How do we deliver effective online learning?

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Life-changing Learning

Thank you S282 / S284 team +

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(+ many many others in LDS, V&A, ACQ, Faculty…)
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Life-changing Learning

How does online learning design in modular physics teaching enhance the student experience, employability outcomes and close disability gaps?

What impact does tuition and assessment strategy have on outcomes in level 1 / 2 physics modules?

Can technology be used to replace experimental work in the first two years of a physics degree?

Life-changing Learning

ASTRONOMY

S284

Helen Fraser
Module Team Production/ Presentation Chair (20/21 & 21/220

ASTRONOMY

S284

"S284 covers basic astronomy with a modern observational approach across two broad themes: stars and galaxies, and multi-wavelength astronomy. You will look at cosmic length scales and learn how modern astronomers measure the Universe, considering spectroscopy, imaging and time-variability as observational tools.

You will study the formation, evolution and rebirth of stars and galaxies through energetic processes, as well as learning about the constituents of stars and galaxies. Finally, you will revisit our Universe from the perspective of cosmic time scales. S284 will develop your basic understanding of astronomy, as well as developing your computing, maths and physics skills."

What are we trying to "address" with learning design?

Retention

Pass rates

Disability Gaps

Understanding of Transferable Skills

Why a new Astronomy module?

Replaces S282 Astronomy from 20J

Students always below (at bottom of) Faculty average retention & success (pass)

BROAD STUDENT BODY

Leisure learners
S10
"New" to OU
Retired

DON'T ENGAGE
WITH EXAM

< 25 % have
recommended perquisite
courses
SM123, S111, MST124

A lot of "Astronomy for
Poets / Chemists / Open
Degree etc

Workload ~ 3x >>>!

Students with
Dyslexia
Mental health
ND
Pain

More likely to withdraw
More likely to fail

A lot of innovation all at once!!!

- Assessment strategy including ONLINE exam

- Module structure

- Employability

- Tutorial strategy

- Content

- Accessibility by design (not retrofitting)

- Links to research / "real data / software use"

- Headstart & Bootcamp

Topics in S284

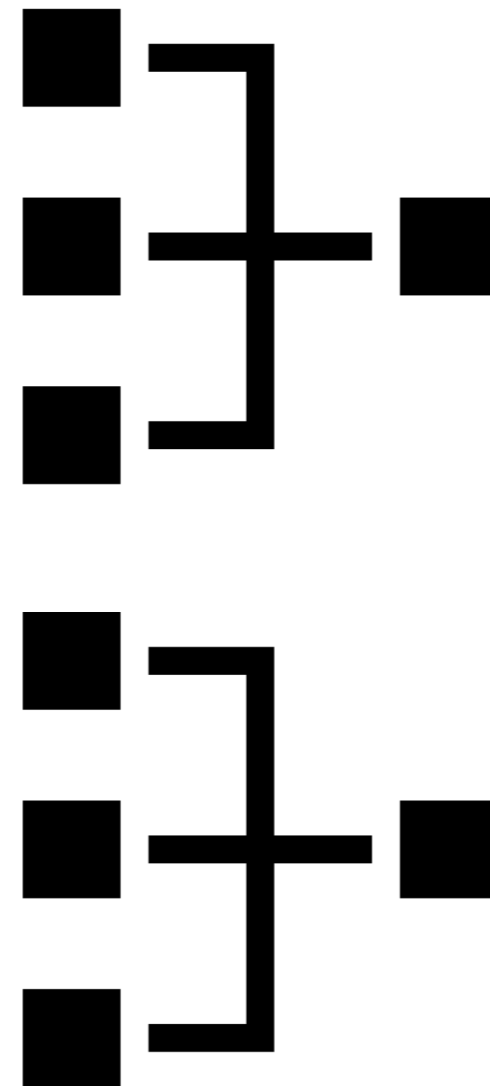Topic 1: Cosmic length scales

Topic 2: The spectral Universe

Topic 3: Mapping the Universe

Tools

Topic 4: Birth & life

Topic 5: Evolution & death

Core

Topic 6: The extreme Universe

Topic 7: Cosmic timescales

Revision

Activities in S284

Topic 1 : Using TOPCAT to analyse *Gaia* data on open clusters
Employability skill: Self-management & resilience

Topic 2: Calculations using spreadsheet data on eclipsing binary stars
Employability skill: Problem solving

