

Increasing Competence and Confidence in Algebra and Multiplicative Structure (ICCAMS Maths) [www.iccams-maths.org]

How would you solve the problem below? How might your students approach the problem?

Algebra: Lesson 1 STARTER

Which is larger, $3n$ or $n + 3$?

The ICCAMS Maths project is interested in two main issues: (1) trying to understand the common misconceptions that students have and the mistakes that they make, and why they make those mistakes; and (2) to find ways to target these misconceptions and mistakes to help students to move their thinking forward. Students don't make mistakes to irritate their teachers (☺) ... rather, they make mistakes because they believe that they are doing the right thing. We try to make sense of their mistakes so that we can understand why they think what they are doing is correct and then look for ways to help them to see why their understanding is flawed.

For example, for the problem above students commonly respond that the two expressions are the same because $n+3$ simplifies to $3n$ or that $3n$ is bigger because 'multiplication makes things bigger'.

Only a small number of students recognise that the answer to the question depends on the value given to the letter n and that changing the value of n changes the value of each expression differently.

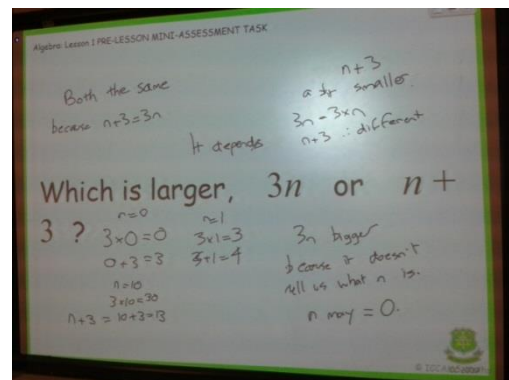


Photo supplied by Brigit Burke of Trinity College

To help students to see this we might ...

... introduce a realistic story or context →

not ordered	
a	$5a$
1	5
4	20
3	15

ordered	
a	$5a$
1	5
3	15
+1 4	+5 20

← then get students to set up a table of values ...

Algebra: Lesson 1A

Boat Hire

Olaf is spending the day at a lake. He wants to hire a rowing boat for some of the time.

Freya's Boat Hire charges £5 per hour.

Polly's Boat Hire charges £10 plus £1 per hour.

Whose boat should Olaf choose?

... then ask them to draw a graph and to think about what it means that the graphs cut each other, why the graphs cut the vertical axis at different values, why the graphs have different steepness, and if the graphs will continue or stop →

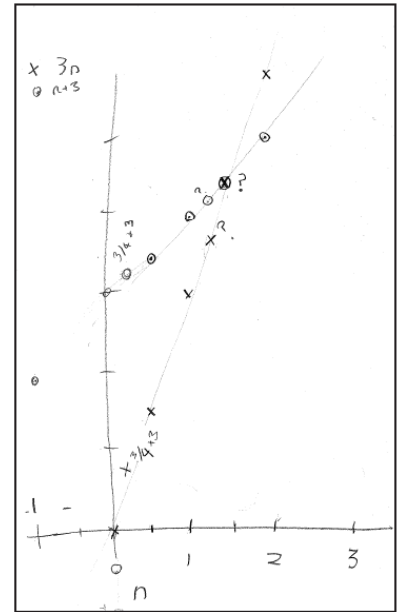
... finally, we may also ask students to think about different ways of writing these expressions (initially using words, and then using letters)

↓

Freya: £5 per hour → $5 \times t$

Polly: £10 plus £1 per hour → $10 + (1 \times t)$

... and explore why algebraic notation is useful and how to work with that notation.



ICCAMS Formative Assessment Lessons

In a previous ICCAMS project the team developed a series of lessons using a formative assessment approach. There are 40 lessons in total, 20 for Algebra and 20 for Multiplicative Reasoning. There are also 20 pre-lesson mini-assessment (10 per topic) tasks. As shown above, the lessons draw on a series of particular design principles, including the use of realistic contexts, multiple representations and models, and collaborative working, and samples of students work. All of these support teachers in formatively assessing students understanding of particular mathematical contents and principles.

ICCAMS Lessons Key Principles

Formative assessment
Realistic contexts
Collaborative working
Multiple representations
Samples of student work

The lessons were trialled in a small number of schools with Year 8 students and the students involved showed significant gains - equivalent to about two years' normal progress in one year!

