

Appendix 1

Images of mathematicians and mathematics

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Your Pupils' Images of Mathematicians and Mathematics

by John Berry
and Susan H. Picker

'Mathematics is a discipline that enjoys a peculiar property: everybody has some mental image of it' (Furinghetti, 1993)

This article describes some results of an international comparison of the images of mathematicians and mathematics held by children in lower secondary schools in Europe and the USA. We are adopting a dual approach of a simple questionnaire and getting children to draw a picture of a mathematician. The impetus for the research work is to explore the changing views of children towards mathematics as new topics of mathematics are introduced.

What images do your pupils have of mathematicians and mathematics? Finding out more about pupils' images of mathematics can be a way of better understanding their attitudes, misconceptions and opinions of the subject. One way to find these out is to ask your pupils to create a drawing of their perceptions of a mathematician. You may be surprised at the results!

When two groups of children aged 12-13 years in schools in Plymouth (UK) and New York City (USA) were given the task of drawing a mathematician they produced images of which Figures 1 and 2 are examples.

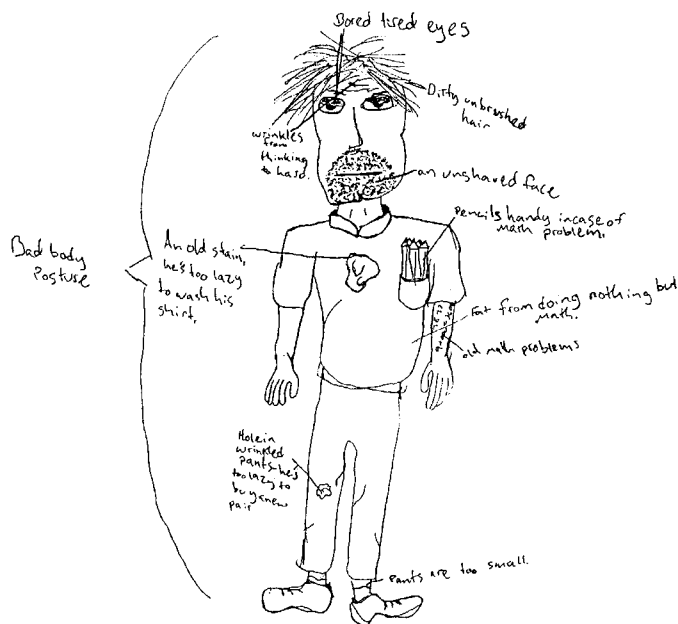


Fig. 1

'Mathematicians,' the pupil-artist wrote in a list accompanying Figure 1,

'have no friends (except other mathematicians)
are not married or seeing anyone
are usually fat
are very unstylish

have wrinkles in forehead from thinking so hard
have no social life whatsoever
are 30 years old
have a very short temper'.



Fig. 2

It is important to ask: Should we be concerned about these images? What do they say about the pupils who have them? Where do these images come from? What do they show about pupils' knowledge about what mathematicians really do? And most importantly, how can we as teachers oppose and change these views?

Teacher Concern about Negative Images

We need as teachers to be aware of negative images of mathematicians held by our pupils because they tend to have a negative effect on their attitudes to mathematics education:

'It is a matter of concern that ... negative images of mathematics might be one of the factors that has led to the decrease in student enrolment in mathematics and science at institutions of higher education, in the past decade or two ... the term 'image of mathematics' refers to a mental picture, view or attitude towards mathematics, presumably developed as a result of social experiences, through school, parents, peers, mass media or other influences.'

(Lim and Ernest, 1998)

Pupils (and their teachers!) are as affected by society and the media's views of mathematics as anyone, and the image generally portrayed of mathematics and mathematicians is not a good one. As an often quoted example, explaining to someone that one teaches mathematics seldom elicits any other response than,

"I was never good at math," as if displaying a badge of courage for enduring what, for them, was a painful and useless experience. In contrast, people do not freely admit that they can't read. (Battista, 1999)

The only way to begin to challenge these images is to uncover them.

The idea of drawing a mathematician at work arose after we saw Figures 1 and 2 and then read about studies conducted in which pupils were asked to draw a scientist, the Draw-A-Scientist-Test (DAST) (see Chambers, 1983; Finson, Beaver and Cramond, 1995; Huber and Burton, 1995). The DAST arose originally partly as a result of a pilot study in the 1950s conducted by the anthropologist Margaret Mead and psychologist Rhoda Métraux which explored high school pupils' images of the scientist (Mead and Métraux, 1957). The researchers' rationale then was their concern with '... a large disparity between the large amount of effort and money being devoted to interesting people in careers as scientists or engineers and the small amount of information we have on the attitudes these young people hold toward science and scientists.'

All of these studies with the DAST turned up images of scientists which were highly stereotypical. Thus the images of the mathematicians in Figures 1 and 2 led to the idea of looking further to see how widespread these stereotypical images of mathematicians are among middle school pupils.

