



University
of Glasgow

School of
Chemistry

Interactive Teaching Units – Applying Lecture Content to Real World Problems through Active Learning

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**WORLD
CHANGING
GLASGOW**

THE SUNDAY TIMES
THE SUNDAY TIMES

**GOOD
UNIVERSITY
GUIDE
2022**

**SCOTTISH
UNIVERSITY
OF THE YEAR**



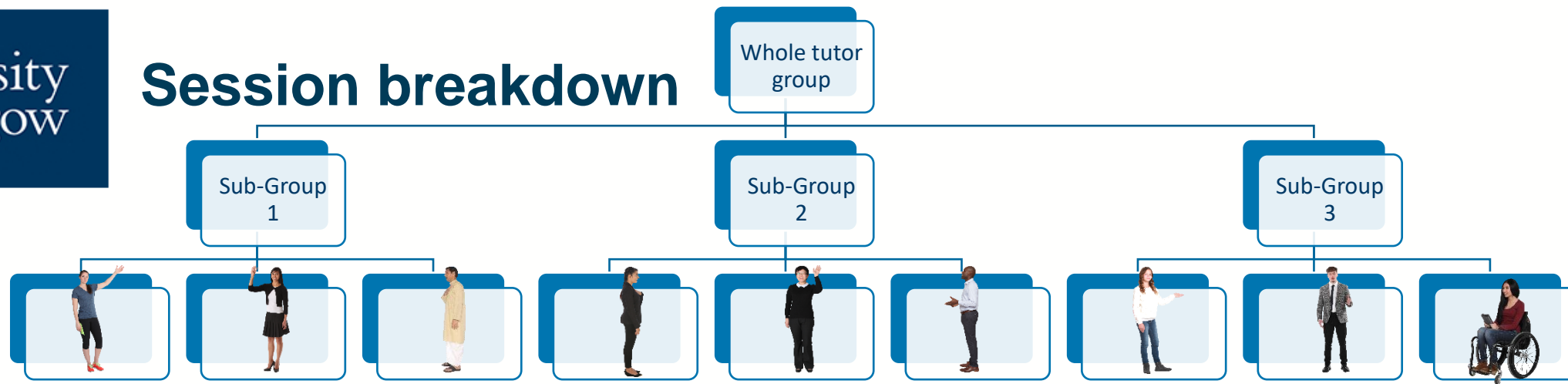
What is an Interactive Teaching Unit (ITU)?

- Level 2 chemistry
- Aim:
 - To apply chemistry knowledge to a real world problem in an industrial context.
 - To develop transferrable skills
- 12 students + 1 staff member
- 3 hour session





Session breakdown



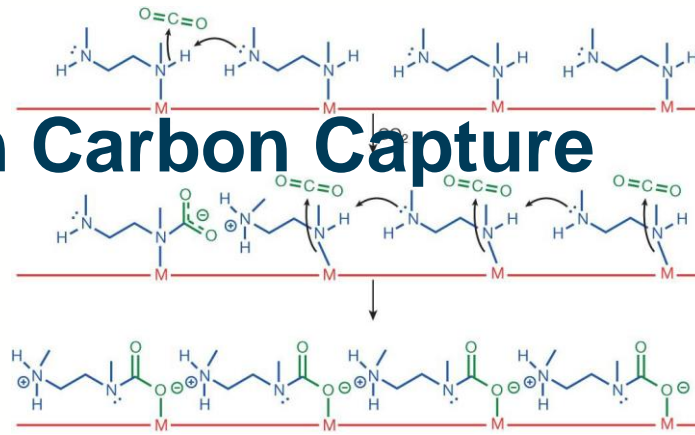
Welcome (2pm)	All together with tutor, create breakout rooms for sub-groups		
Section A INTRODUCTION	read introduction, answer questions, choose speaker	read introduction, answer questions, choose speaker	read introduction, answer questions, choose speaker
Speaker presents answers to other groups			
Section B CAPTURE TECHNOLOGIES	read about MOFs , answer questions, choose <i>different</i> speaker	read about Amines , answer questions, choose <i>different</i> speaker	read about Photosynthesis , answer questions, choose <i>different</i> speaker
Speaker presents answers to other groups			
Section C	group work etc.	group work etc.	group work etc.
...	Speaker presents answers to other groups etc.		
etc.	etc.		



