

'BATH MAT' VERSUS 'BAR MAT'

Jonny Griffiths and Colin Foster have a conversation about two alternative approaches to teaching post-16 mathematics

Jonny: If I say 'bath mat' and then 'bar mat' – would you know the difference?

Colin: I think so, but I'm sure you're going to surprise me!

Jonny: Let me say Bath Mat is Basic yet Thorough Maths A Level Teaching (I'm sticking to A Level, if that's all right with you, because that is what I know most about), whereas Bar Mat is Balanced and Rich Maths A Level Teaching.

Colin: Just as I thought! 'Bath Mat' for me sounds like something that ensures safety, whereas 'Bar Mat' has quite different connotations.

Jonny: Indeed. While a bath might be an end in itself, it is most often, I would say, a preparation for something – a night out perhaps. While Bar Mat, of course, summons up a picture of a conversation in a pub – which could actually be the night out...

Colin: I think I can already see where your preference lies! So what does Bath Mat entail?

Jonny: You need to turn up, to explain theory, to demonstrate examples. You set problems – ones that are similar to exam questions. You mark, you write reports, you get on with your students – on a good day, you inspire some of them. You perform a bit if you are being observed, you revise hard for exams. No one complains.

Colin: A lot of students would say that sounds like the ideal teacher. They want their teachers to tell them as simply and clearly as possible exactly how to do whatever it is they need to do, and then let them have a go, and then tell them if they're doing it right or not. They would say that has to be the most efficient way to learn.

Jonny: Bath Mat is not an easy ride. Most of us fall back on this when things get tough. But somehow I would say Bath Mat sells mathematics short. A non-stop diet of Bath Mat means a student comes out of the end of the course not knowing what maths actually is.

Colin: I guess in a sense the teacher in Bath Mat is the one doing all the mathematics. The students don't make any significant mathematical decisions or tackle any problematic mathematical problems. So what are the students doing?

Jonny: Could it be the gym-work required to do mathematics? A proper football team needs to get fit,

to pump iron, to do press-ups – but a football team that does nothing but this can hardly be called a football team.

Colin: So you're saying that Bath Mat is something that real mathematicians have to do regularly? I'm not sure about that. Do 'real mathematicians' (whatever that means) do exercises to get ready for constructing a proof? Don't they just stay fit by doing mathematics every day? Maybe instead Bath Mat is actually an alternative to mathematics, that looks like mathematics but isn't – something no self-respecting mathematician would engage in. Like an actor playing a footballer in a film – they have to look like they're playing football, but in fact it's all choreographed. Are they playing football or acting or both? I would say they are acting.

Jonny: Except that you can't interrupt a movie – while our students can throw in awkward questions that can bring Bath Mat alive...

Colin: Yes. I think that the improvising that a teacher needs to do to handle an 'off-the-wall' comment or question from a student can be a great way of breaking out of a regimented approach. Reality intrudes! When everything that happens in the lesson seems to have been preordained in fine detail in advance, it can all feel rather pointless, to the teacher as well as to the students – as though we are just 'going through the motions'. When something happens that the teacher didn't anticipate there is the opportunity to 'be mathematical' about it in a much more authentic way.

Jonny: Whatever we do, we need to include the right kind of task, create a milieu where everyone feels happy about asking questions, and somehow improvise the preordained material as well. Yet surely there is a Better Bath Mat (reassuringly accurate, passionate despite being teacher-centred, secure technically with maths and its history, with tasks set at the right level) and a Worse Bath Mat (lots of mistakes that aren't rectified, a loveless approach to the maths, teaching based on a shallow appreciation of the subject, with ill-judged tasks that are either too easy or too difficult). From a student point of view, how would Better Bath Mat compare with Worse Bar Mat?

Colin: I think you might be trying to save something that isn't worth saving. It seems to me that Bath Mat is about drill-and-skill as an end in itself, and I just don't think that's a good use of mathematics

classroom time. Even if exams are what it's all about, I'm sure that the best way to do well in mathematics exams (even lousy ones) is to develop a deep understanding of mathematical ideas through working on rich tasks. I also suspect that this is the most efficient way too, in terms of time, because the more solid the connections that are built the less you have to go over and over the same ground, the more confidence and interest is likely to develop, and the more the student takes charge of their own mathematical growth.

Jonny: I recall at school our teacher walking in and trying an investigation for the first time – something about points and lines and counting – and it was as if someone had switched the light on. So this is what maths is! Suddenly all the trundling through Exercise XXI receded into the background. But I also feel this kind of teacher, the Bar Mat teacher, needs great skill. Anyone can have a bit of fun with a rich task in the odd lesson and then go back to Bath Mat again – but to use rich tasks to tackle syllabus topics, as your basic approach to the material, long-term with an A-level group, keeping all abilities on board (not to mention the parents, your colleagues and management) – now that requires a sensitivity to individuals and a flexibility towards the mathematics that is really an art. I wouldn't call Bath Mat an art.

