PEER ASSESSMENT IN MATHS

DOES IT WORK??

Clare Wallace (Durham University)

1. Why peer assessment?
2. How we're using peer assessment in maths at Durham
3. How staff and students think it's going

Why peer assessment?

Building students' skills!

Students receive a lot less support at University, compared to A Levels (Walker, 2015).

This support drops off as they move from 1st-year to final-year.

Skills such as feedback literacy can support them to become more independent as learners, and peer assessment is an "enabling activity" for developing feedback literacy (Carless & Boud, 2018).

Personal interest: developing students' approach to mathematical writing (Topping, 1998).

The problem:

Selling mathematicians on a new type of assessment.

Why peer assessment?

Students with good feedback literacy are more likely to engage productively with the solutions we give them (and less likely to rate our feedback badly on the NSS).

Students with good mathematical writing skills will produce work that is easier to read, and to mark.

Students marking each other's work means less marking for us! (Topping, 1998).

(an) answer:

Finding a way to introduce peer assessment with minimal disruption for most lecturers.

Peer assessment in Maths at Durham

- Four courses this year:

  Calculus 1; Analysis 1;

  Analysis in Many Variables 2;

  Decision Theory 3.

- One assignment per course, per term.

- More planned!

How we set up each peer assessment

- Take (part of) an existing written Maths assignment
- Create ~3 "equivalent" versions of it.

Q1. Solve the initial value problem

$$6y'' + y' - y = 0$$

for $y(x)$, such that $y(0) = 3$, $y'(0) = 1$. 10 marks

Q1. Solve the initial value problem

$$y'' - 2y' + 10y = 0$$

for $y(x)$, such that $y(0) = 1$, $y'(0) = -5$. 10 marks

Q1. Solve the initial value problem

$$y'' - 2y' - 2y = 0$$

for $y(x)$, such that $y(0) = 0$, $y'(0) = 2\sqrt{3}$. 10 marks

How we set up each peer assessment

- Take (part of) an existing written Maths assignment
- Create ~3 "equivalent" versions of it.
- Every student submits their answers to one set of questions…
- …and then marks others' work from *different* sets of questions, so that they see all versions of the questions*

- The student's final grade is based on a combination of factors: participation, points for maths, and points for good feedback (both peer generated).

* with ~~high~~ reasonably high probability

Platforms

- Two different platforms in use at Durham this year:

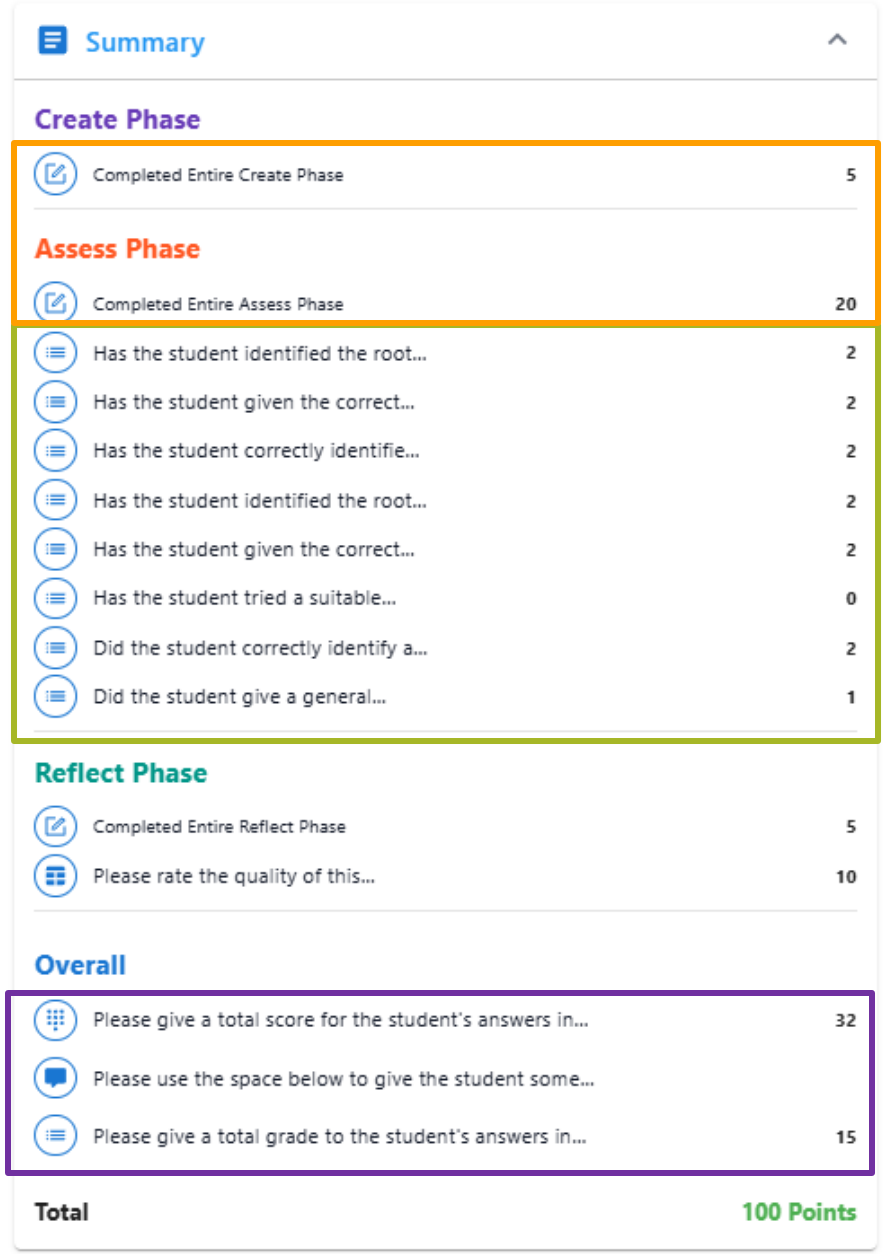




Peerscholar

- Pros: infinite customisation

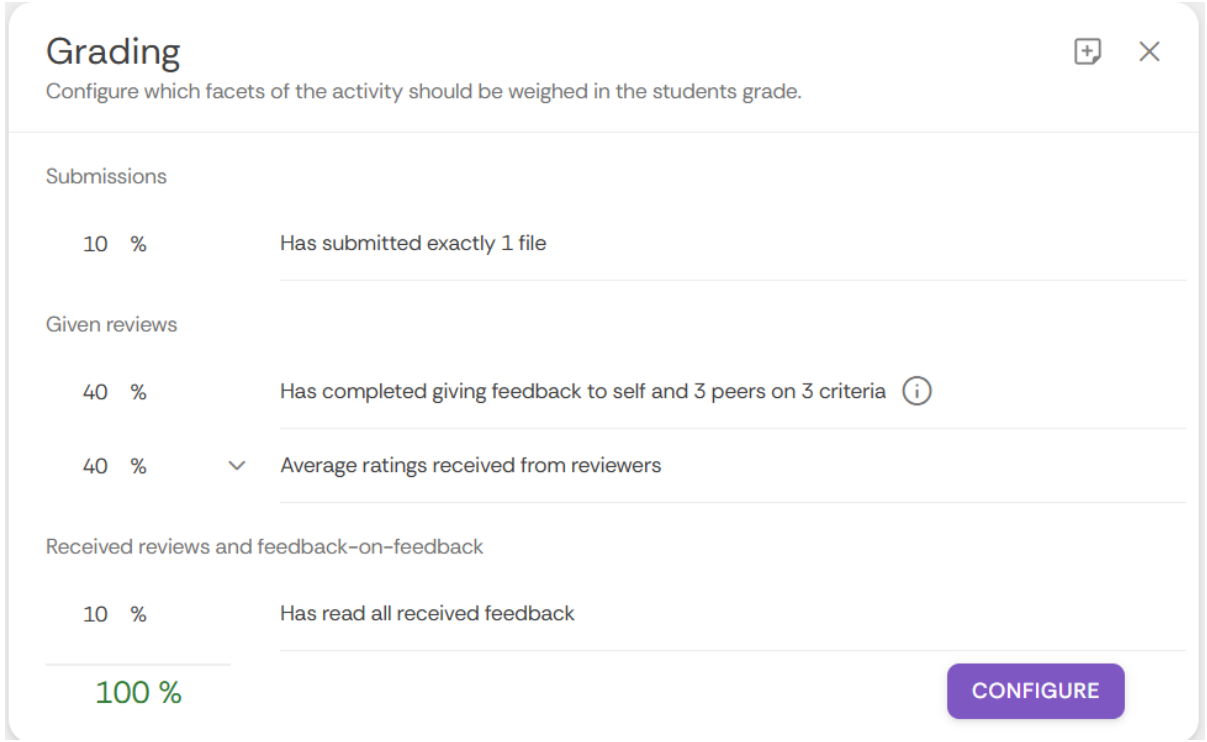
- Cons: infinite customisation



FeedbackFruits

- Pros: very easy to set up a straightforward assignment

- Cons: very difficult to customise



Factors for success

- “Equivalent” versions of the questions: you need enough variety (but not too much).

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Q1. Solve the initial value problem

$$y'' - 2y' + 10y = 0$$

for $y(x)$, such that $y(0) = 1$, $y'(0) = -5$. 10 marks

Factors for success

- "Equivalent" versions of the questions: you need enough variety (but not too much).
- A few different ways to answer the question (but not too many).
- A *really* good mark scheme: students are new to marking.

70. (a) $x_n = \frac{(-1)^n}{\sqrt{n^2+n}}$. We can do this with the Squeezing Theorem (2.8) without using COLT. Note that

$$0 \leq |x_n| = \frac{1}{\sqrt{n^2+n}} \leq \frac{1}{\sqrt{n^2}} = \frac{1}{n}.$$

Now $1/n \to 0$ as $n \to \infty$ (no reference needed for this). By the Squeezing Theorem we get $x_n \to 0$ as $n \to \infty$.

We can also use COLT, but then we also need COR (Continuity of Root). Write

$$x_n = \frac{n \cdot \frac{(-1)^n}{n}}{n \cdot \sqrt{1+\frac{1}{n}}} = \frac{\frac{(-1)^n}{n}}{\sqrt{1+\frac{1}{n}}}$$

Now use that $(-1)^n/n \to 0$ as $n \to \infty$ (by the Squeezing Theorem) and $\sqrt{1+\frac{1}{n}} \to 1$ by COR (2.14) and COLT. Another application of COLT gives $x_n \to 0$ as $n \to \infty$.

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Marking notes:

1 20 marks:
a. Correct feasible region : 2
. Fully correct PB : 2
. States Quo pt : 1
5

b. Nash pt, gamble, EDP, gamble, recommendation: all 2
→ 10

c 5

2 10 marks:
correct method set-up : 2
Strategy for R : 3
Strategy for C : 3
Value : 2
10

