Using online marking platforms to train TAs on how to give effective formative feedback

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Context

- Large first year courses (> 400 students) at the University of Toronto
- Emphasis on mathematical communication and proof writing
- Markers with different backgrounds and level of experience

Before Crowdmark

Traditional approach to TA training on feedback

1. Initial training
2. Provide detailed marking scheme
3. Hope for the best

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Concerns

- Is marking consistent?
- Is feedback helpful?
- Do marks and feedback align with course writing goals?

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- Is marking consistent?
- Is feedback helpful?
- Do marks and feedback align with course writing goals?

Very difficult to check!

Crowdmark

Crowdmark $\rightsquigarrow$ easy to oversee marking process

[1] Henderson et al. Grading student problem solutions: The challenge of sending a consistent message, Am. J. Phys.72, 164 (2004).
Henderson et al., Grading Practices and Considerations of Graduate Students at the Beginning of their Teaching Assignment, 2014 PERC Proceedings

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Discoveries

- Marking is often inconsistent
- Marking didn't align with course writing goals [1]
- Many comments are not helpful

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Not helpful feedback

1. Does Span $\left\{\begin{bmatrix}1\\0\\1\\0\end{bmatrix}, \begin{bmatrix}1\\1\\1\\1\end{bmatrix}, \begin{bmatrix}0\\1\\1\\1\end{bmatrix}\right\}$ = Span $\left\{\begin{bmatrix}1\\0\\1\\0\end{bmatrix}, \begin{bmatrix}0\\1\\0\\1\end{bmatrix}, \begin{bmatrix}2\\3\\2\\3\end{bmatrix}\right\}$?

Denote the vectors in in the first set by $\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3$, and the vectors in the second set $\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3$

Firstly, $\mathbf{v}_1 = \mathbf{u}_1$

Secondly, $\mathbf{v}_2 = \mathbf{u}_1 + \mathbf{u}_3$.

nope

However, no combination of $\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3$ equals $\mathbf{v}_3$. This is because the 1's in $\mathbf{u}_1$ correspond only to 2's in $\mathbf{u}_3$ and the 1's in $\mathbf{u}_2$ correspond to 3's in $\mathbf{u}_3$. It is therefore impossible to eliminate only the top value from any of the vectors.

There is a more efficient way to check linear dependency.

Thus, $\text{Span}\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\} \neq \text{Span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$

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Switch u's and v's.

Firstly, $\mathbf{v}_1 = \mathbf{u}_1$.

Unnecessary steps

Secondly, $\mathbf{v}_2 = \mathbf{u}_1 + \mathbf{u}_3$.

However, no combination of $\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3$ equals $\mathbf{v}_3$. This is because the 1's in $\mathbf{u}_1$ correspond only to 2's in $\mathbf{u}_3$ and the 1's in $\mathbf{u}_2$ correspond to 3's in $\mathbf{u}_3$. It is therefore impossible to eliminate only the top value from any of the vectors.

Better to show with a matrix.

Thus, $\text{Span}\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\} \neq \text{Span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$

Helpful feedback

Q1 1

1. Does Span $\left\{\begin{bmatrix}1\\0\\1\\0\end{bmatrix}, \begin{bmatrix}1\\1\\1\\1\end{bmatrix}, \begin{bmatrix}0\\1\\1\\1\end{bmatrix}\right\} = \text{Span}\left\{\begin{bmatrix}1\\0\\1\\0\end{bmatrix}, \begin{bmatrix}0\\1\\0\\1\end{bmatrix}, \begin{bmatrix}2\\3\\2\\3\end{bmatrix}\right\}$?

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Firstly, $\mathbf{v}_1 = \mathbf{u}_1$.

Secondly, $\mathbf{v}_2 = \mathbf{u}_1 + \mathbf{u}_3$.

Yes, but why? Try to find an linear comb. and when you can't --> done.

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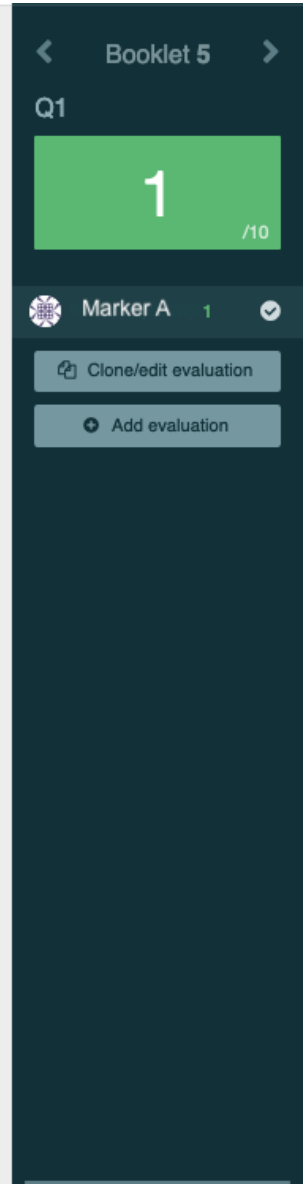
Thus, $\text{Span}\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\} \neq \text{Span}\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$

This is not a "proof". Try to turn "correspond to" into mathematical equations.



Traditional approach to TA training is insufficient when it comes to providing feedback on students' writing!

Our solution: marking supervision as continuous training [2]

1. Initial training on feedback and how to use Crowdmark
2. Provide detailed marking scheme/benchmarking session
3. Ask TAs to mark 20 papers and wait until they get our feedback
4. Give TAs detailed feedback on their feedback
5. If marking is good, continue. If not, fix issues and do another round (of 20)
6. Perform random checks to ensure consistency

[2] work with Alfonso Gracia-Saz

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Key points:

- Provide **constant support** during marking process
- **Use TAs' input** to adjust marking guidelines
- Work with markers to create a **shared comment library**

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Benefits and Challenges

Potential Challenges

- Time consuming
- Some TAs might not like feeling watched

Potential Benefits

- Improve consistency
- Quality of feedback improves
- Comments and marks align with course goals
- Prevents you from having TAs overworking
- Better and more confident markers

Thank you!