Listening to student feedback

- Previous negative feedback
 - Lack of relevance
 - Unsure about engaging with scientific literature and writing essays
 - Prefer working on their own in a traditional format, e.g. lectures
- Modifications this year
 - Pre-ITU task – graduate attributes
 - New ITU on COP26 days before the conference started
 - Signposted connections to lecture courses.
 - Post-ITU video
 - Interviews with PhD students in the School of Chemistry about their research in this area.
 - Carrying out a literature search
 - Referencing

ITU on Carbon Capture



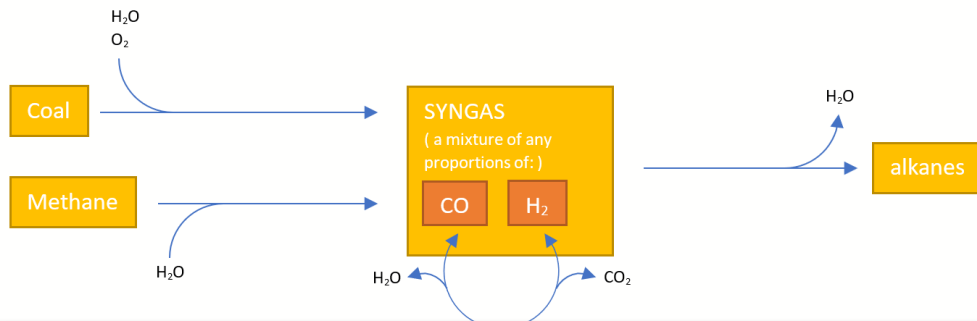
31 OCT - 12 NOV 2021
GLASGOW

COP26

IN PARTNERSHIP WITH ITALY

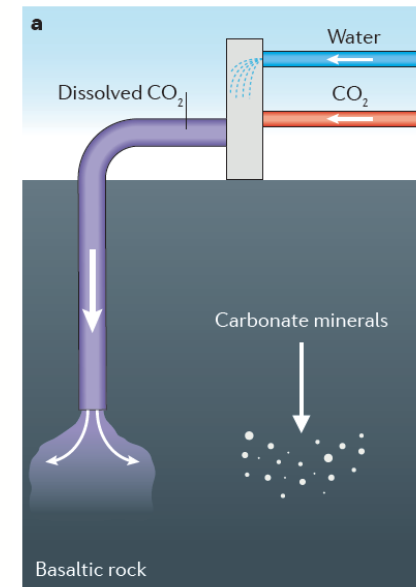
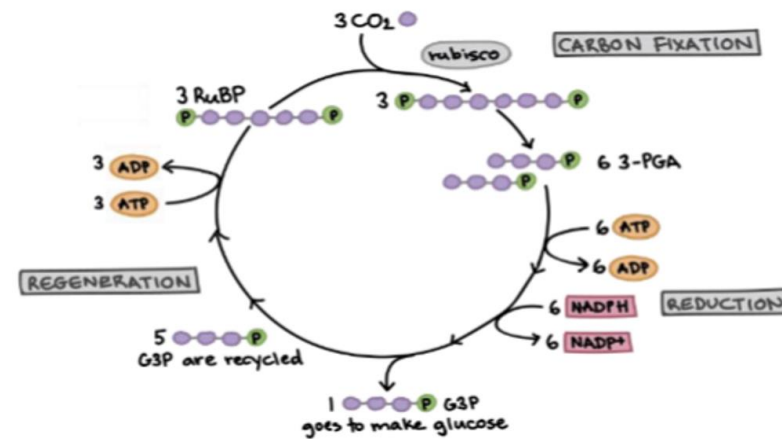


