

Flipping the Classroom

in the Online Environment –

Having students create their own Learning Content

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Lecturer in Biopharmaceutical Engineering
Science



Back-Flipping (and Somersaulting) the Classroom

in the Online Environment –

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Flipping in the Classroom

- Level: Year 3 Level 7 class
- Module: Medical Device Technologies
- Cohort: Some transfer students from undenominated programmes and other colleges.
- Diverse group (socioeconomic, race, ethnicity, learning needs etc)

The screenshot displays the Moodle LMS interface for the course 'Medical Device Technologies', which has 494 subscribers. The interface includes a navigation menu with 'HOME' and 'VIDEOS' tabs, and a 'PLAY ALL' button for the video uploads. A central 'Moodle™ screenshot' overlay shows a playlist for 'Week 2 - Global industry and device design' with items such as 'Week 2 slides', 'Medical device companies', and three 'Section 1' videos (P3, P4, P5). A video player on the right shows a video titled 'Week 2 P4 Metal medical devices' with a duration of 12:56. The video player includes a 'CUSTOMISE CHANNEL' button and a 'MANAGE VIDEOS' button. The video content shows a slide titled 'Titanium and Titanium alloys' with bullet points: 'High strength to weight ratio', 'Density of 4.5 g/cm³ compared to 7.8 g/cm³ for 316 SS 304', 'Modulus of elasticity for alloys is about 120 GPa', 'Low modulus of elasticity - does not match bone causing stress shielding', and 'Poor shear strength, making it undesirable for...'. The video player also shows a 'SORT BY' dropdown and a 'years ago' timestamp.


In Class Activities





 **Journal of Cleaner Production** 
Volume 108, Part A, 1 December 2015, Pages 363-376

Exploratory study of the state of environmentally conscious design in the medical device industry

James Moultrie ^a, Laura Sutcliffe ^a, Anja Maier ^b

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<https://doi.org/10.1016/j.jclepro.2015.06.014> [Get rights and content](#)
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Highlights

- We conduct a cross sectional survey of 34 medical device designers on Design for Environment (DfE) topics.

 **Powder Technology** 
Volume 364, 15 March 2020, Pages 189-204

Review

Metal injection moulding of surgical tools, biomaterials and medical devices: A review

Ali Dehghan-Manshadi ^a, Peng Yu ^b, Matthew Dargusch ^a, David StJohn ^a, Ma Qian ^c

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<https://doi.org/10.1016/j.powtec.2020.01.073> [Get rights and content](#)

Abstract

Over the last three decades, Metal Injection Moulding (MIM) has become an increasingly important manufacturing technology for small (typical maximum



Week 1 -2



After Week 2



After Week 6



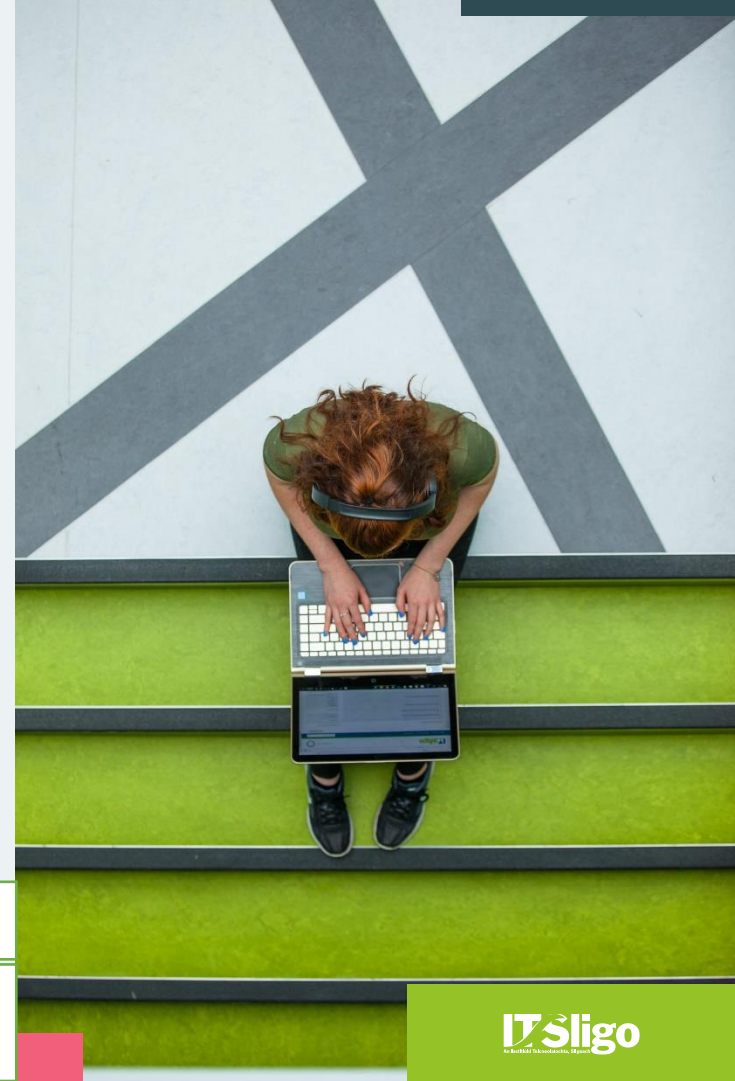
The Pandemic...

