MATHEMATICS DISPOSITIONS OF SECONDARY SCHOOL STUDENTS WITH SPECIAL EDUCATIONAL NEEDS

8TH INCLUSIVE AND SUPPORTIVE EDUCATION CONGRESS

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Outline

The (educational) problem

The TELEPRISM project

The analytical/methodological framework

- brief overview of instruments
- brief overview of measure construction

Overview of Findings

- Some descriptive results
- Qualitative Evidence

Concluding Remarks

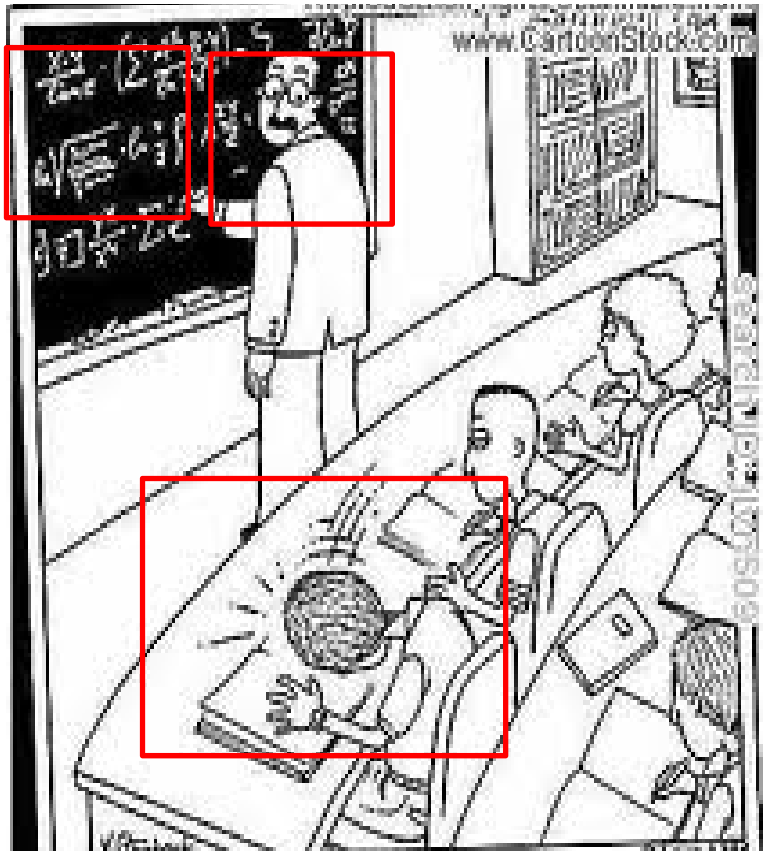
Introduction: The STEM 'issue'