Topic 3: Analysing multiwavelength images of supernova remnants
Employability skill: Numeracy

Topic 4: Summarize information from research reports & prepare press release
Employability skill: Written communication

Topic 5: Analysing astronomical data on star formation rates in galaxies
Employability skill: Digital literacy

Topic 6: Research information on a GW detection & prepare slide show & script
Employability skill: Self awareness of transferable skills

Topic 7: Research the siting of a new astronomical observatory
Employability skill: Global citizenship

Employability

implicit not explicit

"engage without realizing"

Structure in S284

Each Topic has a similar structure
6 hours *directed* study per week

Week 1: Introduction + Part 1 (5h) + Video tutorial (1h)

Week 2 : Part 2 (5h) + AL-led Office hour / Drop-in session (1h)

Week 3 : Part 3 (5h) + Activity (1h)

Week 4 : Revise, Reflect & Look ahead (3h) + TMA (3h)

Studying S284

Study Time and Individual Pacing

S284 Weekly Study Time (~ 10 hours / week)		
Directed Study 60 % (~ 6 hours)		**Self-Study 40 % (~ 4 hours)**
Assimilative (~ 4 hours) e.g. reading, note taking, tutorials	(~ 2 hours) e.g. assessments, activities, videos, audio	(~ 2 hours) e.g. assessments, activities, videos, audio

1.1.2 Distance units

🔖

Approximately 2 units of study time.

The objects you've just been learning about are so far away that conventional measures of distance are unhelpful. Later in this topic, you'll see how distances to astronomical objects are measured, but for now, it's useful to have a summary of some common astronomical distance units and see how to convert between them. Different distance units are useful in different circumstances.

"Pencils" icon indicate study time:
1 = approx. 10 min
2 = approx. 20-30 min
3 = approx. 30-40 min
5 = approx. 1 hour or more
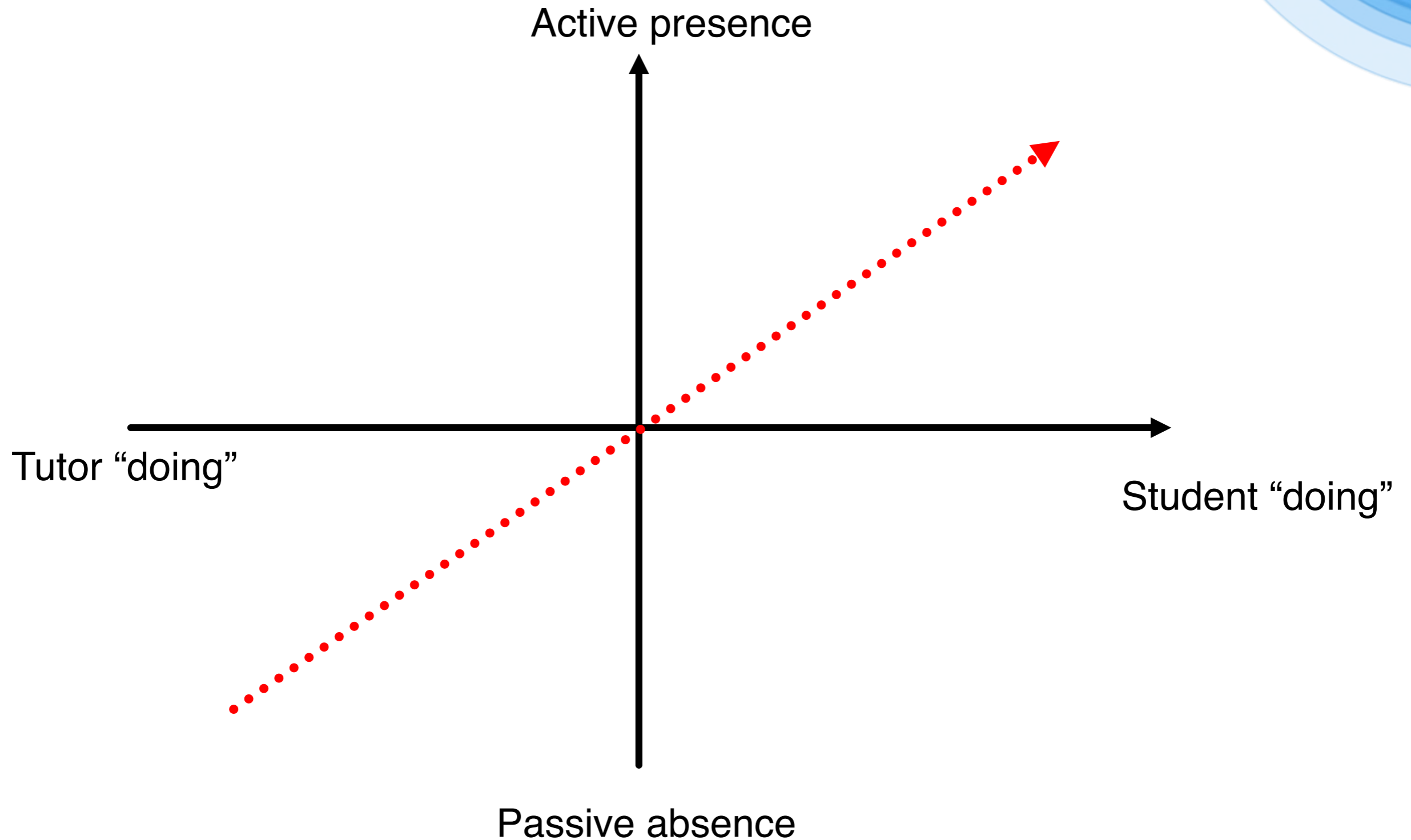
Think CURRY!!!