Session	Sub-group 1	Sub-group 2	Sub-group 3
Capture	MOFs	Amines as scrubbers	Photosynthesis
Sequestration	Geological carbonates	Enhanced Oil Recovery	Algae to carbon fibres
Utilisation	Concrete	Synthetic fuels	Biodiesel



Overall message

- No *single* solution: we need all of these + renewable power generation + more
- Focus on the interesting chemistry in CC processes



OneNote ITU Thurs Group C

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ITU Thurs Group C

- Section A Section B Room 1 Reading
- Section B Capture Section B Room 2 Reading
- Section C Sequestrati... Section B Room 3 Reading
- Section D Use Section B Room 1 Questi...
- Section E Section B Room 2 Questi...
- Section B Room 3 Questi...

Section B Group 1

Metal organic frameworks (MOFs)

Metal-organic frameworks (MOFs) are organic-inorganic hybrid crystalline porous materials that consist of a regular array of positively charged metal ions surrounded by organic 'linker' molecules. The metal ions form nodes that bind the arms of the linkers together to form a repeating, cage-like structure. Due to this hollow structure, MOFs have an extraordinarily large internal surface area. [1]

An example of a recently-reported MOF that contains calcium cations is shown in Figure 1 below, alongside the chemical structures of the organic linkers. Can you identify the pores, organic molecules and metal centers in the ball-and-stick image?

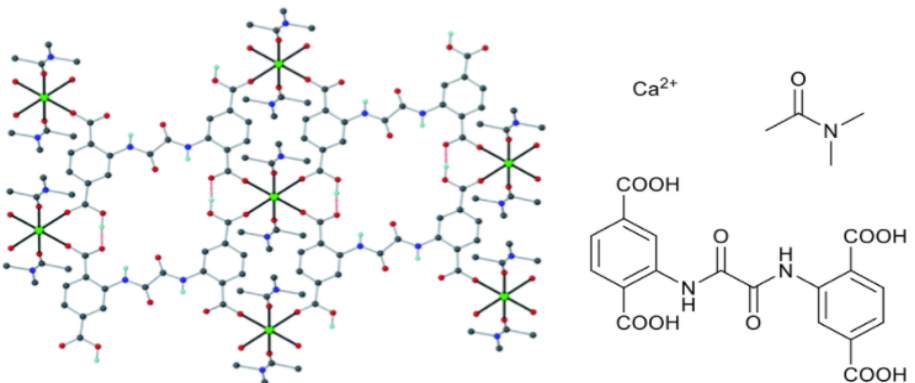
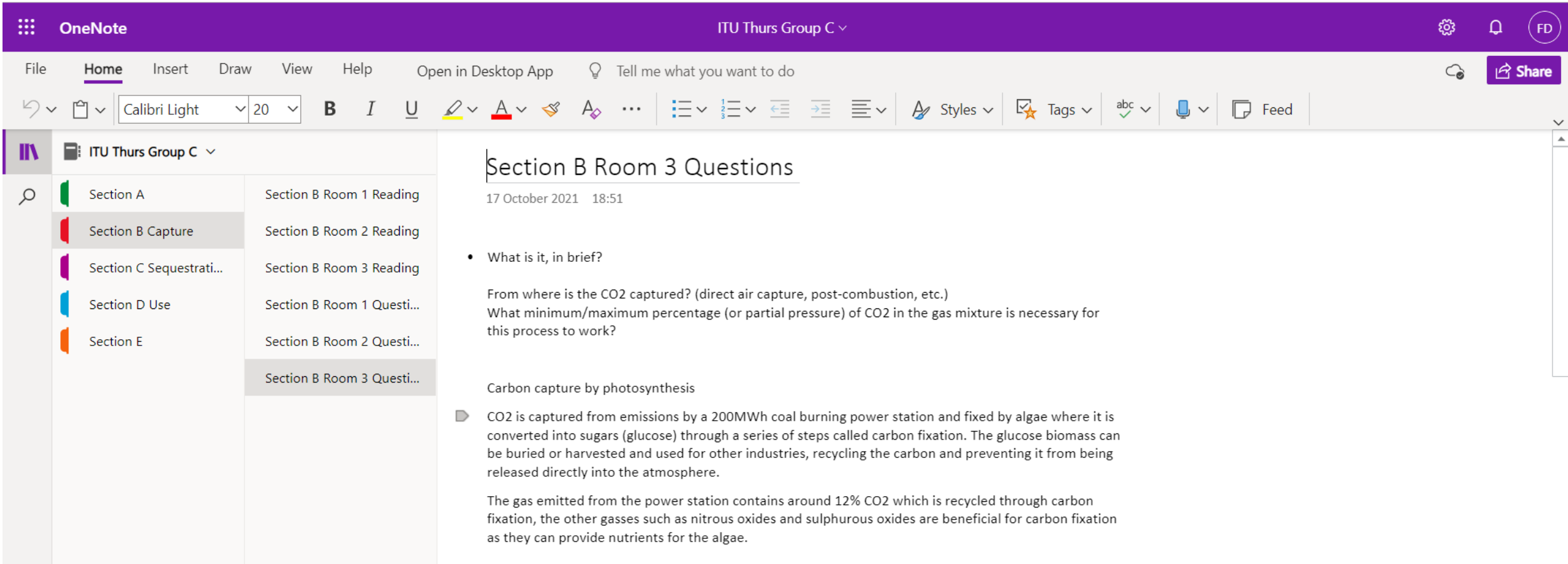


