Review of Teaching Practice

Session/artefact to be observed/reviewed:	Lecture on satellite imaging
Size of student group:	40-50 students
Reviewee:	Agnes Cameron
Reviewer:	Nicola Thomas

Note: This record is solely for exchanging developmental feedback between colleagues. Its reflective aspect informs PgCert and Fellowship assessment, but it is not an official evaluation of teaching and is not intended for other internal or legal applications such as probation or disciplinary action.

Part One
Reviewee to complete in brief and send to reviewer prior to the review

What is the context of this session/artefact within the curriculum?
These students are part of a course called the Diploma in Creative Computing, a year-long course for third year UAL students to learn programming and electronics, with a critical engagement with technical tools.
This is a one-off lecture, as part of a wider course called 'critical infrastructures', where students engage with different forms of technical infrastructure as ways of forming how we perceive the world. I have been invited to give a guest lecture (which I've given in the past) around satellite imaging, though I also used to teach on this course and contributed to its development.
This workshop is part of a wider brief around air pollution, where students carry out a 'creative investigation' into an infrastructural system.

How long have you been working with this group and in what capacity?
I have not formally taught this cohort, but many of them have made use of the workshop in some capacity — I have worked with approximately half of the students.

What are the intended or expected learning outcomes?
Students will develop their capacity for looking critically at satellite images — both analysing what is there, and also assessing the reliability and limitations of these images as artefacts that make a claim on objective truth. Students will learn about concepts including spatial and temporal resolution, imaging bands, and raw vs derived datasets, and about social and political aspects of satellite imaging.

What are the anticipated outputs (anything students will make/do)?
Students will use one of two tools to conduct a short investigation into something that has changed over space and over time — both tools will be introduced during class using shorter tasks. Students will be guided to find supplementary materials to provide a lens on an event or a feature of the landscape.

Are there potential difficulties or specific areas of concern?
The last time I taught this class, I got the students to program image-making tools themselves. This was helpful for some students, but was too fast for others and meant that coding issues obscured deeper engagement with the material. In this

class, I've taken the coding component out (by making tools for the students), which I'm hoping will make things more accessible, and also added in more activities that involve open-ended responses to the material. I'd really like to ensure the class feels like it involves everyone, and provides multiple opportunities to engage with what is quite technical material.

How will students be informed of the observation/review?
Verbally during the session.

What would you particularly like feedback on?
How possible it is for *all* students (rather than just the most able) to engage with the tasks — and where I could do a better job of this through my teaching.

How will feedback be exchanged?
Verbal and/or written would be great!

Part Two

Reviewer to note down observations, suggestions and questions.

- Agnes greeted all the students before the start of the session making them comfortable and informed them of my presence. Agnes was very good at making the students at ease
- Agnes queried with students whether the session was timetabled for 9:30am or 10:00am start
- Although the session was scheduled for a 9:30am start, from 9:20 am Agnes informed students using a countdown on the screen that she would start at 9:45am (most students started arriving after 9:30). Agnes also used the screen to greet the students and have her name
- Agnes introduced herself to the students well
- Also introduced well the purpose of the session/workshop - and informed the group of my presence. Agnes then started to use slides to further introduce the session
- She then went on to explain the learning objectives and to give an outline the content of the session
- The slides were clear, concise, with not too much text and engaging images
- Agnes then explained the structure of the session
- ~~qu. wondered whether it would be ok for students to ask questions during Agnes's talk?~~
- Agnes explained terminology used as she went along e.g. such as aerial photography, OSINT - Open Source Investigative techniques
- explained the value of Open Information and Satellite Imagery
- Agnes explained her work (tool created) whilst on a scholarship with Bellingcat and multispectral Imaging - how to use geological sciences
- Students appeared engaged, listening, and attentive
- Agnes let the students know that they can interrupt her at anytime with any questions that they may have - and that they had time
- Agnes then went on to share her slides on Moodle for a student who requested it

