THE UNIVERSITY OF MELBOURNE

Implementing a new authentic group assessment to foster peer connection and collaborative learning

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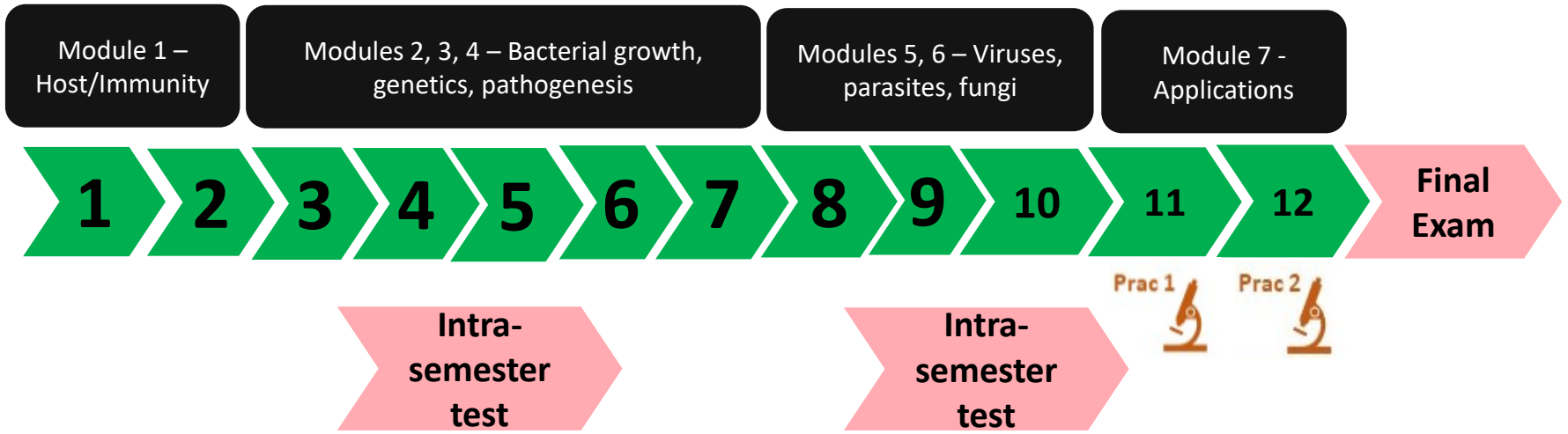
Overview: *Principles of Microbiology and Immunology* Foundational Subject

Context and Setting

- Undergraduate Bachelor of Science students embarking on the Immunology, Infection & Immunity, or Microbiology majors will start with a foundational subject in semester one of the second year of their studies, known as *Principles of Microbiology and Immunology* (MIIM20001)
- This subject is designed largely as a lecture-based subject that sets out to provide students with an overview of the basic principles of microbiology and immunology, including:
  - the terminology used by microbiologists and immunologists;
  - the role of microbes in infectious disease and their interactions with the host's immune system;
  - the key steps and proteins (both from the host and microbial) that are utilised during microbial growth and life cycles and their outcomes;
  - the type of investigations fundamental to the development of basic microbiological concepts;
  - the importance of microbiology and immunology in the fields of medicine, genetics, and biotechnology.

Overview: *Principles of Microbiology and Immunology* Foundational Subject

Subject Structure (prior to 2025)



- Each week included three live, in-person, 50-min lectures on campus
- The final two weeks also included a 1.5-hour PC2 ‘wet-lab’ practical class component
- Assessment involved intra-semester testing (20% each) and a final exam (60%)
- Approx. 300-400 students each year with diverse backgrounds and interests

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Challenges Identified

- Assessments were only conducted in a single way (invigilated, timed testing)
- There were limited opportunities for active learning and knowledge consolidation
- Large numbers decreased meaningful peer connections and a sense of belonging

https://www.cae.net/e-learning-education-10-tips-to-get-the-most-out-of-it/

Key Considerations

- Student engagement and active learning increasingly seen as a prerequisite for effective and meaningful learning (Freeman S. *et al*., 2014, PNAS, 111(23):8410-5).
- Experiential learning sessions and authentic assessment shown to facilitate higher-order thinking, allowing students to use/apply knowledge and skills in meaningful real-life settings (Herrington J. *et al.*, 2003, AJET, 19(1), 59-71).
- Subject redevelopment could further assist students in developing 'job-ready' skills and peer connection via an authentic group assessment task, as these have been shown to effectively bring students together, particularly when designed as authentic, purposeful, and include cognitively challenging tasks that mirror activities potentially encountered in the workforce (Crawford, J. *et al.*, 2023, Studies in Higher Education, 49(3), 395–409).

