New Model in Technology & Engineering

# New approaches to project-based learning

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- Why are projects required?
- Why is project based learning considered valuable?

## Project-based learning

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- Projects are a normal feature of professional engineering practices.
- You cannot professionally practice as an engineer without working in and on projects.

Therefore

- If you are learning Engineering you have to learn how to contribute to or lead collaborative projects

## Project-based learning

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Collaborative project based and interdependent learning is:

- Avoided at school;
- Avoided at college;
- Rarely practiced at university.

Therefore has had to be developed during graduate schemes

## Project-based learning

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Why do we do project based learning?

- Relevance
- Value
- Transferable skills
- Learning gain
- Capability development

Provides motivation

Provides experiential learning

## Project-based learning

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What do many students learn from project based learning?

*There is no 'I' in team,*
*but there is an 'I' in*
*"I really hate teamwork"*

***The Psychology of Effective Studying: How to Succeed in Your Degree***
*By Paul Penn*

Provides demotivation

Provides experience to be avoided

## Project-based learning

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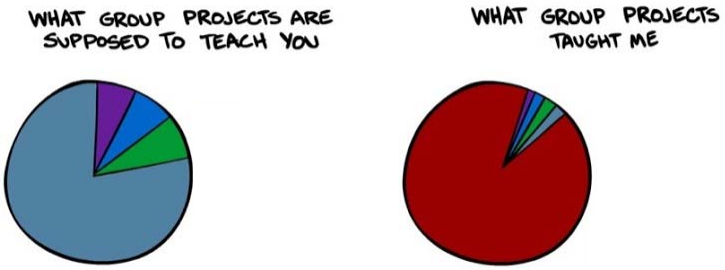


http://www.newcollege.utoronto.ca/student-blog/the-group-project-scapegoat/

## Project-based learning

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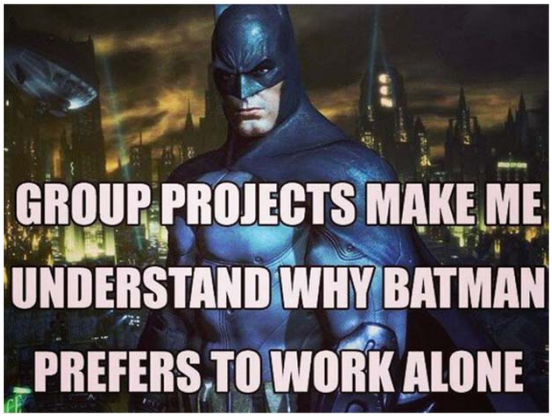


## Project-based learning

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What ***should*** many students learn from project based learning?

*The only consistent feature*
*of all of your dissatisfying*
*relationships is…*
*You*

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Provides demotivation
Provides experience to be avoided

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Causes:

- A group of individuals working towards a common purpose
- The assumption of equality
- The absence of management
- The absence of leadership
- The Ringleman effect

Projects are ***not*** run in the same way as they would be in commercial practice.

Projects are ***not*** practiced often enough to develop competencies.

Project and group work is learned but ***not*** taught.

## Curriculum Design

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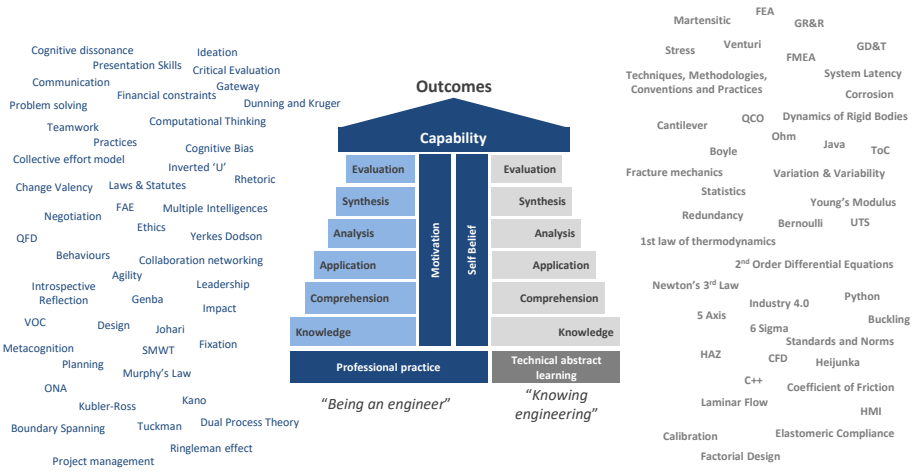

