E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL
MANCHESTER 1824

'I could have done better with like a positive atmosphere': Secondary students' mathematical dispositions

Afroditi Kalambouka, Maria Pampaka, Lawrence Wo, Sophina Qasim, & David Swanson

Outline

- **Project overall description**
- **Aims**
- **Design**
- **Survey first data point**
- Case studies and interviews

The project: TeLePriSM

Teaching and Learning Practices in Secondary Mathematics

"Mathematics teaching and learning in secondary schools: the impact of pedagogical practices on important learning outcomes" (ESRC: RES-061-25-0538)

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

Surveys for students from Years 7 to 11 (3 times) and also for their mathematics teacher (twice).

Case studies in a small number of schools with lesson observations and interviews with students and teachers.

Particular Aims

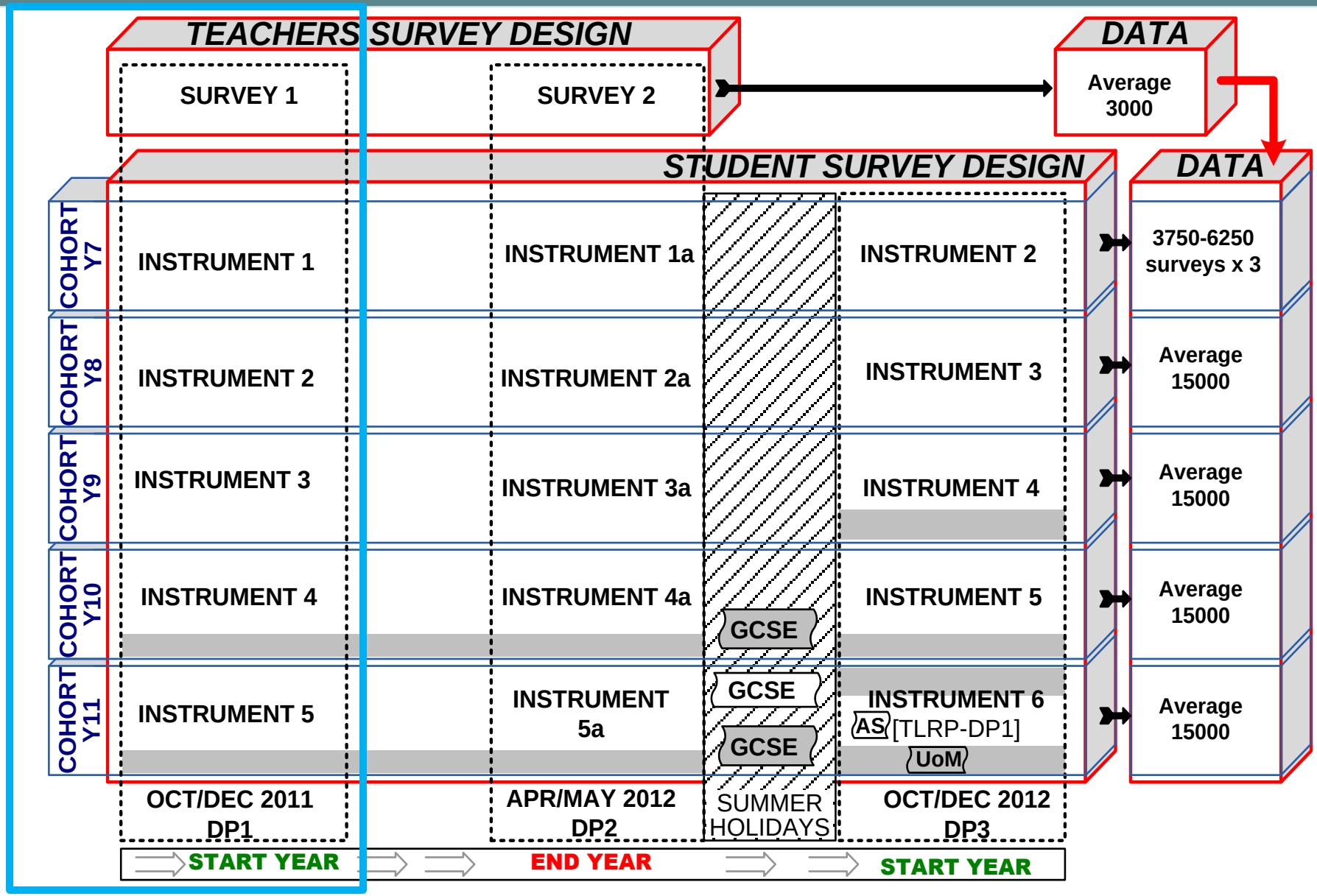
(i) to understand how learners' dispositions to study Mathematics develop through Secondary School (i.e. KS3 and KS4)

