Low Stakes Testing in the Mathematics Classroom

Colleen Young
What Makes Great Teaching?

1. (Pedagogical) content knowledge

As well as a strong understanding of the material being taught, teachers must also understand the ways students think about the content, be able to evaluate the thinking behind students’ own methods, and identify students’ common misconceptions.
What Makes Great Teaching?

2. Quality of instruction

Includes elements such as effective questioning and use of assessment by teachers. Specific practices, like reviewing previous learning, providing model responses for students, giving adequate time for practice to embed skills securely and progressively introducing new learning (scaffolding) are also elements of high quality instruction.
What Makes Great Teaching?

Classroom climate (Moderate evidence of impact on student outcomes)

“Covers quality of interactions between teachers and students, and teacher expectations.”

What makes great teaching?

Review of the underpinning research.

Robert Coe, Cesare Aloisi, Steve Higgins and Lee Elliot Major  October 2014
Assessment for Learning

However, the thing that really matters in feedback is the relationship between the student and the teacher.

When teachers know their students well, they know when to push and when to back off.
Assessment for Learning

Moreover, if students don’t believe their teachers know what they’re talking about or don’t have the students’ best interests at heart, they won’t invest the time to process and put to work the feedback teachers give them.
Assessment for Learning

Ultimately, when you know your students and your students trust you, you can ignore all the “rules” of feedback.

Without that relationship, all the research in the world won’t matter.

(Wiliam, 1999).
What helps students learn?

A teacher who provides the student with the opportunity to see what they need to revise. Regular tests and quizzes do this. Tests that don’t have further impact on levels / grades. Just there for you to know what you don’t know.
What helps students learn?

Low stakes tests are really good because there is not much pressure and at the end of them I can see how I’m doing and what I need to improve on for later formal tests. Going through and marking tests / homework.
My Achievements and Development Areas

Achievements:
- I have shown my working clearly
- No careless mistakes

Improvements:
- I need to speed up
- Don’t spend too much time on 1 question

I Learn Best When:
- We do practicals e.g. Algebra Tiles
- When it is repeated
- When we do exercises (in our book)
- **Surprise** Mini Tests.
- Quiet environment
- When we watch videos.
What helps students learn?

Dear Mrs Young,

Here are my views on ways of learning:

- Mini tests: I think that mini tests are a really good way of improving my learning as they are a stress-free way of seeing how much I know and helping me to prioritise what I need to revise in the future. I really find it useful to do questions and then go through them in class as it allows me to see how I have a go at them myself as well as also seeing the model answers helping me to improve my answers for next time.
What helps students learn?

Practice exam papers.

Mark schemes *(train them in marking!)*

Remember that we have a lot of subjects.

Post tests *(test after a formal test with questions the students found the most difficult)*
What helps students learn?

Diagrams and other visual aids.
Online resources.
Worked examples. Good notes
Detailed explanations.
Regular checking of answers.
Today's Lesson Tweet.

@Maths Department
Made summary notes on quadratics using mini test #enlightened

Today's Lesson Tweet.

@Mrs Young Maths Class
Remembering the quadratic formula 'Somewhere over the 2a' #maths2k15 #pi
Students need to recall information and the evidence suggests that testing is a better way of doing this than simply rereading material, a method often favoured by students.

Mini-tests are low stakes ‘Self-checks’, a learning tool, not something to be stressed by.

Aristotle apparently wrote “exercise in repeatedly recalling a thing strengthens the memory.”
**Uses for Mini Tests**

- For reviewing one or a small number of topics
- For reviewing several topics
- As a revision tool for tests / exams
- To provide a revision list
- To check feedback from previous lesson
- The Mini test format can in fact be used for more than just recall but also to help students make links between topics. Sophisticated questions requiring a deeper understanding can be asked.
Examples – students work

I did very well on this mini test but I read the wording wrong on the last question. I also learnt how to simplify algebra after the last mini test and I got it right with good working out. My working out was better and more clear but I need to read the question more clearly. I think I got a pretty high score but I still need to keep revising algebra.
Student survey on the use of Mini Tests.

July 2016
Survey Results

Please indicate your Year group by choosing one option. (69 responses)

- 7W: 36.2%
- 7G: 29%
- Year 10 (CY): 34.8%
1. We have used Mini Tests regularly throughout the year. How helpful are these for your learning?

