

Teaching and Learning Mathematics and Statistics online? What lessons can we take away?

Rachel Hilliam – The Open University

22 January 2021, Warwick Teaching Forum



The Open
University

Outline

In this presentation I'll give an overview of some of the resources that the mathematics and statistics community have shared through TALMO workshops and share some initial feedback on the resources.

I will show you how my students at the OU use (or fail to use) different resources and where it might be wise to direct limited staff resource. We will discuss how this might be different in different institutions.

Finally, we will discuss whether there are aspects of online learning that we might want to incorporate into our teaching provision when we return to a predominantly face to face environment.

What aspects are important for us and for students when designing a module?

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- Spine of the module
- Ways of dealing with 'difficult' topics (threshold concepts)
- Assessment (both formative and summative)
- Interaction
- Modelling/statistics software/group work

Spine of the module

Spine of the module

- Lectures
- Printed notes
- Videos (length?)
- Links to other material?

Threshold concepts

Threshold concepts

- Exercise sheets
- Quizzes
- Computer animations
- Videos
- Discussion forum
- Tutorials

Assessment

Assessment

- Exams f2f
- Online exams, time allowed
- Continuous assessment
- Quizzes
- Projects
- Reports
- Presentations

Interaction

Interaction

- Lectures?
- Tutorials
- Polling
- Office hours
- Discussion forum
- Online tutorials (chat, breakout rooms)
- Peer interaction (online?)
- More than just the module material!

Modelling

Modelling

- Computer labs
- Online computer labs? R Notebooks, Jupyter Notebooks, Application sharing
- Group work
 - Setting up groups
 - Discussion/wiki
 - Sharing work

What's missing?

What's missing?

- Pastoral support
- Module choice advice
- Additional support
- Careers
- Interaction between years

Some online resources TALMO

VIDEO SOFTWARE AND RECORDING

- * [Katie Chicot's TALMO talk on video recording](#) Includes ideas for hardware to use
- * [Pros and Cons of different video software](#) Crowdsourced info from Talking Maths in Public
- * [How to use OBS A How-To Guide](#) from Julia Goedecke and Andy Tonks on Open Broadcaster Software
- * [Producing high quality media whilst working remotely](#) FutureLearn guide to recording
- * [Tips for setting up remote lessons](#) Grant Sanderson ([3Blue1Brown on YouTube](#)) recently gave some live lectures. This is how he did it.
- * [James Sumner's Video Guide to setting up video](#)
- * [OBS for Teaching Part 1](#) and [OBS for Teaching Part 2](#) Two videos from James Sumner on using OBS

Some online resources TALMO

ONLINE WHITEBOARD TOOLS

Much of this list is taken from the [Talking Maths in Public](#) document on [making events interactive](#).

- * [Sharing mathematical writing – using video](#) Blog post from [George Kinnear](#)
- * [Writing on the screen -- how to do mathematics without paper](#) Blog post by [Ben Parker](#)
- * [Awwapp](#)
- * [Classkick](#)
- * [Google Jamboard](#)
- * [Ideaboardz](#)
- * [Microsoft Teams Whiteboard](#)
- * [Miro](#)
- * [Padlet](#)
- * [Repl.it](#)
- * [Whiteboard.fi](#)

Some online resources TALMO

POLLING

Again, this list is mostly taken from [Talking Maths in Public](#) document on [making events interactive](#).

- * Acadly
- * Blackboard collaborate
- * Feedbackr
- * Glisser
- * Google Forms
- * ItemPool
- * Kahoot
- * Mentimeter
- * Microsoft Forms Math Quiz
- * Moodle See items 6-10
- * Numbas
- * Pingo
- * Polls Everywhere
- * Slido
- * Socrative
- * Top Hat
- * Turning Point
- * Vevox
- * Zoom

Some online resources TALMO

E-ASSESSMENT

Numbas

- * [Numbas](#) Good for random questions in assessment and is client-side based so doesn't suffer so much from student internet problems.
- * [A page on how Numbas can help during Covid-19 Crisis](#)

STACK

- * [STACK](#) Package for online assessment.
- * [STACK Videos on TALMO YouTube Channel](#)

Möbius

- * [Digital Ed](#) Information on Möbius

Gradescope

- * [Gradescope](#)

