

## **How frequent are your eureka moments? A discussion of pace in mathematics education**

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Research focused specifically on pace is scarce. Pace is raised in a range of literature in various ways as something for teachers to be concerned about yet it is an ill-defined quality. In this session I presented texts for discussion with the aim of considering these questions: How is the term 'pace' used in representations of school classroom practice found in educational literature? What ways of representing school classroom practices are evident in the way the term 'pace' is used? What are the implications for continuing engagement with the notion of pace in mathematics education? Texts were drawn from inspection reports, historical reports and research.

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### **Introduction**

I once observed a PGCE student with her mentor. After the lesson, whilst we were moving to the room we would use to discuss the lesson, the mentor raised the issue of pace unprompted.

I know they are always talking about pace, 'Got to get through the work; got to move on.' But I'm not bothered about that, it's whether it's right for the kids that matters and if they need more time, I give them more time.

One of the things I wondered about was who 'they' were. I recall when I was a head of maths, being taken through a process of reviewing Ofsted reports for clues about what they would be looking for and decided to look there again. I also looked at historical reports and some research in mathematics education. So far, I have relied upon my own practical knowledge of where to collect samples. Ultimately, the set of sources needs to be developed with people working within the discursive practices under scrutiny. This is not straightforward as classroom teachers, researchers and inspectors find themselves in different situations, continuously developing their own discursive practices over time.

I chose to look at the most recent inspection reports on secondary schools in the London area. During 2009-2011, all maintained schools should have received a full inspection under section 5 of the Education Act 2005. My corpus was a subset of these reports from the London Area. The corpus was searched for all instances of the word "pace" regardless of context. Each instance of the word "pace" was individually analysed in its broad context to identify those making reference to classroom practice. Some instances of the word "pace" were discarded; for example, where pace of change since the last inspection was a concern of the inspectors. A similar process was adopted for the less systematic sampling of historical reports and research. This analysis focuses on how the metaphor of pace is developed and how other concepts are associated or mingled with it.

## **Texts**

### ***Inspection reports***

The following quotations are from Ofsted reports on inspection of secondary schools in the London area carried out under section 5 of the Education Act 2005, (Ofsted 2009-11). I have chosen them to illustrate and explain my interest in the full set of inspection reports that I searched for references to pace. These are illustrations of the various ways I have found the term “pace” used to represent classroom practices. I am not trying to make any point about specific schools or inspectors. There were 495 reports, with 594 references to pace in 224 of them. These were not always references to pace in lessons; sometimes it was about pace of change or improvement at a school level. There were, however, 38 reports containing 49 references to “brisk pace” and all of these with the majority of other references were to do with pace in lessons.

In the best lessons, in particular English, mathematics and music, appropriate challenge moved students on at a brisk pace. (Ofsted 2010, 7)

“Brisk” seems to me to have what linguists would call positive prosody; that is, it only seems to be used in a positive way; see Xiao and McEnery (2006) for a general discussion of semantic prosody. In this sentence, the collocation of words “brisk pace” describing how students are moved on is certainly chosen by the author to indicate a good quality of lessons.

In the best lessons, good teaching skills and a variety of techniques maintain a fast pace throughout. (Ofsted 2010, 8)

Here “a fast pace throughout” is presented as a characteristic of “the best lessons” achieved through “good teaching skills and a variety of techniques”. The teaching skills and techniques are not named or described. A slow pace is implicitly constructed as not best or maybe even worst, in binary opposition to best. To some extent, it is assumed the reader already knows what fast pace looks like.

Detailed knowledge about individual stages of learning is used to ensure that tasks, groupings and questioning drive learning at a brisk pace. (Ofsted 2011, 8)

Here learning is driven at a brisk pace. This is achieved by lesson design based on assessment information. Tasks, groupings and questioning are aspects of individual lessons so there is an implicit claim that it is possible to observe individuals “learning at a brisk pace”.

