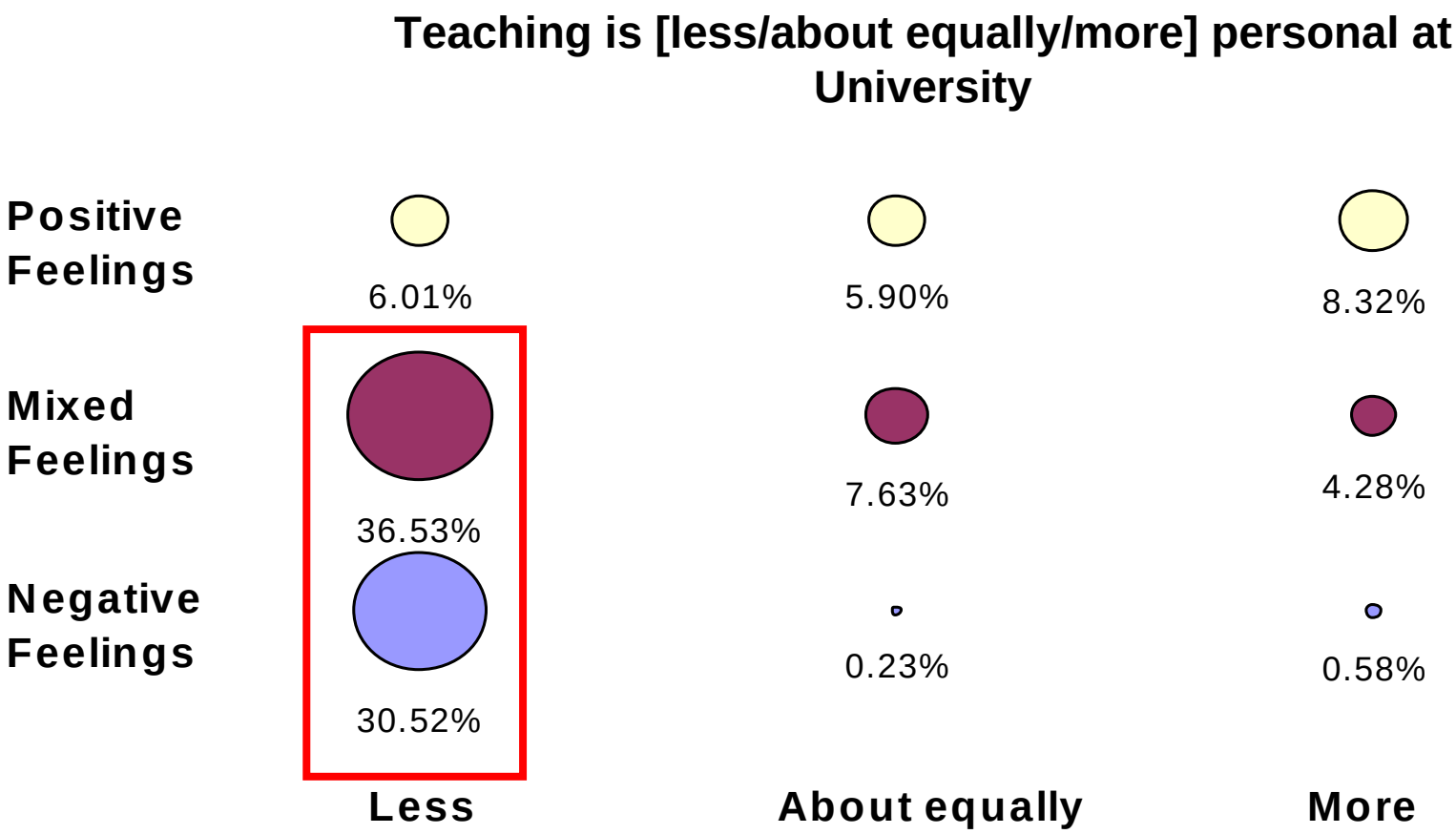
The Maths Disposition Instrument

Item	Description	Number of response categories
Amount	My preferred options for my future studies include	5 (No mathematics, ..., A lot of mathematics)
Importance	The mathematics in my future study will be	4 (Not at all, ..., essential)
Feelings	If I find out that my future studies involves more mathematics than I thought, this would make me feel	5 (Very unhappy, ..., Very happy)
Math type	If in the future I am studying a course involving mathematics, then I would prefer it to be	3 (New, mix, familiar)
Career	How important do you think mathematics will be for your career?	4 (Not at all, ..., very important)

Measuring the transitional gap...

What is different between university and school/previous experience? ***[Please tick the appropriate box to indicate what you find different]***	**How do you feel about it?** ***[Tick appropriate 'face']***			
	Negative	**Mixed**	**Positive**	**DON'T KNOW**
I have to do *more* ☐/ *less* ☐/ *about the same amount of* ☐ private study at university.	☹	😐	☺	
I am treated *more* ☐/ *less* ☐/ *equally* ☐ like an adult at university.	☹	😐	☺	
I have *more* ☐/ *less* ☐/ *about the same amount of* ☐ responsibility for my own learning at university.	☹	😐	☺	
The work is *harder* ☐/ *easier* ☐/ *about the same* ☐ at university.	☹	😐	☺	
I have access to *better* ☐/ *worse* ☐/ *about the same* ☐ quality of resources/equipment at university.	☹	😐	☺	
The pace of the course is *faster* ☐/ *slower* ☐/ *about the same* ☐ at university.	☹	😐	☺	
Learning is *more* ☐/ *less* ☐/ *about equally* ☐ 'in depth' at university.	☹	😐	☺	
Teachers have *more* ☐/ *less* ☐/ *about the same* ☐ control over my work at university.	☹	😐	☺	
I have *more* ☐ / *less* ☐ / *about the same* ☐ opportunity to ask questions at university.	☹	😐	☺	
I have *more* ☐/ *less* ☐/ *about the same* ☐ opportunity to discuss ideas and problems at university.	☹	😐	☺	
The language used is *more* ☐/ *less* ☐/ *about equally* ☐ formal at university.	☹	😐	☺	
Teaching is *more* ☐/ *less* ☐/ *about equally* ☐ personal at university.	☹	😐	☺	
I have a *more active* ☐/ *less active* ☐/ *about the same* ☐ social life at university.	☹	😐	☺	

How was the transition to HE? (UK)



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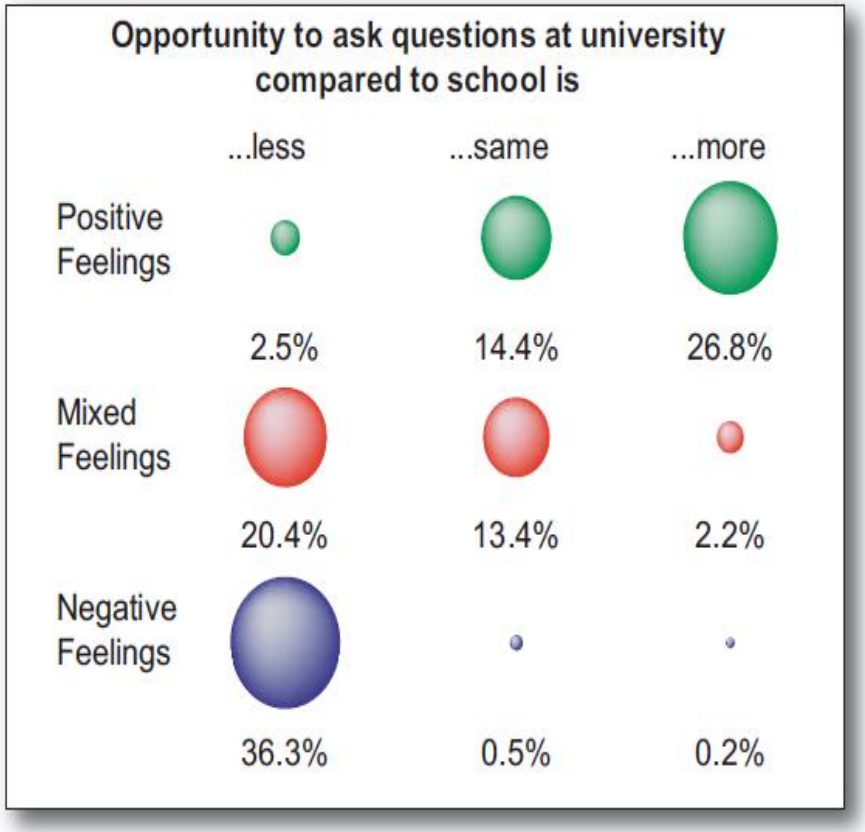
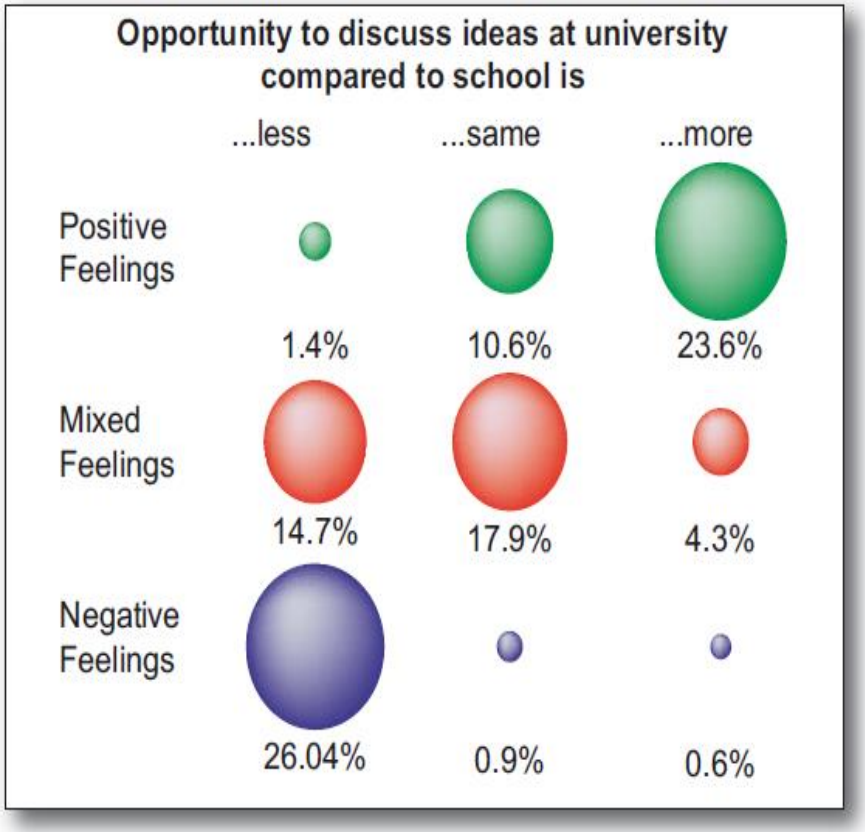




Students' perception of pedagogy

0. This is not relevant to me as I haven't learnt or studied mathematics this year.					☐
	Almost never	Some of the time	Most of the time	Almost always	DON'T KNOW
1. We (students) use only the methods the lecturer teaches us.	☐	☐	☐	☐	
2. We choose which questions to tackle.	☐	☐	☐	☐	
3. We compare different methods for doing questions.	☐	☐	☐	☐	
4. The lecturer draws links between topics and moves back and forth between topics.	☐	☐	☐	☐	
5. We work collaboratively in small groups.	☐	☐	☐	☐	
6. We discuss our ideas.	☐	☐	☐	☐	
7. We work collaboratively in pairs.	☐	☐	☐	☐	
8. We invent our own methods.	☐	☐	☐	☐	
9. The lecturer tells us which questions to tackle.	☐	☐	☐	☐	
10. The lecturer encourages us to work more quickly.	☐	☐	☐	☐	
11. The lecturer teaches each topic separately.	☐	☐	☐	☐	

How is maths taught this year?

