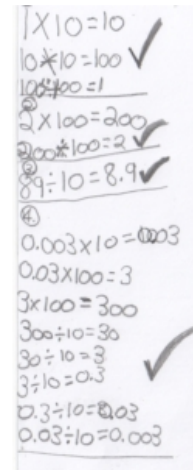


Research Briefing No. 22

Tacking underachievement through creativity in the primary mathematics curriculum

Key findings and implications for Policy Makers

1. All students gained from work with big numbers. Extending early number work to hundreds and thousands exposed students to the regularity and structure of the system, hidden when work is limited to 1 to 20 (see Gattegno Tens Chart).
2. By offering students the purpose of 'becoming a mathematician' and the linked processes of looking for pattern and making predictions students focussed on extending their work into big numbers and was central to developing positive attitudes.
3. In all classrooms, students were encouraged to discuss their work. From students' own work, others would be invited to raise questions that could form the basis for on-going activity. Seeing each other notice pattern supported the practice spreading.
4. For meaningful talk, students need to be doing the same or related tasks. This allowed mixed-attainment groups and all teachers commented positively on mixing up seating plans.
5. The notion of 'becoming a mathematician' freed teachers to unhook from feeling they needed to know the answer to every question; changes in their classrooms were as much about a new manner of interacting with students as with finding new activities.
6. Teachers described how they began to introduce teaching strategies they were comfortable with in other subjects, to their work in mathematics.
7. With teachers and students both documenting their own learning they felt empowered.



The research

This project ran in 2011-12 and in 2012-13. In 2011-12 we worked with three schools and in 2012-13 five schools across Bath and Wiltshire. We worked with whole classes in each setting (from Reception to Y6). The PI visited each school on 10 occasions each year, to lead classroom projects in mathematics and teachers instigated their own projects. Educators from the five schools met six times each year to share developments and ideas. All meetings were audio recorded and field notes and student work was collected from each school. All teachers devoted one mathematics session a week to work linked to the project, i.e. developing ideas of 'becoming a mathematician'. In some schools, teachers shifted their entire approach to mathematics. We collected assessment data on all classes. The schools that made the most radical shifts made the biggest gains (2 years' progress in a single year).

0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1000	2000	3000	4000	5000	6000	7000	8000	9000

The Gattegno Tens Chart

Research design

This project was a collaboration between the University of Bristol and the charity "5x5x5=creativity" (5x5x5). The charity 5x5x5 places emphasis on the importance of documenting learning. All the teachers on the project have commented on the significance of having the opportunity to watch their classes and perhaps see students behaving differently. There was symmetry in the processes offered to teachers and students in terms of supporting an exploration of questions that are meaningful to them and encouraging documentation, with choice about how this is done. For the purposes of the project, we defined 'creativity' in mathematics to be indicated by the students:

- asking their own questions
- following their own lines of enquiry
- noticing and extending patterns
- making predictions
- choosing their own methods of representation

The work with teachers was informed by the notion of collaborative action research.

The Gattegno Tens Chart was commented on as being the one that was used most by teachers.

Further information

The group of educators on the project discussed on several occasions how to balance a focus on creative processes in mathematics (pattern spotting, asking questions, choosing your own method of representation) with the pressures of curriculum coverage. The projects that teachers created over the year demonstrated consistently that these twin aims need not be mutually exclusive. The student work in the previous image is an example from one project where the class were invited to work on multiplication and division by powers of 10. The student was in year 3 and the page gives a sense of the explorations, within mathematics, that student would engage with. That 'journeys' project used a structured image of the number system (the 'Gattegno Tens Chart' - see second image). We see creativity here in the student choosing their own journeys and a sense of why this can be successful in tackling underachievement that can be seen in the way the student extends work into decimals.

Website

<http://www.5x5x5creativity.org.uk>

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