Maslow's Hierarchy of Needs



Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370–396. <https://doi.org/10.1037/h0054346>

Abraham Maslow and the pyramid that beguiled business By William Kremer and Claudia Hammond
BBC World Service
Published 1 September 2013
<https://www.bbc.com/news/magazine-23902918>

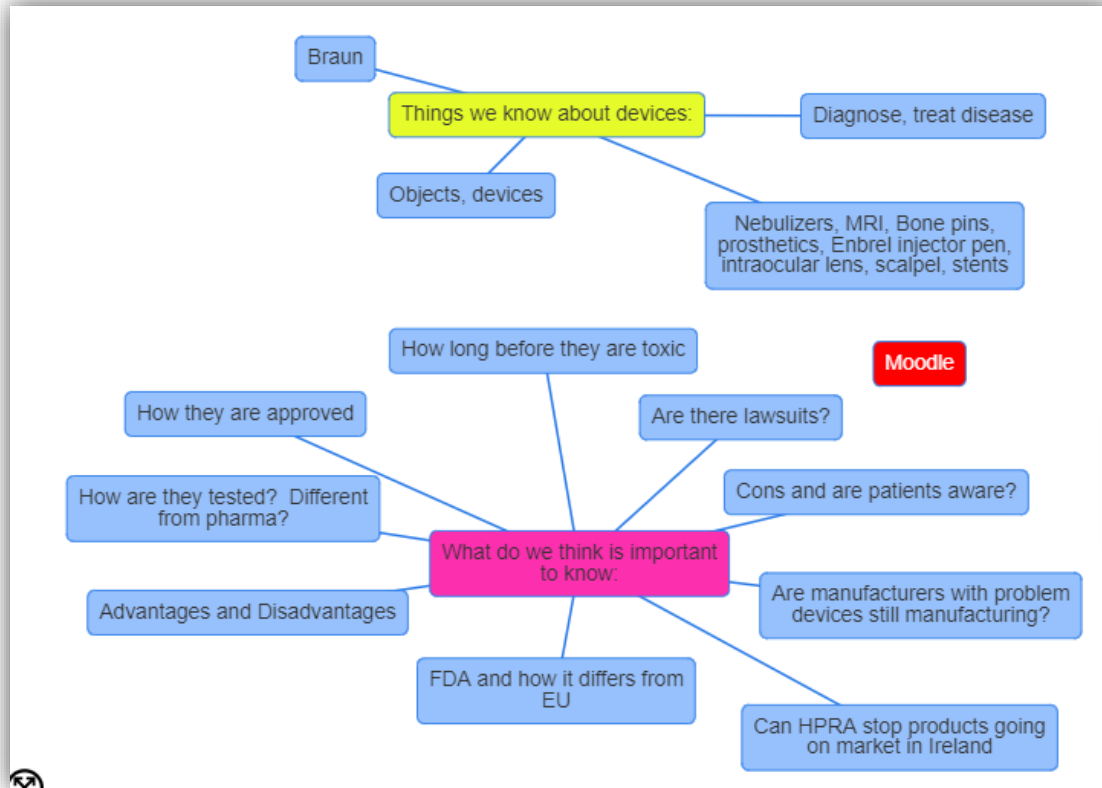


Backflipping



- 3 hours timetabled
- 1 hour was dedicated to students watching pre-recorded content
- 2 hour session of **active** engagement
- Lots of breakout rooms!
- Some fun

