

# Student Experiences of Online Problem-based Learning in an Interdisciplinary Dietetic and Engineering

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# Introduction



A Problem-Based Learning (PBL) approach using a real-world, topical and carefully selected scenario.



Interdisciplinary and interfaculty between two UL programmes (School of Allied Health, EHS and Department of Electronic and Computer Engineering, science & Engineering).



Online teaching and learning environment (pivoted by COVID-19).



“Health Technology” project blended requirements to provide students with an online, interdisciplinary PBL assignment

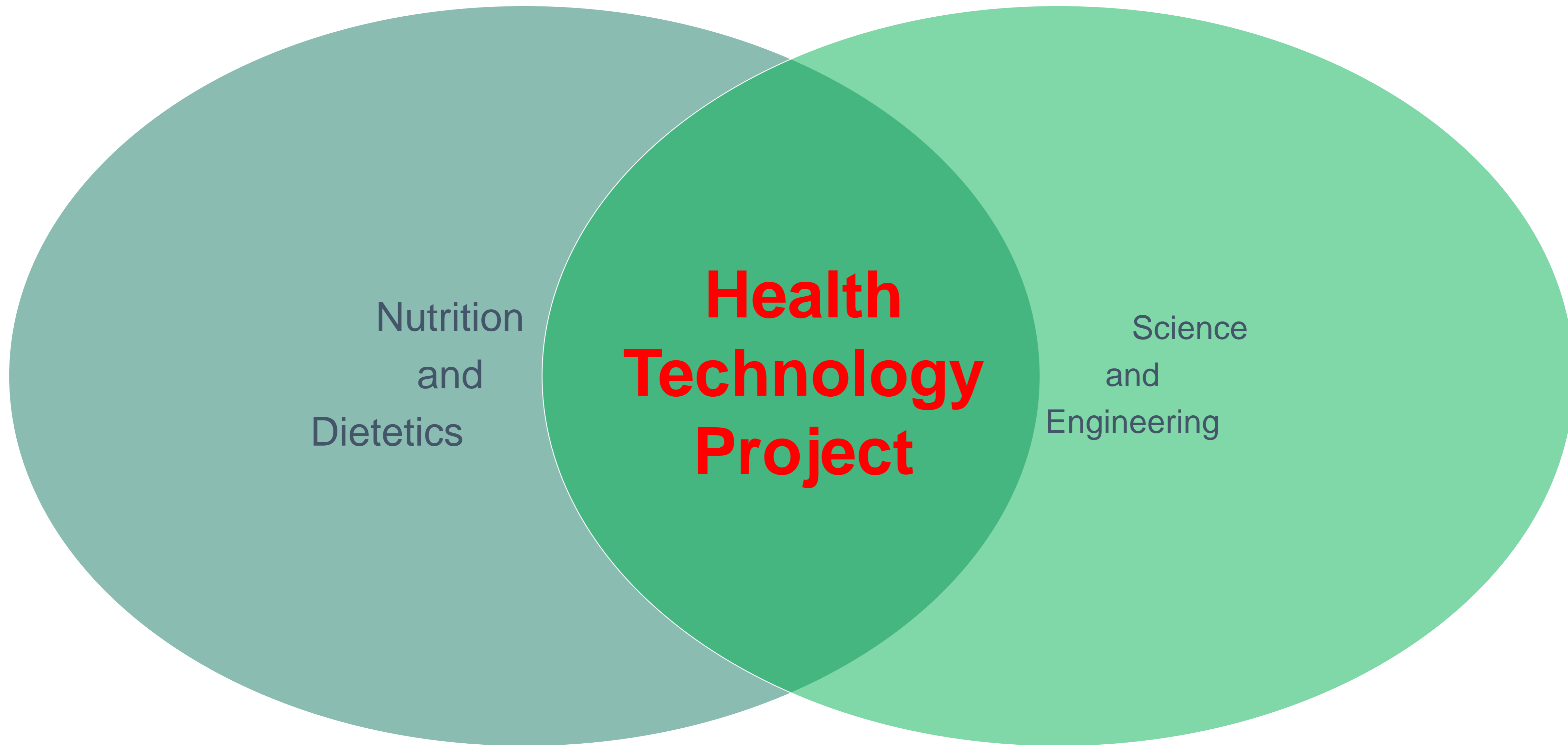




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# Dietetics and Technology

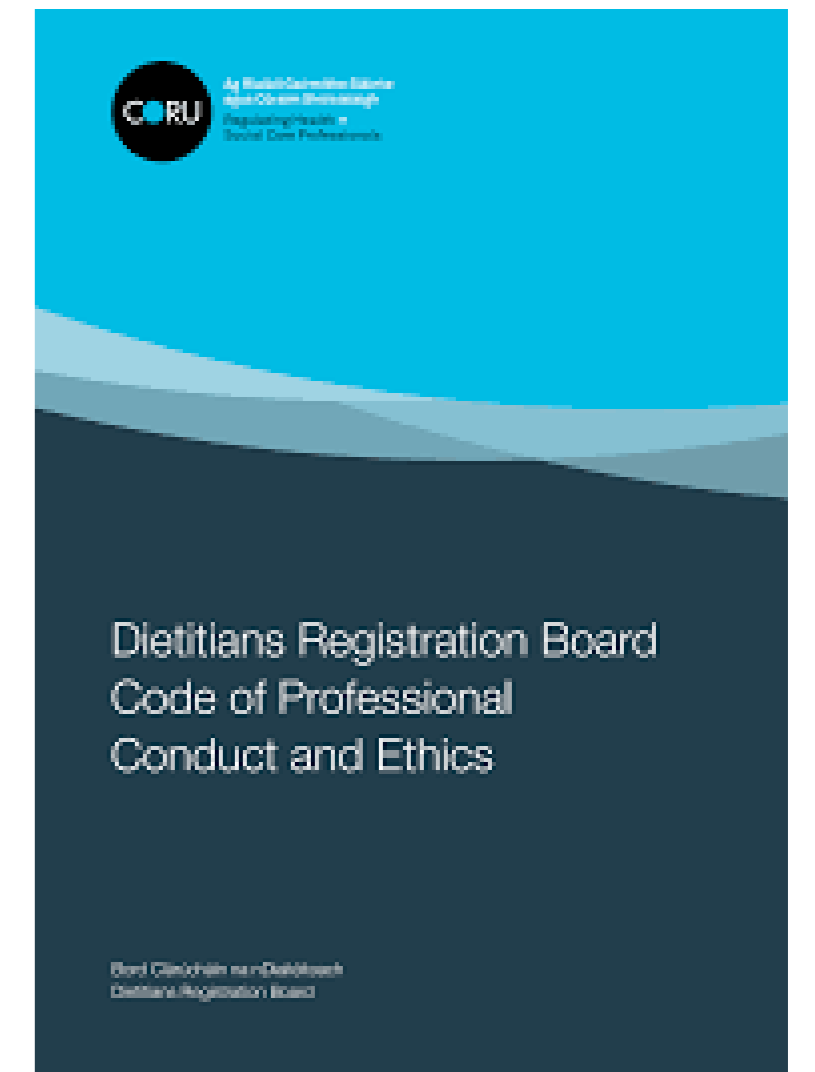


*Figure 1 Results of the scoping review exploring trends, challenges, opportunities, and future needs of the dietetic workforce, in descending order of commonality.* Larger circles indicate the topic was referred to more often; however, this is a graphical representation only and circles are not to scale. Items listed in boxes are subcategories. Linking of circles indicates the path from most commonly to least commonly mentioned topic: emerging or expanding areas of practice (n=52); skill development (n=43); economic considerations (n=31); nutrition informatics (n=23); diversity within the workforce (n=20); specific areas of practice (n=20); additional education (n=17); intrapersonal factors (n=9); perceptions of the profession (n=9); support systems (n=5); protect the scope of practice (n=5); employment outcomes (n=3); registration and credentialing (n=3).

Blair, M., Mitchell, L., Palermo, C. and Gibson, S., 2022. Nutrition Reviews, 80(5), pp.1027-1040.

