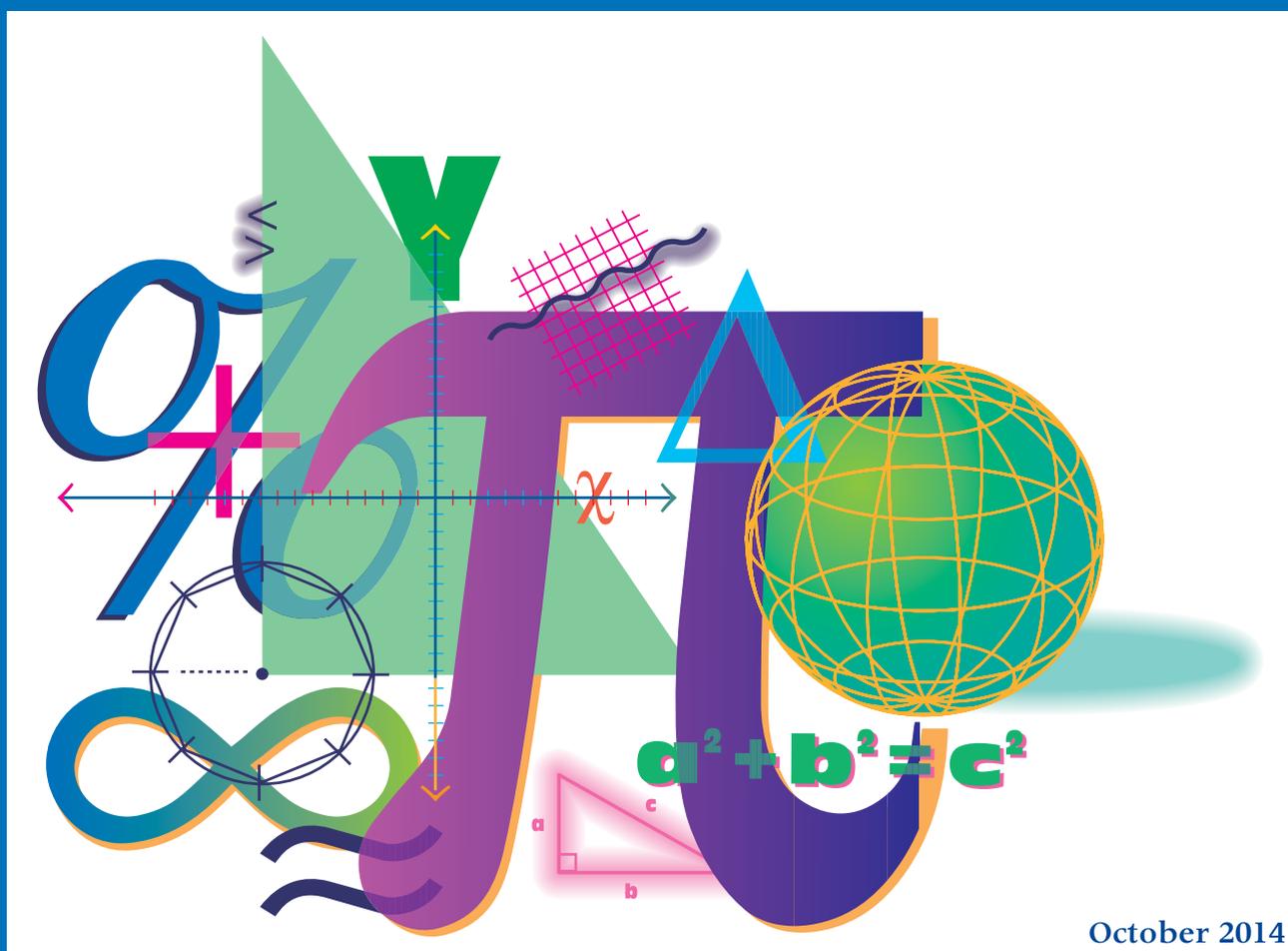


## EDUCATION AND TRAINING INSPECTORATE

# A Second Report on the Follow-up to Better Mathematics

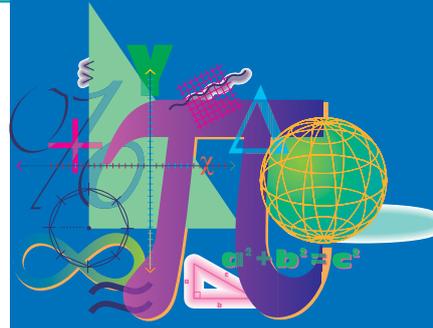
A REPORT ON POST-PRIMARY  
MATHEMATICS PROVISION 2010-14



## **Glossary of abbreviations used to identify earlier ETI mathematics reports**

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<b>BM</b>	<b>Better Mathematics: evaluation and prompts for self-evaluation and improvement in post-primary schools</b>
<b>CMT</b>	<b>Commentary on Post-Primary Mathematics Teaching</b>
<b>TM</b>	<b>Transition in Mathematics: primary to post-primary</b>
<b>FUBM</b>	<b>Follow-up to Better Mathematics</b>
<b>BPEM</b>	<b>Survey of Best Practice in English and Mathematics</b>



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## INTRODUCTION

In January 2007, the Education and Training Inspectorate (ETI) published *Better Mathematics* (BM)<sup>1</sup>, which provided the summary evaluations arising from inspection of post-primary mathematics between September 2001 and June 2006. Later in the same year, this was augmented by the *Commentary on Post-primary Mathematics Teaching* (CMT)<sup>2</sup>.

The three areas for improvement (AFIs) identified in BM were:

*AFI 1 the need for departmental planning that provides clear guidance to help teachers address the needs of all the pupils, including the most able and those who require additional help;*

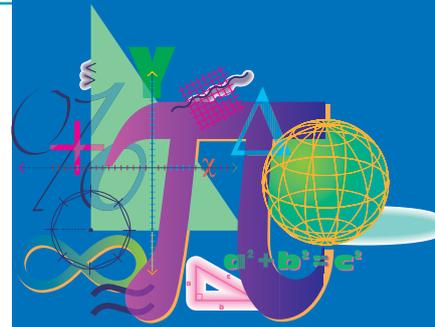
*AFI 2 the need to use a greater variety of activities and experiences (including pupils using ICT [information and communications technology], working in groups, communicating with one another, problem-solving, applying their knowledge to real-world contexts and using mental mathematics strategies) in order to improve the pupils' mathematical thinking and understanding; and*

