

Integrated Curriculum Design Effect on Foundational Design and Manufacturing Education

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Presented by:
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Breadth was not the problem. Organisation was.



≈600

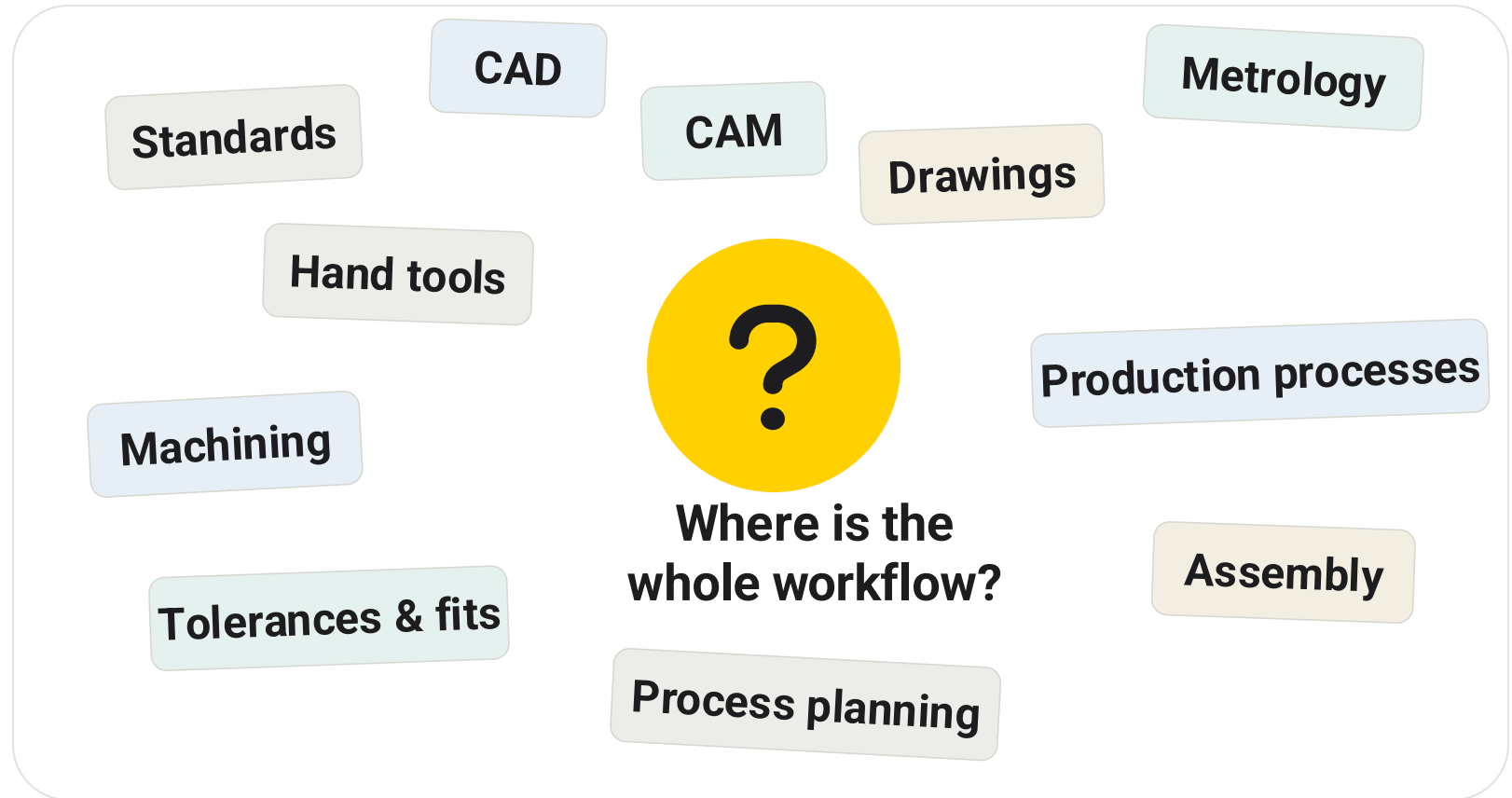
students in each 10-week term



Year 1

core course across five engineering specialisations

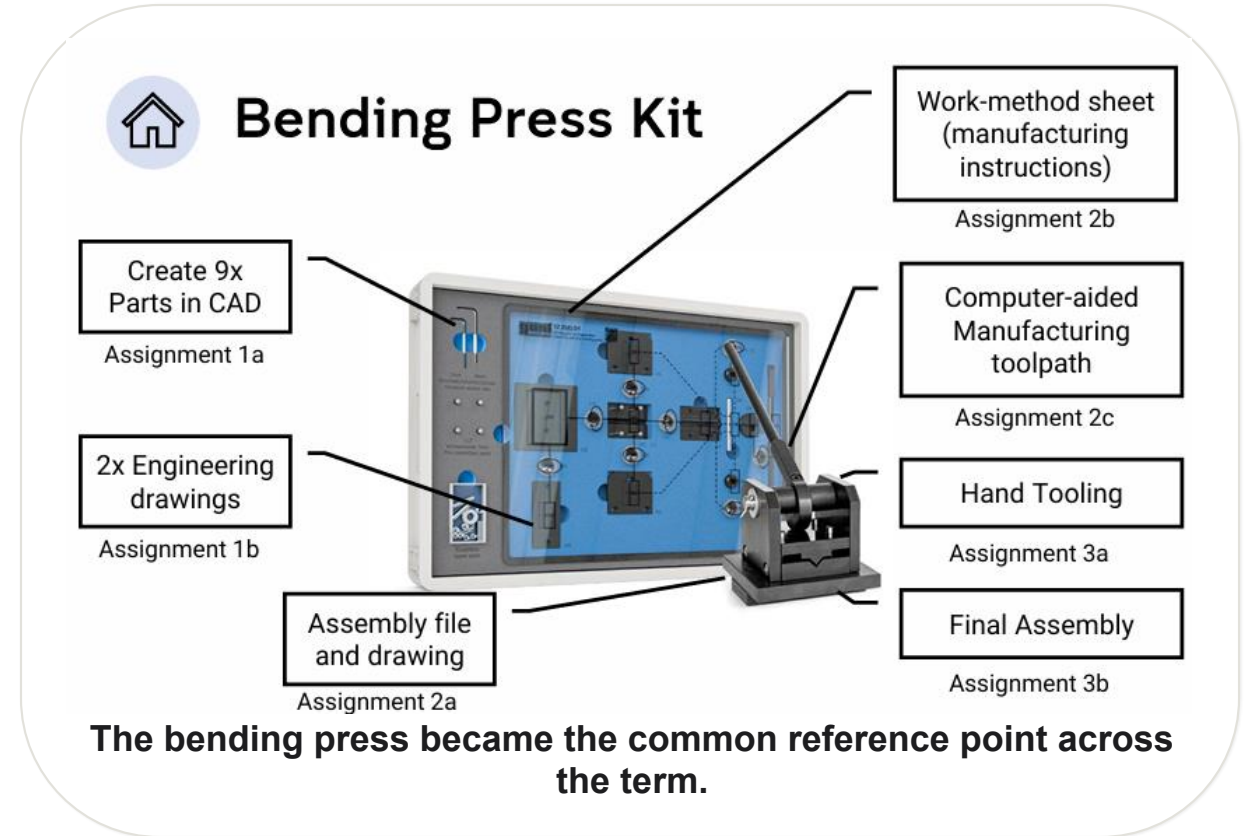
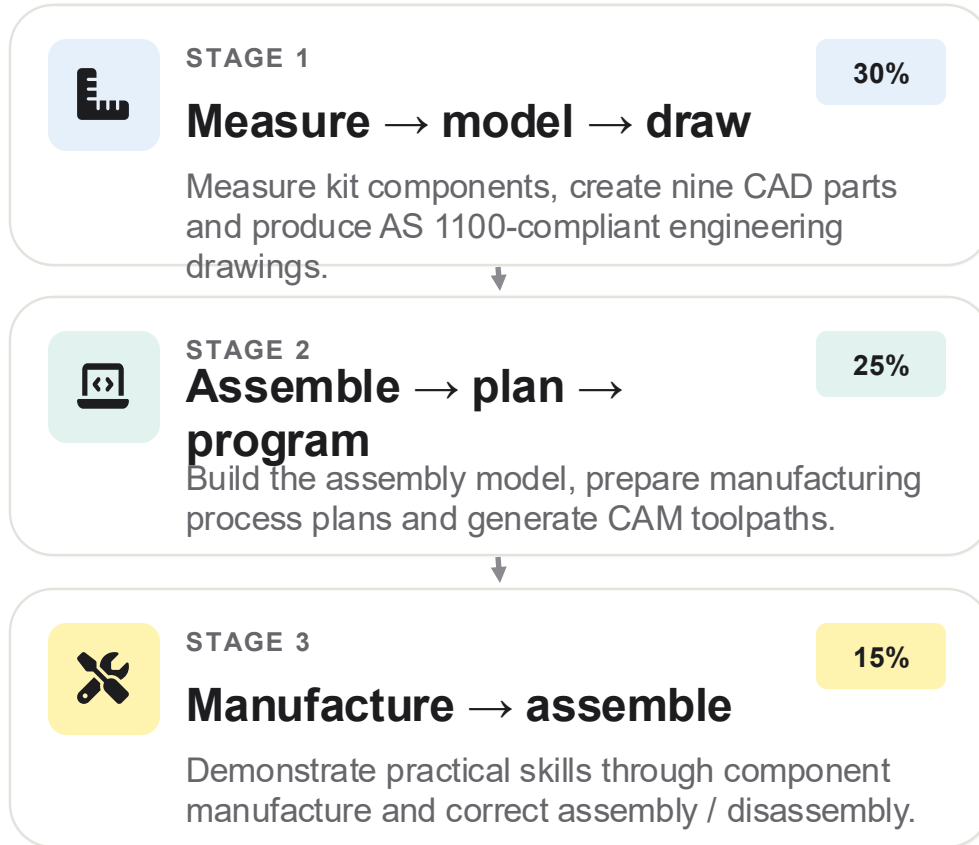
"The course feels very fragmented and disorganised ..."