General Theory

- * [EAMS 2016 programme, recordings and slides](#) E-assessment in the Mathematical Sciences conference
- * [EAMS 2018 programme, recordings and slides](#) E-assessment in the Mathematical Sciences conference
- * [Proceedings of EAMS2016](#)
- * [Proceedings of EAMS 2020](#)
- * [Practical Online Assessment of Mathematical Proof](#) Robert Bickerton, Chris Sangwin

Some online resources TALMO

EXAMINATIONS

- * [Mathematics take away open book assessment](#)
- * [Modifying closed-book exams for use as open-book exams](#) Advice from Toby Bailey, George Kinnear, Steven O'Hagan and Chris Sangwin at the School of Mathematics, University of Edinburgh.
- * [An investigation of assessment and feedback practices in fully asynchronous online undergraduate mathematics courses](#) Trenholm et al, (2015) *IJMEST* (Currently open access)
- * [Maths Exams in a Time of Disruption](#), page 22 of Gazette of the Australian Mathematical Society, Volume 47 Number 2: May 2020 K.A. Seaton, La Trobe University
- * [Assessing Mathematics at University: Covid-19 and Beyond](#) Paola Iannone, LMS Newsletter September 2020, p34

INTERACTIVE

- * [Sue Pawley talk for TALMO and follow up](#)
- * [GeoGebra](#) Free online math tools for graphing, geometry, 3D, and more
- * [GeoGebra Notes](#) Learn how to use GeoGebra Notes, see also [Tutorial](#)
- * [Desmos](#)
- * [Wolfram Demonstrations](#)
- * [Discord](#) Online chat facility for interactive sessions

Some online resources TALMO

ONLINE ACCESSIBILITY

- * [LMS Mathematics and Accessibility](#) How to make your material more accessible.
- * [Emma Cliffe talk for TALMO](#)
- * [Chris Hughes talk for TALMO](#)
- * [Using LaTeXML to convert your latex files to accessible html](#) by Andy Tonks and Julia Goedecke. [An example is here](#). Note that the videos had to be embedded by hand rather than automatically.

PREPARING THE NEW STUDENT INTAKE

Bit of an A Level bias here. We'd welcome other resources.

- * [Support during school and college closures](#) AMSP resources for A Level Students -- Might be useful for 2020/21 HE intake
- * [Videos to support A Level for 2020/21 intake](#) From Paul Glaister
- * [Study Tips for incoming students at Loughborough University](#) Blog posts from Lara Alcock
- * [Integral](#) Support from MEI to help undergraduates with A Level and AS level material

MISCELLANEOUS

- * [Latex.css](#) A CSS style sheet that makes HTML look like Latex. Could be useful to help consistency between online and printed documents

My experience M140

- Introducing statistics, M140 Level 1 module
- 700 students per presentation (twice a year)
- About half on non-maths/stats quals
- About 50% in full time work
- Over 20% have less than A-level equiv

The core



Current weeks | All weeks | EXPAND ALL

You last viewed: Minitab and Computer Book dataset installation instructions in Computer resources

Week	Topic	Progress
WEEK 1	Starting M140 3-9 October	0 of 1 completed
WEEK 2	Book 1 Unit 1: Looking for patterns 10-16 October	0 of 14 completed
WEEK 3	Unit 1 (continued) 17-23 October	0 of 3 completed
WEEK 4	Book 1 Unit 2: Prices 24-30 October	0 of 6 completed
WEEK 5	Unit 2 (continued) 31 October - 6 November	0 of 3 completed
WEEK 6	Book 1 Unit 3: Earnings 7-13 November	0 of 6 completed
WEEK 7	Unit 3 (continued) 14-20 November	0 of 4 completed
WEEK 8	Book 2 Unit 4: Surveys 21-27 November	0 of 7 completed
WEEK 9	Unit 4 (continued) 28 November - 4 December	0 of 5 completed
WEEK 10	Book 2 Unit 5: Relationships 5-11 December	0 of 6 completed
WEEK 11	Unit 5 (continued) 12-18 December	0 of 3 completed
BREAK	19-25 December	
BREAK	26 December - 1 January	

News

Last chance - close 20th Dec
Posted: 15 Dec 2020

Hi All

Just a few days left to have your say about the TMA feedback that you receive.

If you have ...

6 mins to give your views?
Posted: 8 Dec 2020
Carol Cavers

Hello all

Many thanks to the many of you that have already completed the questionnaire.