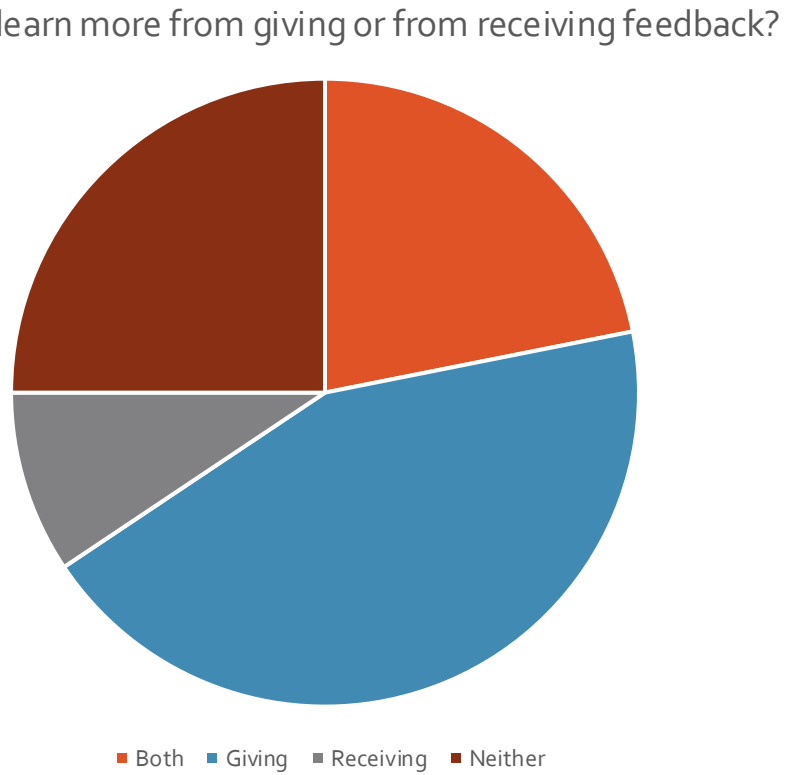
Factors for success

- "Equivalent" versions of the questions: you need enough variety (but not too much).
- A few different ways to answer the question (but not too many).
- A *really* good mark scheme: students are new to marking.
- Timing is everything! Don't just try to shove it in to your usual schedule.