Created using Moodle™ Mindmap – Whole Class Activity

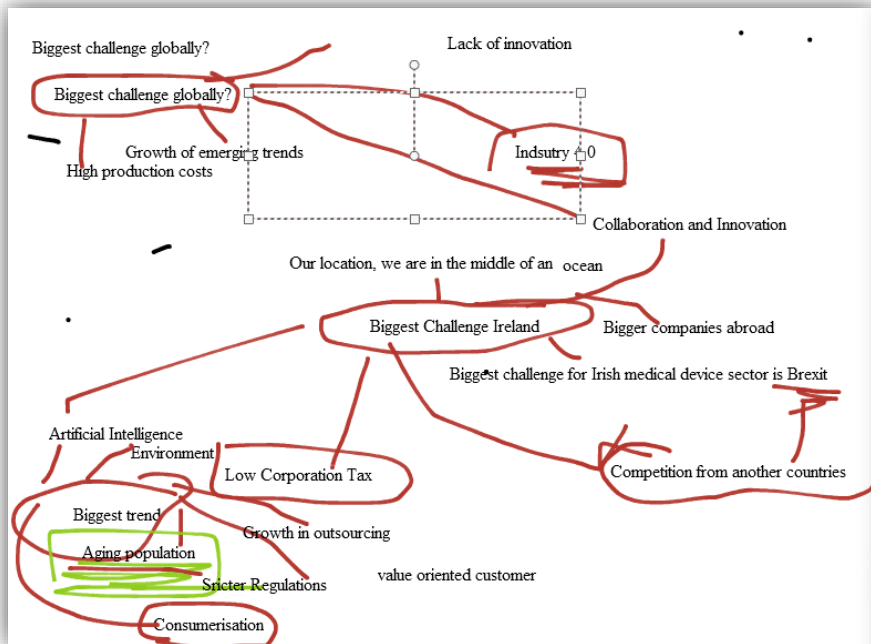


Moodle™ screenshot

- 💡 Discussion points today - 29Sep2020
- 💡 Design considerations for heart valve - discussion point



Created using Teams™ Whiteboard – Group Activity



Regulatory body

material wear

production costs

Make sure the products are actually effective

testing performed

Make sure theyve gone through successful trials

would they be rejected by the body in any case

doesnt cause harm to the person

who can get them

Make sure it is accessible to everyone who will need it

Heart valves should be resistant to the conditions of the body (Heat, corrosion, friction) and made of materials that will cause the least harm

will the heart perform at the same rate as it does now, does it provide any help to the patient

are suitable for the environment of the body

Can Doctors implant them correctly

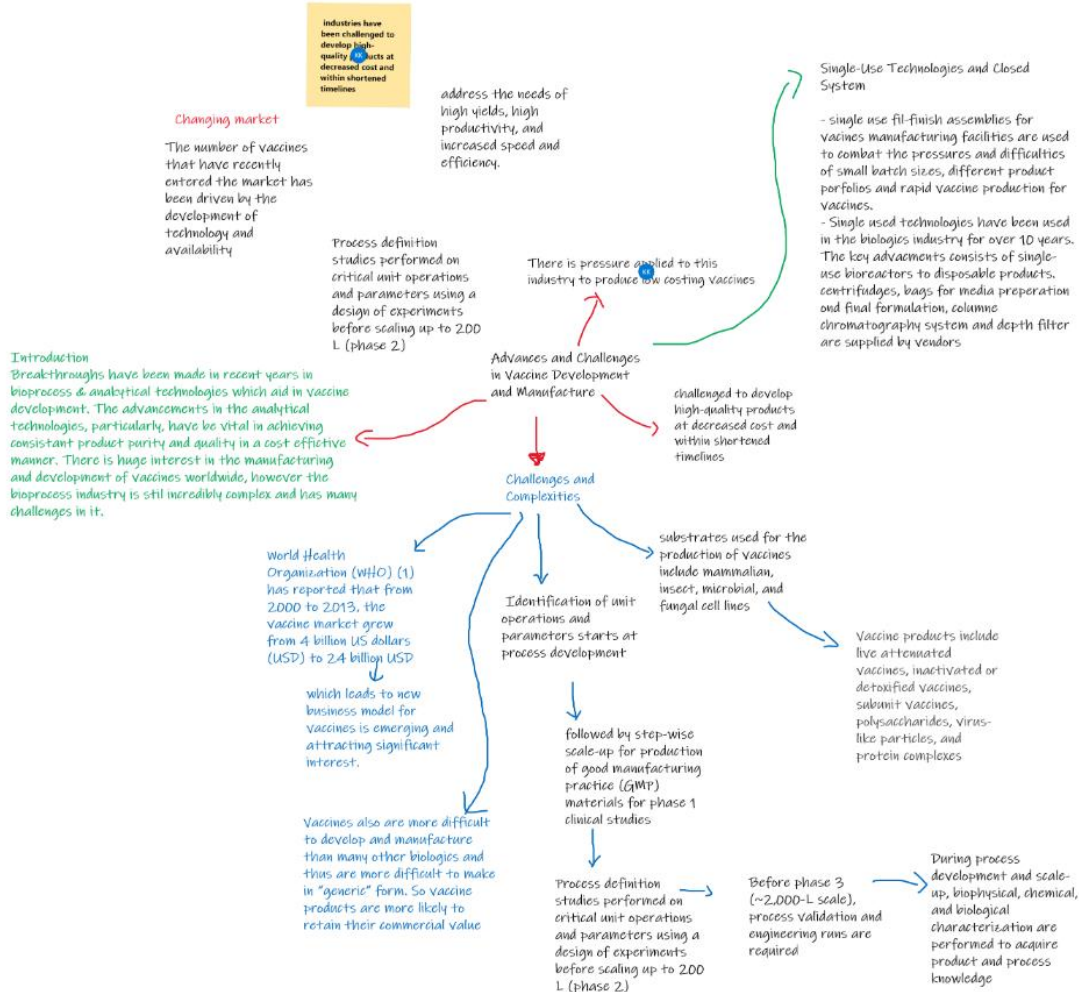
do they need to be replaced ?