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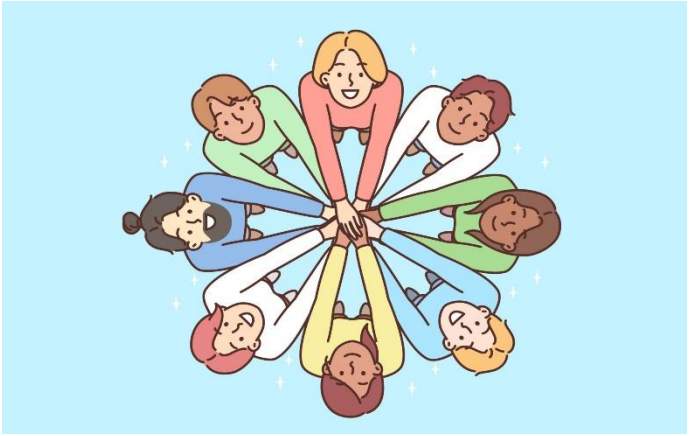
Aims

- Develop extra opportunities in the subject that concentrated on promoting, creating, and delivering student-focused active learning, with teaching activities that lead to increased student participation and enthusiastic application of content
- Increase activities that allow for more meaningful peer connection, interaction, collaboration, and sense of belonging across a large subject
- Incorporate elements where students can demonstrate autonomy and agency, allowing them to take ownership and responsibility for how and what they learn
- Provide an opportunity for students to work authentically in settings that more closely mimic real-world situations and applications



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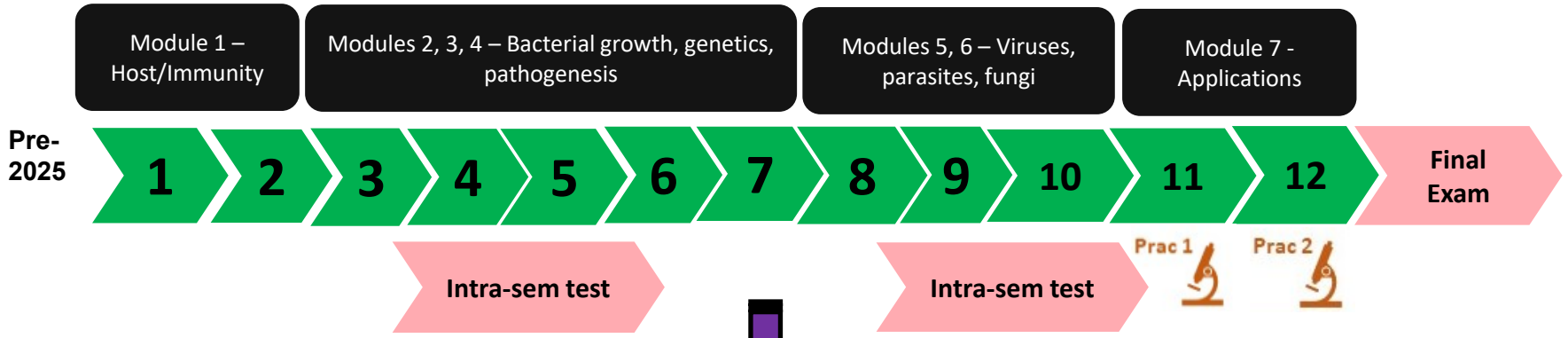
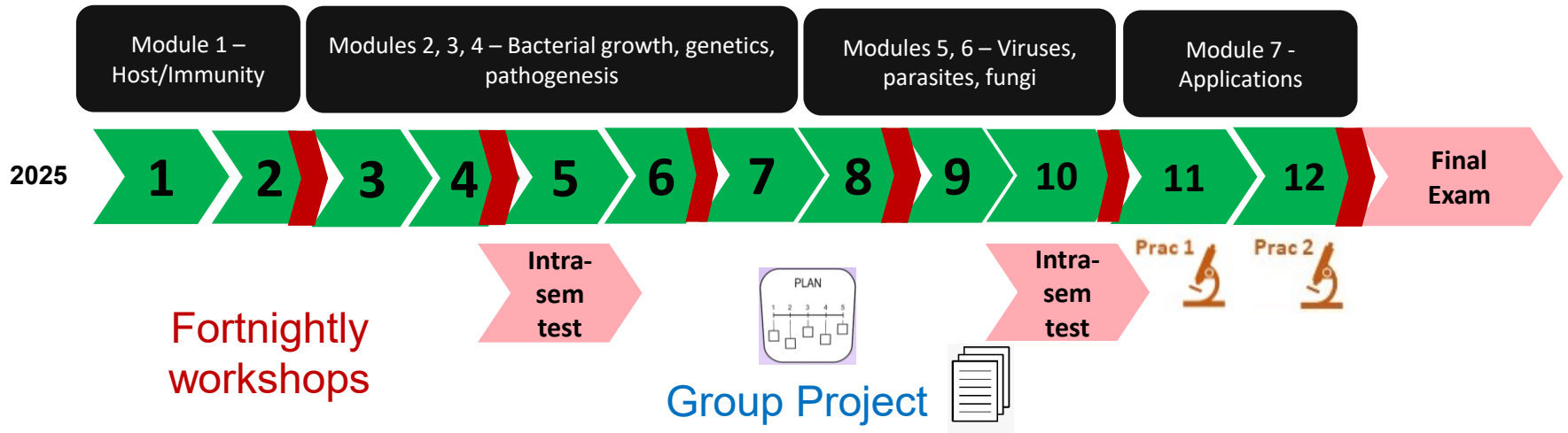
MIIM20001