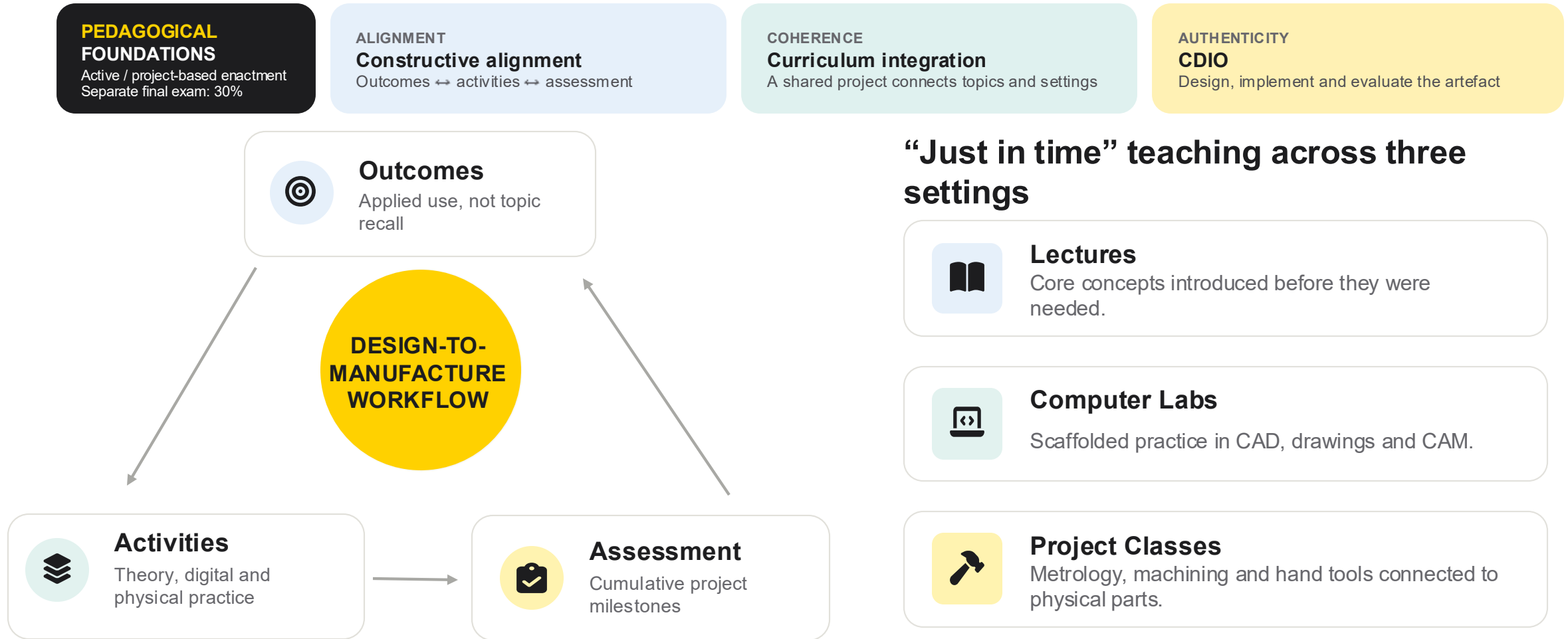
“By separating the lecture content and the lab, the course feels very fragmented and disorganised and also makes trying to grasp the concepts and skills taught extremely difficult.”