# MSc Human Nutrition and Dietetics

- Module CT6061 - Dietetic Assessment and Practice
  - 12 weeks
  - 4 contact hours per week
  - ECTS 6 credits
- 15 first year students, first semester, graduate entry
- Students learn the foundations of dietetic practice including the skills of nutrition assessment.
- Focus is on Nutrition Care Process Model
- OSCE to demonstrate skill and competence at basic dietetic assessment skill



# BSc Applied Physics and BE Electronic and Computer Engineering

- Module ET4305 – Instrumentation & Control 1, Code Shared as EE4115 - Systems Analysis
  - 12 weeks
  - 4 Contact hours per week
  - 6 ECTS
- 23 students, 3<sup>rd</sup> Year, Undergraduate
  - Erasmus/Study Abroad/International Students
- Introduces students to the fundamental principles of practical control engineering, the use and specification of instrumentation for control and the application of technology and ICT to instrumentation and control systems and processes.



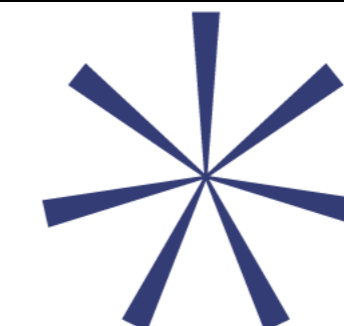
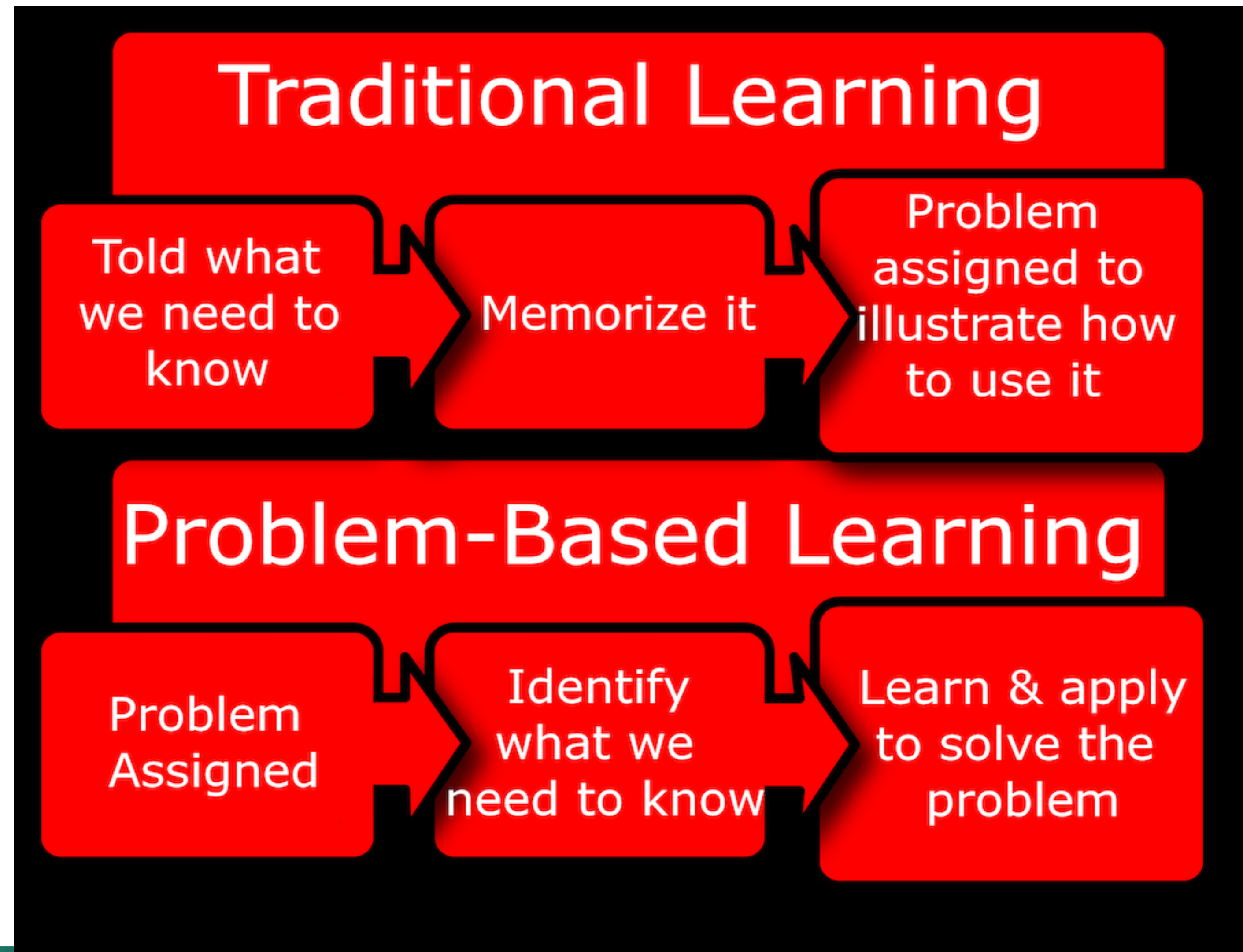
## Worth noting:

- For both student cohorts, this learning activity is their first taste of collaborative groupwork and project work at a team level



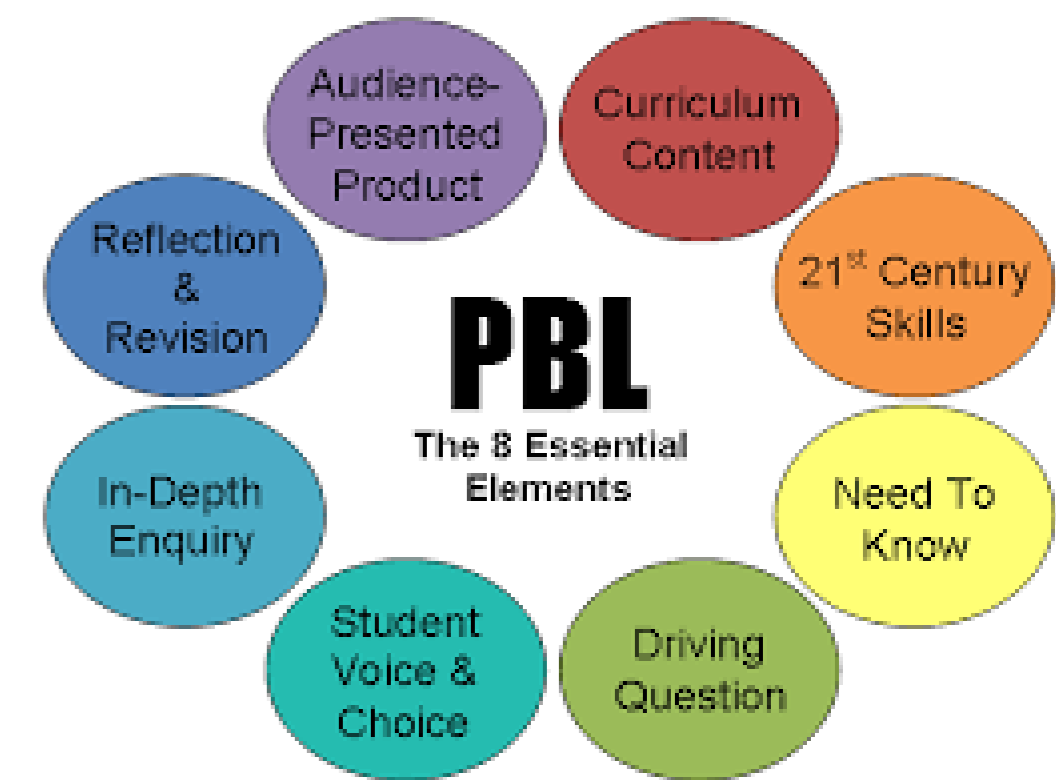


# Problem Based Learning



# Problem-Based Learning Assignment

- Hands-on, active investigation and resolution of problems that might be found in the real world
- Develop critical thinking and creative skills
- Increase motivation & responsibility for own learning
- Help students learn to integrate knowledge to new situations
- Supports collaborative learning
- Focuses on the process of knowledge acquisition rather than the product
- Communication and interpersonal skills
- TEACHER AS FACILITATOR