Videos in S284

Each Topic has a 5 minute Introductory Video from the Topic author

Each Topic has a ½ hour Video Tutorial presented by Helen / Andrew / Judith

"Drop in Tutorials"

Active presence

Tutor "doing"

Student "doing"

Passive absence

Assessment

S284 assessment components

						12% Online Exam Part 1 (iCME 81)	40% Online Exam Part 2 (iCME 82)
8% TMA 01	8% TMA 02	8% TMA 03	8% TMA 04	8% TMA 05	8% TMA 06		
study week 5	study week 9	study week 13	study week 18	study week 22	study week 26	study week 14	study week 31

TMA 00, 0% study week 1

resit = Online Exam Parts 1 and 2

(a)

S284 module outcomes

You will need 40% TO PASS	40–60% = grade 4 or grade 3 pass	To continue to Level 3 astronomy we recommend a grade 1 or 2 pass	≥85% = guaranteed grade 1 pass

To pass you must attempt at least Online Exam Part 1, or Online Exam Part 2, or both

Requires attempting Online Exam Part 2

(b)

iCMEs in S284 "exam part 1"

iCME81 – sat after Topics 1, 2, 3 – worth 12%

2 sets of questions worth 15 marks each = **30 marks** total
1 set of questions on "stars", 1 set of questions on "galaxies"
All are *multi-variant* questions – 15625 exam variations

1 hour of student time allocated : 3 hours allowed to sit it
sometime during the week when it is available

can already "see" outcomes [in a moment]

Up to 2 new questions written each year
= question bank = more variants

iCMEs in S284 "exam part 2"

iCME82 – sat at the end of the module – worth 40%

6 sets of questions worth 15 marks each = **90 marks** total
3 sets of questions on "stars", 3 sets of questions on "galaxies"
All are *multi-variant* questions – 45 billion exam variations

3 hour of student time allocated : 6 hours allowed to sit it
sometime during the week when it is available

Up to 2 new questions written each year
= question bank = more variants

How far do the outcomes reach the original aims?

What did we see with retention?

- A greater proportion of bootcamp students in S284 20J were retained and submitted TMAs and iCMEs
- This is not surprising and probably is due to complex factors
- Bootcamp students are likely to be motivated and organised as they have attended a pre-start optional programme

