




**TEACHING & LEARNING STYLES IN ENGINEERING AT UCC**

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This study investigates  
the **learning styles** of  
**Process & Chemical Engineering students**  
at University College Cork  
as well as the **teaching styles** of  
**Engineering Faculty** at the university  
and **compares the two** to see how well  
they map onto each other.




Teaching & Learning Styles In Engineering at UCC




Richard **Felder (1998)** proposed a model that describes the learning styles that pervade engineering disciplines comprising five **learning style dimensions**. Each dimension consists of two polar opposites.

Learning style	Type of learner	Learning style	Type of learner
<b>Active</b>	Processes information through engagement in physical activity or discussion	<b>Reflective</b>	Processes information through introspection
<b>Sensory</b>	Sights, sounds, physical sensations: tend to be concrete, practical, methodical, factual & hands-on	<b>Intuitive</b>	Memories, thoughts, insights: tend to be comfortable with abstractions (theories, mathematical models). Innovative and rapid problem solvers
<b>Visual</b>	Info most effectively perceived through pictures, diagrams, charts	<b>Verbal</b>	Info most effectively perceived through written & spoken explanations
<b>Sequential</b>	Understanding gained through logical progression of incremental steps	<b>Global</b>	Understanding gained in large 'big picture' jumps
<b>Inductive</b>	Learns best through being given facts and observations, from which underlying principles are inferred	<b>Deductive</b>	Learns best through given principles from which consequences and applications are deduced




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**Felder suggested that most engineering students are visual, sensory, inductive and active learners** (while some of the most creative students are **global learners**) while **most engineering education is verbal, intuitive (abstract), deductive, passive and sequential**.

**Challenge:**  
*Is this the case with UCC Engineering Students & Faculty?*

..to establish:  
**Students Learning Styles:** '[Index of Learning Styles](#)' (Felder, 1991)  
**Lecturers Teaching Styles:** Developed Own Survey



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**Methods:**

- Emailed all the **UCC Engineering Faculty** (32 members) and asked them to fill in the teaching styles survey.
- Emailed all the undergraduate **students in department of Process & Chemical Engineering** (just over 100) and asked them to complete the ILS online


**Response:**

- Received **15 Faculty** and **38 student responses**.

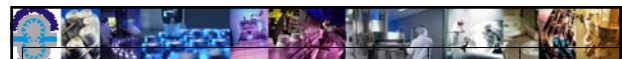
**Faculty questionnaires** (*specially designed to see if lecturers taught to aid any given learning style(s)*) **asked two questions:**

A. **Which** of the following teaching styles or **pedagogies** do you apply in your teaching?


B. In your opinion, **how effective** is this style in terms of **motivating students & enhancing learning**?



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Key: A: Often/most lectures; B: Sometimes; C: Seldom or never	Pedagogy?			Effectiveness? Avg (st.dev.) (1(most)-5)
	A	B	C	
In your lecture do you...?				
Emphasise principles, theories, mathematical models [Intuitive]	13	2		1.92 (0.90)
Emphasise heuristics, hard data, typical values [Sensory]	7	7	1	2.33 (0.98)
Emphasise practical problem solving methods [Sensory/Active]	10	4	1	1.58 (1.38)
Emphasise fundamental understanding of material [Intuitive/Reflective]	14	1		1.67 (0.78)
Emphasise the applied nature of the material by providing concrete examples of the phenomena the theory describes or predicts [Sensory/Inductive]	8	6	1	1.83 (1.19)
Provide the big picture/context/goal/relevance of a lesson or topic before presenting the steps [Global]	8	7		2.00 (1.28)
Assign some exercises to provide practice in the basic methods being taught [Sensory/Active/Sequential]	3	12		1.75 (0.75)
Pose questions and have students organise themselves into small groups and come up with collective solutions/suggestions [Active]		4	11	2.55 (0.96)
Recap on material just covered to allow students to think about/reflect on what they've been told [Reflective]	4	9	2	2.00 (1.13)
Encourage class participation, comment & feedback [Active]	8	6	1	2.00 (0.85)