Part D – How maths is taught and learnt

26 items

In this section we want to find out how maths is taught this year.
Please tell us, how often does the following happen in your maths lessons?

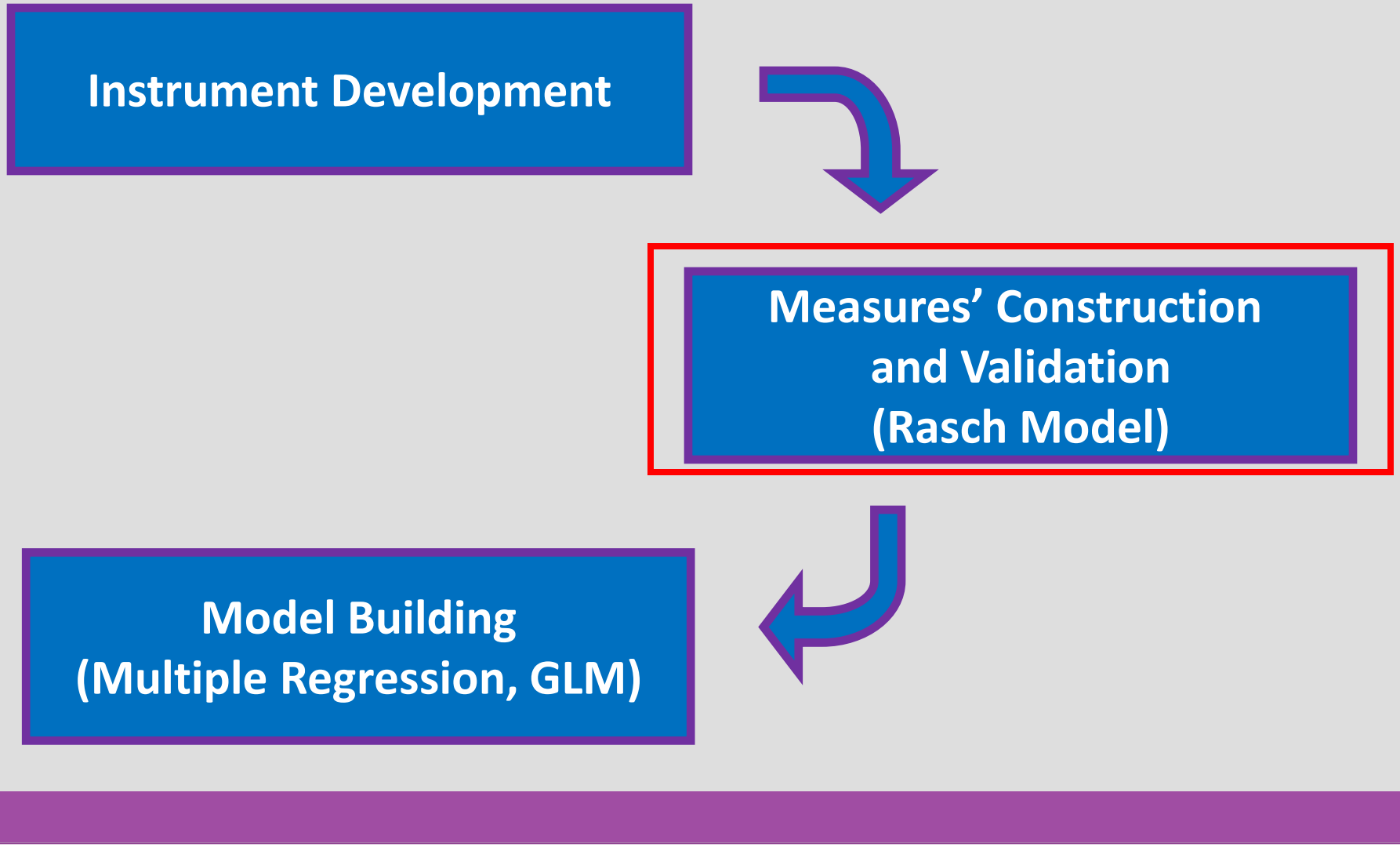
[Please circle the appropriate number in each line]		Never	Rarely	Sometimes	Always
1	The teacher asks us questions.	1	2	3	4
2	The teacher asks us to explain how we get our answers.	1	2	3	4
3	The teacher starts new topics with problems about the world.	1	2	3	4
4	The teacher tells us to work more quickly.	1	2	3	4
5	The teacher uses the computer to teach some topics.	1	2	3	4
6	The teacher gives us problems to investigate.	1	2	3	4
7	The teacher expects us to remember important ideas we learned in the past.	1	2	3	4
8	The teacher tells us which questions/activities to do.	1	2	3	4
9	The teacher asks us what we already know about a lesson topic.	1	2	3	4
10	The teacher tells us what value the lesson topic has for future use.	1	2	3	4
11	We work together in groups on projects.	1	2	3	4
12	We listen to the teacher talk about the topic.	1	2	3	4
13	We copy the teacher's notes from the board.	1	2	3	4
14	We talk with other students about how to solve problems.	1	2	3	4
15	We ask other students to explain their ideas.	1	2	3	4
16	We do projects (assignments) that include other school subjects.	1	2	3	4
17	We work through exercises from the textbook.	1	2	3	4
18	We learn how mathematics has changed over time.	1	2	3	4
19	What we learn is related to our out-of-school life.	1	2	3	4
20	We learn that mathematics is about inventing rules.	1	2	3	4
21	We get assignments to research topics on our own.	1	2	3	4
22	We use calculators.	1	2	3	4
23	We use computers.	1	2	3	4
24	We use other things like newspapers, magazines, or video.	1	2	3	4
25	We discuss ideas with the whole classroom.	1	2	3	4
26	We explain our work to the whole class.	1	2	3	4

The teacher instrument

- 30 items

teaching_15	Students work on extended mathematics investigations or projects (a week or more in duration)
teaching_16	Students start with easy questions and work up to harder questions
teaching_17	Students read from a mathematics textbook in class
teaching_18	Students use mathematical concepts to interpret and solve applied problems
teaching_19	Students play mathematics games
teaching_20	Students work through exercises from textbooks or worksheets
teaching_21	Students work on their own, consulting a neighbour from time to time
teaching_22	Students choose which questions to tackle
teaching_23	I choose examples that appeal to students
teaching_24	I try to indicate the value of each lesson topic for future use
teaching_25	When a student asks a question, I give a clue (or scaffold) instead of the correct answer
teaching_26	During instruction I ask a lot of short questions to check whether students understand the content matter
teaching_27	I assign mathematics homework
teaching_28	I ask students to explain their reasoning when giving an answer
teaching_29	I encourage students to explore alternative methods for solutions
teaching_30	I allow students to work at their own pace

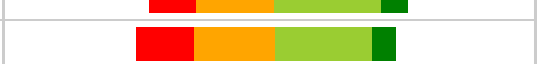
Analytical Framework



Measurement Methodology

- 'Theoretically': Rasch Analysis
  - Partial Credit Model
  - Rating Scale Model
- 'In practice' – the tools:
  - FACETS, Quest and Winsteps software
- Interpreting Results:
  - Fit Statistics (to ensure unidimensional measures)
  - Differential Item Functioning for 'subject' groups
  - Person-Item maps for hierarchy

