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# Valuing Choice as an Alternative to Fixed-ability Thinking and Teaching in Primary Mathematics

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**ABSTRACT** This article offers a personal account of a primary mathematics teacher's current practice and how it developed through participation in a professional development programme. This alternative to fixed-ability teaching is based on creating opportunities for learners to exercise choice and on an understanding of mathematics as connected. Key influences in the development of practice have been research evidence and theory, engagement with mathematics and alternative practices as a learner, and space and encouragement to reflect and make choices as a teacher. The account is structured in the form of a dialogue between the authors.

## Introduction

The important role that fixed-ability thinking has in mathematics education, including in primary mathematics, is discussed in other contributions to this issue. Dominant teaching and learning practices in mathematics are embedded in, and tend to reproduce, a fixed-ability mindset in teachers and learners (Dweck, 2006). There have been various accounts of alternative practices in mathematics classrooms (for example Boaler, 2010), in other subjects (Hart et al, 2004), and in primary schools (Swann et al, 2012). In this article we add the account of one of the authors, Amy, who over the last few years, has increasingly put choice at the heart of learning and teaching primary mathematics

We begin by introducing ourselves. Amy is currently a Year 4 teacher at a primary school whose pupils are mainly white British and with approximately one third of pupils in receipt of free school meals. Amy was one of the first cohort who participated in the Mathematics Specialist Teacher (MaST) programme at Sheffield Hallam University. This is a two-year course, leading to

a Post Graduate Certificate, that aims to develop subject knowledge, pedagogical understanding and the capacity for subject leadership; Mark was involved in the initial design and leadership of this course. Mark interviewed Amy as part of a research study into the outcomes of the course for participants. The main part of the article is presented as a dialogue between us, in the form of a constructed text based on the interview. We offer it in this form as a counterpoint to the textual form of other articles in this Special Issue and in response to the invitation to offer compelling accounts of alternative practices. After the dialogue we offer some reflections about why choice offers an important way of allowing all children to engage meaningfully and without limits in mathematics.

### The Dialogue

*Mark:* Could you describe how you developed your current approach to teaching mathematics?

*Amy:* It was a gradual process. To begin with, for the first two terms after we started in January, I tried out different activities from the MaST course that involved problem solving and developing thinking skills. Then from my reading I started to think about grouping children and thought about how to re-organise my classroom from the following September.

I was teaching Year 1. Before I used to give children different tasks according to the level I had assessed them at. But then I thought that what they were doing was very similar so I decided not to differentiate between 1a and 1b and so on. I put the children in mixed ability groups and looked for open-ended tasks that they could all do. So I might say 'Find me ways of making ten'. Some would find pairs of numbers whilst others would do these really long number sentences with as many numbers as they could.

*Mark:* Could you say more about how you taught maths before?

*Amy:* I would start from objectives, from thinking: 'This is the level they are and this is where they have to be by the end of the year'. It was about moving from one point to another and to get from a) to c) they first have to go through b). It was about moving in a line. My approach to differentiation was very much like that. Although I was teaching Year 1 and the spread of levels wasn't very big I would think about the children as being top of level 1 and bottom of level 2. Although there were only subtle differences between 1a and 1b, I would prepare three or four different tasks and decide who was going to do what by their assessed level.

*Mark:* The idea of mathematics being in a straight line seems to have been important to how you used to teach; where did that come from?

*Amy:* Well, I started teaching in 2001 just after the Numeracy Strategy came in. So I was very much a Strategy trained teacher. The Strategy was based on mathematics going in a sequence. I started teaching in a school where all the planning was done for you and that is how teaching was structured. Also there wasn't really a lot of time on my PGCE to think deeply about teaching a particular subject. So I went to the Strategy to see what you teach in Year 2, what you teach in Year 4 and so on.

*Mark:* And how do you see mathematics now?

