The Alchemist's Laboratory: Systems & Innovation

(Year 7 - Ages 12-13)

Lesson 3 of 9

Lesson Summary

In Lesson 1 and 2, students explored the heart and mind of the Alchemist (Altruism and Empathy). In Lesson 3, they enter the Laboratory. This 60-minute lesson adapts the "Future of Transplantation" module to focus on the Systems and Science that make the magic happen.

Students will act as "Process Engineers" to decode the complex logistics required to move an organ from a donor to a recipient (The "Great Work"). They will identify the critical difference between the "Urgent Pathway" (Organs) and the "Banked Pathway" (Tissues). Finally, they will gaze into the "Crystal Ball" of science to explore future innovations like 3D bio printing and perfusion machines, understanding that science is a human endeavour that constantly evolves to save more lives.

Learning Intentions

Students will .....

- Investigate the complex system of organ and tissue donation, identifying the key stages from donor to recipient.
- Distinguish between the logistical requirements of Organs (Time-Critical/Urgent) vs. Tissues (Bankable/Storable).
- Explore how scientific knowledge and innovation (e.g., machine perfusion, 3D printing) are solving problems and creating new possibilities for the future.
- Recognise that "Medical Alchemy" relies on a massive team of diverse professionals working in sync.

Success Criteria

Students can .....

- Create a flowchart or sequence diagram showing the basic steps of the Donation Pathway.
- Explain why a heart transplant must happen within hours, while a cornea transplant can happen weeks later.
- Identify one "Future Innovation" and explain how it could change the "Alchemy" of saving lives.
- Use systems thinking terms (e.g., logistics, preservation, recipient matching) to describe the process.

Lesson Details

Time:	60 minutes
Year Level:	Year 7 (Ages 12-13)
Unit:	This is Lesson 3 of 9 in the series.
Educational Partner:	This lesson is adapted from resources provided by DonateLife

General Capabilities

Scientific Literacy; Critical and Creative Thinking; Personal and Social Capability (Collaboration); Ethical Understanding.

Curriculum Mapping and Links

Australian Curriculum (v9.0)

Subject	Strand	Content Descriptor
Science	Science as a Human Endeavour	AC9S7H02: Investigate how... scientific knowledge is used to solve problems and inform personal and community decisions. (Focus on how medical systems solve the problem of organ failure)
Design and Technologies	Processes and Production Skills	AC9TDE7P01: ...Sequence and document steps in a design process... (Focus on systems thinking and process mapping)
HPE	Personal, Social and Community Health	AC9HP7P01: Plan and implement strategies... to enhance their own and others' health... (Understanding health systems)

Queensland Curriculum (QCAA)

Subject	Syllabus	Content Description
Science	Year 7	Scientific knowledge changes as new evidence becomes available... and science contributes to solving problems.
Design and Technologies	Year 7	Analyse how motion, force and energy are used to manipulate and control electromechanical systems (Systems Thinking).
HPE	Year 7	Understand the role of preventive health and health services.

Resources Required

- Whiteboard/Smartboard.
- Resource: "The Laboratory Cards" (Cards representing steps in the process: e.g., Identification, Consent, Retrieval, Transport, Transplant).
- Video Hook: A clip showing a "Heart in a Box" (Perfusion Machine) or 3D Bioprinting to spark awe.
- Student Worksheet: "The Lab Report: Systems & Futures."
- Butcher Paper/Markers: For the "Pipeline Challenge" (Group mapping).

Skills

- Systems Thinking (Understanding cause and effect in a chain).
- Sequencing (Logical ordering).
- Scientific Literacy (Understanding preservation and biology).
- Future Forecasting (Imagining solutions).

Teacher Preparation

- The Metaphor: "The Laboratory." An Alchemist doesn't just wave a wand; they have a rigorous process. If one step fails, the gold is lost. The system is the magic.
- Prepare "The Laboratory Cards":
  - Set A (Organs): ICU Admission -> Brain Death Checks -> Family Consent -> Organ Retrieval -> UrgentTransport (Lights & Sirens) -> Transplant.
  - Set B (Tissues): Death -> Cooling -> Family Consent -> Retrieval (up to 24hrs) -> Processing & Storage(The Bank) -> Transplant (Weeks/Months later).
- Key Concept: The "Time vs. Time" contrast. Organs fight the clock; Tissues pause the clock.

Additional Information

This lesson appeals to the "Engineers" and "Scientists" in the classroom. At 12-13, students are starting to understand that the world is run by complex systems. By revealing the "behind the scenes" logistics of a transplant (helicopters, ice boxes, matching databases), we make the topic exciting and action-oriented. We also introduce "Future Tech" to show that this field is cutting-edge, potentially inspiring future career interests in STEM.