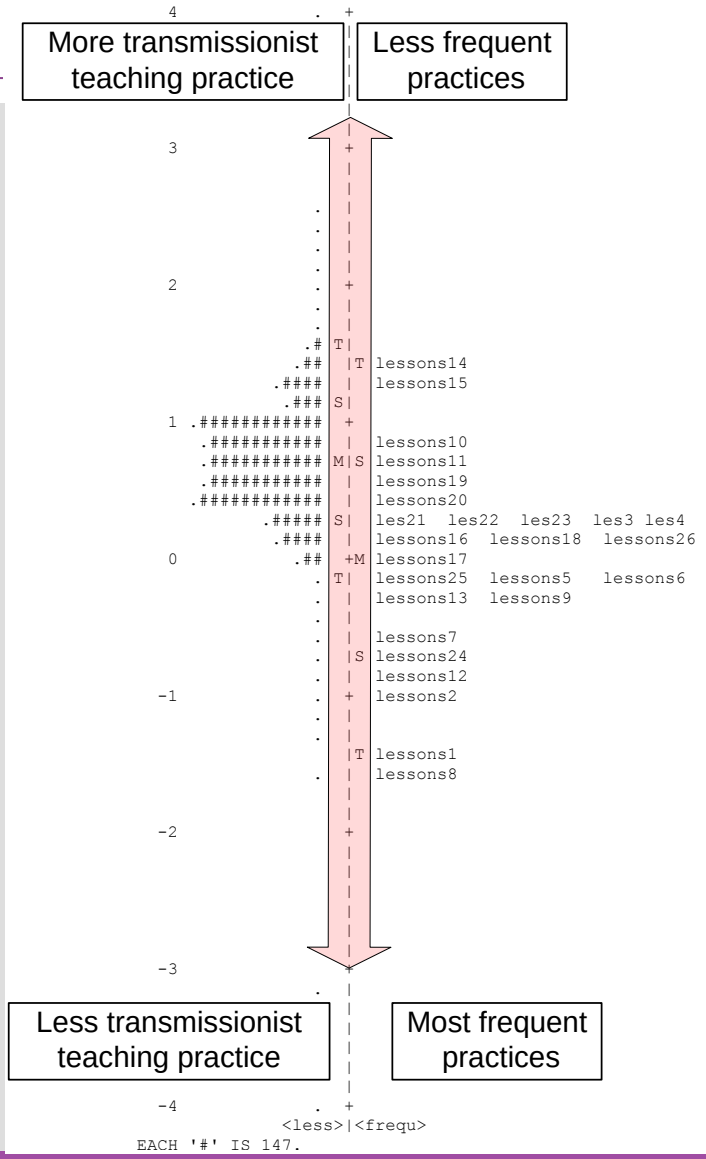
Key	Never	Rarely	Sometimes	Always

Item name	Frequency bars
The teacher asks us questions.	
The teacher tells us which questions/activities to do.	
The teacher asks us to explain how we get our answers.	
We listen to the teacher talk about the topic.	
The teacher expects us to remember important ideas learnt in the past.	
We copy the teacher's notes from the board.	
The teacher gives us problems to investigate.	
The teacher asks us what we already know about a lesson topic.	
We discuss ideas with the whole classroom.	
The teacher uses the computer to teach some topics.	
We talk with other students about how to solve problems.	
We work through exercises from the textbook.	
We use calculators.	
We ask other students to explain their ideas.	
We explain our work to the whole class.	
The teacher tells us to work more quickly.	
The teacher tells us what value the lesson topic has for future use.	
We work together in groups on projects.	
What we learn is related with our out-of-school life.	
We learn that mathematics is about inventing rules.	
We get assignments to research topics on our own.	
The teacher starts new topics with problems about the world.	
We use computers.	
We do projects (assignments) that include other school subjects.	
We learn how mathematics has changed over time.	
We use other things like newspapers, magazines, or video.	

Before the Rasch Model

TeLePriSM

After: The Rasch Item-Map Hierarchy...



14: We talk with other students about how to solve problems.
15: We ask other students to explain their ideas.

10: The teacher tells us what value the lesson topic has for future use.
11: We work together in groups on projects.
19: What we learn is related with our out-of-school life.
20: We learn that mathematics is about inventing rules.
21: We get assignments to research topics on our own.
22: We use calculators.
23: We use computers
3: The teacher starts new topics with problems about the world.
4: The teacher tells us to work more quickly.

16: We do projects (assignments) that include other school subjects.
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26: We explain our work to the whole class.
17: We work through exercises from the textbook.
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25: We discuss ideas with the whole classroom.
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13: We copy the teacher's notes from the board.

7: The teacher expects us to remember important ideas learnt in the past.
24: We use other things like newspapers, magazines, or video.
12: We listen to the teacher talk about the topic.
2: The teacher asks us to explain how we get our answers.

1: The teacher asks us questions.
8: The teacher tells us which questions/activities to do.

During the Process…Item Fit Statistics

ENTRY NUMBER	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
1	47644	13060	-1.49	.02	1.07	4.5	1.08	4.6	.23	.21	69.6	67.5	lessons1
2	45741	13011	-1.11	.01	1.00	-.1	1.05	3.3	.17	.24	53.2	54.4	lessons2
3	36117	12866	.19	.01	1.11	9.9	1.12	9.9	.40	.31	37.1	43.0	lessons3
4	36148	12970	.22	.01	.97	-2.9	.97	-2.4	.17	.31	47.5	42.9	lessons4
5	39481	12973	-.18	.01	1.08	6.7	1.13	9.9	.05	.29	52.3	43.8	lessons5
6	39929	12949	-.24	.01	.96	-4.0	1.01	1.0	.02	.29	56.8	43.9	lessons6
7	42968	12966	-.66	.01	.96	-3.0	.99	-.8	.21	.27	49.9	46.0	lessons7
8	47479	12937	-1.57	.02	1.14	8.2	1.09	5.5	.30	.20	73.7	69.5	lessons8
9	40497	12878	-.35	.01	1.14	9.9	1.22	9.9	-.01	.28	49.4	43.9	lessons9
10	30956	12828	.77	.01	1.08	7.7	1.09	8.3	.40	.31	44.0	43.1	lessons10
11	32504	12888	.61	.01	.74	-9.9	.75	-9.9	.44	.31	51.1	42.6	lessons11
12	44006	12855	-.89	.01	1.04	2.9	1.09	6.8	.15	.25	49.5	49.2	lessons12
13	40896	12847	-.41	.01	.93	-6.3	.95	-4.3	.21	.28	51.8	44.1	lessons13
14	25718	12824	1.39	.01	.87	-9.9	.87	-9.9	.27	.30	57.2	45.0	lessons14
15	27191	12807	1.20	.01	.91	-8.4	.91	-8.3	.29	.31	53.4	44.8	lessons15
16	36534	12778	.11	.01	.92	-7.3	.92	-7.3	.57	.30	39.4	43.2	lessons16
17	38491	12800	-.12	.01	1.19	9.9	1.22	9.9	.18	.30	47.6	43.8	lessons17
18	37365	12787	.02	.01	1.00	.3	1.00	-.3	.57	.30	36.1	43.5	lessons18
19	32611	12734	.56	.01	.94	-6.2	.94	-5.9	.52	.31	45.2	42.6	lessons19
20	33788	12684	.41	.01	.98	-2.1	.98	-1.6	.50	.31	41.3	42.5	lessons20
21	35695	12672	.18	.01	.97	-2.5	.98	-2.3	.57	.31	37.0	43.0	lessons21
22	36120	12839	.18	.01	.79	-9.9	.81	-9.9	.11	.31	59.4	43.0	lessons22
23	35816	12817	.21	.01	.95	-4.9	.95	-4.7	.39	.31	42.8	42.9	lessons23
24	42787	12784	-.72	.01	.96	-3.0	.93	-5.3	.44	.26	50.7	46.8	lessons24
25	24275	12806	1.57	.01	1.07	5.6	1.08	6.6	.20	.29	49.2	44.7	lessons25
26	36456	12718	.11	.01	1.21	9.9	1.26	9.9	-.07	.30	48.5	43.2	lessons26
MEAN	37200.5	12849	.00	.01	1.00	-.2	1.01	.5			49.8	46.3	
S.D.	6009.0	97.2	.77	.00	.11	6.8	.12	6.9			8.8	6.9	

Students' pre-uni pedagogical experience Item Fit Statistics [UK, N=1516 students]

Obsvd Score	Obsvd Count	Obsvd Average	Fair-M Avrage	Measure	Model S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	PtBis	Nu	Items
4568	1499	3.0	3.11	-.50	.04	0.9	-4	0.9	-3	.32	1	item1
4125	1488	2.8	2.82	-.01	.03	0.9	-3	0.9	-3	.38	2	item2
3668	1494	2.5	2.47	.51	.03	0.8	-5	0.8	-5	.45	3	item3
3524	1478	2.4	2.39	.63	.03	1.0	0	1.0	0	.38	4	item4
4180	1493	2.8	2.85	-.06	.03	1.0	0	1.0	0	.48	5	item5
3750	1494	2.5	2.53	.42	.03	0.9	-4	0.8	-4	.55	6	item6
4150	1493	2.8	2.82	-.02	.03	1.1	1	1.1	2	.33	7	item7
4825	1486	3.2	3.31	-.90	.04	1.1	2	1.0	0	.44	8	item8
4195	1489	2.8	2.86	-.09	.03	1.0	0	1.0	0	.35	9	item9
3875	1488	2.6	2.63	.27	.03	1.4	9	1.5	9	.07	10	item10
4294	1475	2.9	2.96	-.25	.03	1.1	3	1.1	3	.24	11	item11
4104.9	1488.8	2.8	2.80	.00	.03	1.0	-0.3	1.0	-0.3	.36	Mean (Count: 11)	
368.3	6.8	0.2	0.26	.43	.00	0.2	4.1	0.2	4.0	.12	S.D.	

RMSE (Model) .03 Adj S.D. .43 Separation 12.53 Reliability .99
Fixed (all same) chi-square: 1634.3 d.f.: 10 significance: .00
Random (normal) chi-square: 10.0 d.f.: 9 significance: .35

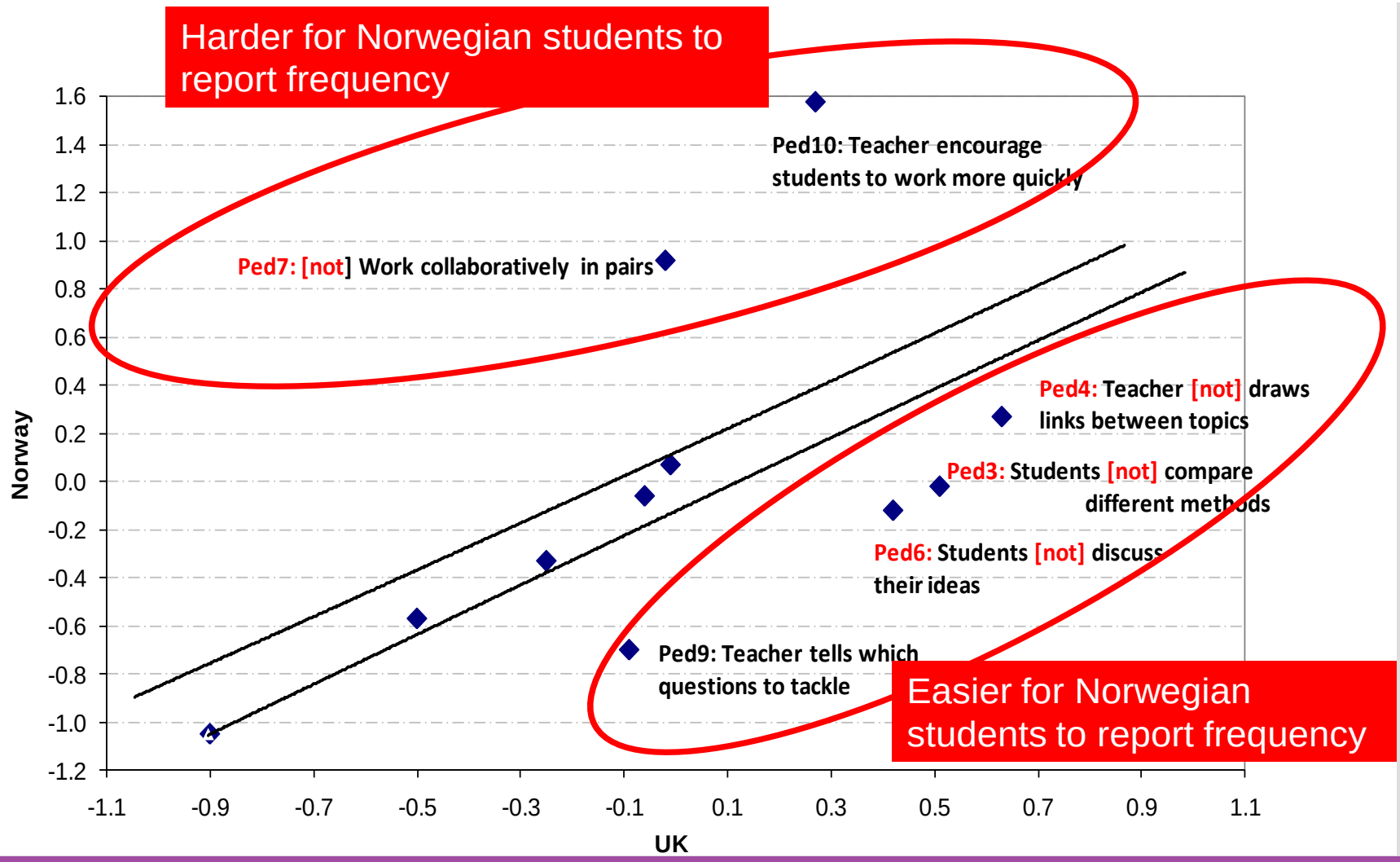
Item 10: The teacher was encouraging us to work more quickly

