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Remote mathematics teaching during COVID-19: intentions, practices and equity

Jeremy Hodgen, Becky Taylor, Laurie Jacques, Antonina Tereshchenko, Rosa Kwok & Maria Cockerill

# Outline

- Background & context – The Student Grouping Study

- Remote mathematics teaching during lockdown – study

- Recommendations, conclusions, ongoing work

# What can we say about grouping?

- Students in low sets have low subject and general self-confidence. Attainment & self-confidence increases for high sets, but decreases for low sets over time

- Certain pupil groups more likely to be misallocated

- Schools find it hard to improve equity in setting (practical challenges; cultural challenges)

- Attainment grouping *as practised* is more complex than a simple dichotomy

- Not enough evidence about the relative effects on outcomes of setting and mixed attainment grouping as currently practised in the UK

# Existing research on grouping by attainment

- Extensively researched: countless reviews, 12 primary meta-analyses, 1 secondary meta-analysis ("What One Hundred Years of Research Says About the Effects of Ability Grouping and Acceleration on K–12 Students' Academic Achievement", Steenbergen-Hu et al, 2016)

- BUT … research is dated, US-based, often poorly described & methods often now considered problematic

    - The most recent experimental study of between-class grouping in Steenbergen-Hu et al's secondary meta-analysis was published in 1991, and in their primary meta-analysis, 1972

# The Student Grouping Study

- Focused on mathematics (in Years 7 & 8)

- Sample: naturalistic sample of 120 schools: 40 mixed attainment schools / 80 matched setting schools

- Mixed methods: Large scale surveys + intensive case studies

- Team: Jeremy Hodgen, Becky Taylor, Jake Anders, Antonina Tereshchenko, Martin Mills, Maria Cockerill (QUB), Laurie Jacques, Rosa Kwok

# What differences (if any) are there between students in the two group of schools?

- Attainment & general self-confidence

- All students & low attaining students

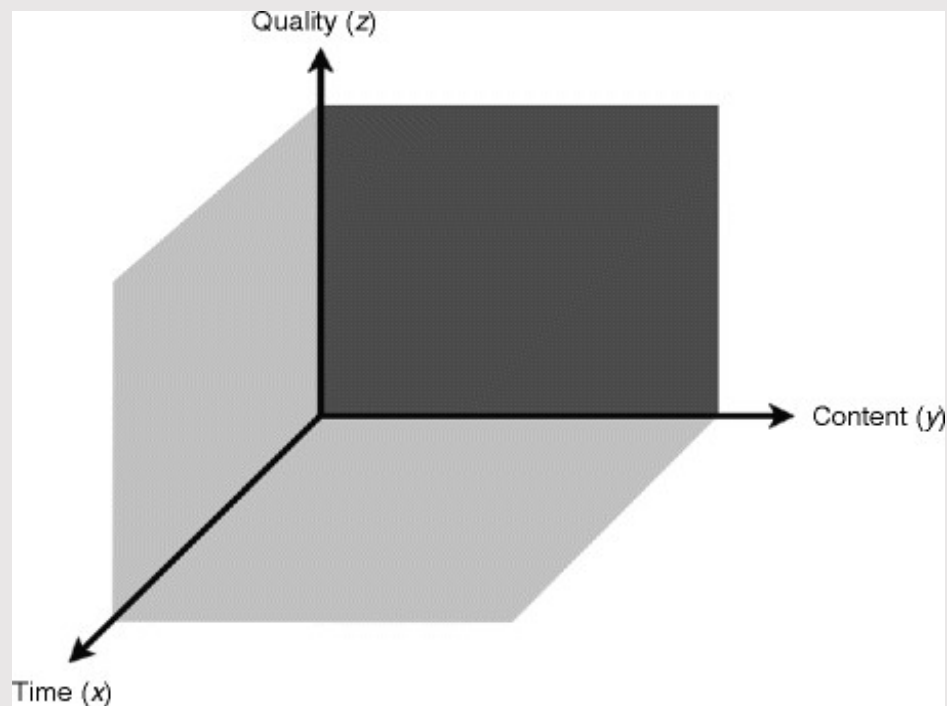- Associated factors: teacher quality & opportunity to learn

# What specific grouping practices do schools use and why do they use them?

- Pedagogy, opportunity to learn, teacher quality, school context

- Experiences of, and support for, low attaining students

# Opportunity to Learn (OTL)



Kurz (2011) has provided a contemporary conceptual framework of OTL as an accountability-based curriculum framework which includes 1) time on instruction, 2) instructional content, and 3) quality of instruction

