

## Research Briefing N° 32

# Cornerstone Maths: embedding dynamic interactive technologies in key stage 3 mathematics classrooms

This research is about 'dynamic interactive technology', that is, systems that exploit the way moving screen objects can be controlled by learners, who receive feedback from the on-screen objects.

**Key words:** mathematics; digital technology; linear functions; cornerstone maths; Key Stage 3



Image: Ormiston Sir Stanley Matthews Academy, Stoke on Trent

## Key findings

- Using dynamic interactive technology in mathematics helps 11-14 year old students to understand complex mathematical ideas about linear functions and geometric similarity.
- A diverse group of teachers of mathematics (in terms of teaching experience, school contexts and mathematical backgrounds) were able to integrate substantial use of dynamic interactive technology successfully in their classrooms.
- The outcomes of the Cornerstone Maths project provide clear evidence that the use of carefully designed curriculum units that incorporate dynamic and interactive mathematical software, alongside professional development and support for teachers, result in improved student learning of important mathematical concepts that are known to be hard for many if not most students.

## What we did

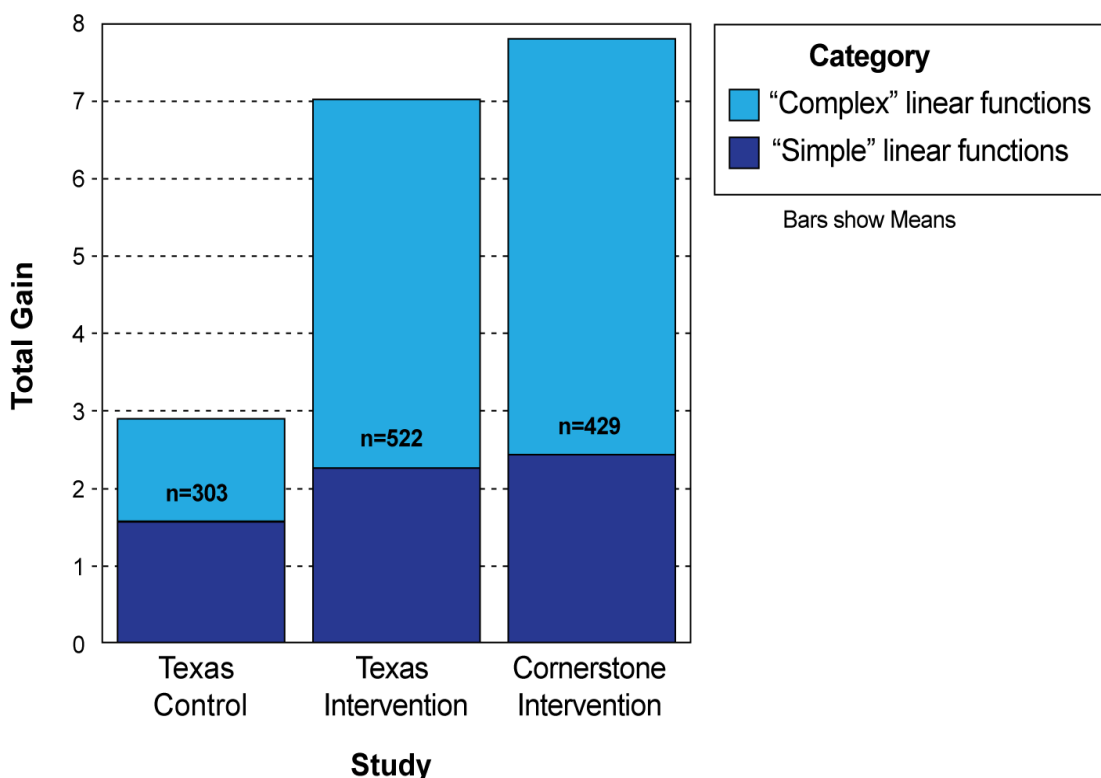
The Cornerstone Maths project, funded by the Li Ka Shing Foundation, aimed to understand how an intervention with technology that had been successfully realised at scale in the US might be adapted in preparation for a large-scale implementation across England. Consequently, the English project adopted a similar approach to the US study and the IOE team based at the **London Knowledge Lab**, a unique collaboration between the Institute of Education and Birkbeck, worked with the Stanford Research International (SRI) team.

The project came about because, despite over 15 years of international research that suggested that technology supports mathematical learning, very few students in English schools were being given the opportunity to use it to support their mathematical development.

Each unit required 3-4 weeks of teaching and the students completed a pre- and post-test that enabled the English outcomes to be compared with those from the US study.

The project is on-going to 2014. The phase reported here ran from 2011 to 2012.

**Figure**



The results of the Cornerstone Maths Intervention showing that the English students achieved learning gains that exceeded their US counterparts. ('n' refers to the number of pupils in each cohort)

## How we did it

Eighteen teachers from nine schools worked with a selected Key Stage 3 class to trial the first two Cornerstone Maths units in the period between July 2011 and July 2012. The project teachers had a range of: mathematical backgrounds (mathematics trained and non-specialist teachers), years of teaching experience and confidence and experience of technology in mathematics. This research shows how technology can support teachers, rather than replace them – a key element was the support provided by the professional development sessions for teachers, the teachers' guides and the online project community. These elements were sufficient for teachers to both integrate the technology use in their own classrooms and, in some cases, support other colleagues in their schools to teach the Cornerstone Maths units of work.

The students were from a diverse range of schools, which included community schools, newly formed academies and a public girls' day school. All of the students completed the same set of tests that had been developed by SRI for the Texan study, with only slight modifications in the mathematical language used to make them accessible for English school students. The participating teachers were all observed teaching a Cornerstone Maths lesson and they also completed an evaluation of the unit and were interviewed by the project researchers. A sample

of the students from each class was also interviewed. All of the questions were consistent with those asked in the US study. The project also collected data from the online community, which gave an insight into how this supported the teachers' on-going reflections about the project.

## Further information

The Cornerstone Maths project is on-going and, following the initial pilot phases reported above, is now open to both individual schools and consortia of secondary schools. Participation in the project involves mandatory teacher development sessions that are organised through local Cornerstone Maths hubs. If you are interested in finding out more about the project, please contact us directly.

Clark-Wilson, A., Hoyles, C., and Noss, R. (2013). Cornerstone Maths: Designing for Scale. *Proceedings of the British Society for the Learning of Mathematics Day Conference, Sheffield Hallam University, 8th June 2013, 32(3)*

Gould, L., Ikhinmwin, S., Walley, A., Clark-Wilson, A., and Hoyles, C. (2013). Embedding dynamic technologies in the key stage 3 curriculum – The Cornerstone Maths approach. *Mathematics Teaching, 235, 44-47*

See project website: [www.csmaths.co.uk](http://www.csmaths.co.uk)

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