I am Carol...

[View all >](#)

View as

Student

Mathematics & Statistics news

More or less - new series starting 13th January
Posted: 18 Dec 2020

New OUBBC Series: More or Less

Start...

[View all >](#)

Recent activity

- Cafe
- M140 Materials for Online tutorial (cluster) Room tutorials
- M140 Online tutor group forum
- Module discussion
- Revision

OU Anywhere

Your app shows this website because you have a role on it.

Ways of dealing with tricky topics – screencasts (short videos)

Screencast 5: The sign test 1

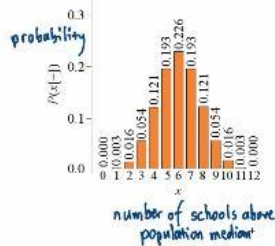


'Median truancy rate in large secondary schools in East of England is 0.98'

Truancy rates in 12 large schools in the East of England

0.83	1.09	1.84	1.88	1.52	2.78	0.31	1.06	2.90	1.19	1.44	0.82
------	------	------	------	------	------	------	------	------	------	------	------

3 schools below hypothesised median
9 schools above hypothesised median
Is this reasonable if median = 0.98?

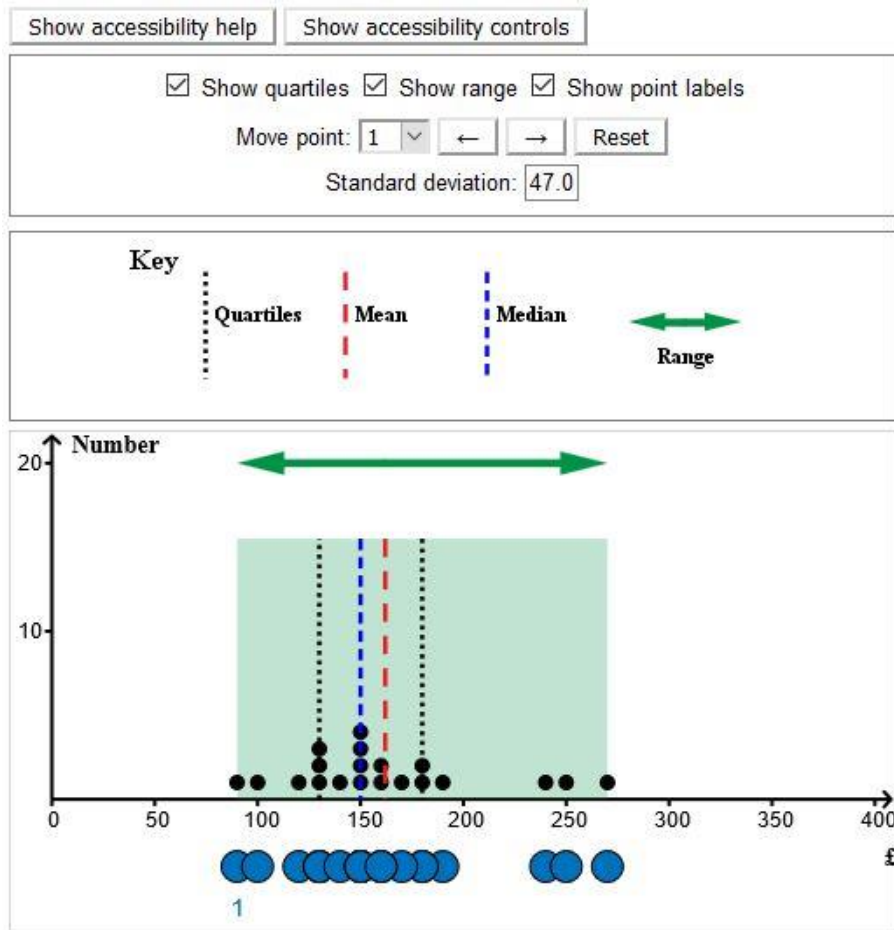


02:13 / 08:53

Transcript CC Settings

<https://learn2.open.ac.uk/mod/oucontent/view.php?id=1643945§ion=5>



Ways of dealing with tricky topics – computer animations



<https://learn2.open.ac.uk/mod/oucontent/view.php?id=1643883>

Ways of dealing with tricky topics – practice quizzes

Question 7 Tries remaining: 3

Marked out of 1.00 |  Flag question |  Edit question

Suppose that currently the consumer prices index (CPI) is 321.5 and that at the same time last year it was 305.0.