Figure 1. Left: Structure of a calcium-containing MOF named **Ca-MOF**. (Ca green, C grey, O red, N blue, and H cyan).[2] Right: structure of the components, including dimethylacetamide, which acted as a solvent during synthesis but has been incorporated into the structure.

Using OneNote to create a shared resource



The screenshot displays the Microsoft OneNote application interface. The top ribbon is purple and includes the 'OneNote' logo, the notebook name 'ITU Thurs Group C', and icons for settings, notifications, and a user profile 'FD'. Below the ribbon is a menu bar with 'File', 'Home', 'Insert', 'Draw', 'View', and 'Help'. The 'Home' tab is active, showing a rich text editor with various formatting options like font face (Calibri Light), size (20), bold, italic, underline, color, and background color. The left sidebar shows a tree view of the notebook's structure, with 'Section B Room 3 Questions' selected. The main content area shows the text of this section, including a date and time stamp, a bullet point, and several paragraphs of text.

OneNote ITU Thurs Group C

File Home Insert Draw View Help Open in Desktop App Tell me what you want to do

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ITU Thurs Group C

- Section A
- Section B Capture
- Section C Sequestrati...
- Section D Use
- Section E

Section B Room 3 Questions

17 October 2021 18:51

- What is it, in brief?

From where is the CO₂ captured? (direct air capture, post-combustion, etc.)
What minimum/maximum percentage (or partial pressure) of CO₂ in the gas mixture is necessary for this process to work?

Carbon capture by photosynthesis

CO₂ is captured from emissions by a 200MWh coal burning power station and fixed by algae where it is converted into sugars (glucose) through a series of steps called carbon fixation. The glucose biomass can be buried or harvested and used for other industries, recycling the carbon and preventing it from being released directly into the atmosphere.

The gas emitted from the power station contains around 12% CO₂ which is recycled through carbon fixation, the other gasses such as nitrous oxides and sulphurous oxides are beneficial for carbon fixation as they can provide nutrients for the algae.

Graduate attributes – pre-ITU task

OneNote Pre ITU Task Semester 1

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Calibri 14 B I U A Styles Tags abc Feed

Pre ITU Task Semester 1

- Introduction Graduate Attributes
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday

Add section Add page

Please state which degree you intend to study for and rank the attributes by letter from most important to least important.