(ii) to understand how mathematics pedagogies vary across different situations and contexts,

(iii) to understand how different pedagogies, programmes and school contexts influence learning outcomes, including dispositions, and

(iv) to solve a series of measurement and analytical challenges involving a synthesis of longitudinal and cross-sectional analyses, and dealing with missing data.

The survey design



The Student Survey Development

Different Sections:

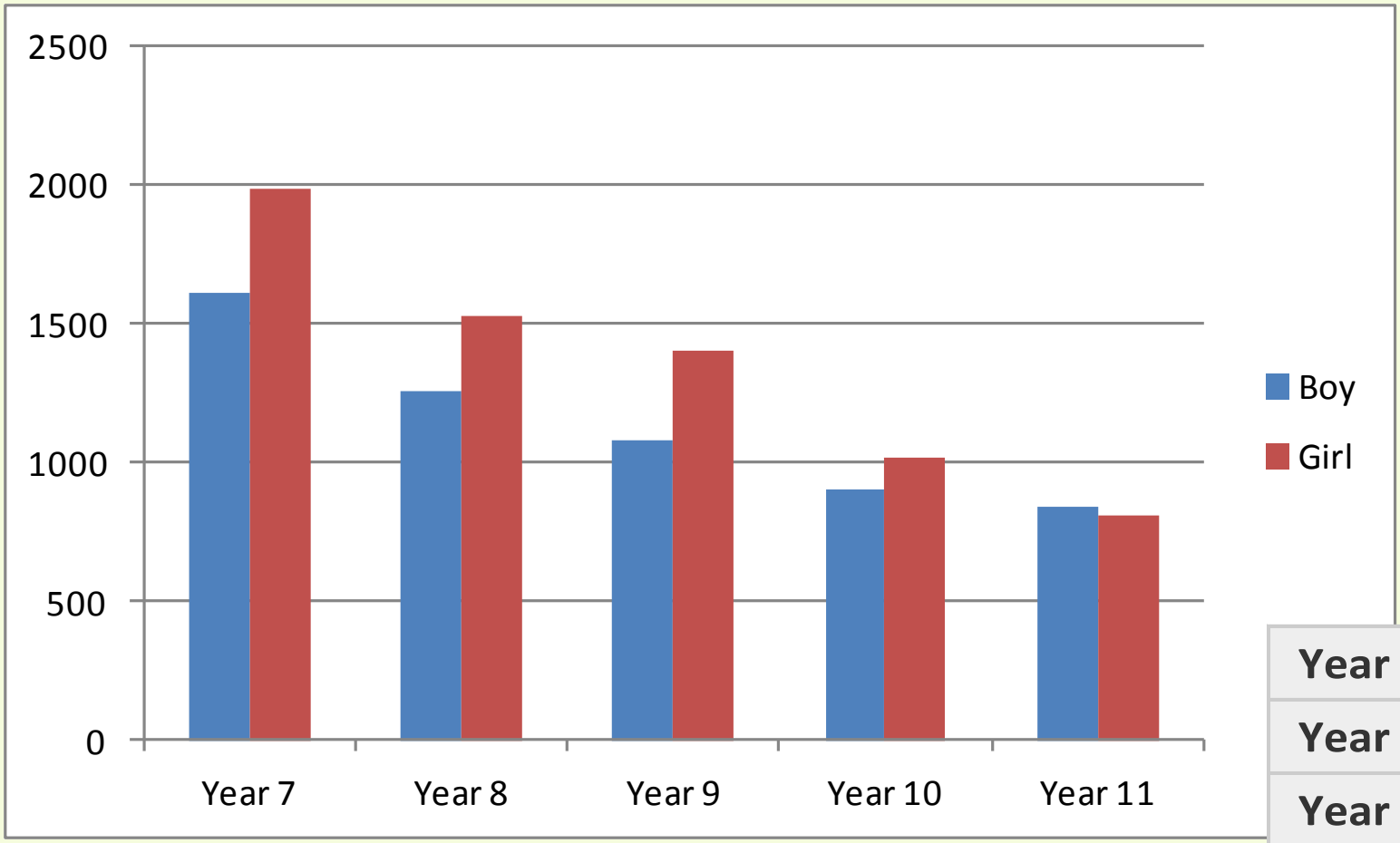
- Background Information
- Attitudes/Dispositions to Maths
- Aspirations/Future Choices
- Perception of Maths Teaching
- Maths Self-efficacy (confidence)