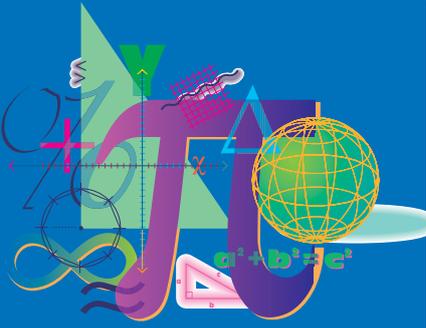
*AFI 3 the need to develop further the role of the HoD [Head of Department] in order that the experiences of the pupils and the standards they achieve can be monitored and evaluated more effectively to bring about improvement.*

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<sup>1</sup> [www.etini.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2007/better-mathematics-evaluation-and-prompts-for-self-evaluation-and-improvement-in-post-primary-schools.pdf](http://www.etini.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2007/better-mathematics-evaluation-and-prompts-for-self-evaluation-and-improvement-in-post-primary-schools.pdf)

<sup>2</sup> [www.etini.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2007/commentary-on-post-primary-mathematics-teaching.pdf](http://www.etini.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2007/commentary-on-post-primary-mathematics-teaching.pdf)





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In October 2010, the ETI published *Follow-up to Better Mathematics (FUBM)*<sup>3</sup> which reported on the progress towards addressing the three key AFIs during the period September 2006 to June 2010. The report's conclusion stated:

*In order to build on the progress that has been made in the first two AFIs and, importantly, to address more fully the third AFI, there is a need to develop further the leadership capacity of the HoDs.*

In September 2013, the ETI published *Survey of Best Practice in English and Mathematics in Post-primary Schools (BPEM)*<sup>4</sup>. The findings of this targeted survey were disseminated widely during two events in January and March 2014, and the best practice in mathematics can be summarized in the following extract:

*Many of the characteristics of good practice illustrated in the case studies are not new and can be best summed up by teachers having high expectations for what the pupils can achieve. This involves having well-planned progression in the schemes of work, challenging questioning which involves all, and rigorous follow-through of support given to pupils.*

The purpose of this publication is to report again on the progress towards addressing the three key AFIs in BM, and also to provide summary evaluations on aspects of provision that lead to high expectations.

Between September 2010 and June 2014, the ETI evaluated the quality of the mathematics/numeracy provision during 96<sup>5</sup> whole-school post-primary inspections. In total, 1,137 mathematics lessons were observed by mathematics inspectors. The evaluations summarized in this report are based on this substantial evidence base.

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<sup>3</sup> <http://www.eti.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2010/follow-up-to-better-mathematics.pdf>

<sup>4</sup> <http://www.eti.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2013/best-practice-in-english-and-mathematics-in-post-primary-schools.pdf>

<sup>5</sup> 69 non-selective schools and 27 selective schools

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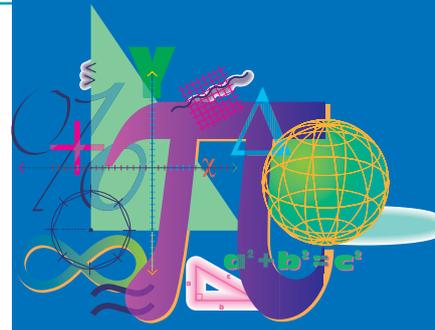
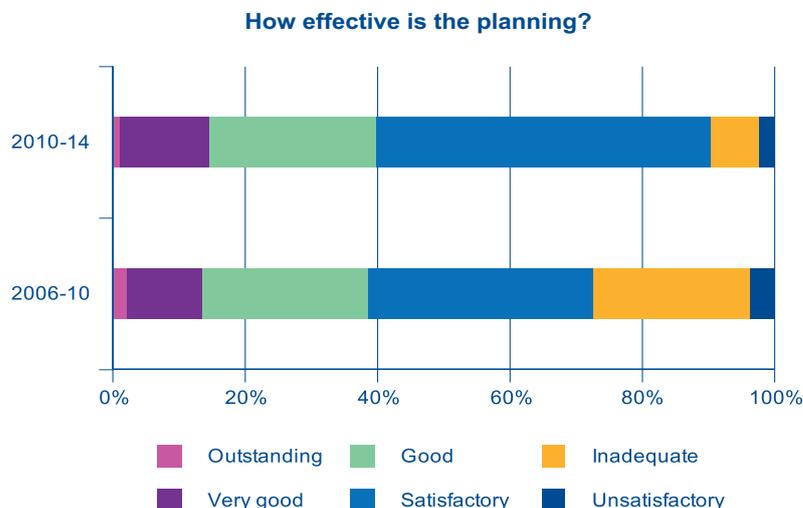
## PLANNING FOR LEARNING – ADDRESSING AFI 1

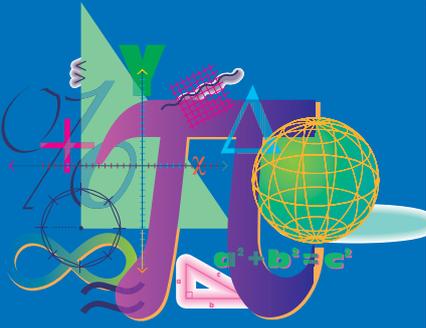
In January 2007, BM highlighted that *in the best practice the schemes of work (SoWs)*:

- > *provided a broad, balanced and coherent curriculum;*
- > *were sufficiently detailed to help the teachers match the work to the abilities of the pupils;*
- > *identified when and how information and communication technology (ICT) would be used;*
- > *emphasised appropriately the role of mental mathematics; and*
- > *outlined both formal and informal instances when the pupils would undertake work related to processes.*

However, it identified the quality of planning for learning in all aspects, including for those who require additional support in their mathematics learning, as the first key area that needed to improve, that is, AFI 1.

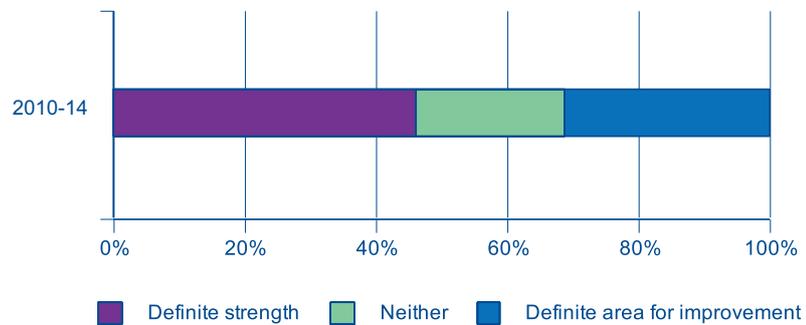
Four years later in 2010, the summary evaluations reported in FUBM indicated that while there had been progress, approximately 60% of departments had planning which was not good enough. This is still the case in the 2010-14 period, although the proportion evaluated as less than satisfactory has reduced significantly from 27% to 10%.