# Quality: Teaching for Robust Understanding (TRU)

| The Five Dimensions of Powerful Mathematics Classrooms | | | | |
|---|---|---|---|---|
| **The Mathematics** | **Cognitive Demand** | **Equitable Access to Content** | **Agency, Ownership, and Identity** | **Formative Assessment** |
| *The extent to which the mathematics discussed is focused and coherent, and to which connections between procedures, concepts and contexts (where appropriate) are addressed and explained. Students should have opportunities to learn important mathematical content and practices, and to develop productive mathematical habits of mind.* | *The extent to which classroom interactions create and maintain an environment of productive intellectual challenge conducive to students' disciplinary development. Students should be able to engage in sense making and "productive struggle."* | *The extent to which classroom activity structures invite and support the active engagement of all of the students in the classroom with the core content being addressed by the class. No matter how rich the content being discussed, for example, a classroom in which a small number of students get most of the "air time" is not equitable.* | *The extent to which students have opportunities to "walk the walk and talk the talk," building on each other's ideas, in ways that contribute to their development of agency (the willingness to engage) and ownership over the content, resulting in positive identities as thinkers and learners.* | *The extent to which classroom activities elicit student thinking and subsequent instruction responds to those ideas, building on productive beginnings and addressing emerging misunderstandings. Powerful instruction "meets students where they are" and gives them opportunities to deepen their understandings.* |

Schoenfeld (2018)

# Quality: Pedagogical content knowledge (PCK)

- Tasks: Knowledge of multiple solutions / approaches

- Students: Knowledge of students' misconceptions, difficulties and solution strategies

- Instruction: Knowledge of different representations and explanations

(Baumert et al, 2010)

# The model
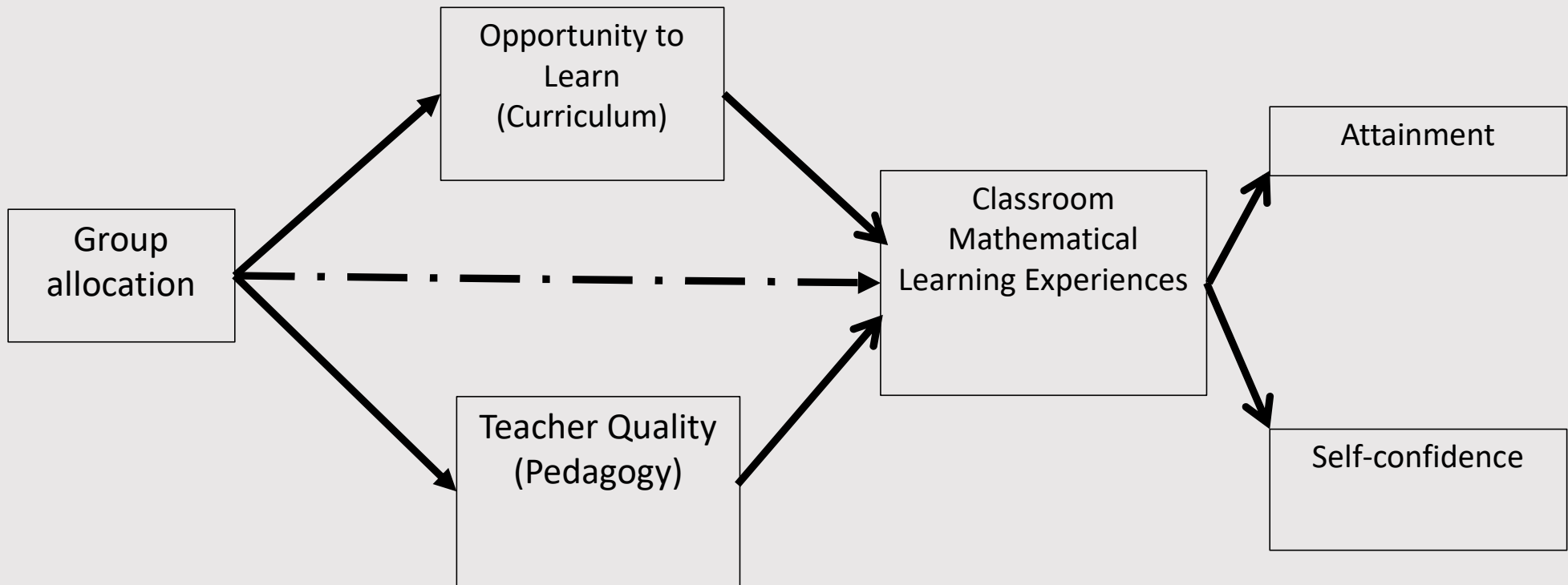
# Background to school closures in England

- Schools closed to most students from 20th March 2020 and majority of Year 7 pupils missed 15 weeks of normal schooling