- Whilst doing so Agnes asked the students again if they had any questions
- Agnes's enthusiasm for her subject matter is very evident.
- Agnes went on to explain about satellites and the electromagnetic spectrum, waves, and the different behaviour of waves due to their wavelength and how they behave differently with matter
- Then went on to use the whiteboard to draw images of the wave to explain frequency (high and low), wavelength, and oscillations
- Provided examples of electromagnetic spectrum throughout and their application: x-rays, microwaves, radio waves etc.
- explained how visible light sits within the electromagnetic spectrum
- explained different forms of sensing and the equipment can be used
- A student asked a question about x-rays. Agnes explained how the x-ray scan would work
- Agnes went on to explain more physics concepts: reflection and absorption of EM waves - and how that effects how we see colour
- explained reflection and absorption affected by structural properties and also chemical substance => also how some material are transparent to EM - how glass is transparent to visible light
- How chlorophyll absorbs light: red and blue light
- Agnes then broke out of using her slides to show a photographic image on photoshop to show how the image looks in blue light versus red light
- Explained how Reflectance Spectra graph can show what gets reflected by a leaf during different seasons: summer, autumn
- Student asked question about wavelengths, colour
- Agnes answered the question
- explained diffraction and how visible light splits into different colours by a prism or with raindrops to form a rainbow
- Explained the graph further that the graph shows 2 different recordings taken of a leaf 1 during summer and 1 during autumn (when the colour of the leaf has changed)
- Agnes invited more questions.
- A student asked a question about absorption
- Explained ow leaves particularly absorb infrared
- Agnes asked a student who was in conversation with another student if they had any questions for her
- Another student asked about the observation of planting
- Student asked if satellites other than from the West were launched / used
- Agnes explained that there are other satellites launched from countries such as India and China - and that it is very political
- Also mentioned Cube Satellite - which is a budget satellite
- Explained that she was not super knowledgeable about other satellite programs
- Explained red, green and blue satellite bands are use to create a 'true colour image'
- Also false colour images
- How these images all us to see images what is beyond visible visible vision e.g. night vision
- Satellite Imaging data sets: Landsat Data Set
- Giant companies, such as NASA

- Explained that tech company Google releasing this data, but google has control over what is released
- Discussed the politics and control the Google can exercise because of its tools
- Mentioned Copernicus, NASA - can also be used for Data Sets
- Google Earth
- Mentioned the Spectral Resolution
- How the different bands include r, g, b, infrared etc.
- Explained that there was politics even around which bands are gathered, as that determined which research can be undertaken
- ASTA - geological satellite
- Showed a visual representation of the bands (Landsat bands) - including waves absorbed by the atmosphere eg. the Ozone Layer
- Student asked a question
- Explained that Hyper spectral imaging can be used for more granular information within a band
- A student asked a question about band 9
- Agnes didn't know the answer to the question
- A student asked why the numbering jumped around on the spectral imaging graph
- Agnes didn't know the answer to the question
- A student asked why band 8 was used which overlapped with parts of band 2,3 &4
- Agnes invited more questions
- Explained chemical sensors and how they are used to sensor the atmosphere
- Showed image using Sentinel-5P
- Explained that there are several other Sentinels

qu. how does Agnes determine what to include within her slides and what to exclude, as there is a great deal of information?
qu. very large cohort - how does Agnes ensure the engagement of students at the back of the class?

- Agnes explained that light reflected is light from the sun - the sun is the source of light
- Explained to students that she wanted to give them an understanding of how the images are made
- Pollution arising form satellites in Low Earth orbit
- Student asks how do satellites get repaired
- Agnes explained that if the satellite is broken that they remain broken
- Student asks if satellite broken, what keeps them up there
- Explained no power is required for the satellite to stay up there due to gravitational pull
- Student asks if there is place/source for public databases with satellite data
- Agnes explains that it depends what you are looking for as there are different sources
- A student asks if can anyone put up a satellite?
- Agnes explained that there are protocols and that it is illegal
- After 1 hour of talking / slides Agnes gave out an exercise for the students to do
- Asked if the students wanted a break?
- Due to the response gave them a 5 minute break
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- Agnes gave the students a practical activity/task
- resumes the session with a quote by Gregory Bateson to introduce Visualising Difference
- Gave information about him - cybernetics and feedback systems
- Also, how we look at the world and interact with the world also affects how the world is perceived
- Agnes provided each table with a handout sheet for them to work through
- Made it clear that they would be doing Task 1 for 5 minutes
- Task 1 was also shown on a slide
- Agnes then walked around each of the table asking each group if they had any questions or needed help
- Explained that there were 3 images to look at for Task 1
- Agnes also let them know when their 5 minutes was coming to an end
- Asked each table to volunteer a person to talk about the information they had gathered from the task
- Used the students comments to talk about the information shown within the images, and what is seen between medium and high resolution - what is captured by different spatial resolutions
- to introduce the term spacial resolutions
- satellites and the military, military technology
- explained how google maps works
- A student asks the difference between Google Maps and Apple maps