Build on previous (TransMaths) surveys and broader relevant literature

Data point 1: 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

Data point 1: Participating students



Year 7	3749
Year 8	2883
Year 9	2560
Year 10	1991
Year 11	1681
Total	12444

DP1 – Some preliminary findings

Students' favourite and least favourite topics

DP1:
Distribution of students' responses on items about their attitudes to mathematics

Key	Strongly disagree	Disagree	Unsure	Agree	Strongly agree

Item name	Frequency bars
Mathematics is important to me.	
Maths is one of the most interesting school subjects.	
Learning maths is enjoyable for me.	
I have a mathematical mind.	
I can get good results in maths.	
I am interested in learning new things in maths.	
I can learn maths even if it is hard.	
I like using familiar maths rather than new maths topics.	
I am more worried about maths than any other subject.	
I often need help with maths.	
Compared to my classmates, I am good at maths.	
I never want to take another mathematics course.	
I would prefer my future studies to include a lot of maths.	
I would look forward to studying more mathematics after school.	
I would like to be a mathematician.	
Maths is important for my future (after school)	

DP1: Students' perception of maths teaching

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.	

Qualitative data

- 49 semi-structured interviews conducted with secondary school students, across all year groups (Year 7 to Year 11).
- Interviews were transcribed by professional transcribers and were subsequently coded.
- Initial codes are based on the interview questions & will provide an initial understanding of the themes & issues explored.

Preliminary Analysis

The interviews focused on:

- Students background factors
- Classroom practices
- Students' experiences
- Students' attitudes and preferences
- Future aspirations and plans

The analysis focuses on how students relate their earlier experiences in mathematics education to their current dispositions. These relationships are assumed to be complex and the results presented here are preliminary. The following snapshots provide an indication of the variety of factors that may influence students in their dispositions of maths.

Student 1: Maths is about in the 'middle'

LM is a lively and sociable girl in Y11 who loves sport and overall enjoys school. He favourite subject is Art and her least favourite is science. She feels that Maths is somewhere in between, '*probably nearer the top than nearer the bottom'.* Maths was her favourite subject in Primary school because, as she explains, she was good at English & Maths but not so good at other subjects: '*being good at it has made me like it*'.

- *I do like Maths actually as a subject I like the idea of it being quite challenging and there only being one answer. […] with English the possibilities are endless how you interpret things but with Maths it's just that one answer.*

She comments on the daily teaching as mainly aimed at the GCSE. She enjoys a variety of teaching methods, especially games and videos related to Maths as she believes that these help you '*to remember things*'.

Student 1 (cont'd)

She also enjoys working on the computer. She finds that working in groups is one of the main differences between Primary and Secondary school, and she enjoys group work.

She thinks that teachers should be strict but '*allow you to talk in groups as far as it is in relation to Maths*'. She would also have liked more interesting books:

> *I think sometimes when you get, you know, the Maths books that you work through I think sometimes the style of that can be quite boring. It's not like a fun way of doing it's like a question and then another question it would be nice if it would be set out like a fun way.*

(LM, girl, Y11, I25)

Student 2: Maths is the least favourite

RD is a girl in Y7 who's favourite subject is DT & her least favourite is Maths. She is '*better in other subjects*' whilst Maths is 'boring' and 'confusing'. She feels that the teachers in the primary school '*did not explain it*' in a way she could understand it and that she '*didn't really get it*'; she did not like asking the teachers for further clarifications. When asked to provide any examples of what she likes in Maths, she struggles to find any…

> *it can be sometimes a bit fun but then not really […] when we played games to do with Maths.*

She points out that she prefers situations where students work in groups, such as in problem solving, as she likes '*working with people*'. She would like teachers '*to explain it a lot more if you don't get it*' and her ideal teacher would be one that '*not like shout a lot and to explain things more*'. (RD, girl, Y7, I40)