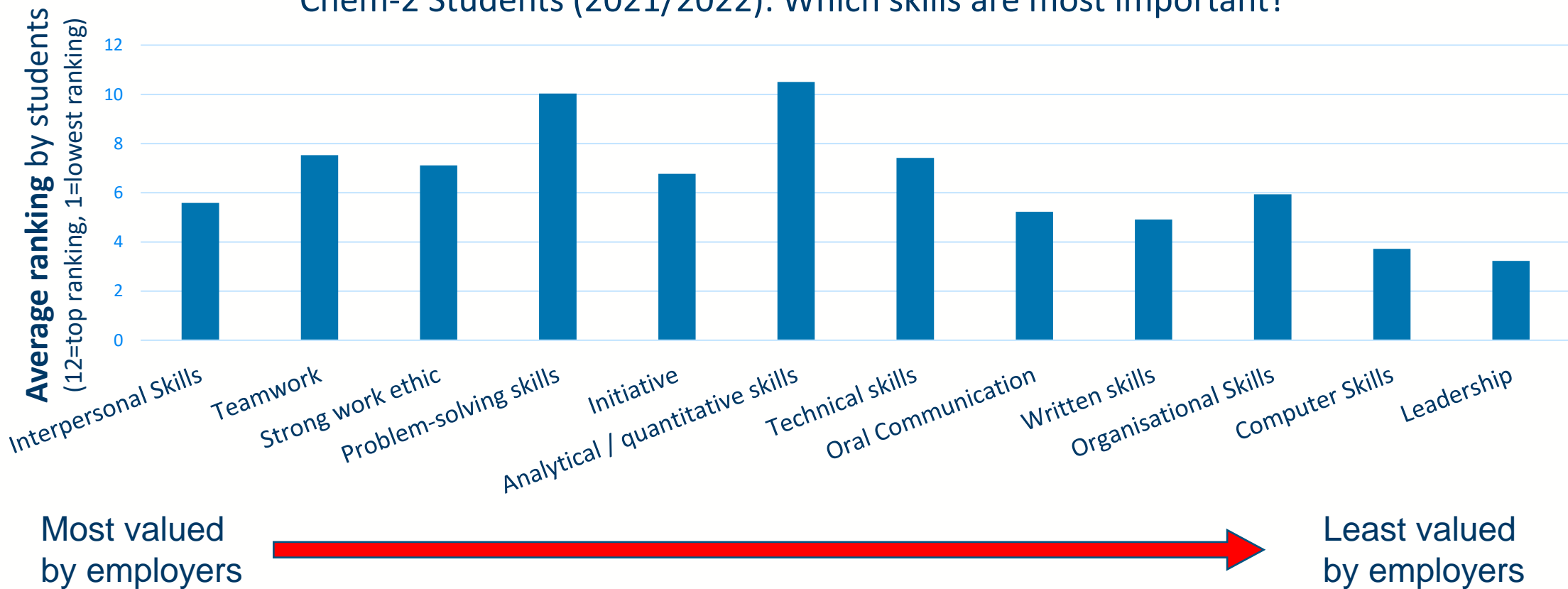
Graduate Attribute
A. Analytical / quantitative skills
B. Computer skills
C. Initiative
D. Interpersonal Skills
E. Leadership
F. Oral Communication Skills
G. Organisational Skills
H. Problem-solving skills
I. Strong work ethic
J. Teamwork
K. Technical Skills
L. Written Communication

Degree	Ranking
Neuroscience	J, A, B, D, E, G, I, C, F, H
Chemistry	B, J, A, H, I, C, E, D, F, G
Chemistry	C, G, B, F, H, I, A, D, E, J