Make sure the quality of the product is durable and long lasting

Moodle™ screenshot

- Files to view in class
- Recording of live lecture
- Screenshots we created in class
- Video: Section 2 Part 1
- Video: Section 2 Part 2

Group Mindmap



Somersaulting

New module with the same group in semester 2

3 hour sessions on Friday mornings!

Lots of breakout rooms!

Moodle™ screenshot

Assessment area

Details of Assessments here:

Exam: 60%
CA: 40% comprises:

1 Written blog assignment (20 %) - 22nd April

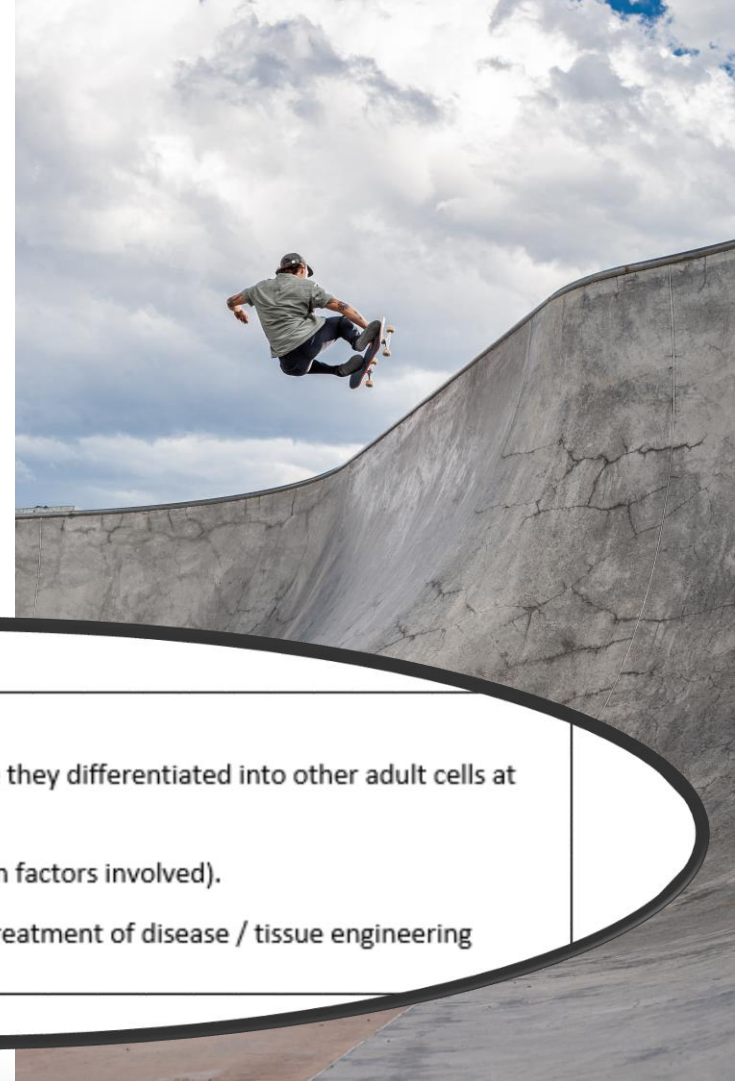
2 X in class assignment (20 %) - 22nd April

Group 3:

What are Mesenchymal Stem Cells? How and why are they differentiated into other adult cells at various timepoints (i.e. what triggers them?).