STEM: Science Technology, Engineering and Mathematics

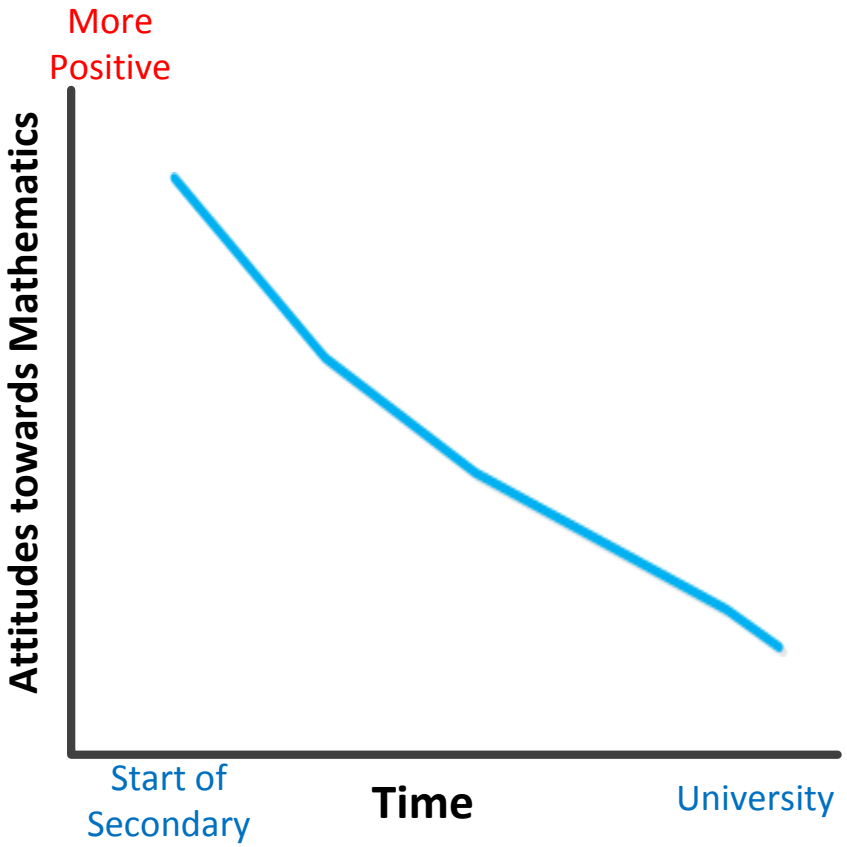
Participation remains problematic

Students dispositions are declining

The main actors



Recent evidence …



A Research Problem

- Widely accepted is that dispositions and attitude are important for learning mathematics and future engagement with STEM (Fennema & Sherman, 1976; Frost, Hyde, & Fennema, 1994; Hannula, 2002; Pampaka et al, 2013).
- And that effective maths teaching should be connectionist
- 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.

- The **broader research question** within our project:

What is the association between teaching styles/practices in mathematics with variables relevant to students' mathematical dispositions /attitudes?

The Teleprism Project

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

TELEPRISM

Teaching and Learning Practices in Secondary Mathematics

ESRC funded study (RES-061-25-0538) in UK

(2011-2014) (www.teleprism.com)

"Mathematics teaching and learning in secondary schools: the impact of pedagogical practices on important learning outcomes"

TEAM

Project investigator	Maria Pampaka
Research Associates	Lawrence Wo, Afroditi Kalambouka
Associate Research Students	S.Qasim, D. Swanson, P. Troncoso-Ruiz, **M. Omuvwie**
Mentors	Prof Julian Williams, Prof Ian Plewis

Teleprism: Aims and Approach

Project Aims:

- **To map secondary students' learning outcomes and choices, including dispositions and attitudes, together with the teaching they are exposed to.**

Project Delivery:

- **Longitudinal surveys for students from Years 7 to 11 (3 times/DPS: Start of the year, end of year, start of next academic year) and also for their mathematics teacher (twice).**
- **Case studies in a small number of schools with lesson observations and interviews with students and teachers.**

Focus here: Maths Dispositions of students with SEN

- Another gap related with SEN: informed analysis of dispositions and attitudes of students with Special Educational Needs (SEN) & Disability, on their learning outcomes – especially in mathematically demanding subjects as compared with non-SEN.

- ***Particular Research Questions:***

How do perceptions of attitudes towards mathematics differ between students with SEN and those of their peers? [From Surveys]

What do the students with SEN consider as important factors affecting their mathematics experiences in secondary school? [From Interviews]

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 @Start

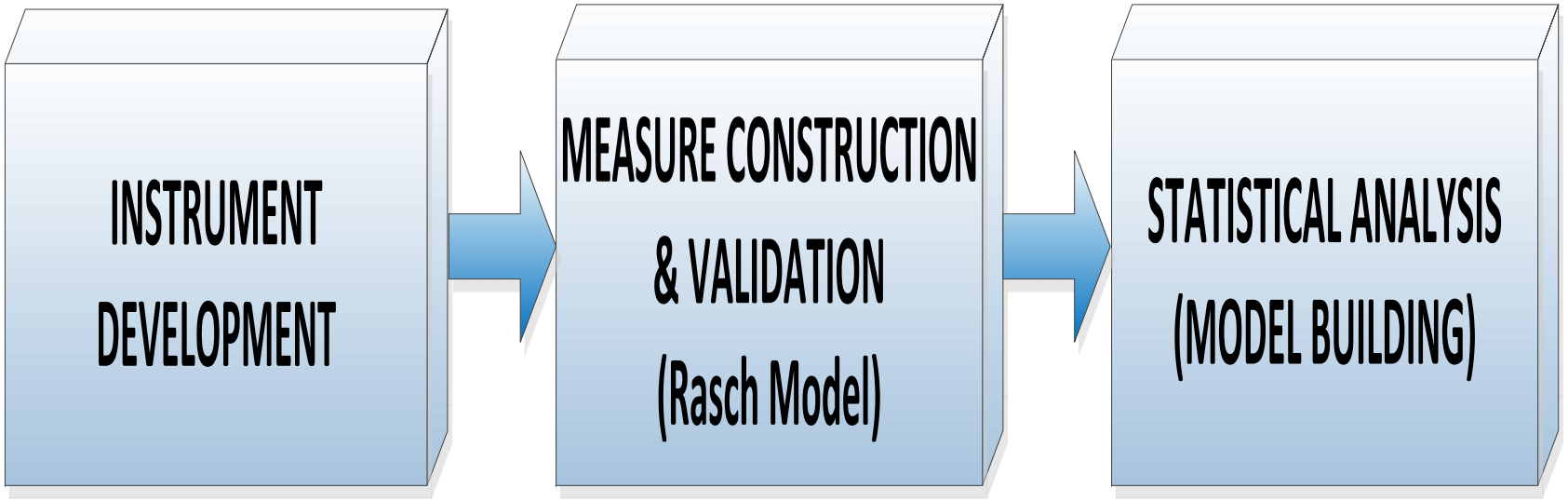
Year 7	3884
Year 8	3025
Year 9	2668
Year 10	2145
Year 11	1794
Total	**13516**