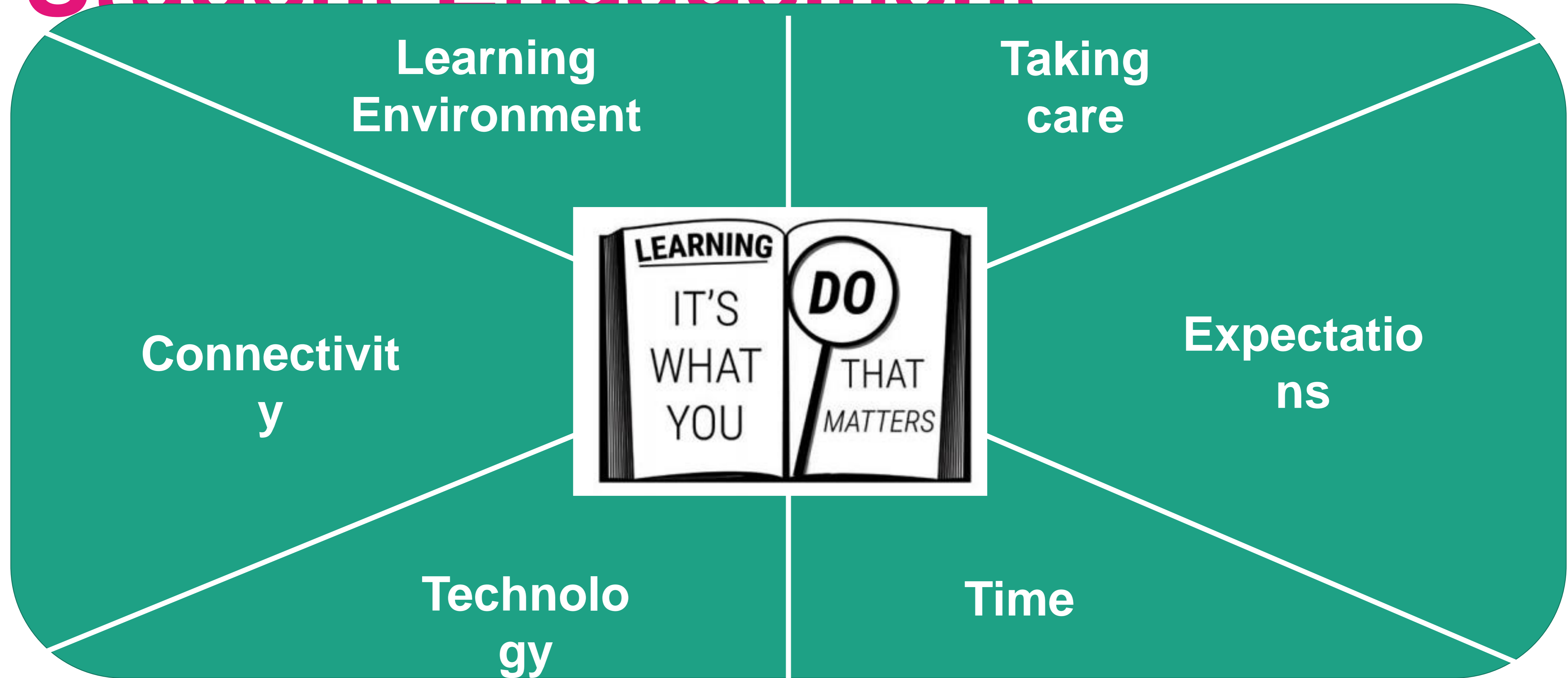


# Student Engagement

Nordmann, et al 2020

<https://psyarxiv.com/qdh25>

Donnelly 2007 <https://arrow.tudublin.ie/ltcbk/25/>



# PBL fosters...



Active &  
self-directed learning



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Authentic  
assessments



Transferable  
knowledge  
and skills

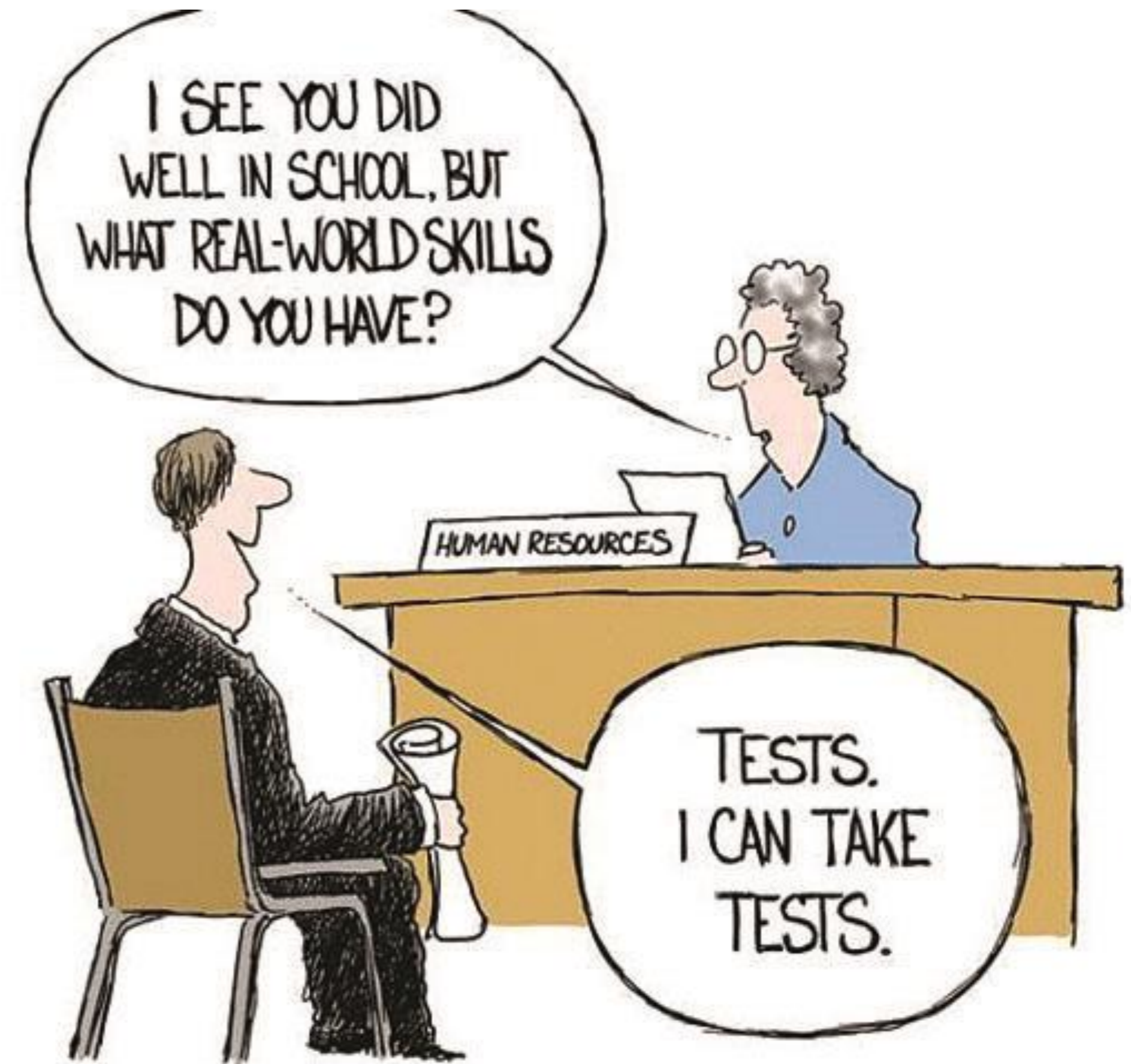
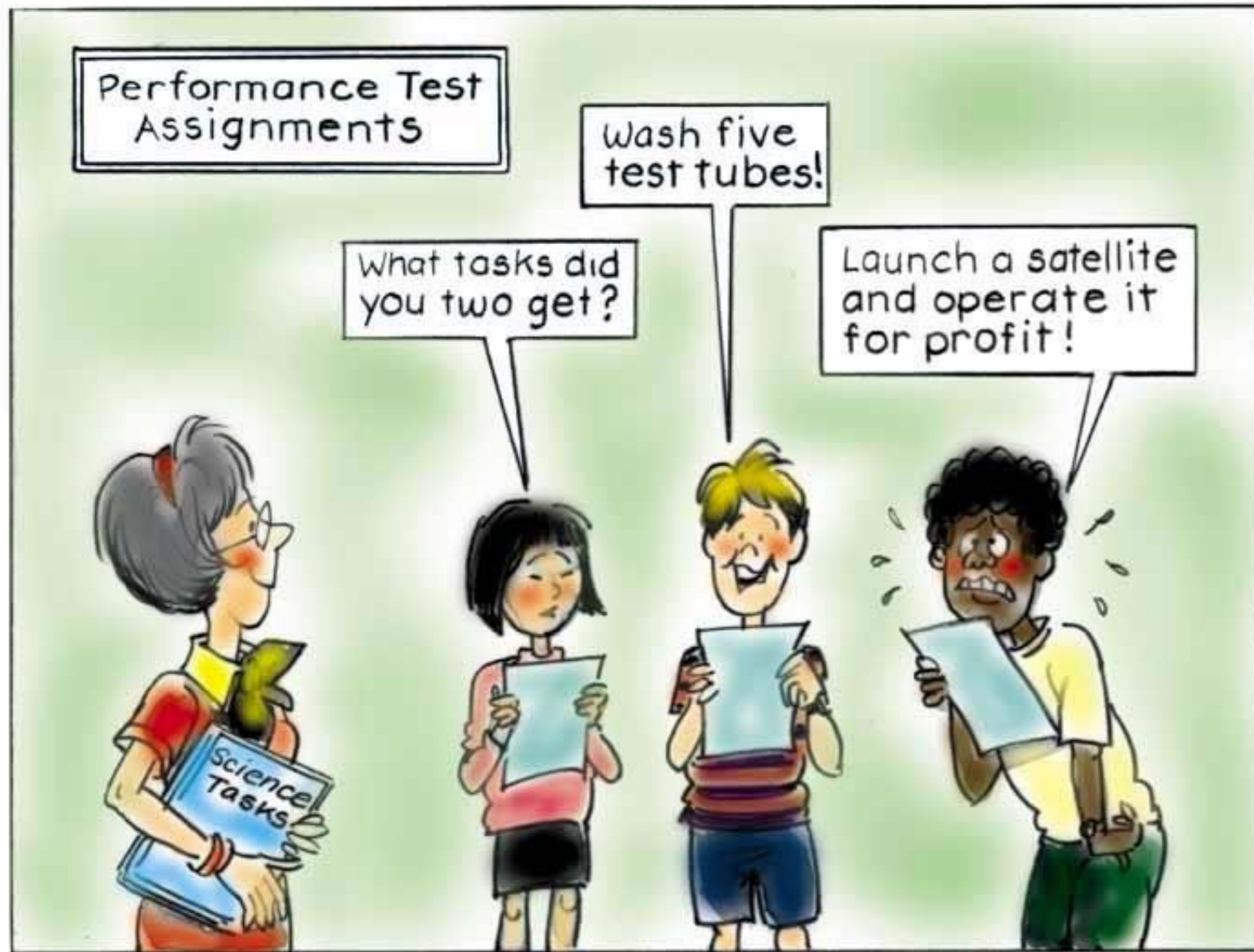