If an index-linked pension was £1132 per month this time last year, calculate how much it should be per month now. (Give your answer to the nearest pound. Do NOT include the '£' sign. Assume the pension is index linked using the CPI.)


Answer:

Check

<https://learn2.open.ac.uk/mod/quiz/attempt.php?attempt=4389968&cmid=1643909&page=7>

Ways of dealing with tricky topics – practice quizzes

Question 7 Tries remaining: 2

Marked out of 1.00 |  Flag question

Suppose that currently the consumer prices index (CPI) is 370.9 and that at the same time last year it was 363.7.

If an index-linked pension was £673 per month this time last year, calculate how much it should be per month now. (Give your answer to the nearest pound. Do NOT include the '£' sign. Assume the pension is index linked using the CPI.)

Answer:


Your answer is incorrect.

See Example 24 and Activity 24, Subsection 5.3

[Try again](#)

Ways of dealing with tricky topics – practice quizzes

Question 7 Tries remaining: 1

Marked out of 1.00 |  Flag question

Suppose that currently the consumer prices index (CPI) is 370.9 and that at the same time last year it was 363.7.

If an index-linked pension was £673 per month this time last year, calculate how much it should be per month now. (Give your answer to the nearest pound. Do NOT include the '£' sign. Assume the pension is index linked using the CPI.)

Answer:

Your answer is incorrect.

The value of an index linked pension is known at date A. Then the value of an index linked pension at date B, linked using the CPI, is given by


$$\text{value of pension at date A} \times \frac{\text{value of CPI at date B}}{\text{value of CPI at date A}}$$

See Example 24 and Activity 24, Subsection 5.3

[Try again](#)

Ways of dealing with tricky topics – practice quizzes

Question 7 Incorrect

Mark 0.00 out of 1.00 |  Flag question

Suppose that currently the consumer prices index (CPI) is 370.9 and that at the same time last year it was 363.7.

If an index-linked pension was £673 per month this time last year, calculate how much it should be per month now. (Give your answer to the nearest pound. Do NOT include the '£' sign. Assume the pension is index linked using the CPI.)

Answer: 

Your answer is incorrect.

The pension (in £) now should be

$$673 \times \frac{\text{CPI now}}{\text{CPI last year}} = 673 \times \frac{370.9}{363.7} = 686.323068463 \simeq 686.$$

See Example 24 and Activity 24, Subsection 5.3

Assessment

- 4 pieces of written work
- 3 iCMA
- Final assessment

Interaction - Tutorials

Events Index

Search

Filter Events

- Slide Changes
- Chat Messages
- Camera

RHilliam [0:00:00]

M140 unit 1 and Adobe connect intro.pptx

Round to three significant figures

a) 6.5895

b) 4.3215

c) 0.006582

d) 52361.5

Attendees (34)

Active Speakers

Hosts (1)

Rachel

Presenters (0)

Participants (33)

- Andrew 2
- Candice 2
- Cheryl
- Clair
- David
- David 4
- Doa
- Esther
- Fiona
- Gabrielle
- Hannah
- Hannah 2
- Hazel
- Jay 3
- Jim
- Jonathan

Chat 4 (Everyone)

David: the show off with straight line and arrow? :P

Nicola 3: why are the zeros in a decimal number not significant?

Nicola 3: that's not what i mean. why aren't the zeros after the decimal place significant when they place the other digits?

Nicola 3: but those zeroes after the decimal place are really important but not significant?

David: I think the bottom if you rounded to 2 x dp then it would read 0.00 so no value

Nicola 3: thank you!

Doa: 64.59, 6.89, 0.02, 0.8

Rachel: 0.80

Type your answer

Type your answer

Type your answer here...

