

# MATHEMATICS IS

Colin Foster and Helen Williams have a conversation

**CF:** ‘Mathematics is not a spectator sport’ was the bold title of the 2004 ATM conference and expresses a sentiment with which I have much sympathy. Mathematics must be actively worked on by learners who are encouraged to ‘get their hands dirty’, rather than merely observed from a distance, if they are to discover its beauty and power. But I also have some reservations. Why is *mathematics* not a spectator sport when it seems to me that many other human endeavours have an essential ‘spectator’ element to them?

Take music, for example. Many people gain a huge amount of fulfilment and enjoyment from a music concert without having even a basic knowledge of music theory. Does an inability to play a musical instrument or compose a symphony mean that you are ‘unmusical’? Surely not. I wouldn’t want to devalue performance and composition, but for many people appreciation is a justifiable end in itself – that’s what music is ultimately for!

**HW:** Ah, perhaps this is the rub – what is maths ultimately for, I wonder? Perhaps if it’s ‘maths for maths sake’ it is good to watch, but what about utilitarian maths, such as working out the VAT on something – is that interesting as a spectator? I suspect not! But I don’t think many of us would deny that watching Kurt Wenner or Julian Beever put something together (see *MT199*) would be fascinating – but are we enjoying the art or the maths? Perhaps it doesn’t matter. What about watching someone tackle a puzzle of the sort you find in the ATM conference workshop? Or constructing something with ATM mats?

Yes, I think you’ve got something there – yet for me, like music, maths is a language, and doing maths is usually an act of communication with others – and therefore ‘listening’ is at least as important a part of mathematical activity as ‘talking’. Even dull bits of applied maths are normally ‘maths for someone’ – there’s a human element; eg, the accountant works out the VAT for her client, so the client has to listen to the ‘answer’ and probably understand at least some of the ‘working’ too, without repeating it all themselves.

No doubt learning about the history of music and some of the techniques associated with different kinds of compositions will enrich a listener’s experience, but this learning may be of a quite different kind from that required to produce original material of their own. Any professional musician, in addition to creating and interpreting music in an original fashion, will certainly spend far more time being a ‘spectator’ (ie, listener) to other people’s work, and surely this is essential food for their creativity? If you are a music teacher, ultimately you want your pupils to love music – some will enjoy playing and writing their own, and I believe all should have the opportunity to experience that in school – but is ‘merely’ listening to music a lesser thing than making it? If a pupil leaves school with a life-long interest in and love for listening to music, I don’t believe that anyone can say that the teacher has failed! Likewise for a pupil who develops a love for reading but never writes a novel.

A spectator doesn’t have to be able to play an instrument or be brave enough to

act or dance to enjoy what they see and hear. But the point you are making here is another interesting one – that spending *more* time being a ‘spectator’ to other people’s work is essential food for creativity. Now, where does this leave maths? When did we last engage in this?

Dancing is interesting, since it is a response to music that is not music itself. You need to be a bit musical, at least, to be able to dance well, yet dancing is not making music. Where are the analogies with maths here? Can spectating on maths prompt you to do things that aren’t maths themselves? Are there non-mathematical ways of appreciating and responding to maths? Do we allow space for them in our classrooms? Should we?

Sport itself is an even more obvious example. Show me a footballer who never goes to watch football matches! Ask someone who loves football whether they would rather play a game themselves or go to see their team play and most will say ‘Both’. Being a spectator is a normal part of engaging with any sphere of activity – there would be a certain arrogance about a sportsman who felt he had nothing to gain from watching others play. Working actors find it very difficult to get to the theatre in the evenings, but when they can they are desperate to do so. How do you react to pupils who say they love drama and are full of enthusiasm and ideas when performing for others, but who seem to lose interest completely when expected to sit quietly and watch the other groups perform in the lesson? Something is wrong there, surely, on a social level, as well as with regard to their drama.

# A SPECTATOR SPORT

about engaging in mathematics and what that might mean.

This is a maturity thing, perhaps? Strangely, the opposite often happens with much younger children – when I have held a class assembly where young children ‘perform’, the rest of the school will sit for ages and watch something which really drags on and on in my eyes.

That’s interesting and contrasts with many ‘mature’ adult mathematicians who get highly frustrated and fidgety if they can see a quicker solution and are being forced to wait while someone does it in what seems to them an unnecessarily long-winded or inelegant way. Does this personality type gravitate towards maths or do years of working on mathematics to some extent form this kind of attitude? Are we unwittingly encouraging it in secondary school?

You might respond that in these examples – sport, acting, etc – the ‘spectator’ is not a passive recipient but is likely to be ‘actively’ listening, thinking, questioning – noticing in an analytical fashion what is taking place. But when I say ‘spectator’ I have in mind a wide range of ways a ‘recipient’ may engage with a ‘performance’. Going to the theatre with someone with a drama background can be eye-opening during the chat in the interval – but it is not always so, and experts do not always operate in that way, nor should they be expected to. There is a place for losing oneself in the spectacle and suspending judgment and explicit analysis.

So – spectating is one form of engaging in something perhaps?

I am starting to think that seeing ‘spectating’ as second-rate undervalues

the highly neglected skill of listening and appreciating the work of others. Does this perhaps contribute to an individualist tendency in mathematicians (I am only really doing maths properly if I am working on my own, deriving it all for myself. If someone else tells me something, that is ‘cheating’ or ‘spoiling it’)? If we present mathematics to pupils exclusively as ‘not a spectator sport’, we are in danger of misrepresenting the subject and discouraging pupils who might engage with it in a fashion that teachers tend to undervalue. I find that I can enjoy mathematical puzzles, for example, in different ways at different times. There are occasions when I want to shut myself away and not be told anything and puzzle something out all by myself, no matter how long it takes (years, in some cases). But there are other times, and I don’t think this is simply laziness, when there is a distinct sort of pleasure in reading or listening to someone else’s mathematical story or journey, not butting in with my ideas but seeking to enter another person’s thinking and see their answer through in their way. Maybe I could have solved it the same way or differently myself, or maybe I wouldn’t have had a clue, but that doesn’t seem to matter.

What has this to say about spectating? Modelling is a popular pedagogical approach in early years – where I might model, say, putting a shopping list together or a pattern with bricks or buying a stamp, whilst ‘thinking aloud’ so the children can ‘see’ what I am going through in my head. Is this spectating?

What you say about modelling reminds

me of university-style ‘demonstrating’ or examples classes, where students bring along problems they are stuck on and the lecturer gets up and does them on the spot. They can be great fun, because you see how the ‘expert’ thinks, the blind alleys they go down and the problems someone ‘successful’ has when working on mathematics. The thinking you do when you don’t know what to do is the real thinking. Going through a pre-prepared routine doesn’t show much about doing mathematics.

I wish I had had a maths lesson like that when I was at school.

I don’t want learners to be self-centred or ‘my-group’-centred. I want them to value the paths that others have taken and to be prepared to ‘spectate’ for a time without growing impatient. This is a difficult attitude to encourage in the classroom, and grows out of deep beliefs about respect for other people.

I do think the question that Barbara and Derek left us with at the end of their opening address to the 2004 ATM conference is very thought provoking. It still haunts me and I have no answer – Where is the mathematical equivalent of the end of year school concert?

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Colin Foster and Helen Williams are two of the editors of MT.

## Reference

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