“This lack of cohesion made me apprehensive ... Some things taught in lectures also weren't well reflected outside of the course.”

One artefact. One workflow. Three progressive Assessments.

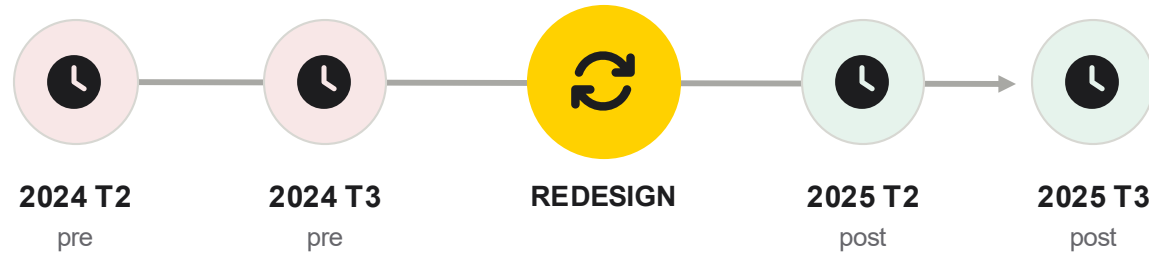


The project was not an add-on. It organised the whole course.



Did students experience greater coherence and relevance?

Retrospective pre-post programme evaluation



No significant T2–T3 differences within year → pooled by year

The question

Did the redesign change perceived quality, relevance and coherence?