Colin: I'm not really sure that it is any harder to teach using rich open tasks than it is to follow a textbook. It's easy to do both badly and hard to do either well. Whatever your teaching style, change is always difficult, and, because Bath Mat is so prevalent, most people experience anything else as a change from that, and therefore as challenging. But imagine if creative, investigative, exploratory mathematics were the norm in school classrooms. Perhaps every new teacher would just take it for granted and find some way to do it? Actually, I think that new teachers are often good at working in this sort of way, regardless of the kind of lessons they have experienced as students of mathematics, but it gets drummed out of them by 'the system'. So I wonder whether using open tasks is necessarily any more demanding.

Jonny: You say 'the system' – by which I suppose you mean SMT, assessment pressure, Ofsted, exam cramming, parental views, and so on. Playing devil's advocate here a minute, there is maybe another system in Maths A Level Teaching, the 'Maths Education as taught at University' system. Here the gospel of 'rich tasks' is preached so fervently that anyone who suggests that rich tasks are wonderful, but that the difficulties in their use need to be acknowledged and examined, gets labelled a heretic and is excommunicated!

Take today. I regard the end of the summer term as a great time for enrichment, when the exams

are over and the pressure is off. I focussed on parabolas, with some tried and trusted rich material. The key thing – can I spark off some curiosity over these rich situations? If I can't, then the open task is more meaningless than an exam question. How prevalent is mathematical curiosity in today's maths classrooms? Given the maths diet students have had previously, it may well be lacking. In mine, there are a decent handful who genuinely love maths, who want to take it further, and will throw themselves into a rich task, understanding the exploration required immediately. There is another handful, less sure of themselves as mathematicians, who ask, 'Is this on the syllabus?' and 'What use is this in real life?' We arrived together at the conclusion of a nice bit of logic today, and the doubters said, 'That's elegant' (they have learnt that I delight in what I call 'elegant' arguments, and they were gently taking the Michael!). These students never complain about being asked to do exam questions. And of course, most of my kids are somewhere in between these two extremes.

I've taught 300 lessons this year. If I had to choose my favourite ten, they would all involve working with rich tasks. If I chose my unhappiest ten lessons, they would include Bath-Mat-Gone-Wrong lessons. But they would also include Bar-Mat-Gone-Wrong lessons.

Colin: Well, you have a point. When a Bar Mat lesson goes wrong it can feel bad, because you're 'out on a limb', doing something you believe in and are passionate about, and you can feel foolish if it doesn't seem to be appreciated or to ignite much interest. Whereas with a Bath-Mat-Gone-Wrong lesson you've got much less at stake. I guess I accept that Bar Mat is higher risk, but I question whether it needs any more skill. As you point out, you are really relying on the students to go with it, so you are very vulnerable, because to a larger degree it's up to them whether it flies or not.

Jonny: Let me describe a Bar-Mat-Gone-Wrong lesson, on the Sine Rule, for example (this is me playing Devil's advocate again!). The Bath Mat lesson would look like this - start by revising the idea of sine in a plenary, prove the Sine Rule, do a few examples, including the ambiguous case, and then set some questions. You make the explanations top-notch, you make sure people attend and listen, and then you are really friendly as you wander round helping everybody. The lesson ends with a feeling of comfortableness. Or does it?

In the Bar-Mat-Gone-Wrong version, you can't choose your favourite ever, rich task, because you have syllabus to target. Do you remind everyone about the sine rule first? Certainly the task needs to be carefully differentiated - what if it's not differentiated enough? What if the rich task is too

difficult? What if people don't all 'get it'? What if there is no curiosity over this rich situation? What if people start chatting rather than exploring? You are now rushing around keeping plates spinning, but because this is rich teaching, the teacher is asking questions far more than explaining – are the students finding this frustrating? What if people head off on a tangent? Suddenly this rich task has taken half the lesson, and nobody seems to have learnt any of the things that you had intended. Those still on the task are humouring you. You call for a plenary, and facing a dissatisfied and rebellious crowd, you rush through a Sine Rule presentation that is too quick, there is just about time for two or three rushed examples, and the lesson finishes with people unhappy and annoyed.

Colin: That sounds stressful, but I would take issue with the idea that a good 'traditional' lesson is better than a bad rich one. I think sometimes people set themselves much higher standards when teaching a Bar Mat lesson, and are overly critical of relatively minor problems. I think it's easy to think that a more traditional lesson has basically gone OK because it's all orderly and everyone has something neat and correct written in their books, but we miss the fact that almost no one has learned anything that they will still know in a few days' time! In terms of the Bar/Bath balance, I would argue that pretty much everything, even routine practice, can be embedded in rich tasks (Foster, 2013), and even if they don't go perfectly I suspect that they're probably of much more use to the students.

Jonny: Ah, now this is where you talk of a focussed rich task as 'a mathematical etude', and Colin, you convince me over the idea. You take a coordinates task and tweak it slightly to make it richer - the same practice is done, but with an overarching goal in view, a win-win situation all round. It cannot be argued here that the rich approach takes longer, because it doesn't. We are talking focussed exploration with a task designed to practice a skill, yet being a work of art the same time. But today most performances of Chopin's etudes don't ask for improvisation. Apparently Chopin was a terrific improviser - I think there needs to be an element in the etude idea of that. And your student in your enlargements etude seems to be going around in circles!