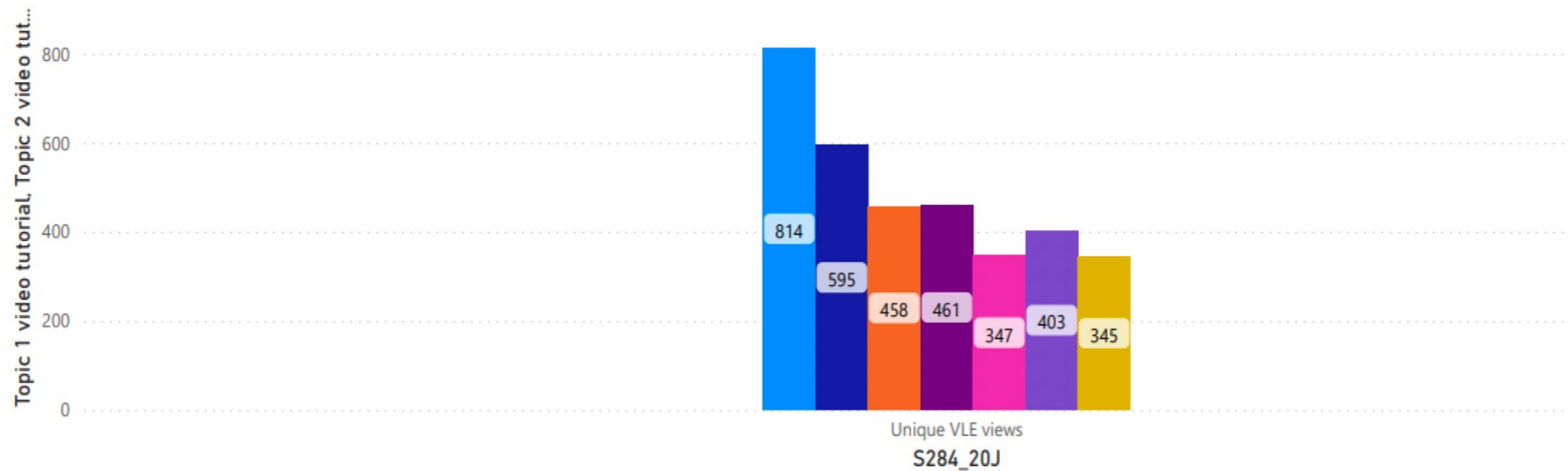Graph showing engagement in S284 20J
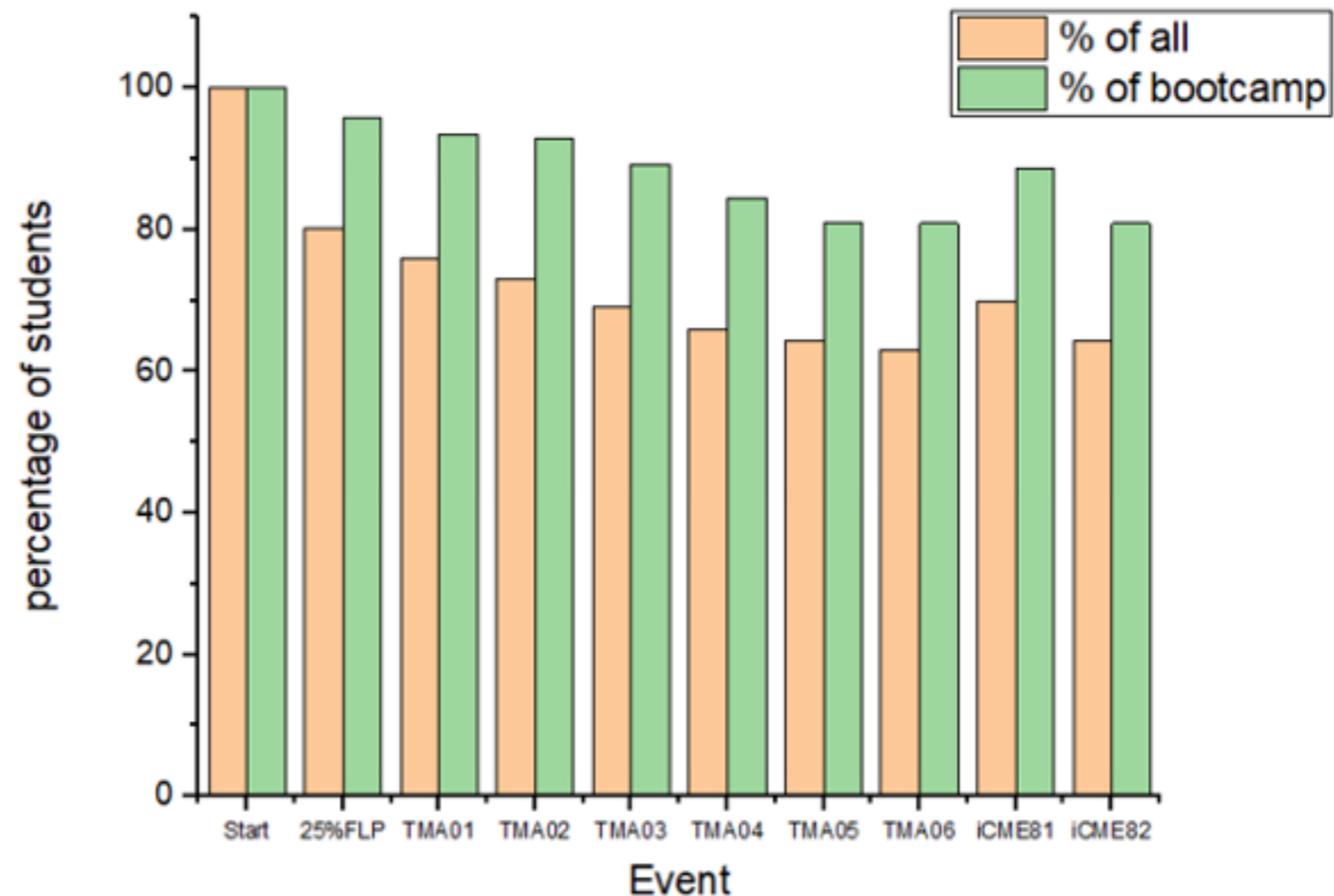
Video tutorial "Attendance"

