

TALKING POINT:

WHAT ARE THE
CHARACTERISTICS OF
EFFECTIVE FEEDBACK TO
MATHEMATICS STUDENTS?

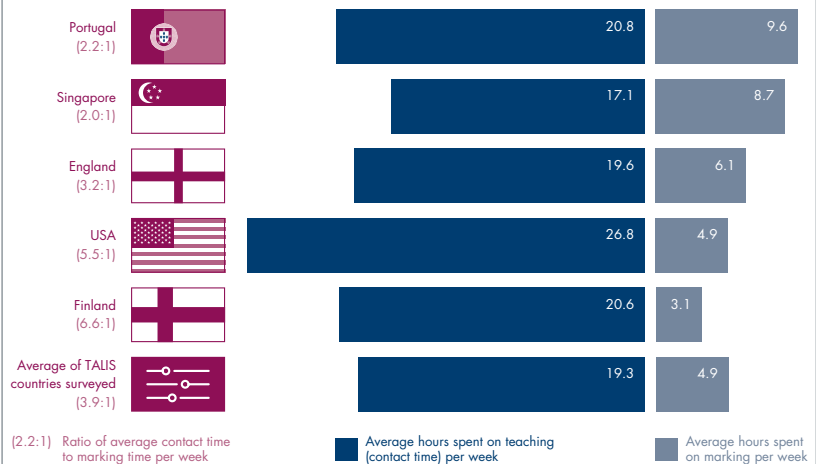
IN SUMMARY

- Feedback is important to mathematics learning but can have both negative and positive effects
- Feedback can provoke cognitive, motivational or metacognitive change
- Comparing students to themselves or against criteria is more effective than comparing them to one another
- Giving students grades only may be ineffective; specific and immediate comments about their processes are more effective
- Effective feedback gives focused information on performance against clearly defined goals
- Verbal and audio feedback can be useful alternatives to written feedback
- Peer and self-assessments can be effective, provided students have clear information
- Only marking answers as right or wrong does not help with error correction or encourage good mathematical communication
- Model answers or past student answers can be helpful

'To be effective, feedback should cause thinking to take place.'

Shirley Clarke

Average teaching contact hours (all subjects, primary and secondary combined) and marking hours by country



1

Feedback is defined as 'information provided by an agent, regarding aspects of one's performance or understanding, that reduces the discrepancy between what is understood and what is aimed to be understood'¹. It is widely regarded as a key element of formative assessment and therefore plays a crucial role in learning. However, within the large body of research on feedback there are still 'many conflicting findings and no consistent pattern of results'². It can come from a teacher, parent, book, peer or oneself¹. Feedback can have positive but also, often, negative effects on student performance^{1,3}; for example, feedback that is seen as critical or controlling may obstruct improvement⁴. Feedback functions in three main ways: cognitive (changing achievement), motivational (changing interest), and metacognitive (changing self-regulation)⁵. Making sense of pupil work and giving good feedback as to what pupils need to do next involves significant 'fundamental' subject knowledge³.

IMPLICATIONS: Feedback is an important part of formative assessment

Feedback can have positive and negative effects on learning

Feedback can change achievement, interest and self-regulation

Understanding pupil work and guiding next steps requires deep subject knowledge

'none of the teachers with whom we worked believed that their students spent as long considering teacher feedback as it had taken the teachers to provide that feedback.'

Leahy et al, 2005

2

Written feedback comparing a student's performance to a set of pre-defined criteria or to their own previous performance (*criterion reference standard* or *individual reference standard*, respectively) has a greater impact on student achievement and is more motivating than feedback comparing students with one another (*social reference standard*)⁴. Elaborated, specific and immediate written feedback is perceived as more useful than brief, general feedback^{5,6}. Process-oriented feedback (considering confidence, strengths and weaknesses of the individual student) positively affects achievement and interest compared with grade-oriented feedback (giving grades and comparisons) via perceived usefulness to students⁴. When marking student work, giving only grades to students is not supported by research as effective practice¹ and can have negative effects^{2,3}, possibly more so for lower attaining students^{7,8}. Setting specific goals and directing feedback towards them is important; giving feedback on, for example, presentation or spelling when it is not a 'critical dimension' of the goal can cause problems¹. One synthesis of mathematical marking found that 'useful comments written every two to three weeks were more useful than a mark on every piece of work'³.