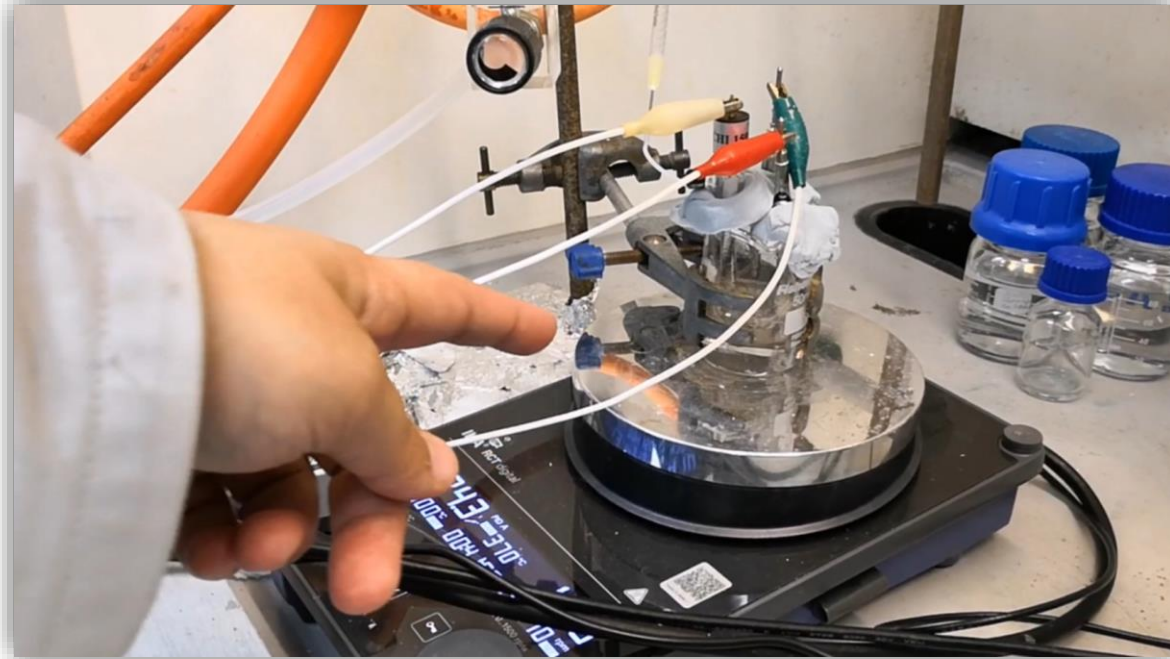
Graduate attributes – evaluation

Chem-2 Students (2021/2022): Which skills are most important?





Linking students to research (1)



Video

with UofG PhD students undertaking Carbon Capture research was shared at end of ITU session.

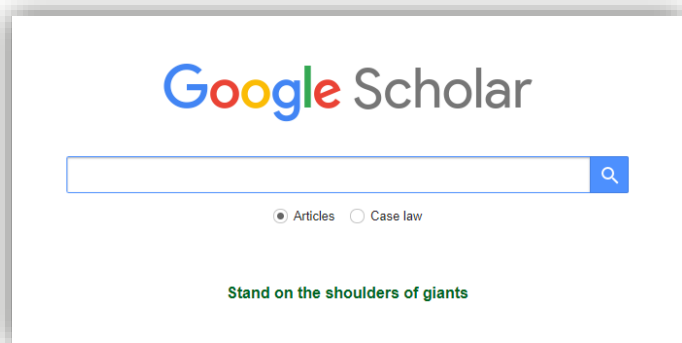




Linking students to research (2)


Post-ITU assessment task





- Research the chemical literature
- Choose a recent research paper
- 500–600 word essay on one method of carbon capture



University of Glasgow

Types of chemical literature



			
Research articles a.k.a. primary literature Full paper (ca. 7 pages) Communication or Letter (ca. 3 pages)	Review articles a.k.a. secondary literature. 10–100 pages long	Patents	Other Theses Edited books Textbooks etc.

Guidance video / screencast with member of staff explaining how to use Google Scholar



Initial feedback

It is certainly **topical** and certainly seemed to interest the students a lot more than refrigeration.
– Staff Member

Really **enjoyed** today's session. Was nice to interact with other students and learn from them. The tasks were easy to follow and allowed a **lot of discussion**. Thank you.

The more critical feedback centred around the length of material students were asked to get through – this will be reduced and streamlined next year.

Themes covered were really **interesting** and covered a range of applications (from experimental to already applied).

Discussing it through with my group was really helpful and it's also nice to get some **interactive learning**.

Next steps

- Analyse feedback
- New ITU for 2022/23
 - Anti-viral drug discovery
 - Alternative assessment?

Thank you for listening!

Questions? Comments?
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