



Institiúid Teicneolaíochta Chorcaí
Cork Institute of Technology



Transitioning to E-Assessment in Maths Education (www.teame.ie)



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Project funded by the National Forum for the Enhancement of Teaching and Learning in Higher Education

Cork Institute of Technology

- ▶ 12,000 students
- ▶ 1,425 staff members
- ▶ 824 academic staff
- ▶ 18-20 lecture hours per week
- ▶ Continuous assessment
- ▶ No help with correcting



Me



Calculus Bootcamp

- ▶ MSOR Conference in Coventry 2013
- ▶ Bridging Maths January 2014
- ▶ 2 Week Calculus Course
- ▶ Daily Assessment
- ▶ Increasing Numbers

Using Numbas as an Engagement Tool for First Year Business Studies Students

Introduction to Numbas
Numbas in Cork
Themes Emerging
Feedback from Lecturers, Tutors and Students
Implementation in CIT

Introduction to Numbas

- ▶ Online e-assessment maths tool.
- ▶ Open-source system developed by Newcastle University.
- ▶ Run entirely in the browser.
- ▶ Global Community of practice. (And local)
- ▶ Questions can be fully randomised.
- ▶ Answers to questions can be mathematical expressions.
- ▶ Images, videos, interactive graphs, geogebra easily added.

Website: <http://www.numbas.org.uk/>

Editor: <https://numbas.mathcentre.ac.uk/>

Features of Questions

- ▶ Question Types supported
 - ▶ Number entry
 - ▶ Text entry - match set pattern
 - ▶ JME - enter mathematical expression
 - ▶ Multiple choice - choose one from a list, several from a list, or grid of choices
- ▶ All question types can be randomised.
- ▶ Easy input
- ▶ Graphs
- ▶ Interactive (geogebra)
- ▶ Adaptive marking
- ▶ Hints
- ▶ Advice
- ▶ Resources
- ▶ Can tailor.

Features of Exams

- ▶ Allow user to regenerate questions?
- ▶ Can set time limit (or not)
- ▶ Show current score
- ▶ Show maximum score
- ▶ Show answer state
- ▶ Allow reveal answer
- ▶ Can shuffle questions
- ▶ Can pick a subset of questions at random from a set.
- ▶ Can do printable versions (as many as you like with answers)

Example

Website: <http://www.numbas.org.uk/>
Editor: <https://numbas.mathcentre.ac.uk/>

The screenshot shows a web browser window with the URL <https://numbas.mathcentre.ac.uk/numbas-previews/exam-12181-ratio-proportion/index.html>. The page title is "NUMBAS" and the subject is "Ratio & Proportion".

Question List:

Question	Marks
Question 1	8 marks.
Question 2	9 marks.
Question 3	6 marks.
Question 4	9 marks.
Question 5	8 marks.
Question 6	1 mark.
Question 7	4 marks.
Total	0/45

Question 1: Solve the following ratio questions:

a) Express the ratio 28 : 77 in its simplest form.

:

Show steps (Your score will not be affected.) 2 marks.

b) In a class there are 20 boys and 15 girls. Find the ratio of boys to girls in the class in its simplest form.

boys : girls

If the whole year group of 210 students is in the same ratio, how many girls are there in the year?

Show steps (Your score will not be affected.) 3 marks.

c) Express $\frac{1}{8} : \frac{5}{8} : \frac{7}{16}$ as a ratio in whole numbers.

: :

Show steps (Your score will not be affected.) 3 marks.

Navigation: Submit all parts (8 marks), Try another question like this one, Reveal answers

Taskbar: Start, Internet Explorer, Firefox, VLC, Chrome, PowerPoint, Excel

Formative Assessment Features

Show steps *(Your score will not be affected.)*

Express $\frac{1}{6} : \frac{5}{8} : \frac{7}{16}$ as a ratio in whole numbers.

 : :

Show steps *(Your score will not be affected.)*

Submit all parts

8 marks.

