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Reframing Engineering Education:
Impact and Future Direction
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IMPLEMENTATION AND EFFICACY OF ACTIVE LEARNING STRATEGIES IN ENGINEERING MATHEMATICS

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Teaching Engineering Maths!

Teaching Engineering Mathematics is a worldwide issue

Entrance Standards

Motivation

Teaching

Resources

Active Learning

Assessment

Content



How?

What are we going to do?

Summary of Presentation

Introduction

- Rationale
- Existing Year 1 Mathematics Provision

2nd Year Mathematics Module Preparation

- Rationale
- Objectives
- Content

2nd Year Mathematics Module Efficacy

- Assessment Results
- Student Feedback

Conclusions

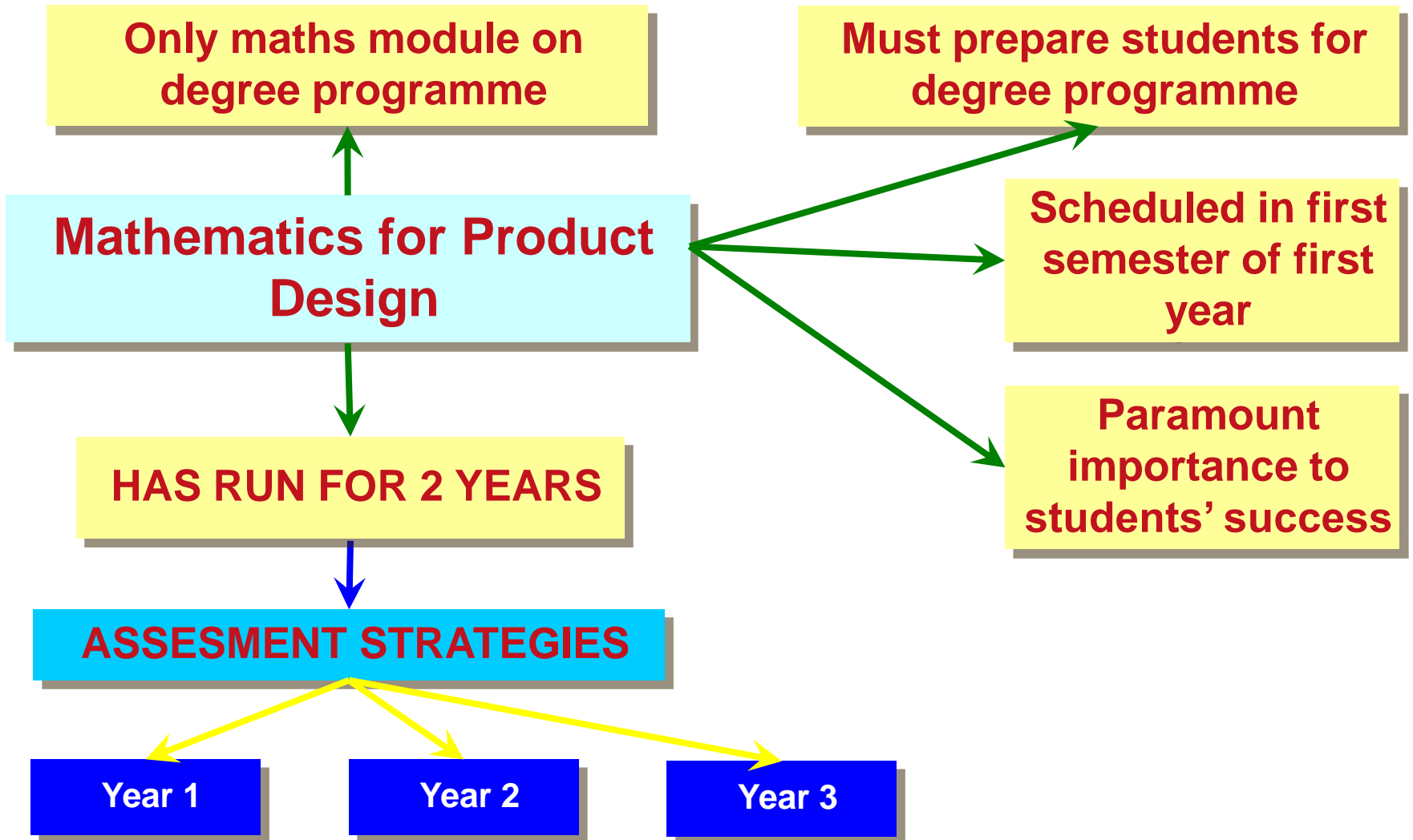
Introduction

- **CDIO Collaborator** since 2003
- Partway through **plan to implement CDIO**
 - established BEng and MEng programs
 - New Product Design program
- Product Design Program has different entrance requirements
 - **LESS MATHS!**
- Mathematics module at Stage 1 on PD program
 - **ONLY** formal tuition