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# The learning journey

**Integrated Engineering (MEng)**

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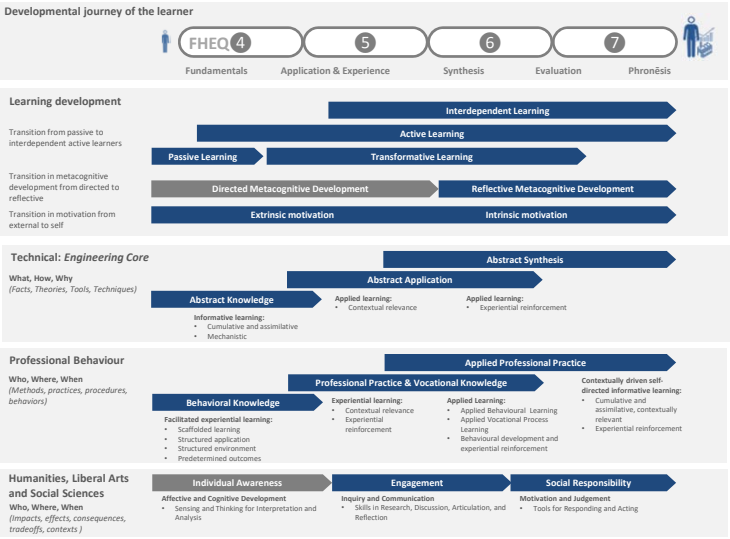
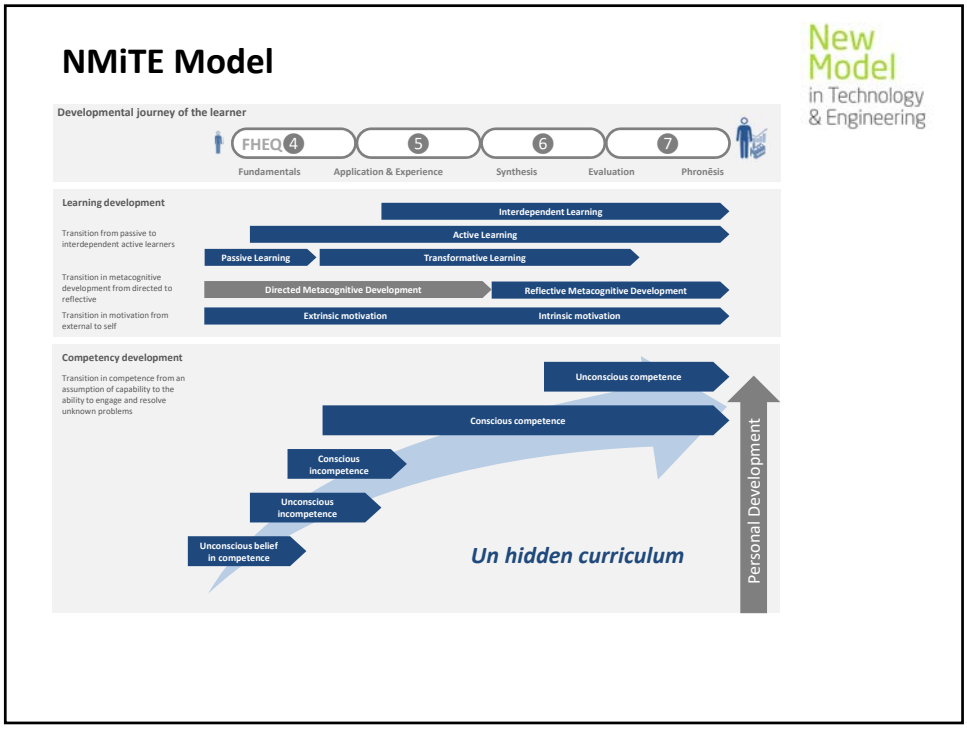
## NMiTE Model