Try another question like this one

Reveal answers



Uses of Numbas in Cork (in CIT and UCC)

- Tutorial tool (CIT)
- In class assessment tool (CIT)
- At home assessment tool (UCC)
- Supportive tool (CIT & UCC)
- Prerequisites tool (CIT & UCC)

Numbas as a tutorial tool

- ▶ Tutorial = A Numbas “exam”
- ▶ Each student works at their own pace
- ▶ Students can help each other but ...
- ▶ Students like the green tick
- ▶ “students are more likely to try again than in traditional pen and paper tutorials.” Lecturer
- ▶ Try another question of this type
- ▶ Build confidence
- ▶ Can see at a quick glance how students are getting on
- ▶ Efficient use of your time - helps identify weakness

Can see how student is getting on with a quick glance - quickly and easily identify who needs help

The screenshot shows a web browser window with the URL <https://numbas.mathcentre.ac.uk/numbas-previews/exam-12181-ratio-proportion>. The page title is "Ratio & Proportion". The main heading is "NUMBAS" and the sub-heading is "Ratio & Proportion".

On the left side, there is a table of questions:

Question	Marks
Question 1	8 marks.
Question 2	9 marks.
Question 3	6 marks.
Question 4	9 marks.
Question 5	8 marks.
Question 6	1 mark.
Question 7	4 marks.
Total	0/45

At the bottom of the left sidebar are buttons for "Pause" and "End Exam".

The main content area shows the following questions:

Solve the following ratio questions:

a) Express the ratio 28 : 77 in its simplest form.

:

Show steps (Your score will not be affected.)

b) In a class there are 20 boys and 15 girls. Find the ratio of boys to girls.

boys : girls

If the whole year group of 210 students is in the same ratio, how many boys are there?

Show steps (Your score will not be affected.)

First Year Business Studies

Low attendance and low engagement.

“Not always an uplifting experience”

- Tutorial
- Assessment at end
- Blackboard
- Instant feedback
- No corrections for tutor/lecturer
- Issue with 1% of results
- Adaptive Release on Blackboard