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In your lecture do you use...?	Pedagogy?			Effectiveness?
	A	B	C	Avg (st.dev.)
Verbal description of material [Verbal]	9	2	2	2.36 (1.63)
Typed Handouts with text [Visual]	7	2	6	3.00 (1.50)
Typed Handouts with diagrams, pictures, plots, etc [Visual]	7	5	3	2.50 (1.35)
Prepared overhead acetates with text [Verbal]	1	1	12	3.89 (1.27)
Prepared overhead acetates with diagrams, pictures, plots, etc [Visual]	1	5	8	2.90 (1.52)
Prepared Powerpoint slides with text [Verbal]	4	2	9	3.11 (1.36)
Prepared Powerpoint slides with diagrams, pictures, animations, etc [Vis]	6	3	6	2.40 (0.97)
Overhead acetate (write text) [Verbal]	4	1	10	2.75 (1.67)
Overhead acetate (draw plots, diagrams, etc) [Visual]	5	2	8	2.19 (1.36)
Blackboard/whiteboard/greenboard (write text) [Verbal]	4	3	6	2.05 (1.07)
Blackboard/whiteboard/greenboard (draw plots, diagrams, etc) [Vis]	6	3	5	1.91 (0.94)
Videos [Visual]		5	10	3.32 (1.15)
Animations [Visual]	1	5	8	2.75 (1.14)
Classroom physical props [Visual]		10	3	2.50 (1.08)
Live demonstrations [Visual]		3	10	2.22 (1.48)

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Improve Motivation / Enhance Learning		
Rank	Pedagogy	Use
1	Emphasise practical problem solving methods [Sensory/Active]	3 (-2)
2	Emphasise fundamental understanding of material [Intuitive/Reflective]	1 (+1)
3	Assign some exercises to provide practice in the basic methods being taught [Sensory/Active/Sequential]	8 (-5)
4	Emphasise the applied nature of the material by providing concrete examples of the phenomena the theory describes or predicts [Sensory/Inductive]	5 (-1)
5	Emphasise principles, theories, mathematical models [Intuitive]	2 (+3)
6	Recap on material just covered to allow students to think about/reflect on what they've been told [Reflective]	9 (-3)
6	Provide the big picture/context/goal/relevance of a lesson or topic before presenting the steps [Global]	4 (+2)
6	Encourage class participation, comment & feedback [Active]	5 (+1)
9	Emphasise heuristics, hard data, typical values [Sensory]	7 (+2)
10	Pose questions and have students organise themselves into small groups and come up with collective solutions/suggestions [Active]	10 (-)