Group Project Design - Scenario

- Students ‘chose their own adventure’ where allocated groups of ~10 members worked together as a Public Health team to investigate an outbreak scenario of a bacterial pathogen of medical concern in the community
- Each group first chose the microbe/outbreak that they would like to explore further from ten possible scenarios, including:
  - Food poisoning in a restaurant from ingesting enterotoxigenic *Escherichia coli*, producing nausea and diarrhoea.
  - Skin infections (impetigo) in a childcare setting by *Staphylococcus aureus*, resulting in skin sores/blisters.
  - Community acquired pneumonia in an elderly care community caused by *Streptococcus pneumoniae*.
  - Tuberculosis in an outback community by *Mycobacterium tuberculosis*, leading to coughing and breathlessness.
  - Gastroenteritis from contaminated food with *Salmonella enterica*, causing foodborne illness in the community.
  - Meningococcal disease in high school students as a result of infections with *Neisseria meningitidis*.
  - Bacterial pneumonia caused by *Klebsiella pneumoniae* that originated in a hospital ward (nosocomial setting).
  - Cases of tetanus discovered in farmers from a country community, caused by *Clostridium tetani* infection.
  - An increase of symptomatic cases of gonorrhoea in a population of young adults by *Neisseria gonorrhoeae*.
  - Lung infections in a busy office from *Legionella pneumophila* contaminating air conditioning cooling towers.

Group Project Design - Scenario

- Group members then self-selected into three smaller specialised units based on their interests, working to demonstrate applied content knowledge and produce written outputs as if they were diagnostic laboratory members, clinical scientists, or epidemiologists.

Diagnostics Unit

Image by iconscout.com

Clinical Unit

Image by freepik.com

Epidemiology Unit

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- Each specialised unit was responsible for assembling their report components, with each student choosing one specific topic to address, such as bacterial cellular morphology, biochemical testing, culturing and growth conditions; transmission, pathogenesis, immune response; prevalence, genetic testing, and disease prevention & treatment
- Students then constructed ~200-word descriptions for their topic as well as an associated diagram (either drawn or adapted/taken from a reputable source and referenced), and then the entire group came together to compile the final document with all elements included for submission; combined group report worth 10% of the final grade for the subject