Student 3: Maths is the least favourite

AJ is a Y8 boy who found primary school overall 'fun' despite moving schools a couple of times. His favourite subject currently is PE and he plays a lot of sports. His least favourite subject is Maths:

> *I want to get out of here' […] I usually just say 'sir, can I got to the toilet.' Just skip it*

During the interview he often comments on the difficulty of the required work. Describing a typical lesson, he explains that he can get the '*add and subtract right*' but not the multiplications and divisions:

> *cause we usually do a starter where we do add and subtract, times and divide and I don't like the…times and divide bit 'cause times is like 564x3499*

He recalls some negative experiences from the primary maths: '*always getting told off cause I didn't know the question*'. He admits '*sitting back*' during group work & avoiding doing any revisions. He prefers working in Maths on the computers as it does not involve 'writing'. (AJ, boy, Y8, I3)

Student 4: Maths is on the favourites

MC is a Y8 boy who goes to scouts and likes playing the piano & the guitar. His favourite subject is DT & his least favourite is Geography. Maths was his favourite subject in primary school (where there was no DT); he was '*top of the class*' & he '*really enjoyed it*'. However, there were areas still that he found difficult:

> *I didn't really understand negative numbers, like how to use negative numbers in questions.*

Currently, he finds Maths mainly 'interesting' & has certain preferences in topics:

> *I like shapes, but I am not too fond of methods of calculations, it kind of passes over my head. I do them, but it sort of goes in one ear and out the other. Because I already have got a big set of ways that I do things.*

Student 4 (cont'd)

Sometimes he feels '*a bit bored*' when they '*do things that [they] went over in earlier years*'. He likes working in groups &/or in pairs with another boy in his table who is of similar high ability. He thinks that he will go to University to do '*something with landscaping'*, possibly architecture, and he would be happy to take maths as one of the subjects. (MC, boy, Y8, I41)

‘Ideal ‘lesson

- *I’d probably do it like more games things, like…a bit fun like get outside, we’ve done that once in the eight weeks but we were doing maths out there, we were like making circles and rectangles and then we had like one in the middle of them and then it’s like how many spaces to get to the other people so…probably go outside a bit more, that would be good.* (AB, boy, Y7, I1)
- *I’d do something about maths like what people are interested in like about maths like join maths and their interests together. So like people that like are like influenced by like learning about it ‘cos like you can use it in this way and that way so yeah.* (CA, boy, Y8, I18)
- *Like massive board games and all that, like the fun sort of worksheets and things.* (JB, boy, Y9, I8)

‘Ideal’ teacher

- *Funny and they help you loads and don’t shout* (LR, boy, Y9)
- *Ideal maths teacher positive and very lively.* (CA, boy, Y8, I18)
- *One that doesn’t just talk to the group in general, but like they help the ones…well they help everybody but…the ones that really aren’t getting it, they sit them like together and they talk to them like in general to each person.* (BW, boy, Y9, I44)

Issues on pedagogy

Students commented favourably on pedagogy issues such as the social aspect of learning

I think I like as our maths class, we have been the same class for 3 years and we all get on together and when we go to maths we are looking forward to it. The teacher has bonded with us and we are a good group and it goes quick. But we are learning and at the same time we are bonding with each other – so it goes quick. (SW, boy, Y9, I31)

Prefer to sit with my friends? […] because bring a positive atmosphere I can do better I can do better like with a positive atmosphere. (CA, boy, Y8, I18)

Issues on pedagogy (cont'd)

Teacher's style

She makes you understand like get a better understanding of it all, where other teachers will explain a bit of it and say 'do it' where Miss X goes through it all so you understand it a lot more. (ED, boy, Y10, I46)

Don't like … ratio and algebra 'cause it's a bit hard. I don't understand it most of the time. I ask the teacher and she comes over and explains it a bit but…I still don't get it after that. (JE, boy, Y8, I4)

presentation & real world examples

Well we did a bit like board work we do like you know the smart board? We do it there and it's really fun because like it does it's like they animate it to make maths fun. […] When you're doing things about ratio about like Rooney scoring a goal like this is the ratio of him scoring a goal and if you get the answer right it does like this word flip and it's really good. (CA, boy, Y8, I18)

Thank you!