UNIVERSITY OF TORONTO
LESLIE DAN FACULTY OF PHARMACY

Lessons learned from a large-scale PharmD program curriculum renewal

Natalie Crown, Jamie Kellar, Naomi Steenhof

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4 Year PharmD Program

- Traditional Fall/Winter Semester, 6-7 courses per term
- Foundational Courses in Biomedical and Pharmaceutical Sciences, Clinical and Social Administrative Pharmacy
- Pharmacotherapy and Medication Therapy Management Course Streams
- Elective and Selective Courses in Year 3
- Early Experiential Learning after Years 1 and 2, and Advanced Pharmacy Practice Experiences in Year 4

Lewin's Change Theory

PharmD Curriculum Renewal

Major Modification of a Degree Program

Engagement

Faculty, experiential partners, preceptors, alumni, students and members of the community

Curriculum Design

Advisory Team	Working groups	Course design teams	Theme Leads	Student Advisory Committee

Course Design Process

Course Design Teams & Theme Leads

Small Group Faculty Training Sessions

Backwards design & adaptive expertise

Deliverables:

Enduring Understandings

Learning Outcomes

Topics

Proposed Schedule with Content/Focus

Mini-Retreats and Integration meetings

Curriculum Renewal Timeline

Feb 2023

Faculty Retreat – Vision for Future

June 2023 – May 2024

Environmental Scan & Site Visits

Faculty Retreats

Program Design

May 2024 – April 2025

Governance Approval for (Part 1) – Program Structure

Course Design Teams

Theme Leads and Integration Meetings

May 2025

Governance Approval (Part 2): Course Descriptions, Courses Structure and Policies

Aug 2025

3 Year PharmD Program Launch

3-Year PharmD Structure

Key Features

- Integrated Course Blocks
  - Foundations
  - Applied Therapeutics
  - Pharmacy Practice Skills
- Longitudinal Early Experiential Learning
- Programmatic Assessment Model
- Breaks between Courses
- New Academic Standing and Progression Policies

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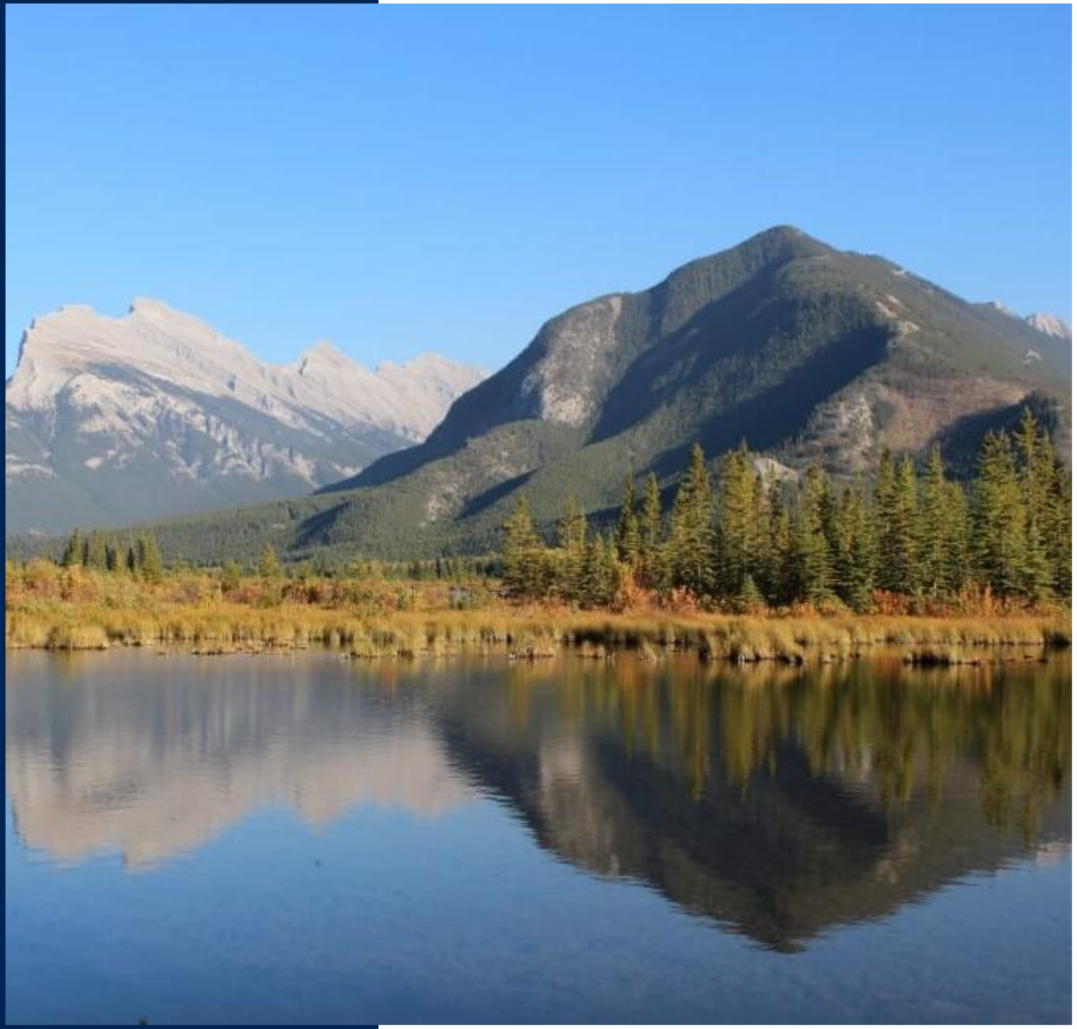
Advanced Pharmacy Practice Experience

4 Year PharmD Program (35 weeks total)

5 weeks	5 weeks	10 weeks	5 weeks	5 weeks	5 weeks
Required Institutional	Required Institutional	Required Community	Selective	Elective	Elective

3 Year PharmD Program (36 weeks total)

Required Institutional	Required Community	Selective	Elective	Mini Elective
8 weeks	8 weeks	8 weeks	8 weeks	4 weeks



Reflections
Drivers of Success

- Vision for change & early engagement with key partners generated momentum
- Strong Support from our Dean
- Dedicated Leads
- Broad Faculty Engagement – strategic leveraging of expertise
- Student Advisory Committee

What We Learned Along the Way

- Invest and Plan Early Faculty Development
- Engage Central University Partners in Early Planning
- Implement a structured communication plan for change management
- Prioritize Strong Project Management
- Deliberately Share and Celebrate Success

Thank you!

Discussion

UCL
Centre for International Medical Education Collaborations

جامعة الجيزة الجديدة
NGU.
SCHOOL of PHARMACY
NAQAAE Accredited

Embedding Clinical Reasoning & Decision-Making into Pharmacy Education

Dr Michael Leech[1], William Swain[1], Prof. Cate Whittlesea[1], Prof. Rabab Hamed[2]

1 – University College London School of Pharmacy

2 – NewGiza School of Pharmacy, Cairo

Agenda and faculty Declarations

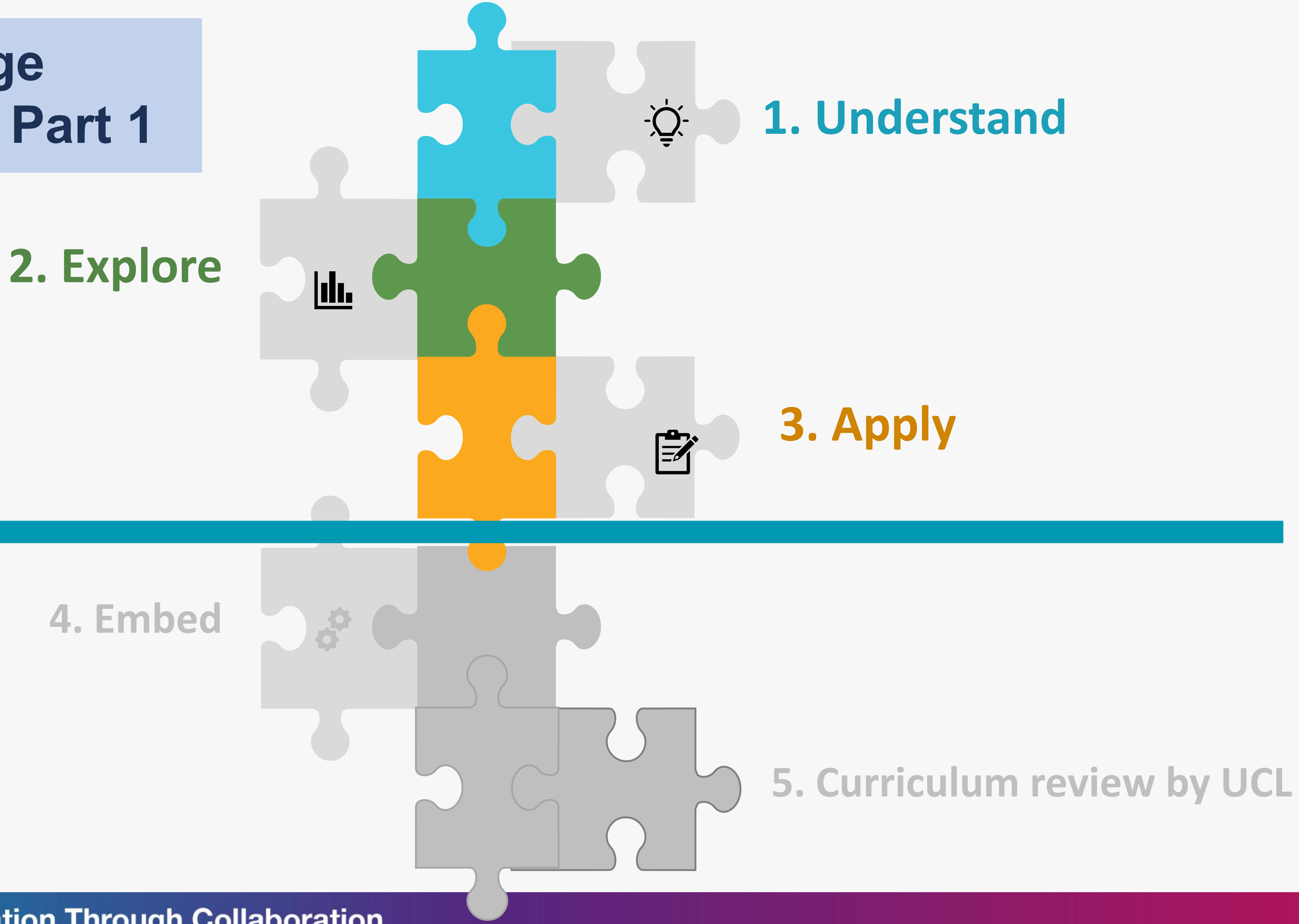
- Collaboration process
- Survey results – PRE collaboration
- Understanding session
- Exploration sessions
- Application session
- Survey results – POST collaboration
- Next steps: embedding and review

UCL CIMEC
Nicola Ho

UCL SOP
Prof. Cate Whittlesea
William Swain

NGU School of Pharmacy
Prof. Manal Maher
Prof. Rabab Hamed

Two - stage collaboration: Part 1



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Five considerations

Pedagogical models

Constructivism,
Spiral Curricula,
Scaffolding,
Cognitive apprenticeship

Models of CR / CDM

Dual Process theory,
Bayesian Reasoning,
Illness scripts,
Hypothetico-deductive model,
Therapeutic Reasoning,
Collaborative Reasoning

Assessment models

Miller's triangle,
OSCE,
WBA,
MCQ types,
Script concordance testing

Curriculum design

SPICES model,
Harden's integration ladder

Change Management

Kotter 7/8 step model

Self-Assessment Survey PRE collaboration MEAN scores

n=7/8

1. Rate level of understanding of the term **clinical reasoning (CR)**	3.57
2. Rate level of understanding of term **clinical decision-making(CDM)**	4.00
3. Rate level of understanding of the **dual-process theory**	3.29
4. Rate level of understanding of the **conscious competence model**	2.43
5. Rate level of understanding of the **hypothetico-deductive model**	2.43
6. Rate level of understanding of **illness scripts**	3.29
7. Rate level of confidence in ability to **teach CR and CDM skills**	3.14
8. Rate level of confidence in ability to **assess CR and CDM skills**	3.00
9. Rate level of confidence in ability to **design curricula for CR & CDM**	2.86

KEY: 1	2	3	4	5
No understanding / Not confident	Limited understanding / Slightly confident	Moderate understanding / Moderately confident	Good understanding / Confident	Full understanding / Very confident

UNDERSTAND

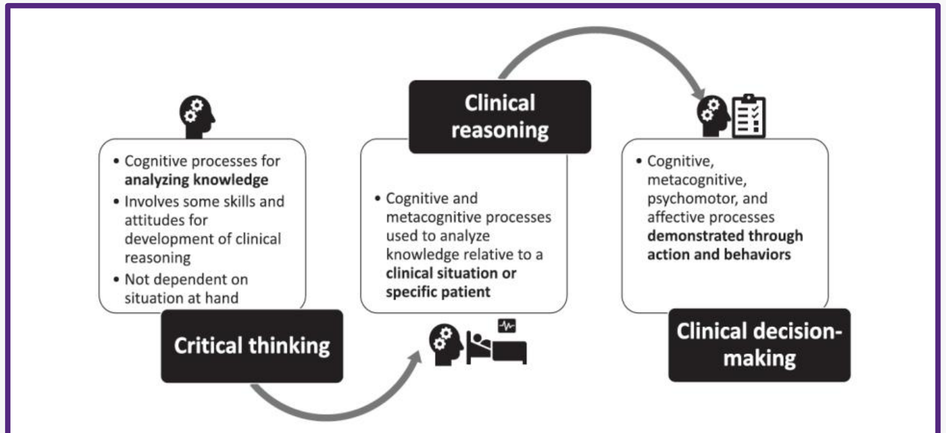


Fig. 1. Relationship among critical thinking, clinical reasoning, and clinical decision-making.
Progression from critical thinking, which is situation independent, to clinical reasoning applying critical thinking skills to a clinical scenario to clinical decision making, the final action or behavior and culmination of the process.

Nelson, N.R. and Rhoney, D.H. (2024) 'Use of a clinical reasoning scaffolding document improves student performance', *Currents in pharmacy teaching and learning*

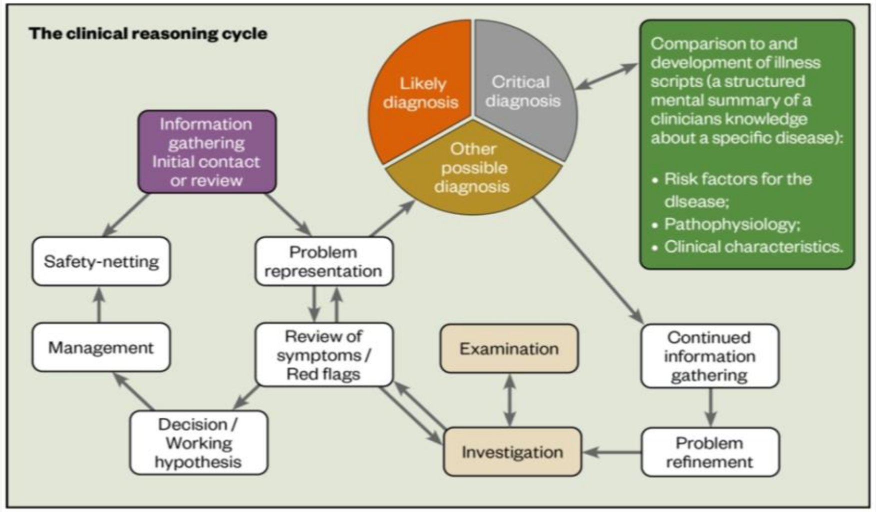


Figure: The clinical reasoning cycle

Rutter, P.M., Harrison, T. and Mills, L. (2022) **How to use clinical reasoning in pharmacy**, The Pharmaceutical Journal

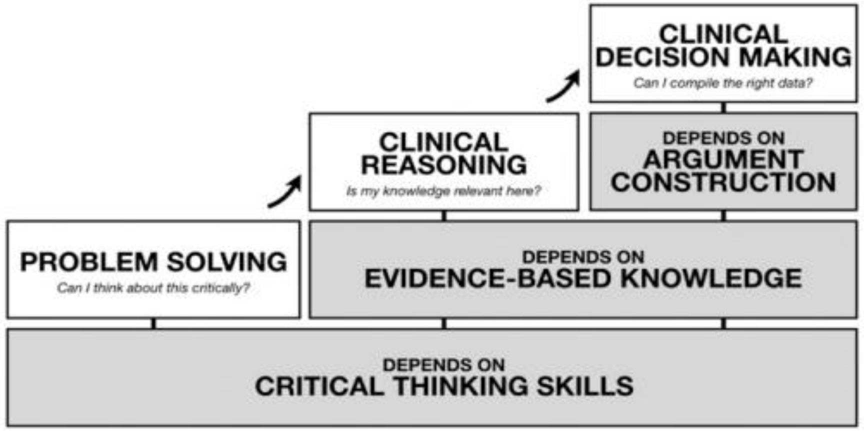


Figure 1. Schematic of Critical Thinking and its Relationship to Other Types of Thinking

Persky AM, Medina MS, Castleberry AN. Developing critical thinking skills in pharmacy students. *Am J Pharm Educ*. 2019 Mar;83(2):7033