- Schools moved to **remote teaching** with very limited knowledge and expertise, little time to prepare and, at least initially, almost no guidance

- Limited evidence on what are the most effective strategies for remote teaching or how to implement it

- Very limited research on mathematics and secondary – most research during lockdown was either generic or focused on primary literacy / English

# Impact of school closures

- The impact of school closures generally is poorly understood; existing evidence is largely of much shorter school closures (Sims, 2020)

- Potential learning loss estimated at an effect size of 0.06 – 0.10 (DELVE, 2020)

- The impact is inequitable; the attainment gap is likely to increase (EEF, 2020)

- Pupils from disadvantaged backgrounds:
  - more likely to spend less time on remote learning
  - less likely to have access to technology, space to work
    (Andrew et al., 2020; Eivers et al., 2020; Green, 2020; Lucas et al., 2020; Moss et al., 2020)

# Research questions

- How are mathematics teachers in schools participating in the Student Grouping Study supporting Year 7 pupils' learning during 'lockdown' due to COVID-19?

- What specific practices are these teachers using in their attempt to meet the needs of pupils with high and low prior attainment, and how do these practices differ from their usual practices?

- How do distance learning practices differ between 'setting' and 'mixed attainment' schools?

# Methodology

- Online **survey** sent to all 115 of the study schools' Heads of Mathematics (HOM) in May 2020, 49 respondents.

- 17 HOM follow-up **interviews**, conducted online in early June 2020.

# Survey Design

The survey includes 18 closed questions, with options for respondents to add further information in free text boxes

Questions related to overall teaching aims, teaching provision, meeting the needs of high and low attainers, assessment and feedback

A personalised link is sent to each HOM

Surveys were completed in mid-May

Characteristics of the respondents' school  and details of the schools' attainment grouping practices were  linked to the data collected through the survey

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# Survey Sample

| | Total | Mixed attainment | Setting |
|---|---|---|---|
| More disadvantaged* | 28 | 12 | 16 |
| Less disadvantaged* | 21 | 6 | 15 |
| Total schools | 49 | 18 | 31 |

* Disadvantage: Based on Ever 6 FSM National median 24%

# Interview Schedule Design

- Aim of the interview was to seek HOMs' views of their remote teaching practices for Y7 students.

- Semi-structured interview schedule informed by RQs and survey responses with a focus on:

  - Aims of remote teaching
  - Differentiation
  - Pedagogical practices
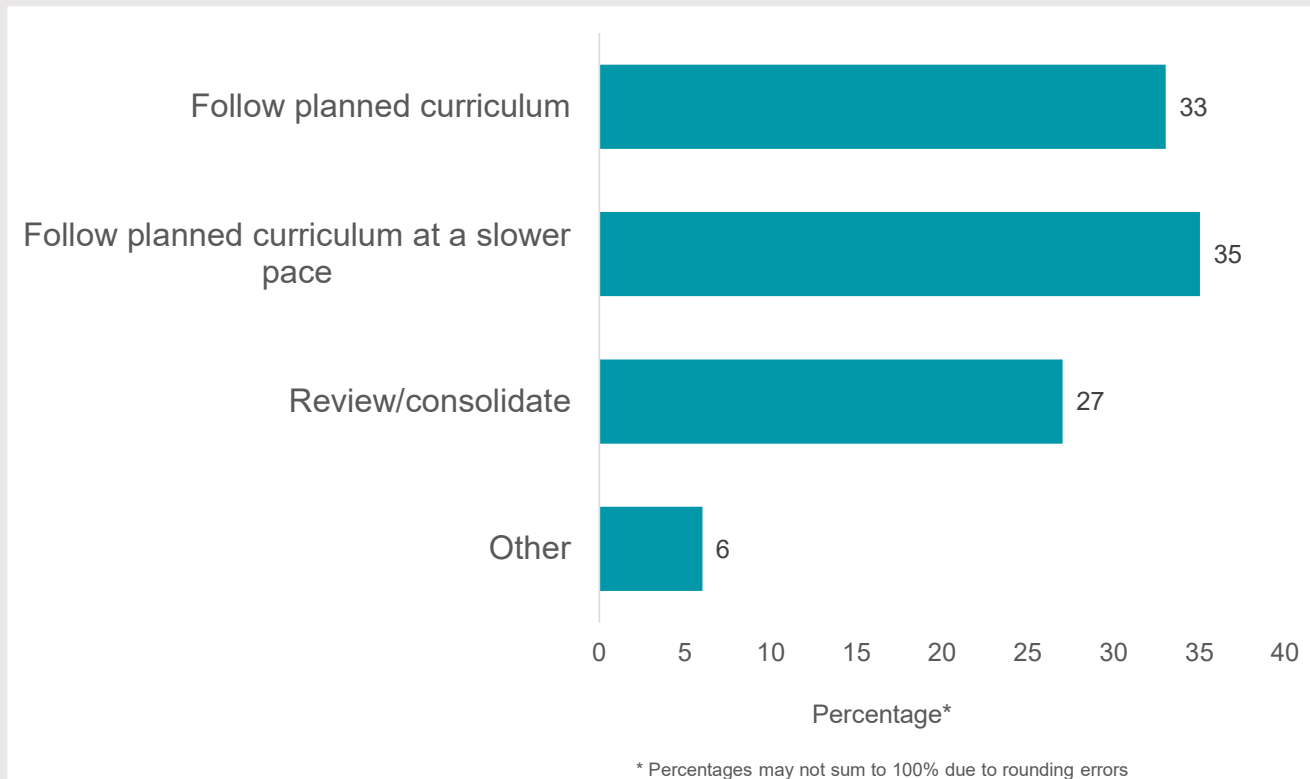  - Assessment
  - Reflection

# Interview Schedule : Sample

| | Total | Mixed Attainment | Setting |
|---|---|---|---|
| Less disadvantaged* | 11 | 4 | 7 |
| More disadvantaged* | 6 | 3 | 3 |
| Total schools | 17 | 7 | 10 |

* Based on Ever 6 FSM National median 24%

# School aims for Year 7 maths learning in lockdown



| | Percentage* |
|---|---|
| Follow planned curriculum | 33 |
| Follow planned curriculum at a slower pace | 35 |
| Review/consolidate | 27 |
| Other | 6 |

Percentage*

* Percentages may not sum to 100% due to rounding errors

Heads of Mathematics' responses to the multiple choice question 'What is your school's main aim for Year 7 pupils' learning in mathematics while the school is closed to most pupils? Please select one.'
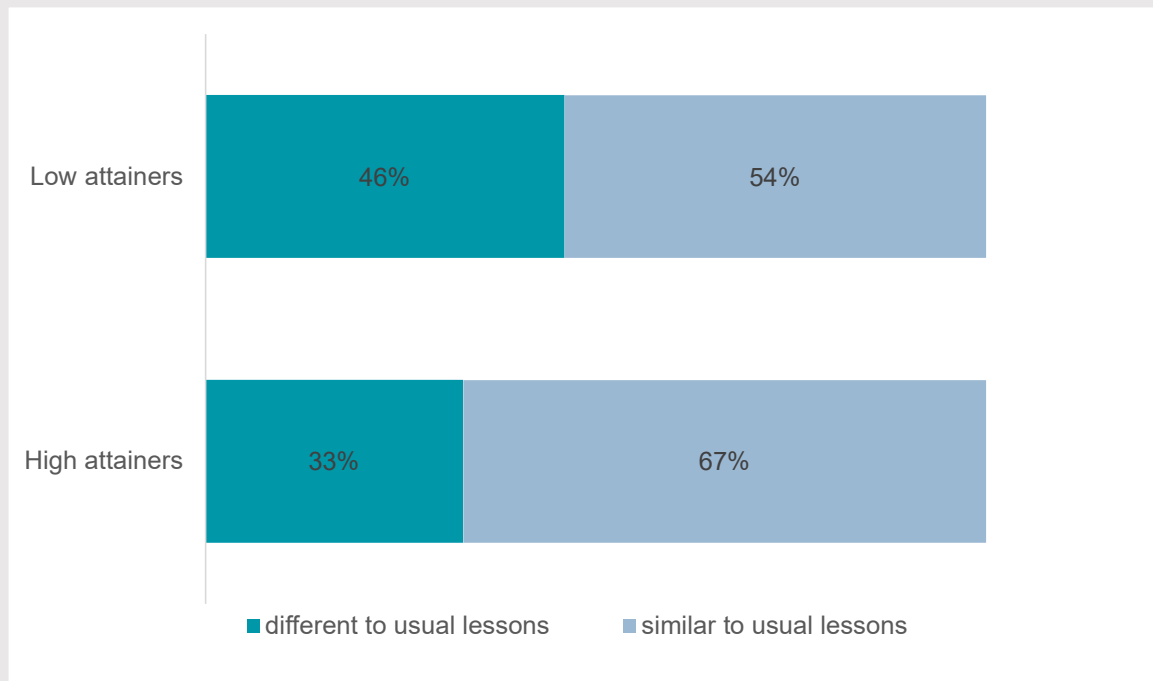
# Findings: Decisions about provision