Rationale

Introduction

Mathematics for Product Design: Year 1 Module





Preparing the Engineering Mathematics Module

CDIO Strategy

Module integrates with rest of course

Learning Strategies

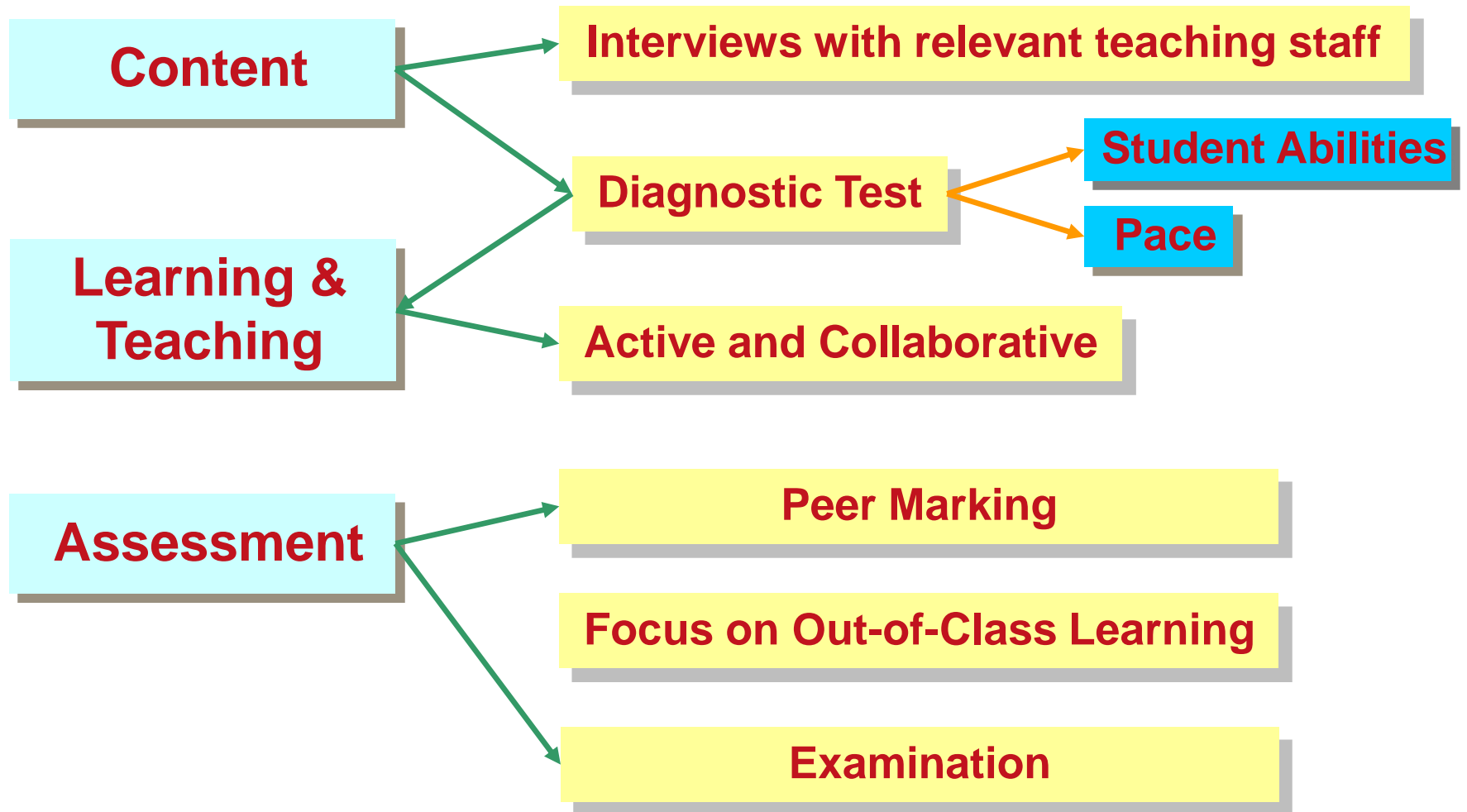
Relevance/Applications

Keep students motivated and engaged

Developed using best current pedagogical practices

Introduction

Overview of Year 1 Mathematics Module



Rust

“if work does not have marks attached many students will either not do it at all or only do it in a perfunctory way”

Gibbs

“assessment works best to support learning when a series of conditions are met”

.....“what influenced students most was not the teaching but the assessment”

However...

More was needed!

