Scottish Survey of Achievement 2008
Mathematics and Numeracy

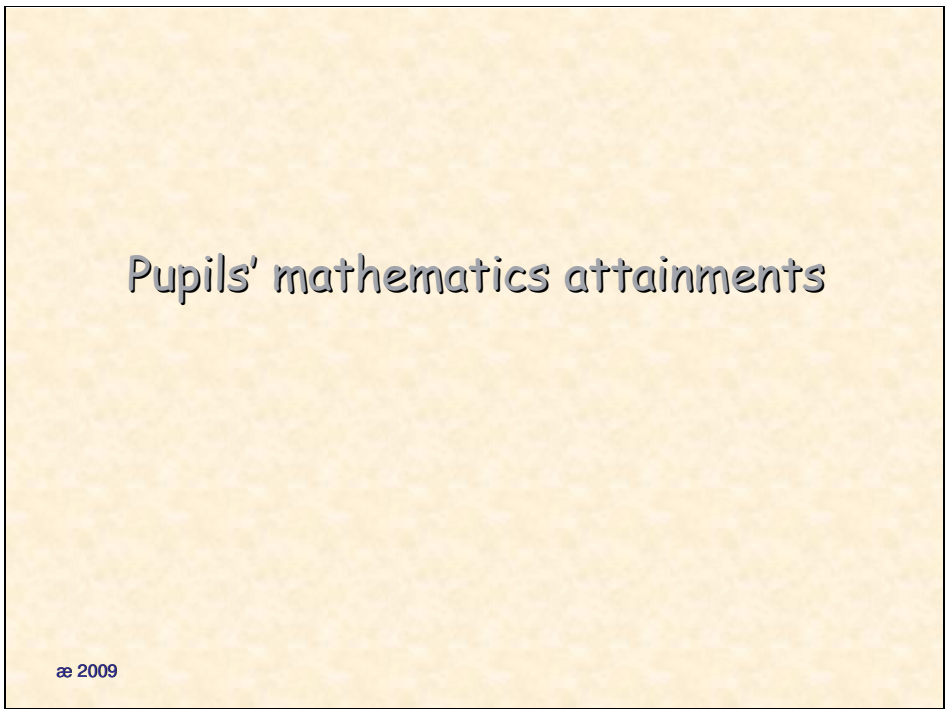
Argyll & Bute

Mathematics and numeracy: as defined for SSA 2008

- Mathematics was defined in terms of the outcomes, strands and targets contained in the 5-14 Curriculum Guidelines
- The four outcomes for mathematics were:
  - number money and measurement
  - shape position and movement
  - problem solving
  - information handling
- Numeracy was defined as a subset of mathematics, and included the strand "interpret information" from the outcome 'information handling', along with most of the strands within the 'number, money and measurement' outcome, with the exception of algebra related topics

The authority samples for SSA 2008

- Almost 2,000 pupils – over 450 per stage - were randomly selected for the assessment of mathematics and numeracy in 51 primary schools and 9 secondary schools
- 1,200 pupils in 41 primary schools were tested, along with almost 400 S2 pupils in 9 secondary schools
- These numbers represent over 80% of the selected pupils in each sector
- Despite the losses, all stage samples represented their populations in terms of gender and deprivation

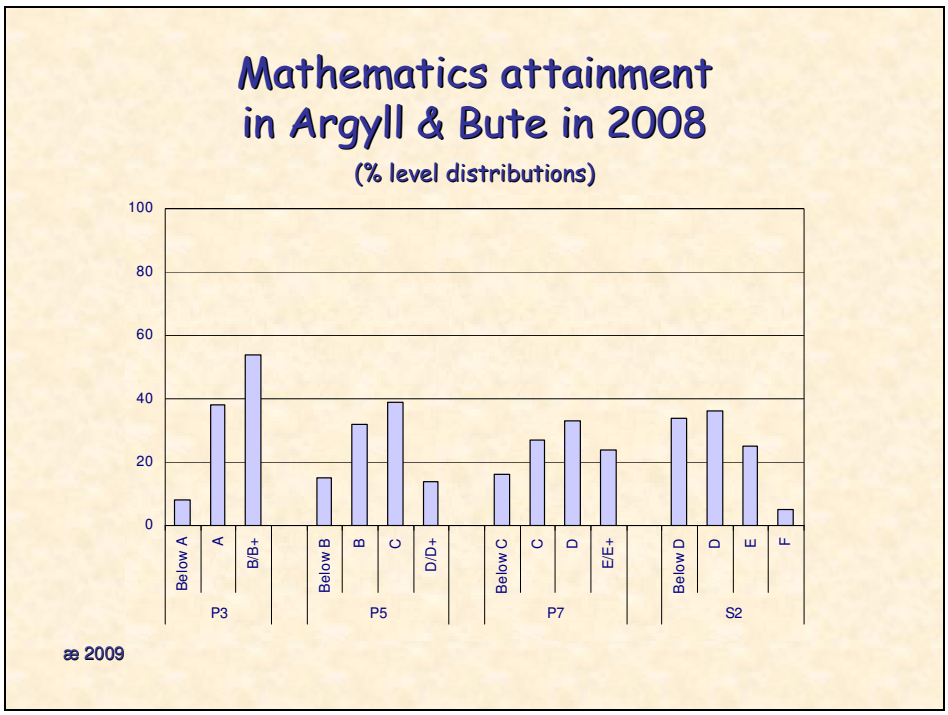


The 2008 SSA survey provided details of the proportion of pupils whose test performance in mathematics or numeracy demonstrated a "good start" at the level concerned (50% to 64% of the marks achieved), "well-established" skills at the level (65% to 79%), or 'very good' skills at the level (80% or more of the marks achieved).

To produce profiles of level attainment at each stage comparable to the profiles routinely produced on the basis of teachers' level judgements (discussed later), the reported SSA attainment results were modified as follows:

- P3 pupils were assessed using tests at level A and level B - where a P3 pupil showed 'well-established' or better skills at, say, level A, but did not do so at level B, then s/he would be judged as being at level A
- should the pupil have shown 'well-established' skills at level A *and* level B, then s/he would be judged to be at level B/B+ (i.e. level B or higher)
- should the pupil not have shown 'well-established' or better skills at level A, then the judgement would be that the pupil was below level A.