The available survey data related to SEN

	DP1	DP2
Not SEN	6177 (87.1%)	5850 (87.65%)
SEN	915 (12.9%)	824 (12.35%)
Total	**7092**	**6674**

SEN Details	DP1 (N, %)		DP2 (N, %)	
ASD (Autistic Spectrum Disorder)	8	0.87%	8	0.97%
BESD (Behaviour, Emotional & Social Difficulties)	70	7.65%	46	5.58%
HI (Hearing Impairment)	15	1.64%	15	1.82%
MLD (Moderate Learning Difficulty)	122	13.33%	103	12.50%
OTH (Other Difficulty/Disability)	8	0.87%	8	0.97%
PD (Physical Disability)	9	0.98%	7	0.85%
PMLD (Profound & Multiple Learning Difficulty)	4	0.44%	3	0.36%
SLCN (Speech, Language and Communication Needs)	17	1.86%	14	1.70%
SPLD (Specific Learning Difficulty)	50	5.46%	35	4.25%
VI (Visual Impairment)	2	0.22%	1	0.12%
Not specified	610	66.67%	584	70.87%
Total	**915**		**824**	

The Methodological/ Analytical Framework



Descriptive Results

Qualitative Evidence

INSTRUMENT DEVELOPMENT

The Questionnaire

- About yourself and your school
  - Background information
  - Class and Teacher identifiers
  - Parental support/involvement

- Your feelings about mathematics (Mathematics Attitudes)
- Aspirations and intentions for after High School
- Confidence in mathematics tasks (Maths Self-efficacy)
- How maths is taught (Perceptions of teaching)

Example: Mathematics Attitudes

Constructed and Validated Measures

With students' responses to the surveys we validated the following measures:

- A measure of 'perceived parental involvement/support'
- Mathematics disposition: (the higher the score the more disposed the student is towards further study or engagement with mathematics)
- Mathematics 'identity': (the higher the score the more positively/strongly the student relates or identifies with mathematics)
- Mathematics Self-efficacy
- Perceptions of teaching