ICCAMS Maths Professional Development

The current ICCAMS Maths project is a research project funded by the Economic Endowment Foundation. The project involves collaboration between the University of Nottingham, Durham University, and the University of Manchester. The main focus of this project is a much larger trial of the materials with 110 schools drawn from across the country run by Durham University. This trial will start in September 2016 and will run over two school years. Teachers involved in the trial will be given comprehensive professional development on how to use the lessons effectively by renowned professional development consultants.

The ICCAMS research project is seeking school participation across the following regions in England:

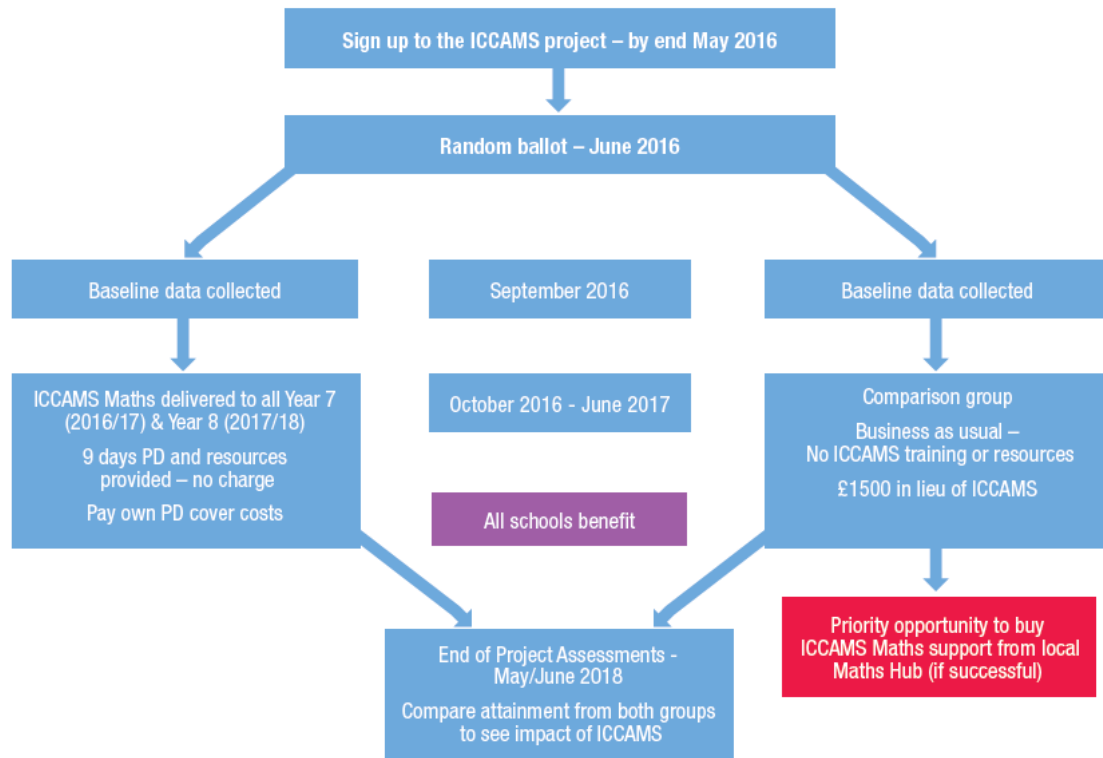


All schools benefit from being part of the ICCAMS project. Schools will either receive ICCAMS or be in a comparison group.

- For schools receiving the ICCAMS Maths programme, we will fund the programme between September 2016 and July 2018.
- For schools in the comparison group, we will provide £1,500 to support testing and data collection.

Random allocation is essential to the evaluation as it is the best way of establishing what effect ICCAMS has on students' attainment. It is important that schools understand and agree to this process.

The picture below shows the timeline for the project.



What sets the ICCAMS Maths professional development apart is a major focus on analysing *videos* of interviews with students and *sample extracts of student work* to identify student ways of thinking, misconceptions and misunderstandings. We then show how the lessons help teachers to target these misconceptions.

Get involved

Project places are limited and will be allocated on a first come, first served basis.

Please register your interest as soon as possible using the contact details below. We will send you further information about the project and details of events in your area. Our project website also contains more information about ICCAMS Maths <http://iccams-maths.org/>

Contact: Clare Collyer, Administrator

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