IMPLICATIONS: Giving feedback relating to criteria or comparing student work to their own previous work is more effective than comparing students to one another

Students perceive immediate, specific and detailed written feedback as better than when it is delayed, general or brief

Giving grades or comparisons to students is not as effective as addressing their processes, giving grades only may be ineffective and even have negative effects

Defining a goal and providing focused feedback is important

Detailed comments on some work may be more useful than putting a mark on every piece of work

3

There are effective alternatives/complements to teachers' written feedback: recorded audio feedback is a possible alternative for a teacher to 'properly explain, motivate, and detail their critiques' and may allow for more detailed feedback in the same time frame⁹. Careful questioning in class discussion may allow teachers to check for understanding there and then, instead of 'after they have left, as is the case with grading'¹⁰. Effective feedback causes thinking; this can be done effectively by peers and students themselves as long as enough information about rubrics and possible ways to improve are provided^{11,3}.

IMPLICATIONS: Written feedback is not the only way to give feedback; verbal or audio feedback are possible alternatives

Peer and self-assessment can be effective when students have enough information to move forward

4

In mathematics, marking student answers as only right or wrong might be an easy way to provide feedback, but this doesn't help with error correction, can be demotivating³ and provides 'little incentive for students to write logical arguments, practise using notation or explain decisions'¹⁰. For older students, providing model answers for extended questions could help eliminate extended correction-writing, could model standards, and allow students to self-assess their answers⁹; teachers can also provide past student work for students to analyse to help them better understand what the success criteria look like¹¹.

IMPLICATIONS: Marking answers as only right or wrong doesn't help with error correction and developing mathematical argument

Giving students model answers or past student work to analyse against success criteria can be effective

Lucy Rycroft-Smith, 2017

REFERENCES

1 Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77, 81–112

2 Shute, V., (2008) Focus on formative feedback, *Review of Educational Research*, Vol 78, No. 1, 153–189

3 Hodgen, J. and Wiliam, D., (2006) Mathematics inside the black box: assessment for learning in the mathematics classroom, GL Assessment: London

4 Fedor, D., Davis, W., Maslyn, J. & Mathieson, K. (2001) Performance Improvement Efforts in Response to Negative Feedback: The Roles of Source Power and Recipient Self-Esteem, *Journal of Management* 27(1): 79–97

5 Harks, B., Rakoczy, K., Hattie, J., Besser, M. & Klieme, E., (2013) The Effects of Feedback on Achievement, Interest and Self-Evaluation: The Role of Feedback's Perceived Usefulness, *Educational Psychology*: Vol 34, No 3

6 Van der Kleij, F. M., Eggen, T. J. H. M., Timmers, C. F., & Veldkamp, B. P. (2012). Effects of feedback in a computer-based assessment for learning, *Computers & Education*, 58, 263–272

7 Klapp, A. (2015) Does Grading Affect Educational Attainment? A Longitudinal Study, *Assessment in Education: Principles, Policy & Practice* 22(3): 302–323

8 Lipnevich, A., & Smith, J. (2009) Effects of Differential Feedback on Students' Examination Performance, *Journal of Experimental Psychology, Applied* 15(4): 319–333

9 Weld, C. (2014) Listen to This! Utilizing Audio Recordings to Improve Instructor Feedback on Writing in Mathematics, *PRIMUM* 24(6): 513–528

10 Seaton, K., (2013) Efficacy and Efficiency in Formative Assessment: An Informed Reflection on the Value of Partial Marking, *International Journal of Mathematical Education in Science and Technology* 44: 963–971.

11 Leahy, S., Lyon, C., Thompson, M., & Wiliam, D., (2005) Classroom Assessment: Minute by Minute, Day by Day, *Assessment to Promote Learning*, Vol 63 No. 3, 19–24