No. of	459
No. of tutors	7
No. of	3
No. of	21
No. of groups	25

Proof in Maths v Proof in Education

Quantitative Data

- Survey of Tutors/lecturer

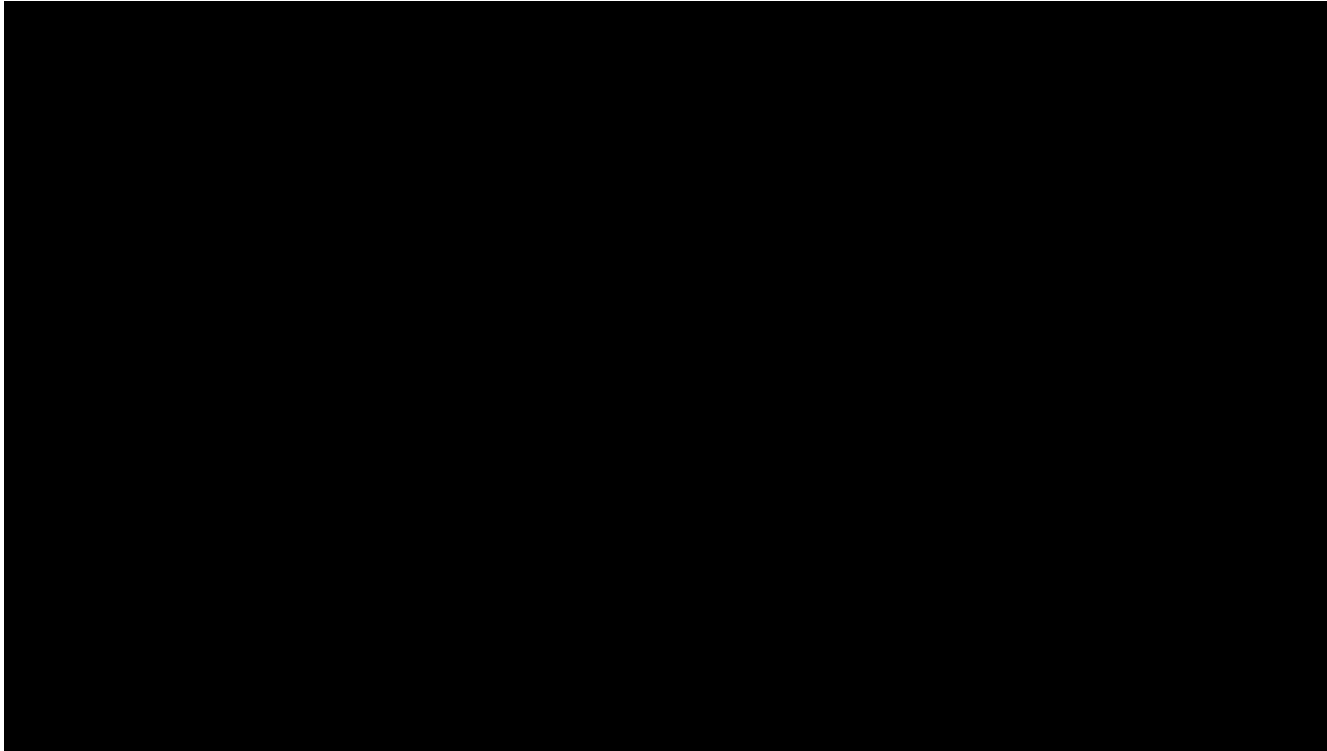
Qualitative Data

- Survey of Tutors/lecturer

Themes

- Student Engagement
- Enjoyment
- Attendance
- Lecturer workload
- Numbas system
- Usability
- Academic Performance
- E-assessment Implementation

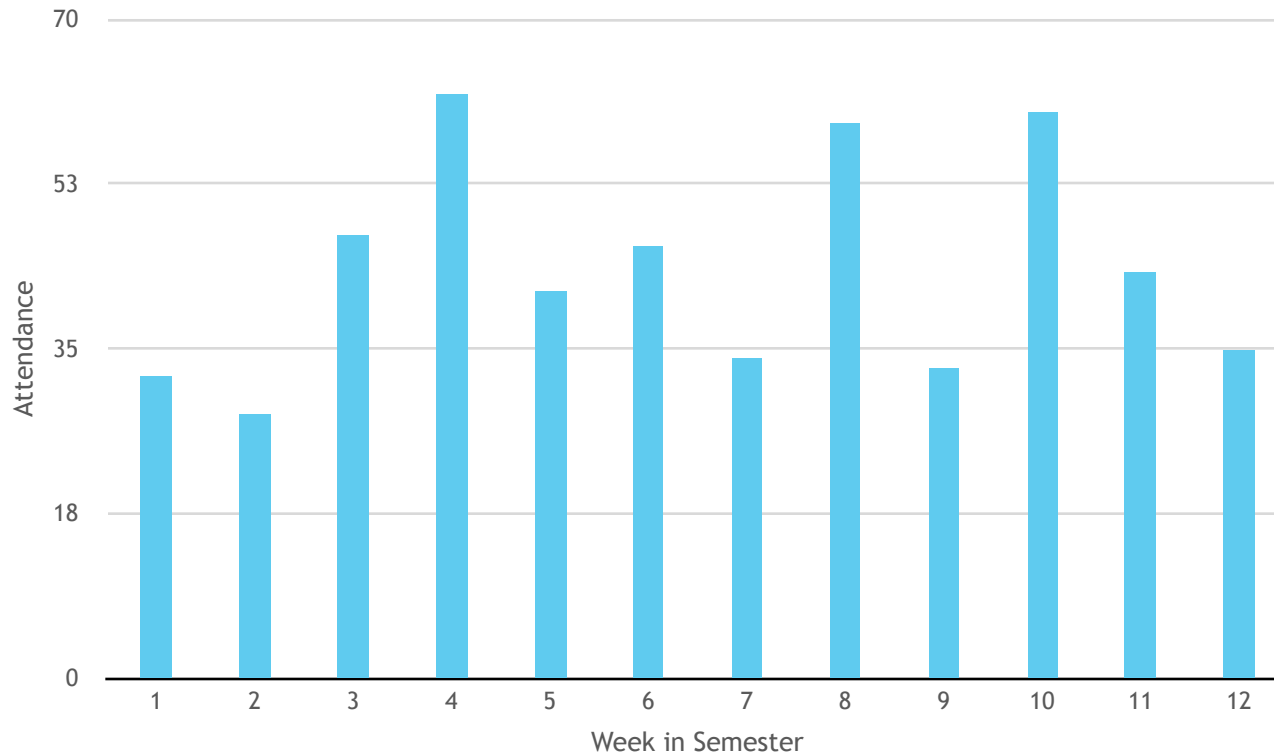
Lecturer's views



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Attendance

Tutorial attendance (4 tutorial groups) MATH6051 Semester 1 Acad
2015/16



Ignore Weeks 1,2 and 12 due to Tutor change and missing data.