*Amy:* It's shaped more like a sphere – or a perhaps a tree with lots of things branching off each other. So it doesn't matter how they go from a) to c). They could miss out b) and come back to it later. They will get there eventually. It doesn't mean they shouldn't have the experience of doing the higher level thinking, because in fact, some of that they can do. What they actually struggle with are things that they missed out lower down the school or have gaps in.

*Mark:* How has your own relationship to mathematics changed?

*Amy:* I hated it at school. I never really got on with it at primary school. I didn't understand how people could be so quick at things like times tables. I thought maths was about being fast and I couldn't do that. This was before the National Curriculum; we used to work through cards and if you got something wrong you had to go and correct them and go back and do them again. At secondary school, although I was quite good and in the top set, I never really understood it or understood why we had to do things. I could do it but I didn't get it or understand it. But teaching started to change that. Even teaching the Strategy I could see how it fitted together and things that hadn't been explained at school began to become clearer to me. The idea that there were number facts helped me to get quicker at mental maths. Now I have a deeper understanding of mathematics; I can see that it is not about speed but about other things, such as hypothesising and generalising, logic and reasoning. The MaST course has been important for that.

*Mark:* So you said you have changed your approach to teaching mathematics by using more open-ended tasks?

*Amy:* Yes, but when I moved into Year 4 this year, the spread of levels was wider and I found it harder to find tasks that would be suitable for all the students. So I went down the route of allowing them to choose their own task. So we would all look at something together and then there would be different tasks. They would choose which ones to work on. I would ask them to choose the one that they thought was appropriate for them, based on what they had done at the beginning of the lesson when the whole class had worked together.

A simple example is when we were looking at place value and the tasks would be different depending on the size and type of the numbers. So I had students who were working at a Year 2 level choosing the hardest task. Perhaps they would not produce as much as the others who had done the one that I might have chosen for them if I was differentiating, but they were having a go and managing to do it. They worked on it and felt they had achieved something.

*Mark:* Do you tell the students which are the hardest tasks?

*Amy:* No. They always ask me and want to know which is the hardest but I don't ever tell them. What I say is: 'The one that is hardest for you is the one that is going to challenge you the most'. They also want to know who is best at maths or best at this or the other. I say: 'There isn't a best: it's about what you can do on this particular task'. What happens is that they see that on different tasks different people find the task difficult. So I reflect that back to them – that different people are successful at different times and that everyone has something they find difficult. What I am trying to encourage is that they challenge themselves rather than comparing themselves with others.

*Mark:* It sounds as if you have quite a different view of ability from the one often found in schools?

*Amy:* I think anyone can get better at anything if they really want to. I don't think people are born with a level of mathematics and that is the end of it. Children should be given opportunities to go as far as they want with something. If children are determined, are independent enough, and are focused on what they want to achieve, then they should be supported to go as far as they can.

*Mark:* Has that always been your view? If it has changed, why has it changed?

*Amy:* No, I think it has changed. I think doing the MaST course, and also having my own child have changed the way I see children learn. I believe a lot more strongly now that the way adults talk to children and direct children and the tasks they give them can have a big influence on children's ideas about what they can and cannot do. We have to be careful that we don't put a ceiling on their ideas about what they can do. If we allow them to make their own choices then we give them the chance to do what they want to do.

*Mark:* Could you say more about what on the MaST course changed your ideas?

*Amy:* Reading was important. I read Jo Boaler's book, *The Elephant in the Classroom*, and that made me think about grouping in the classroom and giving children open problems, so you don't put a cap on their learning. I also read

Carol Dweck, who talks about children's self-theories – about their ideas of themselves and what they can do. So if there are children that are seen as being quite clever and they are always praised for that and for the things that they can do, then when they come up against things that they can't do they can find that really difficult. Those were the two pieces of reading that led me to change the way I group children and the problems I give to them. It also made me think about what I say to them and the ideas we give them about themselves.

It was also important to have the opportunity to talk to people and reflect on my practice and think about what I was doing. Often on courses I have been on before, you are given lots of ideas and lots of information about how you should be doing things, and you are supposed to go away and implement it in your classroom. You don't really have time to think about how it might work or reflect on it or come with up anything yourself. You are told: this is how to do it.