Describe 1-2 cell lineages (growth factors, transcription factors involved).

From the literature, described some MSC studies for treatment of disease / tissue engineering applications.



CELLS-SOURCE

You will **select your cell based on what function** you need your tissue to serve.

If you are looking to make cartilage

If you want to make bone.....

We choose these cells because, despite the fact that all cells contain the complete genome, **cells also have memory**. That is, these cells have differentiated from some progenitor cells in the past and have something that either allows them to make certain proteins more often or to not be able make others at all.

As a result, you want to choose a cell that is going to most naturally produce the **proteins and materials that you are looking to produce**

This can be due to a covalent modification of the actual DNA, a soluble signal

LIVING PART OF TISSUE

The cells are what provide the tissue with the "living" component. The tissue itself is **inert** to tissue repair and healing. During wound healing and repair, the tissue undergoes:

3

CELLS ALSO PROVIDE THE TISSUE WITH THEIR FUNCTION

Cells also provide the tissue with their **function**. For example, in cartilage the proteoglycan and glycoprotein that the cells produce provide the tissue with their **structural properties**.

In other tissues, such as the **prostate**, the cells produce the **prostate glands** providing the prostate with its function.

As can be seen, the cell plays a vital role in the development of a tissue engineered construct with the desired properties.

4

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5

WOUND HEALING By Corbett, George, Davis, Anderson, DeWitt and others

6

MS Teams™ screenshot



Week 11 - 23rd April (In class assessment week)

Ethical and Regulatory Issues

 [Extra reading - Ethical issues case study](#) ▲▼

 [Lecture 11 slides](#) ▲▼

Assignment details are in the assessment section and

 [Ethics lecture - please watch before class](#)

 [Regulations lecture - please watch before](#)

 [Some useful links](#) ▲▼

Groups 1, 2 and 3

The following is a link to the 'clinicaltrials.gov' registry which details a clinical trial currently recruiting participants, titled '**Anti-CD5 CAR T Cells for Relapsed/Refractory T Cell Malignancies (CD5CAR-T)**'

<https://www.clinicaltrials.gov/ct2/show/NCT04594135?term=cAR-T&draw=2&rank=2>

The study directors would have submitted an ethical approval application to their Ethics Review Board prior to obtaining clinical trial approval.

1. What are the main ethical issues that need to be considered for such a product at the (i) bench (ii) preclinical phase (iii) clinical phase? (3 slides)
2. In this study protocol summarised on the webpage, are the ethical considerations clear and would you have further questions / considerations for the study directors? (1 slide)
3. How would this product be classified and what regulation / guidance applies to it? (1 slide)
4. Detail the considerations for (i) starting and raw materials (ii) pharmacology and toxicology (iii) human safety studies according to the relevant regulation. (3 slides)

Total: 8-10 slides

Outcomes and Feedback

- As the weeks went on, students became more comfortable speaking in Teams and abandoned 'chat' function
- Got used to reading papers, dissecting information, sharing information
- Used multiple means of engagement, representation, action and expression



Active learning

- Whiteboards and Moodle quizzes
- Active conversation between the tutor and students
- A freedom of choice to do the project in a way I liked.

Flipped

- Youtube videos were a great help and the voice notes for feedback.
- The quizzes and breakout rooms were good for breaking up the material and helping further the learning

Breakout Rooms

- Talking in groups while having a task - very beneficial.
- More involved when we had to make flowcharts/brainstorm together in our small groups.
- Wasn't so beneficial on discussing the topic but I enjoyed time on chatting on random things. This was also beneficial.
- Thinking more about the topics and seeing them from different perspectives.

In class assessment

- The group assignments were challenging but fun and I learnt loads learning with a group of people
- The presentations and group assessments were useful in my opinion.

Thank You

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