Attendance

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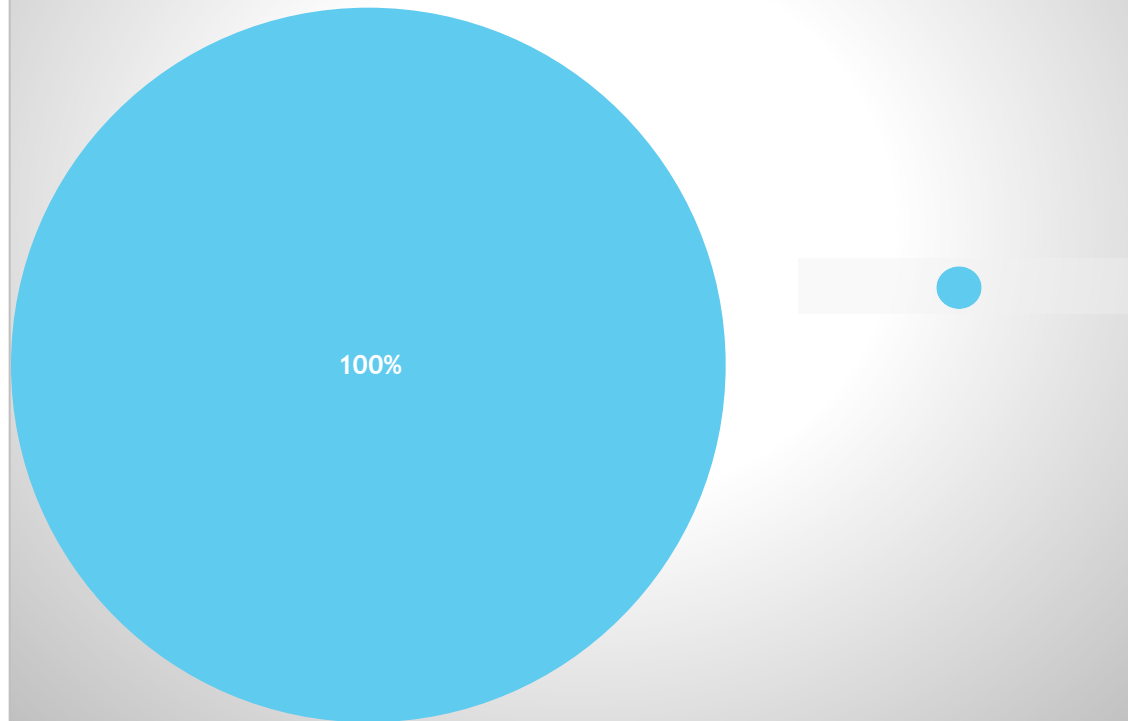
Attendance

Lecturer Comments

- “When
(pen and

Stude

Do you feel that Numbas Assessments have allowed you to enjoy maths more in college?(CIT)



These are the results of an online survey emailed to all first year Business Studies students at the end of Semester 1 Academic Year 2015/16. There were 83 responses.

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More Enjoyment (Yes 64%)

