



Effective Programmes for Primary Mathematics

Educator's Summary

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Best Evidence Encyclopaedia
Empowering educators with evidence

Mathematics is central to primary education. Indeed, Key Stage 2 assessments in mathematics at age 11 are considered one of the main indicators of primary school success. With a range of materials and training available, it is essential that teachers know which programmes are most likely to be effective.

This review summarises research on maths programmes for pupils in primary schools. We looked at *all* available evidence on programmes designed to improve primary maths achievement, in order to establish what we know works for pupils aged 5-11. We examined all studies of relevant mathematics programmes from all countries, as long as a report was available in English.* (NB Most studies took place in the US). We were then able to assess and compare the effectiveness of these programmes. Descriptions and ratings for all the programmes are listed further down this summary.

The results of the review show that programmes that change the way the teacher teaches (instructional process programmes) have more promise than those that deal primarily with curriculum or technology alone. These programmes had the most positive effects on achievement, and included forms of co-operative learning, classroom management and motivation programmes, and supplemental tutoring programmes. In contrast, there was limited evidence to support the use of various mathematics textbooks, and the effects of ICT were moderate.

The full report (which this review summarises) is available at www.bestevidence.org.uk

Instructional Process Strategies (IP)

(Changing the way the teacher teaches, eg co-operative learning)

The highest-quality studies and strongest positive effects were found for instructional process programmes such as cooperative learning, classroom management and motivation programmes, and small-group tutoring programmes. Median effect size across 36 studies: +0.33.

Information and Communication Technology (ICT)

(Programmes based on ICT)

Our review showed that most studies of ICT find small positive achievement outcomes. However, the outcomes are very mixed, and the highest-quality studies find few positive effects. Also, most qualifying studies evaluated programmes that are no longer available; there are few studies of current versions of ICT. Median effect size across 38 studies: +0.19.

Mathematics Curricula (MC)

(Textbooks)





Our review found little evidence that it matters which textbook is used, at least for pupil outcomes on standardised tests. Studies of innovative curricula supported by the US National Science Foundation, such as Everyday Mathematics and Math Trailblazers, found small differences in maths achievement in comparison to control groups. Similarly, Saxon Math and traditional maths texts had little evidence of effectiveness. Median effect size across 13 studies: +0.10.








*Overall, 87 studies met the inclusion criteria, of which 36 used random assignment to treatments. These included 13 studies of mathematics curricula (2 randomised), 38 studies of ICT (15 randomised), and 36 studies of instructional process programmes (20 randomised).

Programme Ratings

Listed below are currently available programmes, grouped by strength of effectiveness. Within each group programmes available in the UK are listed first, and then the remainder in alphabetical order. The type for each programme corresponds to the categories above (eg IP = Instructional Process Strategies).

Key to Programme Ratings	
	Strong Evidence of Effectiveness: At least one large or two small randomised studies with median ES= +0.20 or more.
	Moderate Evidence of Effectiveness: At least two large or four small studies (randomised and matched) with median ES= +0.20 or more.
	Limited Evidence of Effectiveness: At least one qualifying study with median ES=+0.10 or more.
	Insufficient Evidence : Studies show no significant differences
N	No Qualifying Studies: No studies met inclusion standards

Strong Evidence of Effectiveness







Rating	Programme	Type	Description	Contact / Website
	Student Teams-Achievement Divisions (STAD)	IP	Structured co-operative learning programme in which pupils work in 4-member teams. STAD is now disseminated as PowerTeaching.	UK website: www.successforall.org.uk (Product training provided)
	Classwide Peer Tutoring	IP	Pair learning approach in which children take turns as teacher and pupil.	US contact: Charles Greenwood, University of Kansas, greenwood@ku.edu
	Missouri Mathematics Program	IP	Programme focusing on active teaching, classroom management, and motivation.	US Contact: Thomas Good, University of Arizona, good@u.arizona.edu
	Peer Assisted Learning Strategies (PALS)	IP	Structured pair learning strategy in which children take turns as teachers and learners.	US website: www.kc.vanderbilt.edu/pals (Teacher manuals can be ordered through this site)
	TAI (Team Assisted Instruction) Math	IP/MC	Structured co-operative learning programme in which pupils work on	US contact: Brent Farmer, Charlesbridge Publishing, bfarmer@charlesbridge.com





Rating	Programme	Type	Description	Contact / Website
			individualised materials in 4-member teams.	

MC = Mathematics Curricula, ICT = Information and Communication Technology, IP = Instructional Process Programmes









Moderate Evidence of Effectiveness

Rating	Programme	Type	Description	Contact / Website
	Classworks	ICT	Supplementary integrated learning system.	US website: www.curriculumadvantage.com
	Cognitively Guided Instruction	IP	Programme that provides teachers with workshops in maths strategies.	US contact Linda Levi, Teachers Development Group, llevi@wisc.edu
	Connecting Math Concepts	IP/MC	Structured approach to maths with grouping by performance.	US website: www.sraonline.com/math
	Consistency Management & Cooperative Discipline	IP	Programme that emphasises classroom management and pupil engagement.	US contact: Jerome Freiberg, University of Houston, cmcd@uh.edu
	Project SEED	IP	Supplementary programme that involves mathematicians teaching advanced maths topics, in addition to normal classes.	US website: www.projectseed.org US contact: Helen Smiler, National Projects Coordinator, HSmiler@ProjectSEED.org
	Small-Group Tutoring	IP	Provides tutoring in small groups for pupils struggling at age 6/7.	US contact: flora.murray@vanderbilt.edu (Request the 'first-grade math tutoring manual')