2nd Year Engineering Mathematics Module *Preparation*

RATIONALE

Active learning sessions

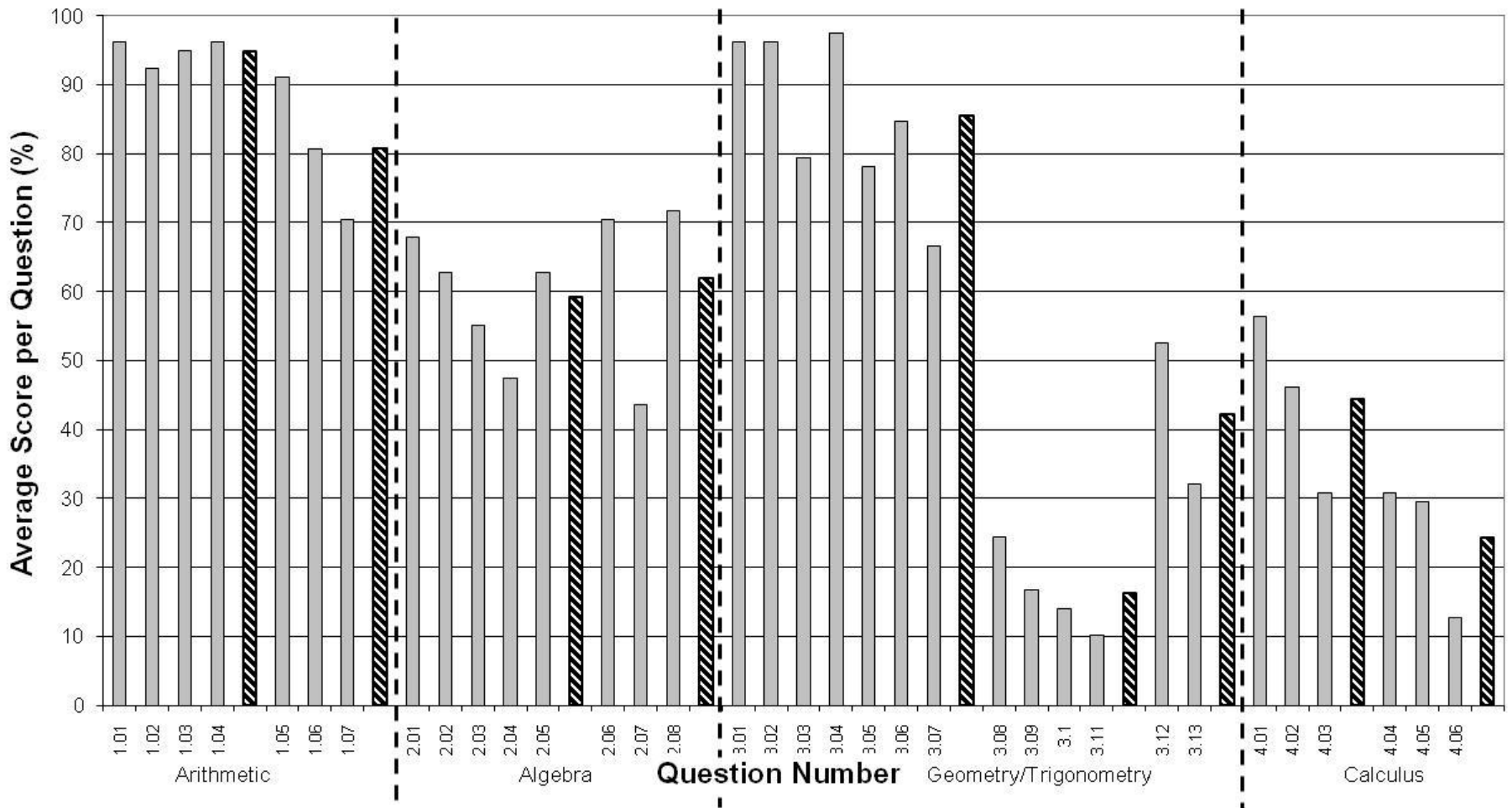
Homework/tutorial sheets

Examination

Second diagnostic test