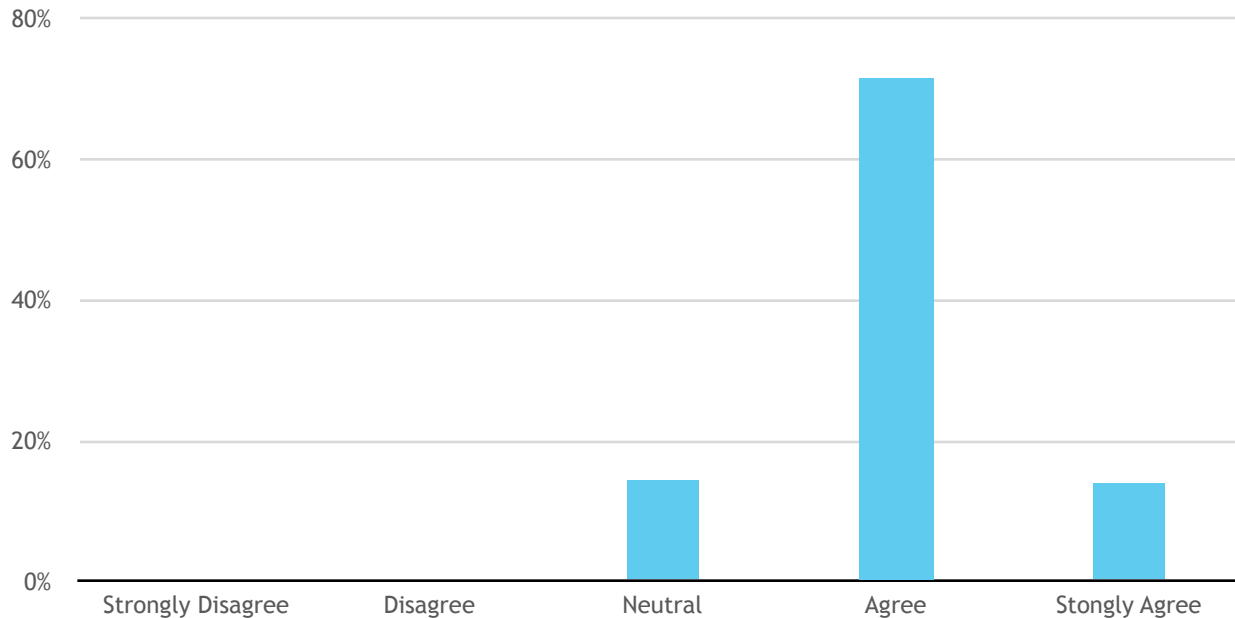
- ▶ “A bit yes I'll never enjoy maths but Numbas really helps.”
- ▶ “I do feel that you get constructive feedback on your work. Computerised mathematics opens up more visual and interactive learning.”
- ▶ “It is defiantly more enjoyable than normal maths.”
- ▶ “Yes because it is easier to study small bits and pieces then big bits”
- ▶ “Yes it's a change to listening to a lecturer all day and gives you the opportunity to work on maths.”
- ▶ “Yes, definitely. It is something I really didn't mind practising at home in my own time.”
- ▶ “Yes, it was a new way of learning maths then before and it's much easier.”
- ▶ “Yes, you are more engaged with assessments than versus a class and it is more enjoyable”
- ▶ “Yes. The interactive section of Numbas helped me to enjoy maths more in college. I looked forward to practicing my Numbas at home in preparation for Numbas assessments.”

More Enjoyment (No 31%)

- ▶ Definitely not
- ▶ No I hate maths full stop
- ▶ no. under too much time pressure when completing assessments. an extra 5 minutes is necessary per exam
- ▶ Not at all I find it quite draining
- ▶ no because they do not offer solutions with answers. only steps to find the answers

Student Experience - Engagement

"Numbas has changed the manner in which students engage with maths in college." Lecturer/tutor Perspective



Student Experience - Engagement

Lecturer
comments on
Student
Engagement

Academic: Formative Assessment

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Academic: Formative Assessment

Project funded by the National Forum for the Enhancement of Teaching and Learning in Higher Education

Academic: Student Understanding

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Academic: Student Understanding

Some student
comments on
Student
Understandin

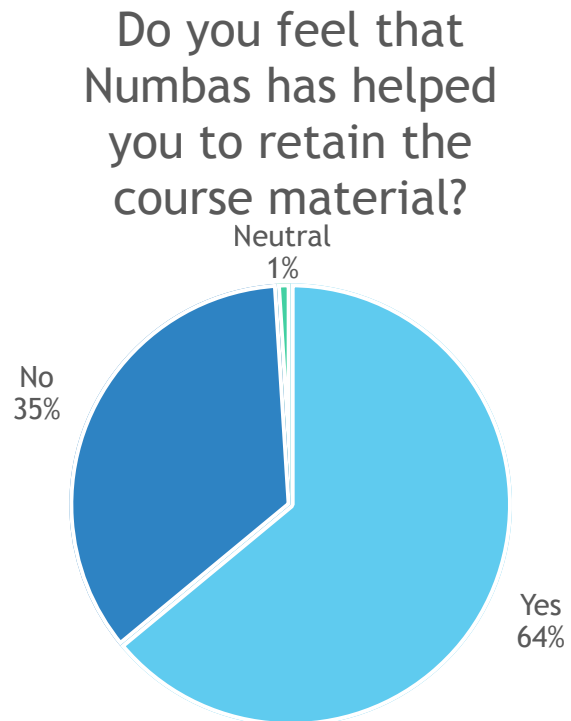
Academic: Student Understanding

Project funded by the National Forum for the Enhancement of Teaching and Learning in
Higher Education