… the potential for children to feel demoralised, we felt, was less if they were seeing things that they've already seen, at least to an extent, rather than trying to get their head around lots of new material.
(Setting, less disadvantaged)

…we had to tweak some of the work slightly for some students and maybe focus on just some basic maths really, just so they would engage with it.
(Mixed attainment, less disadvantaged)

# Compared to the schools' usual practices, how similar is the school provision for Year 7 pupils with high and low prior attainment?



Low attainers: 46% different to usual lessons, 54% similar to usual lessons

High attainers: 33% different to usual lessons, 67% similar to usual lessons

■ different to usual lessons  ■ similar to usual lessons

- Pupils with **low prior attainment** attending schools with a higher proportion of **disadvantage** were more likely to have a **different** experience of mathematics during remote teaching

- Remote provision for **HPA** pupils in **sets** was more similar to usual than for **HPA** in **mixed attainment** groups

# Findings: Opportunity to learn mathematics

- Reduction in ability to scaffold LPA students' learning
- Access to additional adults
- Limited range of task types
- Reduced level of challenge
- Reduced curriculum

the more that time goes on, the more […] students think that maths is about […] watching a clip and doing some maths, […]. We're not able to do the inspirational stuff because it's just utterly unfair to set that sort of thing for parents to do.
(Mixed attainment, more disadvantaged)

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# Findings: Opportunity to learn mathematics – not all so bad…

our quiet girls, […]they're really starting to thrive in this environment. Less distractions in the classroom, they're able to rewatch a video and so on, so they could really get what they specifically need whereas sometimes they don't always ask for that.
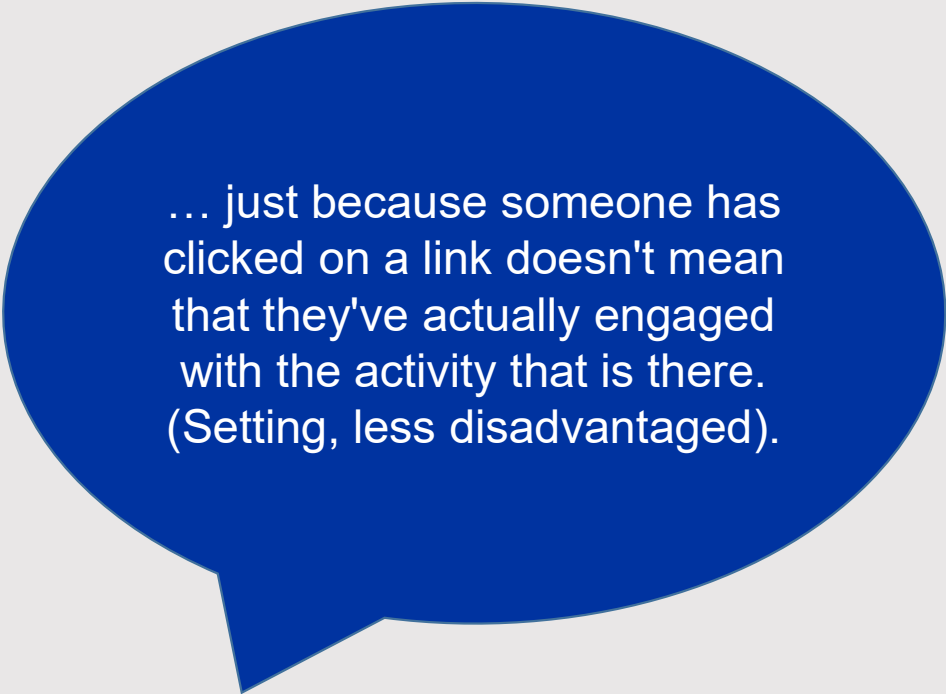(Setting, more disadvantaged)