Rationale for 2nd Year Engineering Mathematics Module

Diagnostic Test - Student Performance per Question



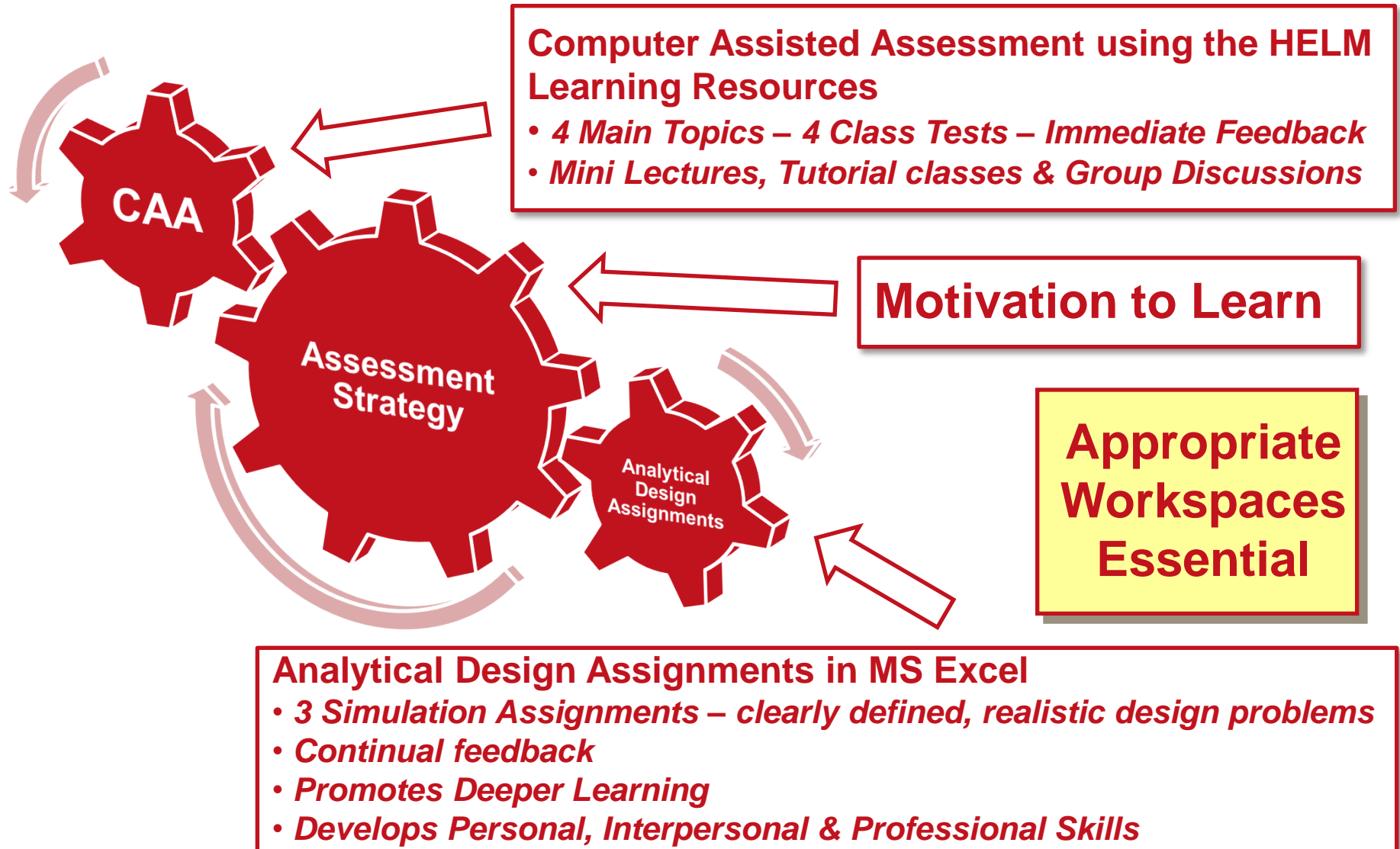
Objectives for 2nd Year Engineering Mathematics Module