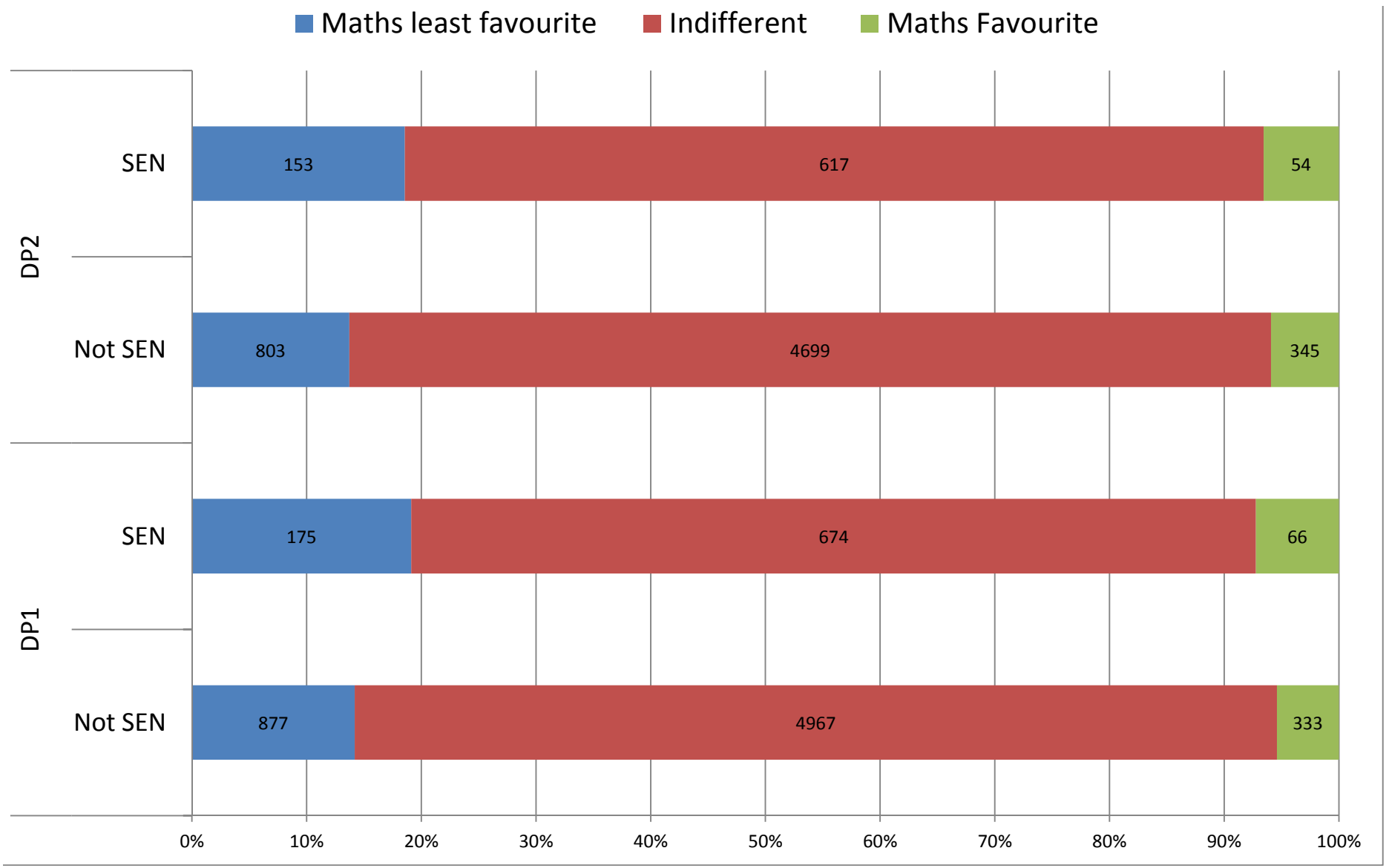
Some Findings related to SEN…

An overview of results with a combination of:

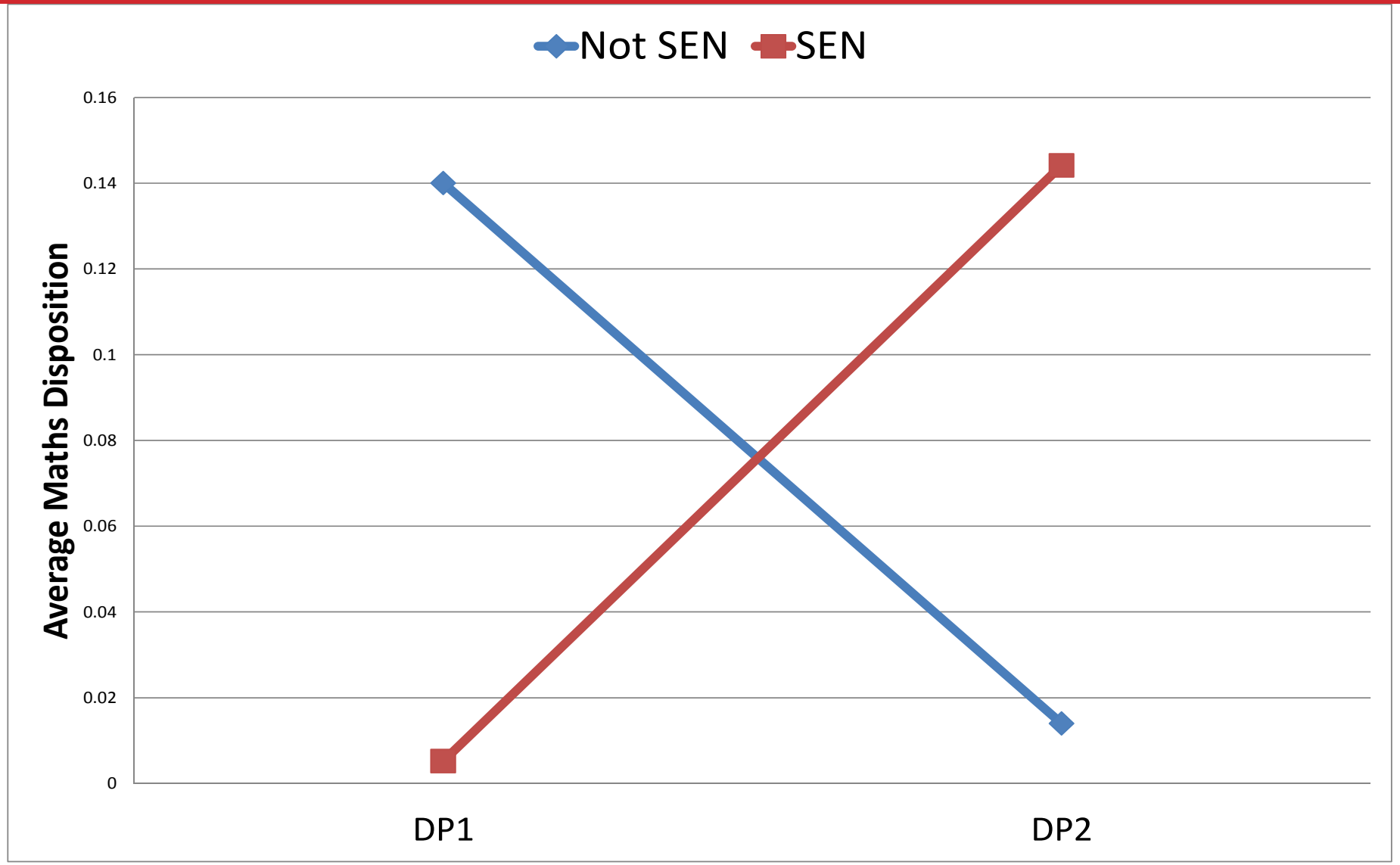
- Descriptive Results (From Surveys)

- Qualitative Evidence (From Interviews with students with SEN)

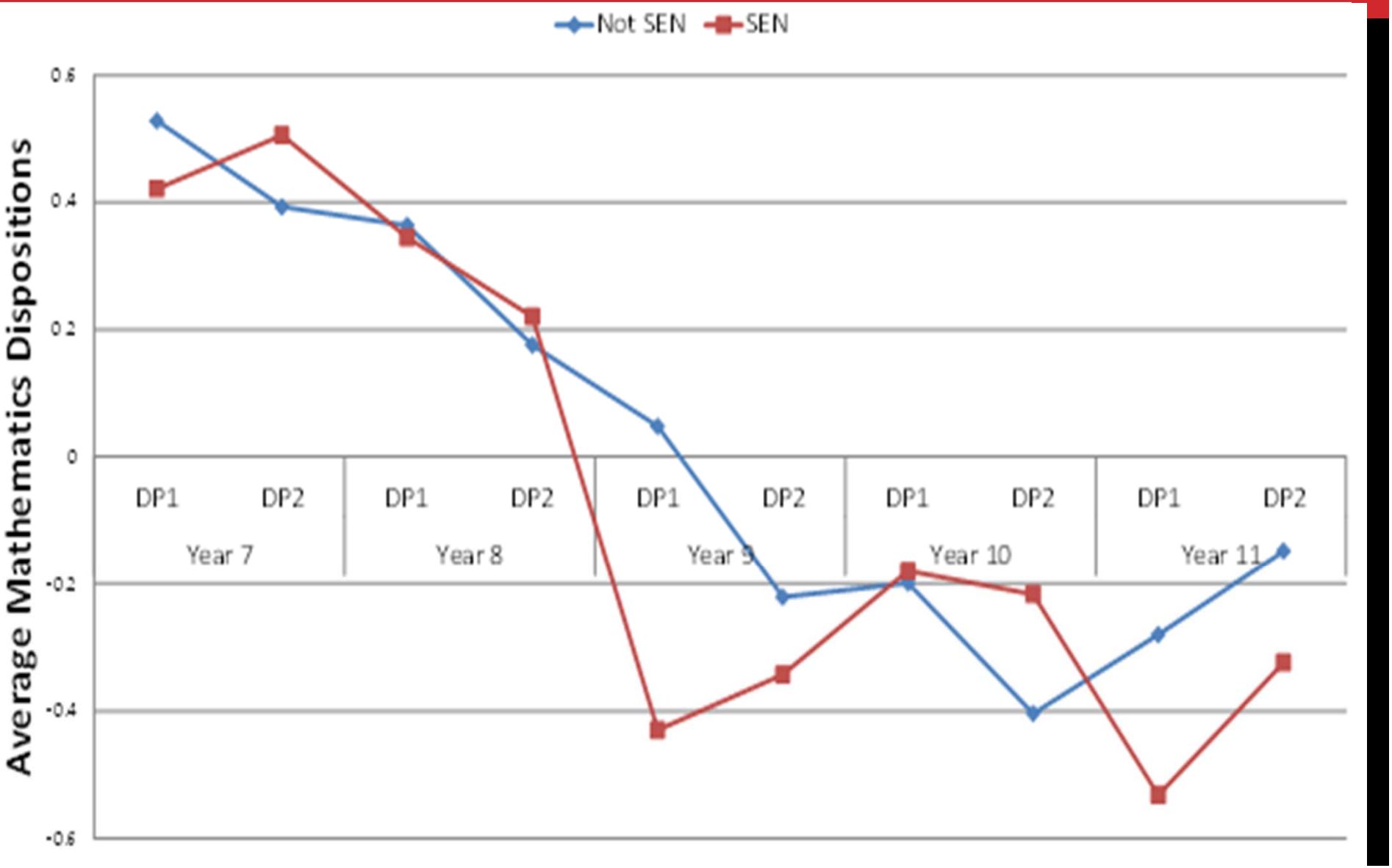
Reported subject preference: Differences between SEN and non-SEN