Application  
to several  
disciplines



# The Problem is Key

- How to select a suitable real-life scenario/problem for the PBL project?



# Choosing the PBL Problem



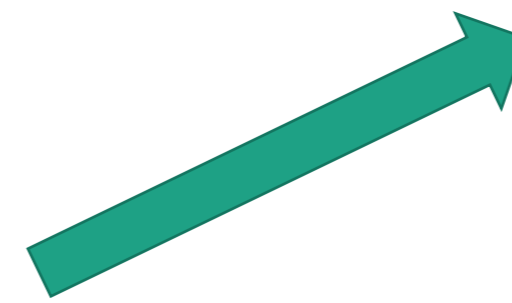
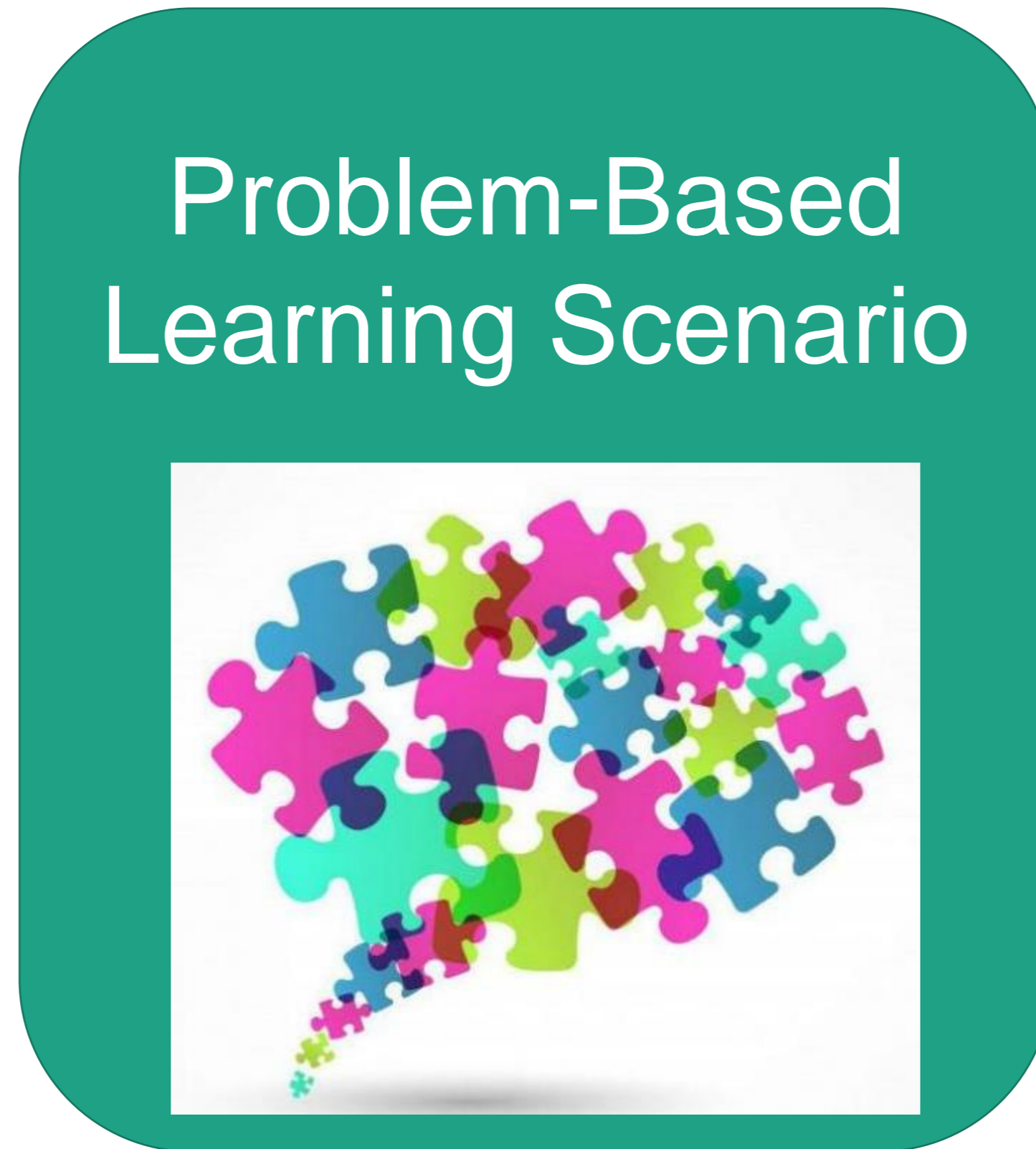
Engineering