*Mark:* You also said that having your own child was important in changing what you do.

*Amy:* Yes, I suppose it was seeing that babies learn so much without being taught. I saw how my own daughter is so inquisitive and so determined, and she will keep trying something until she succeeds. You don't always see that determination to succeed after children have been at school for a while. When children first come into school, they often come in with curiosity, asking questions and wanting to explore the world. Then we tell them what we think they should be interested in. We assess them and put them in boxes because it is easier for us as teachers. They arrive at school with a lot of the qualities that, as teachers, we want our children to have. But we don't foster them; rather we dampen them down and so eventually they start to give up very easily.

*Mark:* How do you encourage that sense of determination?

*Amy:* I always try to answer their questions with a question or try to guide them through the issue. Obviously it does depend on what the question is. So if they say they are stuck, I will try to get them to think about things in a different way, to find it out for themselves. Because I think that then they are more likely to try to find things out for themselves in future. If they need a piece of information that I know, then I will tell them. I try to be very positive with the language I use. So even if they get something wrong, I will not just simply say 'You are wrong', but ask them where they think they went wrong and ask them to go back and look at how they could do it differently.

*Mark:* How do you organise who children work with?

*Amy:* They sit at mixed-ability tables – not just for maths but also for their other subjects. I mix them up every half term so they have the opportunity to work

with others. This creates a lot of social cohesion in the class and means they all can work well with everybody. More recently I have started to give them choice about how they work and who they work with. So I say if you want to work with a partner you can, if you want to work on your own you can, or if you want to work as a table group you can.

*Mark:* Where did that idea come from?

*Amy:* From my own experience of working on mathematics as part of a module at University. Since finishing the MaST course I have been doing a module called Understanding Mathematical Activity. We have been thinking about how people want to work – whether they want to work on their own or with others. It's not that the tutor has suggested we should do it in the classroom. I just thought 'I wonder what the children would do if gave them the choice?'. It seemed like the next step to take. I already did ask them to work on their own or in pairs or in groups for different tasks, so it was a next step to give them choice.

*Mark:* How have the children responded to that?

*Amy:* They have enjoyed it. I have been surprised by what they have chosen to do – who has decided to work on their own and who in a group. It's interesting that children I thought might want to work on their own haven't and children who I thought wouldn't want to have wanted to. The children have really enjoyed it. They have begun to ask me if they can choose how they work in other subjects.

*Mark:* I have heard people say that teachers who begin to work in more open ways or provide more choice in the classroom often seem to mention that they are surprised by what children choose to do or can do.

*Amy:* Yes, I think that's true. I have children in this Year 4 class who are working at Year 2 or 3 levels, but that doesn't mean they shouldn't be exposed to Year 4 maths and have the chance to engage in higher level thinking. Because they can do some of that, even if they struggle with some other things or there are things they missed out on lower down the school. For example, last week there was a girl in my class who had been struggling to add 1 and 4 a few weeks ago, but we were doing proportion and ratio and she understood it and flew through it. But if I had been differentiating the task to her level, then she wouldn't have had that opportunity. I would have closed it down for her, perhaps to basic fractions, and she wouldn't have had the chance to show she could do something more.

*Mark:* In what other ways do you create opportunities for choice?

*Amy:* I try to provide a choice of different type of materials and activities rather than just working from a textbook, and I think about how we can make them more interesting. Sometimes I provide a choice of different resources to use. So I might say 'You could use Numicon or you could use cubes or you could use a calculator to check it'. I would then let them go and choose. Sometimes I will put resources I think they might need out on the tables, but generally I will put them at the front or make them available in the classroom and they can come and choose what they need. Sometimes they make poor choices –perhaps they might get a digit fan to help them with multiplying numbers together or to add two numbers, and then they might say 'I don't know how this can help me'.

*Mark:* And how do you respond to that?