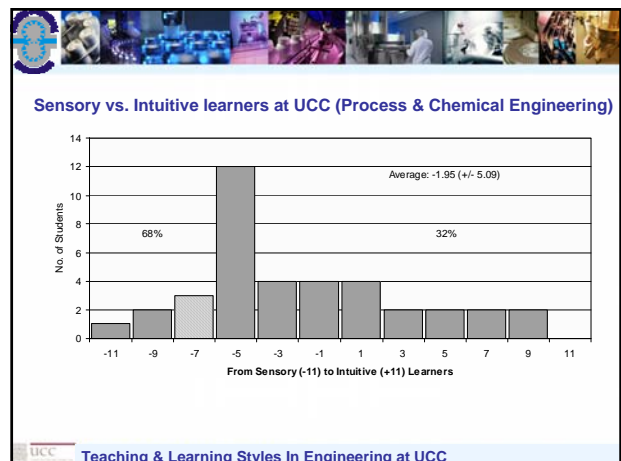
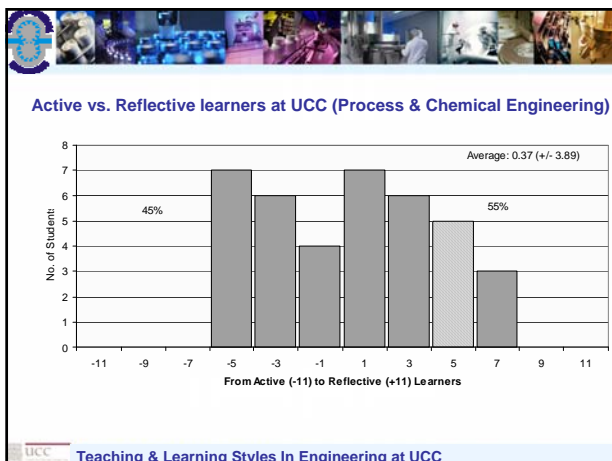
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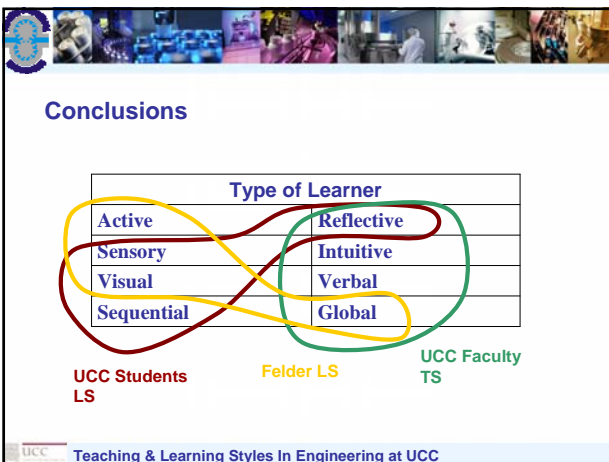
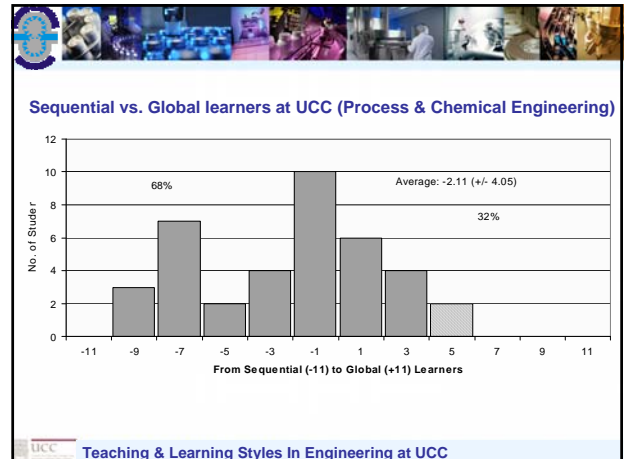
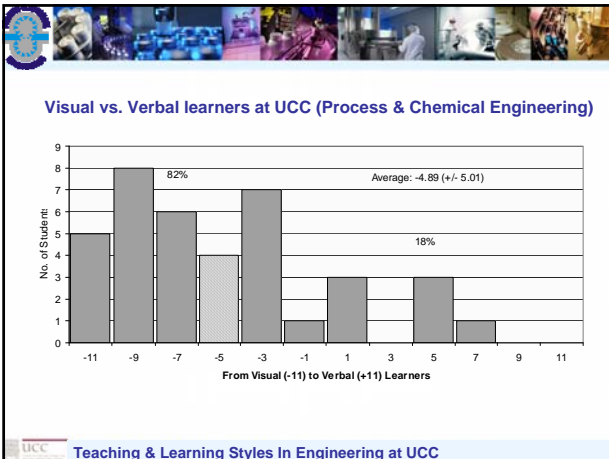
Improve Motivation / Enhance Learning		
Rank	Teaching Aid	Use
1	Blackboard/whiteboard/greenboard (draw plots, diagrams, etc) [Visual]	4 (-3)
2	Blackboard/whiteboard/greenboard (write text) [Verbal]	7 (-5)
3	Overhead acetate (draw plots, diagrams, etc) [Visual]	6 (-3)
4	Live demonstrations [Visual]	15 (-11)
5	Verbal description of material [Verbal]	1 (+4)
6	Prepared Powerpoint slides with diagrams, pictures, animations, etc [Visual]	4 (+2)
7	Classroom physical props [Visual]	10 (-3)
7	Typed Handouts with diagrams, pictures, plots, etc [Visual]	2 (+5)
9	Overhead acetate (write text) [Verbal]	9 (-)
9	Animations [Visual]	11 (-2)
11	Prepared overhead acetates with diagrams, pictures, plots, etc [Visual]	11 (-)
12	Typed Handouts with text [Visual]	3 (+9)
13	Prepared Powerpoint slides with text [Verbal]	8 (+5)
14	Videos [Visual]	13 (+1)
15	Prepared overhead acetates with text [Verbal]	14 (+1)

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		Sum	Sum		
Active	-2-5+1+0	-6	-2	+1-3	Reflective
Sensory	-2-5-1+2	-6	+4	+1+3	Intuitive
Visual	-3-3-11+2-3+5-2+0+9+1	-5	+5	-5+4+0+5+1	Verbal
Sequential	-5	-5	+2	+2	Global

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### Conclusions

A survey of **UCC** engineering students found that with respect to their learning styles the group is non-homogeneous; **all learners are different**. However, that is not to say teachers should despair in attempting to adopt a style or styles to suit as many as possible; by **applying a range of teaching techniques** the lecturer can **reach all types of learners**, if not in every single lecture or session, then throughout the module.