[…] in a school context they don't always engage that much in the classroom but somehow sat at home in front of a computer screen they seem to be engaging a little bit.
(Mixed attainment, more disadvantaged)

# Findings: Engagement and participation

- More than one third of the HOMs interviewed reported more than 30% Year 7 students **not** participating in remote learning

- Some as high as 70%-90% non-participation

… just because someone has clicked on a link doesn't mean that they've actually engaged with the activity that is there. (Setting, less disadvantaged).

# Findings: Engagement and participation; prior attainment and disadvantage

- Limited access to technology;
- Low levels of parental involvement with school work,
- Covid-specific challenges e.g. bereavement, moving between households of separated parents, living with older relatives who were shielding;
- Difficulties in addressing the needs of SEN and EAL pupils remotely

We've definitely found that students with higher prior attainment are engaging more. The engagement rates, for example, in the top set are about 90%. […] Engagement rate in the bottom set are around 30 to 40%. (Setting, less disadvantaged)

# Findings: Established online remote teaching

- 9 HOM had already established expectations for online learning

…Hegarty Maths […] is our new homework software this year. […] the students have been used to a weekly homework task. We follow the exact model of students watching a video then copying out the examples then engaging with the quiz that Hegarty recommend.
(Setting, more disadvantaged)

# Findings: Established online remote teaching

| Resource From surveys | No. of schools |
|---|---|
| Hegarty | 18 |
| Maths Watch | 10 |
| MyMaths | 5 |
| BBC Bitesize | 4 |
| Corbett | 4 |
| White Rose Maths | 4 |
| Oak National Academy | 3 |
| Maths Genie | 2 |
| NRich | 2 |
| Sumdog | 2 |

| Resource From surveys | No. of schools |
|---|---|
| TT Rockstars | 2 |
| EEDI | 1 |
| GCSE Pod | 1 |
| Kerboodle | 1 |
| Learning by Questions | 1 |
| Numbots | 1 |
| SAM Learning | 1 |
| Sparx | 1 |
| Tassomai | 1 |
| Wild Maths | 1 |

| Resource From interviews | No. of schools |
|---|---|
| Google Classrooms | 4 |
| Show my Homework | 4 |
| Diagnostic Questions | 2 |
| Dr Frost | 1 |
| DESMOS | 1 |
| Doddle | 1 |
| MathsPad | 1 |
| Mr Carter Maths | 1 |
| Parallel Maths | 1 |
| See Saw | 1 |
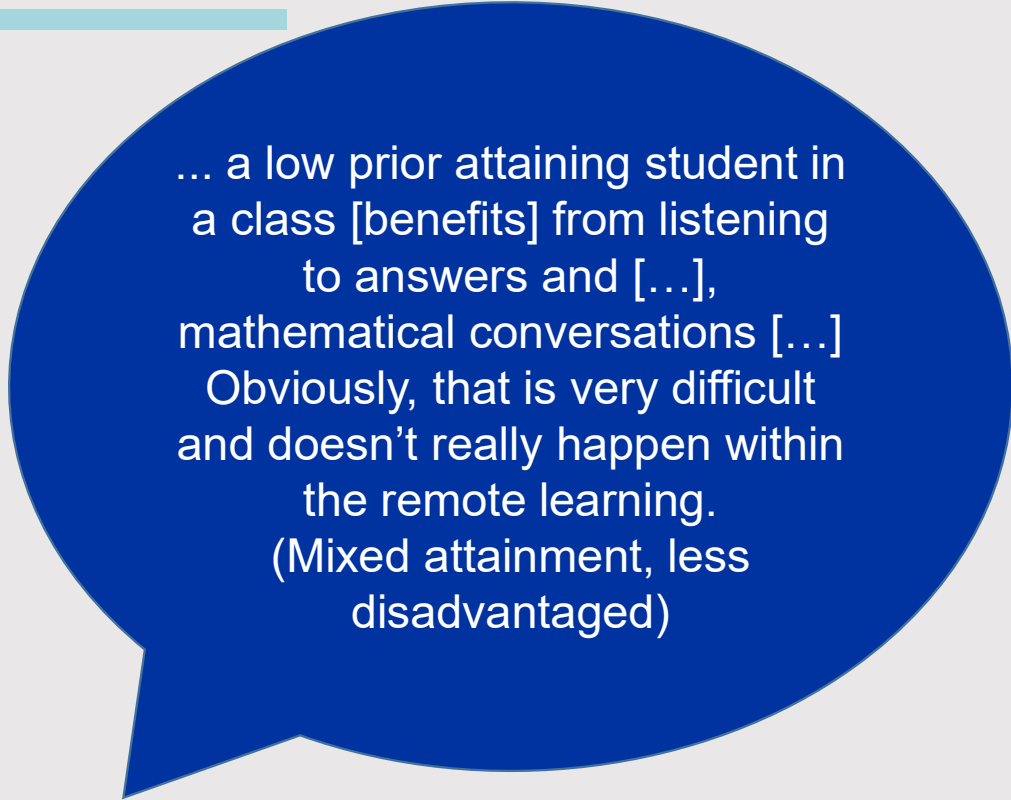
# Findings: Engaging in mathematical talk