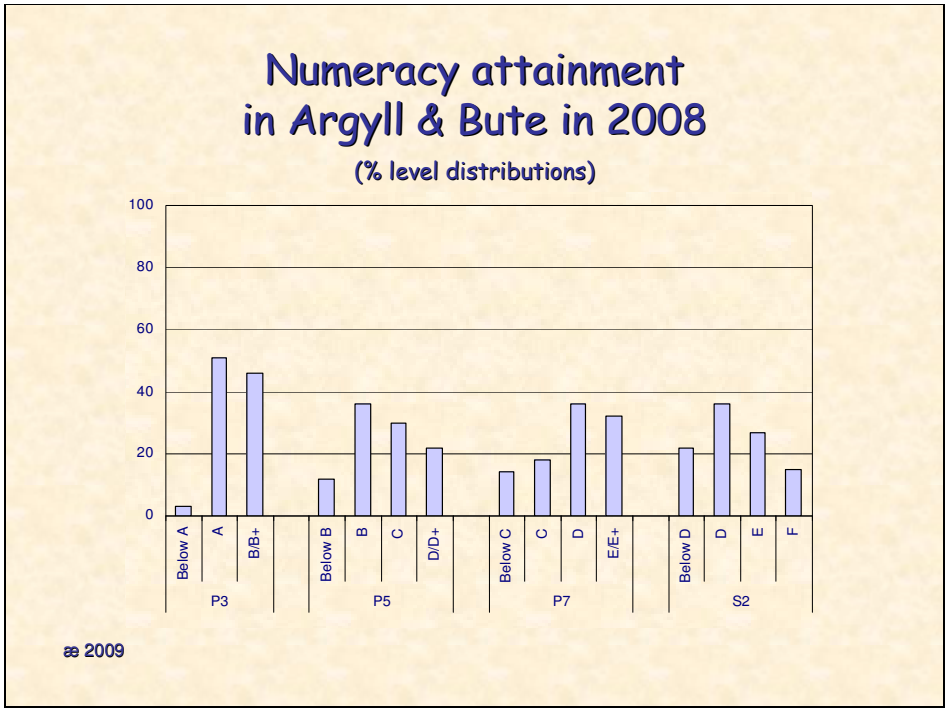
The chart shown overleaf is based on the resulting "well-established" figures.



This chart* shows that in the authority, on the evidence of the SSA test results:

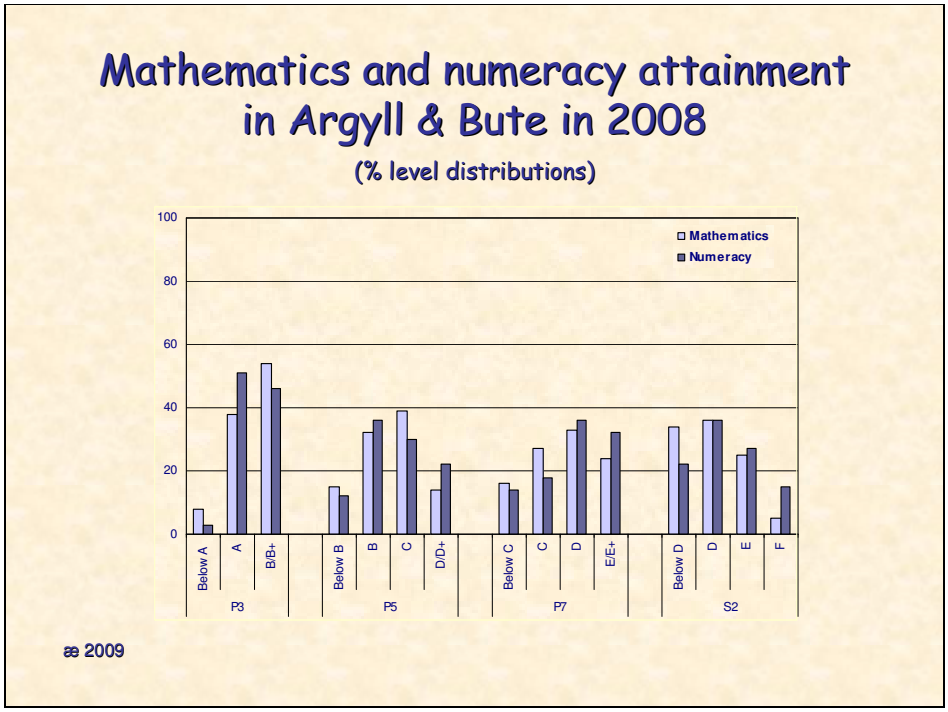
- at P3 around 90% of the pupils attained level A (the expected level) or even level B in mathematics, while at P5 – for which there is no expected level – over 80% of the pupils attained level B or higher (around 50% attaining level C or higher)
- almost 60% of the P7 pupils attained level D (expected level) or higher, and around 30% of the S2 pupils attained level E (expected level) or F.

* Note that confidence intervals around the attainment estimates in this and the following charts are typically around 6 percentage points (lower or higher depending on stage and level).

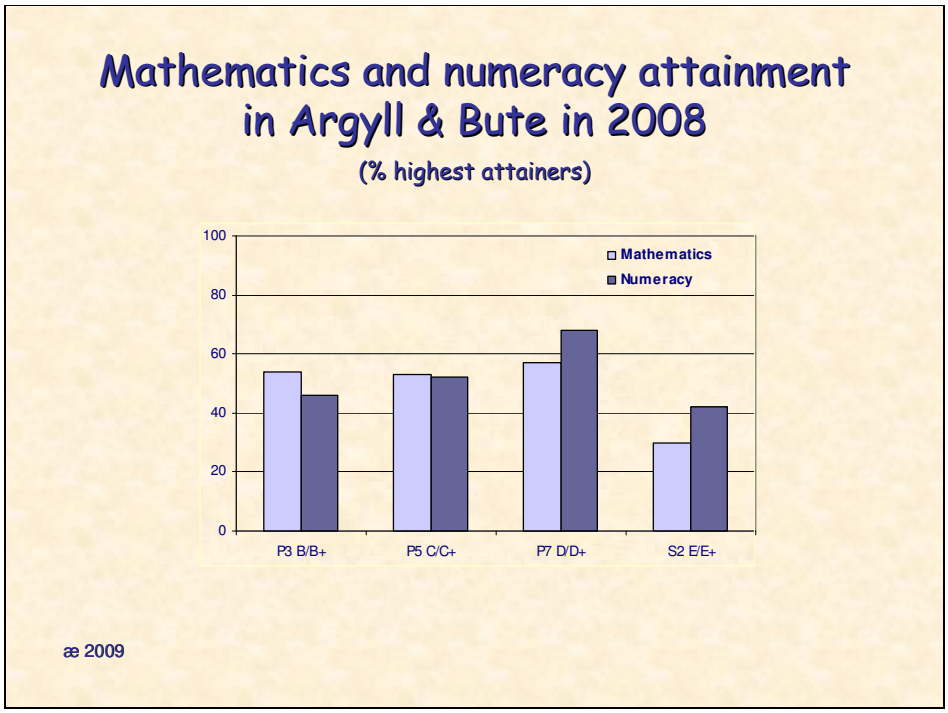


For numeracy the picture is more positive:

- at P3 over 95% of the pupils attained level A or B in numeracy, and over 85% of the P5 pupils attained level B or higher (over 50% attaining level C or higher)
- over 60% of the P7 pupils attained level D or higher, and over 40% of the S2 pupils attained level E or F.