Students' pre-uni pedagogical experience Item Fit Statistics (Norway): N=709

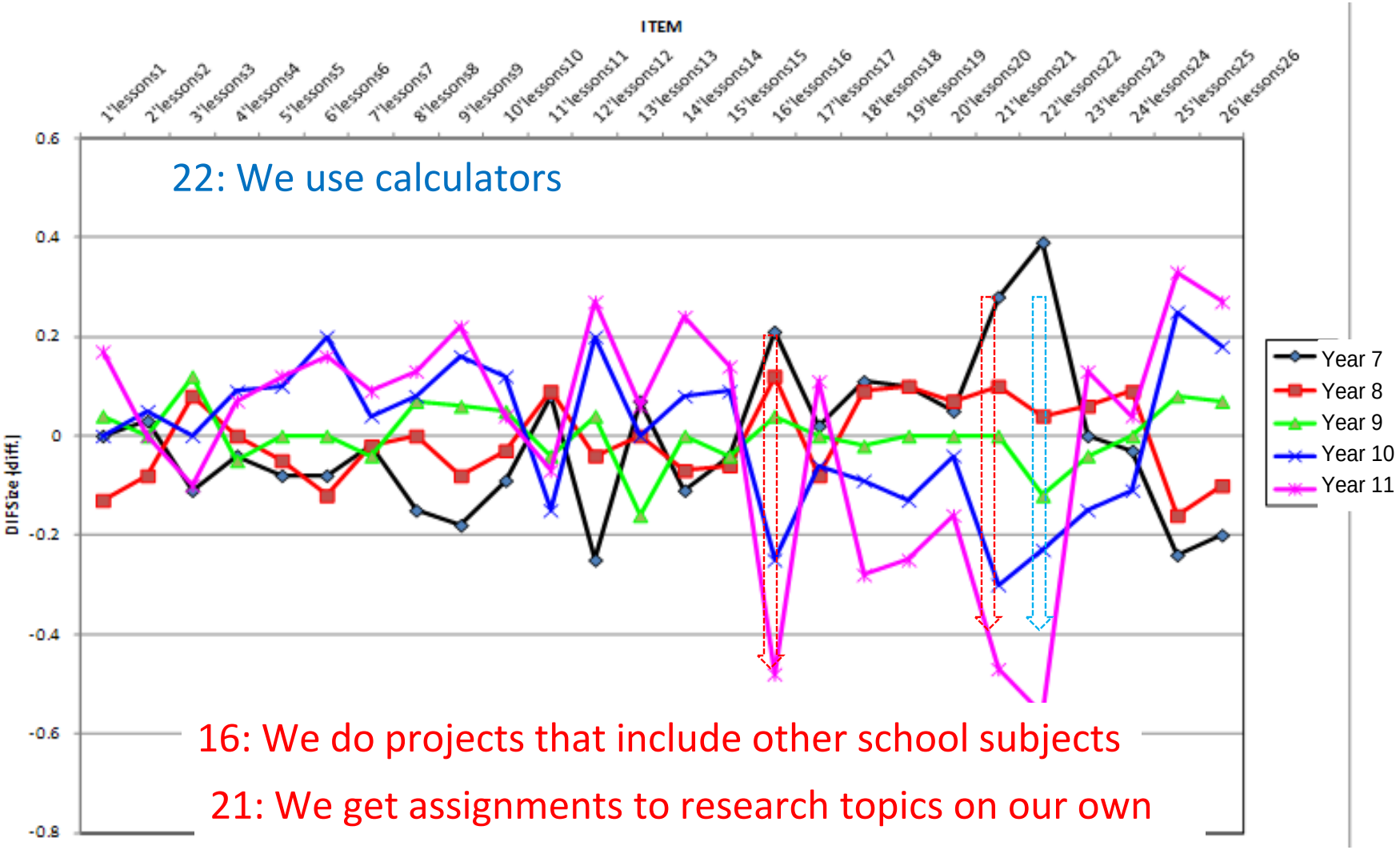
Obsvd Score	Obsvd Count	Obsvd Average	Fair-M Avrage	Model Measure	Model S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	PtBis	Nu	Items
2312	700	3.3	3.37	-.57	.06	1.0	0	1.1	1	.28	1	item1
2100	702	3.0	3.05	.07	.05	1.0	0	1.0	0	.35	2	item2
2110	695	3.0	3.10	-.02	.05	0.7	-5	0.7	-5	.46	3	item3
1954	679	2.9	2.93	.27	.05	0.8	-3	0.9	-2	.38	4	item4
2150	703	3.1	3.12	-.06	.05	1.1	2	1.1	1	.40	5	item5
2173	702	3.1	3.15	-.12	.05	0.9	-1	0.9	-1	.51	6	item6
1768	704	2.5	2.52	.92	.05	1.1	2	1.1	2	.29	7	item7
2435	697	3.5	3.56	-1.05	.06	1.0	0	0.9	-1	.42	8	item8
2368	705	3.4	3.43	-.70	.06	1.0	0	1.0	0	.33	9	item9
1434	676	2.1	2.09	1.58	.05	1.4	7	1.5	8	.13	10	item10
2158	675	3.2	3.26	-.33	.06	0.9	-2	0.9	-1	.33	11	item11
2087.5	694.4	3.0	3.05	.00	.05	1.0	-0.1	1.0	0.0	.35	Mean (Count: 11)	
272.0	11.2	0.4	0.40	.70	.00	0.2	3.3	0.2	3.5	.10	S.D.	

RMSE (Model) .05 Adj S.D. .70 Separation 12.93 Reliability .99
Fixed (all same) chi-square: 1862.4 d.f.: 10 significance: .00
Random (normal) chi-square: 10.0 d.f.: 9 significance: .35

Differential Item Functioning (UK vs Norway)

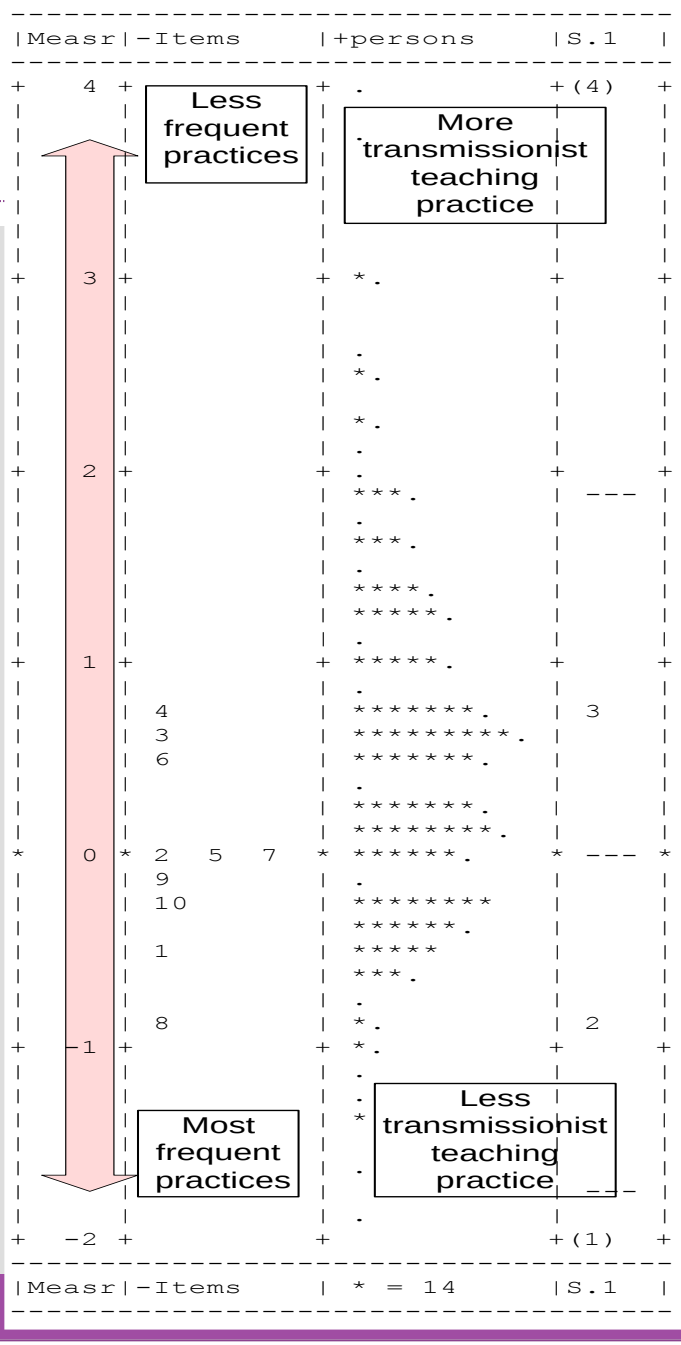


Differential Item Functioning Across Year Groups



Interview Data: Some evidence for differences

Student: In younger years, like Year 8 and 9, maybe Year 7 I can't really remember, we used to go in the computer room there but we used to do maths on the computer, but then not anymore.