Allied Health



Industry Stakeholders



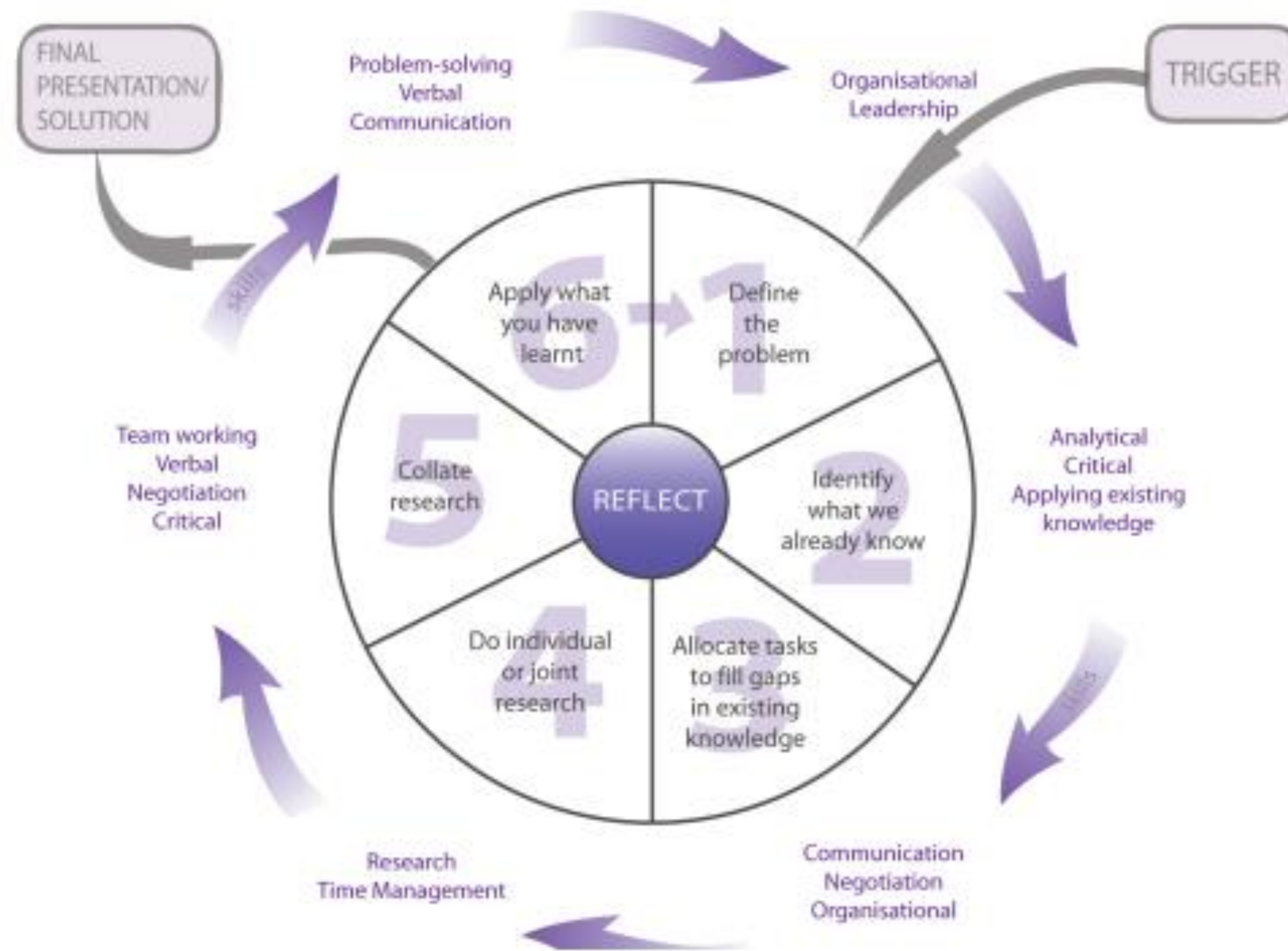
**Dietetics:** - John Smith is a deputy manager at a busy retail outlet. He has been referred to you for weight management.



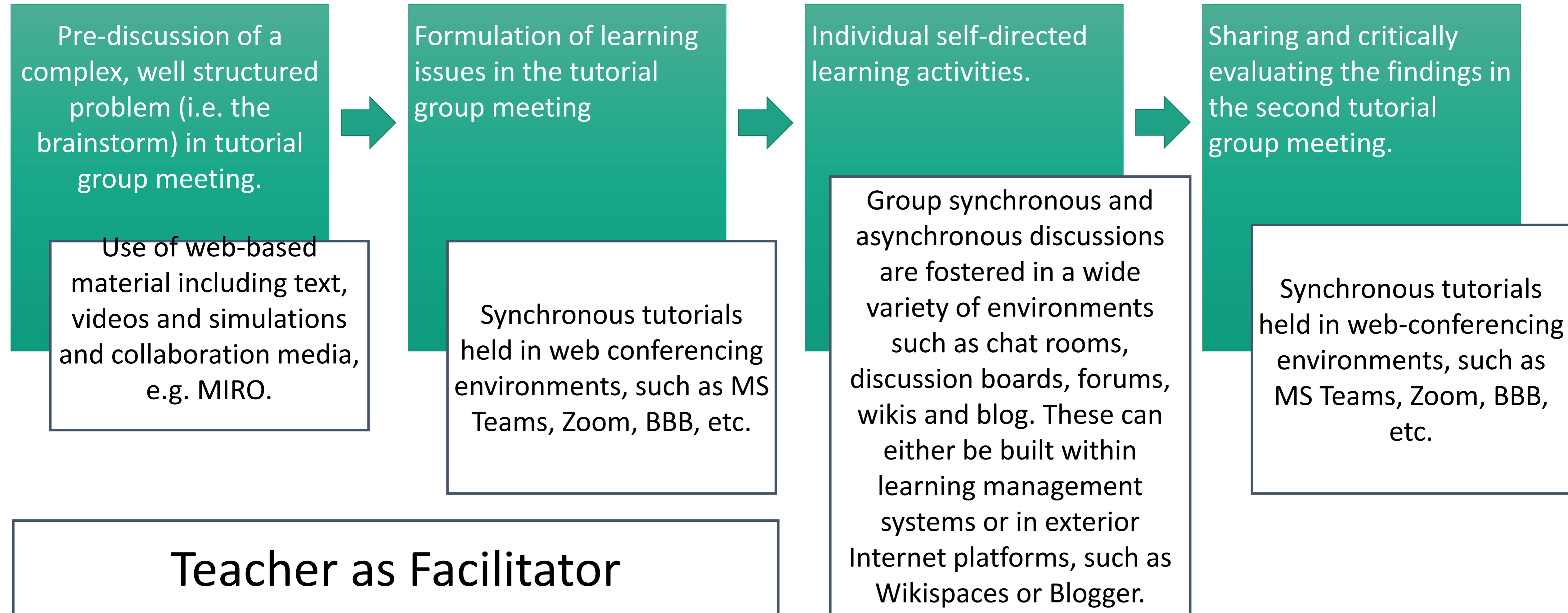
**Electronics:** - Design and build a simple, portable device which will allow a patient to monitor their % body fat in real time.



# The EBL Process-Skills Wheel



# PBL – Transition to Online Teaching





## The Health Technology Project “Problem”

*How can we accurately assess an adult individual’s height using mobile/smart phone technology while maintaining the public health recommendation of physical distancing and avoiding direct physical contact?*

## Problem Justification

- The era of Covid-19 has presented many challenges, in particular in the dietetic practice which have been met through technological support and innovation, **e.g. teleclinics.**
- Smartphone or mobile phone applications could offer a solution to developing an accurate 'hands-free' alternative to the use of standard tools that necessitate proximity and close contact.



## The Health Technology Project “Problem”

*“How can we accurately estimate the weight of commonly eaten foods from a clients photo of their plated meal to provide a nutritional report?”*



## Problem Justification

- Accurate estimation of the weight of food eaten allows the calculation of the nutrient composition of foods and an assessment of nutritional intake.
- Nowadays, most people have access to smart technology that can provide timely information.



