How do we deliver effective online learning?
Thank you S282 / S284 team +

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++++++++++
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?
“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

**Topic 4**: Birth & life

**Topic 5**: Evolution & death

**Topic 6**: The extreme Universe

**Topic 7**: Cosmic timescales
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)

1.1.2 Distance units

“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

<table>
<thead>
<tr>
<th>TMA 00, 0% study week 1</th>
<th>8% TMA 01 study week 5</th>
<th>8% TMA 02 study week 9</th>
<th>8% TMA 03 study week 13</th>
<th>8% TMA 04 study week 18</th>
<th>8% TMA 05 study week 22</th>
<th>8% TMA 06 study week 26</th>
<th>12% Online Exam Part 1 (ICME 81)</th>
<th>40% Online Exam Part 2 (ICME 82)</th>
</tr>
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<tbody>
<tr>
<td>resit = Online Exam Parts 1 and 2</td>
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### 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
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.
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.

<table>
<thead>
<tr>
<th>S284_20J</th>
<th>Topic 1 video tutorial</th>
<th>Topic 2 video tutorial</th>
<th>Topic 3 video tutorial</th>
<th>Topic 4 video tutorial</th>
<th>Topic 5 video tutorial</th>
<th>Topic 6 video tutorial</th>
<th>Topic 7 video tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique VLE views</td>
<td>814</td>
<td>595</td>
<td>458</td>
<td>461</td>
<td>347</td>
<td>403</td>
<td>345</td>
</tr>
</tbody>
</table>

Drop-in Tutorial Attendance

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

n = 269 (reg 25%)

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

[Graph showing trends in tutorial attendance and TMAS scores over time for different topics.]
Disability Gap – closing but not shut

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
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**