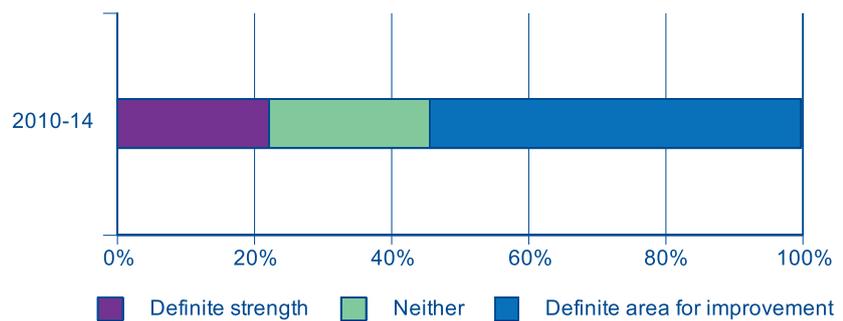


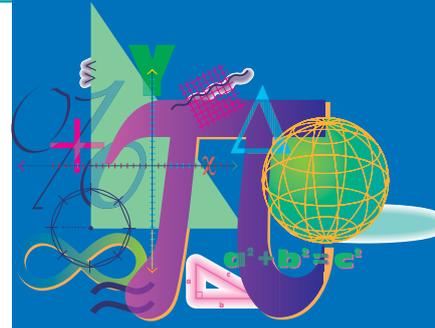
The role of the SoWs in guiding the teachers in their personal short-term planning is central to ensuring appropriate continuity, progression and challenge. While the quality of the KS3 SoWs needs to improve, a particular issue is the lack of detail in the SoWs for years 11 and 12. Too often, departments rely exclusively on the specifications and associated guidance provided by the awarding organisations.

**The SoW at KS3 is appropriate and provides effective guidance from which the teachers can plan their teaching**

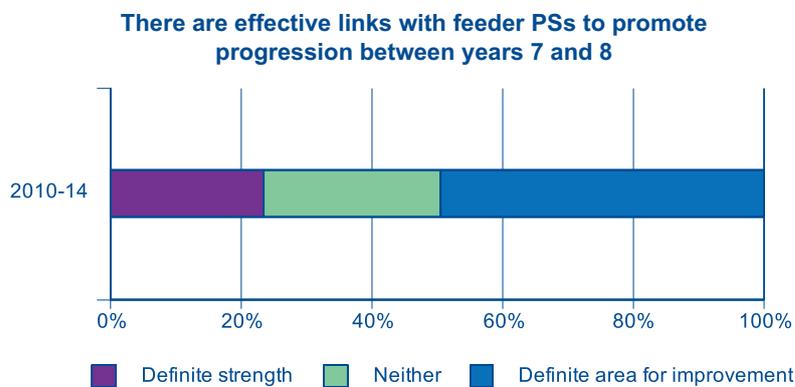


**The SoW at KS4 is appropriate and provides effective guidance from which the teachers can plan their teaching**



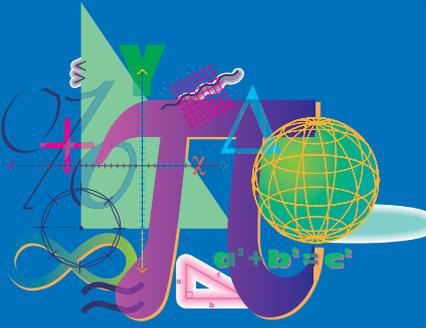


The transition between primary school and post-primary school has many dimensions, but the need to improve the quality of the curricular links between the Numeracy Co-ordinators (NCs) of the feeder primary schools and the HoD has been identified in *Transition in Mathematics: Primary to Post-primary (TM)*<sup>6</sup>. The summary evidence since the publication of TM demonstrates that this remains a major area for improvement, with the quality of the curricular links evaluated as a definite area for improvement in 49% of departments.

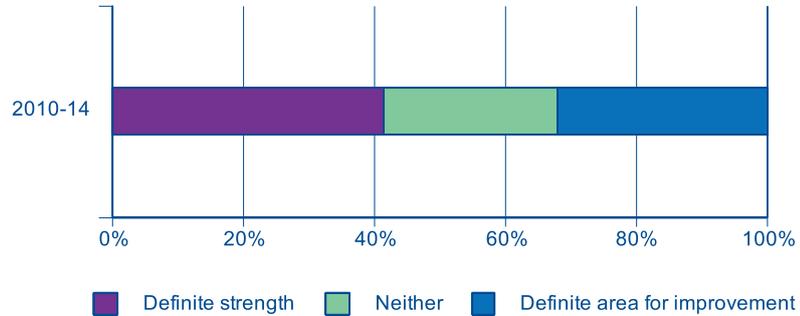


In the best practice, the SoWs are documents which have a formative purpose as well as a purely summative one. The collaborative work needed to reach an agreed scheme of work brings with it added benefits including the development of a shared view among the teachers of what constitutes effective provision. Interestingly, in just over 40% of departments, this was evaluated as a definite strength, even though there were shortcomings in the actual summative document in regard to providing effective guidance for teachers.

<sup>6</sup> <http://www.etini.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2010/transition-in-mathematics-primary-to-post-primary.pdf>

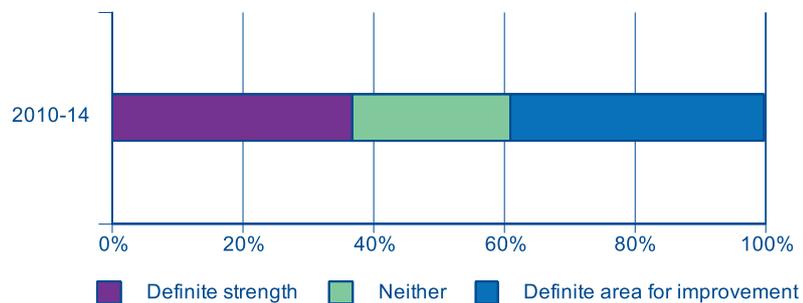


**The SoWs are working documents that serve as a depository of best practice and a tool for sharing good practice and resources**

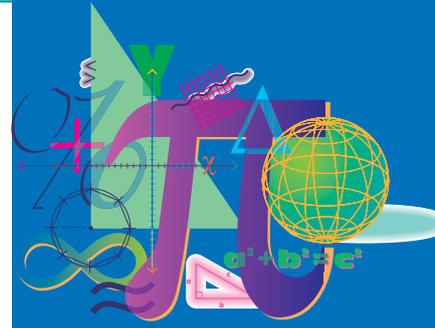


The extracts from the school commentaries that are an integral part of the report on the Best Practice Survey (BPEM) provide detail on the importance that the successful departments put on the SoWs. That said, an appropriate SoW is only guidance: teachers need to know the pupils in their classes in order to meet their needs and progress their learning. Increasingly, teachers are using assessment data (for example, see case studies on pages 29 and 30 of BPEM) to good effect. However, the overall evaluation of how well teachers are using available assessment data to inform teaching and learning was a definite area for improvement in 39% of the 96 departments inspected.