Measr
-Items
+persons
S.1
Less frequent practices
More transmissionist teaching practice
Most frequent practices
Less transmissionist teaching practice
* = 14

How these numbers could be used…simply?

A word of warning… We have no answer about what are the most effective teaching practices – there is very good teaching that is transmissionist and very good teaching that is connectionist each of which can lead to successful student outcomes in terms of attainment.

The teacher I have in mind is…

○ A teacher in school/college ● A teacher at university

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1. We use only the methods the teacher teaches us.

○ Almost never ○ Some of the time ● Most of the time ○ Almost always

2. We choose which questions to tackle.

● Almost never ○ Some of the time ○ Most of the time ○ Almost always

3. We compare different methods for doing questions

○ Almost never ● Some of the time ○ Most of the time ○ Almost always

4. The teacher draws links between topics and moves back and forth between topics.

○ Almost never ● Some of the time ○ Most of the time ○ Almost always

5. We work collaboratively in small groups.

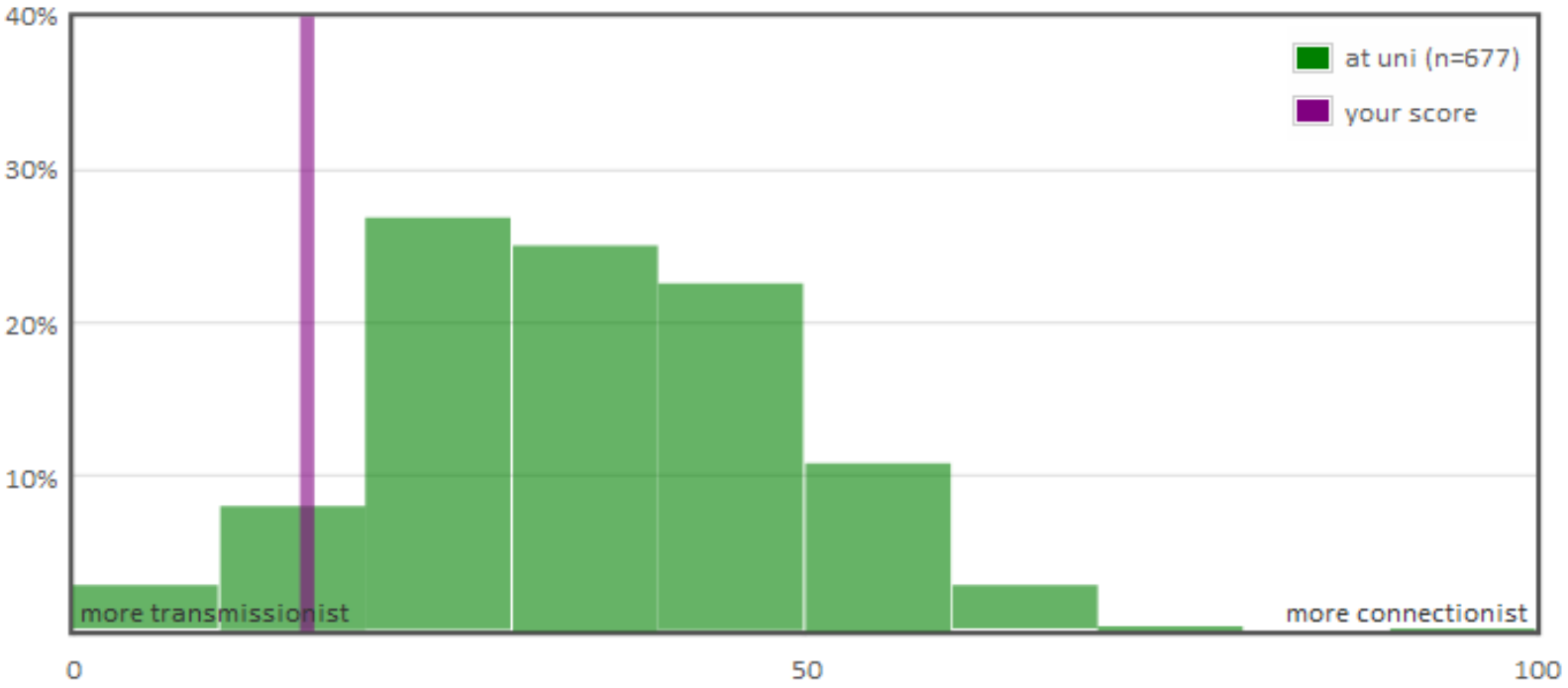
● Almost never ○ Some of the time ○ Most of the time ○ Almost always

6. We discuss our ideas.

○ Almost never ● Some of the time ○ Most of the time ○ Almost always

About the teaching you received

Based on the responses you gave to questions about your teaching experiences your teacher scored **16** on our scale. This is indicated on the diagram below where you can see how the practices of your teacher relate to those of other teachers we surveyed in our research.

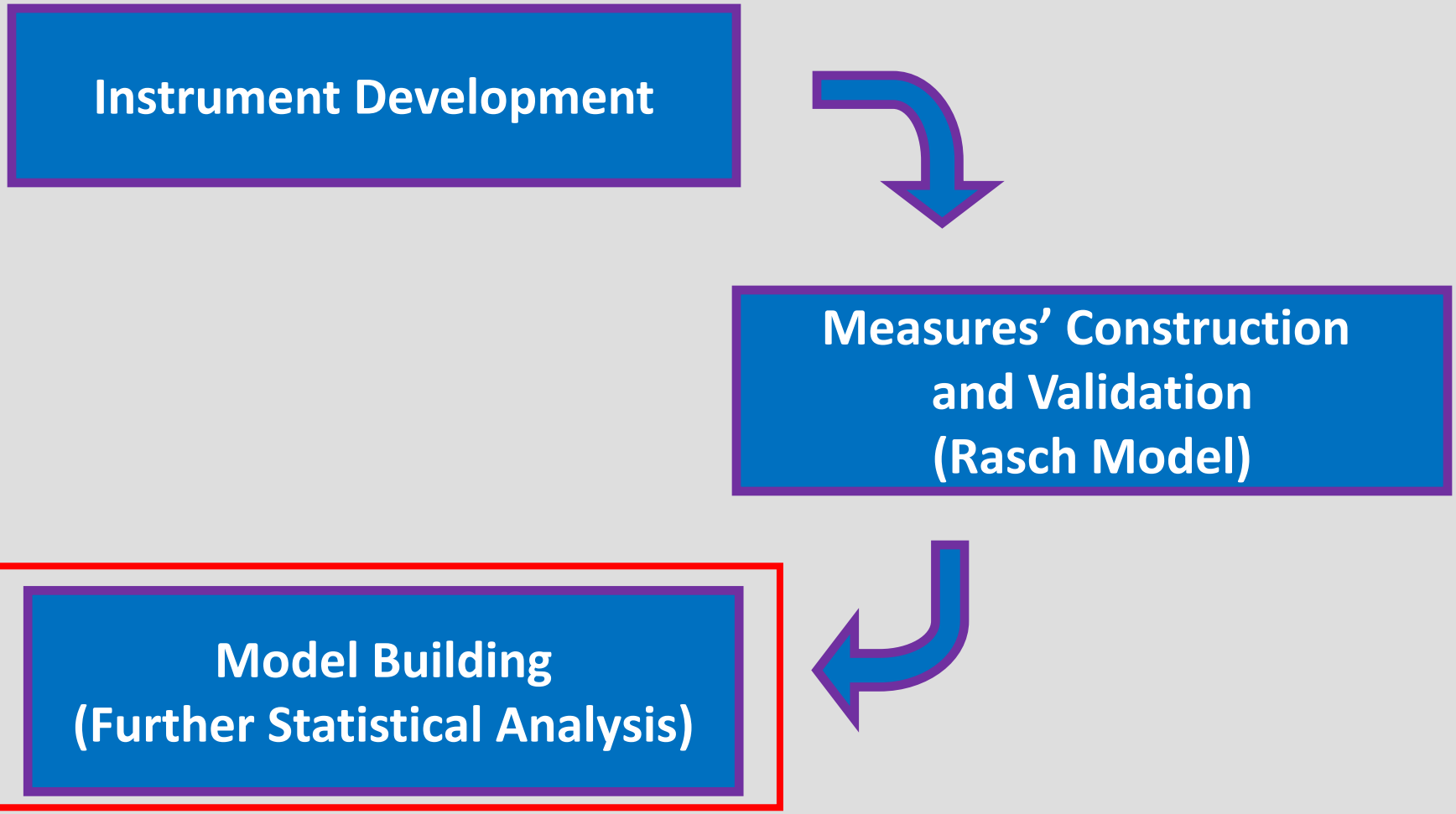


A score of 0 indicates highly transmissionist practices; a score of 100 indicates highly connectionist practices.

Our research does not tell us which of these different extremes of teaching practices is best – there are highly effective teachers at both extremes. However, it may raise some thoughts for you about what you personally find most effective in your learning of maths.

Click to retake survey for another teacher.