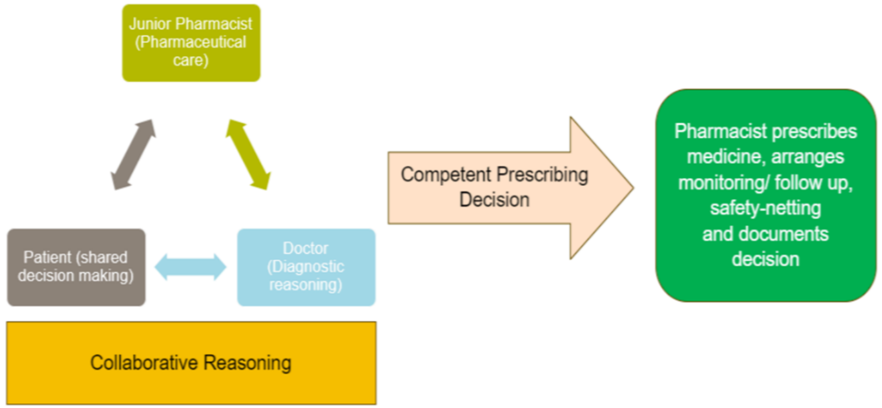
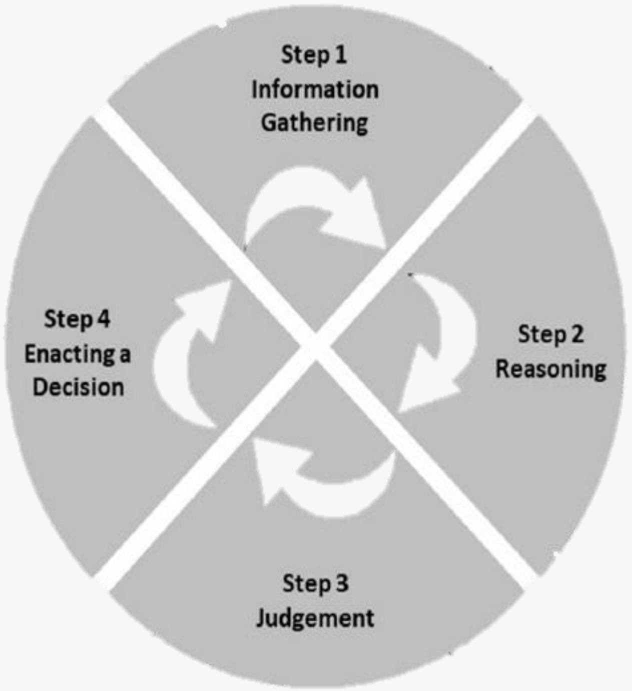


Figure: Collaborative approach to prescribing

Swain W. It is time to rethink prescribing scope of practice and the DPP model for foundation training. *Pharmaceutical Journal*. 2024 Mar;312(7983)

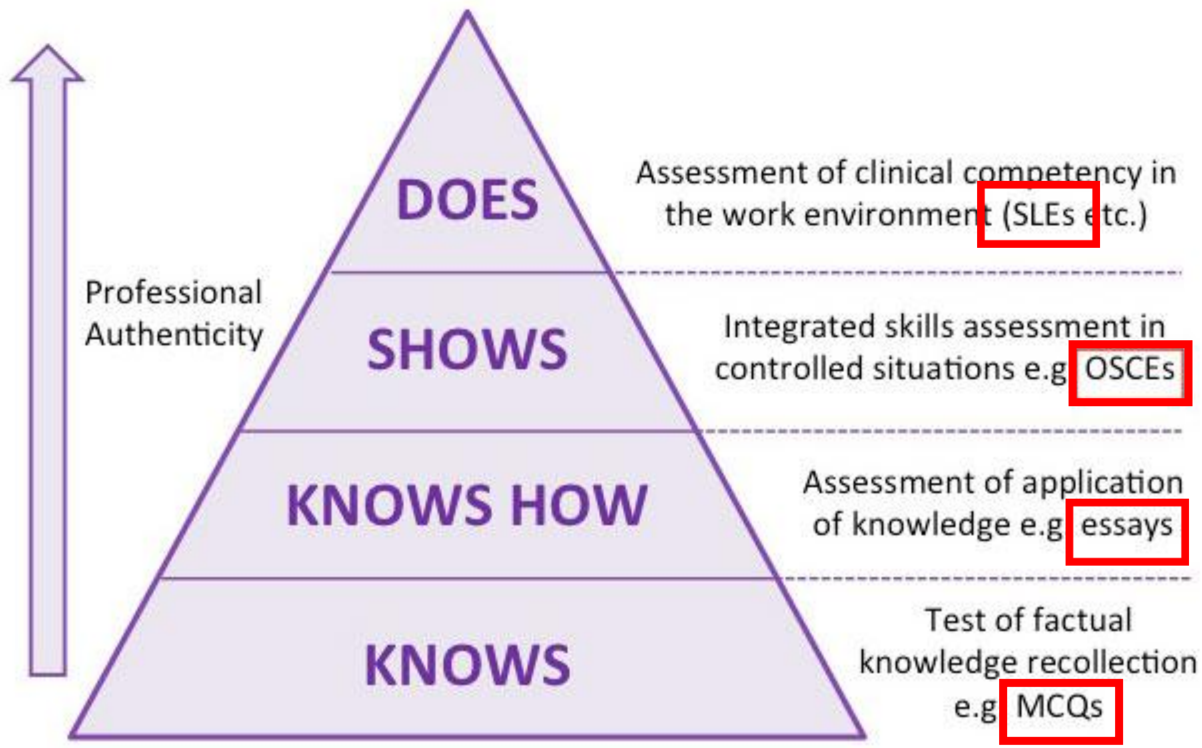
EXPLORE



Anakin M, Duffull SB, Wright DFB. Therapeutic decision-making in primary care pharmacy practice. Res Social Adm Pharm. 2020;16(9):1231-1238.

Diagnostic decision-making step	Therapeutic decision-making step	Equivalent Clinical Decision-Making Process
Problem recognition	1. Information gathering	Problem identification and data collection
Hypothesis generation	2. Reasoning	Interpretation of information and generation of likely options
Test selection and interpretation	3. Judgement	Weighing benefits, risks, and contextual factors to narrow the best option
Diagnostic conclusion	4. Decision	Selecting, negotiating, and implementing the final therapeutic plan

Assessment models



Miller's Pyramid of Professional Competence with examples of assessment techniques used in medical education
Source: adapted from Miller GE. Assessment of clinical skills/competence/performance. Acad Med 1990;9:63–7.

Your are a pharmacist in a small village. Miss X asks you for advice about her husband who presents a swelling of the lower lip following the intake of an NSAI which you sold him 30 minutes ago and which was prescribed by his general practitioner (GP) for osteoarthritis of the left knee.

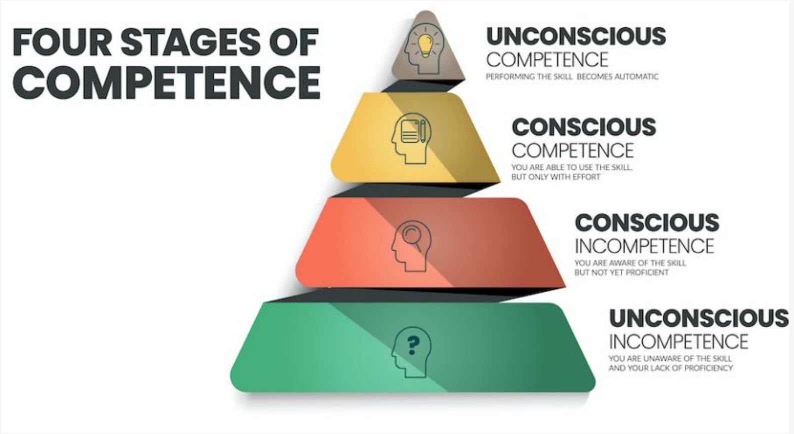
Your initial intention is...	And the patient reports...	It has the following effect on your initial intention				
		-2	-1	0	+1	+2
To send him to his GP this evening	He has an itchy throat					
To give her a self-injectable epinephrine pen	He is red and feels dizzy					
To give another NSAI	He has no other symptoms					

-2 : Absolutely inappropriate
-1: fairly bad
0 : the new information has no effect on the initial intention
+1 : fairly good
+2 : absolutely appropriate

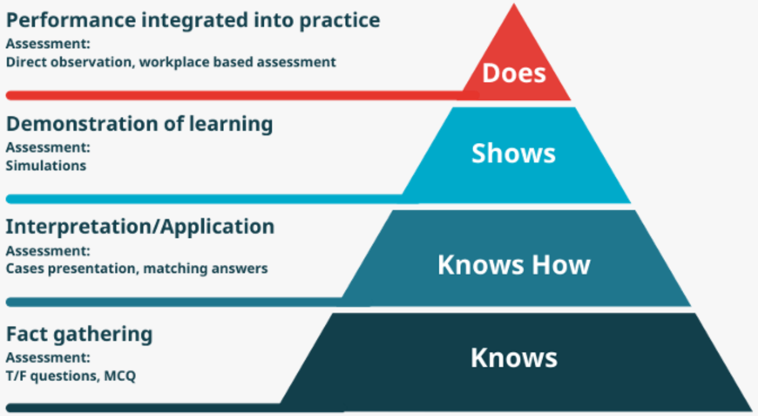
Boulouffe C, Gagnon R, Charlin B, Vanpee D, Sotto C, Bosse R, et al. Evaluation of clinical reasoning in basic emergencies using a script concordance test. Am J Pharm Educ. 2010;74(8):Article 145.

APPLY

Dreyfus SE, Dreyfus HL. A five-stage model of the mental activities involved in directed skill acquisition. Berkeley: University of California, Operations Research Center; 1980.

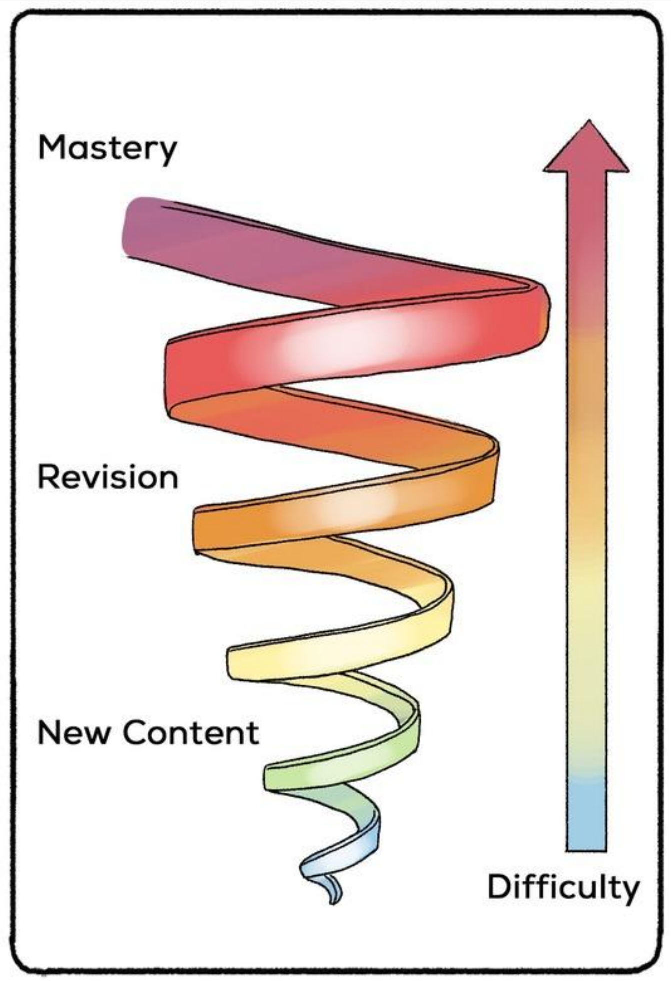


Burch N. Four stages of competence. In: *Noel Burch's model of learning* [Internet]. 1970s.



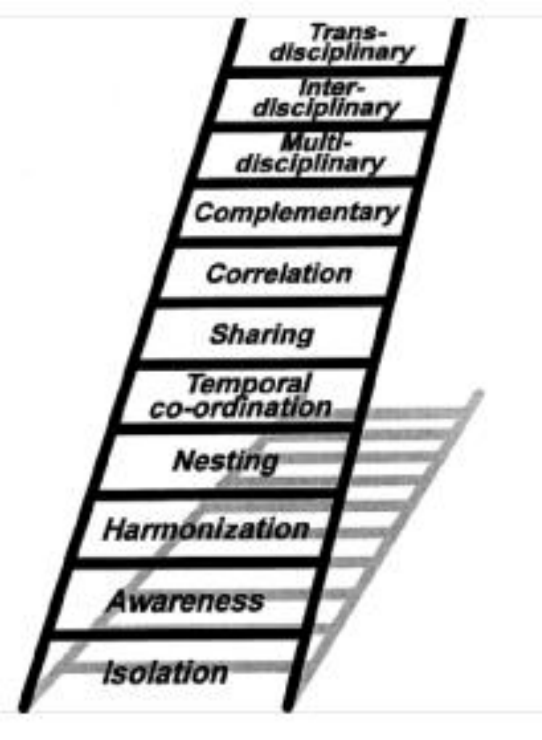
Miller's Pyramid of Professional Competence

Miller GE. The assessment of clinical skills/competence/performance. *Acad Med*. 1990;65(9 Suppl):S63-S67.

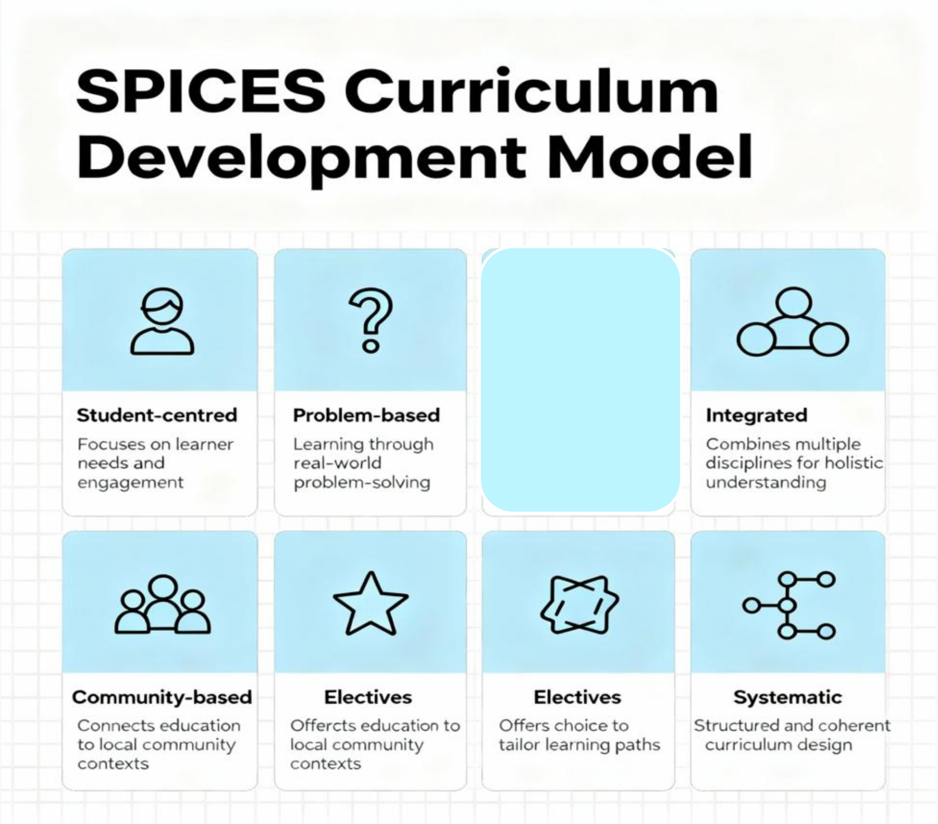


Bruner JS. The process of education. Cambridge: Harvard University Press; 1960.

Implementing curriculum change



Harden RM. The integration ladder: a tool for curriculum planning and evaluation. *Med Educ.* 2000;34(7):551-7.



Harden RM, Sowden S, Dunn WR. Educational strategies in curriculum development: the SPICES model. *Med Educ.* 1984;18(4):284-97.