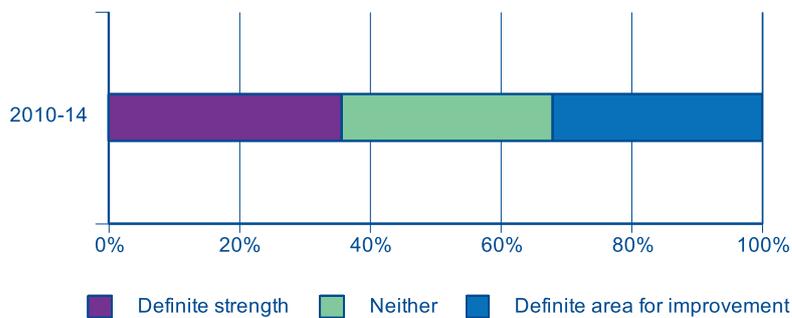
**Teachers make effective use of available assessment data to inform teaching and learning**



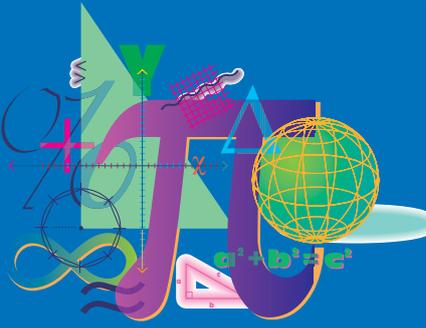
Finally, the case studies in the BPEM report highlighted the importance of addressing the needs of the pupils who require additional support in their mathematics learning. In particular, the numeracy targets and approaches/strategies identified in the individual education plan (IEP) need to inform the short-term planning of the teacher. The evidence from the inspections during 2010-14 indicates that there has been little improvement in the planning and communication between the teacher, the Special Education Needs Co-ordinator (SENCO) and the NC and/or HoD.



**When additional numeracy support is available, there is effective planning and communication between the class teacher, the SENCO and the NC and/or HoD**



**In summary, while there are departments in which the planning for learning is effective, in more than half of the departments it is not good enough.** It is significant that in all of the aspects of provision that are reported upon above, there are at least one third of departments in which the aspect is a definite area for improvement.



## TEACHING AND LEARNING – ADDRESSING AFI 2

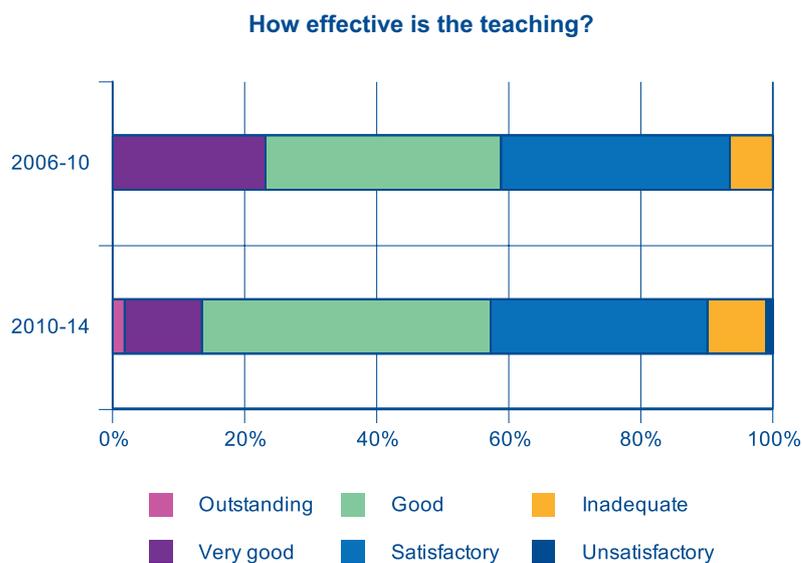
In January 2007, BM identified that *effective teaching and learning was in place when teachers:*

- > *share the intended learning with the pupils at the start of the lesson;*
- > *recap and link the work to previous learning, or set the work in an appropriate real-world context;*
- > *provide clear exposition involving, where appropriate, multiple explanations, with board-work modelling what the pupils should do;*
- > *use a variety of activities, including ICT and practical equipment, which entails the pupils working individually, in pairs or in groups;*
- > *provide opportunities for the pupils to problem-solve;*
- > *integrate, when appropriate, the use of effective mental mathematics strategies;*
- > *use skilful questioning, challenging the pupils' understanding and requiring them to draw conclusions and justify their thinking;*
- > *highlight common misconceptions and exploit these in a sensitive way;*
- > *relate the ongoing work to other parts of the course to encourage the pupils to make interconnections and think of mathematics holistically;*
- > *engage the pupils fully by ensuring that the lesson had appropriate pace, challenge and progression;*

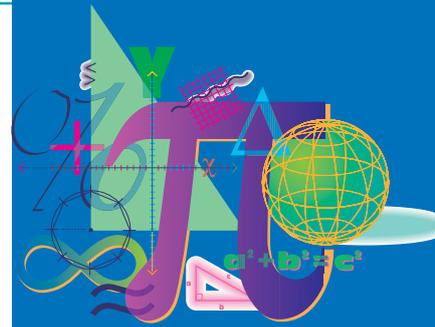
- > *teach step-by-step algorithms only when necessary; and*
- > *encourage the pupils to think and talk about how they learn and what they have learnt, often through appropriate plenary sessions at the end of lessons.*

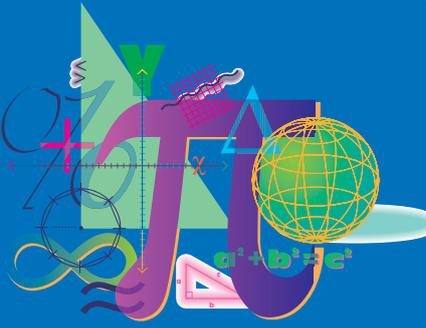
However, it concluded that the quality of teaching and learning needed to improve, that is, AFI 2.

Four years later in 2010, the summary evaluations reported in FUBM indicated that while there had been progress, in approximately 40% of departments the effectiveness of the teaching was not good enough. In the 2010-14 period, this is still the case, although the proportion that was very good or outstanding has increased from 14% to 23%.