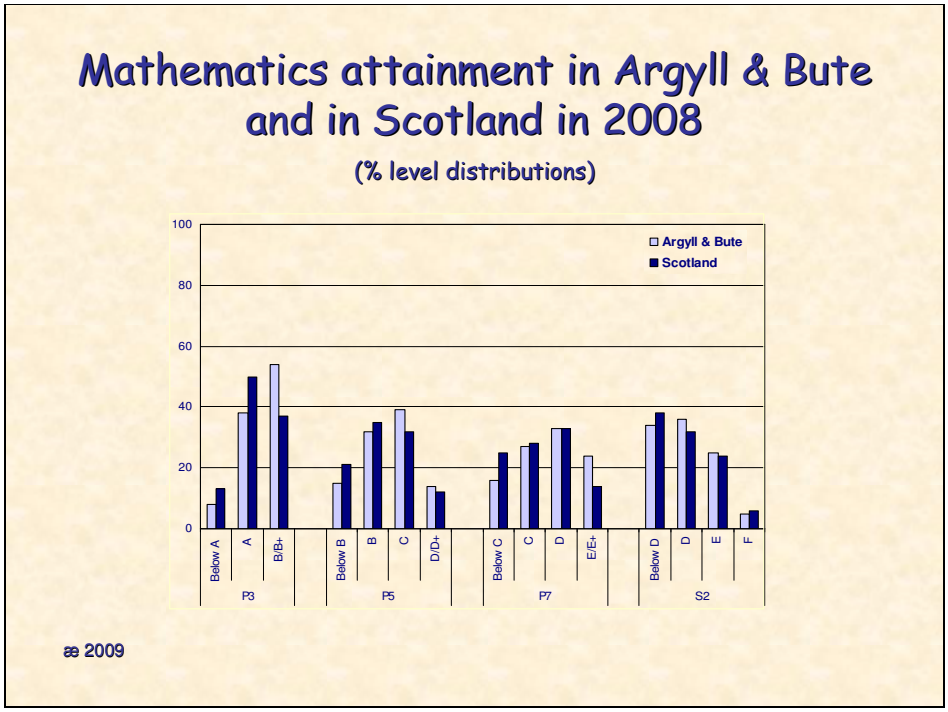


These two charts confirm the tendency for numeracy attainment to be higher than mathematics attainment at all stages, with the exception of P3. At P3 the overwhelming majority of pupils were at levels A or B in numeracy and in mathematics, but with level B attainment more common for mathematics than for numeracy.

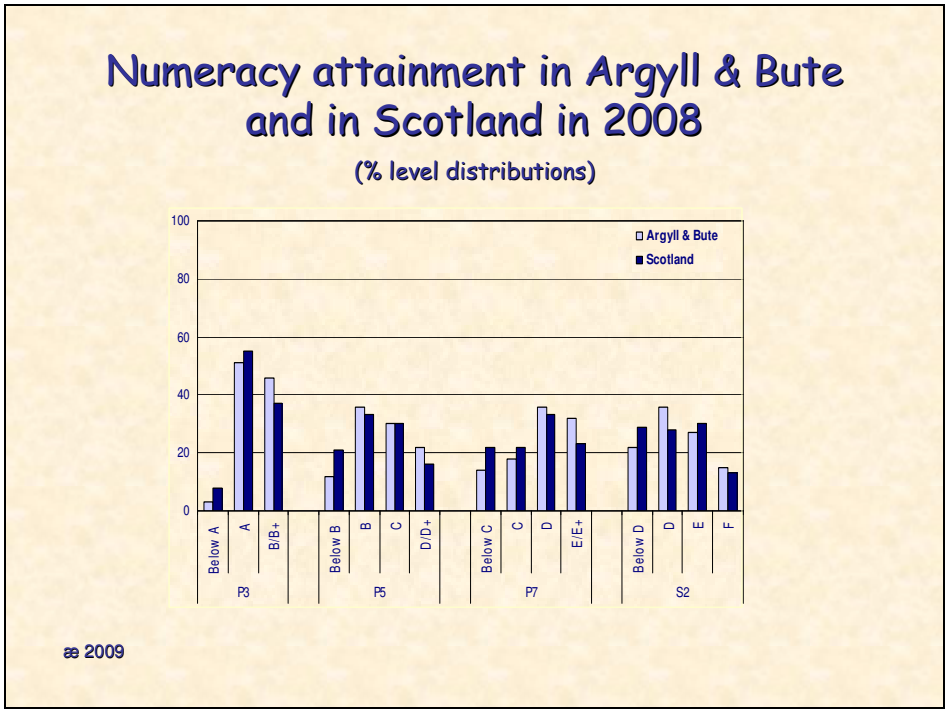


Questions

- Is this the attainment picture you would have expected to see for mathematics and numeracy in the authority?
- If yes, why do you think so?
- If no, what surprises you, and can you explain it?
- What kinds of changes in mathematics/numeracy learning and teaching might lead to an improvement in the picture?
- If these changes were made, what might be the impact on other aspects of learning?

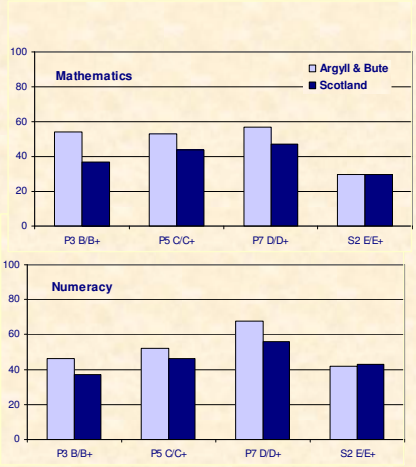


The comparisons of mathematics and numeracy attainment between the authority and Scotland reveal a fairly consistent picture of higher authority attainment, especially in the primary sector.



Mathematics/numeracy attainment in Argyll & Bute and in Scotland in 2008

(% highest attainers)



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Questions

- Would you have expected to see this particular picture of attainment difference in mathematics and numeracy between the authority and Scotland as a whole?
- What do you think might explain the patterns?
- Is there any need to be concerned?