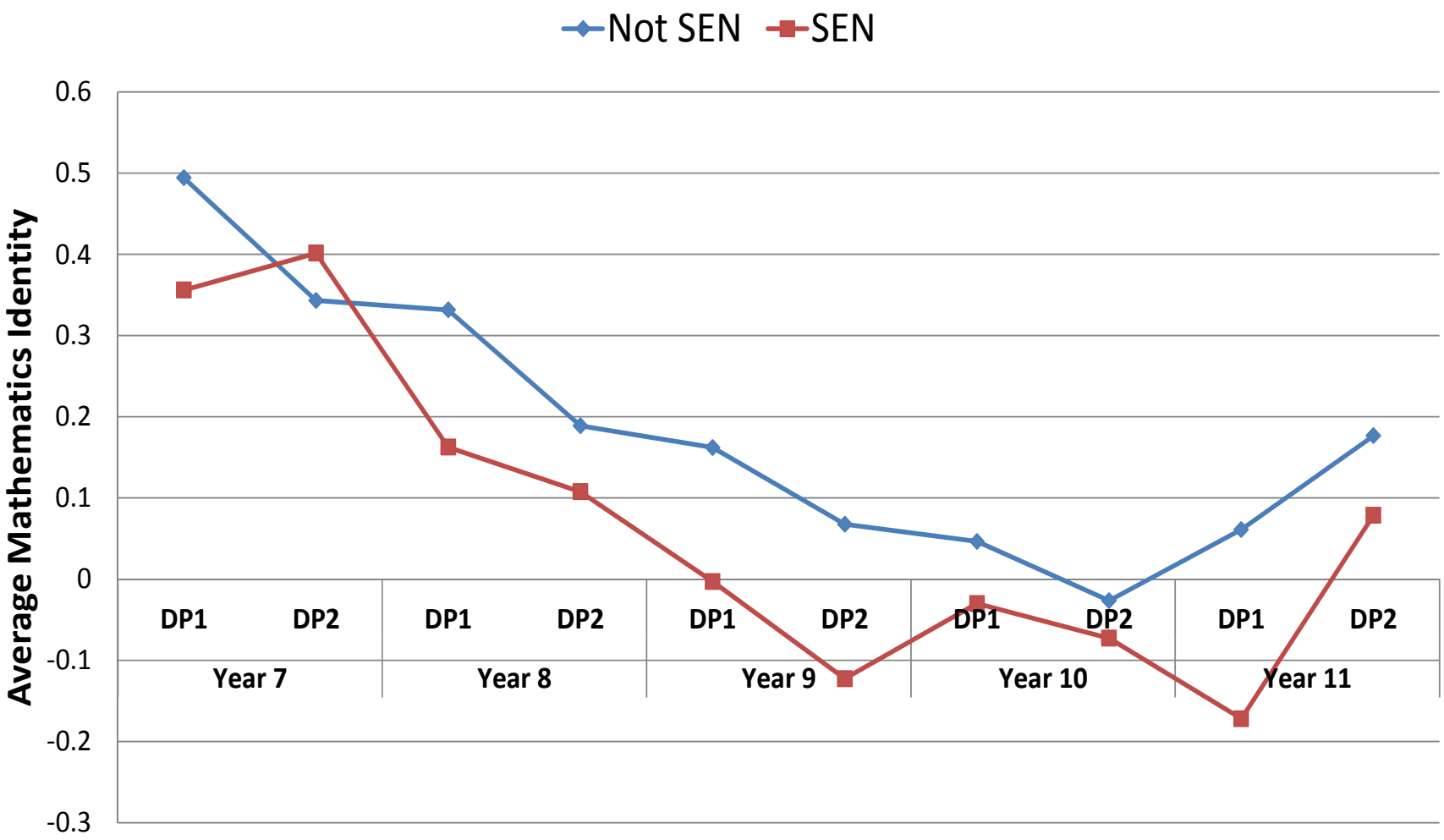
Students' mathematics dispositions based on SEN vs Non-SEN