Graph showing total unique views for S284_20J Video Tutorials in topics 1-7 (SC pages) Calculated against Students reg at 25FLP.
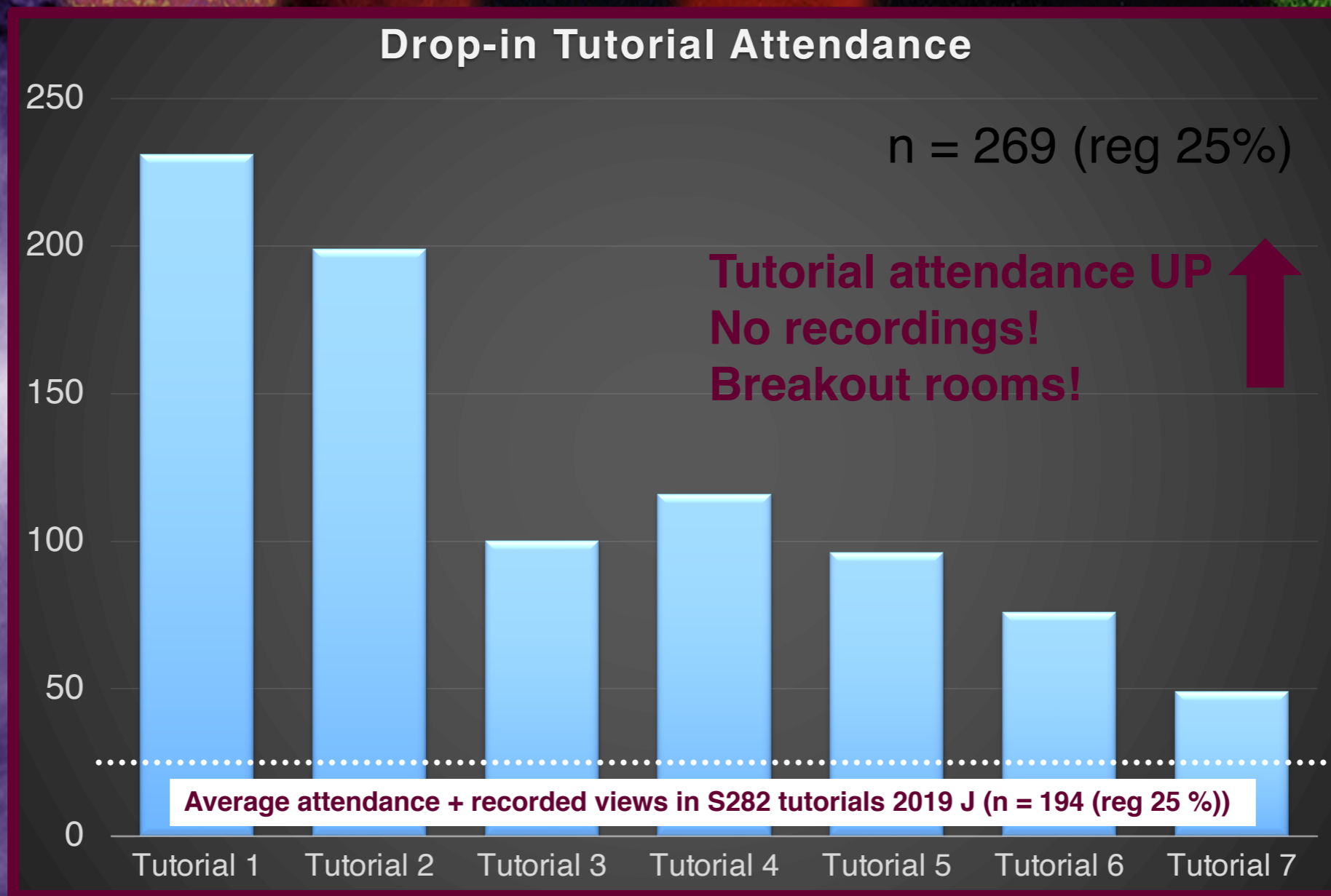
- Topic 1 video tutorial
- Topic 2 video tutorial
- Topic 3 video tutorial
- Topic 4 video tutorial
- Topic 5 video tutorial
- Topic 6 video tutorial
- Topic 7 video tutorial

