Mixed-ability Maths Groups Influence Pupils' Mindsets, Teachers' Mindsets and Teachers' Beliefs and Practices

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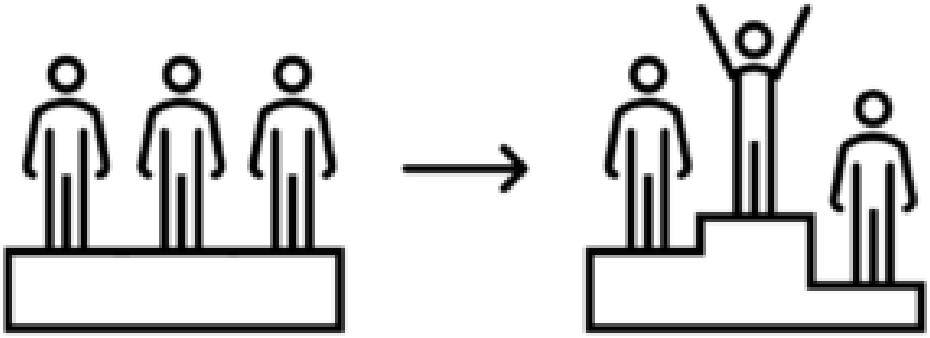
The Coronavirus outbreak showcased the adaptability and resilience of teachers. However, teachers face a further challenge as schools return. Because social-distancing means many will be teaching mathematics in mixed-attainment groups – a practice often uncommon in secondary schools.

The prospect of mathematics classes being organised in mixed-attainment groups might be daunting to some mathematics teachers. However, this can be viewed as an opportunity rather than a problem. Most teachers would welcome interventions that improve teaching and learning in mathematics. We report on a small-scale study suggesting that teaching mathematics in mixed-attainment groups may benefit pupils in terms of both their motivation and learning. If pupils believed they could improve, were less reluctant to engage with challenging problems, and persevered following setbacks, this could benefit both the experience of learning mathematics and pupil outcomes.

Setting and streaming does not appear to be an effective strategy for raising attainment. However, there is a "vicious circle" of factors deterring UK secondary schools from teaching maths in mixed-attainment groups. So there are few examples of good practice in mixed-attainment teaching, and thus little evidence of success. Stakeholders are therefore sceptical of the benefits. 'Ability grouping' is dependent on underlying assumptions that abilities are 'fixed' and can be accurately assessed. However, usual setting practices mean up to 50% of pupils would be put in the "wrong" set and unlikely to be moved – and this can have dire consequences:

The dynamic of 'sets'

"If three pupils with the same scores on entrance to school were placed in different sets, one in a top set, one in a middle set and one in a low set, the performance of the pupil in a top set would be significantly higher and that of the pupil in the bottom set significantly lower."
(Ireson, Hallam, Hack, Clark, & Plewis, 2002, p. 311)



It is desirable for pupils to believe that mathematical ability increases as a result of effort and effective teaching (a growth mindset). The alternative view is you have a 'fixed' ability that must be preserved by avoiding challenging work so that no one sees your failures. Many schools see the potential benefit and believe they are 'doing growth mindset' but growth mindset interventions do not tend to work beyond the short-term – it is the actual practices that matter – unfortunately research suggests setting practices can create fixed mindsets. Effectively telling some pupils:

"You're good at mathematics… so you don't have to try."
or
"You're not good at mathematics… so there's no point in trying."

Teachers' beliefs matter and are influenced by government policies, national curricula, the school context in which they teach, and their views of mathematics, pupils and how mathematics is best taught.

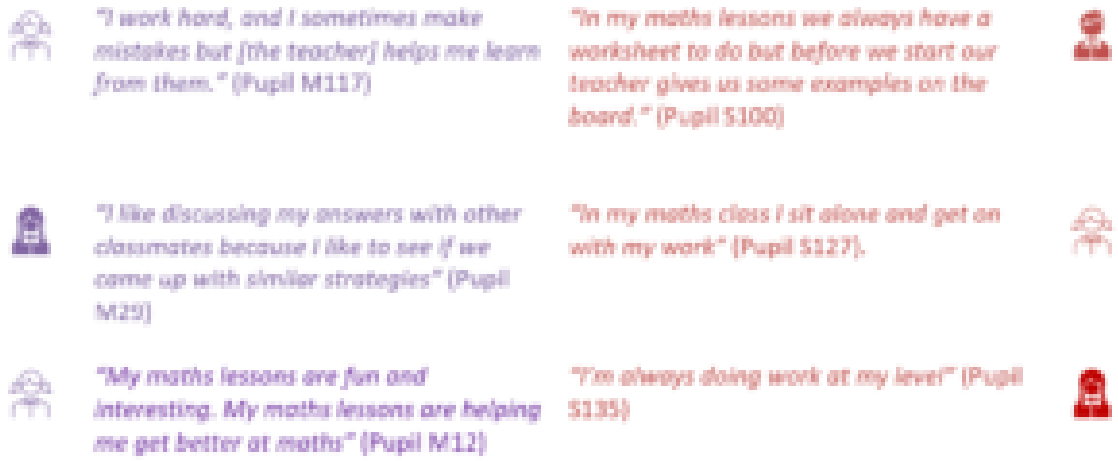
Our study of grouping practices

We compared beliefs and practices around mathematics in two schools: School M teaching in *Mixed-ability* groups and School S teaching in *Setted* groups. We surveyed 286 year 7 (age 11/12) pupils and 12 teachers via questionnaires (pupil and teacher), lesson observations and interviews.