Colin: I like the idea of improvisation within an etude – I think that's really nice. I also agree with you about the enlargements example - it's a tricky issue to know when to intervene to stop a student who is doing something like that. Are they getting anything out of it or are they just locked in to repeating a process again and again while their mind is elsewhere? I like the idea that students take as much practice as they need from a task, but it

takes a lot of awareness for the student to make that decision.

Jonny: I guess the Bath Mat lesson on the Sine Rule I described just now can give the impression that everyone is learning lots, but in reality, they may not be. We need to trust our students a little more, and to gently throw them in the deep end with an open task before gathering things together in a way that then systematises the knowledge. At that stage, the teacher has earned the right to address the whole class. If the rich activity has gone well, then every student in the room will be hungry to learn the theory that underlies, fulfils and solves the task, some of which they will have already discovered for themselves.

Colin: Yes. I do think it is hard when students – particularly post-16 students – are not convinced of the value of what you are doing. It's much easier if you can start with Year 7s. Trying to convert sixth formers is probably as hard as trying to convert their parents (or your colleagues), and I take my hat off to you for doing that! The markers that prove to them that they are learning something are much less clear-cut in a Bar Mat lesson and they can easily turn round and say 'You're wasting our time'.

Jonny: I spoke earlier about the 'Maths Education as taught in Universities' system. I do worry about the academic/teacher divide sometimes. There often seems to be the underlying belief that if you are bright enough as a teacher, you will stop working in a classroom and move to a university, from where you can lecture the poor saps left behind on what they ought to be doing! And I sometimes wonder - have I ever honestly and consciously used Vygotsky's theory of proximal development in my classroom?

Colin: Yes, I agree about the teacher/researcher thing. A bit like the pressure on 'good' teachers to become SMT in schools and then more or less stop teaching and spend all day arguing with kids about their uniform and ringing up supply agencies for cover teachers.

But perhaps you have internalised what you have read and thought about the ZPD to such an extent that it informs your practice 'under the surface'. I have certainly often thought in the classroom about how much or how little to assist the student I am working with, as I'm sure you have, and no doubt that has been influenced by the idea of a ZPD, although I might not have expressed it in that language. So I think we all probably use insights from research much more than perhaps we realise, even if we have obtained them second or third hand through a little chat with a colleague, and we don't use the technical names for the ideas.

Jonny: *Would you agree with this - that while a researcher and a teacher have equally important jobs, the job of a teacher is primary, while the job of a researcher is secondary? My college makes sense (just) without researchers, but not without teachers.*

Colin: *For me it's a bit like the debate between pure/applied maths or science. The applied ones are doing the 'real' work, you might say, but they need the backroom 'pure' people. So the teacher is the 'applied', actually doing the job, and the researcher is the 'pure', to some extent. Yes, the teachers could get by without the researchers, certainly, but only by living off things that have been worked out before, or things that they have worked out themselves informally in their own classroom – which I would call 'research' too.*

Jonny: *Yes, so just as I would say, we are all theologians, in that our lives are inevitably theological statements that embody what we consciously and unconsciously believe about God, so our lives as maths teachers inevitably embody what we consciously and unconsciously believe to be true about maths education. We are all researchers, whether we like it or not.*

Colin: *Yes, we mustn't let the word 'research' be hijacked by people in universities!*

Jonny: *The full-time teacher in the classroom is often too busy to do much written research. We need thoughtful ex-teachers to reflect explicitly on their behalf. BUT – there is still an alarming gap between the theory and the classroom. Maybe the answer is to have teachers who are part-time teachers and part-time researchers (as hopefully I might be) or researchers with a lot of recent experience in the classroom (as you have) to do some bridging.*

Colin: *Yes, but I think there's a place for 'out-of-touch' people too! We need people to say things that no one immersed in the classroom might think of. I definitely think we need more diversity among people looking into what goes on in classrooms. Maybe actually we need to involve people who apparently know 'nothing'? I would be fascinated to hear what people from various walks of life – with no experience of school other than attending it themselves and sending their children there – would make of watching a few maths lessons. I think we might learn a surprising amount that we might be too close to see. Maybe their experiences from other areas would be enriching?*

Jonny: *I agree completely. We need in our classrooms the equivalent of the boy in the Emperor's New Clothes story, who knew nothing about fashion, but was brave enough to state the obvious – 'But he's not wearing anything!'*

Jonny Griffiths teaches mathematics at Paston College, Norfolk.

Colin Foster works in the School of Education at the University of Nottingham.

Reference

Foster, C. (2013). Mathematical études: embedding opportunities for developing procedural fluency within rich mathematical contexts. *International Journal of Mathematical Education in Science and Technology*, 44(5), 765–774. Available open access at <http://www.tandfonline.com/doi/abs/10.1080/0020739X.2013.770089#.UjxYyWTXgzE>

Note

For more information about Mathematical études see "Mathematical Fluency Without Drill and Practice" MT240.