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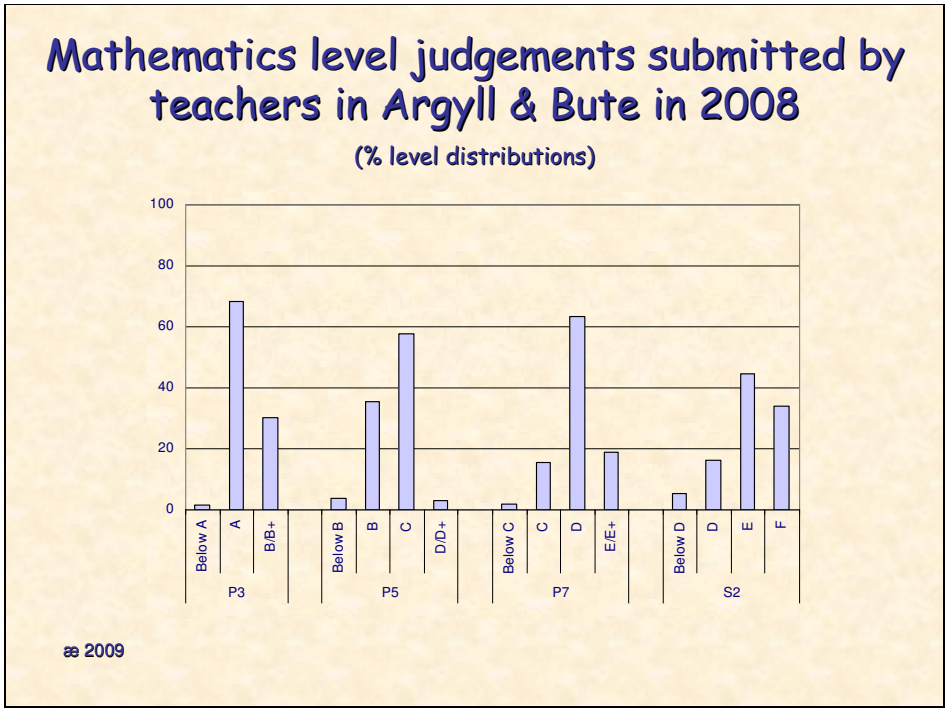
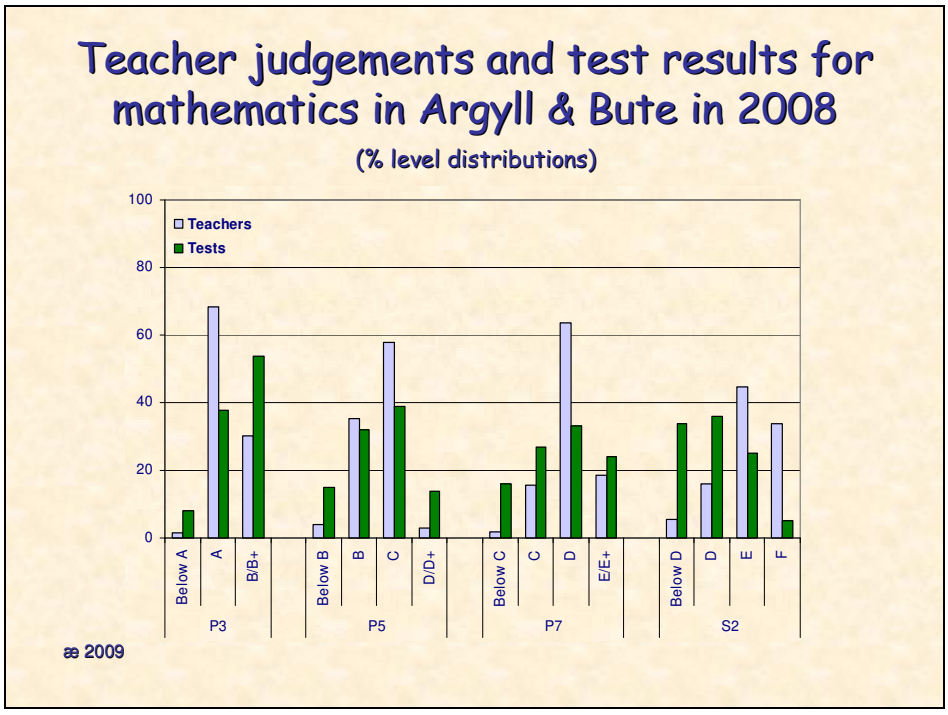
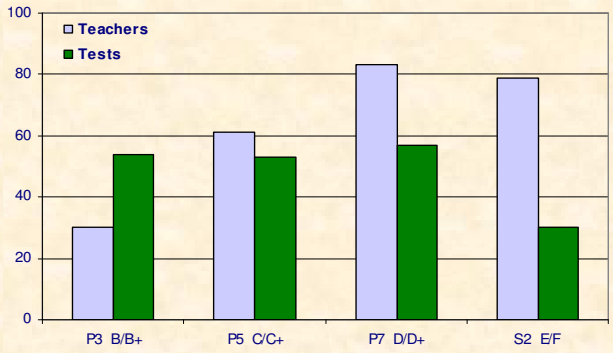


In the 2008 survey teachers' judgements were invited in reading, writing and mathematics for those pupils selected for testing. The chart shows the resulting level distributions for mathematics in the authority. The picture here is visibly more positive than for the mathematics test results at the higher stages, particularly S2. In the primary sector the teachers' level judgements tended to cluster around one or two levels, whereas the test results spread them wider.



Teacher judgements and test results for mathematics in Argyll & Bute in 2008

(% highest attainers)



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Questions

- In all stages teachers tended to judge the majority of pupils to be at expected levels or above. The tests either spread pupils more over levels (lower stages) or shifted levels downwards (at the higher stages). Is this a pattern you might have expected to see?
- Could differences between judgements and test results be explained by differences in the aspects of mathematics that the teachers and the tests were assessing? Or do teachers tend to make assumptions about expected levels and judge accordingly?
- What might be done to help teachers ensure that their assessments are valid in terms of mathematics curriculum guidance?

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Pupils' reports on mathematics

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The pupil questionnaire samples

- Over 1,300 primary pupils and over 400 S2 pupils completed questionnaires inviting their reports on and opinions about mathematics and mathematics learning
- These numbers represent just over 80% of the selected primary pupils and over 85% of those at S2