Kotter, J. P. *Leading Change*. Boston: Harvard Business School Press; 1996

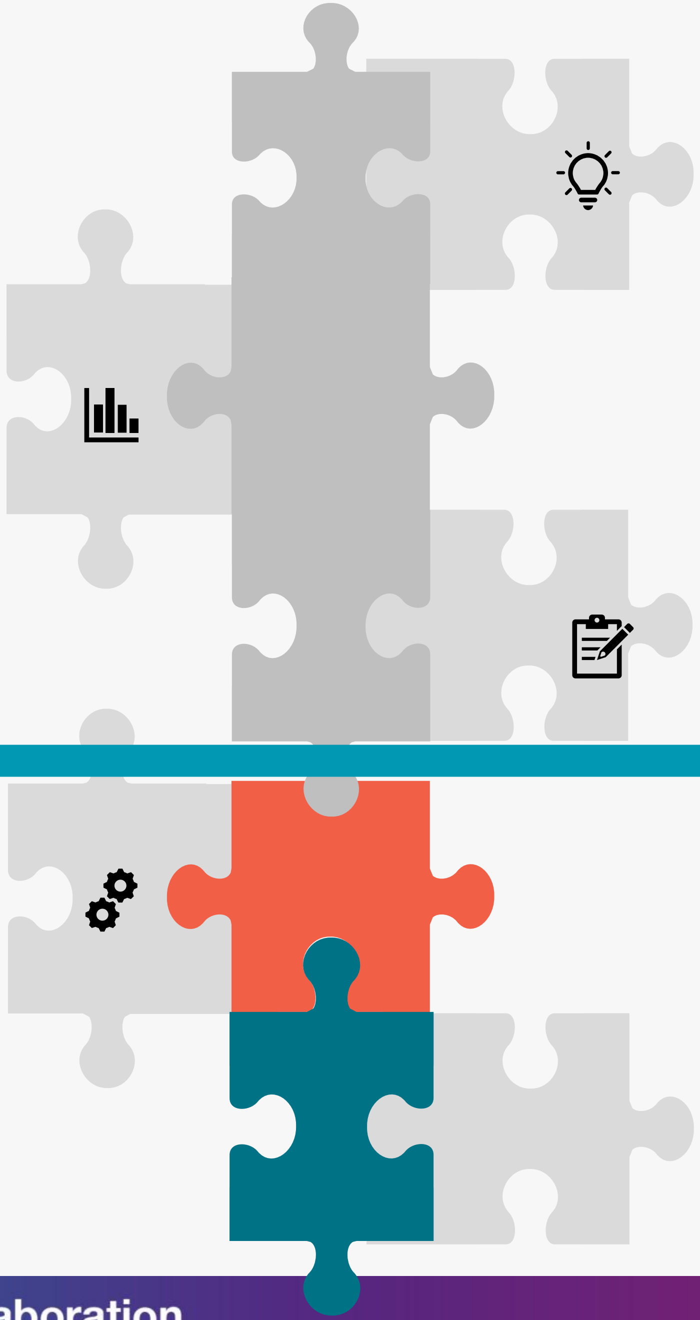
Self-Assessment Survey POST collaboration MEAN scores

n=5/8

1. Rate level of understanding of the term **clinical reasoning (CR)**	3.57	4.60	
2. Rate level of understanding of **clinical decision-making(CDM)**	4.00	5.00	
3. Rate level of understanding of the **dual-process theory**	3.29	4.00	
4. Rate level of understanding of the **conscious competence model**	2.43	5.00	
5. Rate level of understanding of the **hypothetico-deductive model**	2.43	3.00	
6. Rate level of understanding of **illness scripts**	3.29	4.60	
7. Rate level of confidence in ability to **teach CR and CDM skills**	3.14	3.60	
8. Rate level of confidence in ability to **assess CR and CDM skills**	3.00	3.40	
9. Rate level of confidence in ability to **design curricula for CR & CDM**	2.86	3.40	

KEY: 1	2	3	4	5
No understanding / Not confident	Limited understanding / Slightly confident	Moderate understanding / Moderately confident	Good understanding / Confident	Full understanding / Very confident

Two - stage collaboration: Part 2



1. Understand

2. Explore

3. Apply

4. Embed

5. Curriculum review

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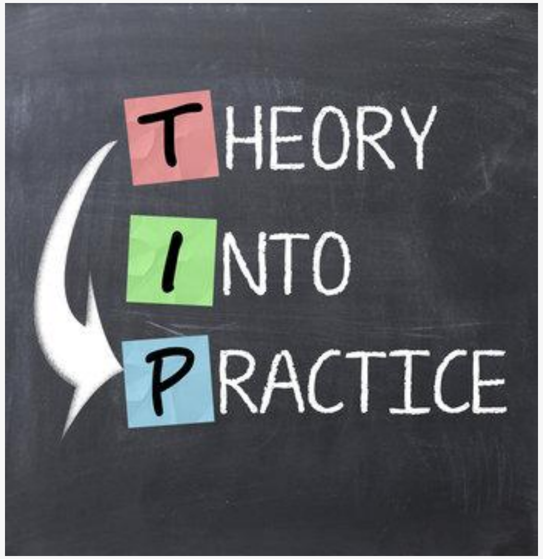
EMBED



1. Review materials and learning from sessions
2. Disseminate learning and expertise across faculty
3. Convene a working group
4. Identify where CR/CDM can be embedded across the programme
5. Refine one clinical pharmacy module
6. Refine one science based (non-clinical module)
7. Review assessment strategy

Post workshop review (>6 month later)

REVIEW

1. **Programme specification** document.
2. A **spiral curriculum map** showing increase in complexity of CR/CDM principles across programme.
3. One **module specification** document for **clinical pharmacy** with largest amount of CR/CDM.
4. One **module specification** from a **non-clinical (science-based)** module.
5. Programme assessment strategy, including assessment types, weighting, and feedback processes
6. **Assessment artefact from clinical pharmacy** module (if not clear from module specification).
7. **Assessment artefact from non-clinical module** (if not detailed in module specification).

UCL will produce a post-review report with recommendations and further enhancement opportunities.

The project created a unique opportunity for academics from two institutions to collaborate internationally.

Mean scores increased across all survey domains.

Improved understanding of CR/CDM models, pedagogical approaches, assessment strategies, and change-management processes that may not previously have been familiar within the local context.

Encouraged consideration of both horizontal and vertical curriculum alignment.

Bibliography

Nelson NR, Rhoney DH. Use of a clinical reasoning scaffolding document improves student performance. *Curr Pharm Teach Learn*. 2024;16(7):102102. doi:10.1016/j.cptl.2024.04.018.

Persky AM, Medina MS, Castleberry AN. Developing critical thinking skills in pharmacy students. *Am J Pharm Educ*. 2019;83(2):7033.

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Swain W. It is time to rethink prescribing scope of practice and the DPP model for foundation training. *Pharm J*. 2024;312(7983). doi:10.1211/PJ.2024.1.305124.

Anakin M, Duffull SB, Wright DFB. Therapeutic decision-making in primary care pharmacy practice. *Res Social Adm Pharm*. 2020;16(9):1231-1238.

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Dahle LO, Brynhildsen J, Fallsberg MB, Rundquist I, Hammar M. Pros and cons of vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum: examples and experiences from Linköping, Sweden. *Med Teach*. 2002;24(3):280-285.

Embedding systems thinking for responsible chemistry in pharmaceutical and cosmetic science education

Monash Pharmacy Education Symposium

7th July 2026

Seamus Delaney, Zoe Porter, Laurence Orlando, Alistair Pearl, Zi Xing Mun

School of Education, Research for Educational Impact (REDI), Deakin University, Australia

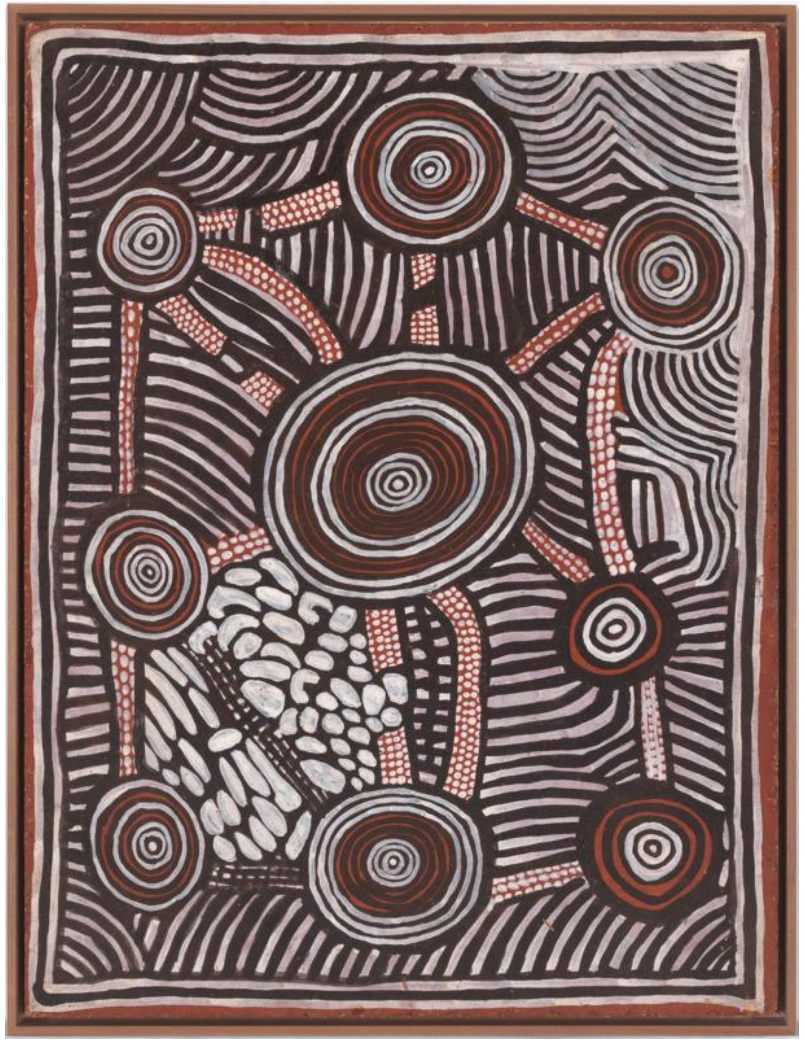
Secretary – Royal Australian Chemical Institute (RACI) Chemistry Education National Division

Secretary - International Organisation of the Chemical Sciences in Development (IOCD)

Acknowledgement of country

I acknowledge that I work on the unceded lands of the **Wurundjeri people**, First Nations people and Traditional Custodians of the Country on which I live and work and acknowledge the stories, traditions and living cultures of Aboriginal and Torres Strait Islander peoples on this land

I commit to building a brighter future together



Timmy Payungka Tjapangarti , Pintupi people https://searchthecollection.nga.gov.au/object?uniqueId=16754

IUPAC Guiding Principles of Responsible Chemistry (2025)

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

- **Responsible Innovation**
- **Safety, Security & Sustainability**
- **Ethical Behaviour**
- **Inclusivity, Equity & Belonging**
- **Communication & Collaboration**
- **Equitable Access**
- **Integrity & Accuracy**
- **Convergence Across Disciplines**

https://iupac.org/responsible-chemistry/

From what chemistry *can* do…

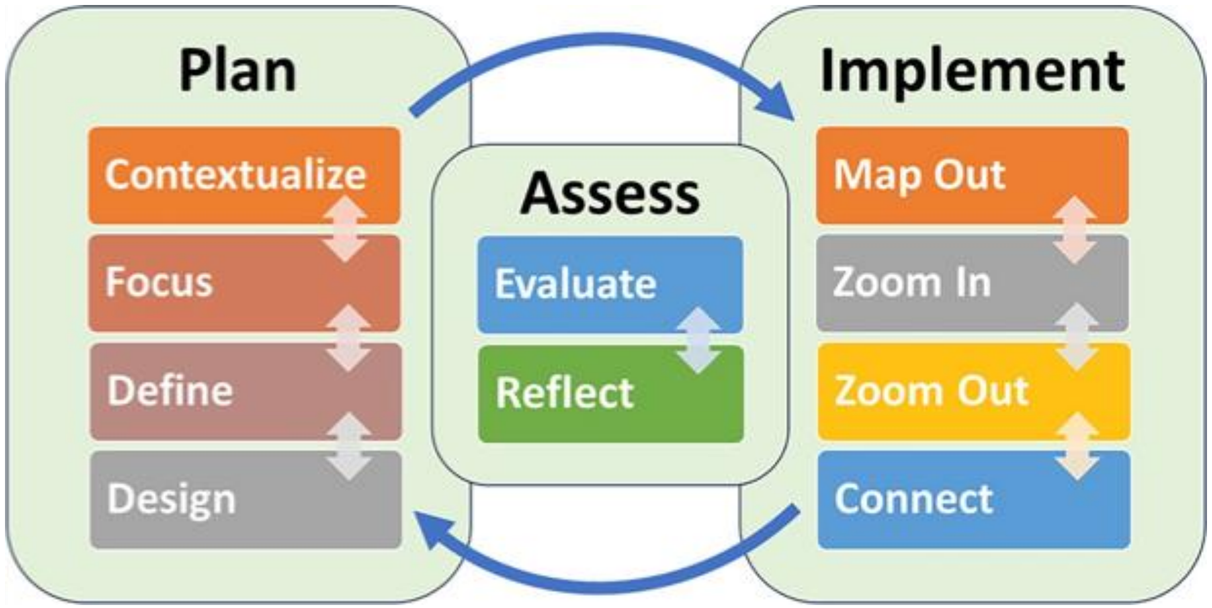
…to what *chemists* *should* do

"an ***ethic of responsibility*** must be woven deeply into chemistry education…
…life-cycle analysis and ***systems thinking (ST),*** to align molecular innovation with planetary well-being" (Mahaffy and Garcia-Martinez, p.4661–62)

Mahaffy, P. & Garcia-Martinez, J (2025). From What Chemistry Can Do to What Chemists Should Do. *Journal of Chemical Education*, *102*(11), 4661-4665.

Sustainability and Systems Thinking in Chemistry (SaSTICE)

ST strengthens students' ability to recognise chemistry's role in societal and environmental challenges



System Composition

(e.g., components and boundaries)

System Structure

(e.g., interactions between and organisation of components)

System Behaviour

(e.g., behaviours from Interactions between components)

System Effects

(e.g., intended and unintended consequences of system interactions)

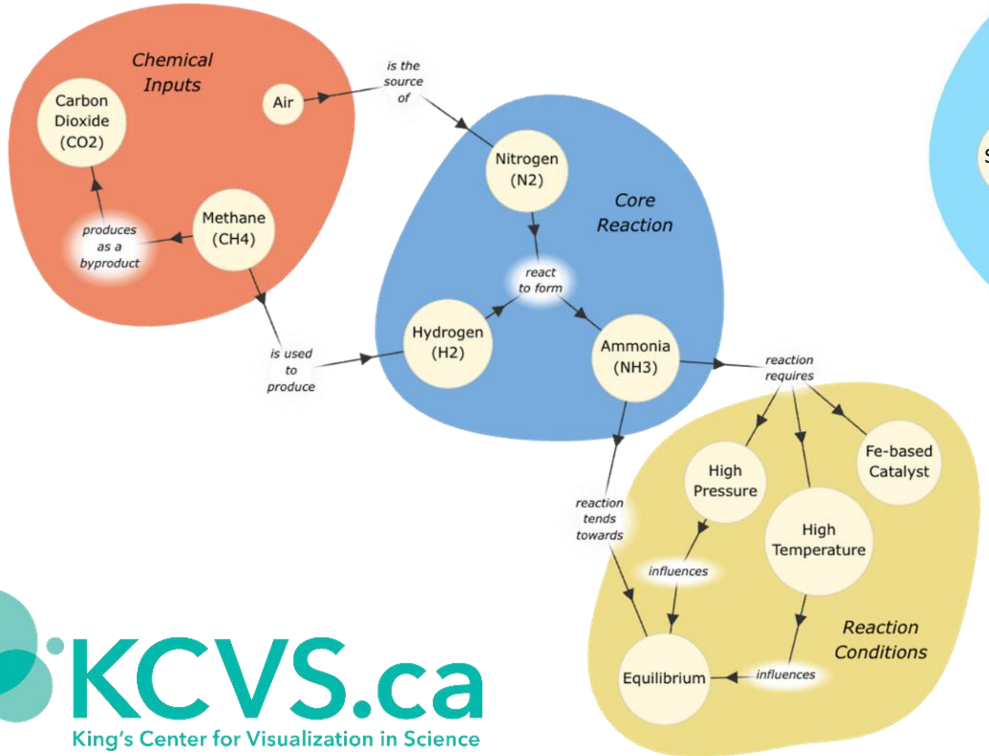
Delaney, S., Ferguson, J. P., & Schultz, M. (2021). Exploring opportunities to incorporate systems thinking into secondary and tertiary chemistry education through practitioner perspectives. *International Journal of Science Education*, *43*(16), 2618-2639.

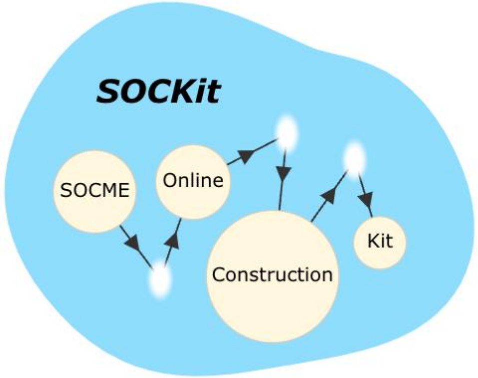
Talanquer. V.; Szozda. A. (2024). An Educational Framework for Teaching Chemistry Using a Systems Thinking Approach. *Journal of Chemical Education,* 101(5), 1785-1792. DOI: 10.1021/acs.jchemed.4c00216

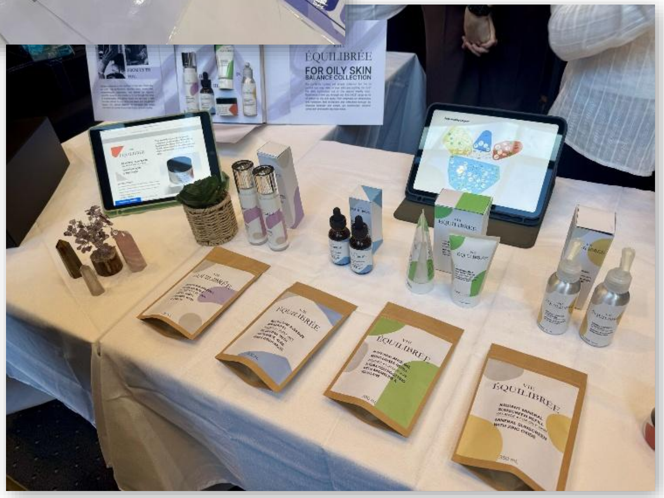
BPS3061-Industrial Project, Cosmetic Expo

Mapping to make explicit the different subsystems in interaction related to the problem under analysis

Systems Oriented Concept Mapping Extension (*SOCME*)







https://applets.kcvs.ca/sockit/

KCVS.ca
King's Center for Visualization in Science

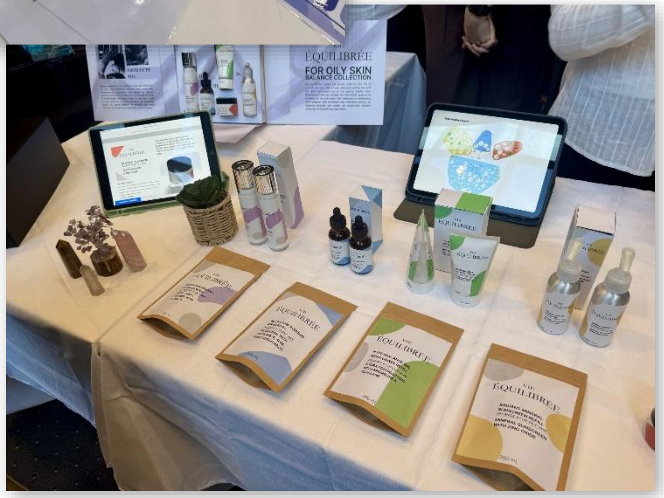
BPS3061-Industrial Project, Cosmetic Expo

Mapping to make explicit the different subsystems in interaction related to the problem under analysis

Research questions

- How do students use SOCMEs to connect cosmetic formulation decisions with broader environmental, economic, and social systems?
- What evidence of developing systems thinking is visible in students' reflections on the SOCME process?