Answers (25)

- 6.59
- 6.59
- 0.590
- 6.590
- 6.590
- 6.59

0:29:33/1:26:55

Interaction – Tutorials (application sharing)

Unit 1 and introduction - Rachel Hilliam - Adobe Connect

Events Index

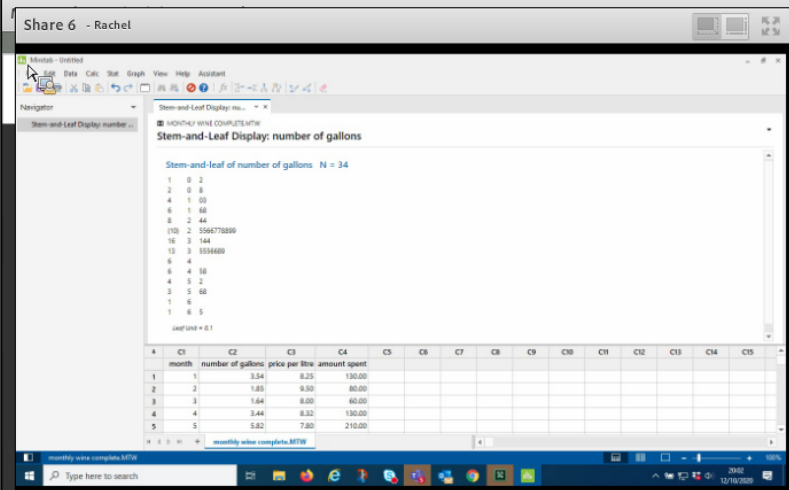
Search

Filter Events

- Slide Changes
- Chat Messages
- Camera

RHilliam [0:00:00]

Share 6 - Rachel



Stem-and-Leaf Display: number of gallons

Stem-and-leaf of number of gallons. N = 34

```

1 0 2
2 0 8
4 1 88
6 1 88
8 2 88
10 2 556778889
16 3 144
18 3 5594889
6 4
6 4 18
4 4 2
3 5 88
1 6
1 6 5
LAMP:LNK = 8.1
    
```

month	number of gallons	price per litre	amount spent
1	1	1.54	1.54
2	2	1.85	3.70
3	3	1.64	4.92
4	4	2.44	9.76
5	5	5.82	29.10

Attendees (34)

Active Speakers

Hosts (1)

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Presenters (0)

Participants (33)

- Andrew 7
- Candice 2
- Cheryl
- Clair
- David
- David 4
- Doa
- Esther
- Fiona
- Gabrielle
- Hannah
- Hannah 2
- Hazel
- Jay 3
- Jim
- Jonathan

Chat 4 (Everyone)

Martin 2: yes

Sarah 2: yes

Roisin: Yes

Esther: no

David: it does until it goes back down!

David: haha, That would do it!

Jonathan 2: is it like a runninh

Jonathan 2: running total?

Nicola 3: it's a counter

Nicola 3: median?

Using this the final column is the calculated amount I've spent on wine in that month. Fill in the missing values