NMiTE Model
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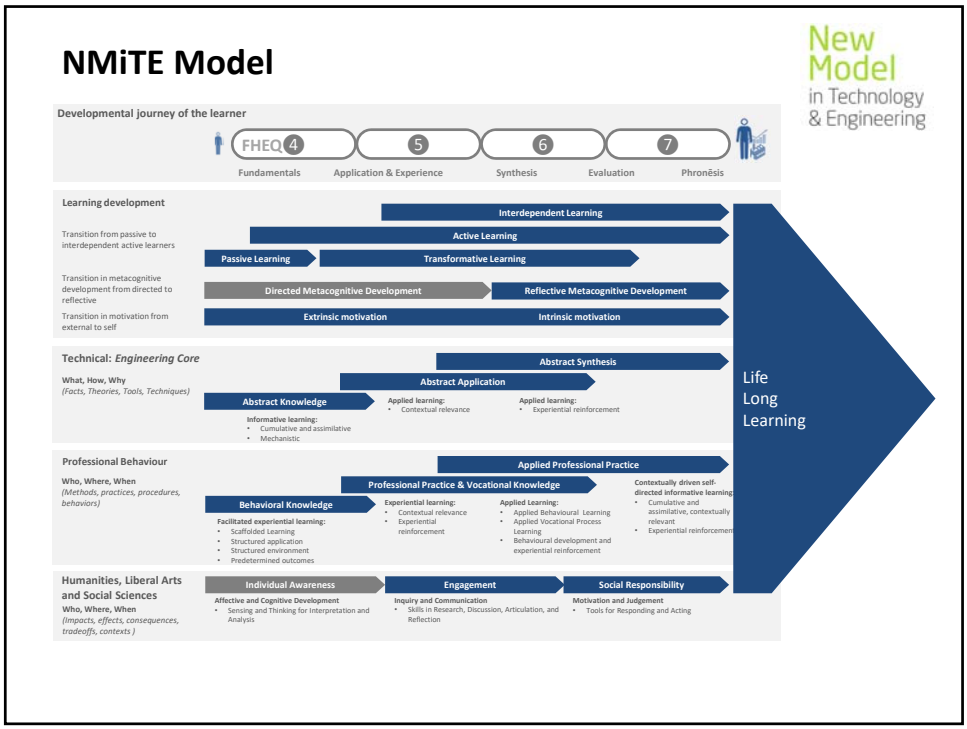
Developmental journey of the learner
FHEQ 4
5
6
7
Fundamentals
Application & Experience
Synthesis
Evaluation
Phronēsis
Learning development
Transition from passive to interdependent active learners
Transition in metacognitive development from directed to reflective
Transition in motivation from external to self
Interdependent Learning
Active Learning
Passive Learning
Transformative Learning
Directed Metacognitive Development
Reflective Metacognitive Development
Extrinsic motivation
Intrinsic motivation
Competency development
Transition in competence from an assumption of capability to the ability to engage and resolve unknown problems
Unconscious competence
Conscious competence
Conscious incompetence
Unconscious incompetence
Unconscious belief in competence
Un hidden curriculum
Personal Development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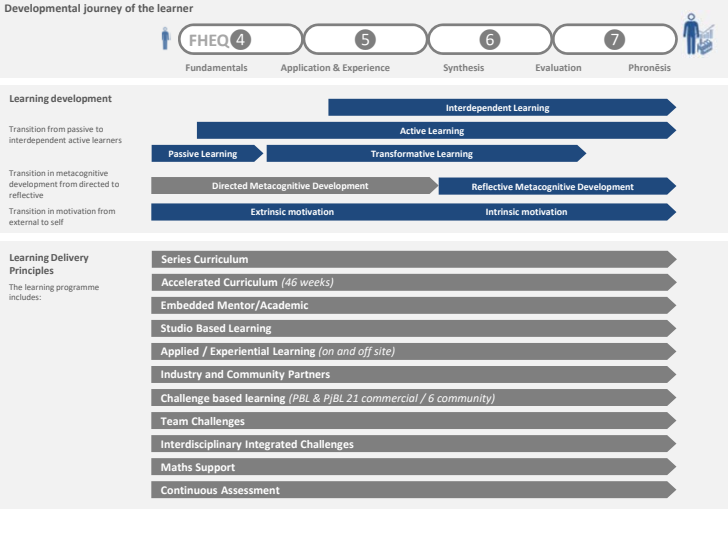
Passive Learning
Transformative Learning
Directed Metacognitive Development
Reflective Metacognitive Development
Extrinsic motivation
Intrinsic motivation
Technical: Engineering Core
What, How, Why
(Facts, Theories, Tools, Techniques)
Abstract Synthesis
Abstract Application
Abstract Knowledge
Applied learning:
• Contextual relevance
Applied learning:
• Experiential reinforcement
Informative learning:
• Cumulative and assimilative
• Mechanistic
Professional Behaviour
Who, Where, When
(Methods, practices, procedures, behaviors)
Applied Professional Practice
Professional Practice & Vocational Knowledge
Behavioral Knowledge
Experiential learning:
• Contextual relevance
• Experiential reinforcement
Applied Learning:
• Applied Behavioural Learning
• Applied Vocational Process Learning
• Behavioural development and experiential reinforcement
Contextually driven self-directed informative learning
• Cumulative and assimilative, contextually relevant
• Experiential reinforcement
Facilitated experiential learning:
• Scaffolded Learning
• Structured application
• Structured environment
• Predetermined outcomes
Humanities, Liberal Arts and Social Sciences
Who, Where, When
(Impacts, effects, consequences, tradeoffs, contexts )
Individual Awareness
Affective and Cognitive Development
• Sensing and Thinking for Interpretation and Analysis
Engagement
Inquiry and Communication
• Skills in Research, Discussion, Articulation, and Reflection
Social Responsibility
Motivation and Judgement
• Tools for Responding and Acting
Life Long Learning