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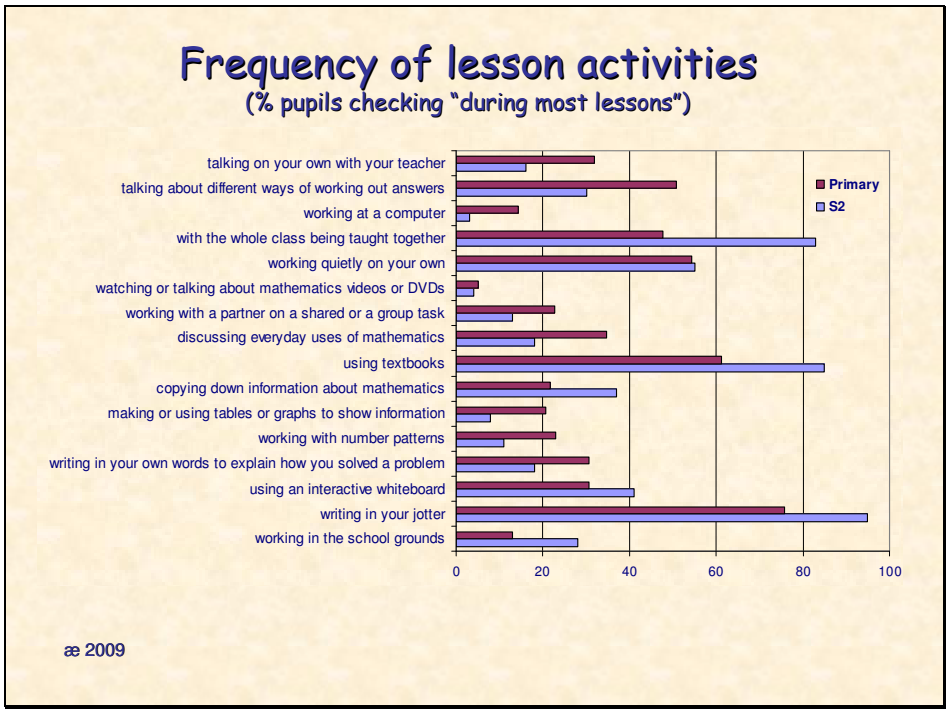
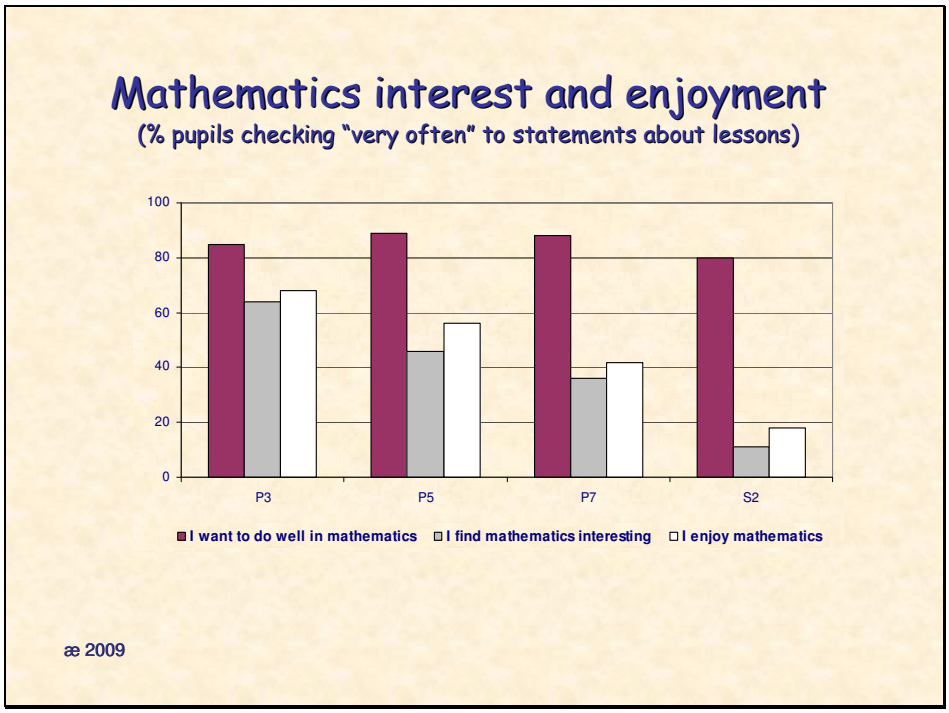
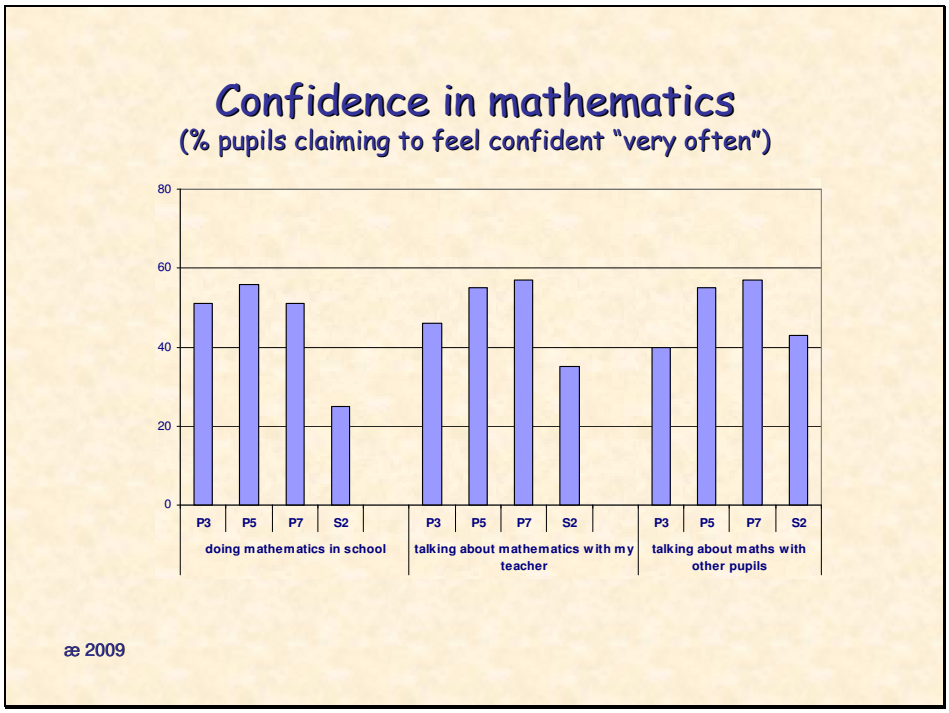