- Lack of opportunity for pupils to interact with teachers and with each other during their learning.

- Formative feedback was limited due to lack of live/ synchronous interaction with pupils; any teacher feedback was usually 'delayed'

- Safe-guarding stated as main reason for not facilitating synchronous discussions online

- High attainers missing opportunities 'to articulate, verbalise and question […] and wonder'

... a low prior attaining student in a class [benefits] from listening to answers and […], mathematical conversations […] Obviously, that is very difficult and doesn't really happen within the remote learning.
(Mixed attainment, less disadvantaged)

# Findings: Moving to Y8

- Mixed attainment practice seemed committed to mixed attainment in Year 8
  - support to groups of pupils outside of the mathematics lessons
  - catch-up hybrid model
- Setting schools planned to continue to set in Year 8.
  - the majority decided to halt the movement of pupils between sets till later in Year 8
  - delaying teaching new content by one term, differentiation within the lesson, boot camps, teaching low attainers in even smaller groups with an additional teacher.

We may […] [use] a hybrid model […]: exposition of new topics […] all together and […] practice […] might have to be separate so they can get the support that they need. (Mixed attainment, more disadvantaged)

# Selected recommendations

- Post lockdown catch up responses should not simply focus on catch up or remedial teaching
  - *include more challenging mathematical work*

- Establish distance learning and homework practices to prepare for any further school closures
  - *integrate with 'normal' classroom practice*
  - *explore remote teacher-student interaction*

- Government (and other) 'mitigation' responses should be sensitive to the different needs of schools and students

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## Conclusion

- Mathematical experiences of low attaining pupils were significantly more likely to be different, and more restricted, in comparison to high attaining pupils.

- Pupils from more disadvantaged backgrounds were more likely to spend less time on and have less access to remote teaching.