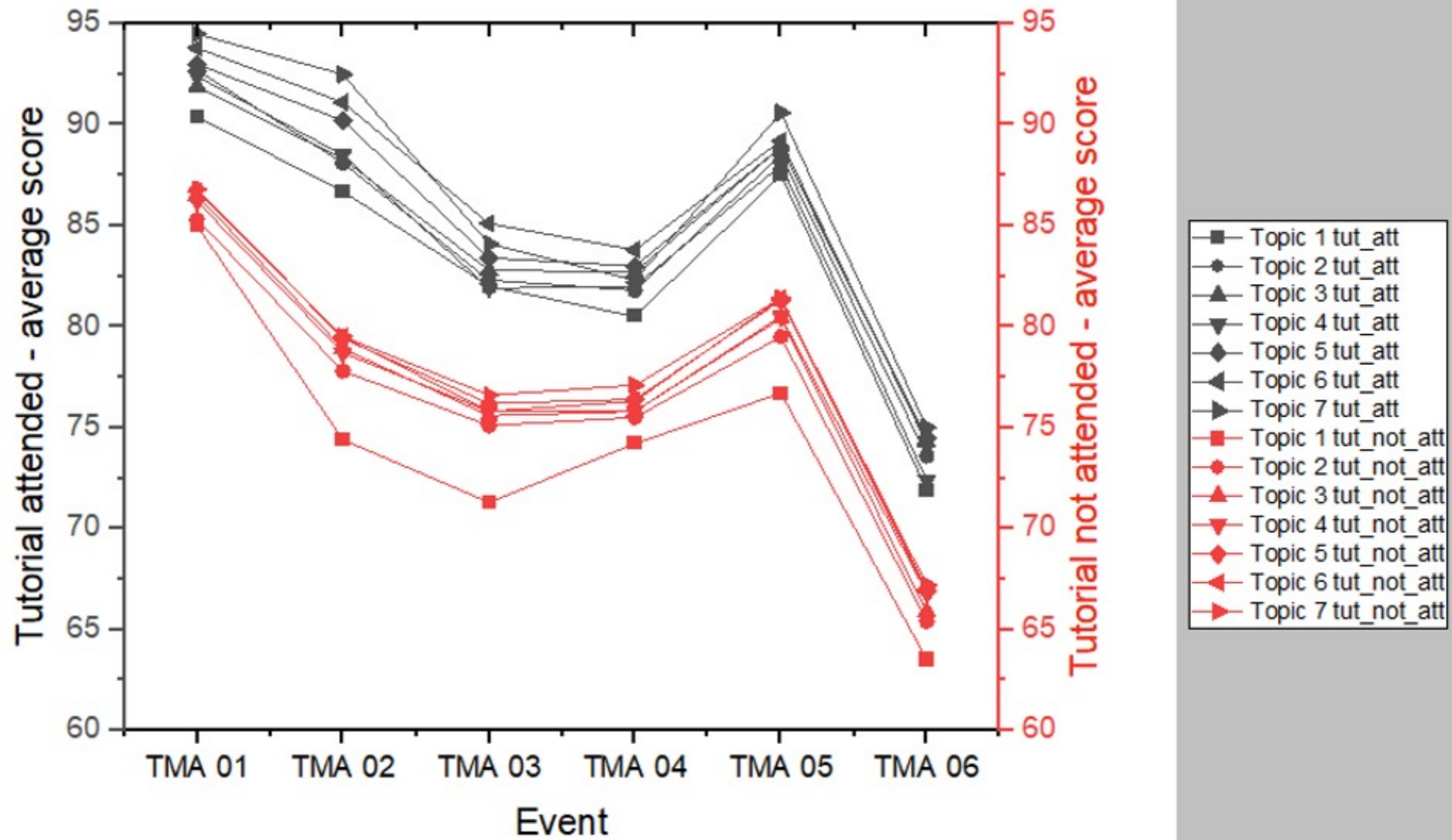| S284_20J	Topic 1 video tutorial	Topic 2 video tutorial	Topic 3 video tutorial	Topic 4 video tutorial	Topic 5 video tutorial	Topic 6 video tutorial	Topic 7 video tutorial
Unique VLE views	814	595	458	461	347	403	345