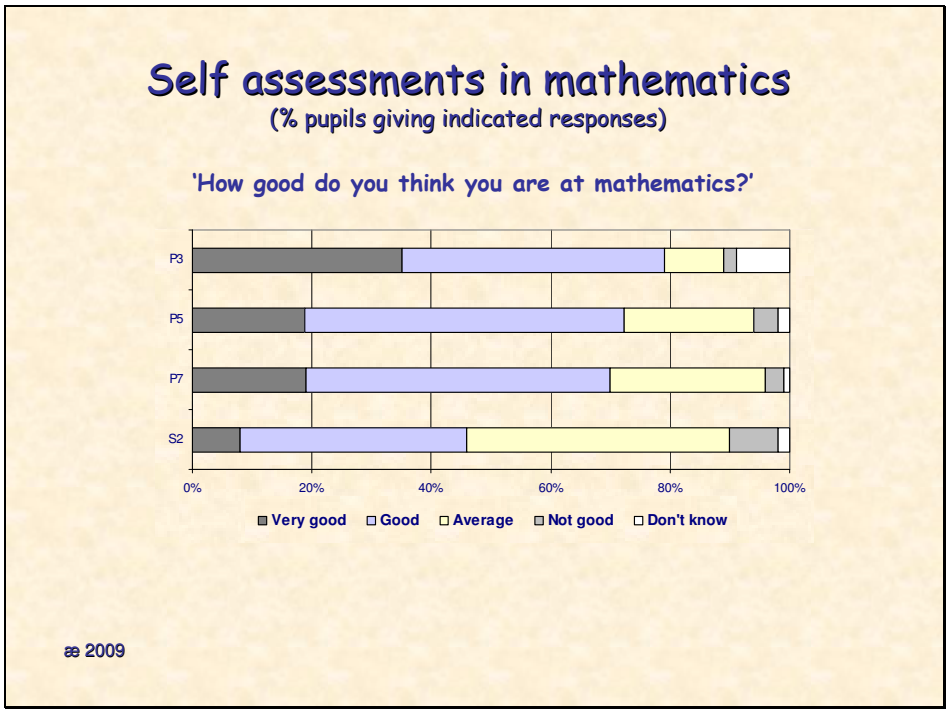
Pupils were presented with a large number of different possible lesson activities and asked to rate each for frequency, using the answer options 'during most lessons', 'most weeks', 'once or twice each term' and 'once a year or less'. The evidence is that, as nationally, being taught as a class, using textbooks, copying down information about mathematics, and writing in their jotters, were more frequent activities in S2 maths lessons than they were in the primary school. So, too, were using an interactive whiteboard and working in the school grounds. Discussion, collaboration and exploration were more common in the primary classroom than at S2.



Pupils were presented with a large number of statements, which they were asked to rate for frequency. The chart shows the results for "very often" selections, for three of the statements that relate most strongly to interest and enjoyment. While relatively high proportions of pupils found maths both enjoyable and interesting at P3, proportions fell steadily as pupils moved through their primary schooling and into S2. Positive responses to the statements "I want to do well in mathematics", however, were fairly stable across the stages, suggesting that the perceived importance of mathematics is not diminished by personal experience of it as learners. This picture mirrors that for Scotland as a whole.



As the chart above shows, between 40% and 60% of the primary pupils agreed that they were "very often" confident when doing mathematics or talking about the subject with their teacher or other pupils. The corresponding proportions were lower at S2 for doing maths and talking to the teacher. Pupils' self assessments in mathematics were generally positive at P3, as the chart below shows, falling by P7, and falling again at S2. For both aspects the authority picture is in line with that for the country at large.



Questions

- Is it an inevitable fact of life that pupils' interest in and enjoyment of mathematics learning will decline, their confidence in the subject fall, and their self assessments become less positive, as they move through their schooling?
- Can anything be done within the mathematics curriculum to counter the downward trend? How might the Curriculum for Excellence help?
- Are there any implications for CPD in the authority?

Teachers' reports on mathematics

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The teacher questionnaire samples

- All the teachers who were teaching pupils selected for testing in the survey were invited to complete a questionnaire about their mathematics teaching at the stage concerned
- 128 primary teachers and 39 S2 mathematics teachers submitted completed questionnaires
- These numbers represent almost 75% of those invited to respond in the primary sector and almost 65% of those invited at S2

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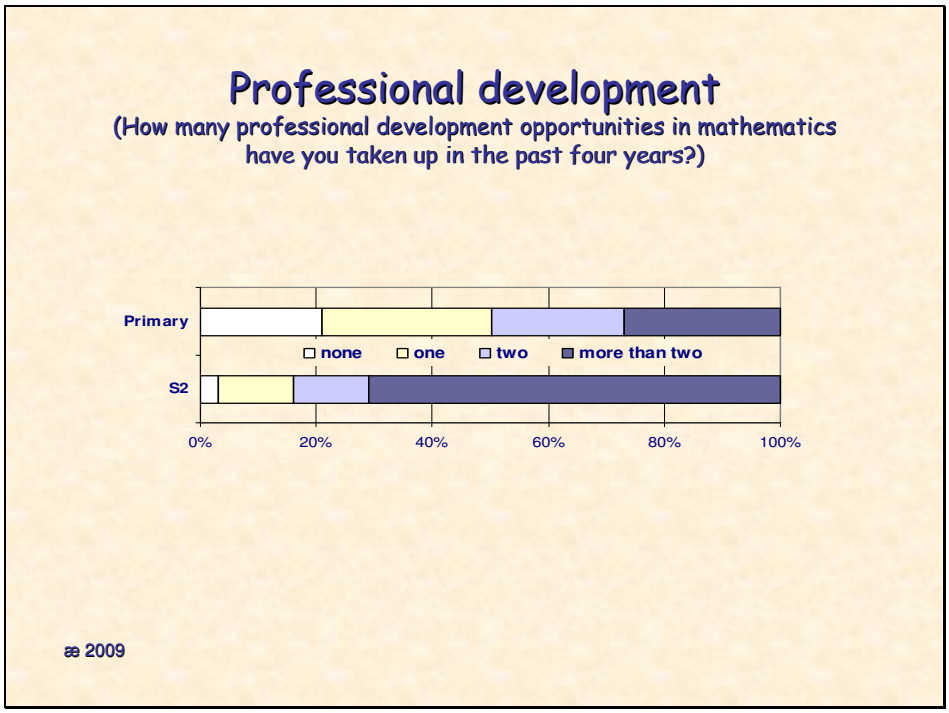
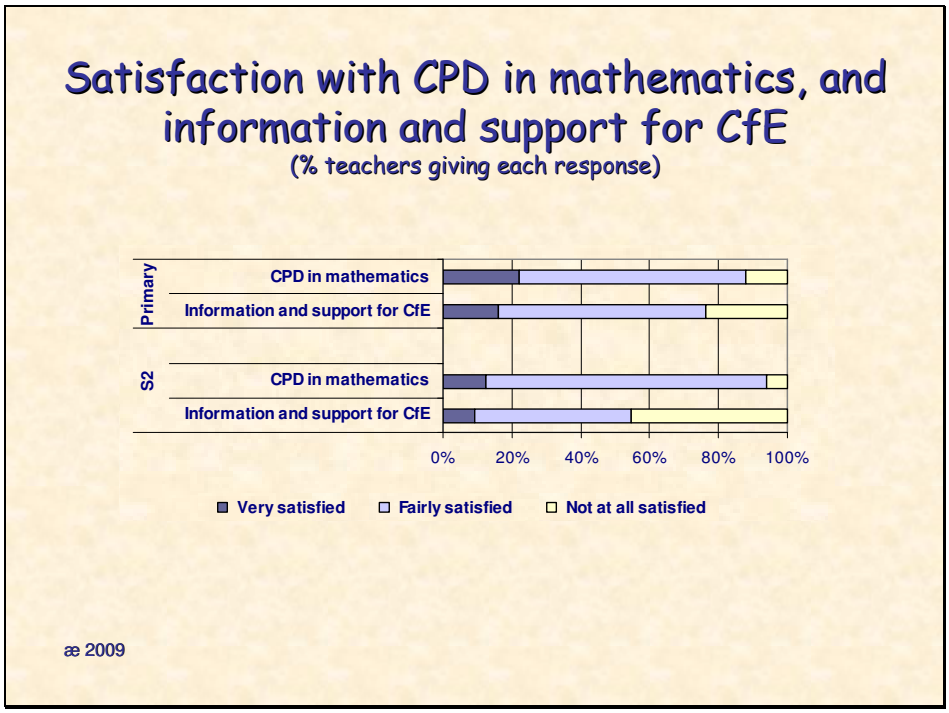