BPEM identified the central importance of teachers having and setting high expectations for the pupils' work and the standards they achieve. As stated in the introduction, this is mainly achieved through well-planned progression in the schemes of work, challenging questioning which involves all pupils, and rigorous follow-through of support given to them. While the first of these has been covered in the Planning for Learning section, a clear focus on the intended learning and the sharing of these





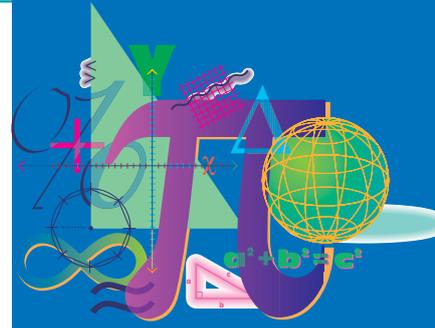
intentions with the pupils is an integral part of the lesson. FUBM stated that this had improved during 2006-10 and was a strength in three-fifths of departments during the second half of that four-year reporting period. During the four-year period 2010-14, the proportion of departments inspected where a clear focus on learning was evaluated as a definite strength increased to 73%.

**The intended learning is clear and shared with the pupils**

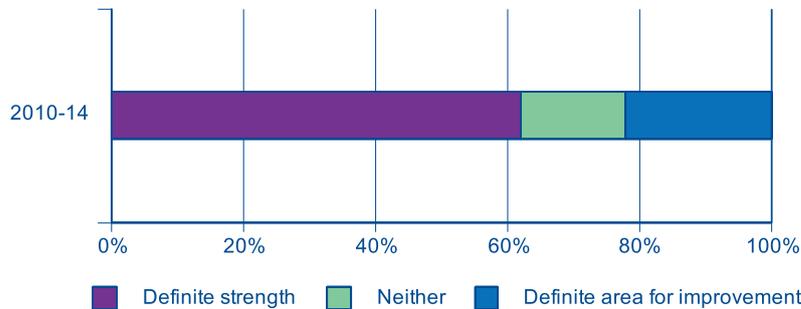


FUBM refers to the predominant practice, summarized by 'Explanation, Examples and Exercises', stating that *within this traditional paradigm, the teachers' exposition in which model solutions are provided for the pupils through clear board work, the level of individual support the teachers provide and the appropriateness of their whole-class intervention were strengths in over three-quarters of departments visited.* These three features continue to be strengths, the first two in particular being strengths in over 90% of the departments.

BM identified that in many less effective lessons *the pupils began an exercise of questions from the textbook, which were often routine, repetitive and insufficiently challenging.* This remains a characteristic of many less effective lessons and giving pupils time to work at appropriately challenging exercises was identified as a definite area of improvement in 22% of the departments.

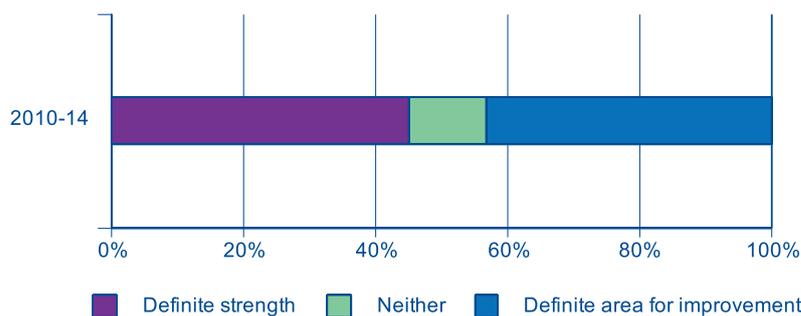


**The pupils are given appropriate time to practice and consolidate their learning with appropriately challenging exercises**

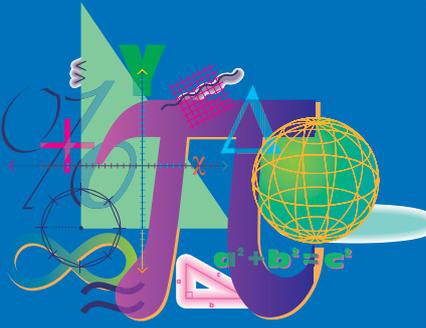


FUBM identified that the variety of activities that are promoted in *Improving Learning in Mathematics*<sup>7</sup>, and which are in contrast to the traditional exercises of questions completed by pupils working independently, had a beneficial effect during the four-year period 2006-10. However, the improvement which was evident particularly in the last year of that four-year period has not been sustained. During the four-year period 2010-14, the use of a variety of activities to extend the pupils' understanding was a definite area for improvement in 43% of the departments.

**A variety of activities is used in order the pupils' understanding is extended**



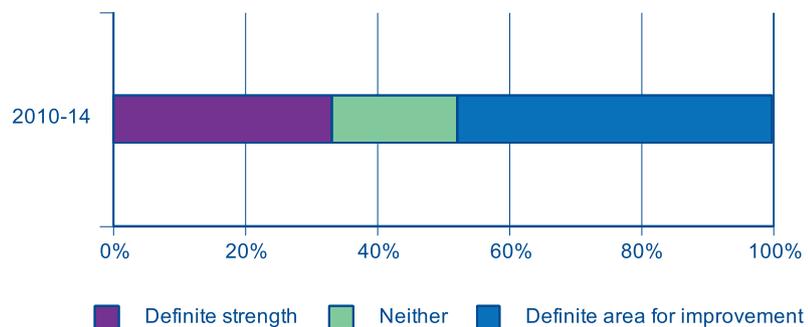
<sup>7</sup> Produced by the Standards Unit, Department of Education and Skills, 2005, <http://www.nationalstemcentre.org.uk/elibrary/resource/1015/improving-learning-in-mathematics-challenges-and-strategies>



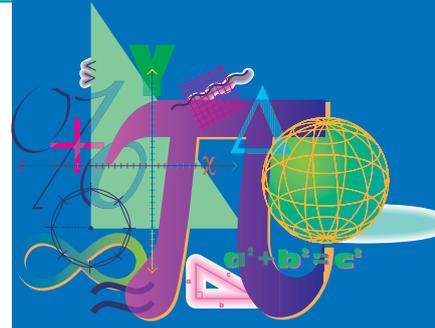
In 2006, the teaching and learning sections of BM were augmented by the commentary CMT (see Introduction). The underlying rationale of the commentary is that when pupils are fully engaged in mathematical thinking, they are better placed to deepen their understanding and, importantly, consolidate their learning so it is more robust and secure. The *Improving Learning in Mathematics* resource supports this rationale, as does the *Mathematics Matters*<sup>8</sup> report of the National Centre for Excellence in the Teaching of Mathematics (NCETM).