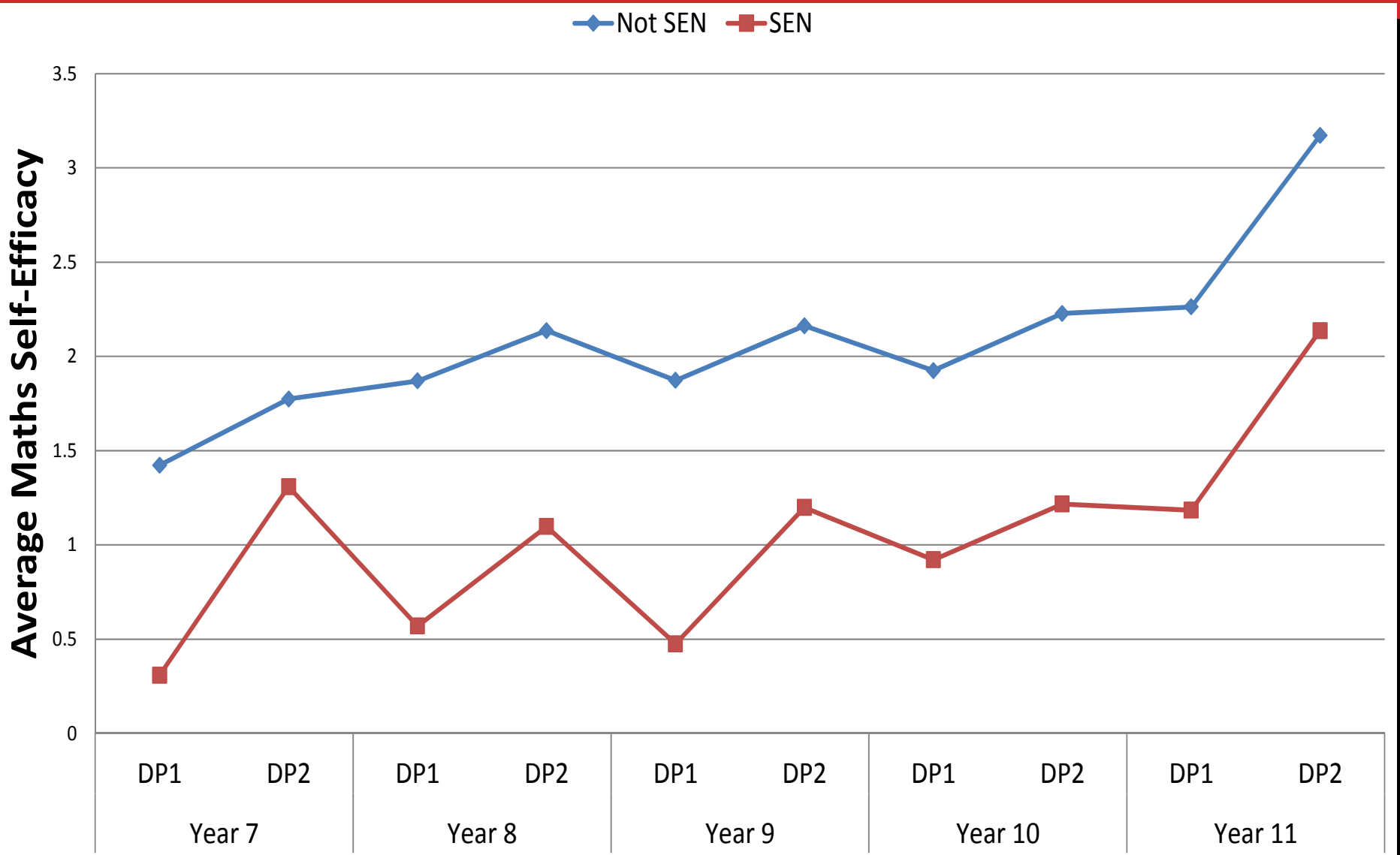
Students' mathematics dispositions: SEN vs Non-SEN, by Year group and DP