During the inspection, the school was mostly calm and orderly, though there was lack of focus and attention in some lessons as a result of lack of pace and challenge. (Ofsted 2010, 6)

This indicates cause and effect processes. I read an implication that agency is with the teacher only. “Lack of focus and attention” (of pupils) is a result of “lack of pace and challenge” (offered by the teacher). Pace is associated with challenge.

In the many good lessons observed, teachers planned well for students’ learning and injected good pace and variety into lesson activities. (Ofsted 2011, 5)

The metaphor of injecting seems to me to be important here. We have pace injected by the teacher along with variety. This implies that variety is something different from pace and provided by the teacher.

In the majority of lessons seen, the effective use of assessment by teachers enabled them to make good adjustments to learning activities to quicken the pace of students’ progress. (Ofsted 2011, 7)

According to this perspective, it is possible to “quicken the pace of students’ progress” during a lesson. This raises the question of what kind of progress this might be. What is meant by progress here; perhaps learning how to do something so that pace of learning might be getting through more work? In this representation of classroom practice, it is adjustments to activities that quicken the pace of progress. Is this progress in learning or progress through tasks? Or perhaps these two concepts are being mingled.

Opportunities are missed to add pace and enjoyment to the learning through well-constructed paired and group activities. (Ofsted 2011, 3)

The inspectors have seen points in lessons where they believe paired or group activities would have added pace and enjoyment. So there is an association of pace and enjoyment as if they are assumed to go hand-in-hand. There seems to be implied advice here that paired and group activities would make things better conditional on them being “well-constructed”.

In a minority of lessons, all students work at the same pace, as directed by the teacher, and this leads to insufficient challenge for the more able students. (Ofsted 2011, 7)

This seems to imply that pupils should be allowed to work at different paces from each other (particularly identifying “the more able students” to be allowed to proceed faster, we can assume). In this representation of classroom practice, the teacher directs the pace of students’ work. The inspector is concerned that more able students could do more work and thereby experience more challenge; perhaps through being expected to complete more of the same work or some higher level questions.

### ***Historical reports***

From the early twentieth century there was a growing concern to give children time to learn at their own pace. This was a reaction against the rote learning at one pace that characterised nineteenth century schooling. Piaget’s work in psychology was used to support ideas of staged development along with notions of general intelligence to justify alternative curricula for different pupils differentiated by the pace of progress through content over the short-, medium- and long-term.

Without serenity no environment can be satisfying to a child; nor should he be forced beyond a pace at which he can go without confusion. (MoE 1959, 47-8)

In mathematics education, these concerns were converted into policy recommendations by Cockroft (1982); long-term learning would be secured by paying attention to individual needs; and there was an ideal that pupils would be given time to learn at their own pace. The Key Stage 3 Framework for Teaching Mathematics introduced the notion of lesson pace. “A typical lesson” would have a starter that would “be more effective if you: get off to a clear start and maintain a brisk pace” and a main part that “is more effective if you...maintain pace” (DfEE 2001, 29). This signals a change in emphasis between Cockroft and the Framework: from pace referring to the rate at which children learn (in some sense outside the control of the teacher and part of the innate nature of an individual child) to pace being the rate at which lessons are taught or material presented (in some sense within the control of the teacher).

### ***Research reports***

Pace is considered in discussions of various aspects of mathematics education. Examples include, setting, the challenge of inclusion in mathematics and consideration of learners' wellbeing:

significant numbers of students experienced difficulties working at the pace of the class resulting in disaffection and reported under achievement (Boaler 1997, 592) cited in Gates and Cotton (1997, 116).