Quantitative

Six institutional items on a 1–6 scale
Mann–Whitney U tests
Bonferroni-adjusted comparison



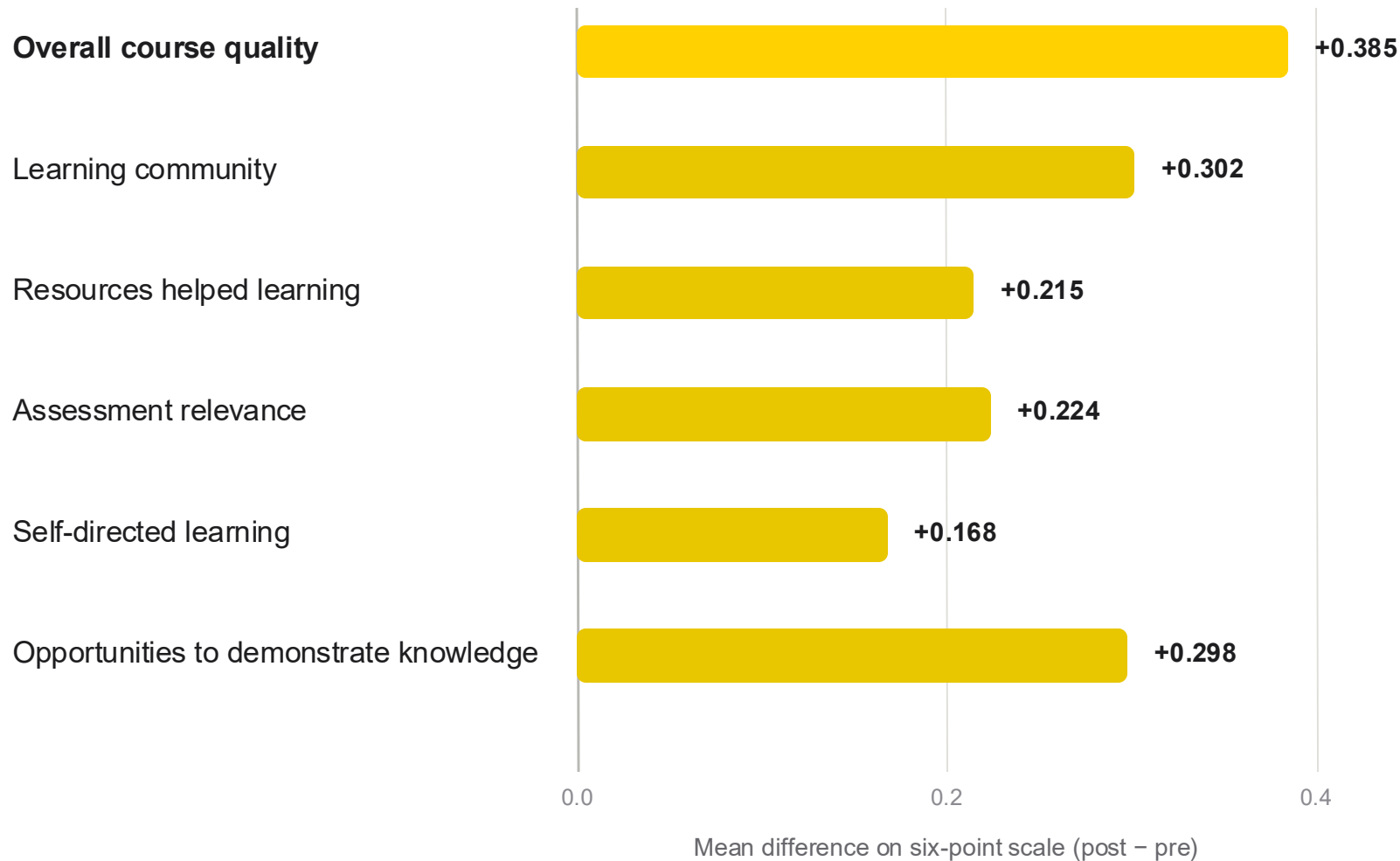
Qualitative

Two open-ended questions
Codebook thematic analysis
Automated retrieval; researcher-made coding



Retrospective evaluation: the findings are associative, not causal.

All six student-perception measures shifted positively.



6 / 6

items significantly more positive

$p < 0.005$

all items after Bonferroni

0.55–0.59

common-language effect size

+0.17–0.39

mean increase / 6 points

A broad, consistent shift - despite already high pre-redesign scores.