Academic: Student Understanding

Some
lecturer/
tutor
comments on

Academic: Retention of material



Academic: Retention of material

Retain
material, Yes

- Yes,
because

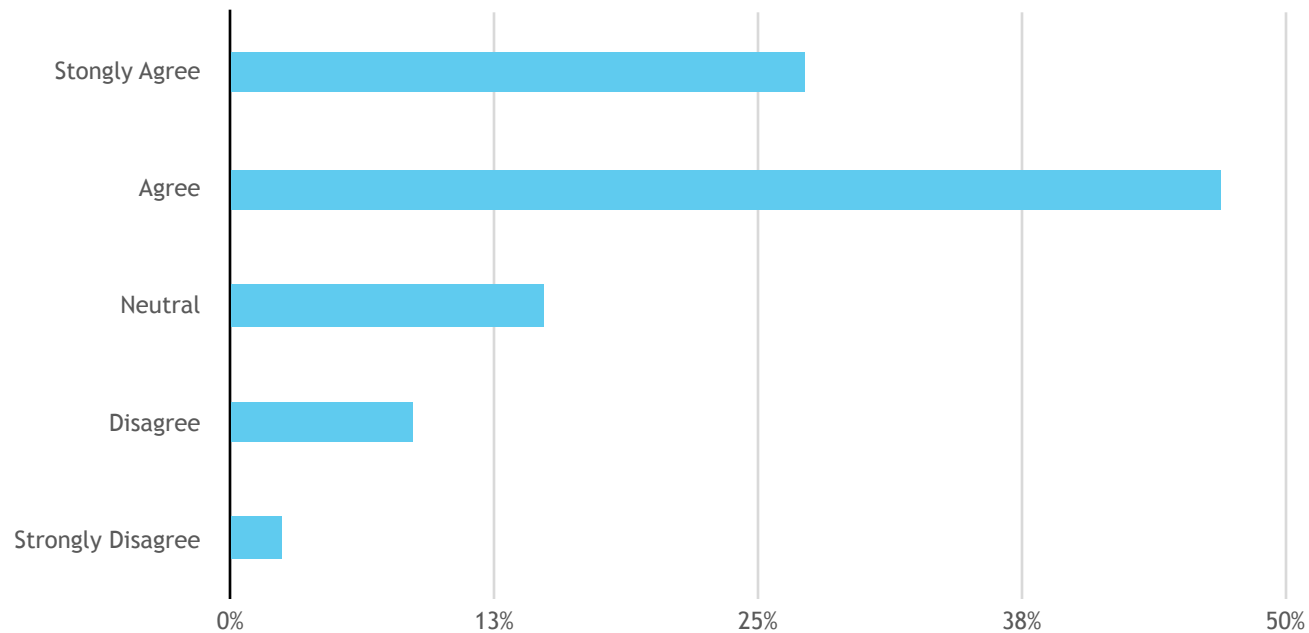
Academic: Retention of material

Retain
material, No

- no, i prefer
written

Usability - Student Perspective

The Numbas system is straightforward for me, as a student, to use. - Student Perspective