Denvir and Brown (1986) showed how idiosyncratic the individual tracks are in the learning of mathematics, and the pace of learning varies as learners develop at different rates at different times. (Woodrow 2001, 80)

The giving of more time, creating space rather than imposing pace, and offering choice by letting children devise their own questions, has been seen to have positive emotional, behavioural and cognitive effects. (Geest, Watson, and Prestage 2002, 23)

There are potentially conflicting concerns here. Ofsted reports reveal concerns for the pace of learning, lesson pace, challenge and engagement. Research reports reveal that the mathematics education community remains concerned with understanding individual idiosyncrasies, wellbeing and positive attitudes towards mathematics. These are probably not incompatible concerns but there may be a danger of concerns about pace being oversimplified. For example, there is evidence that some teachers are seeing the main advantage of new technology as facilitating their own faster progress through content rather than enhancing learning.

The resulting practitioner model of the contribution of graphing software to the teaching of algebraic forms can be summarised in the following terms: effecting working processes and improving production through making it easier to produce graphs accurately and rapidly, so increasing the efficiency and pace with which related topics can be covered; (Ruthven, Deaney, and Hennessy 2009, 197).

This might be the tip of the iceberg with other innovations being evaluated with the same terms of reference; ignoring the proliferation of eureka moments in favour of increasing lesson pace.

### **Discussion**

In the session we explored other references to pace and reflected on mathematics classroom practices. A clock available on interactive white boards is used for setting time limits for pupils. Hatch offers a qualitative definition of pace as "not to do with getting through more 'sums' per lesson but to do with the energy expended in understanding the meaning behind the sums and reflecting on mathematics" (2002, 131). There is also the idea of a lesson being pacy; that is, having more things going on and consisting of short episodes.

The texts introduced could be from two different constituencies representing qualitatively different practices or they could be two different ways of representing the same practices; different people seeing different things in the same lesson. Returning to a definition of pace, the difference between perspectives could be characterised as a focus on teacher pace or learner pace. Teacher activity (and pupil activity) can be observed but learning has to be inferred. We kept returning to the idea that this is an ideological battle; for example, possibly between instrumental and relational teaching (Skemp 1976).

It was suggested this might be a case of regulatory discourse following (Bernstein 2000). However, representing mathematics classroom practice as appropriately high paced is not exclusively restricted to regulatory texts. There is some evidence that this is more widely assumed. Here is an example in a discussion of teachers' designs of interactive whiteboard texts in which the relationship between pace and learning was considered.

In this lesson, the teacher exclusively controlled the flow of materials on the board and in this respect he dominated the lesson. The effectiveness of such fast pace would, of course, depend upon the teachers' broader purposes, and to some extent the nature of the subject matter they were covering in this way. For instance, fast pace seems particularly appropriate when teaching certain aspects of maths. It has a less immediate application to substantive areas of English teaching. Indeed the use of such prepared presentational texts may result in a rigid scaffolding and superficial interactivity. (Jewitt, Moss, and Cardini 2007, , 311)

It was noted that the inspection reports presented are a product of a non-participant observer based on judgements of lessons. The process does not include anything from the teachers who are thinking about it.

Here is a question asked but not answered. Was it the National Strategy or the levels and discrete itemisation that came with the National Curriculum that brought us the idea of lesson pace?

## Conclusion

In this session my aim was to present some texts, explain what I see in them and follow this with an open discussion. Texts were drawn from inspection reports, historical reports and research. This account is my best effort to present my ideas again and to accurately represent contributions to the discussion.

Following Fairclough (1993), it is not possible to explore intended meanings or interpretations without discussion with the authors, readers and appropriators of texts. But it is possible to speculate on the potential of making sense of and acting on the world. Texts such as those presented may have different functions for authors, readers and appropriators. Observers operate within a discourse framework related to the job they are doing at the time and these discourse frameworks facilitate particular styles of representation. Different discourses offer different characterisations and representations. Writing and talking about lessons and learning is a discursive practice involving choice of what to write and talk about. It may be that some ways of talking about mathematics classroom practices militate against recognising particular aspects as problematic. If we name a quality of lessons as 'pace' and decide it is a quality that can be noticed and observed, what are we noticing and observing?

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