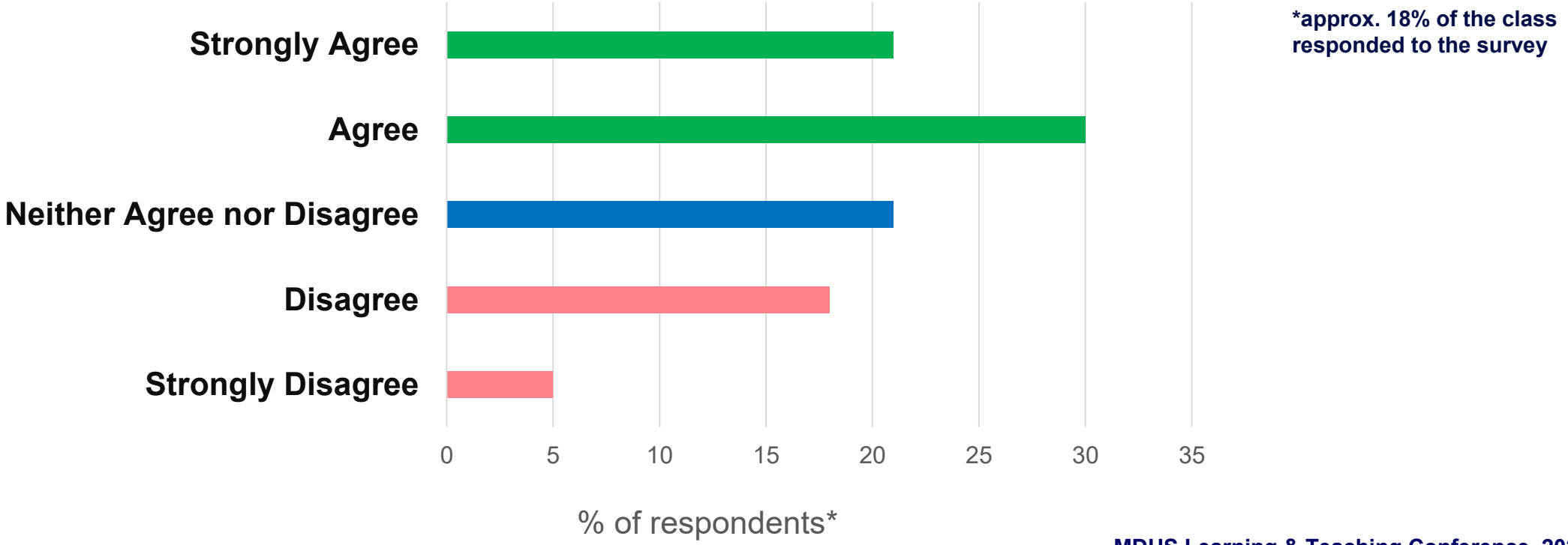
Group Project Design - Assessment

- Completed project reports were then assessed via three components:
  - ❑ individually, on the accuracy of the content description, the appropriateness and inclusion of an associated relevant diagram, and the consistent use of correct spelling/grammar (10 marks)
  - ❑ as a group, for overall consistency, cohesion, and visual design across the whole report (8 marks)
  - ❑ averaged peer mark, in terms of the level of group member engagement and contribution across the group (2 marks)

- Resulted in ~90% of the class achieving a H1 grade (cohort average = 17/20), demonstrating the effect of collaborative effort and peer performance across the groups

Student Perceptions of the Group Project

- Although largely positive, the in-house feedback survey respondents seemed to have mixed feelings about whether “the Group Project aided (my) learning and helped (me) to develop (my) understanding of the content in an interesting way”



*approx. 18% of the class responded to the survey

Student Perceptions of the Group Project

"I was lucky enough to be put with a really great team and had great fun. Learned a lot from each other and had great help when some topics were not understood."

"I found the group project helpful for my independent research and learning. I found it engaging and interesting as it balanced well with the other forms of assessment and reinforced what I understand about my topic."

"It helps me to learn how to apply theories to real life situations and I did enjoy this style of assessment. It was really nice to talk to other people as well."

"Very difficult to contact group members"

"Group project was too large. Smaller groups would have been better for communication."

"The group project coordination would have been far better if we met our group in person/were provided with better contact information."

Evaluation & Lessons Learnt – the Positives

- **Learning Experience:**
  - ✓ Helped consolidate learning and apply theories to real-life situations
  - ✓ Provided an opportunity for in-depth understanding of specific diseases
  - ✓ Balanced well as an alternative with other forms of assessment
- **Engagement:**
  - ✓ Increased engagement with the material through interesting and engaging topics
  - ✓ Provided an opportunity for the practical application of theory
  - ✓ Less stressful than individual reports
- **Collaboration:**
  - ✓ Provided an opportunity to connect with peers
  - ✓ Some groups collaborated well and enabled new friendships within the cohort
  - ✓ Helpful for peer feedback and support

Evaluation & Lessons Learnt – the Challenges

- **Communication:**
  - ❖ Difficulty contacting group members
  - ❖ Lack of awareness about LMS groups and discussion forums
  - ❖ Challenges in coordinating meetings
- **Group Size:**
  - ❖ Groups of 10 people were too large to coordinate effectively
  - ❖ Large group size made meaningful connections and task allocation difficult
- **Organisation:**
  - ❖ Lack of clear instructions on where to find project information
  - ❖ Insufficient time for group formation before project start

Concluding Remarks

- Overall, student feedback demonstrated that when groups could communicate and collaborate effectively, the project constructively supported the application of scientific knowledge and development of transferable skills, while also providing an avenue for students to connect and learn together

- The main issues centred around communication across a large group, as well as the organisational aspects inherent with working with new people; earlier structured opportunities to meet, and clearer instructions on how to communicate more easily together will hopefully overcome this in the future

- By delivering an authentic group task that mimics aspects of real-life workplace settings, we have successfully facilitated a real opportunity for peer connection across the class and elevated the overall learning experience for our students

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Thank you

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