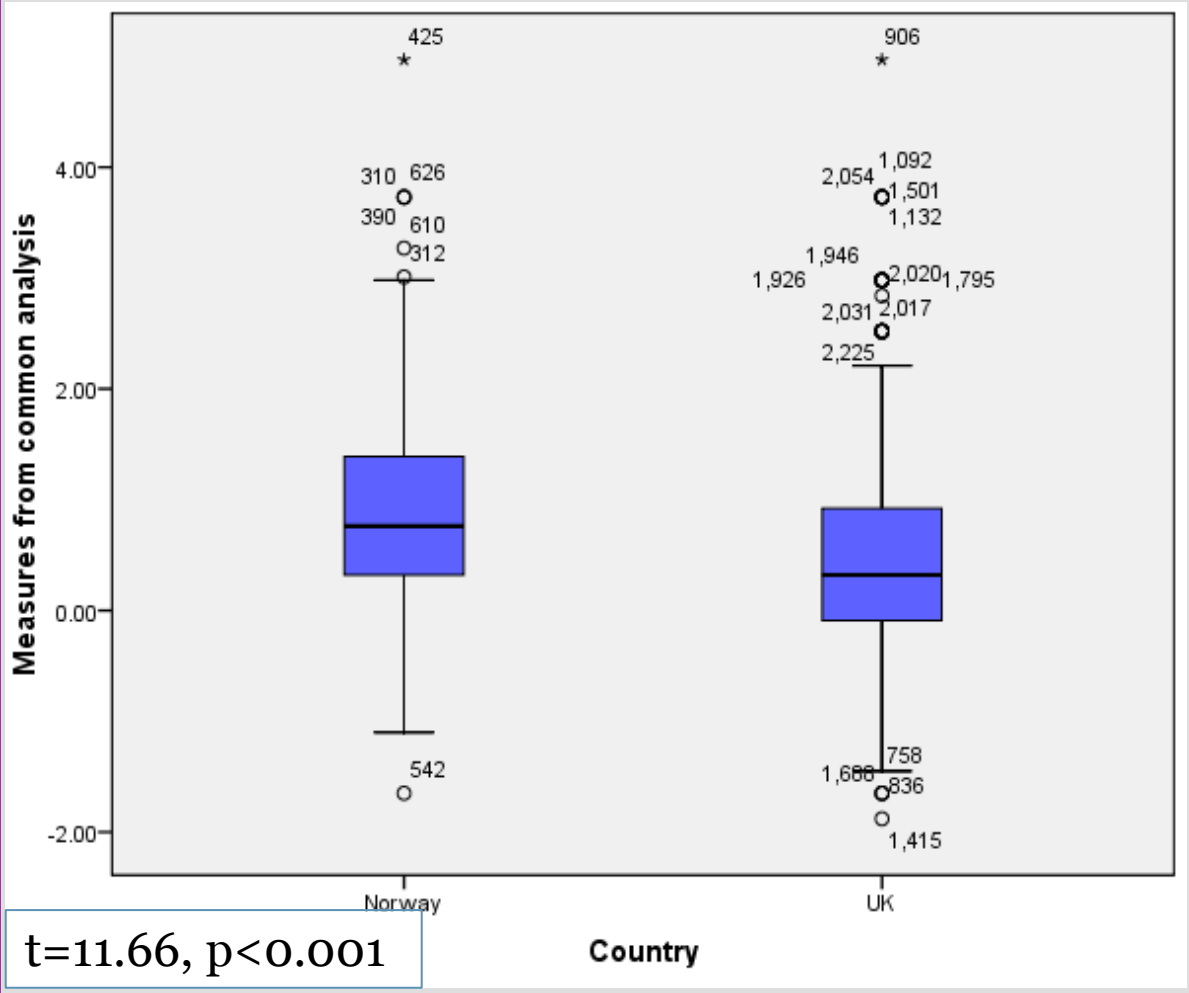
Using the measures…



Some of the measures we constructed

Items / Measures	DP1	DP2	DP3
Disposition to complete chosen course	✓ N	✓N	✓
Transitional Experiences & Feelings		✓ N	
Mathematics Dispositions	✓ N	✓ N	✓
Perceived Pedagogic Practices at Pre-uni (maths) experience	✓ N		
Perceived Pedagogic Practices at Uni (maths)		✓ N	
Mathematics Self Efficacy	✓		
Confidence with Mathematics	✓N	✓ N	✓
Perceived Mathematical support at Uni		✓N	✓

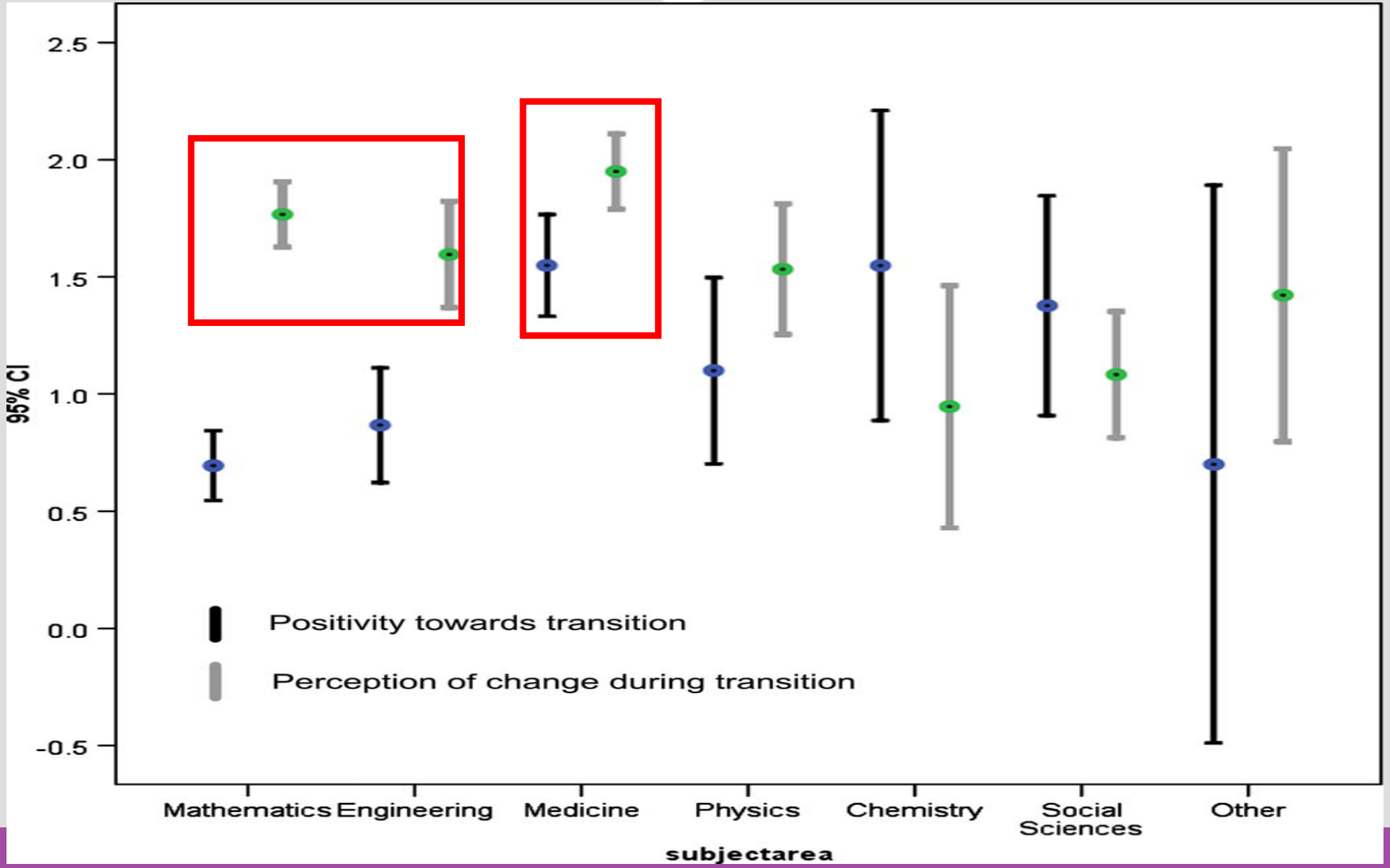
Comparing pedagogical experiences before university



t=11.66, p<0.001

The Norwegian students reported more transmissionist practices in their pre-university maths courses

Comparing the transitional experience of students in different courses (UK)



Associations between measures (UK)

Pearson Correlations (p-values)	Pre-Uni Pedagogy	Uni-Pedagogy	Perception of transitional gap	Positivity towards transition
Maths Confidence DP1	**-0.27 (<0.001)**	0.04 (0.44)	0.02 (0.642)	0.01 (0.79)
Maths Confidence DP2	**-0.22 (<0.001)**	**-0.08 (0.03)**	-0.02 (0.62)	**0.16 (<0.001)**
Math Dispositions DP1	**-0.30 (<0.001)**	0.03 (0.478)	0.05 (0.21)	**-0.10 (0.01)**
Math Dispositions DP2	**-0.22 (<0.001)**	-0.007 (0.86)	0.02 (0.67)	0.04 (0.22)
Perceived support at uni	**-0.17 (<0.001)**	-0.0006 (0.9)	**-0.12 (0.016)**	**-0.12 (0.022)**
Pre-uni Pedagogy		**0.22 (<0.001)**	-0.006 (0.88)	0.06 (0.163)
Uni pedagogy			-0.04 (0.292)	**-0.18 (<0.001)**
Perception of transitional gap				-0.07 (0.06)

Associations between measures (Norway)

Pearson Correlations (p-values)	Pre-Uni Pedagogy	Uni-Pedagogy	Perception of transitional gap	Positivity towards transition
Maths Confidence DP1	**-0.37 (<0.001)**	**0.16 (0.012)**	-0.01 (0.88)	0.02 (0.733)
Maths Confidence DP2	**-0.28 (<0.001)**	-0.06 (0.017)	0.02 (0.614)	**0.24 (<0.001)**
Math Dispositions DP1	**-0.2 (0.001)**	**0.18 (0.004)**	0.07 (0.093)	0.10 (0.113)
Math Dispositions DP2	**-0.13 (0.042)**	-0.13 (0.002)	-0.01 (0.918)	**0.21 (<0.001)**
Perceived support at uni	-0.04 (0.514)	**-0.29 (<0.001)**	**0.19 (<0.001)**	**0.30 (<0.001)**
Pre-uni Pedagogy			-0.01 (0.835)	0.03 (0.685)
Uni pedagogy			-0.11 (0.078)	-0.10 (0.018)
Perception of transitional gap				**0.32 (<0.001)**