At the heart of this ‘fully engaged in mathematical thinking’ is the teachers’ use of skilful questioning and Assessment for Learning (AfL) strategies – strategies that enable the teacher to gauge whether teaching has led to learning. In the four-year period 2010-14, there were more than 40% of departments in which both of these needed to improve.

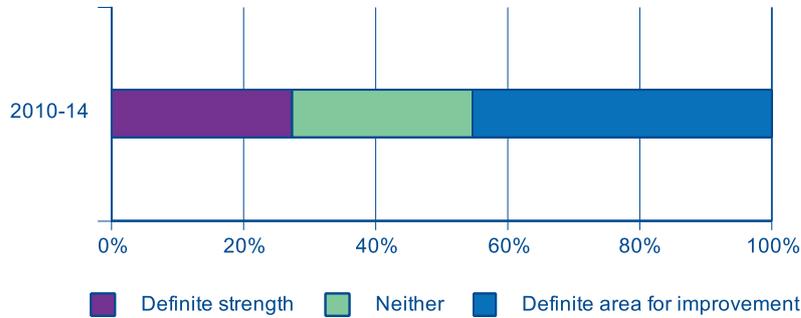
**The teacher uses skilful questioning which encourages the pupils to reflect, reason, conjecture, test and justify their thinking**



<sup>8</sup> <https://www.ncetm.org.uk/public/files/309231/Mathematics+Matters+Final+Report.pdf>



### Teachers employ appropriate Assessment for Learning strategies in lessons

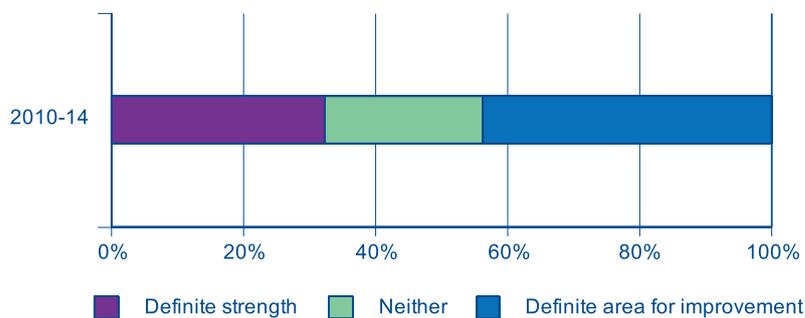


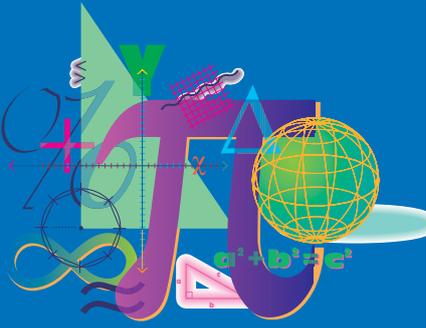
The last of the 11 characteristics of effective teaching outlined in BM and above is:

*The teachers encourage the pupils to think and talk about how they learn and what they have learnt, often through appropriate plenary sessions at the end of lessons.*

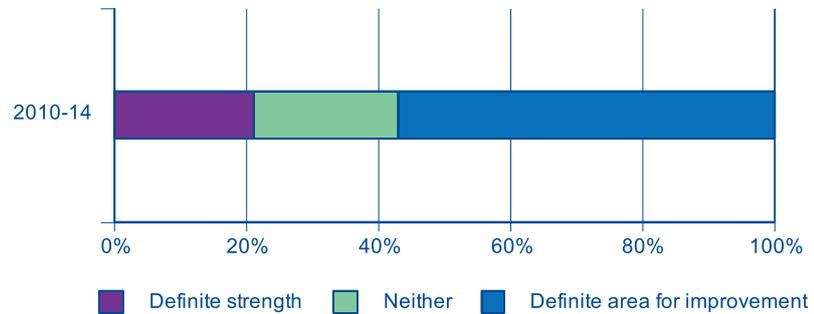
This is a characteristic that still needs improvement, particularly the development of meta-cognition (see section 12 of CMT), which was an area for improvement in 57% of the departments inspected.

### The lessons draw to an appropriate conclusion, giving the pupils time to reflect on their learning





### Pupils are encouraged to think about their own thinking



BM identified *three important aspects of assessment as particular weaknesses:*

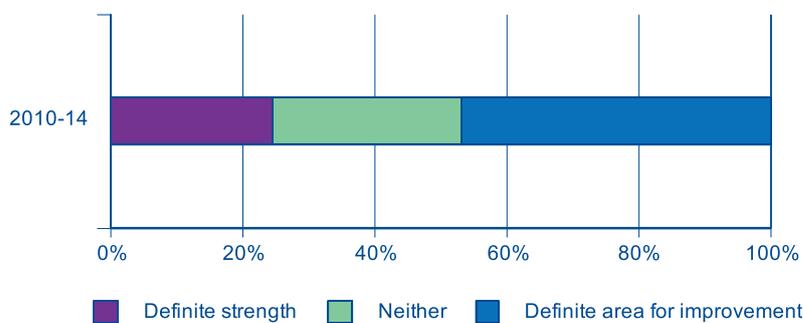
- > *too much self-marking by pupils which was not regularly monitored and followed-up by individual, group or whole class feedback;*
- > *an over emphasis on marking without an appropriate proportion of errors being corrected; and*
- > *the use of comments which, although encouraging, provided little guidance to enable the pupils to improve.*

These aspects are at the core of effective feedback from teachers to pupils which is central to good AfL. This was highlighted during the mathematics presentation at the BPEM dissemination events and was also identified as one of the top ten most important factors in John Hattie's synthesis<sup>9</sup> of over 800 meta-analyses relating to improving achievement.

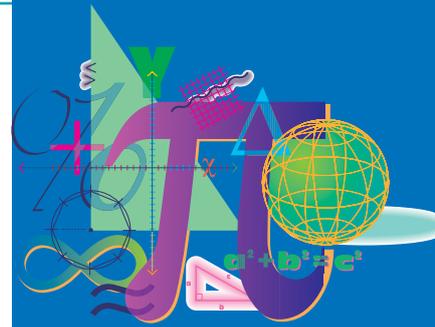
<sup>9</sup> *Visible Learning, John Hattie, ISBN 978-0-415-47618-8*

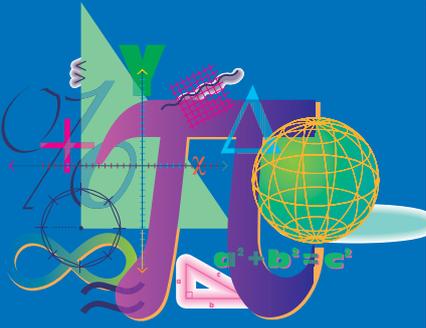
Pupils receive feedback through: effective questioning strategies; the marking of their written work; and the follow-through support provided when the teacher assesses that the learning is insecure. Self-marking or peer-marking are often allowed by mathematics teachers to alleviate the pressure arising from the perceived shortage of time. However, BPEM highlighted that the quality of the monitoring and follow-through support is a key focus in successful departments. During the four-year period 2010-14, this was identified as a definite area for improvement in 47% of departments.