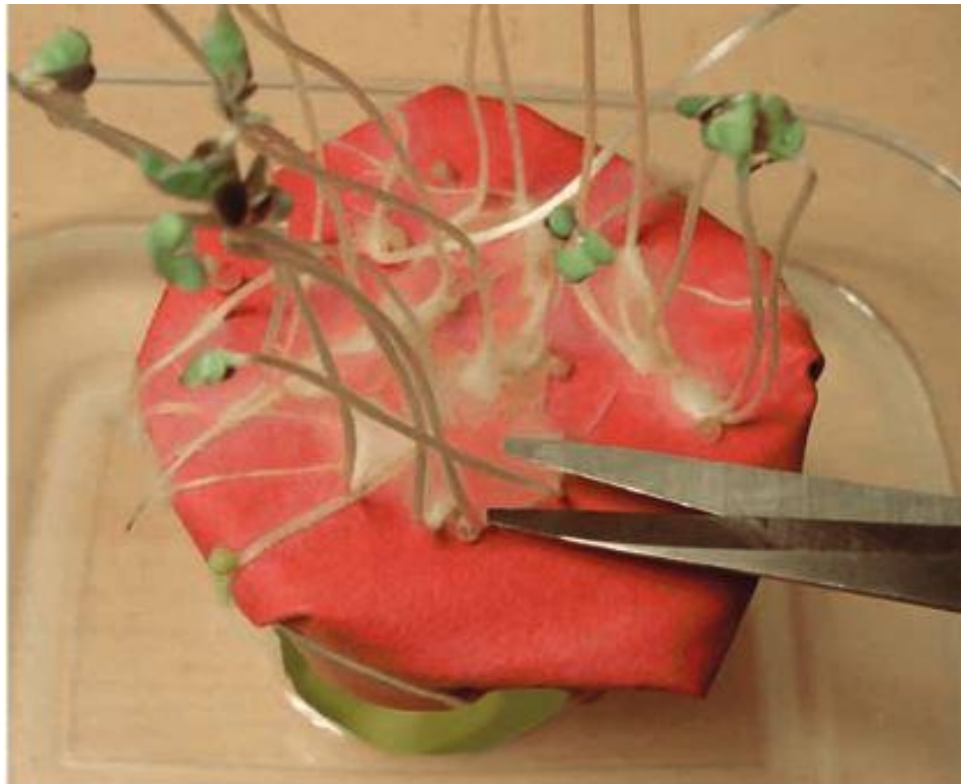
Using the data in the last 26

0:59:04/1:26:55

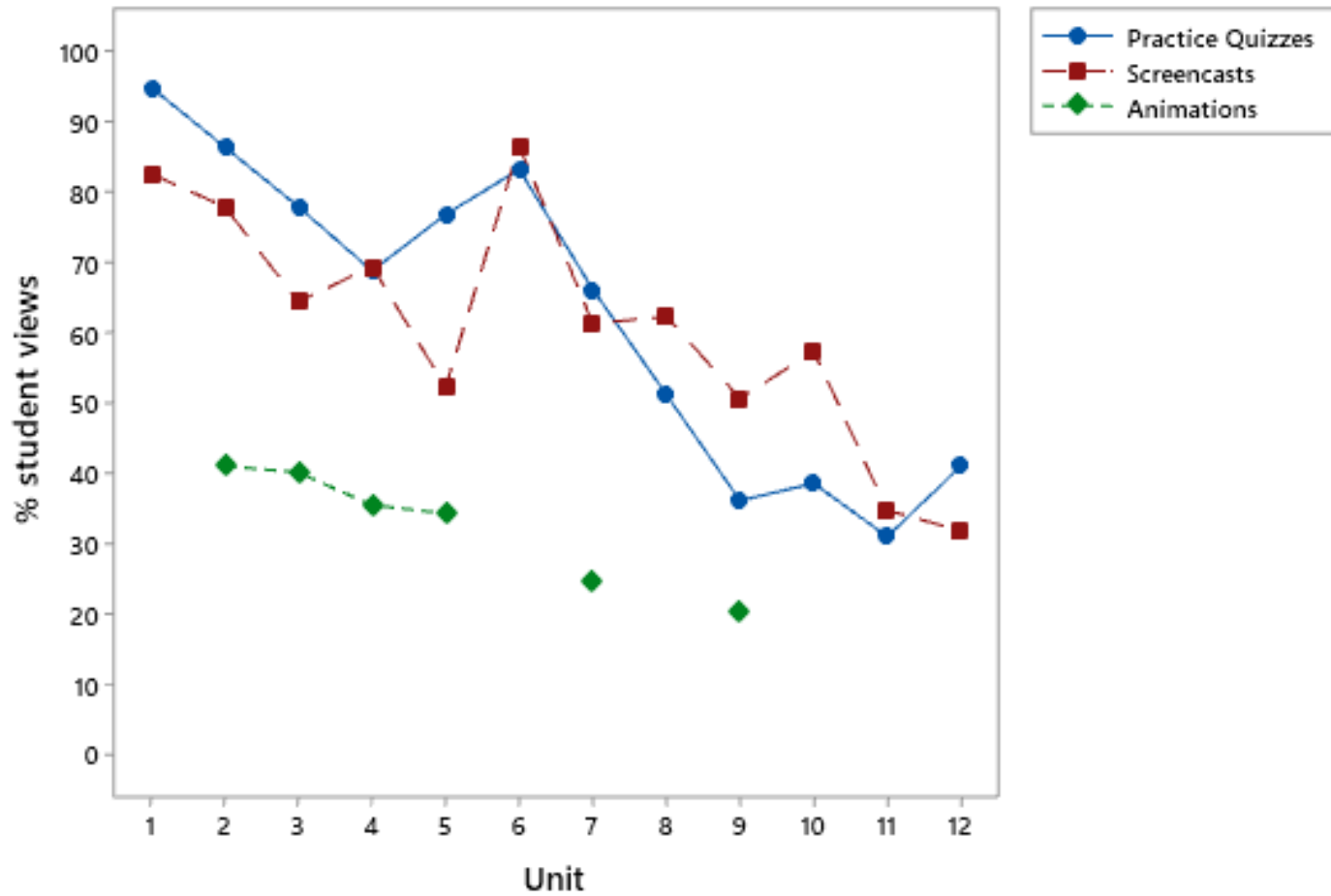
Discussion forums

- Think about the purpose of the forum
- Decide how you are going to moderate it and tell students in advance
- Be clear of expectations of behaviour and what can and cannot be discussed
- You will need to feed it!

