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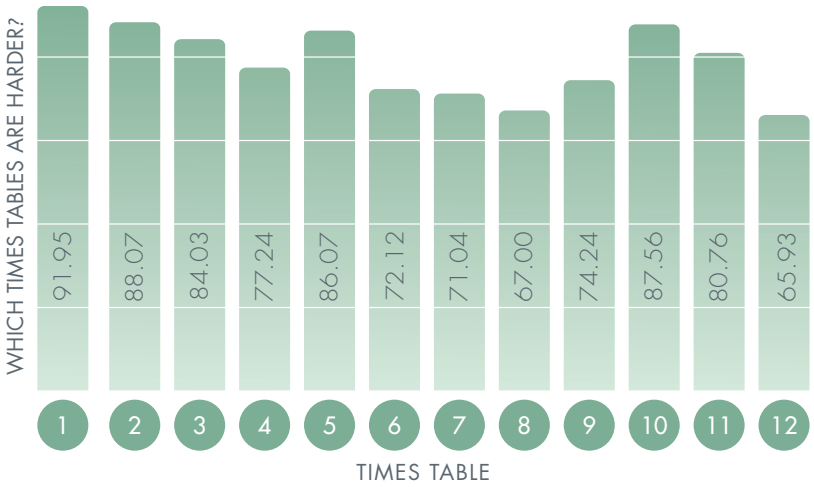
TALKING POINT:

WHAT ARE THE ISSUES IN LEARNING AND ASSESSING TIMES TABLES?



PERCENTAGE ACCURACY ON TIMES TABLES TESTS (KS2 PUPILS)
(Guardian, 2013)

1

Facility with times tables facts is needed in order to perform higher-order mathematical processes efficiently (Westwood, 2003). Repeated systematic practice of times tables is effective and this declarative knowledge serves as a building block for procedural knowledge. This process is the key to making the retrieval of basic times tables facts fluent for pupils (Hasselbring, Lott, & Zydney, 2005). Times tables are the basis for further advancement in maths (Wong & Evans, 2007; Wallace & Gurganus, 2005) and nearly all maths curricula in high-performing countries contain the memorisation of times tables up to 10 x 10 (Ruddock & Sainsbury, 2008) but just learning times tables doesn't mean that a student will be good at later mathematics (Bratina & Krudwig, 2003).

IMPLICATIONS: Knowing times tables is important and should be taught in schools at a young age to ensure fluency for later mathematics, but it is not the only or most important thing to learn for early mathematicians.

2

Automatic memorisation of times tables frees up working memory to be used on other tasks (Hunt & Ellis, 1999). However, young children with a high proficiency with working memory (which also correlates with generally high academic performance, especially in problem-solving and reasoning) are prone to higher maths anxiety levels, which can have a negative impact on their achievement in maths by co-opting working-memory (Ramirez et al, 2013).

IMPLICATIONS: Maths anxiety can interfere with memory, which means testing times tables may create anxiety that skews test results and undermines confidence, a barrier in working towards automaticity.

3

Studies comparing computer-based practice of times tables with pencil and paper practice (e.g. Godfrey, 2001) suggest that computer-based practice is more effective, perhaps because students are more motivated.

IMPLICATIONS: Using ICT to learn times tables facts can be more effective and motivating than paper and pen methods.

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4

Some times tables seem to be easier to memorise than others (see infographic) and a structured progression of difficulty such as introducing 2, 5, 0, 1, and 9 first can reduce the amount of memorising for pupils (Van de Walle, 2004). Research suggests peer discussion, different representations and a broad selection of strategies are more effective than just repetition and practice alone (Brendefur et al, 2015).

IMPLICATIONS: Using a range of different methods and representations to help pupils learn times tables facts has been shown to be more effective than drill and practice alone.

5

Written tests sometimes fail to be good indicators of mathematical ability as poor performance can be due to slow processing, reading or recognising skills. When a significant amount of teacher time is taken up by excessive testing then formative assessment may be restricted in favour of summative assessment (Harlen & Crick, 2003). However, using multiple ways of assessing can give a more valid picture (Howell & Nolet, 2000).

IMPLICATIONS: Combining the results of formative and summative testing leads to a more reliable way of assessing recall of times tables.

6

Research shows that giving students progressively less time to answer multiplication questions forces them to move from inefficient methods to rapid recall; however more recent research suggests timed, online tests reveal some associated maths anxiety effects, whereas untimed pen-and-paper tests do not (Ashcraft, 2002).

IMPLICATIONS: Combining the results of formative and summative testing leads to a more reliable way of assessing recall of times tables.

'The DFE (should be) ensuring that assessment for pupils aged 5–14 is light touch and geared primarily to supporting and encouraging their progress.'
– Royal Society

'Educational research shows memorising supports understanding, and understanding supports learning'
– Charlie Stripp, NCETM

'It is not terrible to remember maths facts; what is terrible is sending kids away to memorise them and giving them tests on them which will set up this maths anxiety.'
– Prof Jo Boaler, Stanford University

IN SUMMARY

- Times tables should be taught explicitly, using a range of methods and representations
- Digital resources have been shown to be effective in helping pupils practise times tables
- It is advisable to balance the amount of summative testing pupils experience with formative assessment
- Pupils should be assessed in a variety of different ways

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