**The homework and marking policies and practice emphasise appropriately the importance of providing pupils with good feedback on their work**



**In summary, while there are departments in which the teaching and learning is effective, in approximately two-fifths of departments it is not good enough.** This is not to say that in these two-fifths, all aspects of teaching and learning are ineffective: there are, of course, lessons in which the characteristics of the traditional paradigm, described in FUBM and earlier in this report, are appropriate. However, the BPEM report confirmed that pupils can be more successful in their learning when the teaching approaches are broader in nature and so more engaging and challenging for the pupils.





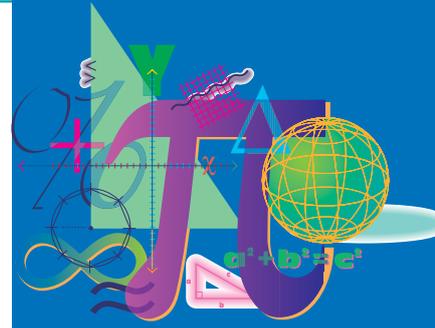
## LEADERSHIP AND MANAGEMENT – ADDRESSING AFI 3

In January 2007, BM identified the strengths in leadership and management included the strong collegiality amongst the staff and the efficient and effective departmental administration.

However, BM also reported that *in a majority of departments:*

- > *mathematics department meetings are infrequent, dominated by administrative tasks and attended mainly by the subject specialists only;*
- > *discussion of teaching and learning and the sharing of good practice often happen in an informal setting and do not involve all staff who teach mathematics;*
- > *while most HoDs do keep departmental records of internal and external assessments, these are often not used effectively to aid the monitoring and evaluation of the progression in the pupils' learning;*
- > *peer-observation and observation by the HoD are underdeveloped; and*
- > *the outcomes of benchmarking to evaluate the performance of the department are often not shared with all of the teachers who teach mathematics.*

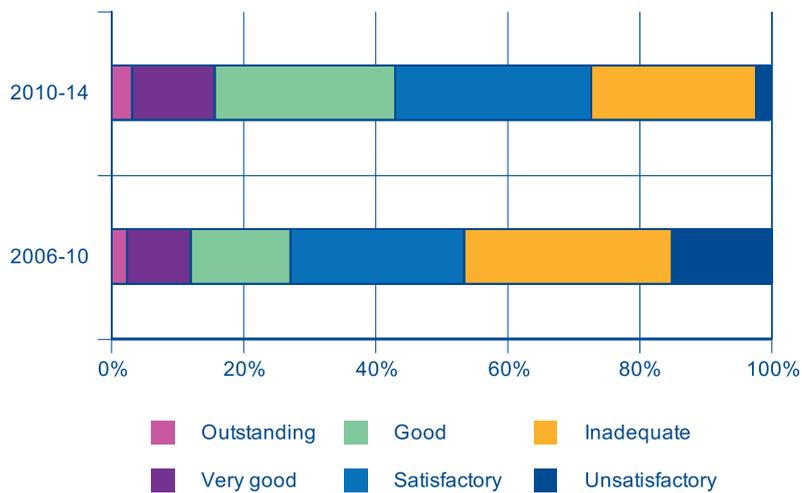
It concluded by identifying the need to develop further the role of the HoD in order that the experiences of the pupils and the standards they achieve can be monitored and evaluated more effectively to bring about improvement as the third key area for improvement, that is, AFI 3.



Four years later in 2010, FUBM reported that there had been little improvement in addressing AFI 3. It proceeded to identify:

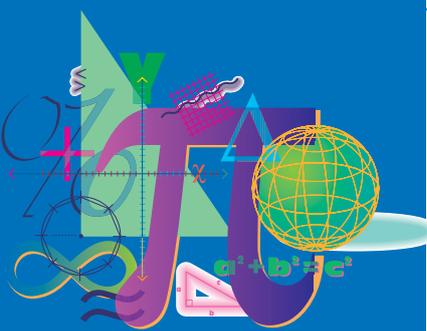
*there is a need to build further the leadership capacity of HoDs, in order to increase the opportunities for all the teachers of mathematics to agree and share best practice, to self-evaluate both individually and departmentally, to implement changes designed to bring about improvement in the provision, and to review these changes through rigorous monitoring and evaluation processes.*

**How effective is the monitoring and evaluation?**

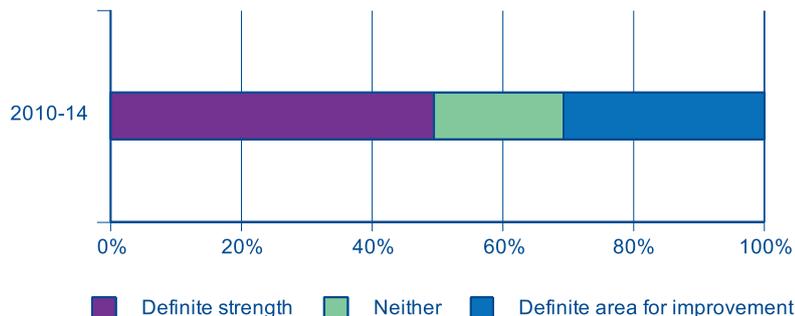


In the four year period, 2010-14, there has been progress. However, the effectiveness of the monitoring and evaluation was still not good enough in over one half of the departments inspected.

Generally the way HoDs undertake their administration duties remains a strength; it was a definite strength in 89% of the inspections during the 2010-14 period. However, the HoD's role in leading and managing, rather than just administrating, was not so strong; for example, ensuring that department meetings are regular and inclusive and not focused on administrative tasks was a definite area for improvement in 31% of the departments inspected.