Images of Mathematicians

In the 306 surveys returned from schools in England and the USA, the images of mathematicians were primarily male, all were white, the majority with glasses and/or a beard, balding or with weird hair, invariably at a blackboard or computer. When the drawing included a blackboard, one of two types of writings was generally on it: trivial arithmetic, such as $1+1=2$; or a meaningless gibberish of mathematical symbols and formulas. Often among these symbols could be discerned Einstein's ' $E=mc^2$ ' (see Figure 3).

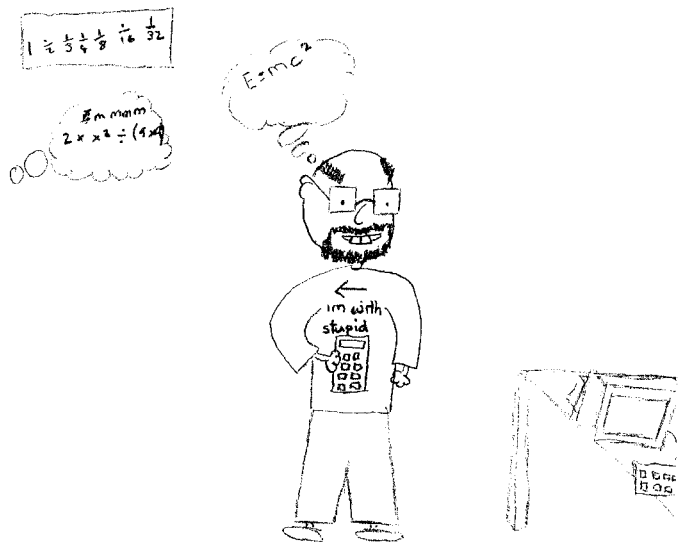


Fig. 3

At the same time we asked the pupils why one might need to hire a mathematician. The responses to this request were very skimpy. Pupils mentioned teaching and tutoring, doing taxes, working in a bank or shop, 'to solve hard problems' (USA pupils), 'to do hard sums' (UK pupils), although no specific type of 'hard problem' or 'hard sum' was ever mentioned. By and large it does not seem to be at all clear to pupils what it is that mathematicians do and what types of problems they can solve:

"The bottom line for many students is that despite being exposed to mathematics continuously from Kindergarten ... the typical [student] cannot connect the value of the study of mathematics with what mathematicians really do. Put differently, students have learned when to 'call' or hire a doctor, electrician, geologist, or plumber, but not when to 'call' or hire a mathematician." (Malkevitch, 1997)

Perhaps then it is not surprising that in the survey, 59% of the UK and USA students indicated that they did not see themselves as a mathematician, with 30% indicating that they were not sure. And the results for each country were nearly identical with 58%–30% for the USA and 60%–32% for the UK.

Some Preliminary Findings

Some of our preliminary findings are that the majority of pupils appear not to base their drawings on their mathematics teachers, nor do they have any clear correspondence in their minds between their teachers and mathematicians. The teacher of the pupil who drew the character in Figure 1, for example, is female, Asian, and at the time of the drawing, was younger than 30. And in Plymouth, when pupils were first asked to draw a mathematician, we suddenly heard one pupil ask his teacher, 'Sir, are you a mathematician? Are you a mathematician, sir?'

In New York, in interviews, students showed that they did not really consider their teachers to be mathematicians, even as they had by and large drawn mathematicians who appeared to be teachers!

Interviewer to female pupil: 'Do you see your teacher as a mathematician?'

Pupil: 'Well, kind of ...' (laughs) '... I don't know.'

Interviewer to male pupil: 'Have you met someone who you knew made their living as a mathematician?'

Pupil: 'Umm, no'.

We have also found, after questioning a great many of them, that there is some confusion within schoolteachers as to whether they consider themselves to be mathematicians. This is one of the areas which we hope to investigate further.


In the UK, where pupils drew female mathematicians, the character was invariably Carol Vorderman of 'Countdown' who appears to be having them understand that mathematicians are not always male. In the US, however, a young man asked of one of the statements on our questionnaire, 'I would not want to marry a mathematician,' 'But how can the boys answer that one?'

Try it Yourself!

It is important for teachers to become more aware of their own knowledge about what mathematicians do. We may assign pupils to write reports on famous mathematicians of the past but overlook the fact that this just reinforces an image of mathematicians as mostly male and of the past. There are three interesting articles on these issues in a recent *Mathematics in School* (Downes, 1997; Rothman, 1997; Taverner, 1997).

What images of mathematicians do your pupils have? We would like to encourage you to try the following activities with your pupils:

1. Draw a picture of a mathematician at work.
If you have a leaky pipe you need to hire a plumber; if you break your leg, you need the services of a doctor. List all the reasons you can think of for which someone would need to hire a mathematician.
Look back at your drawing of a mathematician at work and write an explanation of the drawing so that anyone looking at it will understand what your drawing means, and who the person(s) are in it.
2. Carry out a survey of family and friends to find out what is their image of a mathematician and what mathematicians do.
3. Find out what people with mathematics degrees end up doing.

We would be interested in seeing your pupils' responses. 

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