Harricharan, M., Gemen, R., Celemín, L., Fletcher, D., De Looy, A., Wills, J., & Barnett, J. (2015). Integrating mobile technology with routine dietetic practice: The case of myPace for weight management. *Proceedings of the Nutrition Society*, 74(2), 125-129.  
doi:10.1017/S0029665115000105

# Student Specifics

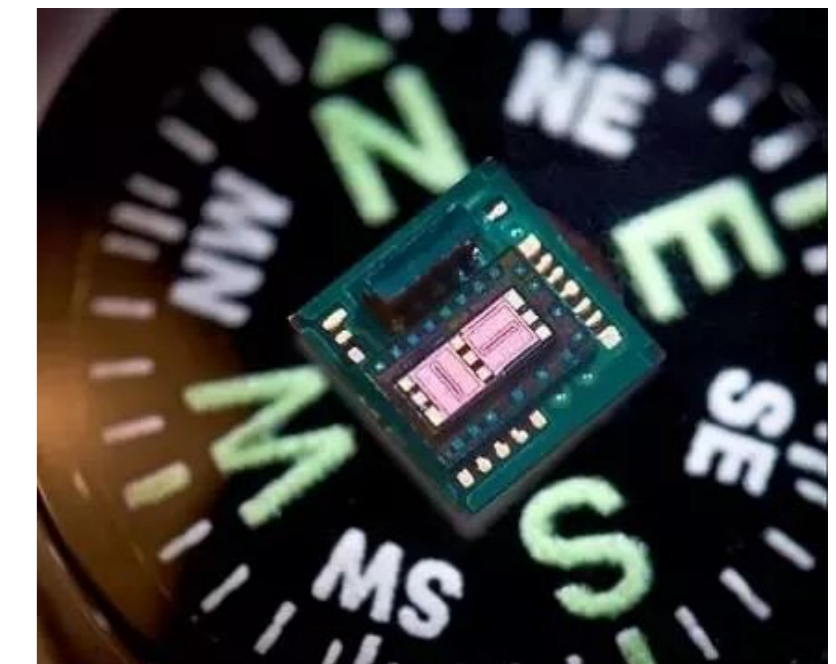
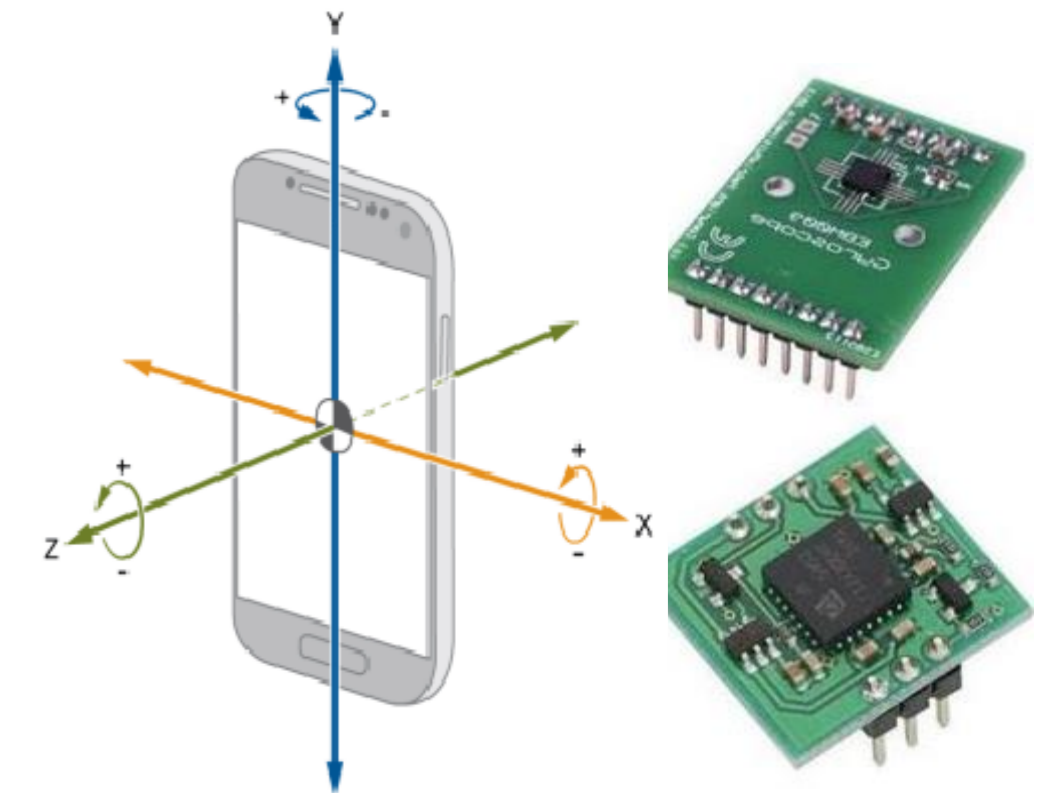
- Working in a small inter-professional team(s) of dietetic and physics/engineering students, you will plan, design and develop the means of a solution.
- The method **MUST** use the sensors and instrumentation on your smartphone in order to achieve this goal.
- Within your team, you will identify the role and responsibility of each discipline to complete the project.



# PBL Stage 1 – Pre-discussion

- Why is an accurate height important?
- What are the variables that need to be accounted for in developing the tool?
- What sensors or instrumentation are available on the smartphone to use to accomplish this?
- What are current alternatives to height assessment?
- How accurate and precise will the height measurement be/need to be?
- How can we be sure the tool works?
- How do we communicate with the client how to use the tool?

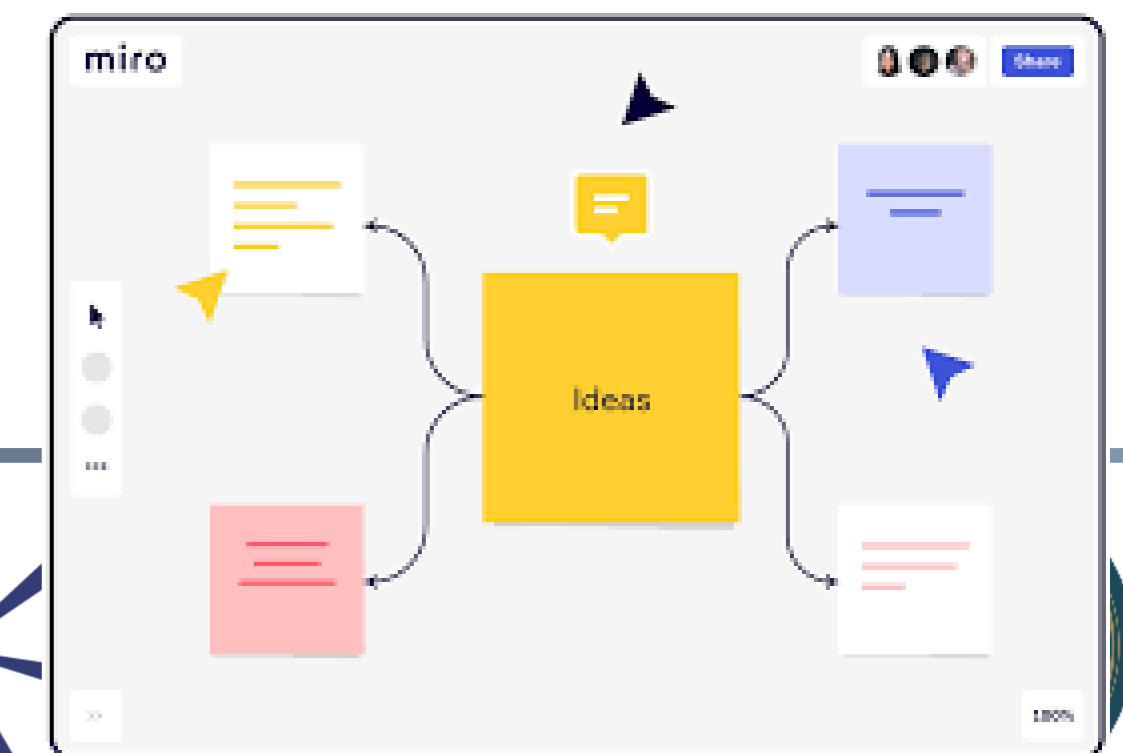
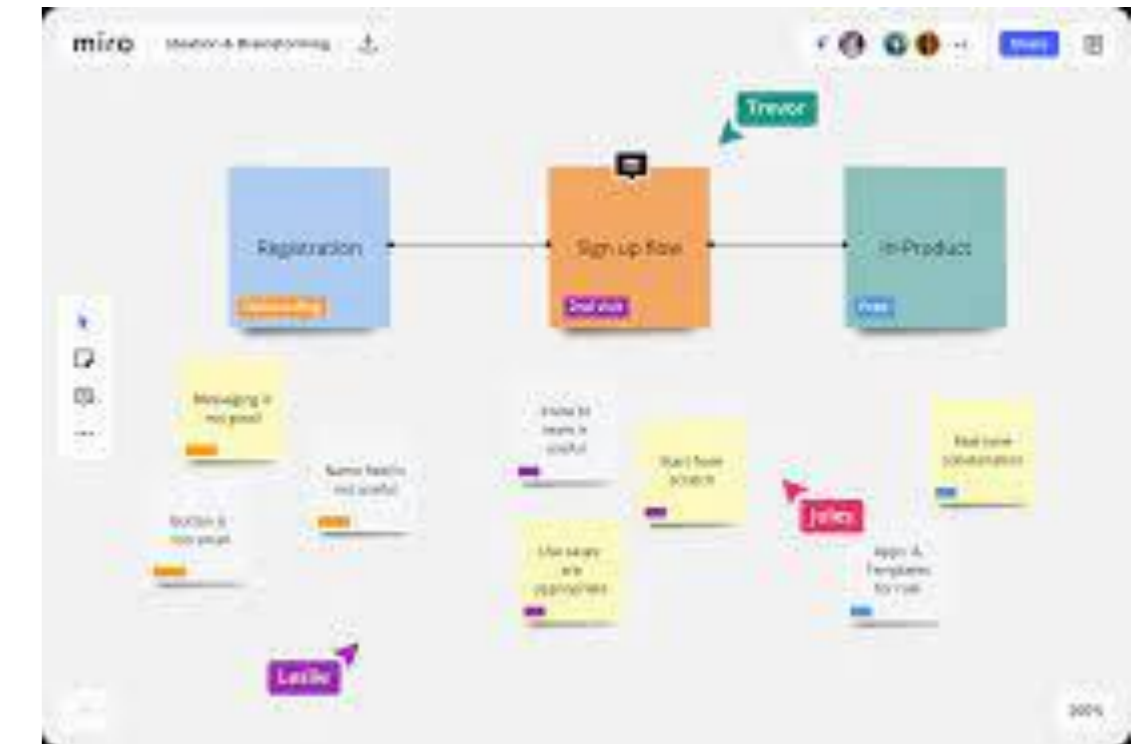
The above is obviously not an exhaustive list of considerations and your group can come up with others in your discussions.