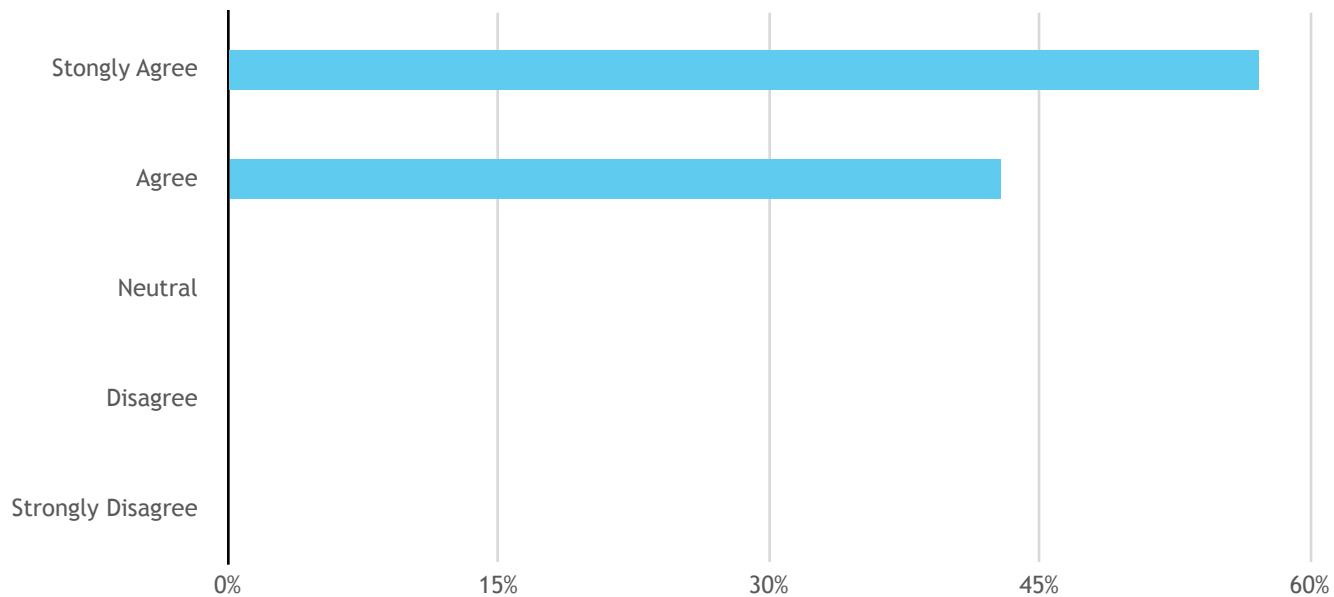
Usability - Student Perspective

Some Student comments on Usability

- "Much

Usability - Lecturer/tutor Perspective

The numbas system is straightforward for me, as a lecturer or tutor, to use.

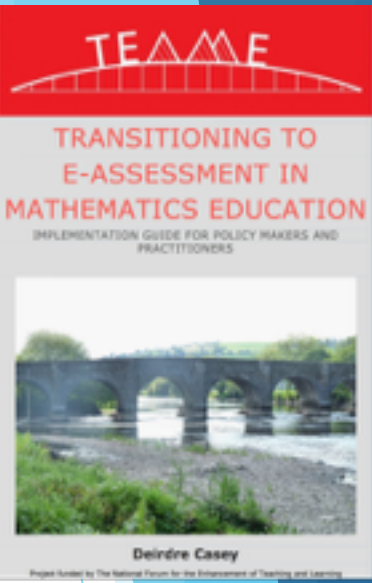
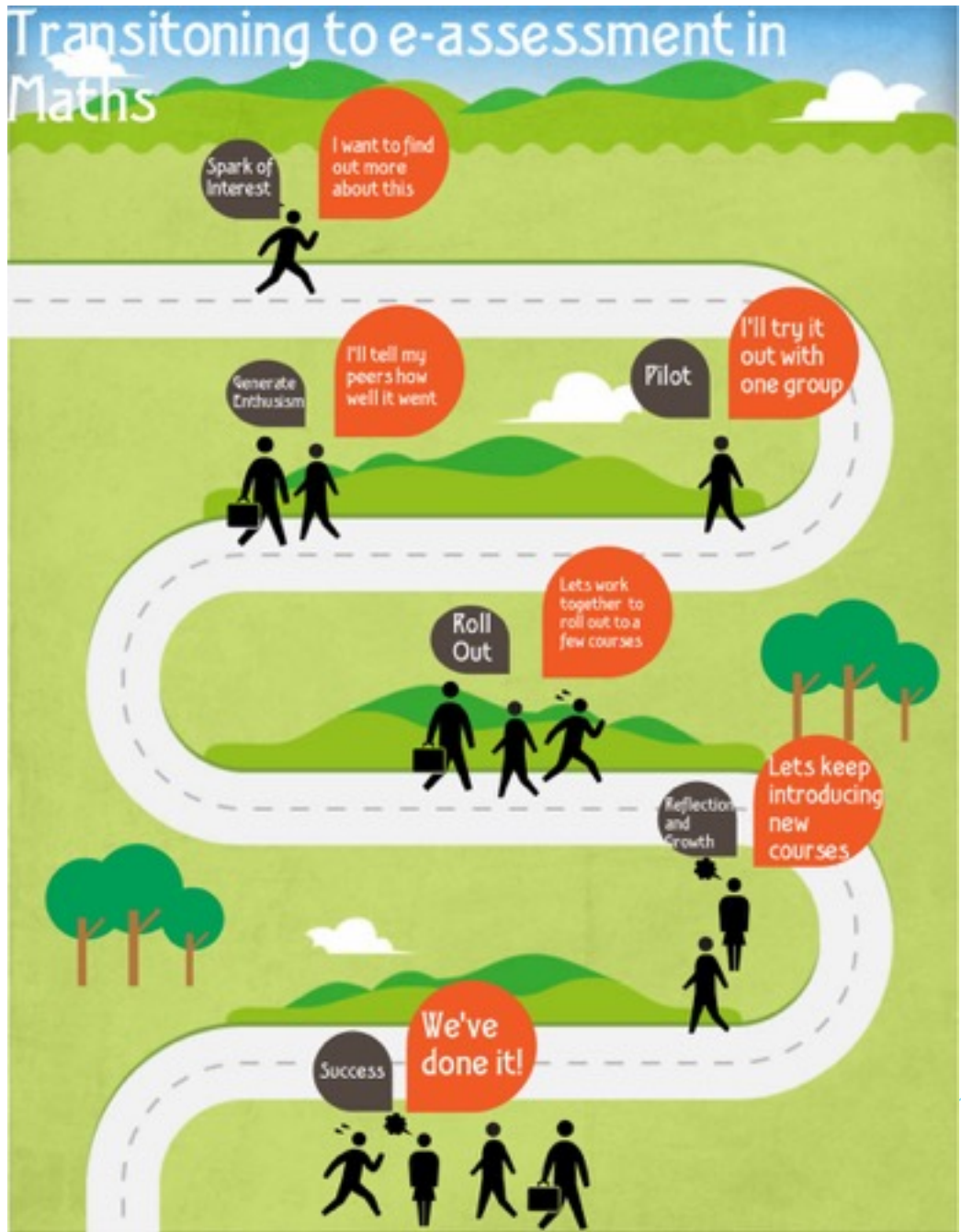