*Amy:* Well, generally they will sit there looking a bit confused so I will go and ask them how they think it will help them and they might say 'Well it won't'. I'd say 'What could you use instead?'. Then they might look around the classroom and see what others are using. Occasionally I might make a suggestion of what they could use. I am trying to provide them with tools for them to choose from and to learn how to make choices.

*Mark:* Are there any challenges in offering these choices?

*Amy:* It can be difficult to find open tasks. Also I have noticed that the girls are more reluctant to challenge themselves. They are more likely to go for the easier choices, so I have to work on that and talk to them about it. I hadn't expected that at the start of the year. I hadn't foreseen that would be a problem.

*Mark:* From what you have said it seems you are going against the stream both in this school and nationally; how has this affected you, and how do you keep going?

*Amy:* Taking part in MaST has allowed me to say to others this is what I want to try because I have read about it or I need to for the course and this has given me space to try different things. It's kind of given me the confidence and the freedom to say 'That might be what the government says but it's not what everybody thinks and I am going to have a go at this instead because I think this is better'. Because of the MaST course it's been tolerated and also maths isn't a priority at the moment for the school. So that has given me space in my own classroom but has limited my opportunity to influence the school more widely. But it's hard sometimes when others question 'Why are you doing it?'.

You have to have a strong belief in working in that way. But I have seen that it works. It makes my class easier to teach because I don't try to force them to do things but rather to let them develop themselves whilst making sure they are challenged. Some of the feedback from children and parents' feedback about their children's change in attitudes since coming into my classroom has helped

to show me the value in what I am doing. There are children who didn't want to come to school that now want to come. It is the positive impact on the children that has encouraged me to develop my practice.

*Mark:* Could you say more about these positive impacts?

*Amy:* The children are more independent and resourceful when it comes to problem-solving. They are able to think about things in different ways. I think that is the key to being successful in life – to be independent and flexible in your thinking. The attitude in the classroom is much more positive and it's a happier place to be, because they have more control over what they do. I think they feel that they are being treated like people, rather than education being done to them. For the school it is important that the children are not doing worse in terms of National Curriculum levels, otherwise people would come and tell me to stop. But they are doing fine.

*Mark:* What do you think could be done to influence more teachers to adopt the type of approach you are using?

*Amy:* I think you have to really believe in what you are doing. It's about your attitudes as a teacher to things and you can't force it on somebody. It's also hard to do it well unless you are willing to put time in and to really reflect. So I think it would need to be a whole school focus. But I also don't think it should be forced on anyone. The Strategy was forced on people – we were told how to teach mathematics. It took away people's ability to think about their practice and their teaching. So if you force an alternative on people then you are just doing more of the same. It would be strange to tell people you must offer more choice in your classes.

I think that the ethos of teacher training needs to change, so that people's ideas change. So that it becomes more accepted that we shouldn't put children into boxes and that assessing children to the minutest detail and planning their next step in the minutest detail doesn't help them to learn. The way we assess children encourages them to think: 'you are working at this level so you sit over here, and you are working at that level so you can sit over there'. The belief is 'that if you are doing this, then to tick that box you need to do that', but it doesn't always work that way.

*Mark:* So you think we need to change the big picture?

*Amy:* Yes.

*Mark:* But sometimes, to change the big picture, we have to make changes one classroom at a time?



*Amy:* Yes, that's how it works here with school policy. We try something out and see if it works and then that changes the policy. I suppose what we need is enough people working in a different way to be gathered together in one school.

*Mark:* If you were looking back now and offering advice to yourself before starting MaST, or to other teachers who might want to change their practice, what advice would you give?

*Amy:* Let the children grow and find their own path and their own level, not level as in National Curriculum level, but where they are comfortable with working. Let them develop things in their own way rather than thinking 'these children don't know their number bonds to ten, so they can't do anything else until they do'. Be a bit more confident that they will actually get there.