S284

Drop-in Tutorial Attendance

n = 269 (reg 25%)

**Tutorial attendance UP
No recordings!
Breakout rooms!**

Average attendance + recorded views in S282 tutorials 2019 J (n = 194 (reg 25 %))

Tutorial 1, Tutorial 2, Tutorial 3, Tutorial 4, Tutorial 5, Tutorial 6, Tutorial 7
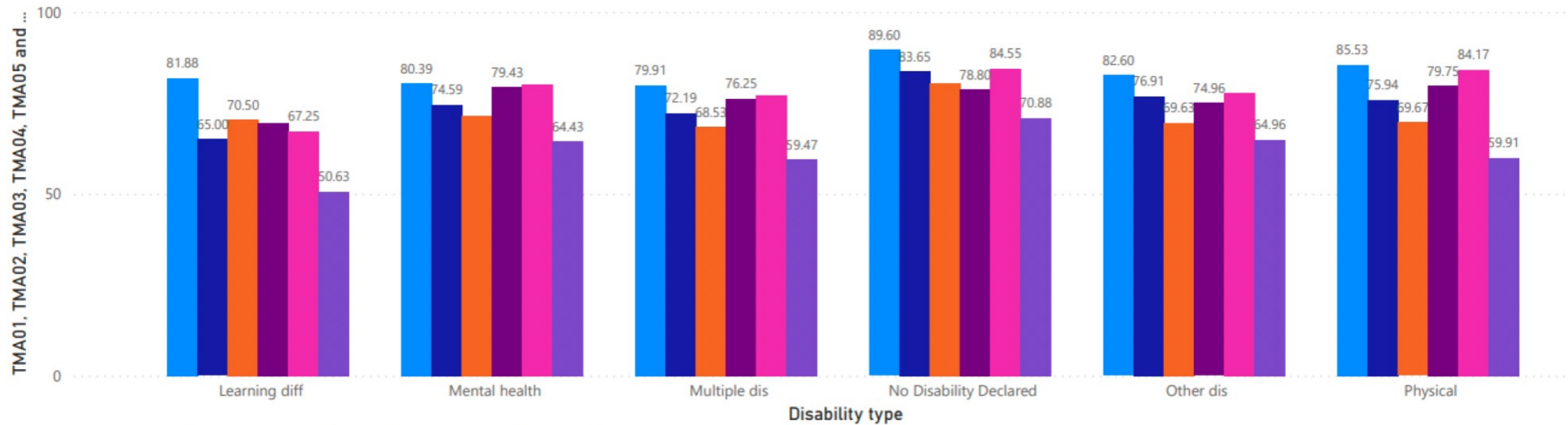
Tutorials & TMAS

Disability Gap – closing but not shut

S284 TMA Average scores by Disability type

● TMA01 ● TMA02 ● TMA03 ● TMA04 ● TMA05 ● TMA06

Disability type	TMA01	TMA02	TMA03	TMA04	TMA05	TMA06
Learning diff	81.88	65.00	70.50	69.50	67.25	50.63
Mental health	80.39	74.59	71.52	79.43	80.00	64.43
Multiple dis	79.91	72.19	68.53	76.25	77.19	59.47
No Disability Declared	89.60	83.65	80.36	78.80	84.55	70.88
Other dis	82.60	76.91	69.63	74.96	77.74	64.96
Physical	85.53	75.94	69.67	79.75	84.17	59.91

Average scores are higher for the "No disability declared" group, except for TMA04

What about results?