Experiment/analysis/report writing



What students use (19J students)



So what do we want to carry forwards?

The Mathematics and Statistics Study Site



Rachel Hilliam | Sign out | TutorHome | IntranetHome | Contact the OU | Accessibility | Search the OU

StudentHome | Profile | **Study** | Library | Careers | Community | Help Centre

[Study Home](#) | [Connect](#) | [Discover](#) | [Skills](#) | [Plan](#) | [Succeed](#) | [Help ?](#) | Search Mathematics and stati...

Your modules

In this area students will see information about the modules they are currently studying. Each open module will have its own box with key dates and collaborative tools with unread indicators.

Examples of what the student will see in all the boxes on this website are available in the [OLS-Guide](#).

Past and future modules

In this area, students will see a list of forthcoming modules that they are registered on, the start dates and a link to their study record. They will also see links to previously completed modules in read-only mode.

Your subjects

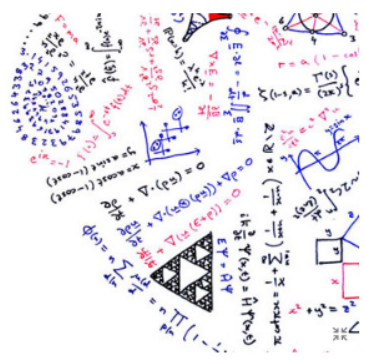
Subjects and qualifications

You are not currently registered for any qualifications.

[Browse all](#)

Mathematics and statistics

For studying mathematics / statistics (M&S) - whether a single module or a whole qualification - all you need is here! Before your module, go to **DISCOVER** to brush up your knowledge. During your studies, use **SKILLS** to optimise your chances of success. Look at **PLAN** for advice about your next M&S module and planning your studies. Explore **SUCCEED** for career advice, and employment and further study options. Within each of these tabs there is a section specifically for **POSTGRADUATE** mathematics study.



News

Secret & Lies - The hidden power of maths

Posted: 30 Dec 2019

2019 Royal Institution Christmas lectures, available on BBC iPlayer until mid-January.

Careers Express - December

Posted: 12 Dec 2019

Your one-stop shop for careers news, opportunities and events in Science, Technology, Engineering ...

[Add](#) | [View all news and events](#) | [RSS](#)

Upcoming events

JAN 13 **Forum about people-related careers**
 Monday, 13 Jan 2020, 09:00 to Thursday, 23 Jan 2020, 17:00
 Online

JAN 29 **Mathematics Teaching Scholarships: Why you should apply**
 Wednesday, 29 Jan 2020, 19:00 to Monday, 30 Mar 2020, 15:00

Free learning

OpenLearn



MATHS FOR ENERGY

[Search interactive >](#)

Maths for Energy Science

Are you considering doing a science qualification but wondering if you have adequate maths skills? Test yourself in our interactive...

Social media

Facebook



Like Page 8.8K likes

Twitter

Tweets by @OUMathsStats

OU Maths & Stats
 @OUMathsStats

Emeritus Professor Kevin McConway said:

Mathematics and Statistics Study Site

Connect, Discover, Skills, Plan, Succeed

Connect

Forums

Your OU M&S community

External M&S societies

OU Library and what it provi...

Recreation

Student prizes

Online room: M&S

Who to contact

Wider OU community

POSTGRADUATE mathema...

Discover

News and events

Your first M&S module

Are you ready for?

Discover your module

Revise and refresh for MST1...

POSTGRADUATE mathema...

Skills

Learning mathematics and st...

Accessibility for Mathematics...

Good academic practice and...

TMA preparation and submis...

Typing mathematical notation

Software for M&S study


Calculators permitted in exa...


Advice about examinations

POSTGRADUATE mathema...