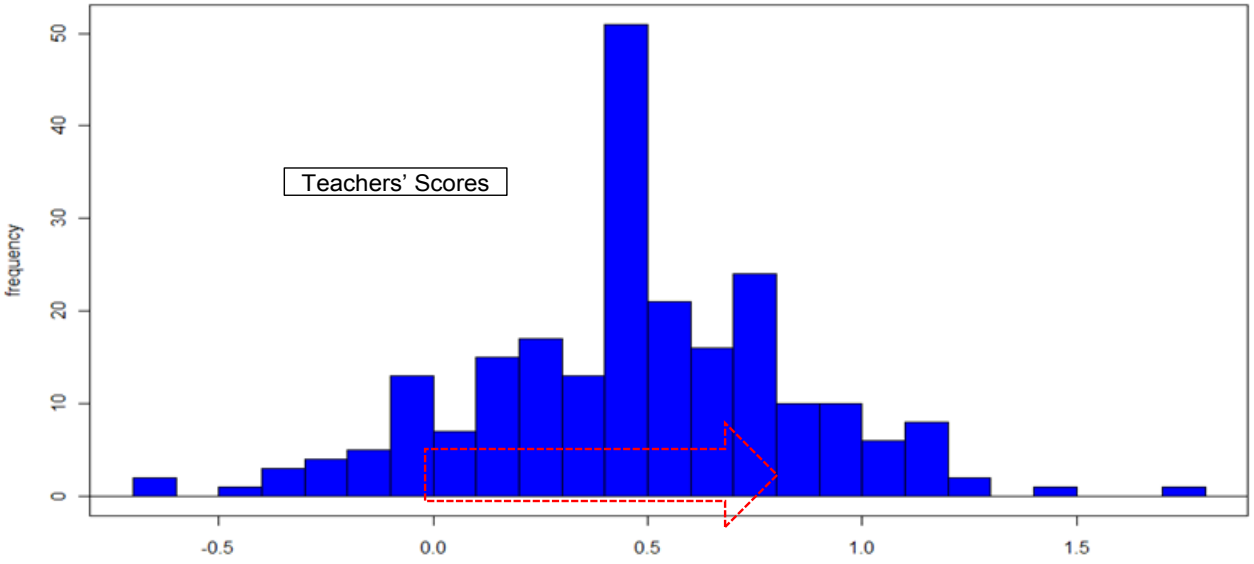
(Some) Common Trends

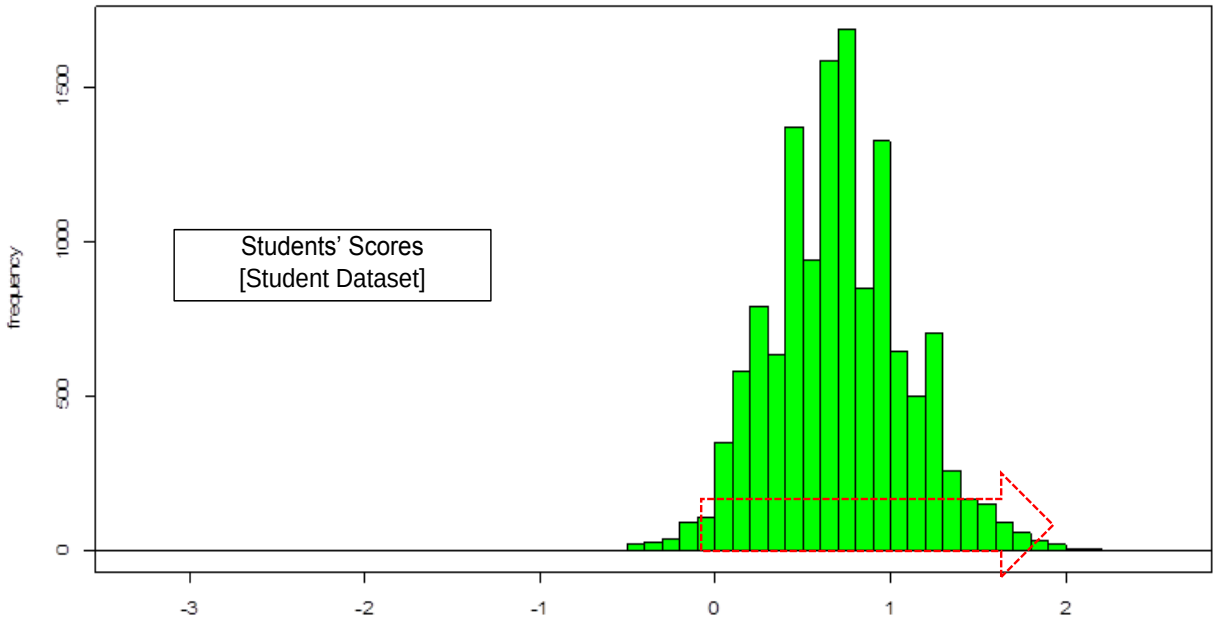
Pearson Correlations (p-values)	Pre-Uni Pedagogy
Maths Confidence DP1	**-0.37 (<0.001)**
Maths Confidence DP2	**-0.28 (<0.001)**
Math Dispositions DP1	**-0.2 (0.001)**
Math Dispositions DP2	**-0.13 (0.042)**
Perceived support at uni	-0.04 (0.514)
Pre-uni Pedagogy	
Uni pedagogy	
Perception of transitional gap	

➔ Transmissionist teaching at school (pre-uni) is associated with lower confidence and maths dispositions

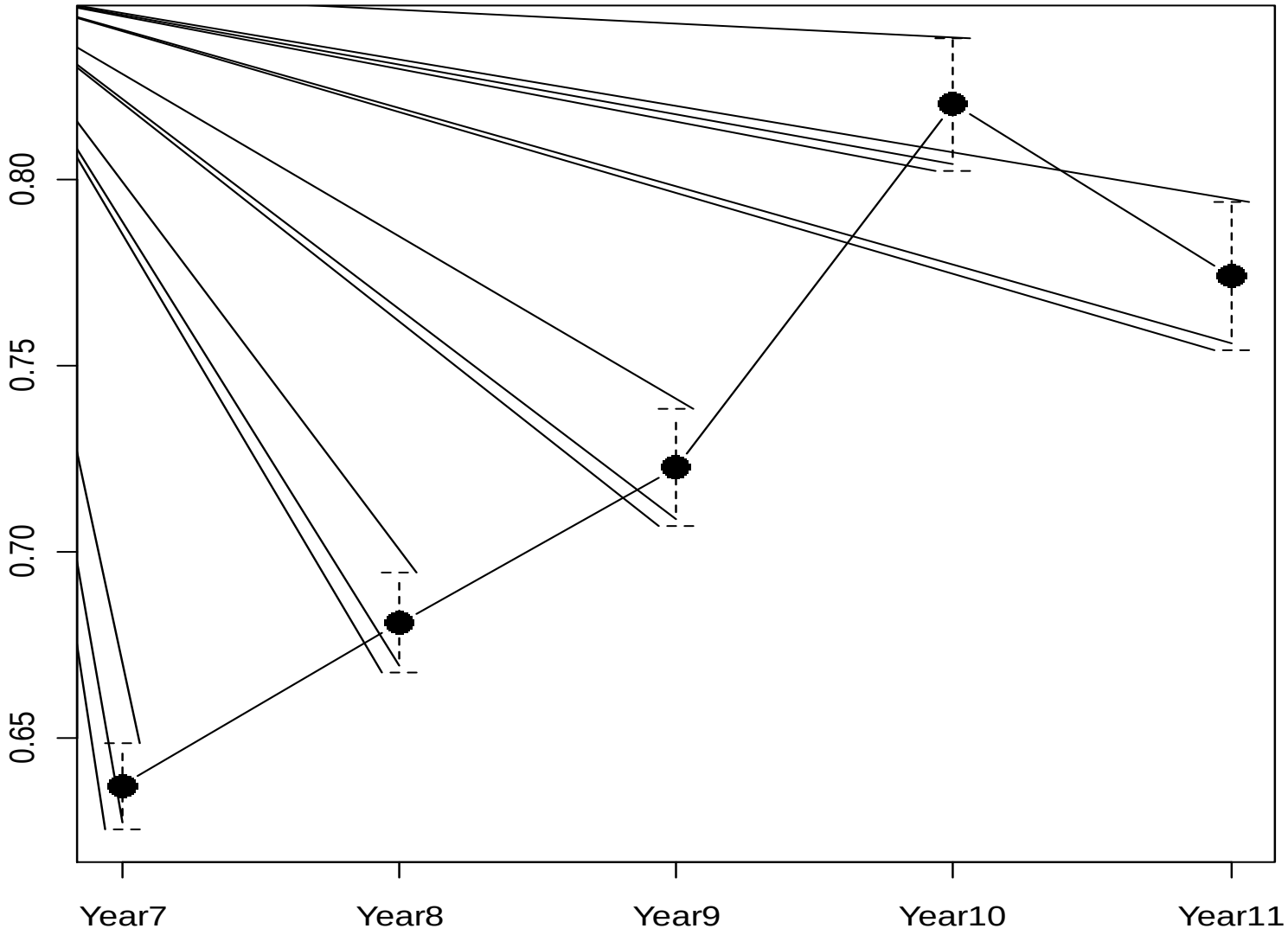
➔ Smaller effect as students progress in HE – but still significant dispositions

The current picture in Secondary Schools…





Student-level data: By Year Group



Are some practices more engaging?

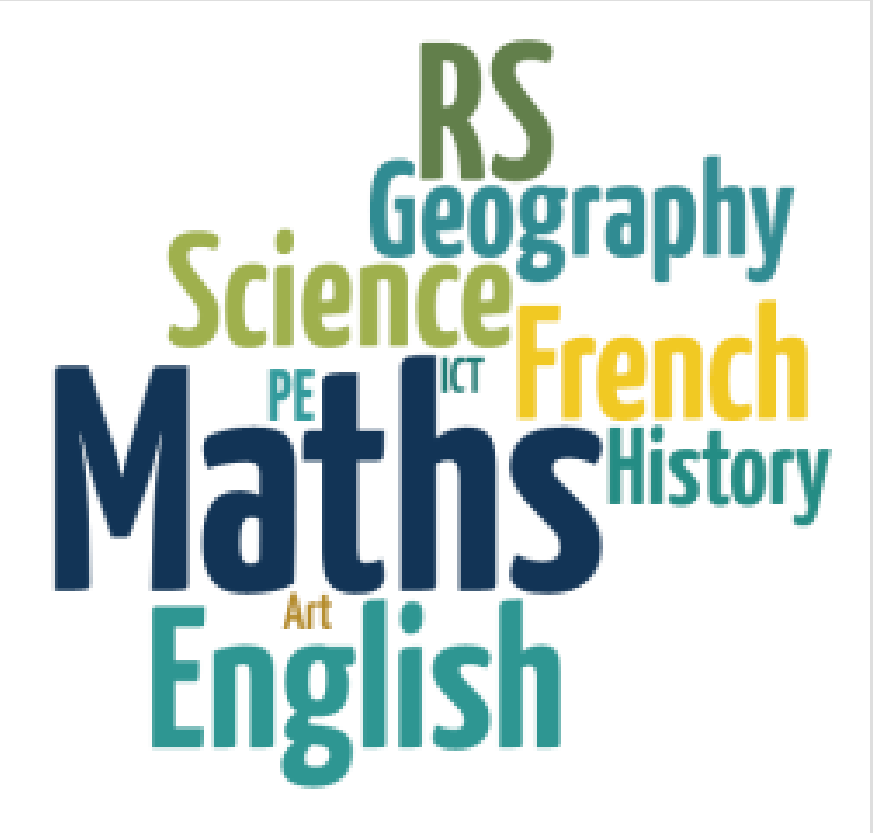
In other words:

- association of the measure of pedagogy perception with variables relevant to students' mathematics dispositions

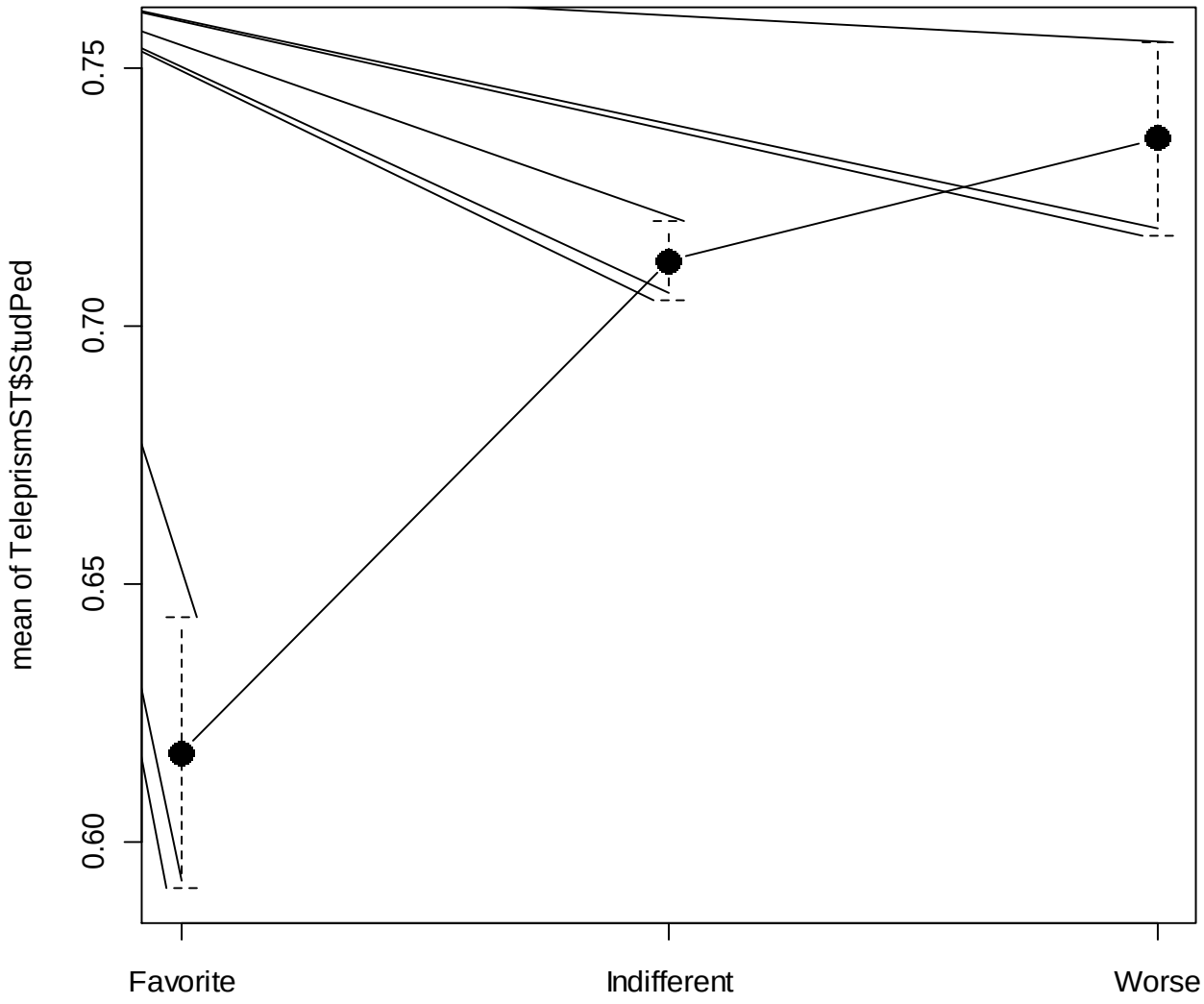
Employing technology
to keep students' attention.

Students' favourite and less favourite topics

- DP1



Pedagogy by 'Preference'



In the news…

'Transmission' teaching may turn pupils off maths

A new university study has revealed that 'transmission' teaching, where the teacher stands at the front and dictates to the class, could be a key factor in explaining why a fifth of secondary children rate it as their least favourite subject.

The 'Teaching and learning practices in secondary mathematics: measuring teaching from teachers' and students perspectives' report by researchers at the University of Manchester reveals that transmission-style teaching is still the main approach in today's classrooms.

Of the more than 13,000 pupils surveyed, activities such as copying the secondary teacher's notes from the board and being asked questions by the teacher were cited as common practice, ahead of learning alternative approaches detailing how maths has changed over time or using media like magazines and videos in class.

For 22 per cent of pupils, maths is their least favourite subject, while for 7.8 per cent it is their most enjoyable lesson.

On the basis of the evidence gathered, the report's authors tentatively concluded that "students engage more with maths in less transmissionist learning environments".

However, they were also quick to absolve those in teachings jobs of blame in this situation.

"Most [teachers] say 'we would prefer to do more of the non-transmission activities, but because of the pressure of preparing pupils for exams, because of the pressure of time, we cannot'," explained Dr Maria Pampaka, who worked on the study.

Traditional teaching methods still dominant in maths classrooms

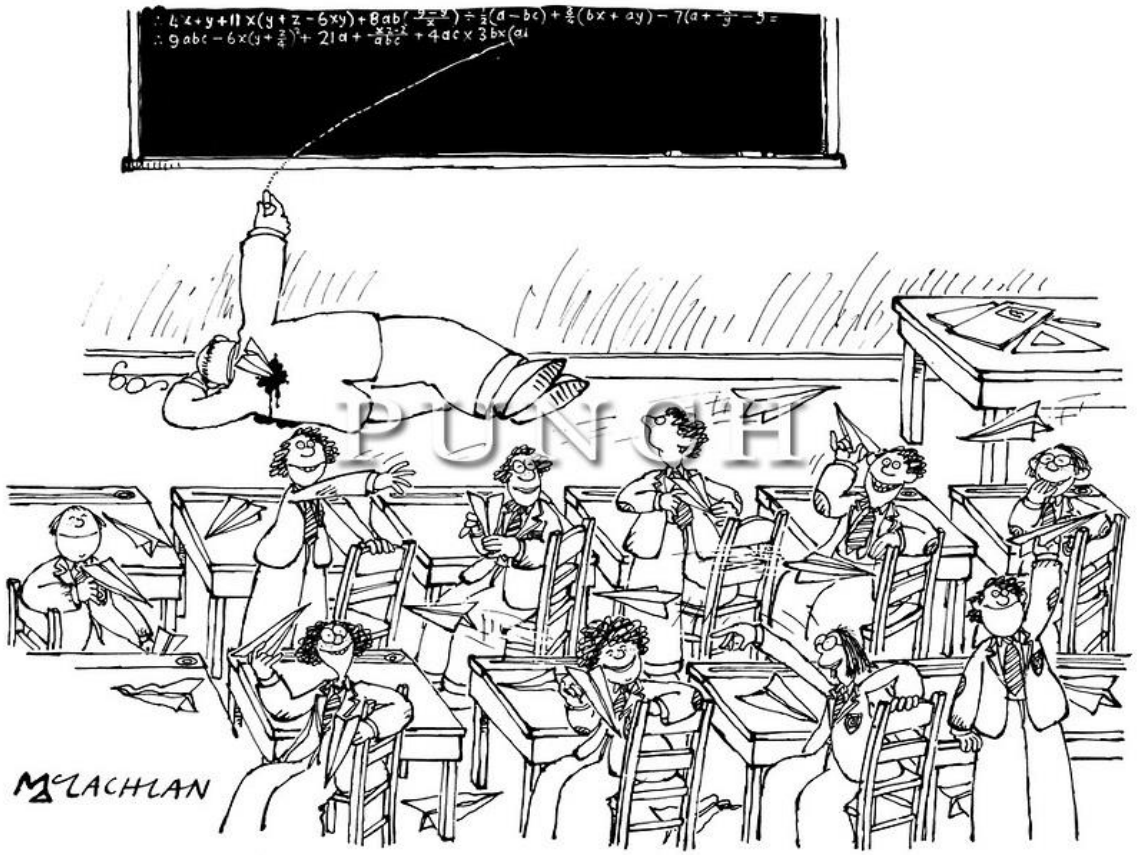
September 7, 2012

Twenty-first century maths lessons in English secondary schools are generally much like those of decades ago, with the teacher standing at the front of the class asking questions and opportunities for pupils to relate the subject to their real lives relatively sparse, according to University of Manchester research.

And the GCSE exams system seems to underscore this position, with lessons becoming increasingly routine and less interactive as pupils get older and approach the end of their compulsory schooling careers.

This may be a factor in maths ranking as the subject secondary pupils are most likely to say they dislike, although it also has among the highest number of pupils naming it as their preferred choice.

Is there common ground for teaching for good results (exams) and engaging students in maths?



Thank you!

For more information

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- www.teleprism.com

- maria.pampaka@manchester.ac.uk

- Thank you !

Some references

- Pampaka, et al. (2013). Measuring Alternative Learning Outcomes: Dispositions to Study in Higher Education. *Journal of Applied Measurement*.
- Pampaka, M., Williams, J. & Hutcheson, G. (2012). Measuring students' transition into University and its association with learning outcomes. *British Educational Research Journal*.
- Pampaka, M., Williams, J., Hutcheson, G. D., Wake, G., Black, L., Davis, P., & Hernandez-Martinez, P. (2012). The association between mathematics pedagogy and learners' dispositions for university study. *British Educational Research Journal*.