- Very limited opportunities for feedback, interaction with teachers, for pupils to engage in metacognitive tasks or to express their mathematical ideas verbally.
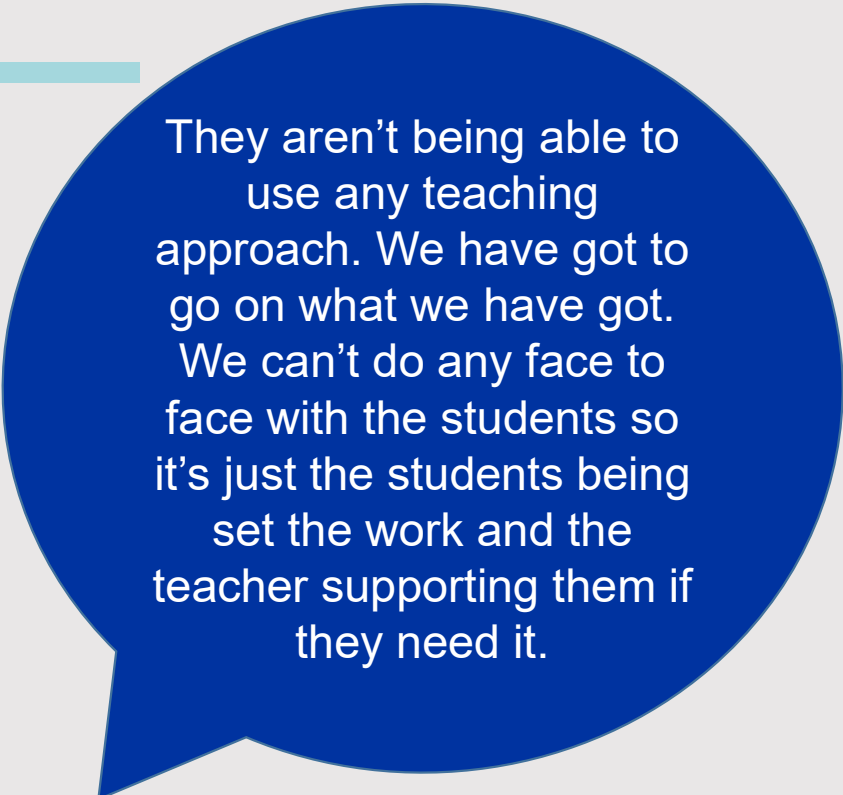
'the attainment gap between pupils from more and less disadvantaged backgrounds is likely to increase substantially as a result of the school closures (e.g., Education Endowment Foundation, 2020c; Müller & Goldenberg, 2020). **Our findings have added weight to this research evidence and additionally indicated that the gap between low and high attainers is also likely to increase considerably.'** (Hodgen et al, 2020)

# On-going work

- Examining the teaching and pedagogical practices in more depth
  - teachers' perceptions of remote teaching
- Identifying opportunities afforded by remote teaching
- Investigating grouping practices post-lockdown
- Using the TRU to analyse the quality of remote teaching / learning
  - in what ways does the TRU need adapting to be useful for remote teaching and learning

They aren't being able to use any teaching approach. We have got to go on what we have got. We can't do any face to face with the students so it's just the students being set the work and the teacher supporting them if they need it.

For more information:

https://www.ucl.ac.uk/ioe/studentgroupingstudy
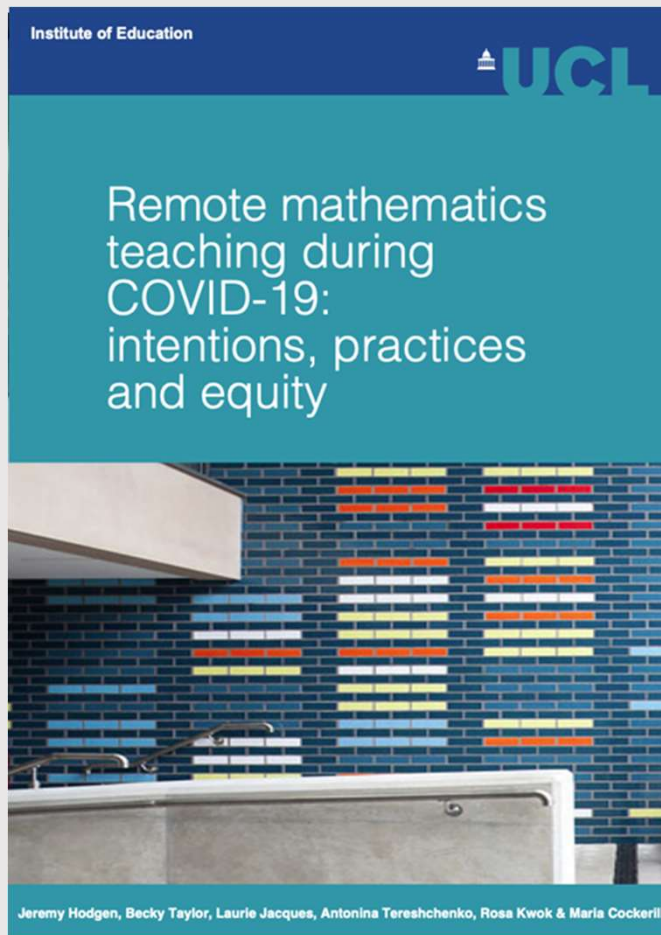
@GroupingStudy

Hodgen, J, Taylor, B, Jacques, L, Tereshchenko, A, Kwok, R, Cockerill, M (2020). *Remote mathematics teaching during COVID-19: intentions, practices and equity*. London: UCL Institute of Education.

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# Teaching for Robust Understanding (TRU)

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Schoenfeld (2018)

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