(69 responses)

- 0 (0%)
- 2 (2.9%)
- 28 (40.6%)
- 39 (56.5%)
2 Please add any comments on how helpful Mini Tests are for your learning.
(59 responses)

- It helps you see where you are in that topic
- They are great because they force us to revise and keep our notes up to date throughout the year.
- You can use your knowledge from the lessons and apply it to questions
- They help you keep all mathematic methods in memory, like a reminder so you don't have to revise a lot
- They help consolidate my knowledge of what we have learnt and help me to identify what to work on for next time.
- They are good at giving you an overview of the areas within each topic, and you can easily establish which areas you need to work on. I like doing a mini test before each topic because it allows you to understand what information you need to know in the topic, and then when you do the end of topic test you can see how easily you have improved
- They give me an idea of how I'm doing
- They tell me what I already know and what to improve on.
- They are fun to do and help me with information.
- It depends what it's on and how fast the questions are asked
Survey Results

<table>
<thead>
<tr>
<th>Response</th>
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<tbody>
<tr>
<td>They help me understand what I need to do more work on.</td>
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<tr>
<td>They help me understand the format of questions</td>
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<tr>
<td>The question are on recent topics to ensure that we understood the topic.</td>
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<tr>
<td>Mini Tests are helpful because they help me realise what I did wrong, whereas in exams, you don't always get the answers and get to see what you did.</td>
</tr>
<tr>
<td>They refresh any old topics that we have come across</td>
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<tr>
<td>They are helpful because then I can see what I need to work on in each individual subject and what I am confident with.</td>
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<tr>
<td>They help me to find my weak spots and allow me to work on them.</td>
</tr>
<tr>
<td>They are mostly helpful but sometimes we spend most of the lesson doing them which means we can't spend time on other things like activities or work from the textbook</td>
</tr>
<tr>
<td>They help with revision as some people may think that you cannot revise maths, but you can if you were to test yourself regularly.</td>
</tr>
<tr>
<td>Mini Tests help me as they show my weaker topics and my stronger topics, so that I know what to revise.</td>
</tr>
<tr>
<td>They test my ability on subjects and if I don't understand a specific question, they can be explained.</td>
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<tr>
<td>Mini tests help you identify the areas that you need improvement on.</td>
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<tr>
<td>It helps to recall past topics, so you remember them better.</td>
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<tr>
<td>I find mini-tests really useful because they act as methods of consolidation, revision and practice. Also, being tested with a variety of questions is a good way to practice applying mathematical knowledge to the format of questions.</td>
</tr>
<tr>
<td>I learn a lot from mini tests and I find them fun.</td>
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</table>
Survey Results

They reinforce what we have already done and give us an idea of what exam questions could be like.

Doing mini tests prior to the real test allows you to see the gaps in your learning in an informal environment.

They are useful, but they’re the most effective when the questions are written down.

They refresh your memory and enforce certain methods and rules.

I like how there isn’t too much pressure on these.

It’s helpful as you know where you have to practice more and what topics you’re confident with.

It has helped me realise what I need to improve on.

They help show me what I need to improve on, and which areas of maths I should focus on more.

They are really good for personal corrections.

They help us and the teacher know what we need to relearn or go over before moving on.

It helps me to know what I need to work on in the future.

They help me to see what areas I need to focus on for the main test.

It gives me an idea if I need to improve overall on a subject.

You can then know whether you need to improve in that topic.

They help me recognize any areas I’m struggling on.

I think these are very helpful as it is like what we do in class but in test conditions and so it is useful to check what you know as well as practicing for future tests.
Survey Results

3 Do you find Mini Tests stressful? (69 responses)

- 29 (42%) not at all stressful
- 32 (46.4%) very stressful
- 7 (10.1%) moderately stressful
- 1 (1.4%) extremely stressful
4 Please add any comments on your answer to question 3. (54 responses)

Stressful if it becomes blatantly obvious that I do not understand the topic, but it is useful for that same reason (to highlight what I know/ don't know).

just the pressure for yourself to do well

No as I know they are for us to improve and don't actually go towards any grade.

it's quite hard to revise if you didn't fully understand the topic or remember the formulas

I find all tests stressful, but that's just me. They are not presented in a stressful way.

I know how helpful they are and they are a very good indicator of how much you know so it is a great way to understand what level you are at without having to go straight into a serious exam/test where the mark is recorded.

they're fine

It depends what the test is about.

When people say stuff is sooo easy at the end when we're doing the answers and I found it hard and when the questions are asked too fast.

It is on a recent topic

People sometimes accidentally (or on purpose) see your score and it's embarrassing if you get a bad score.

They are not very stressful but they can be challenging if I do not know an answer.

I know that they will not be graded or used in marking and that it is only for my use.
I don't find them stressful because they are there to help us.

