

THE ROLE OF PACE WITHIN PRIMARY MATHEMATICS LESSONS

Margaret Sangster

Canterbury Christ Church University

A consideration of the nature and role of pace in the mathematics lessons in primary schools. This is a discussion paper based on observations of student teachers conducting lessons during school experience.

The Numeracy Strategy (DfEE 1999) contains the following statement in the organization section of the introduction;

‘In this first part of the lesson you need to:

get off to a clear start and maintain a brisk pace;’ (p13)

As this is the first piece of advice for starting the lesson it has a dominant position on the page and in people’s minds. This paper sets out to question whether a fast pace is an appropriate approach to the start or any part of the primary mathematics lesson. Pace has been taken as the speed of delivery. It is possibly too easy to ascribe a brisk pace as the solution to an engaging lesson when it might be an exclusive practice. By observing a variety of lessons across a range of subjects a series of interlinking factors emerge which appear to enable pupils to participate in learning.

Here are two brief accounts of observed mathematics lessons, both delivered at a slow pace.

Lesson 1 (student 2.3)

This lesson was taught by a Year 2 student teacher. The lesson was with a Year 3 class. The profile of the class was not exceptional. The lesson objective was to practise word problems. The starter was to order some HTU numbers on whiteboards. The whiteboards were in their trays and they had to collect them. The trays were so full and close together that this caused a problem. Only two sets of numbers were offered and a ‘show me’ strategy used with individual responses. The main teaching was the presentation of a written problem on a flipchart where the pupils were invited to circle two relevant parts. Volunteers were used to draw around phrases. This was repeated with another problem and then pupils were sent away to work on further problems. During the teaching input the pupils called out and the student teacher always responded with a comment. This encouraged further interruption. The student teacher assigned herself to one group and monitored the others from a distance. On going round the class during the task work it was clear that many pupils could not read any sense into the problems and were unclear how to work them out.

WOULD IT HAVE BEEN ANY BETTER IF THE STUDENT TEACHER HAD GONE MORE QUICKLY?

Lesson 2 (student 3.11)

This lesson was taught by a Year 3 student teacher. The lesson was with a Reception/Year 1 class. The profile of the class was not exceptional apart from one autistic child. The objective was to review number bonds to ten. The children were asked to sit in a circle and the student teacher laid down ten pieces of lego and covered them with a cloth. She then removed the cloth with some of the lego hidden under it and the children were asked to work out how many pieces she was holding under the cloth. The children were given a lot of time before she selected someone to answer. The correct response was followed by the question, 'How did you work that out?' This was done four times and then the lesson moved on to a review of the addition and subtraction sign on the flipchart. Children were invited up for short participation activities. Questions were asked of the whole class even as individuals were writing on the flipchart. Throughout calling out was not acceptable. The whole class teaching was followed by differentiated group work. All but three children remained on task for the group work.

WHAT IS YOUR PERCEPTION OF PACE IN THE MATHEMATICS LESSON?

There is a general perception that if pupils are off-task then you need to increase the pace of the lesson to regain their attention. There appears to be an element of truth in this.

IS IT THEN REASONABLE TO SAY THAT IF THE PACE SLOWS THE PUPILS WILL GO OFF TASK?

Again there is probably some truth in this but maybe there are further factors to consider. The pace in the second described session was slow, but the pupils were absorbed. It is possible that pace is an outward sign of other influencing factors and is purely an 'observational truth' with some 'quick fix' solutions which do not address the issue of pupil learning, only whether they are behaving. It is possible this is even more important in mathematics lessons where learning often depends on pupils bringing prior knowledge to new situations and therefore cannot afford not to learn.

This discussion paper is based on observation of 33 lessons, of which 16 were mathematics lessons. The main focus of the observations was on the introduction and teaching phase where whole class teaching was taking place. It could be argued that differentiation was more necessary in some mathematics lessons because of the different states of knowledge held by the pupils but this was not one of the observed criteria. All lessons were taught by initial teacher training students either on undergraduate or postgraduate courses. All taught classes were Primary (5 – 11 years).

The evidence of the initial data collection was used to explore the subject with a view to further research work. The data was interpreted to generate a set of factors considered to be in action during the introduction and main teaching. The research is exploratory and in the mode of grounded theory. As trainee teachers were observed, this was a biased sample of the profession but one which could be more revealing as

teaching skills are at an emergent stage.