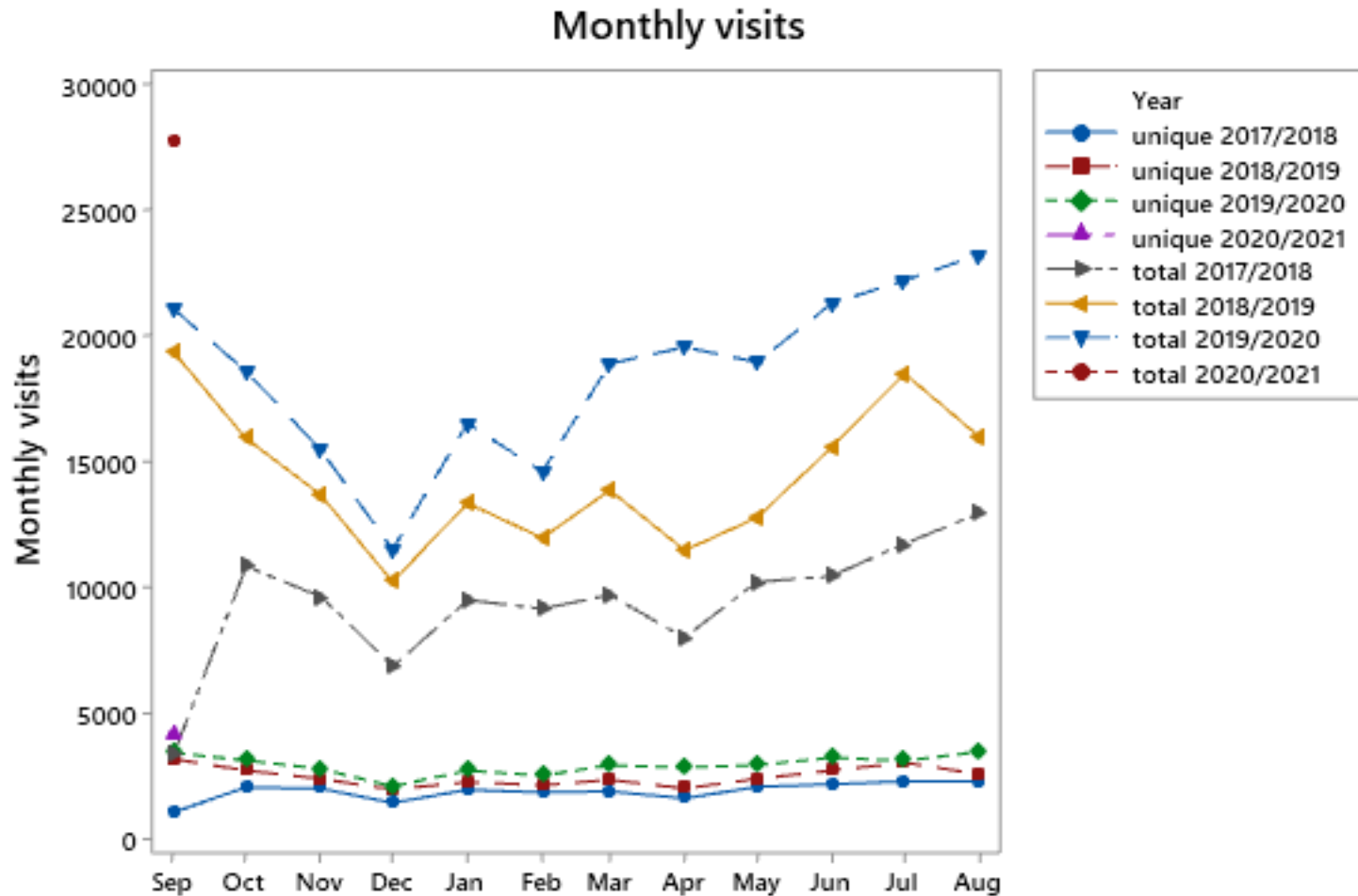
Mathematics and Statistics Study Site

Connect, Discover, Skills, Plan, Succeed

Plan 
Pre-requisite knowledge for ...
Discover your module
Assessment
Qualifications in M&S
Data Science (and related q...
Mathematics & Physics (and...
Planned curriculum changes...
Accreditation of qualifications
POSTGRADUATE mathema...

Succeed 
Careers and employability in...
Career options
What employers want
Developing specific expertise
Searching for work, applicati...
Study beyond a first degree
POSTGRADUATE mathema...

Number of total monthly visits from M&S qualification students



THANK YOU



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University**