As nationally, professional development in mathematics was more frequent among the responding S2 teachers than among the primary class teachers: over 85% of responding S2 mathematics teachers and half the responding primary teachers had benefited from two or more professional development opportunities in the previous four years.



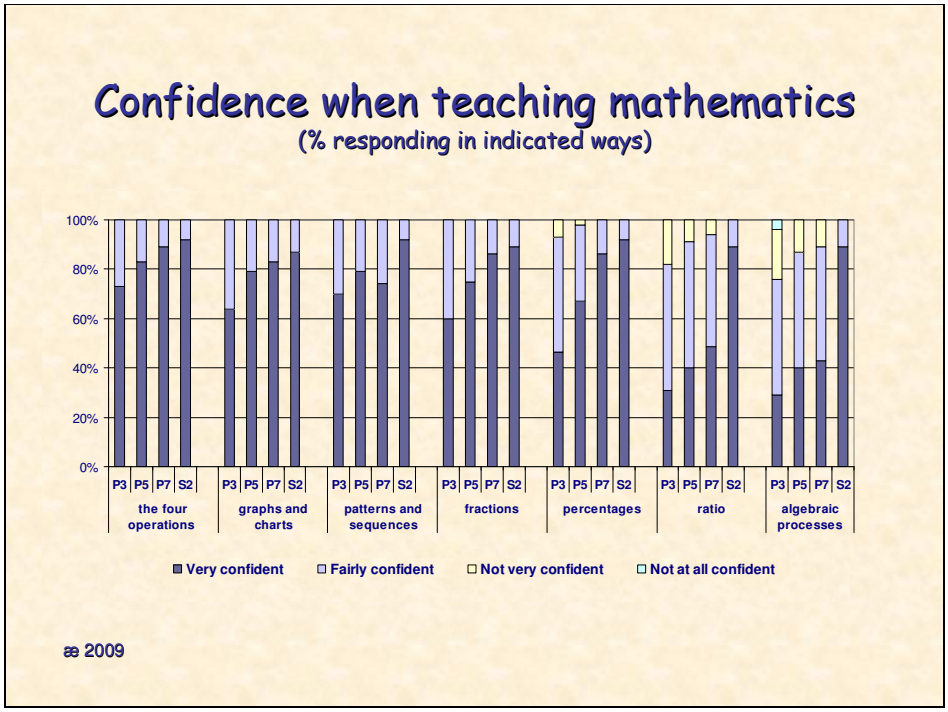
The proportions of teachers claiming to be "very satisfied" with the professional development opportunities they had been offered in mathematics during the previous four years were low, at just over 10% of the S2 teachers and just over 20% of the primary teachers.

For information and support for mathematics and numeracy under Curriculum for Excellence, around 10% of the S2 teachers and just under 20% of the primary teachers agreed to be "very satisfied". Over 40% of the S2 teachers and over 20% of the primary teachers were "not at all satisfied" with this.

The survey did not explore the nature of the professional development, or ask for clarification of satisfaction – was this with the number of opportunities made available, or with the quality of the offerings, or both?

Questions

- What range of professional development opportunities in mathematics are offered to primary and early secondary teachers in the authority? What is their focus?
- Where teachers seem to be dissatisfied with their professional development opportunities and/or experiences, what might be done to improve the situation?



In this authority, as nationally, the survey revealed that among primary teachers confidence for teaching mathematics was not particularly high for any topic. Even for the four operations the proportion of teachers claiming to be very confident was around 70% at P3 and just over 80% at P5. For patterns and sequences, another topic widely taught in the primary school, proportions were between 70% and 80% for the primary stages. At S2, in contrast, 90% or more of the teachers claimed to be very confident in teaching all the topics.

Questions

- Confidence was high for all topic teaching in S2. Among primary teachers, confidence was highest for the four operations, graphs and charts, and patterns and sequences, falling at P3 and P5 for fractions and percentages. What might be the implications for:
  - coverage of 5-14 curriculum mathematics topics in the primary school?
  - the effectiveness of mathematics teaching in the primary classroom?
- What might be done to increase primary teachers' confidence when teaching mathematics?

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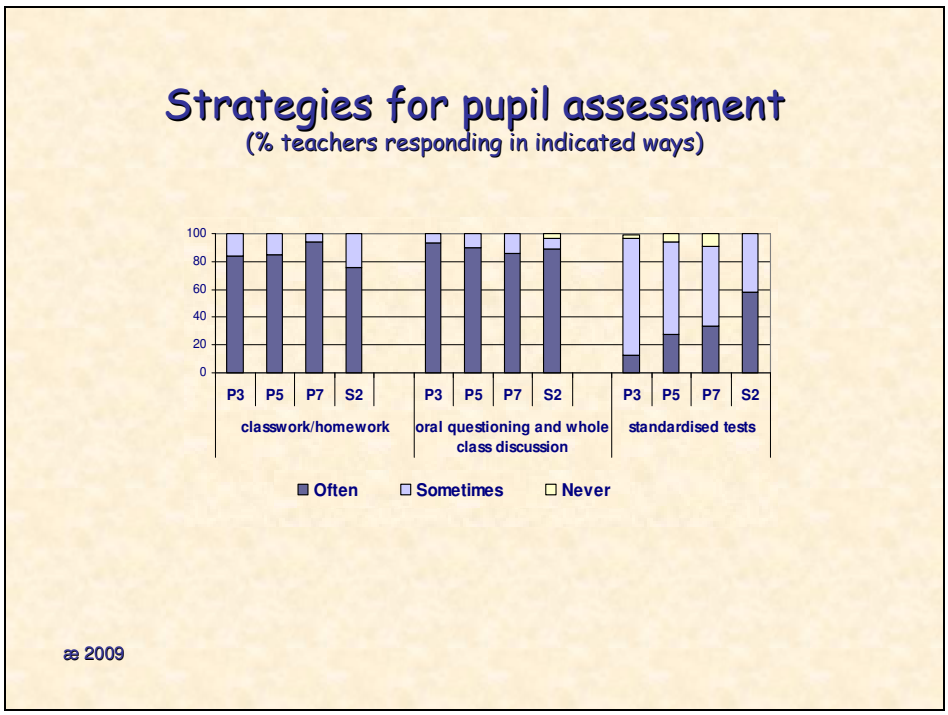
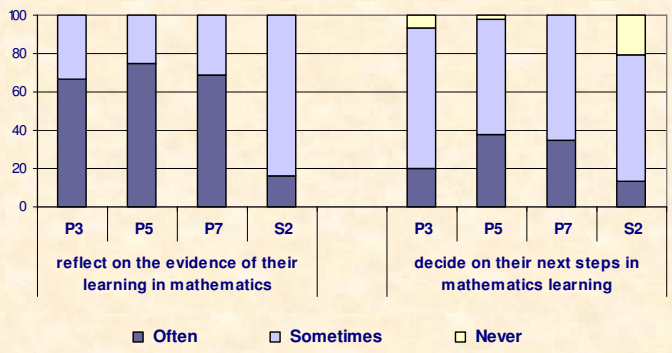