# PBL Stage 2 - Tutorial Group Meeting



- Using MIRO record a 1 minute video describing your proposed solution including information you have gathered and suggestions of how you intend to progress with the task.
- Upload the video in week 7 (Dietitians responsibility to Sulis).
- In week 8, is an opportunity to discuss with your peers and module leads anticipated issues, possible solutions and to formulate learning objectives to complete the task within time.

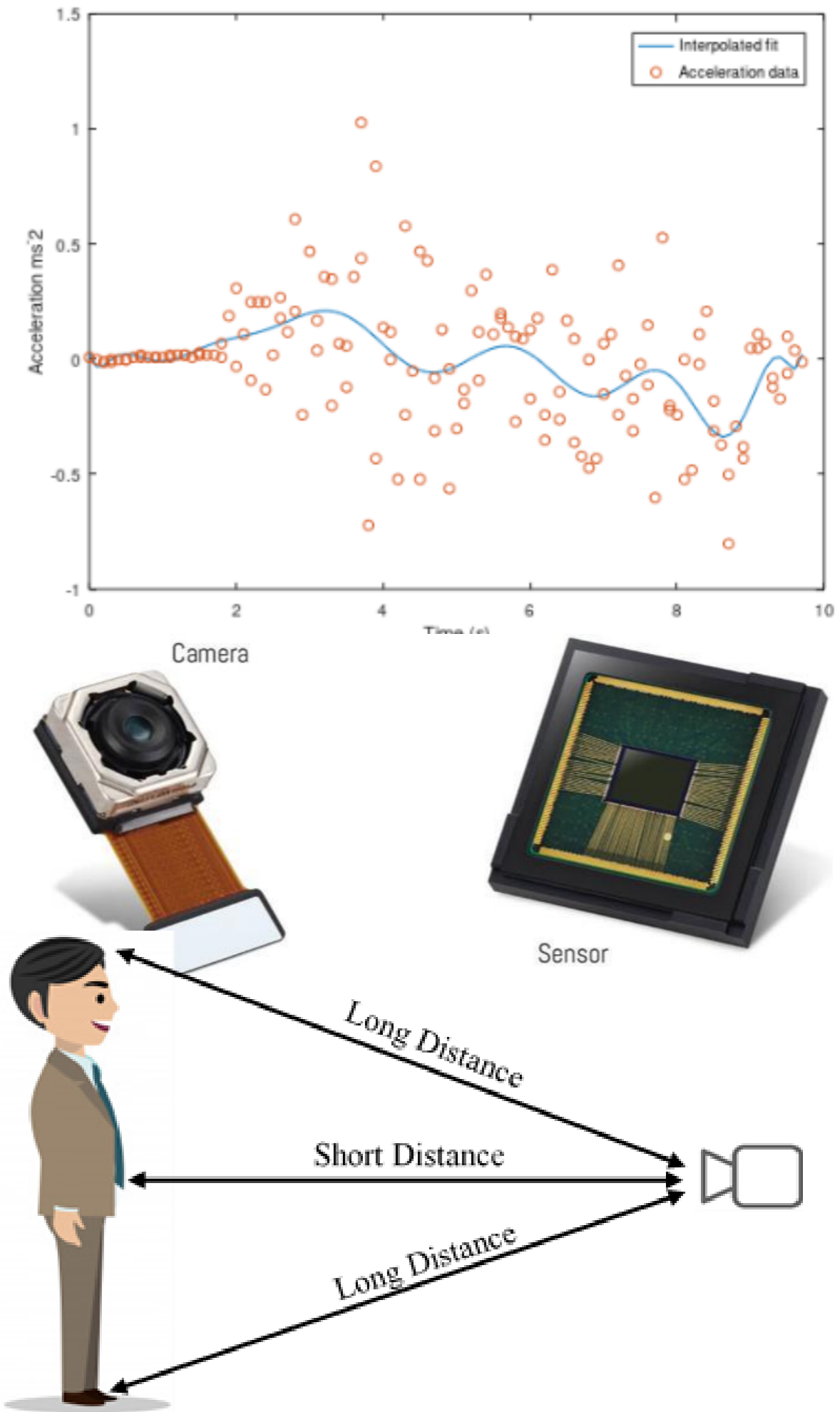






# PBL Stage 3 - Self-directed Learning Activities

- Self-directed learning includes thinking critically about the information gathered, locating resources (existing guides, media, open education programmes, mentors, etc.), understanding the context of patient participation in nutrition assessment.
- During this time, students also needed to develop the measurement method you are going to use, create any programs or methods to take the measurements and calculate the result.
- Students needed to debug and test their proposed solution during this phase of the project.



# PBL Stage 4 - Sharing & Evaluating Findings

- Upload assignments reports structured as :
  - Part A Technical report (Engineers)
  - Part B Reflection (Dietitians)
- In week 12, your team will present your problem solution to the module leads for the project in 3 minutes.
- More details on the format and requirements for the reports/presentation will be provided closer to the due date for the presentation.

Roisin Mc Gowan  
Lison Pouteau



Health Project  
Measure height with a Smartphone  
Instrumentation and control  
Dietetic assessment and practice

## Patient considerations

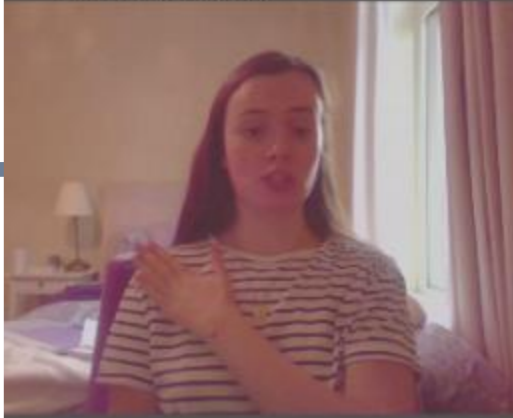
- Patient with disabilities who cannot stand upright
  - Development of a solution that allows the patient to get his height by measuring his knee height.
- Patient who is not comfortable with technology
  - Development of a user-friendly solution, with detailed explanations to help the patient perform the measurement.
- Patient who is confined alone
  - Development of a solution allowing the user to measure his height by himself, without the assistance of another person.



