

Basic skills: test, work, learn?

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1/9

Mathematical doom and gloom

- We enrol many very poorly prepared students.
- The mathematics background of students is getting worse.
- High failure rates.

“The latest TIMSS report shows that students in Australia make very little—if any—progress in maths from Year 4 to Year 8.”

Dan Conifer, ABC News, 30 Nov 2016.

We are below Kazakhstan.

The consequences?

The first-year attrition rate used in the TEQSA study is defined as:

$$\text{First-year attrition rate} = \frac{R1 - R2 - R3}{R1} \times 100$$

where R1= Commencing students (headcount) in year x (cohort A)

R2= Cohort A continuing students (headcount) in year x + 1

and R3= Completing students (headcount) in year x (cohort A).

2/9

Students really are getting worse at maths

NSW HSC mathematics participation by highest level Cohort:
ATAR eligible students

Year	No maths	Elementary MIS/MIP General	Intermediate 2 Unit Mathematics	Advanced 3 Unit Ext 1	Advanced 4 Unit Ext 2
1992	1037 1.8%	20726 36.6%	20406 36.2%	9891 17.5%	4345 7.7%
2012	8665 15.8%	26999 49.2%	10357 18.9%	5390 9.8%	3436 6.3%

Nicholas & Rylands. HSC mathematics choices and consequences for students coming to university without adequate maths preparation. *Reflections*, 40(1):2–7, 2015.

3/9

Inadequate mathematics preparation for university

Of domestic students enrolled in subjects supported by MESH workshops in 2016 (mostly first-year maths/stats),

50.5% had no HSC mathematics,

a further *15%* had HSC general mathematics.

So *65.5% of our first-year students are not prepared for their mathematics and statistics studies.*

We find that many of our students lack very basic mathematical skills.

Students need to have basic skills before moving on. Maths is cumulative.

4/9

A first-year subject

- What does one do with 70 first-year first-semester students when many are mathematically under-prepared?
- It takes time to become proficient in addition and subtraction, fractions, ... and I have only one semester.
- Students will study what they expect to find in assessments.
 - If the test is on calculus, those who study will study calculus, even if they can't add and subtract.
- An attempt at a solution: a basic skills test in which students must score at least 80%. **Else they fail the subject.**
- Six attempts across the semester.
 - With support workshops to build skills.
- A sample test, self marked, before the first test is run.

5/9

The test (no calculators)

- Find $-6 + 4 \times -5 - 3$.
- Find $\frac{2}{3} + \frac{3}{5}$.
- Round 27.48281 to 3 significant figures.
- Write $\frac{11}{20}$ as a percentage.
- Find $6.32 \div 100$.
- Find 4% of \$6000?
- Find $\frac{3}{8} \times 1\frac{1}{3}$.
- Arrange the following in ascending order (smallest to largest) 0.702, 0.072, 0.72, 0.0702.
- Change 24.59 metres into centimetres.
- Write 0.000483 in scientific notation.
- Simplify $5x - 3w - 7x + 8w$.
- Simplify $3x \times 2xy$.
- Expand and simplify $3(a + 4) + 4a$.
- A photograph has length 24 cm and width 16 cm. It is to be enlarged so that its length becomes 36 cm. What will be the width?

6/9

Results

The first attempt:

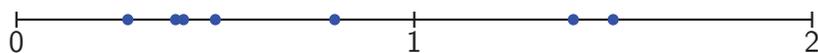
- 56% did not reach the threshold.
- Almost a quarter of students
 - could not change a simple measurement from m into cm,
 - could not find 4% of \$6000,
 - could not divide an integer by 100;
- Over a quarter could not add 2 simple fractions;
- Over a third could not simplify $-6 + 4 \times -5 - 3$;

After a few attempts:

Some do not know where the decimal point goes in 17.

Fifth test, attempted by eight students:

Mark on the number line where $\frac{2}{5}$ should be.



7/9

Results

- Of the 61 students who were still enrolled at the end of semester
All attempted the test at least once.
- Attempt 1: 28/60 reached the threshold.
- 11 had not reached the threshold by the end of semester.
That's 18%.
- 50 eventually reached the threshold. Of these, 7 failed (4 by missing the exam).
- A noticeable number of students spent time working on basic skills. Not all of these made it, but they did improve.
- "I would also like to thank you for your effort this semester, I feel as if I have learned something (finally) although there is still a ways to go." [unsolicited email]

Was the test useful?

- It did improve the basic skills of some.
- Those who didn't reach the threshold failed anyway.

8/9

Recommendation

If you want students to spend time learning basics, working, doing something they find difficult, it's got to be worth marks.

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Better still, make it

a matter of pass/fail.

To keep students working all semester, or until they have gained (enough of) the required skills, give them opportunities to demonstrate their skills

throughout the semester.