Usability - Lecturer/tutor Perspective

Some
Lecturer/
Tutor
comments on

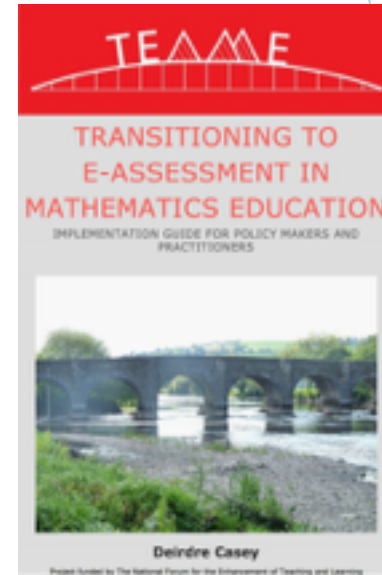
Themes

- Student Engagement
- Enjoyment
- Attendance
- Lecturer workload
- Numbas system
- Usability
- Academic Performance
- E-assessment Implementation



Implementation guide

- ▶ Level 1 Click and play
- ▶ Level 2: Use a test (Upload to a LMS)
- ▶ Level 3: Customise a test
- ▶ Level 4: Develop a test

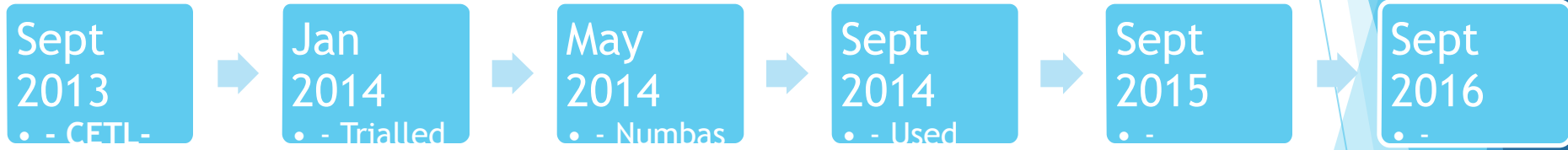


Note: Excellent tutorials and documentation on creating Numbas questions and exams on the Numbas website <https://numbas.mathcentre.ac.uk/>

Implementation in CIT

- ▶ Process for 1st year business studies students: (x lecturers, y tutors, z students, w groups in p rooms at r times)
- ▶ Made up “tutorials” (some questions made up already, some new ones)
- ▶ Released to coordinator(lecturers)
- ▶ Changes made as necessary
- ▶ Coordinator of module creates groups
- ▶ Created groups on blackboard
- ▶ Students need to be reminded to have paper in front of them when doing questions.
- ▶ Note you can try again. Get answer wrong and then it says you are wrong but doesn't automatically give you the right answer.
- ▶ Hints, Advice, try again- doesn't automatically tell you right answer if you are wrong, Try another one like this.

Numbas Timeline CIT



Continued for first year Business Studies

- - First year science course (500 students) as a support tool

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Useful links and contacts

Numbas

Website: <http://www.numbas.org.uk/>

Editor: <https://numbas.mathcentre.ac.uk/>

Twitter: @NclNumbas

TEAME

Web: www.teame.ie

Twitter: @TEAMENUMBAS

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Thank you!