Students' mathematics Identity:
SEN vs Non-SEN, by Year group and DP



Students' maths self-efficacy: SEN vs. Non-SEN, by Year group and DP



Some Qualitative Results

Student: I get in trouble sometimes.
Interviewer: … why do you get in trouble?
Student: I talk too much, I get detention a lot.
(Y7, Boy)

Not always I'm mostly good but I do get distracted quite a lot.
(Y8, Boy)

Student: it stresses me when I say something and he moves me into a different classroom. …
(Y8, Boy)

Interviewer: Okay so what do you think made you go back up and down sets …?
Student: Wasn't listening.
(Y9, Boy)

I think I was messing about a bit in class so I got moved down [ability set].
(Y8, Boy)

What students with SEN said

Interviewer: What was your worst topic?
Student: Maths, I am not really good at maths.
Interviewer: So why didn't you like it?
Student: Because there were some things that I got confused with and some things I found hard in maths, and I am not very good at maths.
(Y7, Girl)

Yes, Maths is quite hard.
(Y7, Boy)

Student: Algebra, I don't like that. […] It does my head in, it is hard and it is just boring.
Interviewer: Do you think there is anyway you would use that in the real world?
Student: Not really. […] No – why would you need algebra? Because you are never really going to change a letter to a number, are you?
(Y8, Boy)

You're not going to go around measuring a square.
(Y10, Girl)

I think I'm going to the army I don't think I'll need Maths.
(Y9, Boy)

What students with SEN said

Student: I like drawing shapes, it's better than doing work.
(Y7, Girl,)

Student: I like shapes and symmetry.
Interviewer: So why do you like that?
Student: It is just more fun and it is not just writing out loads of numbers.
(Y8, Boy)

I don't mind doing shapes.
(Y9, Boy)

Student: Algebra I hate.
Interviewer: Why do you hate it?
Student: Just confusing.
(Y9, Boy)

Student: Algebra, I don't like that. […] It does my head in, it is hard and it is just boring.
Interviewer: Do you think there is anyway you would use that in the real world?
Student: Not really. […] No – why would you need algebra? Because you are never really going to change a letter to a number, are you?
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(Y9, Boy)

Concluding Remarks

Main findings:

- This study has shown overall differences in maths disposition and self-efficacy between students with SEN and their peers, with students with SEN achieving lower scores.
- Results from the case studies have revealed the impact of school on alleviating such trends.

Implications:

- Students with SEN may be particularly in need of more interactive, fun and connective learning, in order to feel motivated and therefore, potentially more engaged in mainstream classrooms
- Different instructional practices may be more appropriate for students with SEN and they may also differ according to the type of SEN

Some references…

Pampaka, M., & Troncoso, P. (2014). Modelling students' progression in secondary education with the combination of separate cohorts of repeated measurements. *Paper presented at the VI European Congress of Methodology*. Utrecht, July 2014.

Pampaka, M., & Wo, L. (2014). Revisiting Mathematical Attitudes of students in Secondary Education. In Liljedahl, P., Oesterle, S., Nicol, C., & Allan, D. (Eds.) Proceedings of the Joint Meeting of PME 38 and PME-NA 36, Vol. 4, pp. 385-392.

And more on www.teleprism.com

THANK YOU!

QUESTIONS?