comments
- comprehensive detailed but also clear overview using slides
- invited questions from the students at several points
- the students felt comfortable to ask several questions
- Agnes was honest enough and had the confidence to let the students know when she didn't have answers to some of their questions, or if their were beyond her scope of knowledge
- importantly, the questions Agnes was able to answer were all key and important questions
- those questions Agnes couldn't answer were those beyond the main topic
- Agnes was not tied to her slides - as in was able to break out to use the whiteboard, or use a browser
- broke at a good point to provide students with a task
- asked the students if they wanted a break - gave them a break and let them know when she would resume
- able to explain aspects of physics very clearly in a digestible and understandable manner
- evident that Agnes has a comprehensive knowledge of what she talking to the students
- task was good in getting the students to apply their knowledge and also work together
- Agnes visited each table whilst they were doing their task - which was good
- students seemed engaged throughout
- Agnes made an effort to engage those students from the rear of the class which was good
- used task 1 to explain new term: spacial resolution
- Agnes had good control over what was an extremely large cohort of at least 50 students

- by walking amongst the class and talking to each table during their Task, Agnes was able to check in on each group and see if any students were struggling - which of course was good
- the session was an enjoyable experience to sit in on - and I too also learnt something

suggestions

- I am assuming this is out of Agnes's control and may also be due to the fact that the CCI Diploma is 1 year in duration and extremely intensive, so scheduling and logistics may be particularly hard, and no doubt there are cost implications too - but the class size of 50+ students is very large. Ideally, this session could be spilt in two. As in repeated and taught to 2 different cohorts of (at least) half the size

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Part Three

Reviewee to reflect on the reviewer's comments and describe how they will act on the feedback exchanged. Reviewee should return this to the reviewer once complete.

I really enjoyed teaching this class, and having Nicola there. I was really pleased about the effects of changes I'd made to the class after having taught it last year.

It was interesting to think about Nicola's questions about how I decide to include information or not, particularly in the introductory part of the lecture around the physics of light. My own bias (as someone coming from an optics background) is likely to influence how 'essential' I think some of this information is to students constructing a working understanding of satellite imaging.

The class definitely improved after I removed information I'd previously considered 'essential', and Nicola's question is a good prompt to follow that idea further. It reminded me of the Carpentries' 'rule' that *"every lesson is too short for the teacher and too long for the learner"* (Wilson, 2019). Were I to develop the class further (or adapt it to a shorter workshop), I'd probably take out a few of the more detailed parts around frequency and save these for questions that might come up.

I appreciated Nicola's observations about my control of the class! I find it personally very hard to teach if students are talking, though I know that often when that happens there's normally a good reason for it. Over the years I've opted to ask students that are talking what questions they have, which normally helps to resolve immediate issues, and then make sure I follow up during breaks or exercises to talk to those students one-on-one. Similarly, I like to check in with students who have come late or seem disengaged.

Nicola observed that the class size was extremely large to teach complex material, which I agree with (my understanding is that the diploma is one of the largest class sizes in UAL!). In my experience studying engineering, it's possible to cover complex technical material in large lectures, but also essential for students to access follow-up support in smaller groups.

In the case of the diploma, this happens with both academics and in the workshops. Since the class, multiple students have got in touch interested in following up on how to program their own tools — to help provide this secondary support, I will try to organise a small group tutorial with these students.

Another action that could mitigate the effects of the class size would have been to make better use of the additional teachers present. There are three additional staff in each class, who could have been better prepared to help students during the group tasks. This reminds me of another Carpentries principle — never teach alone (Wilson, 2019). If I was to teach another class with the diploma soon, I would think about how to make better use of the supporting teaching staff within that, potentially briefing them on the material before the class and indicating points where it would be useful to have more staff to help.

References

Wilson, G. (2019) Teaching Tech Together: How to create and deliver lessons that work and build a teaching community around them. Taylor & Francis. ISBN: 978-0-367-35328-5, accessed here