Limited Evidence of Effectiveness

Rating	Programme	Type	Description	Contact / Website
	Accelerated Mathematics	ICT	Supplementary programme that prints out assignments for pupils based on their level of performance.	UK website: www.renaissance-learning.co.uk (Product training available)
	Lightspan	ICT	Supplementary integrated learning system. Also provides computer assisted	UK website: www.platolearning.co.uk (Product training available)



Rating	Programme	Type	Description	Contact / Website
			programmes for home use.	
	Dynamic Pedagogy	IP	Programme that provides teachers with workshops in maths strategies.	US website: www.gifted.uconn.edu US contact: Eleanor Armour-Thomas, Queens College New York, armourthomas@yahoo.com
	Every Day Counts	IP	An interactive bulletin-board programme for students aged 5-12, designed to supplement ordinary maths teaching with discussions about maths concepts built around the calendar and other classroom routines.	US website: www.greatsource.com
	Excel Math	MC	Maths curriculum for pupils aged 5-12 that focuses on problem solving, integrated lessons, and the development of thinking skills.	US website: www.excelmath.com
	Everyday Mathematics	MC	Curriculum supported by the US National Science Foundation that emphasizes problem solving and concepts.	US websites: www.wrightgroup.com or everydaymath.uchicago.edu/
	Growing with Mathematics	MC	Core mathematics programme for pupils aged 4-11.	US website: www.wrightgroup.com
	Houghton-Mifflin Mathematics	MC	Standard maths curriculum that has a focus on skill building, problem solving, and concept mastery.	US website: www.eduplace.com/math
	Knowing Mathematics	MC	Remedial programme for pupils performing below their expected level.	US website: www.eduplace.com/profdev/knowing1
	Mastery Learning	IP	A strategy in which time to learn is adjusted to fit	



Rating	Programme	Type	Description	Contact / Website
			aptitude. Pupils proceed to new material only after they have mastered the stage before.	
	Project CHILD	IP/ICT	Programme that uses co-operative learning, multi-age grouping, extensive ICT, and other features.	US website: www.ifsi.org/

MC = Mathematics Curricula, ICT = Information and Communication Technology, IP = Instructional Process Programmes

Other Ratings



Insufficient Evidence

Math Steps (MC)
 Math Trailblazers (MC)
 Saxon Math (MC)
 Scott Foresman-Addison Wesley Mathematics (MC)

N No Qualifying Studies

UK:

Ginn, Abacus (Curr/ICT) www.heinemann.co.uk/Series/Primary/Abacus/Abacus.aspx
 Ginn, Abacus Evolve (Curr/ICT) www.abacusevolve.com/abacus_home.html
 Heinemann Maths (Curr/ICT)
www.heinemann.co.uk/Series/Primary/NewHeinemannMaths/NewHeinemannMaths.aspx
 KnowledgeBox (ICT) <http://uk.knowledgebox.com/standard.html>

Non-UK:

Adventures of Jasper Woodbury (IP/ICT)
 AIMSweb® Pro Math (ICT)
 Bridges in Mathematics (MC)
 Compass Learning (ICT) (Current version)
 Corrective Math (MC)
 Count, Notice, & Remember (IP)
 Destination Math Series (ICT)
 First in Math® (ICT)
 Great Explorations in Math and Science (IP/MC)
 Harcourt Math (MC)
 Investigations in Number, Data, and Space (MC)
 Larson's Elementary Math
 Math Advantage (MC)
 MathAmigo (ICT)
 Math Blasters (ICT)
 Math Central (MC)
 Math Coach (MC, IP)
 Math Expressions (MC)
 Math Explorations and Applications (MC)



Math in My World (MC)
Math Made Easy (ICT)
Math Matters (IP)
Math Their Way (MC)
Math & Me Series (MC)
Math & Music (ICT)
Mathematics Plus (MC)
Mathematics Their Way (MC)
Mathletics (MC)
Math Realm (ICT)
MathWings (IP/MC)
Macmillan McGraw-Hill Math (MC)
McGraw-Hill Mathematics (MC)
Number Power (MC)
Problem Solving Step by Step (IP,MC)
Progress in Mathematics (MC)
Project IMPACT (IP)
Project M3: Mentoring Mathematical Minds (MC)
Rational Number Project (MC)
Real Math (MC)
Reciprocal Peer Tutoring (IP)
Scott Foresman Math Around the Clock (IP/MC)
Singapore Math (MC)
Skills Tutor/Cornerstone2 (ICT)
SuccessMaker (ICT) (Current version)
TIPS Math (IP)
Voyages (IP,MC)
Waterford Early Math (ICT)
Yearly Progress Pro (ICT)

Review Methods

An exhaustive search considered hundreds of published and unpublished articles. It included those that met the following criteria:

- Schools or classrooms using each programme had to be compared to randomly assigned or well-matched control groups
- Study duration had to be at least 12 weeks
- Outcome measures had to be assessments of the mathematics being taught in all classes. Almost all are standardised tests or state assessments.

The review placed particular emphasis on studies in which schools, teachers, or pupils were assigned at random to experimental or control groups.

Programmes were rated according to the overall strength of the evidence supporting their effects on maths achievement. “Effect size” (ES) is the proportion of a standard deviation by which a treatment group exceeds a control group. Large studies are those involving a total of at least 10 classes or 250 pupils.



The Full Report

- For the full report, which this review summarises, see Slavin, R.E., & Lake, C., (2008), Effective Programs for Elementary Mathematics: A Best Evidence Synthesis. *Review of Educational Research*, 78 (3), 427-515. The full report is available at www.bestevidence.org.uk.