Avenue for assessment?

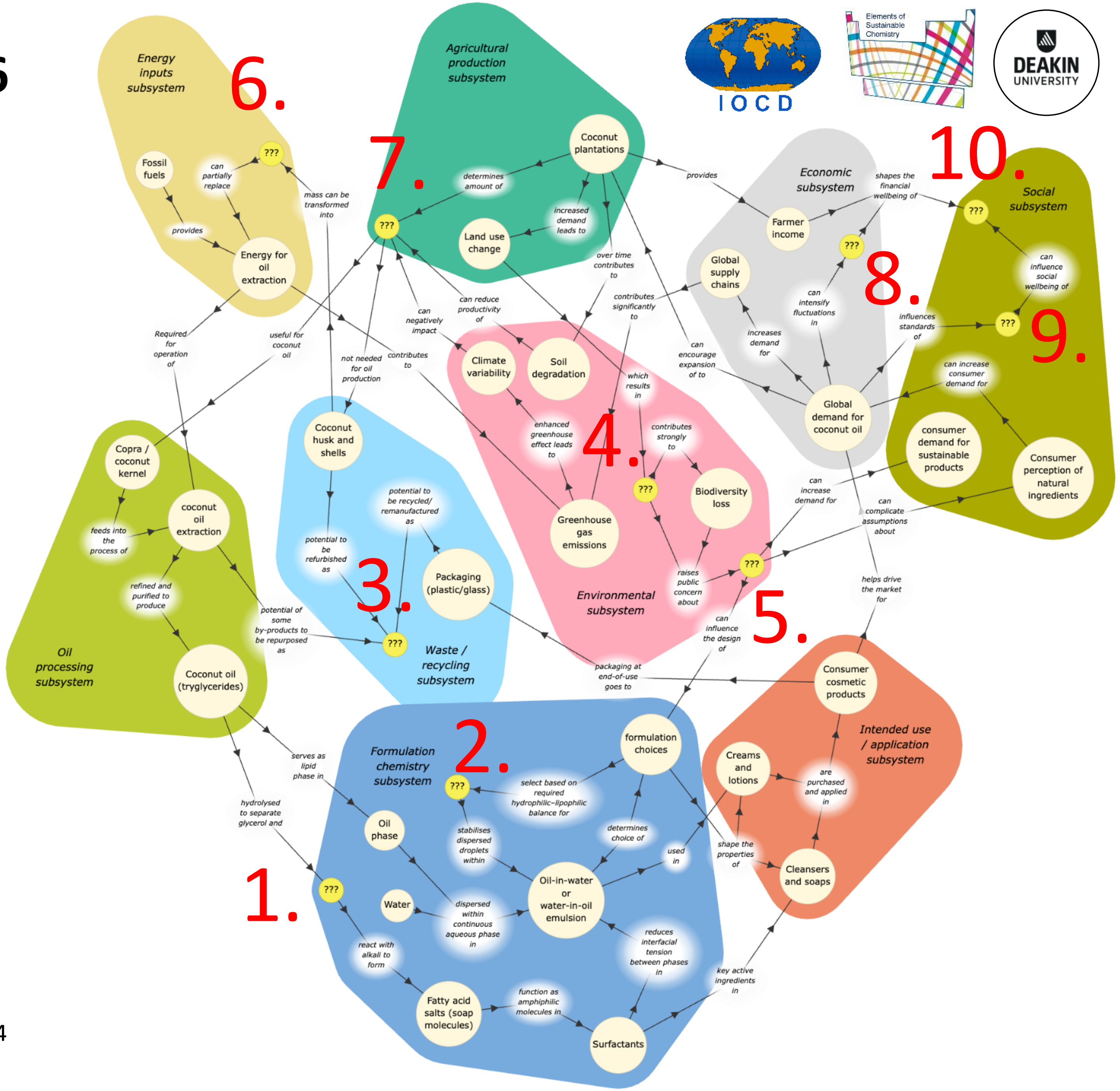


What we did differently in 2026

- ***Week 7***: Khay Fong (green chem principles; SDGs; circular chemistry)
- ***Week 8***: Seamus (ST; planetary boundaries; broader social factors)
  - System mapping/thinking activities - coconut oil and other contexts

What we did differently in 2026

‘Fill in gaps’ activity to gain experience using SOCKit to make SOCMEs



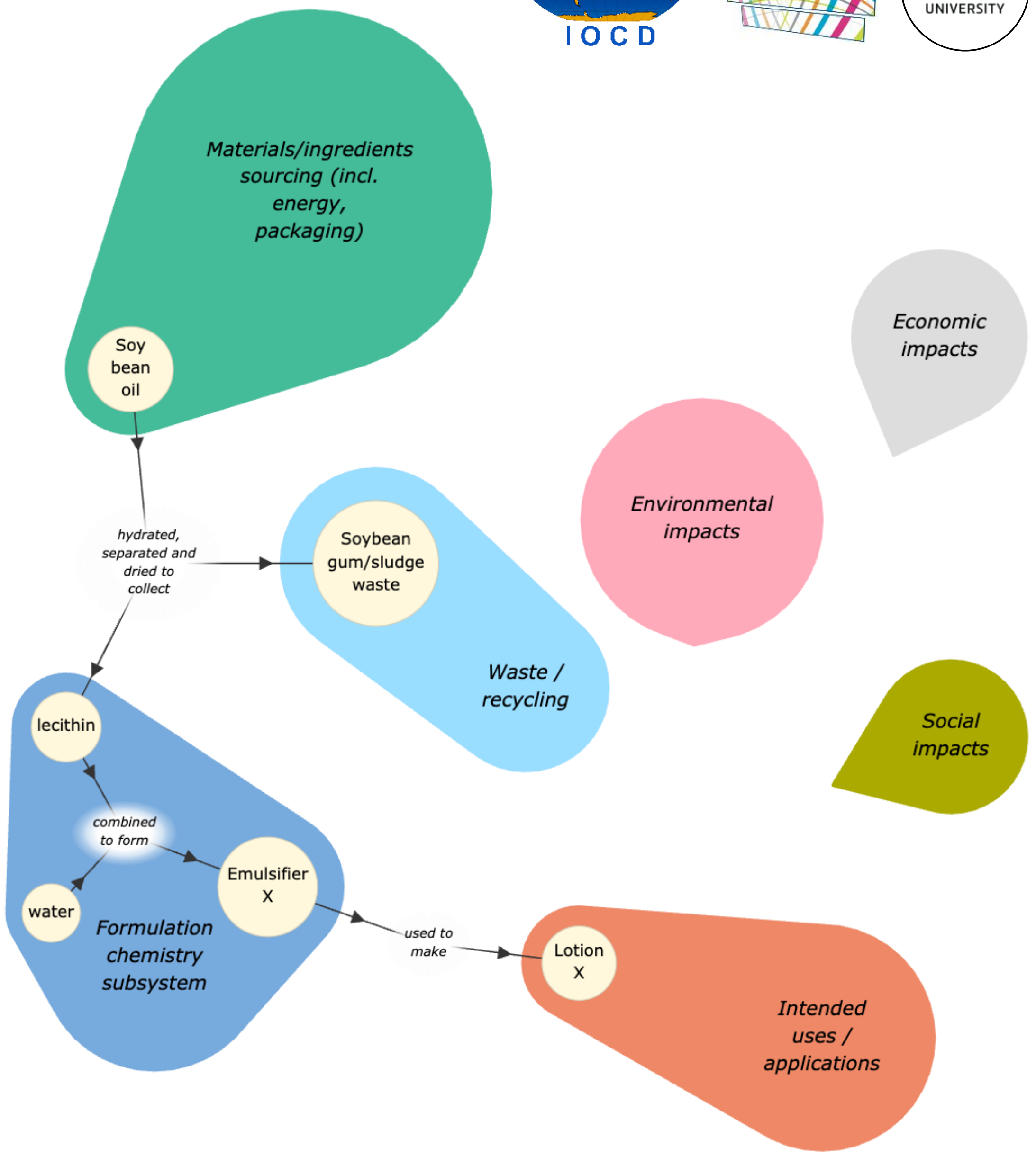
What we did differently in 2026

'Fill in gaps' activity to gain experience using SOCKit to make SOCMEs

Systems mapping assignment (individual)

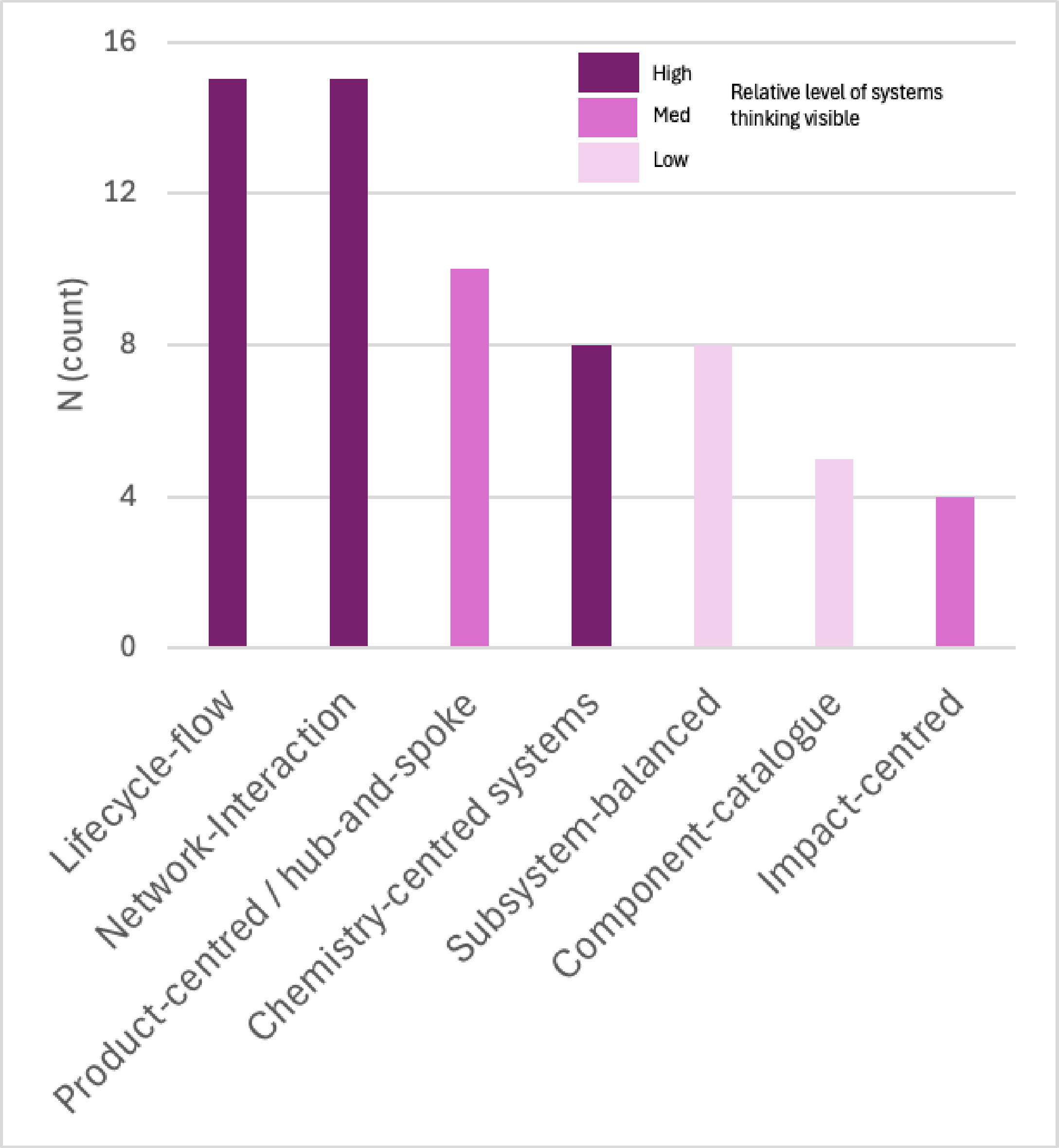
- SOCME for one of the cosmetic products their group has prepared
- Identify a 'leverage point' (a small change in system that could lead to a big impact
- Brief reflection

Sample analysed here (***N=65***)

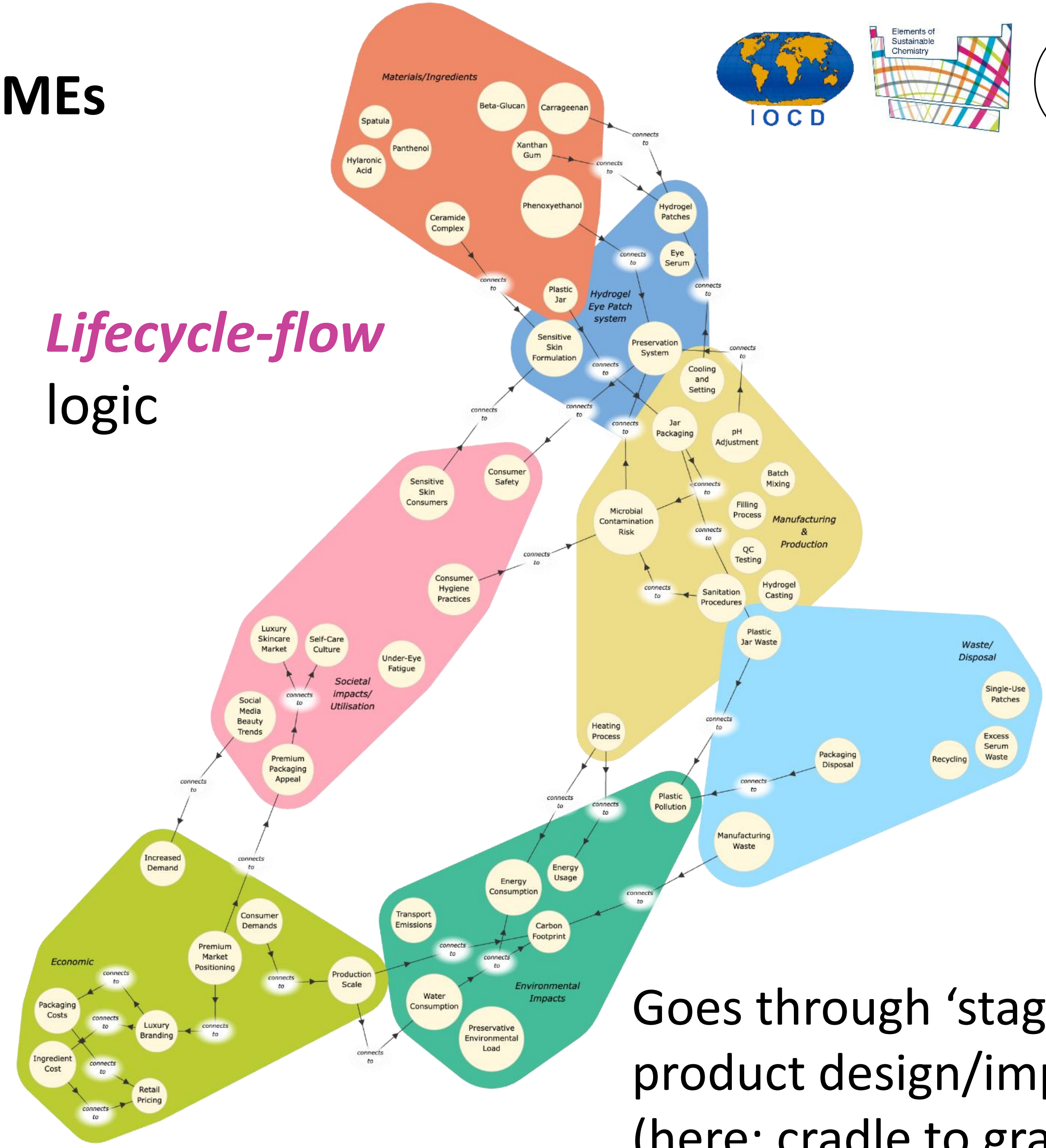


Braun, V., and V. Clarke. 2013. Successful Qualitative Research: A Practical Guide for Beginners. London: Sage