It is important to have a sense of the big picture, to know where children have come from and where they are going, so you can help them to bridge the gap, rather than just focusing on what they are supposed to do in the year they are with you. In some ways, understanding how children learn is more important than what they are supposed to learn. We need to be aware of the effect we teachers have on them, including the effect that our well-meaning praise may have on them. It is important to pay attention to what happens when they come across things they find difficult – to think about how to support them to solve problems, to become resilient and persevere. Those are the skills we would like to develop in them but those aren't on the curriculum. If you think about the children that teachers are concerned with – who find mathematics difficult – it's not really the maths – it's something else that is stopping them. When children give up we should ask, why do they give up? We need to foster that ethos of resilience and perseverance.

If you are trying to do something that is different and is against the way you have been told to do things you have to be very firm in your belief that is the right way to go. You need to remind yourself of the reasons why you are doing it.

### **Discussion**

In this dialogue we see many of the themes found in the mathematics education literature that focuses on ways to allow all learners to engage and succeed in mathematics. The account we have offered of the form of learners' relationship to each other and to mathematical learning echoes that of Corinne Angier and Hilary Povey (1999) who use the concept of spaciousness to describe a successful approach to fostering such positive relationships. The emphasis on challenge and engaging all learners with, what Amy describes as, higher order thinking is central to the approach advocated by many (Boaler, 2010; Watson & de Geest, 2005). The underpinning view that all children can succeed and that ability is not fixed is supported by the work of Carol Dweck (1999, 2006).

The fact that Amy has been influenced to change her practice by engagement with these ideas, either directly through reading, or indirectly through the influence of her university-based tutors, should encourage those making the case for alternatives in research accounts and literature aimed at teachers.

Amy's practice is also resonant with many themes that are found in studies of other teachers who have broken free from the limits of fixed-ability pedagogy (Hart et al, 2004; Swann et al, 2012). These include the emphasis on the central role of choice as an intrinsic part of the development of co-agency, which supports diverse learners to engage, the importance of a shared responsibility within the classroom community for learning and classroom organisation, the importance of trusting learners to make choices about their own learning, and providing for, and valuing, everybody. Amy did not set out to implement a pedagogy based on *Learning without Limits*. Indeed, as she says, trying to force teachers to work in this way would be a continuation of the current dominant approach to teacher professional development and change in classroom practices. Rather, because the MaST course gave her time to reflect and the freedom to try alternatives, she developed her practice in this direction. We believe that there are important parallels between the new focus on choice in Amy's classroom practice and her own experience of engaging in professional development that supported her own agency and autonomy as a teacher.

Another significant aspect of MaST in changing teachers' relationship to mathematics and mathematics teaching is being able to explore mathematics oneself in an open way. Amy's own conception of herself as a mathematical learner was transformed from the legacy of 'not being fast enough' at school, to the belief that she was capable of studying a mathematics degree if she chose to and wanted to put the time and energy into it. Developing an incremental and resilient self-theory about one's own mathematical ability (Dweck, 2000), is, we suggest, potentially important in becoming a teacher who provides learners with an alternative to fixed-ability practices in mathematics.

Amy reflects on the challenges of being an individual teacher developing alternative practices and says that for school wide change what is needed 'is enough people working in a different way to be gathered together in one school'. The story of The Wroxham School in *Creating Learning without Limits* (Swann et al, 2012) is an example of just what is possible when that happens. We wonder too about what might be possible, what might arise from a wider gathering together of all those who have defended, developed or are simply committed to working towards alternative teaching and learning practices based on transformability? In this spirit of enquiry, we conclude by offering an open invitation (below) and look forward to our readers' responses.

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### **Promoting Transformability: an invitation to come together**

Various articles in this Special Issue underline the challenges for a single teacher, department or even single school, in promoting learning and teaching based on principles of transformability. There is a need to learn from each other about what alternative practices can look like and how teachers and school leaders can be convinced to put them into practice. If you are interested in coming to a gathering of people from all sectors of education then please email in the first instance: Mark Boylan, [m.s.boylan@shu.ac.uk](mailto:m.s.boylan@shu.ac.uk)