Boyle, Fahy, Radisson



Instructions



1. Mark the bony part of your elbow (tip of elbow) and the bony, most prominent part of your wrist on your less dominant arm.
2. Place your arm diagonally across your chest with your fingers pointing towards the opposite shoulder.
3. Take your smart phone and allow the sensors to recognise the bony point of your elbow.
4. Slowly move your phone upwards till it reaches the bony point of your wrist.





# Interdisciplinary team – Challenges?

“Technical communication was challenging, but that being said, it has to be done in the real world”

“More to do for the engineering side.”

“Working as team online can be difficult. Finding a suitable time/day. Language/communication barrier”



## PBL – Difficulties?

“I think difficulties are normal and that is precisely what allows us to learn. By resolving the problem alone or in small group, we develop skills that we can never have by doing fully prepared and guided projects.”

“Auto-learning, I found difficult to work by myself from the start, I'd rather someone teach me and then I work”

“Struggled at the start with actually realizing our ideas, some of our original ideas were impractical in the given timeframe.”

“Having little knowledge on how to tackle the problem. The solutions were more difficult to understand than i thought, however it was not my discipline”





# Online Collaboration Challenges

It was hard to coordinate everybody's schedule as with in semester assignments everybody was busy at different times

It was that its more difficult to exchange with other members of the group. We can make meeting but as soon as the meeting is finish, we are all alone so there is less interaction about the way to done the project. Meeting are generally use for split the work on the group at the beginning and then just to say where we are in the project.

## PBL Assignment - Suggestions

“Create a more inclusive project for all students. i.e. make sure they have valuable information that adds to the project.”

“Set up regular meetings and take more notes to use when working on the final report”

“More effective communication, define the roles earlier in the process.”

# Lecturer as Facilitator

- Maybe a more rigid list of requirements so a student can know how much there is to do (n 3).
- This was done as well as possible given the situation (n 5)
- Maybe by showing example of how we could do it (n 2)
- Maybe scheduling group meetings into the timetables to ensure it works for everyone (n 3)
- It could better if someone was following the team each week or month in order to see if everything is ok without necessarily helping them just for checking, encouraging them and pushing them to work more if they are late could be also useful to cheer them up



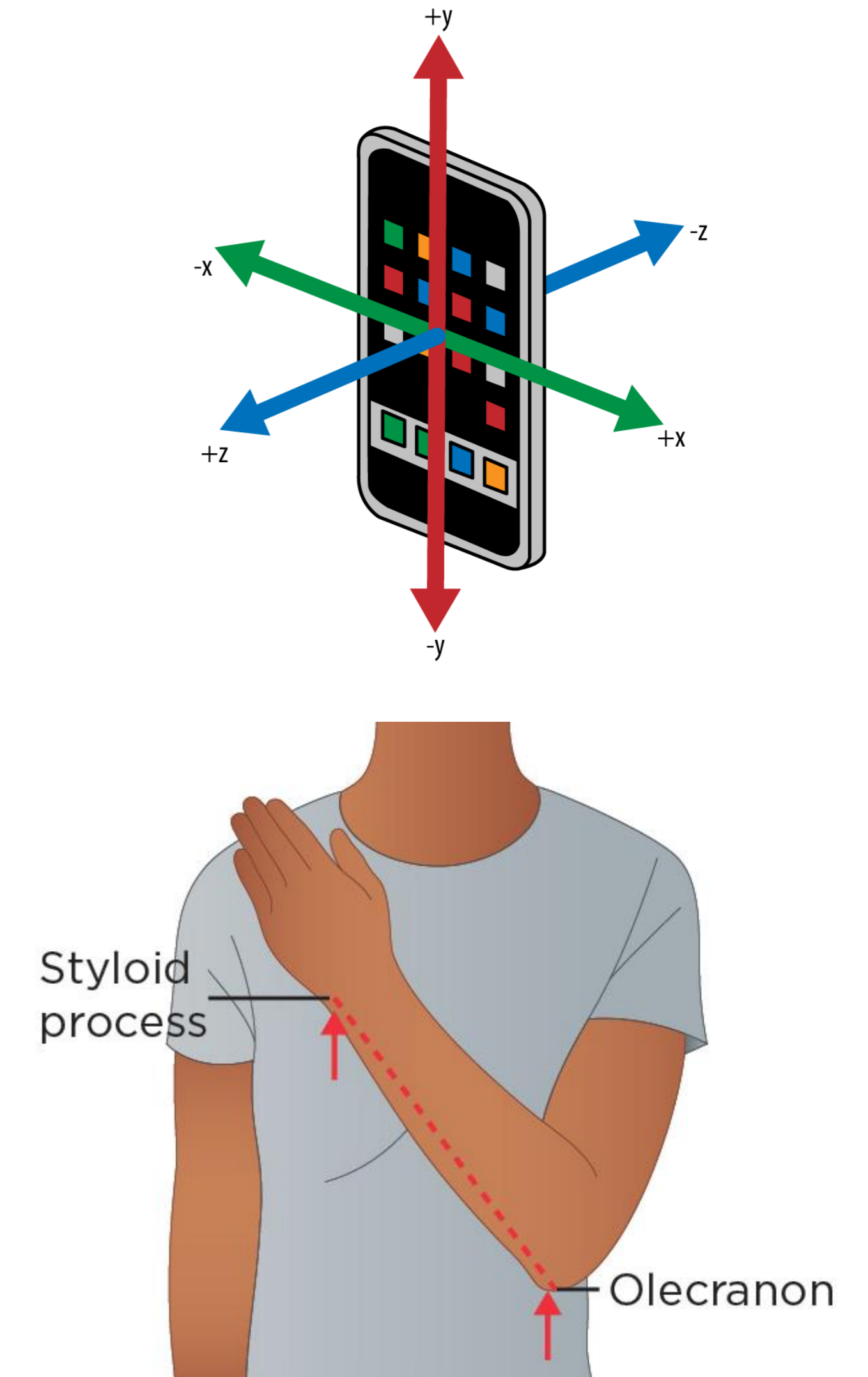
## Revision 1 → Revision 2

- 2020/21 → 2021/22
- Students enjoyed the project/experience immensely
- Challenges in trying to understand each other's disciplines
- Separate reports at end of assignment by discipline diluted the overall groupwork/sense of accomplishment → unified/group report with section(s) going forward.
- Engineers ended up doing majority of implementation phase, dietitians left out of loop here.
- Separated out mock-up/prototype of GUI (Graphical User Interface) as part of Implementation phase → ownership of this to Dietitian to address this.



## AY 2021/22: Additional Student Specifics

- Dietitian should define the clinical problem
- Engineer should propose a sensor solution based on smart technology
- Using MIRO work together to propose your team solution
- Dietitian to develop an interface/GUI to communicate the solution to the end user
- Engineer to prototype the solution in LabVIEW



# Student Experiences of Online Problem-Based Learning in an Interdisciplinary Dietetic and Engineering Environment

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## Abstract

**Background:** During the COVID-19 pandemic, restricted access to in-person facilities and traditional experiential learning activities meant that new, online solutions were needed to facilitate student learning/development across the disciplines of Allied Health and Engineering. **Purpose:** This article describes research conducted as part of an interdisciplinary Dietetic/Electronic Engineering project to evaluate student experiences of online problem-based learning (PBL) activities in addressing this necessity. **Methodology/Approach:** The authors implemented a specific, health technology-based assignment using an online PBL approach to evaluate and develop the effectiveness of this approach for students' experiential learning. Surveys and observations were used to evaluate the project effectiveness. **Findings/Conclusions:** Participating students reported on their experiences of working in interdisciplinary teams, focusing on aspects such as knowledge gained, collaboration, perspective, facilitation and experiential learning. Students identified enhanced learning and research skills as some key benefits. Drawbacks identified included difficulties associated with the online environment, such as synchronisation and remoteness. **Implications:** The use of interdisciplinary assignments highlights the many advantages/benefits which experiential pedagogies have in supporting students to integrate

Johnson, M., & Griffin, A. (2023). Student Experiences of Online Problem-Based Learning in an Interdisciplinary Dietetic and Engineering Environment. *Journal of Experiential Education*, 0(0).  
<https://doi.org/10.1177/10538259231193100>

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