Design Typologies of student SOCMEs



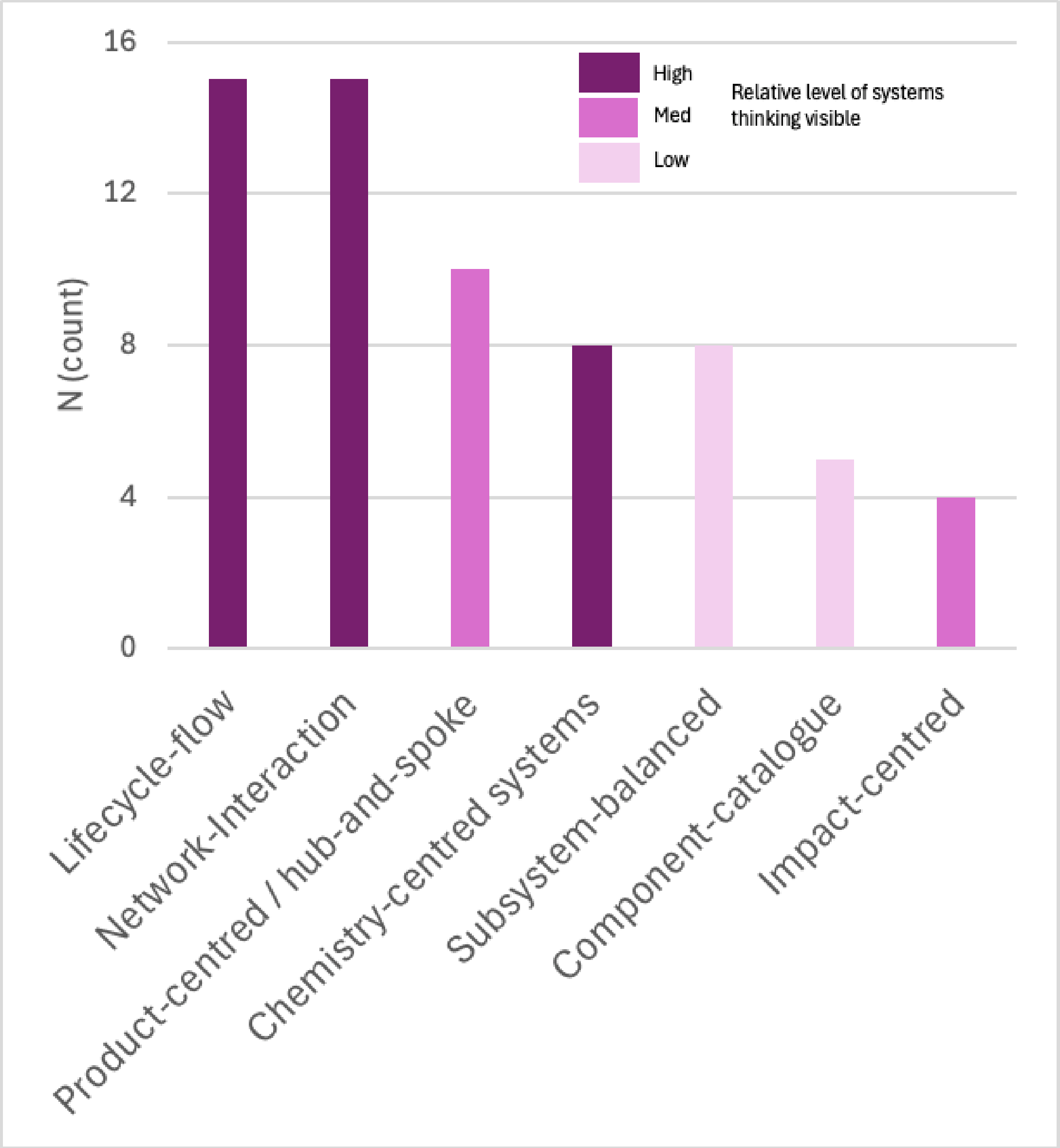
Lifecycle-flow logic

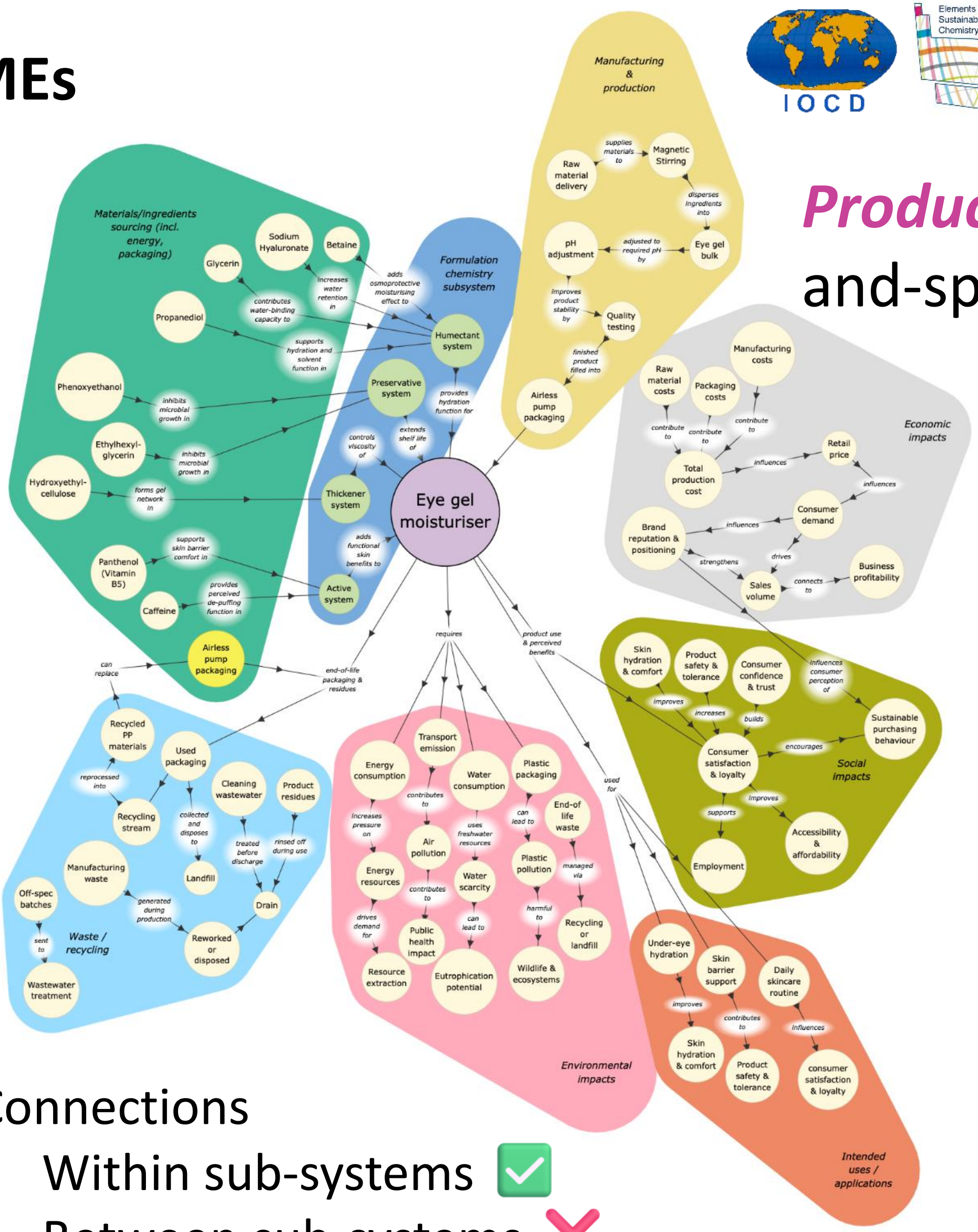


Student 008

Goes through 'stages' of product design/impact (here: cradle to grave)

Design Typologies of student SOCMEs





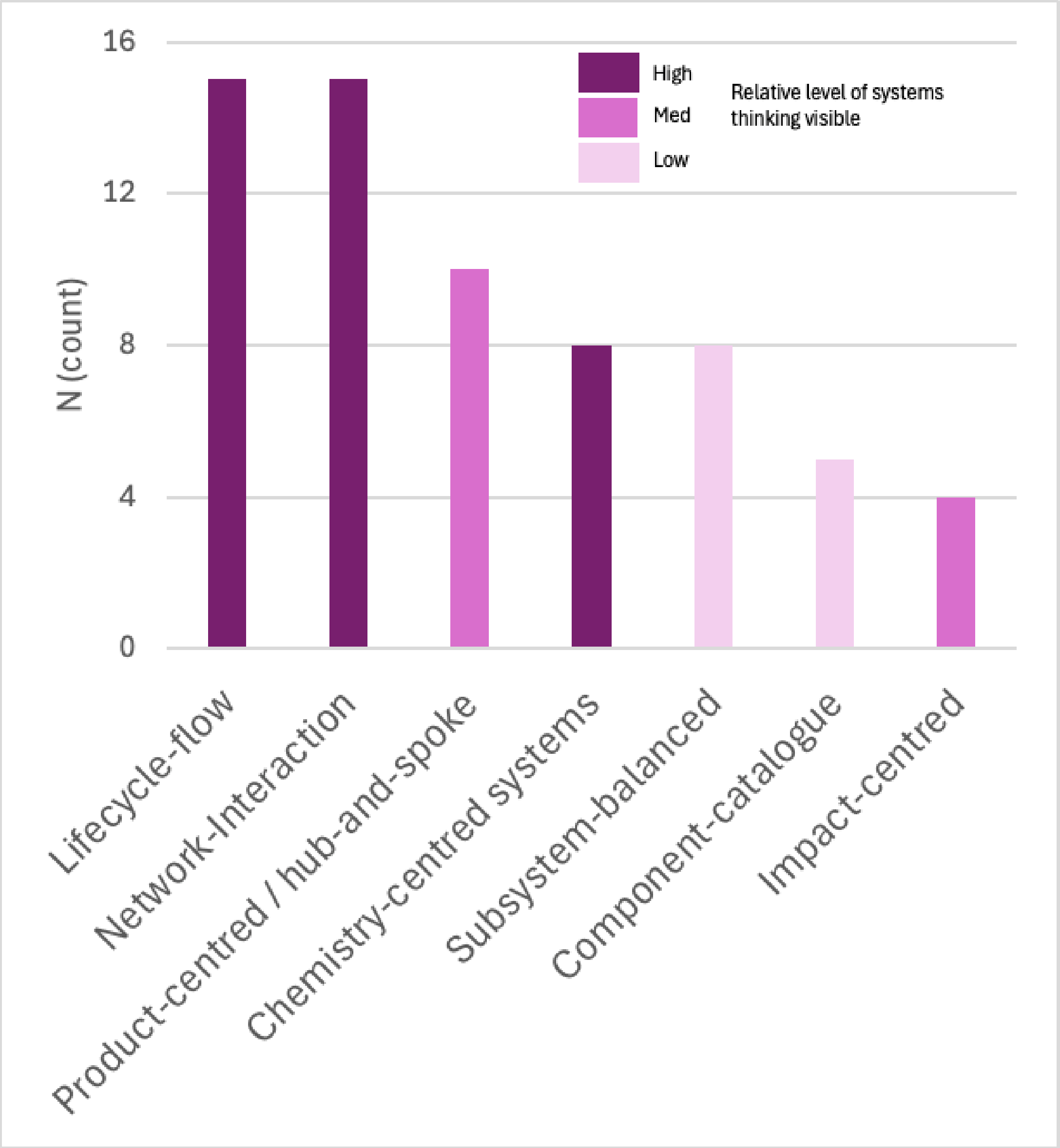
Product / Hub-and-spoke logic

Connections

- Within sub-systems ✅
- Between sub-systems ❌

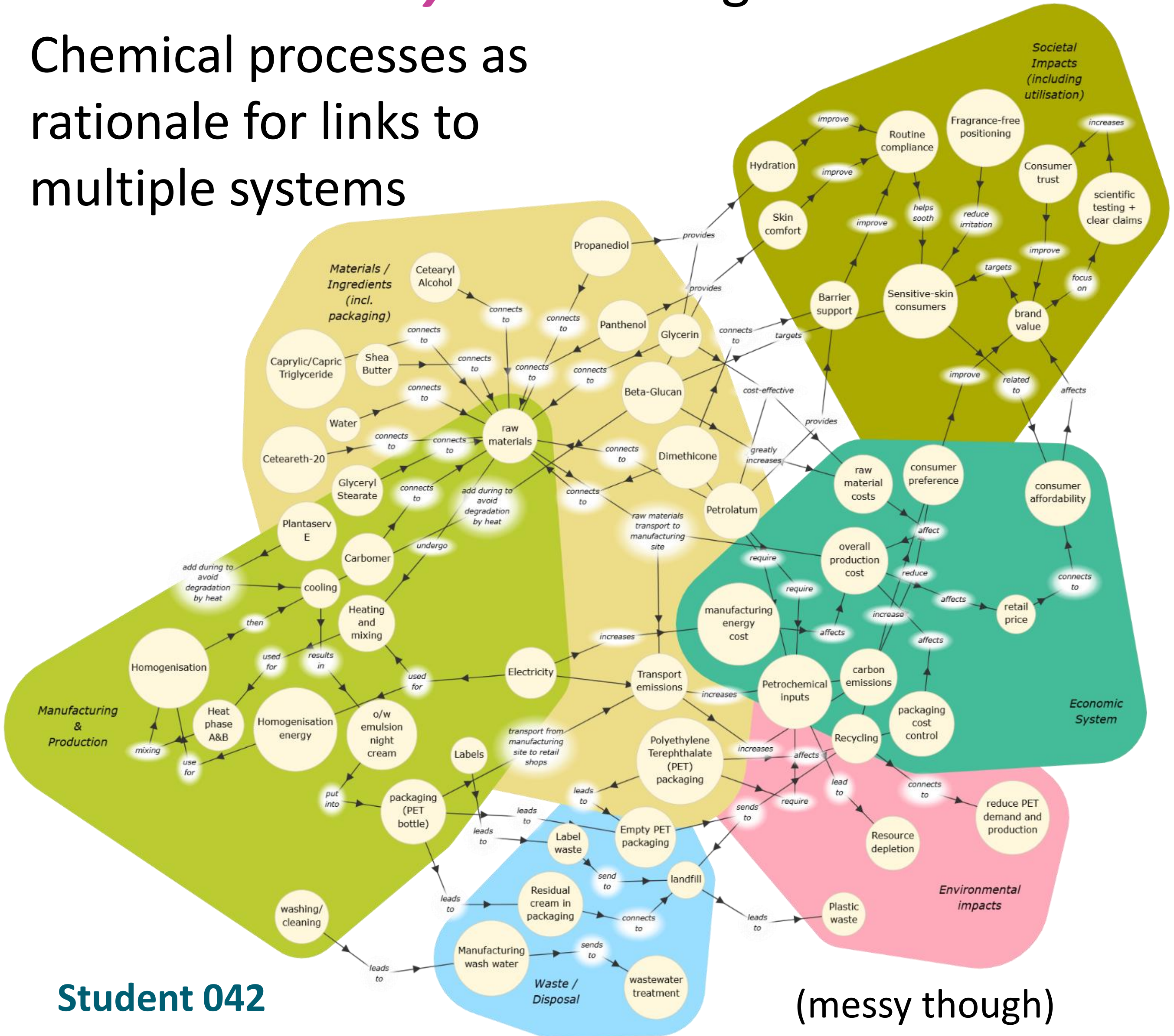
Student 012

Design Typologies of student SOCMEs



Chemistry-centred logic

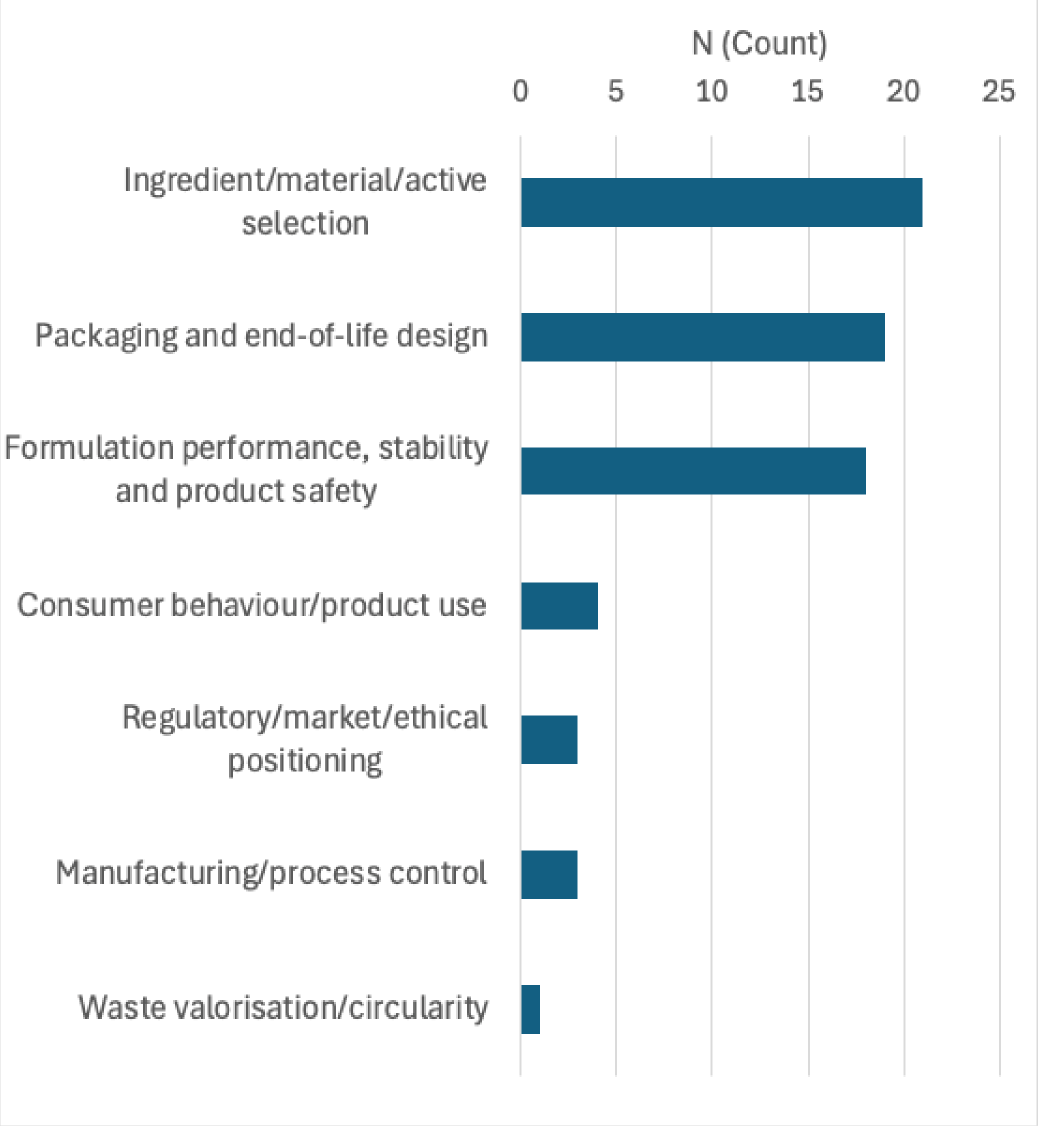
Chemical processes as rationale for links to multiple systems