## NMiTE Model




**Learning theories incorporated**

Activity Theory
Applied Learning
Authentic Assessment
Authentic Learning
Behaviourism
Blended Learning
Classical Conditioning
Cognivitism
Constructivism
Discovery Learning
Dual process theory
Enquiry-based Learning
Experiential Learning
Expertise Theory
Flipped Learning
Interdependent Learning
Kolb's Experiential Learning Cycle
Metacognition
Multiple Intelligences
Operant Conditioning
Problem Based Learning
Project Based Learning
Ringleman effect
Semiotics
Situated Cognition
Social Development Theory
Social Learning
Social Proof
Systems Thinking
Team Based Learning
Threshold Concepts
Transformative Learning

## NMiTE Model

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Series Delivery of 40 Modules:

- 13 Toolkits: Specialist, intensive, problem based module;
- 27 Projects: Project work becomes the new norm.

## NMiTE Model

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27 Projects:

- 25 Team based challenges:
  Team work becomes the new norm;

- 2 Individual Projects:
  Developing personal specialisation.

## NMiTE Model

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25 Team based challenges:

- 21 Commercial/Industrial Projects:
  Projects completed with Industry Partner;

- 4 Community Projects:
  Consideration of community and societal needs becomes the new norm.

## NMiTE Model

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**Embedded in programme:**

- Sustainability,
- Ethics,
- Professionalism.

## Summary

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- Project based learning is relevant and necessary
- You need to complete a number of projects to get any learning gain