Teachers of *mixed groups* believed more strongly that ability could be increased through effort than those teachers who taught pupils in sets. Pupils in both schools reported a growth-mindset, but the beliefs tended to be stronger for pupils in mixed-attainment groups. They had: a stronger view of intelligence as improvable, were more strongly motivated by 'learning goals' and had stronger belief that their effort was a key factor in improvement. Pupils in both schools wanted challenging

work that they might make mistakes on – and learn from through discussion with others. Data suggested pupils in mixed-attainment groups were more likely to be given challenging work, and to believe these tasks would help them learn.

Although teachers from both schools expressed similar beliefs about the way they worked with pupils, this was not supported by the feedback from the pupils. Mixed-attainment lessons tended to involve: pupils discussing ideas collaboratively, in pairs or small groups; substantial tasks which were accessible at different levels; while mistakes and misconceptions were planned to be exposed and used as learning opportunities. Lessons with setted classes tended to involve: pupils working mostly on their own; using a method shown by the teacher; and following a textbook/worksheet closely.



Observations corroborated pupil reports that pupils in the mixed-attainment groups spent a far greater proportion of time actually working collaboratively.

	Whole class	Work alone	Consult peers occasionally	Work collaboratively
School M (mixed-attainment)	38%	2%	25%	35%
School S (sets)	49%	22%	24%	5%

Lesson observation showing the nature of collaboration in Schools M (n=165) and S (n=165).

The table shows similar proportions of time were spent in both schools with students consulting occasionally with peers, such as checking they had the same answer, and whole class teaching still made up a significant proportion of the observed lessons. The vast majority of the remaining time was spent on individual work in School S and on collaborative work in School M.

A small study like this cannot be generalised, but it raises some important questions. Can moving to teaching mixed groups make teachers more likely to believe that pupils can improve mathematically and more likely to teach in ways that support the learning of all pupils?

When teachers work with mixed-attainment groups, in their planning they have to take account of pupils' prior experiences. Teaching "at a particular level" is unlikely to succeed and so offering substantial tasks can allow each pupil to feel challenged mathematically. Different ideas arise and need discussion beyond 'the answer', so collaboration can be genuine. Pupils are more likely to make mistakes working on substantial tasks than following small steps and this allows greater opportunity for pupils to learn from their mistakes. Such a variety of pupil perspectives also allows for greater opportunity to make connections between the different mathematical aspects of their work.

In contrast, the fact that a class is setted can give a teacher a false sense of the pupils being "at the same level". This may lead to more teaching where the pupils are told a procedure that pupils are then more likely to re-produce without error. However, this often means pupils do not feel challenged mathematically, and do not gain the benefits which come with learning from mistakes. There can also be less variety in the mathematics taking place within a lesson and so less opportunity for making connections between different aspects of mathematics. A consequence of this is that the actual experiences pupils have of learning mathematics, and what mathematics is, may be at odds with the beliefs expressed by teachers within the school.

This study offers some evidence that grouping practices could influence pupils' mindsets, teachers' mindsets and teachers' beliefs and practices when teaching mathematics. 'Mixed' pupils had stronger growth-mindsets, 'mixed' teachers held more 'connectionist' beliefs and had stronger growth-mindsets; as one mixed-attainment teacher said *"I think the most important lesson for anyone to learn in maths is the harder you work at it, the better you'll do"* (Teacher M4).

If current circumstances dictate there are more mixed-attainment groups, this might allow for more collaboration between teachers and generate more examples of good practice making transitioning to mixed-attainment groups less daunting for other schools. Mixed-attainment groupings may be a catalyst for improving pupils' experiences of learning mathematics.

For further details, see: Francome, T., & Hewitt, D. (2018). "My math lessons are all about learning from your mistakes": how mixed-attainment mathematics grouping affects the way students experience mathematics. Educational Review. *https://doi.org/10.1080/00131911.2018.1513908 Available for free: here*

About the author

Tom completed his mathematics degree at the University of Birmingham where he stayed to undertake teacher education in secondary mathematics. He taught mathematics in schools and worked for many years as a Head of Mathematics and Head of Faculty, winning the TES Award for 'Maths Team of the Year 2015'.

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