

E-assessment for the Jinan University –  
University of Birmingham joint institute:  
From content development to assignment re-grading

John Christopher Meyer  
j.c.meyer@bham.ac.uk

Robert Leek  
r.leek@bham.ac.uk



UNIVERSITY OF  
BIRMINGHAM

暨南大学伯明翰大学联合学院

30th June 2020

# People involved

- Jonathan Watkins (EPS Ed Tech Team Leader)
- John Christopher Meyer (Deputy Jinan Lead)
- Robert Leek (Director of CAA for the J-BJI)
- All other academic *flying faculty* staff
- UG interns

Our Teaching Staff at J-BJI 伯大在暨伯师资



Figure: Some of our undergraduate interns

## People involved

- Jonathan Watkins (EPS Ed Tech Team Leader)
- John Christopher Meyer (Deputy Jinan Lead)
- Robert Leek (Director of CAA for the J-BJI)
- All other academic *flying faculty* staff
- UG interns



Figure: Some of our undergraduate interns

# CAA at the J-BJI

We use Möbius.<sup>1</sup> [2]

1. 2017/18.

- Y1  $\approx$  100 students.
- 80 credits used CAA for **summative** continuous assessment.
- (Y1) 16 45-minute class tests + intro assessments.

2. 2018/19.

- Y1/Y2  $\approx$  200/100 students respectively.
- 160 credits used CAA for **summative** continuous assessment.
- (Y1) 16 open book take home assessments.
- (Y2) 16 45-minute class tests + intro assessments.

3. 2019/20.

- Y1/Y2/Y3  $\approx$  210/200/80 students respectively.
- 240 credits use CAA for **summative** continuous assessment.
- (Y1) 16 open book take home assessments.
- (Y2) 16 open book take home assessments.
- (Y3) 16 45-minute class tests (due to COVID-19 became open book take home assessments).

---

<sup>1</sup>The SoM also uses STACK.

## Typical\* CAA cycle

Month	Tasks
Jul	Content creation / development
Aug	Content creation / development
Sep	Test course-ware + setup courses + run assessments
Oct	Run assessments
Nov	Run assessments + hire interns
Dec	Run assessments + content creation / development
Jan	Content creation / development
Feb	Test course-ware
Mar	Run assessments
Apr	Run assessments
May	Run assessments + hire interns
Jun	Run assessments + hire interns

## Content creation / development

1. Interns are hired and trained. [4, 5]
2. Module leads write questions.
3. UG interns code + test questions.
4. Module leads check + test questions.
5. Module leads approve questions for use in their assessments.

## Running assessments

- Module leads setup assessments.
- Ad-hoc ongoing support (all aspects) provided by the Director of CAA for the J-BJI.
- Re-grading of assessments shared amongst the lecturing team.

# CAA design

We try to stick to the following principles:

- Avoid multiple-choice questions where possible.
- Favour 'natural' input from students. Don't make students learn ancillary syntax.
- Give (a few) randomised versions of each question, ensuring they are roughly of comparable difficulty. This can be non-trivial.

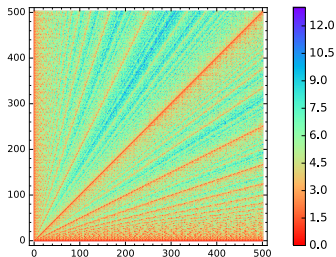


Figure: Euclidean algorithm running time [1]



## CAA design

- Avoid conflating the assessment of different skills.

### Example

How many marks should this student receive?

Give the second-order Taylor series expansion of  $\exp(x)$  about the

point  $x = 1$ :  $\underline{1 + \frac{e}{2}x^2}$

Did the student:

- calculate the expansion about  $x = 0$  instead, in which case only the constant term is correct?
- calculate the expansion about  $x = 1$  but miscalculate the constant term? In which case, did the student forget to (*explicitly*) give the linear term?

Note the correct answer is  $e + e(x-1) + \frac{e}{2}(x-1)^2 = \frac{e}{2} + \frac{e}{2}x^2$ .

# Re-grading

Whilst Möbius automates the grading process, we still need to check the marks for:

- misunderstood syntax,
- edge cases, and
- bugs in grading code.

Count	Question Index	Student Answer	Correct Answer	Raw Response	Mark
1	0	{2}	{2, 4, G}		✗ 0/1
1	1	{2,3}	{2, 4, 5, G, J, a, b}		✗ 0/1
1	2	{2,3,4}	{a, b}		✗ 0/1
1	3	{4,a}	{2}		✗ 0/1
1	0	{3, L}	{3, L}		✗ 0.01/1
1	1	{1, 2, 3, L, V, a}	{1, 2, 3, L, V, a}		✗ 0.01/1
1	2	{2, 3, V, a}	{a}		✗ 0.01/1
1	3	{something wrong}	{3}		✗ 0.01/1
1	0	{1,2,V}	{1, 2, V}		✓ 1/1
1	1	{1,2,5,L,V,4,a}	{1, 2, 4, 5, L, V, a}		✓ 1/1
1	2	{4,a}	{4, a}		✓ 1/1
1	3	{2}	{2}		✓ 1/1
2	4	{4,a}	{4, a}		✓ 1/1
1	4	{a,b}	{a, b}		✓ 1/1






Figure: Example output of regrader script

## Recommendations for CAA systems

Here are some of our recommendations for Möbius and other CAA systems:

- Provide holistic marking (e.g. linked response areas) and allow classification of student responses prior to assigning marks. [3]
- Internationalise your system: “【 1 , 2 , 3 】” is not recognised due to fullwidth characters and lenticular brackets.
- Support multiple 'natural' input methods across all mathematics.
- Designed from the ground-up with assessment and learning in mind. For example, asking for a diagonalisation  $\mathbf{A} = \mathbf{PDP}^{-1}$  is not possible in Möbius whilst satisfying our design principles.

## References

-  **Dearjean13.** *Euclidean Algorithm Running Time*. May 2016. URL: [https://commons.wikimedia.org/wiki/File:Euclidean\\_Algorithm\\_Running\\_Time.svg](https://commons.wikimedia.org/wiki/File:Euclidean_Algorithm_Running_Time.svg).
-  **DigitalEd.** *Custom Content Leads to College-wide Adoption of Möbius*. URL: <https://www.digitaled.com/resources/casestudies/mobius-assessment-adopted-college-wide>.
-  **David Fisher.** *Review of Maple T.A.* Nov. 2004. URL: <http://icse.xyz/mathstore/headocs/44mapleta.pdf>.
-  **2017 intern team.** *Maple TA 2017*. URL: <https://mapletabham2017.wordpress.com/>.
-  **2018 intern team.** *Maple TA 2018*. URL: <https://mapletabham2018.wordpress.com/>.