I don't find them too stressful as they help me realise what I did wrong however, I do at the same time as the score is sometimes really bad.

They are mini so I do not stress that much if not at all

They are not stressful because they will help me in my learning and in my development in maths. Also I do not need to stress because I know that it will help.

I do not find them stressful at all.

They are not stressful as they aren't real exams. They just test you on things which you need to remember.

The majority of the time mini tests are not stressful at all, but the reason I picked a 2 was because the time limits between the questions are occasionally not enough.

I try to relax during a Mini Test as when I am relaxed, I think faster. Also, I have done a lot of Mini Tests so I know what's going to come up.

Since I know they aren't the real exam and are just to help my progress!

They are a little stressful because if you don't do very well on it, then it looks like you haven't understood that topic.

It's just like a class environment, so it's not stressful.
Survey Results

5 Do you think Mini Tests are helpful to see what you can recall? (69 responses)

- Not at all helpful: 1 (1.4%)
- Slightly helpful: 3 (4.3%)
- Moderate helpful: 17 (24.6%)
- Very helpful: 48 (69.6%)
it tests you on what you know or don't know

They act as a checklist where we can get a sense of what we should revise

Yes as it tells me what I can recall from less revision than I would do for a big test therefore seeing what I have taken in in class.

when we mark with colour at the end it helps me remember things easier

With mini tests you can really see what you can remember not what you think you remember.

They have helped me to recall information on some tests but sometimes, I can't recall any information and don't understand it.

Yes because I can see what I need to do more practice on.

In actual tests I find them helpful as I can look back.

These are helpful because they remind you about what you have learnt and whether you understood it.

I think they are because, when I revise, I look at my mini tests and try not to make the same mistakes.

Yes because it makes you dig deep into your knowledge and find specific techniques or methods.

I think it is helpful because they help me revising for exams.

I helps to see what needs revising.

Definitely. They remind me of the topics that I haven't revised or worked on for a while.

I will know which topic(s) to revise as I would have got that question wrong.

Definitely! They highlight what I need help with and what I'm good at.
If the questions are based on the topic you have done, but they are all varied questions within the topic, it really helps you answer all sorts of questions you may get in tests.

By answering questions in a mini-test, sometimes questions are based on previous topics. Therefore, it is very helpful to inform us on what we can work on if forgotten, and what is secure.

Sometimes I think I can do a topic but sometimes by doing a mini test I see that I need work on it.

They are quite helpful to see what you recall because they test the knowledge that you already have from learning the topic, but sometimes you need a refresher of your knowledge.

They are great.

They are very useful as they can be used to see what you need to improve on.

It helps you see what you need to focus on for your revision.

It gives you a good idea of what you need to be revising.

Yes they cover the topics in good detail.

Generally they are helpful but if I haven't revised well then it doesn't mean as much compared to it if I have revised.

It helps me find out what I need help on.

As I don't revise for these thoroughly, it tests my knowledge, and what I can remember.

You can see exactly which section you found harder.

I would not always speak out if I did not understand something.

Shows where my weakness are in Maths.

It helps me to remember points in the topic which I may have forgotten.

Because we can see what we actually know and can remember.
Survey Results

7 Do you have any preference for the format of a Mini Test? (69 responses)

- As an aural test: 60.9%
- As an aural test but with any diagrams provided on an answer sheet: 27.5%
- As a written test: 8.7%
- No particular preference: 3.1%
Survey Results

8 Please add any comments on the format of a Mini Test. (48 responses)

With a written test, you are more likely to be able to check previous questions, which I think is less stressful (not so much time pressure).

With written I can see how the question will be formatted in the future.

If you miss a question with the oral test, then it is reasonably hard to work out what was said, I find it far more beneficial when we can work at our own pace.

Sometimes when it is an aural test you can forget some parts of the question.

Definitely a written test that I can have for future to look back on but an aural test I cannot.

It is easier to write it down as you can give full working and therefore, if you get it wrong, it is clearer where it went wrong.

I like written tests because I can go at my own pace and it is more similar to what the real GCSE will be like when we have a question sheet.

If the questions are on a sheet I find it easier because I am less stressed about time.

I don't like speaking a lot so I prefer written. I can do working out too.

I think the written test should allow us a bit more time and should include us to answer the question in different ways, such as diagrams and written solutions, to give us a better insight to it and to understand the given topic.

It gives me more time to think, then an aural test.
Survey Results

I like aural tests but you can always mishear a question. Written tests are good but when i can hear someone talking or saying the question i don't stress as much because tests are normally silent.