Watching the dynamic of the lessons, a key question emerged; ‘Were the pupils engaged?’ It would be difficult to make assumptions about their learning as their knowledge and skill base was not tested.

DOES NON-ENGAGEMENT BY PUPILS INDICATE THEY ARE NOT LEARNING?

Whilst recognizing this as a possibility, this was the criterion used to judge the success of the lesson. This may need further consideration. On this criterion, of the 33 lessons observed 13 lessons were deemed to be poor. Of these, work was addressed slowly in 6 lessons, at normal ‘speed’ in 5 and 1 poor lesson was delivered at speed. This suggests that the speed of delivery is not the only factor leading to poor lessons.

WHAT OTHER FACTORS WERE OBSERVED?

Some common themes emerged when analysing the observational accounts. It is recognized these were dependent on the knowledge of the researcher. The main themes in lessons where pupils appeared to be engaged in tasks had some of the following features. Poor responses in these areas matched to weak lesson showed the following correlation:

- Strong presence/control (2)
- Contribution from the children (2)
- Stimulating content (5)
- Well organised resources (5)
- Clarity of explanation/expectation (7)
- Quality questioning (7)
- Appropriate level of difficulty (8)
- Sufficient content (9)
- Good timing (9)

Strong presence/control

In those lessons where the student teacher had a strong presence or clear rules of engagement there were fewer interruptions and the pace was maintained. In 3.3’s maths lesson the teaching input was clear and children volunteered and were targeted by the student teacher. Task instructions were clear, the children settled quickly. Student teacher 2.4 did not have clear rules about pupil contribution and the pace slowed as the student teacher fielded interruptions. In a future lesson the same student, 3.6 had increased the pace but she was still responding inappropriately to interruptions. This improved the lesson slightly. Student teacher 4.5 was doing well until she decided to issue the instructions all over again! Most of the children were ready to start the task and a fussy few asked for a repeat of ‘what to do’. The student teacher went through it again with the whole class with the consequence that the majority became restless and awkward.

Contribution from the children

Interestingly, out of the 13 poor lessons only two had a lack of contribution by the children. This did not seem to significantly affect the failure of the lesson. Contribution by children may lead to a better lesson?

Stimulating content

If the content was interesting to the children they tended to pay attention and poor behaviour was at a minimum. Student 4.6 ran a mathematics lesson in which smarties (sweets) were provided to carry out the mathematics. The work was not particularly challenging but the children enjoyed the novelty of working with the sweets. Student 2.8 had a slow pace to the lesson but the content of how you write crime fiction captured the class' imagination and they were keen to contribute and write. Stimulating content and sufficient content are closely linked. It appears possible to run boring lessons as long as there is plenty to do!

Well organised resources

Student 4.9 had a well prepared lesson. A series of images were projected on power point slides and a progressive discussion based around the pictures. The Year 5 children sat on the carpet for three quarters of an hour but they stayed on task. The resource and the questioning kept them engaged. Student 2.3, referred to earlier, had poor resources which did not illustrate the teaching points, nor were some of the resources ready or easily accessible. This almost destroyed the lesson. Students 2.6 and 2.7 had the same objective for their lessons. Student 2.6 utilised flipchart, electronic whiteboard and writing books whereas student 2.7 used a purely aural input followed by writing on paper. Student 2.6's lesson was more focussed and gained a better response from the children. Student 4.7 taught a particularly good lesson on plant observation which was very well resourced with several well illustrated activities and resources pre-prepared. Having good illustrative resources appeared to engage the children. Having resources ready meant the pace of the lesson could be maintained. When resources had to be set up during the lesson or not available, the children often became disengaged.

Clarity of explanation/expectation

This aspect appeared in two areas, the explanation of the teaching and the instruction for supporting tasks. The first of these was difficult to discern and needs further enquiry. Some of the students were ambitious in their topics and there were complex issues to address. For example, student 2.1 was grappling with the difference between a glossary and a dictionary. Student 4.8 chose a simple objective on sentence structure with very clear objectives. The second student had a much easier lesson. A common problem in the instructional part of the lesson was to give the instructions and then a few children did not understand so the instruction was repeated. This then became frustrating for the children who were ready to start. Student 3.2 fell into this trap when repeating the instructions four times to all the children. Student 3.4 gave such little instruction that the children were unable to start their tasks and she then

had to go round each group and instruct them again.