"I love how the course is designed to give us an overview of the entire manufacturing process. It was good to see the relevance of each step in the overall picture."

"everything tied in together so neatly, and it felt like we were directly applying our knowledge to well thought out assessments that helped us learn things."

Negative coherence comments



7.1% → 4.85%

average
pre vs post

Positive coherence comments



1.75% → 5.5%

average
pre vs post

A practical design pattern for large foundational courses

1



Shared artefact

Use one stable reference point across theory, software and hands-on work.

2



Cumulative assessment

Make each output useful - and necessary - for the next project stage.

3



Just-in-time sequencing

Teach concepts and tools when students need them for the next milestone.

4



Applied integration point

Create a setting where planning, documentation and making meet.

Coherence requires more than adding a project.

The project must organise theory, software, assessment and hands-on practice.

Evidence is preliminary: retrospective, perception-based and whole-course.

What could be the shared artefact in your course?

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Backup: what this study can - and cannot - claim



Association, not causation

A retrospective pre-post comparison cannot rule out cohort, staffing or context differences.



Perceptions, not attainment

Institutional evaluations and comments do not directly measure technical learning or perceived coherence.



Whole-course package

The study cannot isolate the effect of the artefact, staged assessments or Project Classes.



Next step

Examine assessment performance and test whether perceived coherence is accompanied by improved academic outcomes.

Integrated Curriculum Design

Integrated curriculum design is an approach where traditionally separate topics or disciplines are taught and assessed through a unifying theme, project, or problem, rather than as isolated units.



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Assessment 1 – CAD and Engineering Drawings

Deliverable 1a Component CAD

- Measurement Skills
- CAD Skills

Deliverable 1b Engineering Drawings

- Engineering Drawing Skills

Assessment 2 – Assembly and Manufacturing

Deliverable 2a Assembly CAD and Assembly Drawings

- CAD and Engineering Drawings Skills
- Tolerances, Limits and Fits

Deliverable 2b Work Method Sheets

- Machining Skills (Turning and Milling)