I also think that if it is written it is easier because everything is on the sheets so i can go back if stuck.

It helps me with my timings.

Because then, you can do it as fast or as slow as you want and if you are done then you can do something else.

If it is a written test, you can answer a question in your own time efficiently instead of worrying about the teacher going onto to next question.

I can see what is in front of me and have a chance to correct if i have not heard information right.

I like orals because writing takes time.

It gets you used to exam conditions.

I don't mind which format the tests are in, because different formats provide different ways of understanding and revising (eg. visual or aural).

I like them all because in tests it is not always a written exam

Having it as a written test is helpful because it gives you as much time time as you need to answer the question, and you don't have to rush to keep up with the teacher asking the questions.

Can all of them be on a full A4 page

Paper tests are better because you can revise from it.
10 We used Mini Tests as part of our exam preparation. Did you find this a helpful revision technique?

(69 responses)
Research in 100 words

Chris Moyse
CHECK FOR UNDERSTANDING

Checking for understanding at each point can help children learn material with fewer errors. Check to see if they are all learning the new material or developing misconceptions.

Ask questions, ask them to summarise, repeat procedures, or ask them to think aloud as they work to solve problems or plan writing.

Checking has two purposes:
1) It tells you when material needs re-teaching
2) Answering questions means that children have to elaborate which strengthens links to other learning in their long-term-memory.

Guided practice, after teaching small amounts of new material, and checking for understanding, can limit the development of misconceptions.


RETRIEVAL PRACTICE

Focus on getting information out rather than just always in. Through the act of retrieval our memory is strengthened and forgetting is less likely to occur. Retrieval practice is a learning strategy, not an assessment tool, designed for improving academic performance. Encourage retrieval during learning to improve children’s understanding and retention of classroom material.

The more difficult the retrieval practice, the better it is for long-term learning. It also helps to identify gaps in learning and aids their metacognition.

For maximum effect, use frequent and varied low-stakes or no-stakes testing and practice with feedback on how the children have done.

Owensky, J., et al. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. Psychological Science in the Public Interest, 14, 4-58.

Further References

Improving Students’ Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology


What Works, What Doesn’t?

Highlighting is a Waste of Time
Further References

Learning Scientists – June 2016

Learn How To Study Using Retrieval Practice

Professor Robert Coe – June 2016

What is worth reading for teachers interested in research?
Further References

Belmont Teach

7 Recommendations to Improve Student Learning based on Pashier et al, 2007 – Organising Instruction & Study to Improve Student Learning

Professor Robert Coe – June 2016

What is worth reading for teachers interested in research?
Further References


Test-Enhanced Learning in the Classroom: Long-Term Improvements From Quizzing - 2011
Further References

“The phenomena reviewed in this chapter constitute compelling evidence that an item's state in memory is modified by its retrieval and, more importantly, that the extent of such modification is a function of the depth or level of the retrieval processes involved.”

Retrieval as a Memory Modifier: an interpretation of negative recency and related phenomena.

Robert A Bjork, 1975
Further References

This excellent piece by Tim Oates points out that our children are not over tested. He writes:

People say that we are the most assessed school system in the world. This simply is not true.

The sense of ‘most assessed’ derives not from the amount of formal testing, but its ‘high stakes’ nature...
Further References

Students often fail to distinguish between a formal, required national test, and a timed, ‘quiet’ test devised by the school. To them, it’s all testing.

Tim Oates – Cambridge Assessment Blog 2016
Colleen Young

https://twitter.com/ColleenYoung

Mathematics, Learning & Technology

Mathematics for Students
Dollops of Feedback!

The most powerful single modification that enhances achievement is feedback. The simplest prescription for improving education must be “dollops of feedback.”


I need to check that I:

- use the correct formulae, eg for area and circumference of a circle.
- understand what corresponding angles are.
- use correct vocabulary, for example ‘corresponding angles’
- use the correct order of operations, eg the meaning of $2p^2$.
- use the total frequency when calculating the mean from a frequency distribution.
- know how to measure a bearing. Check the direction and measure from the correct place.
- know the difference between the lines $x=k$ and $y=k$.
- know how to enlarge a shape about a given centre.
- can identify the shape of the cross section of a prism.
- can find the area of a triangle.
- can find the volume of a prism.
- can convert an amount in one currency to a different currency.
- can interpret data using an average and a measure of spread.

Diagrams in Mathematics

Seeing this problem on Brilliant recently reminded me how useful diagrams can be in the study of Algebra. I used the problem using Algebra (with a little colour for clarity!) as...