As nationally, high proportions of teachers were regularly using classwork and homework for pupil assessment in addition to questioning and discussion. Standardised tests were being used more at S2 than in the primary school, around 60% of the S2 teachers responding that they "often" used standardised tests for this purpose, compared with an average of around 30% of the primary teachers.

Formative assessment and personal learning planning

(How often do you use formative assessment approaches and personal learning planning in your classroom?)



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The evidence from teachers' reports would seem to be that while formative assessment approaches were being used "often" by over 60% of the responding primary teachers, among the S2 maths teachers the proportion was under 20%. As nationally, personal learning planning was not well-established in mathematics at any stage. Around 10% of the S2 teachers claimed "often" to be providing their pupils with opportunities to plan next steps in learning, rising to around 30% on average among the primary teachers.

Questions

- Is teachers' use of assessment methods as you would expect?
- Personal learning planning in mathematics seems to have been relatively infrequent in the authority in 2008. How could it be more actively encouraged?
- What are the CPD implications for the authority?

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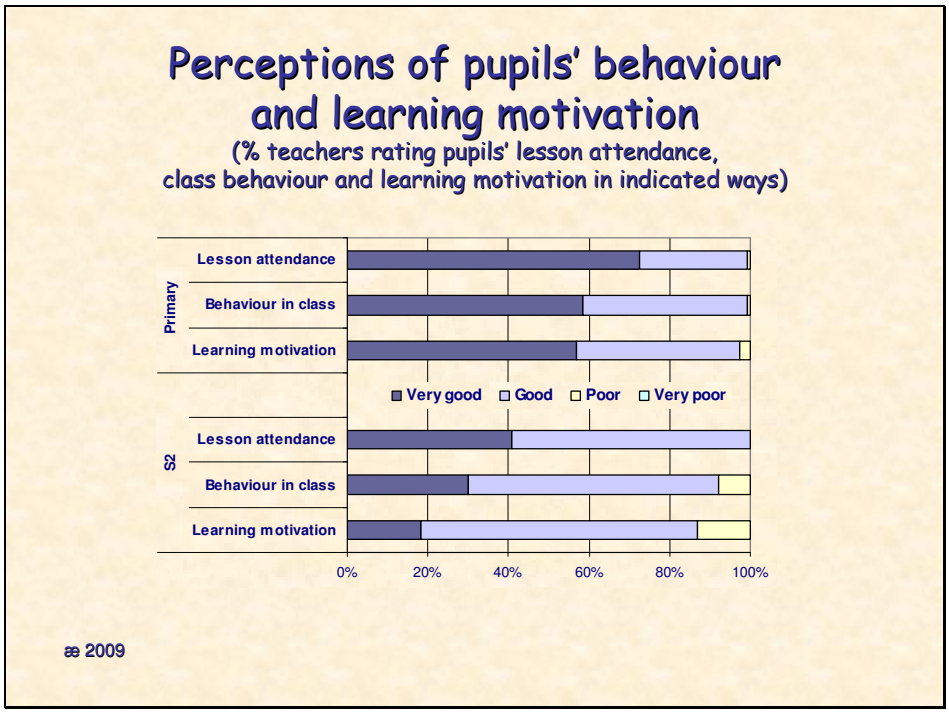
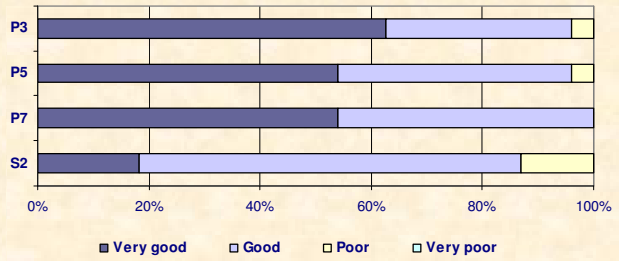


Teachers were invited to rate their pupils' lesson attendance, behaviour in class and motivation to learn. As the chart shows, the primary teachers generally rated their pupils positively on all three aspects. While the majority of S2 mathematics teachers also rated their pupils positively, the proportions giving the most positive rating were lower for behaviour in class and motivation to learn; 10% or more of the S2 teachers offered negative ratings for these two aspects.

Perceptions of pupils' learning motivation

(% teachers rating pupils' learning motivation in indicated ways, across stages)



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Only for motivation to learn did teachers' perceptions nationally show a clear trend across the primary stages. On this evidence, combined with the evidence from the pupils' own reports, the problem of decreasing motivation to learn is not an issue to do exclusively with transition, but that the downward trend actually begins in the primary school. This is a feature that is not confined to mathematics. Earlier SSA surveys have revealed a similar picture for English, science and even social subjects. In Argyll & Bute the trend in the primary sector is not as strong (but bear in mind the rather low questionnaire return rates here).

Questions

- Once again, we see evidence that pupils' interest in and enjoyment of mathematics declines as they move through their schooling. Can anything be done within the mathematics curriculum to counter the downward trend?
- How might the Curriculum for Excellence help? Will this succeed in addressing the motivation issue whilst also improving pupils' numeracy skills?
- What are the implications for CPD?

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'Bottom line' questions for discussion

- If the SSA were to carry out another survey of pupils' mathematics and numeracy at some point in the future, would you expect the picture for your authority to be the same or different? Why?
- How do you – how could you – support your schools to make good use of the SSA reports and related resources as part of self-evaluation and improvement planning?

Further information

For further information please see the authority's statistical report.

The full survey report is downloadable at

- http://www.scotland.gov.uk/Publications/2009/04/02133043/0
- http://www.scotland.gov.uk/Publications/2009/04/02133043/SSA2008-supportingevidence