Deliverable 2c Computer-aided Manufacturing

- CAM Skills

Assessment 3 – Practical Lab Work

Deliverable 3a Hand Tools

- Use of Hand Tools
- Use of Measurement Tools

Deliverable 3b Bending Press Kit Assembly

- Assembly Drawings
- Tolerances and Fits
- Use of Assembly Tools

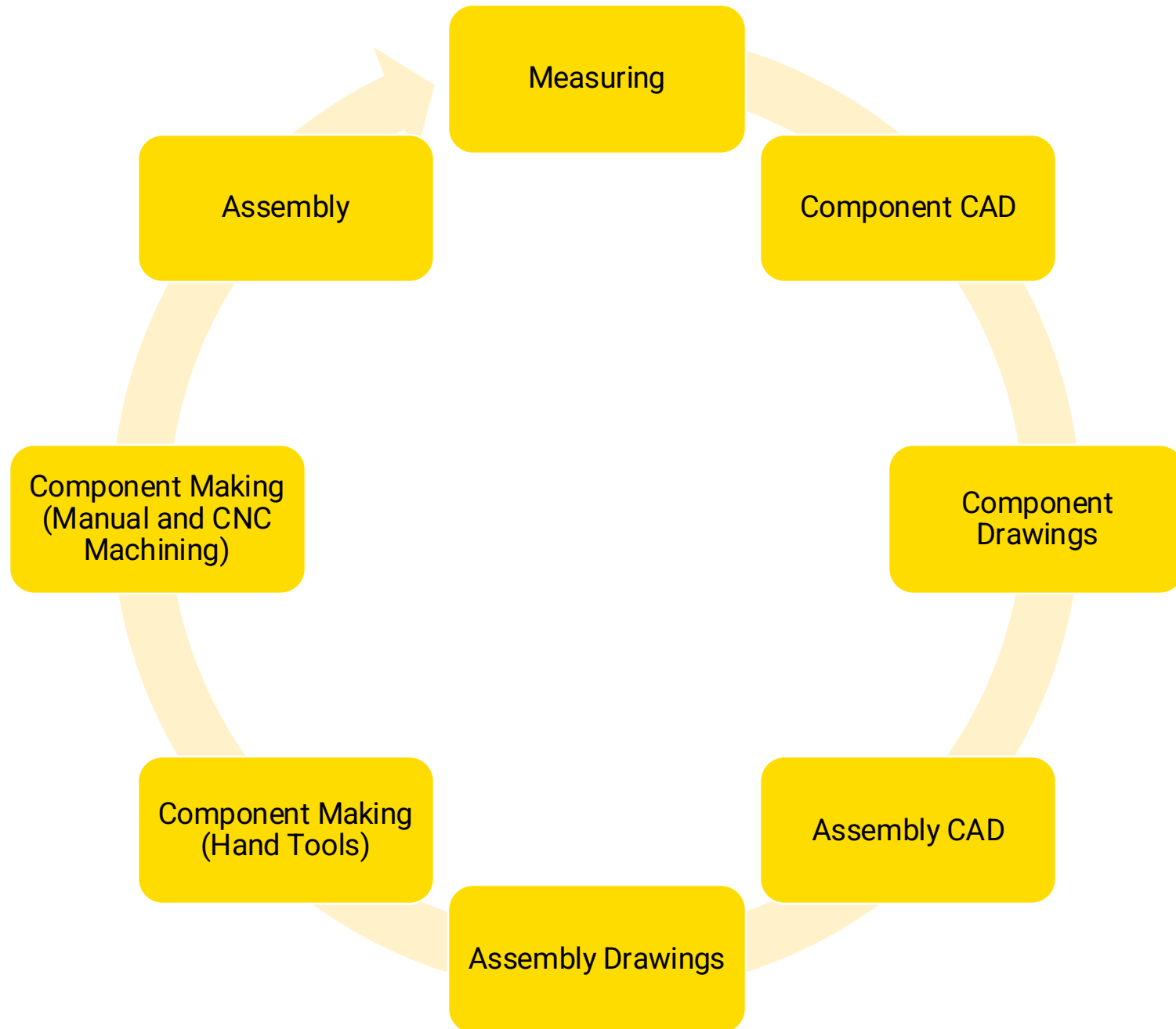
Assessment 4 – Final Exam

Deliverable

4

Final Exam