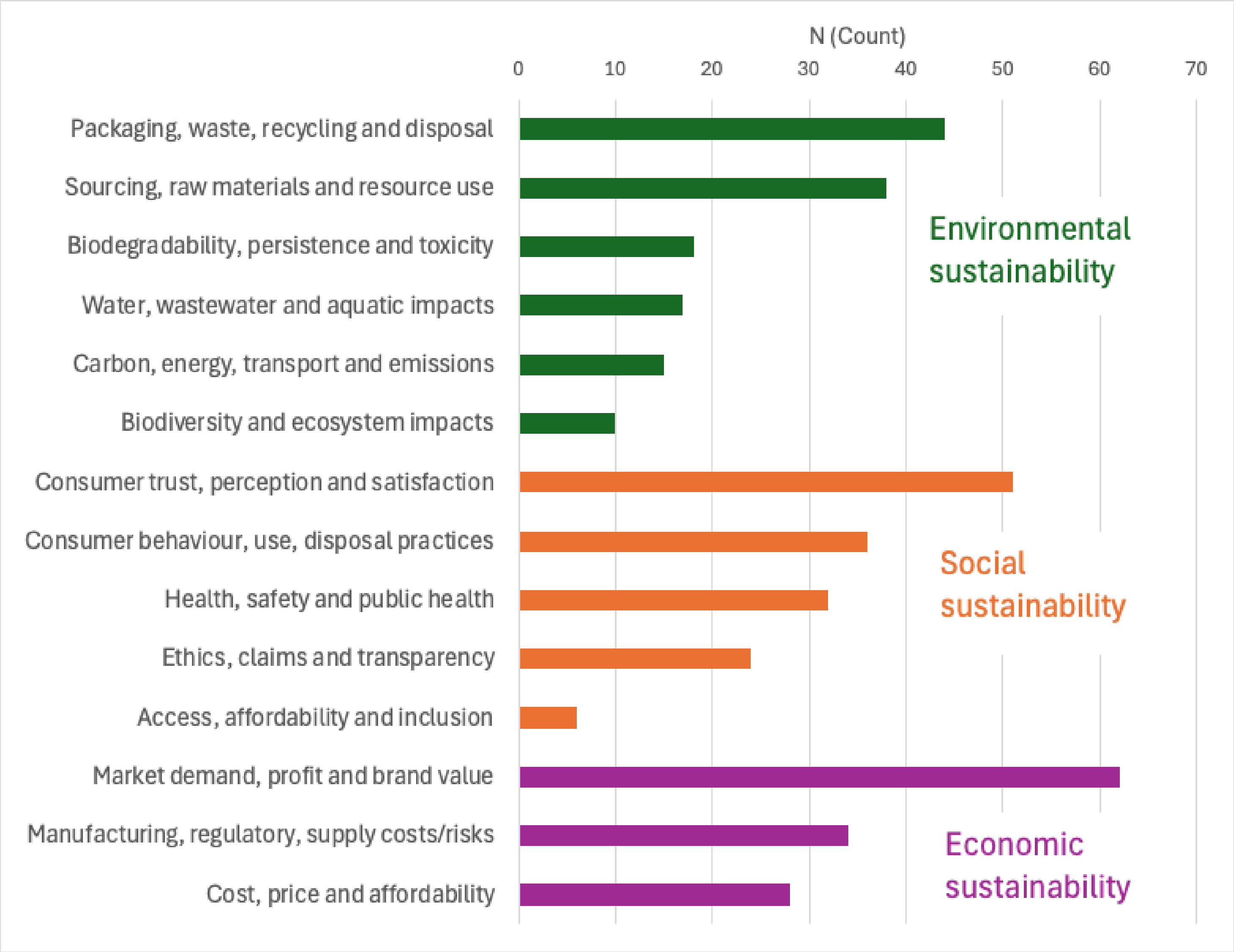


Student 042

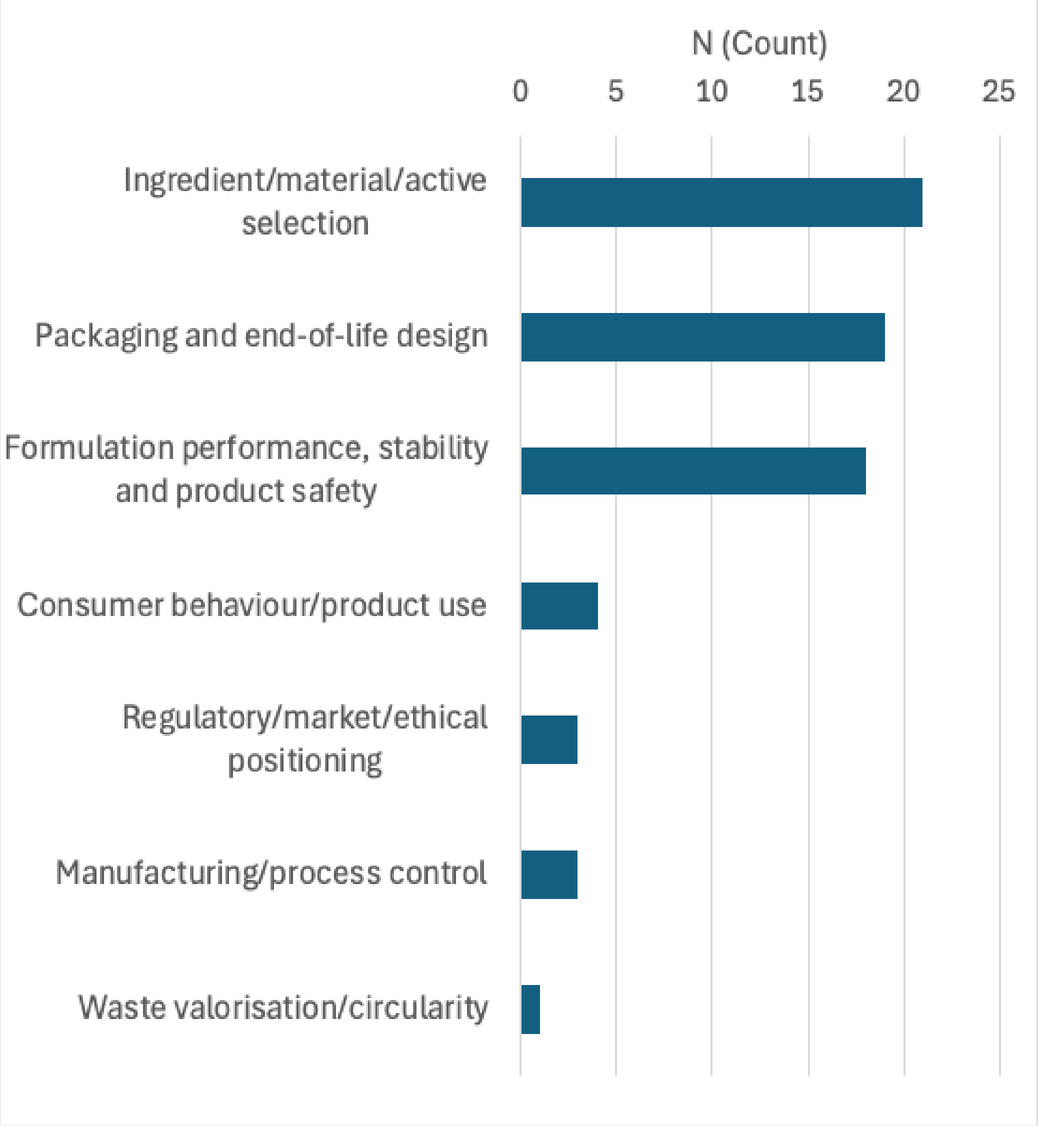
(messy though)

Leverage points identified by students





Leverage points identified by students



Situated in chemical/technological knowledge (small technical change → wider sustainability consequence)

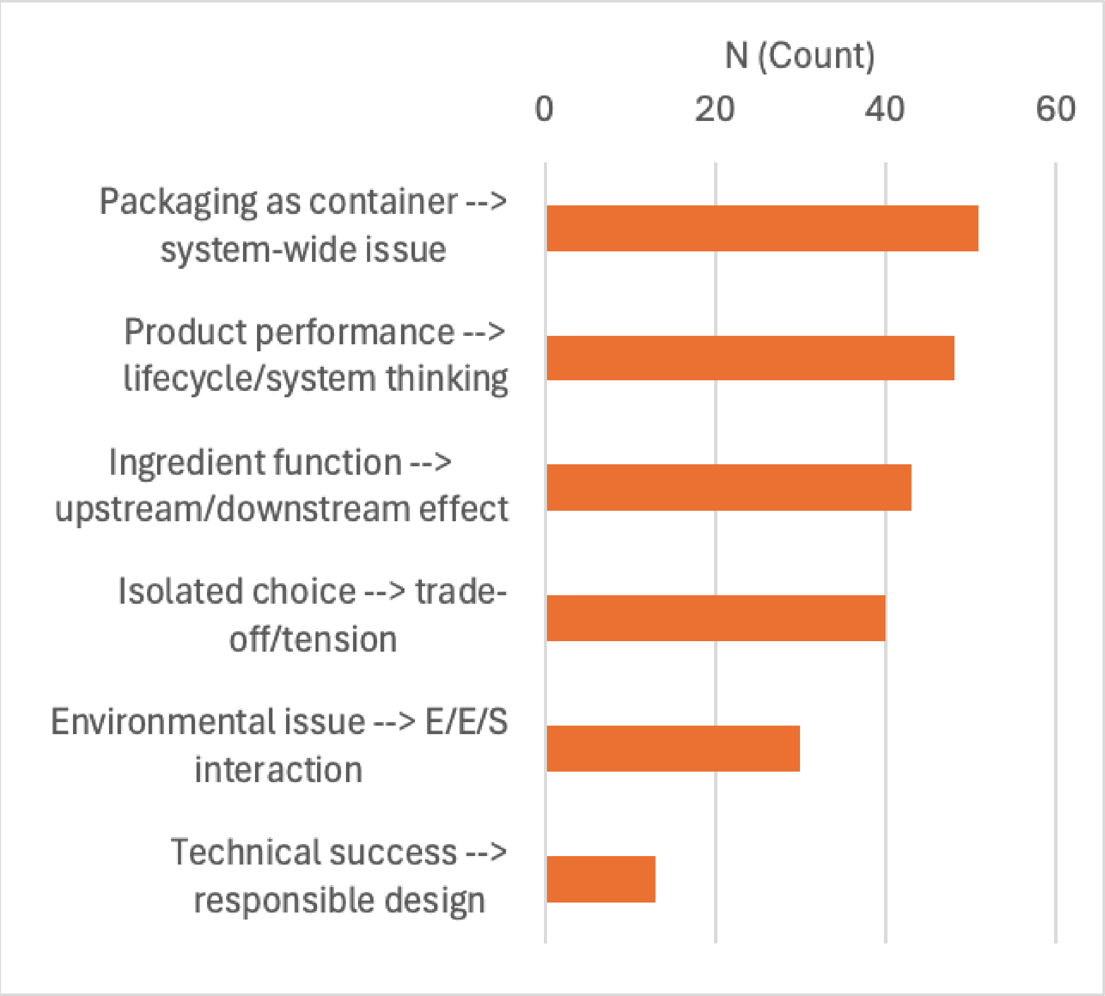
"Improving process control… has the potential to simultaneously improve product efficacy, regulatory compliance, economic viability, and public health impact." (Student 20)

More developed responses recognised constraints, feedbacks and trade-offs

"Overuse of preservatives can also cause environmental toxicity. If safety is not met and the product spoils, it would require a recall that would then affect brand identity and therefore affects business profits." (Student 18)

Student reflections

Did creating a SOCME diagram reveal any subsystems, relationships or considerations that you had not previously thought about when developing your product?

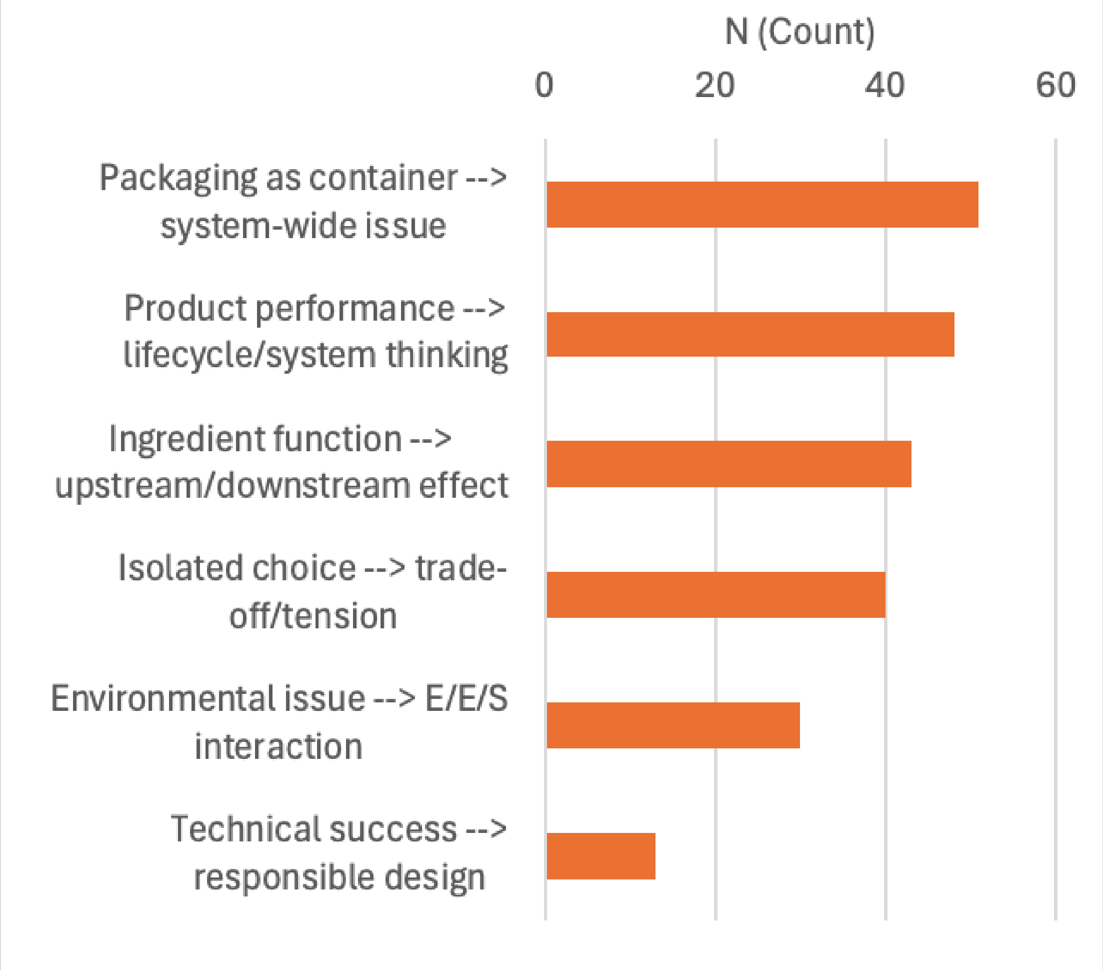


Students used formulation/packaging knowledge as ***disciplinary anchor*** for authentic systems thinking

"I was already familiar with the key functional ingredients, such as the ceramide blend, humectants, emollients and emulsifier system… establishing these relationships within the formulation chemistry subsystem was therefore relatively simple" (Student 28)

Student reflections

Did creating a SOCME diagram reveal any subsystems, relationships or considerations that you had not previously thought about when developing your product?



SOCME activity reframed product development as ***responsible design***

"This activity changed how I think about sustainability. I used to think sustainability was mainly about choosing natural or plant-derived ingredients. Now I understand that sustainable product development also requires safety, stability, suitable packaging, realistic end-of-life thinking and honest communication."
(Student 64)

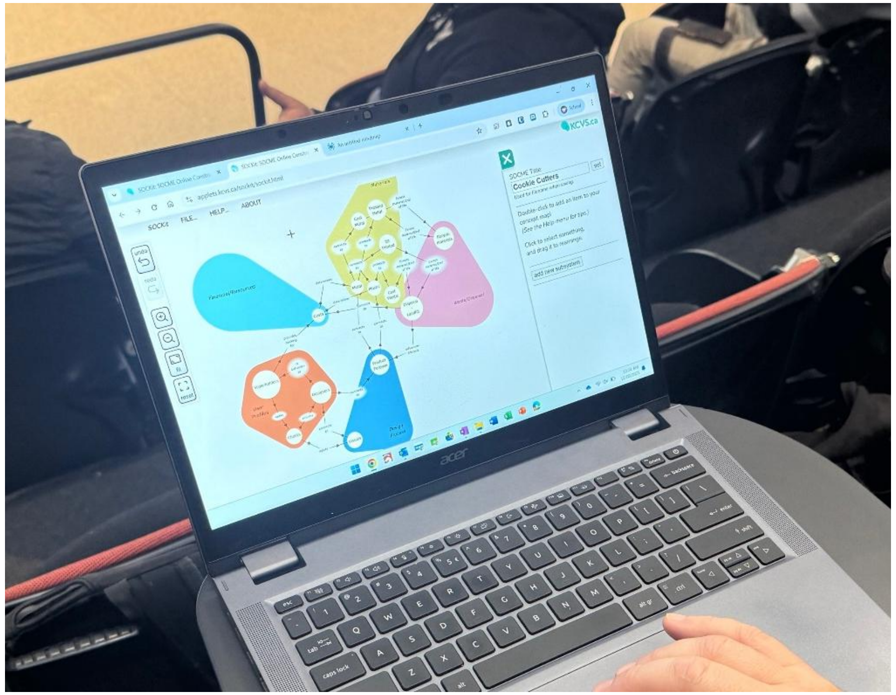
Future work

Validated assessment framework

- Rubric in development, co-design with cross-discipline experts
- Training for tutors on how to reliably assess maps for assurance of learning? (scope for AI?)