- Simplest analysis – those who engaged in bootcamp in S284 20J scored slightly higher in iCME81/82 than those who didn't

- This reflected a similar pattern seen in S282

Average score for final assessment by engagement in S284 20J

Legend:
- engaged in bootcamp
- didn't engage in bootcamp

y-axis: average scores for assessment (0 to 60)
x-axis: Event (Average iCEM81 score, Average iCEM82 score)

But it was more complex than that...

- You would think that the more they engaged the better they did?
- Blue – lowest scoring. Red – highest scoring
- The super clickers of the guide and the forum weren't the highest scorers. Moderate clickers routinely score highest
- **How can we use this analysis?** Perhaps flag superclickers early on to ALs as it could be an indicator that these students need more support
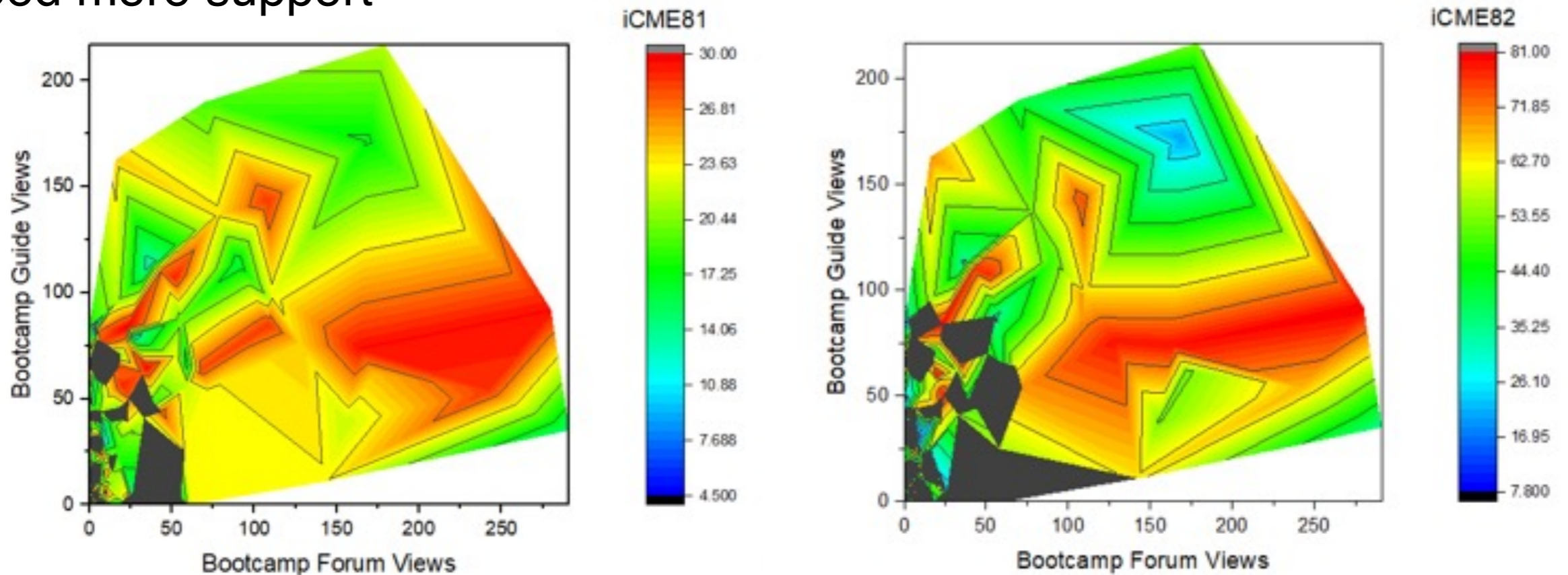
We are happy are students happy?

What about student satisfaction?

- S282 and S284 have both scored very highly in student surveys
- What did the students say about headstart and bootcamp?

"The best feature of Headstart was the forums - being able to ask questions before the course started"

"A great initiative which should ease the way into the main course"

"Bootcamp is an excellent idea, more courses should consider it"

"It's been GREAT!"

Conclusions

How does online learning design in modular physics teaching enhance the student experience, employability outcomes and close disability gaps?

Massive differences – worth time & ££ investment

What impact does tuition and assessment strategy have on outcomes in level 1 / 2 physics modules?

Massive differences in retention and pass rates

Life-changing Learning