Quality questioning

Student 4.1 at one point had very slow pace. She had asked an individual to respond. The pupil was finding it difficult to articulate the answer but the student teacher was prepared to wait. This was only one small part of the input where the wait time was longer. Overall, the student teacher had good control strategies and had engaged the majority well and therefore was able to move into longer wait time strategies with certain children.

Appropriate level of difficulty

If the level of the work is too easy or too hard the children will find it hard to engage. This is particularly true in mathematics where prior knowledge plays an important part in learning new mathematics. Within whole class teaching this can be challenging and is usually managed by differentiated questioning, open ended questions or by ignoring those who have not engaged. It could be possible that other factors cover disengagement and behaviour remains stable. Usually lack of understanding is revealed when children move to the individual tasks. Few students found it easy to challenge all levels of ability in the whole class teaching section. Student teacher 3.9 pitched the input at the able children only and they gained much from the session whilst the less able were lost. Student teacher 4.6 worked very slowly and simply through the teaching section and gained responses from the lower attainers, but not the able children! The level of work appears to relate to those willing to engage and this was particularly evident in mathematics lessons.

Sufficient content

The notion of sufficient content is closely linked to the timing of the lesson and the pace of the lesson. Student 3.2 had time left in the plenary and nothing further to add so she asked the same question over and over again. Even the children failed to respond after a while as they had nothing more to add. Student 2.2 did not have enough content to maintain the momentum of the lesson and the children became restless. One possible reason for this is the student did not prepare enough work for the children to do. Another possible reason is they were caught in the pace of the slowest children. When this happens the brighter children appear to disengage. They may have learned but are ready to move on much sooner.

Good timing

Timing was considered to be good when new tasks or parts of the lesson were introduced before children went off task. It could be argued that this is also pace but often the speed of delivery was fast but the duration of the task was too long and the children became disengaged. Student 3.1 had a series of short tasks with short instruction and analysis in between. The children remained on task throughout the lesson. Those that were keen to get on with their work started to do the wrong thing in some cases. Student 3.8 found her instruction was not effective so stopped the

whole class and gave them a step by step breakdown of what was required.

WHAT IS THE RIGHT PACE?

From observation of the 33 lessons it appears that lessons can engage the children's attention when the pace is fast or slow. It would be useful to consider that the pace is right when children are able to think and respond. Too fast a pace may not give children an opportunity to think. At the same time a slow pace may mean some children disengage. It appears that if the pace is speeded up, the behaviour is likely to improve but this may have more to do with presenting sufficient content at an appropriate level and not spending too long on some of the sections of the lesson. This brings a piece of advice to mind, 'Know when to move on'.

Particularly interesting were the good lessons which were observed. Not all the factors observed above were in place but some students showed strengths in some areas which carried them through weaknesses in others. For example, student 4.8 had great presence and control through the clarity of the instruction but ran a fairly mundane lesson. Other good lessons had plenty of content at the right levels for the children to engage. Student 4.10 had a wonderful introduction and teaching session where the reception children gave their all and were totally worn out after $\frac{3}{4}$ hour. Another delightful lesson taught by student 3.11 had the children thinking and desperate to contribute and yet only three calculations were asked for. The activity was so stimulating that the children wanted to think.

There are many factors occurring at the same time to bring about an effective lesson. From observation, the ones referred to above occurred. As a preliminary investigation this has generated more questions than answers about the dynamics of the lesson.

In the Framework Review consultation document under the heading 'Raising expectations and securing progression in learning' the fifth bullet point refers to pace;

'redefining 'pace' to be about learning which helps to motivate learners rather than the momentum of the lesson'

(<http://www.standards.dfes.gov.uk/primary/features/frameworks/consultation>, p2 of 4)

It seems there is a move to the realization that a brisk pace is not enough and that engagement and learning should be the main drivers of a lesson. It would be useful to develop a more sophisticated model of how the various factors can be brought together to create an effective lesson.

REFERENCES

DfEE (1999), *The National Numeracy Strategy: framework for teaching mathematics from reception to year 6*, London: DfEE.