Breadth in chemical / pharmaceutical science contexts

- More 'fill in gaps' scaffolds, pitched at different education levels
- Leverage points → Tipping points?
- IUPAC task group (2025-2027): Chemical industry involvement



Thank you! Questions?

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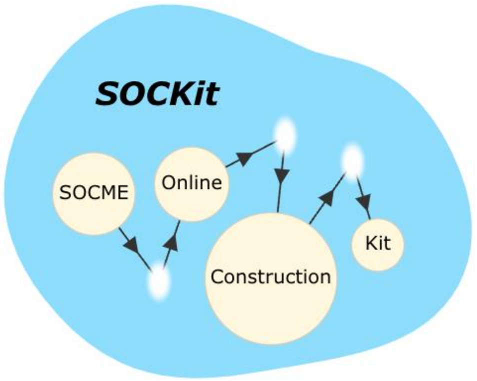
Acknowledgements

- Laurence Orlando, Zoe Porter
- IUPAC Committee on Chemical Education

IOCD

IUPAC
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

DEAKIN UNIVERSITY



https://applets.kcvs.ca/sockit/

QUEEN'S UNIVERSITY BELFAST

Embedding digital literacy and artificial intelligence (AI) into pharmacy and pharmaceutical sciences education: a programme-level curriculum transformation

SHAPING A BETTER WORLD FOR 180 YEARS

Prof Lezley-Anne Hanna, Dr Dan Corbett and Prof Maurice Hall

Background and context

- UK Standards for the initial education and training of pharmacists (MPharm degree programme and Foundation Training Year) require digital skills development for improving patient outcomes
- The Academy of Pharmaceutical Sciences (APS) accredits UK-based university degrees in pharmaceutical science. It emphasises developing graduate attributes and transferrable skills, including digital literacy and use of digital tools
- Priorities for UK Higher Education (including Advance HE and JISC)
- It has relevance for the International Pharmaceutical Federation Development Goals (‘5: Competency Development’ and ‘20: Digital Health’)

Background and context

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Aim

To review programme content (of the MPharm, BSc Pharmaceutical Sciences and BSc Pharmaceutical Biotechnology programmes), identify digital literacy and/or AI related gaps and required changes, and implement these

Timeline

The bulk of the baseline work was undertaken from 2023 to 2025 (but this is an evolving field)

Methods

STAGE 1: PROGRAMME REVIEW

Conducted by the Directors of Education for Pharmacy and Pharmaceutical Sciences with the Senior Lecturer (Digital Education):

Framework Mapping

Benchmarking against three frameworks:

- Framework for digital transformation in higher education (2023)
- Framework for NHS action on digital inclusion (2023)
- All-Ireland digital capability framework for health and social care (2022)

External Consultation

Digital technologies used in practice identified via external meetings with:

- Representatives from the pharmaceutical industry
- Representatives from pharmacy practice

Identify Changes Required

Gaps in digital literacy and AI provision identified from the framework mapping and external consultation. Proposed changes were subsequently discussed

STAGE 2: IMPLEMENT CHANGES

New digital and AI-related activities introduced across the MPharm, BSc Pharmaceutical Sciences and BSc Pharmaceutical Biotechnology programmes

STAGE 3: EVALUATE

Competency and skills development determined through assessment. Learner experience assessed via user testing, module evaluation, student experience surveys, and the MPharm accreditation outcome

Results

Digital literacy-related activities evident in the programmes:

Digital competency

Microsoft Office, science packages and dispensing software

Digital search skills

Locating and evaluating online evidence

Digital communication

Professional online interaction

Critical thinking

Analysing and interpreting information

E-poster creation

Visual presentation of research

Video creation

Multimedia content development

Results

A digital culture and environment was apparent:

Infrastructure & Spaces

- Virtual learning environment (Canvas)
- Digital upgrades to lecture theatres and teaching spaces (including an immersive suite/cave)

People & Leadership

- Appointment of a 'digital education' academic, then a 'Director of Digital Integration' role
- Research expertise

Equipment & Access

- State-of-the-art laboratory equipment and instruments
- 'Laptop for Loan' scheme
- Digital capture of teaching

Influence & Reach

- Influencing university policies and external organisations (digital context)

Results (MPharm programme)

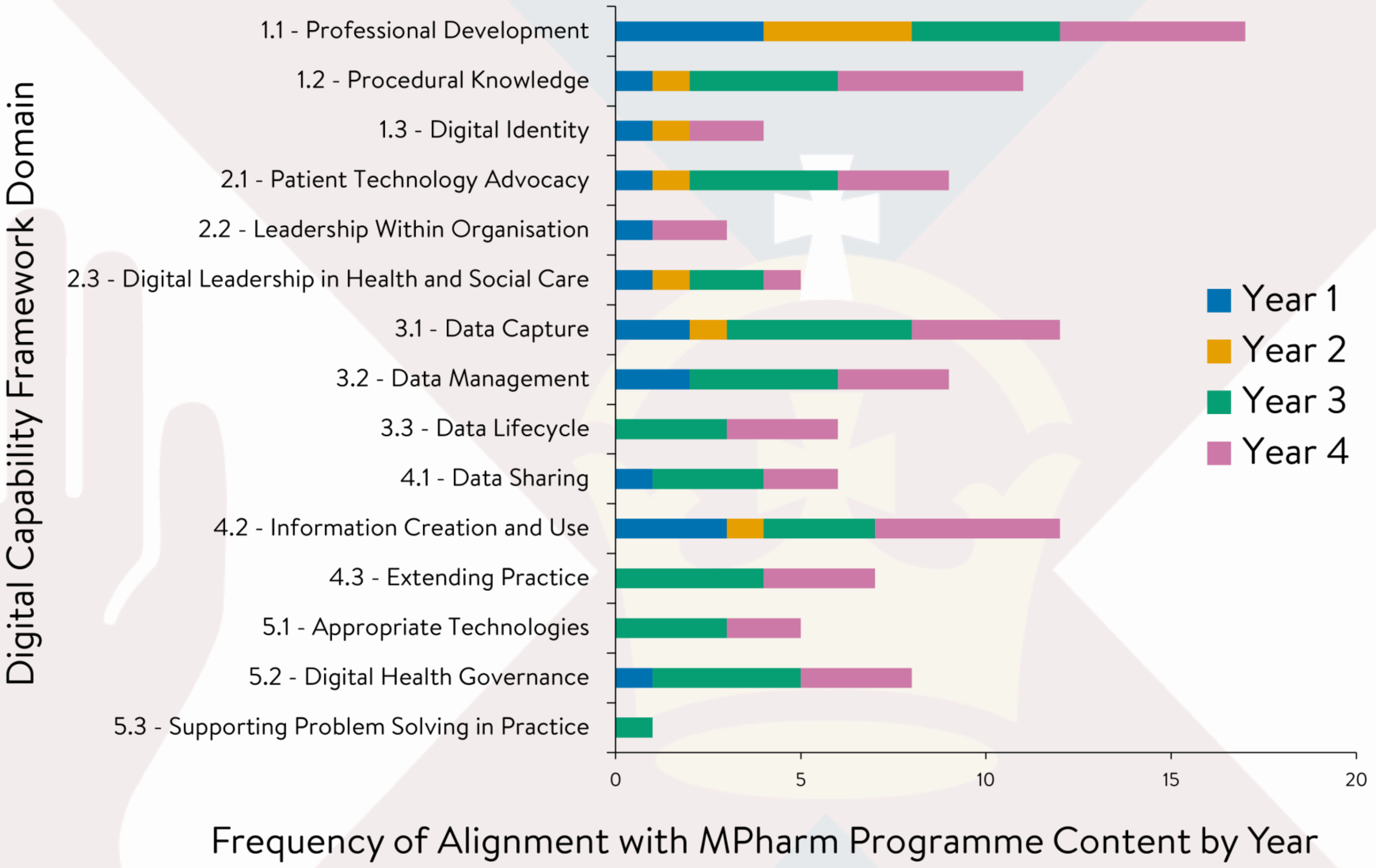

Figure 1. Alignment of the QUB MPharm degree to the domains of the All-Ireland Digital Capability Framework

Results

We implemented the following changes:

Gaps

- Training in cyber security and information governance
- AI training — critically evaluating AI-generated content and responsible use of AI
- Digital tools and devices
- Digital capabilities

Digital innovation

- Timer for OSCE and OSPE circuits
- Assessment density calendar
- E-portfolio/tracker for experiential learning
- Digital diagnostic devices workshop
- Digital patient records
- AI-driven virtual patient & counselling feedback tools
- Virtual reality laboratory session

Discussion/Conclusion

Embedding digital education requires significant effort

Significant expertise is required from multiple stakeholders, such as the University, digital education organisations, professional bodies and employers. National frameworks allow for a consistent, standardised approach

Digital education is an ongoing journey - not a destination

Regular evaluation and continued development are essential, given the vast and rapidly evolving nature of digital technologies

Transform responsibly – don't compromise standards

Curriculum change must remain ethical and continue to meet required professional standards. Digital tools and AI should complement teaching, not replace it – students must still develop core knowledge and skills, without over-reliance on technology

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QUEEN'S UNIVERSITY BELFAST | SCHOOL OF PHARMACY

Acknowledgements

- School of Pharmacy, Queen's University Belfast
- Staff involved in UG Pharmacy and Pharmaceutical Sciences programme delivery
- Students enrolled on the UG programmes and those who have recently graduated

19th in the World
for Pharmacy & Pharmacology
(QS subject rankings 2026)

2nd in the UK
for Pharmacy & Pharmacology
(The Times Good University Guide, 2026)

4th in the UK
for Allied Health Professions, Dentistry, Nursing and Pharmacy
(REF2021)

1st in the UK
for graduate prospects
(Complete University Guide 2025)

QUEEN'S UNIVERSITY BELFAST | SCHOOL OF PHARMACY

UNIVERSITY OF SASKATCHEWAN
College of Pharmacy and Nutrition
PHARMACY-NUTRITION.USASK.CA

Integrating Planetary Health in Pharmacy Education: Assessing Student Engagement and Competence in Sustainable Patient Care

Derek Jorgenson, BSP, PharmD, **Andrea Tang**, BSP, PharmD, ACPR
College of Pharmacy and Nutrition
University of Saskatchewan, Canada

PES 2026

BE WHAT THE WORLD NEEDS

University of Saskatchewan

What is Planetary Health?

Analyzing and addressing the impacts of human disruptions to Earth's natural systems, on human health, and on all life on Earth.

Everything is connected.

Encompasses climate mitigation, climate adaptation, and waste management.

Canada's healthcare system is among the top 4 emitters per capita worldwide - comprises up to 5% of national greenhouse gas emissions.

The pharmaceutical industry emission intensity is 55% higher than the automotive industry.

Pharmacy’s Role

Climate Change Mitigation

Climate Change Adaptation

Waste Management

UNIVERSITY OF SASKATCHEWAN

Are We Preparing our Students?

Study Objective

The aim of this study was to assess pharmacy students' interest and ability to incorporate planetary health into the patient care process, prior to being given formal instruction on the topic in the curriculum.

Jorgenson, June 2025

Methods

Therapeutic Alternative Worksheet

OPTION	EFFECTIVENESS[1]	SAFETY[2]	TOLERABILITY[3]	CONVENIENCE	PLANETARY HEALTH CONSIDERATIONS[4]	COST

University of Saskatchewan

Methods

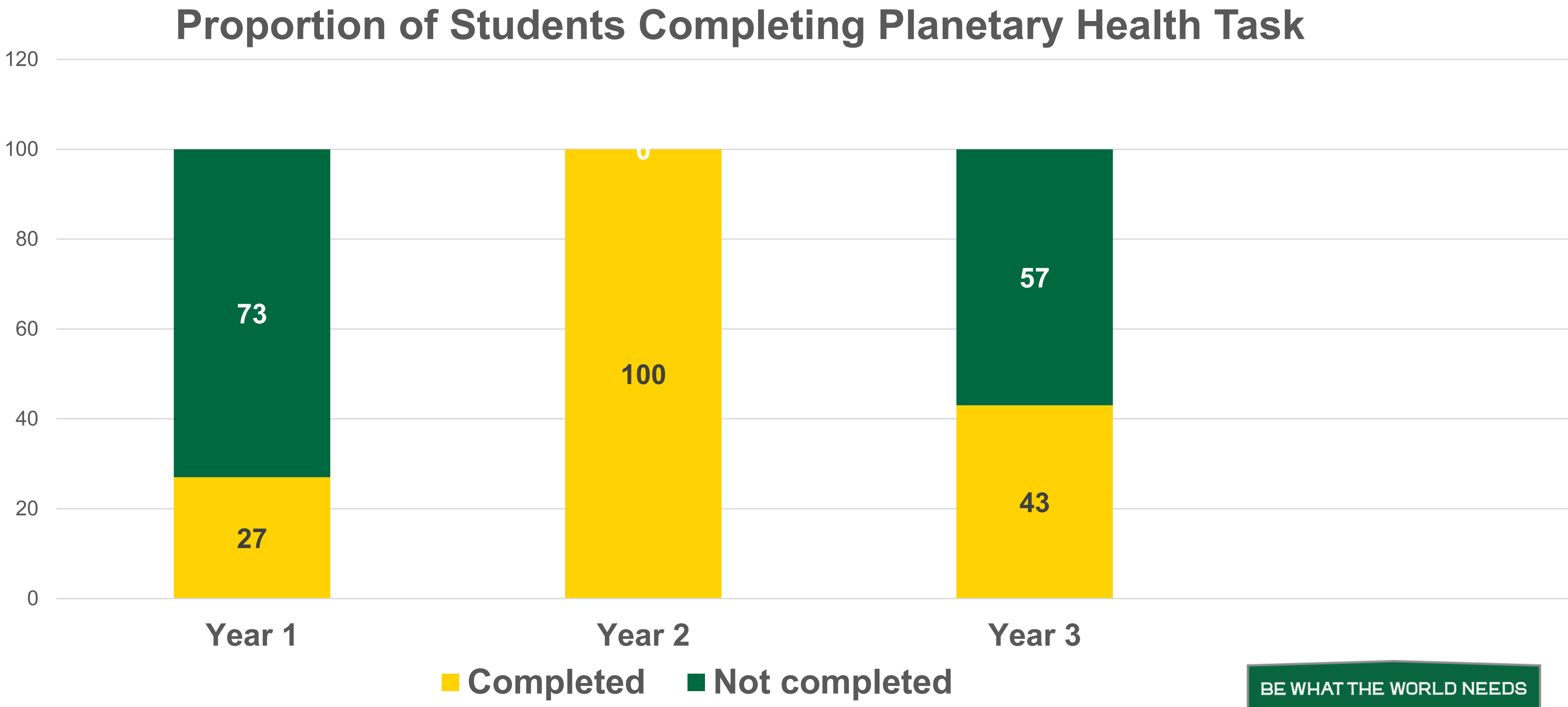
- Students in years 1, 2 & 3 completed a care plan in September 2025 and were instructed to complete the planetary health information on a voluntary basis.
- Students were encouraged to provide info based on their existing knowledge, experience, or by accessing resources they could find about planetary health and how it impacted drug therapy decisions in the patient case.
- **Care plans were evaluated to determine:**