- Provide more practice in the mathematical methods presented in the first year course.
- Promote a deeper learning environment.
- Emphasise the relevance of mathematics to the PDD degree.
- Develop other non-disciplinary skills relevant to the CDIO syllabus.

Again...

**best current pedagogical practices
researched and applied**

Content for 2nd Year Engineering Mathematics Module



2nd Year Engineering Mathematics Module

Efficacy

Did it Work?

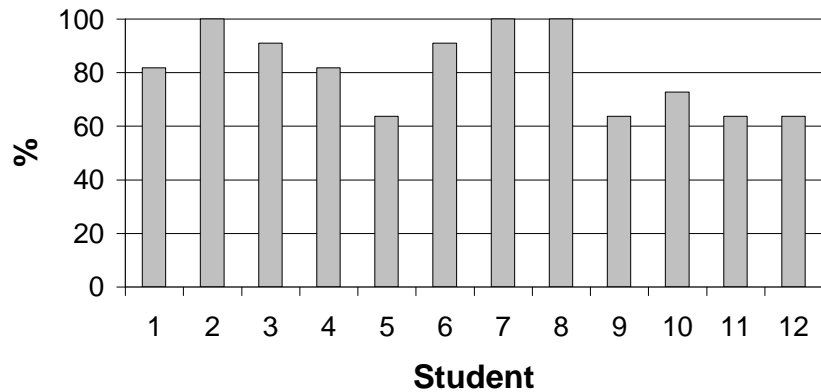
Assessment Results

Student Feedback

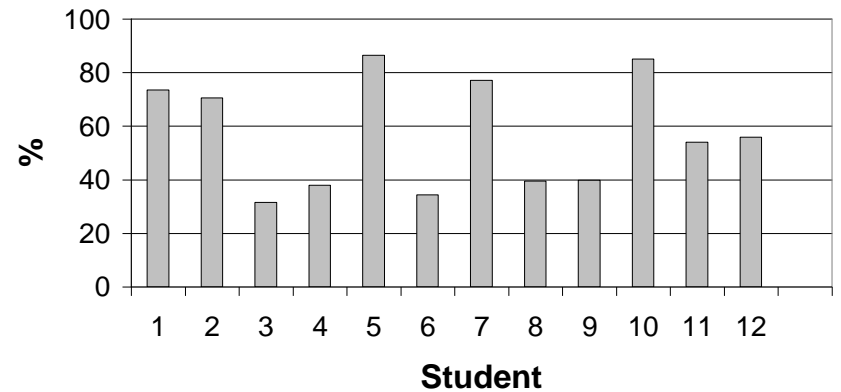
2nd Year Engineering Mathematics Module

Assessment Results

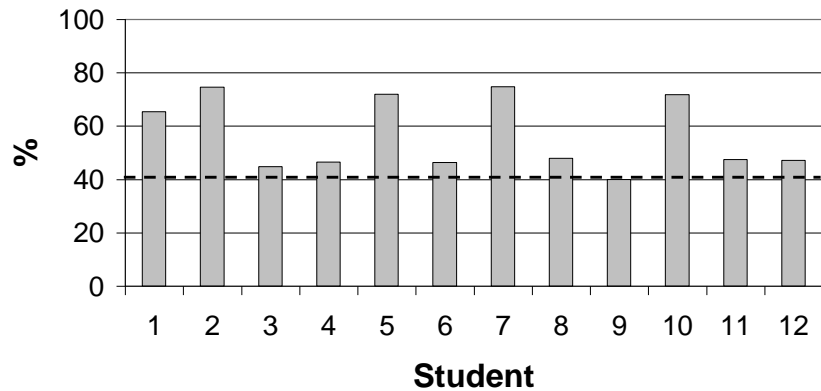
Attendance



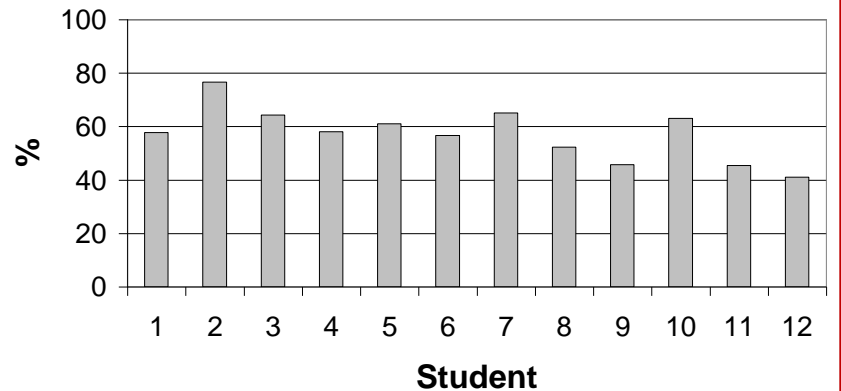
Class Tests - Total Score



Overall Module Score



Assignments - Total Score



2nd Year Engineering Mathematics Module

Student Feedback

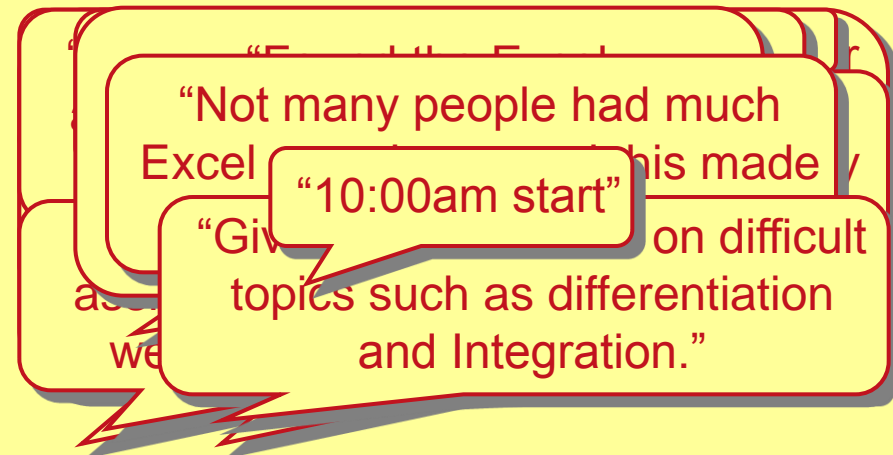
Student Module Evaluation

Questionnaire

- students clearly satisfied with:
 - the module contents
 - the teaching methods
 - the assessment methods
 - the feedback
 - the lecturer's contributions to their learning
- The results indicated a satisfaction level of over 90% for all aspects of the module

Formative Feedback

- Please indicate the most satisfying aspect(s) of this module
- Please indicate the least satisfying aspect(s) of this module



Conclusions

- **New 2nd year mathematics module succeeded in motivating and engaging the students - all passed!**
- **Very positive formative feedback in relation to the CAL, CAA and real life simulation assignments.**
- **Such an active and interactive learning environment involves the students in the learning process**

- Students' understanding of basic concepts can be improved through Computer Aided Learning (CAL), Computer Assisted Assessment (CAA) and realistic simulation assignments.
- It provides students with a flexible learning medium.
- It provides the opportunity to offer constant feedback to individual students.
- It also provides instant feedback to the instructor enabling immediate and focused support for the students.

- Such two-way feedback helps develop and tailor the course.
- It provides an enjoyable and constructive learning environment which fosters a more positive attitude towards learning mathematics

QUESTIONS