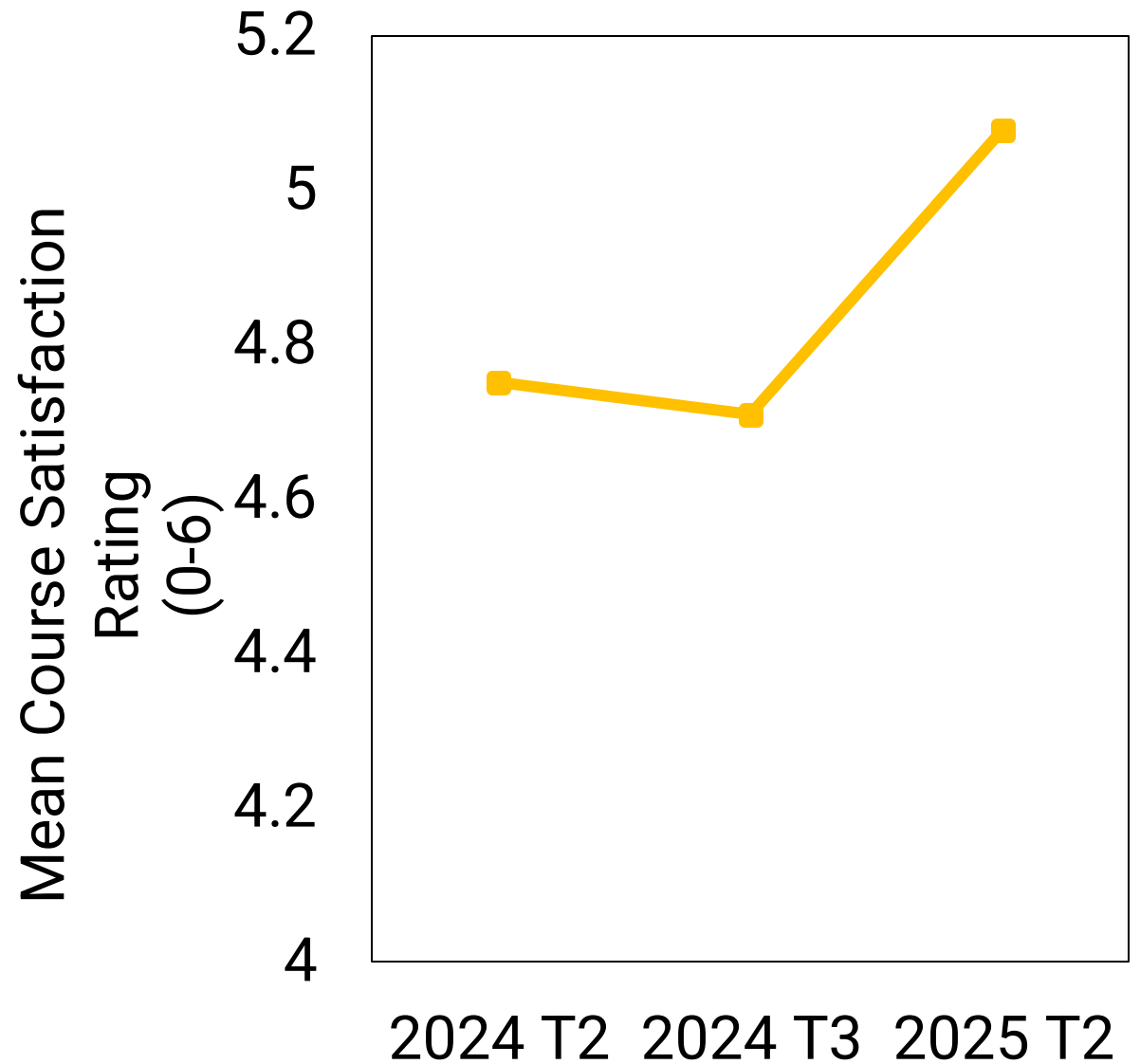
- Assessing all course content in a secure environment
- With a focus on theory



Student Satisfaction



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The 37th Australasian
Association for
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Annual Conference

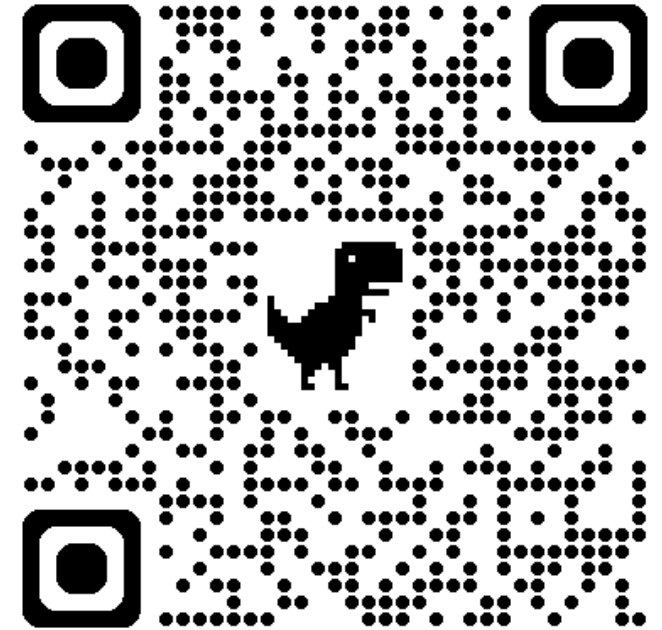


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