  (1) student engagement adding planetary health to alternative worksheet

  (2) accuracy of the information included regarding planetary health

  (3) extent to which the planetary health info affected care plan decisions

Results: Student Engagement



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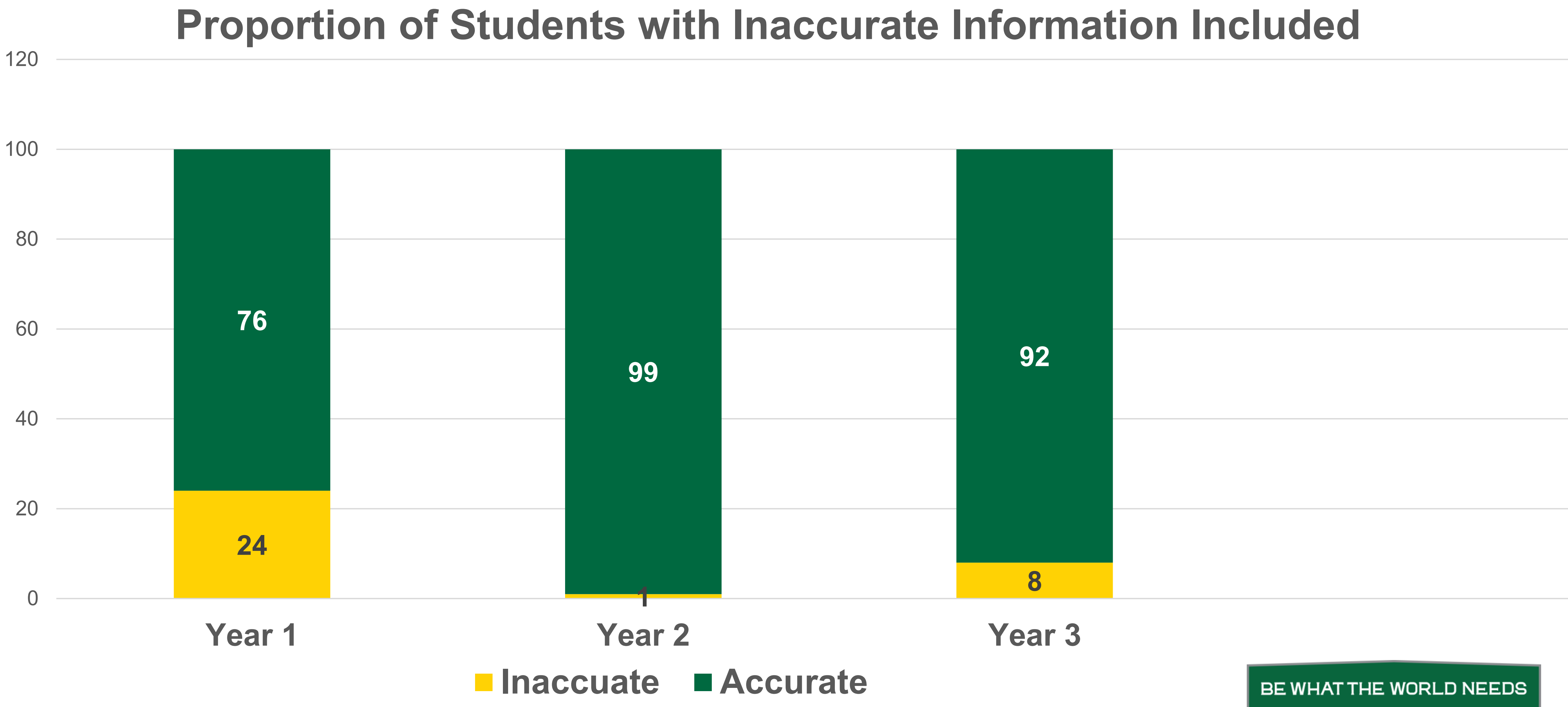
Results: Accuracy of Information



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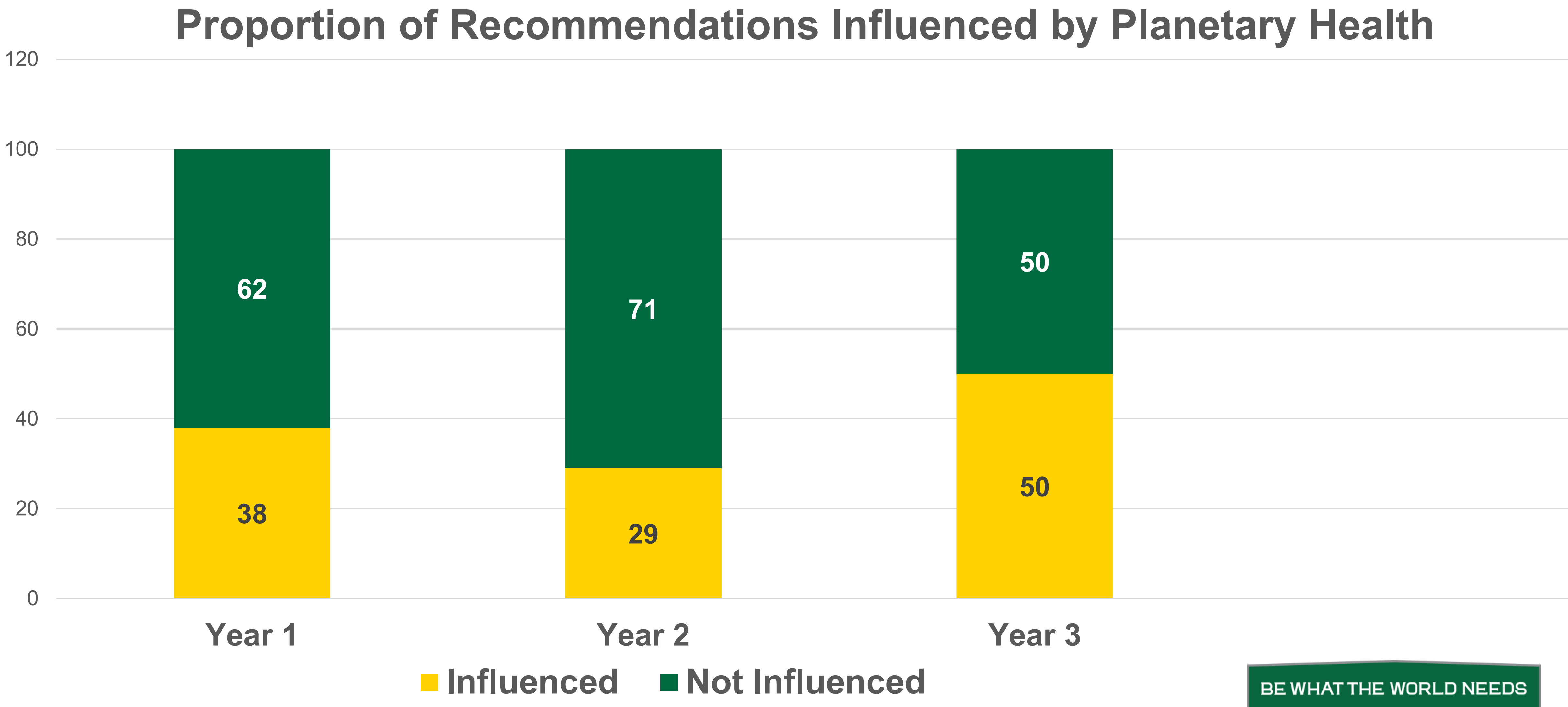
Results: Influence on Care Plan



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Conclusions

Students are passionate about this topic – do not expect pushback if you plan to integrate this into your curriculum

- Students were motivated to consider planetary health in their drug therapy decisions, despite not being required to do so, nor taught formally how to do it.

Students need instruction on the topic - this must be included formally into curricula

- Many students included inaccurate information in their care plans.

UNIVERSITY OF SASKATCHEWAN

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BE WHAT THE WORLD NEEDS

Embedding Programmatic Assessment in an Accelerated PharmD Program: Early Evidence From a New Curriculum

Making longitudinal judgment possible in an accelerated curriculum

Jamie Kellar | Naomi Steenhof | Natalie Crown

Leslie Dan Faculty of Pharmacy University of Toronto

A transformed curriculum cannot succeed with a traditional assessment system.

- Accelerated 3-year PharmD program
- Adaptive expertise as the goal
- Longitudinal and integrated learning

Why are we still assessing learners as isolated snapshots?

Traditional assessment answers the wrong question

Did the learner pass this exam?

versus

How is the learner developing over time?

Programmatic Assessment

A system in which multiple low-stakes assessment data points are collected and aggregated over time to inform both learning and high-stakes decisions.

Assessment as a system, not events

Van der Vleuten et al., 2012

Our Framework

Frequent Low-Stakes Assessments

Progress Testing

LONGITUDINAL JUDGMENT

Cross-Course Analytics

Student Progress Committee

Assessment Redesign

SNAPSHOT → SIGNAL

Traditional	Programmatic
Many discrete exams	>50% fewer assessments
High-stakes	Low stakes
Course decisions	Program decisions
Late intervention	Early support

Snapshot to Signal: What This Looks Like in a Learner

A student shows:

- Borderline performance in therapeutics
- Lower confidence in OSCE communication
- Inconsistent quiz performance
- Poor attendance

Individually = Noise

Together = Signal

Summary of Changes

For Learners	For Educators	For Programs
• Reduced assessment burden/stress • Greater clarity of expectations	• Better visibility of performance patterns • Earlier intervention	• Psychometric reliability maintained • Feasible in accelerated model

Programmatic assessment shifts us from judging learning at a moment to understanding it over time.

No single assessment identified the struggling learner.
The system did.

Why This Matters

- Enables credible accelerated education
- Aligns assessment with adaptive expertise
- Shifts:
  - From: Did the learner pass?
  - To: What is the trajectory of this learner’s development.
  - Assessment becomes a system for understanding learning rather than simply judging it.
- Supports learner wellness without lowering standards
- We are not reducing assessment; we are redesigning how judgment is made.

Take Home

- Transformed curricula require transformed assessment
- Patterns > points
- Longitudinal judgement enables earlier support

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Design Thinking as a Framework for Integrating Digital Health for Managing Diabetes Care

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University of the Pacific – Thomas J. Long School of Pharmacy, USA

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Professor, Department of Pharmacy Practice & Director of Interprofessional Education and Instructional Design

University of the Pacific – Thomas J. Long School of Pharmacy, USA

Digital Health

- Digital health encompasses the use of technology such as mobile apps, wearable devices, telehealth, and artificial intelligence
- Because these technologies are fast becoming standards of practice, future pharmacists need immediate firsthand exposure to guide patients safely and accurately.

Technical Knowledge vs. Empathy in Diabetes Care

Technical Literacy

- How to place continuous glucose monitor (CGM)
- How to decode real time data
- How to make quick, clinical, data-driven therapeutic adjustments.
- Designing patient-centered CGM-based programs

Empathy-Based Learning

Lived experience builds patient empathy by highlighting:

- Self-efficacy
- Alarm fatigue
- Device complexity/failure
- Quality of life changes
- Privacy issues

Helps students transition from clinical advisors to collaborative health partners.

Natale P, Chen S, Chow CK, Cheung NW, Martinez-Martin D, Caillaud C, Scholes-Robertson N, Kelly A, Craig JC, Strippoli G, Jaure A. Patient experiences of continuous glucose monitoring and sensor-augmented insulin pump therapy for diabetes: A systematic review of qualitative studies. J Diabetes. 2023 Dec;15(12):1048-1069. doi: 10.1111/1753-0407.13454.

6-Week Design Thinking Module

Empathize

- Instruction on diabetes care.
- Wore a CGM for 2 weeks & logged activity and diet.
- Installed app to follow personal data.

Define

- Defined the problem.
- Reviewed personal data.
- Delivered targeted education to simulated patients.

Ideate

- Teams brainstormed creative solutions to improving diabetes outcomes using digital health tools.

Prototype

- Designed operational clinical flows and support services for a mock CGM-based clinic.

Test and Revision

- Presented prototypes to peer teams for structured feedback.
- Submitted a revised proposal.

3rd semester Pharmacy Skills course that met 2h/week for 15 weeks
Number of students= 158

Design thinking framework survey- 14 items

Items mapped to “Empathy, define, ideate, prototype”

Two additional questions

“I will use the skills I have learned in this module in managing my patients in the future”

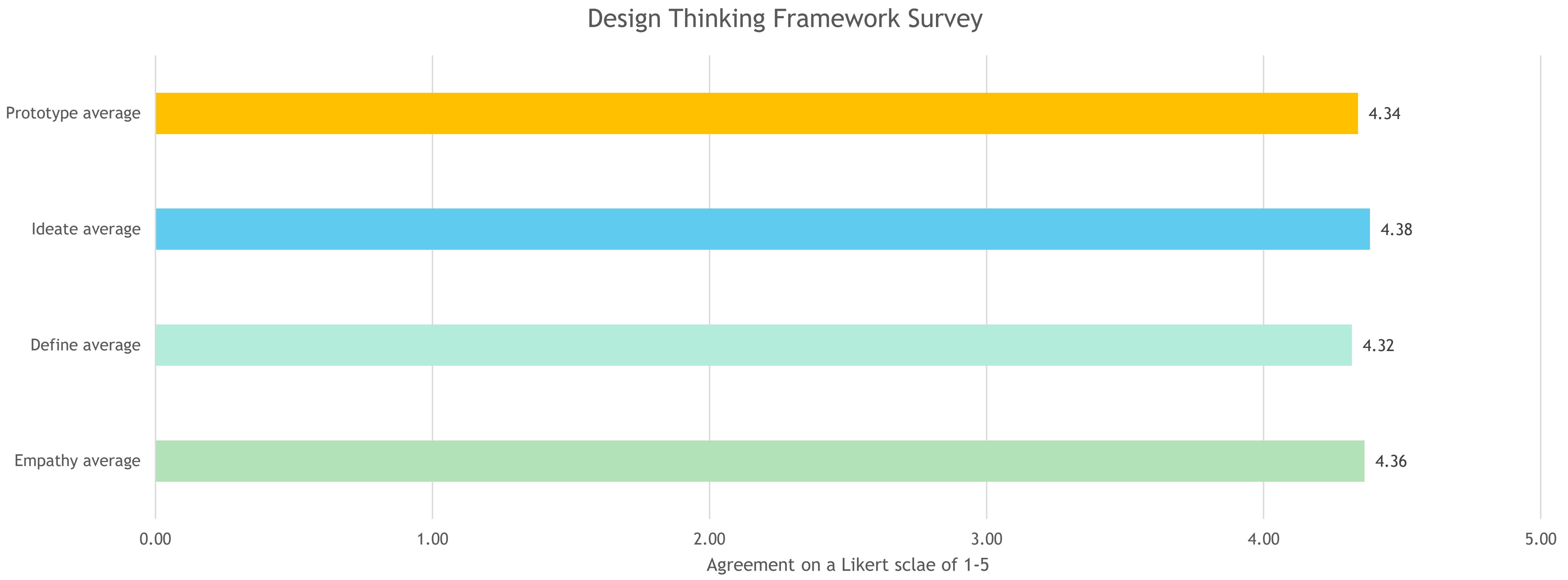
“This course was useful to my learning”

Reflection prompts

“What were your top takeaways from the CGM clinic development activity?”

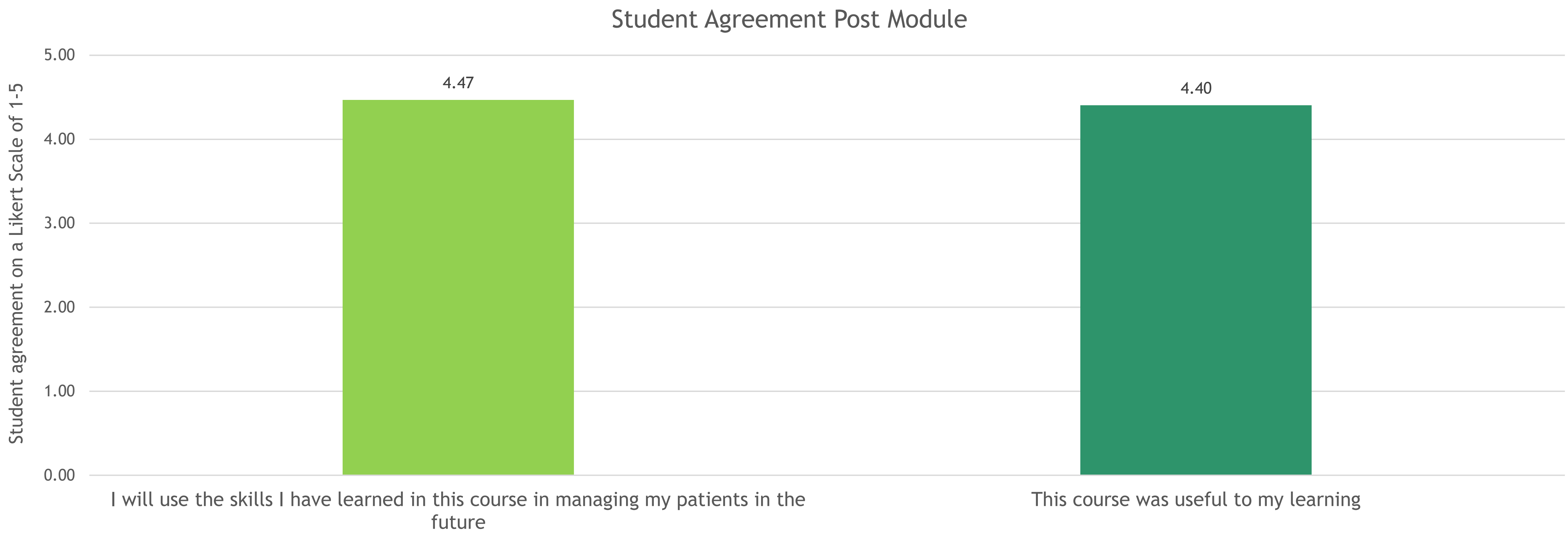
“If you were a patient with diabetes, what it be like to use a CGM?”

Outcomes Measures



Design thinking framework survey

Quantitative descriptive analysis revealed positive responses across the entire design thinking spectrum.



Additional Questions

Thematic Analysis

Lived Empathy

77% Prevalence: Gaining profound patient understanding through personal daily self-monitoring.

Workflow Awareness

53% Prevalence: Understanding organizational challenges of scaling clinical data flows.

Technical Literacy

45% Prevalence: Mastering device software, trend interpretations, and data troubleshooting.

Data Empowerment

27% Prevalence: Utilizing instant visual biofeedback to adjust health habits.

Thematic analysis - Challenges Noted

Physical & Psychological Costs

Students reported distinct physical discomfort and self-consciousness when wearing the active sensor in their daily routines.

Cognitive Overload

Students regularly experienced sensor alarm fatigue and information overload from checking continuous numbers too frequently.

Thematic Analysis

Theme	Count	% of responses
Real-time data & dietary/lifestyle awareness	77	49%
Practical convenience vs. inconvenience	47	30%
Emotional burden (anxiety, stress, overwhelm)	38	24%
Empowerment & sense of control	27	17%
Hypoglycemia safety & alerts	21	13%
Self-consciousness & stigma	15	10%
Cost & access concerns	6	4%

Reflection prompt:
If you were a patient with diabetes, what would it be like to use a CGM?

Conclusion

Empowering Future Pharmacists

Integrating a design thinking framework into a diabetes care module enhanced pharmacy students' empathy, digital health literacy, and innovative problem-solving.

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Questions & Discussion

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