

Towards conceptual understanding in the teaching of tertiary Science

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Students in any learning situation bring:

- experiences from previous learning
- understanding which is personal, incomplete and sometimes contradictory
- a high resistance to change

Students also bring

Differences in learning styles

Learning styles

- Auditory **learn through listening**
- Visual **learn through seeing**
- Kinesthetic **learn through moving, doing, touching**

If there is variability in the way students learn

What to do?

Option 1 – Lets ignore it

- Students need to learn how to learn
- i.e. Students need to learn my way
- i.e. Students need to learn one way
- Outcome – Negative?

Option 2 – Lets include it

- Students learn in different ways
- i.e. Students may learn differently from me
- i.e. Students need to be taught differently
- Outcome – Greater understanding for all?

Traditionally at tertiary

- Transmissive teacher centric model is common
- Emphasis often auditory, sometimes visual

Less often multisensory

An example of an abstract concept

Photosynthesis

Photosynthesis

- Students have misunderstandings and misconceptions
- Conceptually abstract and non intuitive
- Difficult to visualise the submicroscopic

Learning sequence

1. Lecture – didactic – auditory and visual
2. Practical – 3D model of chloroplast – visual and kinesthetic
3. Reteach – lecture – kinesthetic and visual

3. Kinesthetic lecture

1. Overhead projector – photons of light
2. OEC – $4\text{H}^+ + 4\text{e}^- + 2\text{O}$ ($2\text{H}_2\text{O}$) on board
3. Light on PSI – student ejects an electron from PSI, replace from OEC
4. Diffusion of O_2
5. Tiered theatre - electron transport chain
6. Students eject electrons from their hands

Coupled with

Concept diagram

Evaluation

Open-ended question

Please **indicate** the important characteristics of this lecture/class that have been most **valuable** to your overall **learning experience**

Results – 203 students

Category	Number	%
No response	16	
Some aspect of teaching positive to learning	80	42.7
Teaching/learning increased conceptual understanding	37	19.8
Interactivity increased conceptual understanding	25	13.4
Identified learning styles increased conceptual understanding	45	24.1

What can I do?

- Provide opportunities for students to actively engage with content
- Use kinesthetic activities
- Close our eyes visualise
- Build models