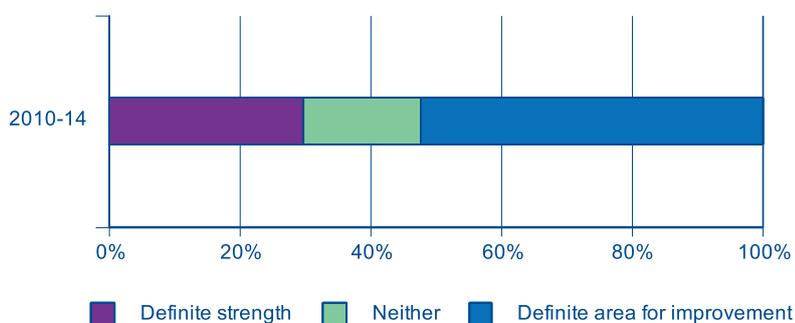


### Department meetings are inclusive, regular and are not exclusively administrative in content



Considering an even broader view of the leadership and management, inspectors evaluated whether there was a culture of self-evaluation leading to improvement and found that this was a definite strength in only 30% of the departments inspected.

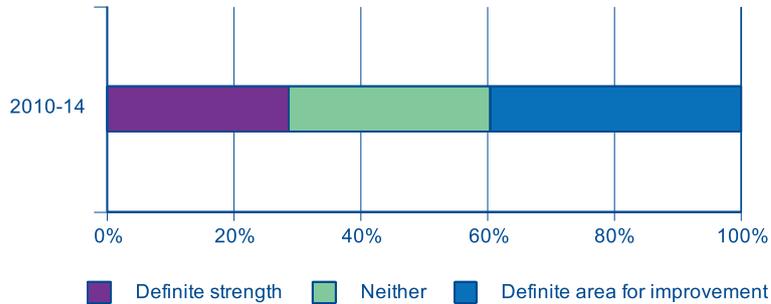
### There is a well-embedded culture of self-evaluation and continuous improvement within the department



Similarly, the sharing of best practice through various means was identified as a definite strength in 29% of departments and a definite area for improvement in 39%.

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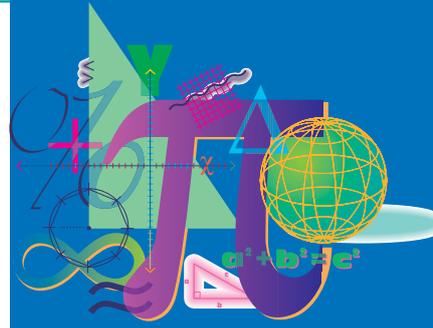
**Best practice is shared through discussion at departmental meetings, peer observations, team teaching and dissemination**

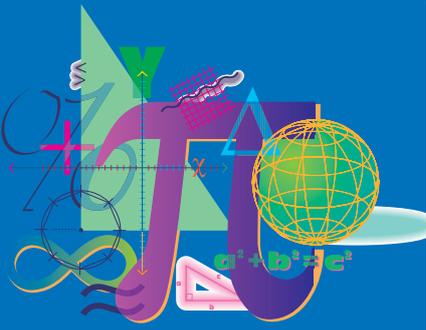


In December 2007, the ETI completed a survey of 18 post-primary schools looking explicitly at the quality of the monitoring and evaluation in mathematics. The report, *Better Mathematics: Monitoring and Evaluation of Mathematics in Post-primary Schools*<sup>10</sup>, identified that in two-thirds of the schools the quality of the overall monitoring and evaluation in mathematics was not good enough. **The evidence from the 96 whole-school inspections during 2010-14 indicates that this remains an area for improvement and that there is a need to develop further the role of the HoD in leading the ‘plan, do and review’ cycle.**

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<sup>10</sup> <http://www.etini.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2008/better-mathematics-report-of-a-survey-monitoring-and-evaluation-of-mathematics-in-post-primary-schools.pdf>





## CONCLUSION

The conclusion in FUBM stated:

*In order to build on the progress that has been made in the first two AFIs and, importantly, to address more fully the third AFI, there is a need to develop further the leadership capacity of the HoDs.*

Elsewhere in the report, it stated:

*There is a need to build further the leadership capacity of HoDs, in order to increase the opportunities for all the teachers of mathematics to agree and share best practice, to self-evaluate both individually and departmentally, to implement changes designed to bring about improvement in the provision, and to review these changes through rigorous monitoring and evaluation processes.*

Paragraph 4.24 of Count, Read: Succeed (DE, 2011) reiterates the importance of these four steps, and also highlights the support needed from the senior leaders of the school for the HoD to fulfil his or her responsibilities. In addition, the evidence of the BPEM survey confirms that the role of the mathematics HoD remains central to improving the quality of the mathematical learning experiences in post-primary schools.

In summary, while FUBM identified some improvement in AFIs 1 and 2, and this report indicates that there has been some improvement in AFI 3, **the evidence from the 96 mathematics departments inspected during**

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<sup>10</sup> <http://www.etini.gov.uk/index/surveys-evaluations/surveys-evaluations-post-primary/surveys-evaluations-post-primary-2008/better-mathematics-report-of-a-survey-monitoring-and-evaluation-of-mathematics-in-post-primary-schools.pdf>

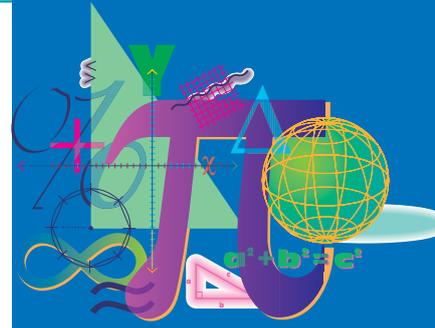
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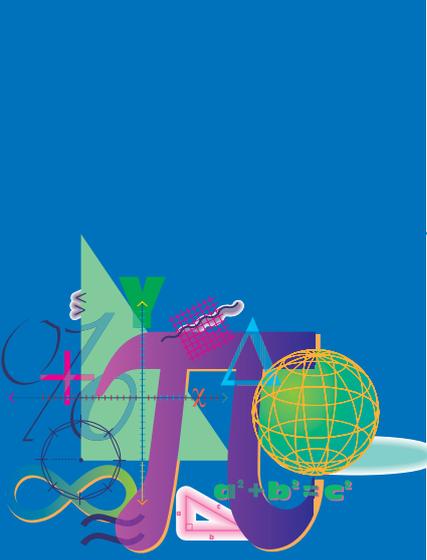
2010-14 indicates that there is a need to continue to address all three of the AFIs identified in BM, that is:

**AFI 1** *the need for departmental planning that provides clear guidance to help teachers address the needs of all the pupils, including the most able and those who require additional help;*

**AFI 2** *the need to use a greater variety of activities and experiences in order to improve the pupils' mathematical thinking and understanding; and*

**AFI 3** *the need to develop further the role of the HoD in order that the experiences of the pupils and the standards they achieve can be monitored and evaluated more effectively to bring about improvement.*









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