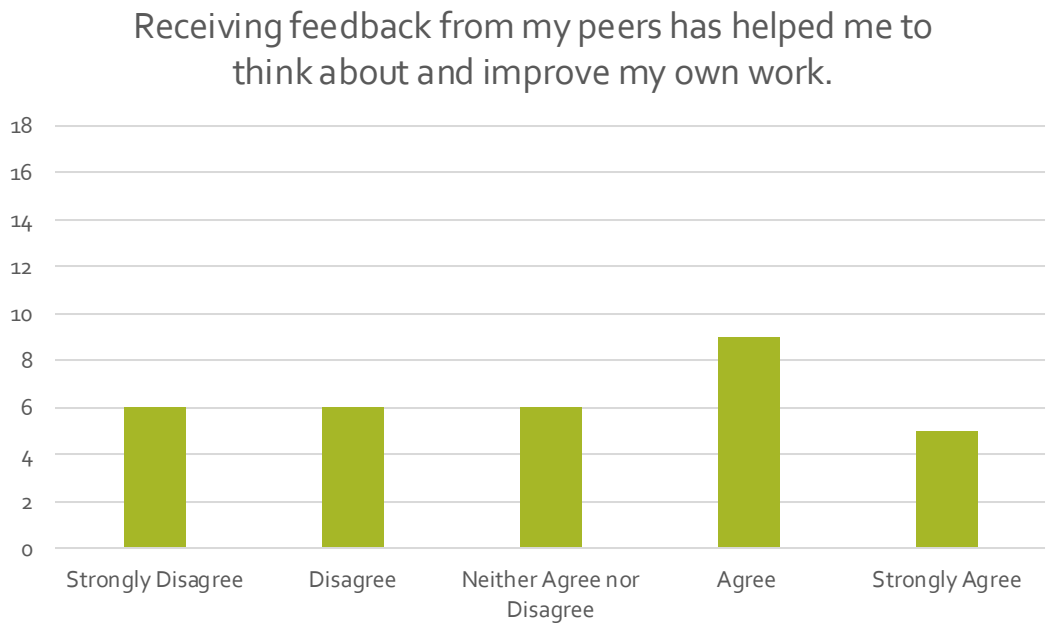
Informal feedback

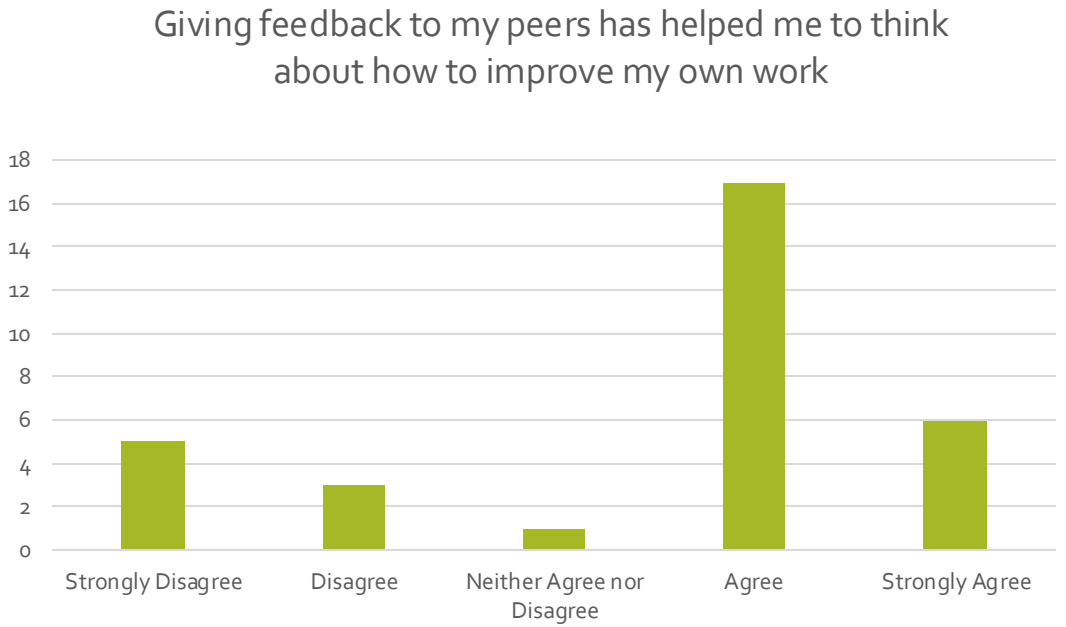
- Staff were generally keen to be involved (with some selection bias?)
- The numbers of students taking part in each peer assessment were close to the numbers submitting "normal" ones (written/e-assessments).
- Students "audibly groaned" when we told them they had another peer assessment coming up.

Student surveys



Student responses





Student responses

- Some of the most common themes from free-text:

- Students said that taking part in peer assessment made them engage more closely with the mark scheme (5/32 responses, all higher years) and that it was helpful to see different approaches to the questions (4/32).

- On the other hand, they tend to want "experts" to mark their work (9/32 responses), and to think that their peers don't understand the mark schemes (7/32 responses).

Student responses

- "Most things that were given as feedback were either potential issues that I knew I should work on (e.g. handwriting, properly spacing out work & clear signposting of what I was doing) or… errors that I realised I did when I encountered the given solutions." (1st year)

- "As of right now, peer feedback is slightly less useful than from tutors/instructors, BUT that is only because of lack of experience." (1st year)

- "Peer feedback is only going to improve the more someone does it." (1st year)

Student responses

- “peer assessment is a myth. it doesnt work in undergraduate. i just get useless flowery responses, and give even more useless flowery responses just to increase the word count, I am not conveying a constructive message. Like, its like Bob the Builder, but giving a daffodil his task, I am not constructing anything useful.” (1st year)

Conclusions

- The "3 comparable worksheets" model is working well at Durham.
- Students are willing to engage, especially if you incentivize them…
- …but you need to get the timing right, and provide really good model answers.

References

1. Carless, D., & Boud, D. (2018). The development of student feedback literacy: enabling uptake of feedback. *Assessment & Evaluation in Higher Education*, *43*(8), 1315-1325.
2. Topping, K. (1998). Peer Assessment between Students in Colleges and Universities. Review of Educational Research, 68(3), 249–276.
3. Walker, L. (2015). Enabling students to become independent learners. *Transitions in undergraduate mathematics education*, 71-84.