

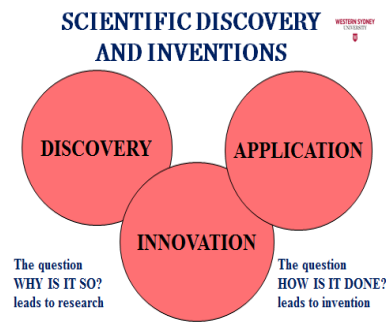
# Adopting a Flipped Classroom approach to foster engagement and learning in science and technology education at the undergraduate level

Poster prepared by Dr Les Vozzo

Email: [l.vozzo@westernsydney.edu.au](mailto:l.vozzo@westernsydney.edu.au)

## INTRODUCTION

One of the challenges of improving science education in undergraduate primary teacher education students is to how to move away from the traditional in-class lecture and tutorial based teaching. This poster outlines how the author developed a component of an elective undergraduate unit titled, 'Scientific Discovery and Inventions' offered by the School of Education at Western Sydney University. The author adopted a model that used a flipped classroom approach in the delivery of content through on-line lectures and a mixture of on-line and face-to-face inquiry-orientated tutorials. For the first half of the unit, the author focused on the nature of scientific discovery while a colleague (Dr Jessy Abraham) developed the second half of the unit with a focus on inventions.



ASSIGNMENT 1 – 40%		
	FOCUS	ILLUSTRATION
PART 1 (10 MARKS)	SCIENTIFIC DISCOVERY EXPLANATION OF CONCEPTS	WHAT HAS CURIOSITY DISCOVERED OVER THE PAST 3 YEARS?
PART 2 (10 MARKS)	SIGNIFICANCE	WHY IS THIS SIGNIFICANT?
PART 3 (10 MARKS)	INQUIRY PLUS IMAGES TO ILLUSTRATE CONCEPTS OR FINDINGS	DETECTION OF LIFE IN THREE MYSTERY SAND SAMPLES
PART 4 (10 MARKS)	SCIENTIFIC MERITS OF A SCIENCE FICTION FILM/NOVEL	'THE MARTIAN'

## LEARNING SCHEDULE

ON-LINE LECTURES	ON-LINE TUTORIALS or FACE-to-FACE TUTORIALS
Origin of Our Universe	Unlocking the Secrets of Rocks
Life and conditions for Life	Conditions for life on Mars
Plate Tectonics and Earth History	Forces shaping Earth
Extinctions and Evolution	Discoveries in Science - EMR
Assignment 1	
Light Energy Part 1	
Light Energy Part 2	Telescopes and Spectroscopes
Chemical Energy Part 1	
Chemical Energy Part 2	Alchemy
Assignment 2	

## DELIVERY OF CONTENT - ON-LINE MATERIALS PLUS FACE-TO-FACE TUTORIALS

The content and delivery of the first half of the unit, equivalent to 4-5 weeks of study focused on topics such as the origins of the Universe, earth history, plate tectonics, and conditions for life, biodiversity and evolution as a context for motivating undergraduate students in scientific discovery. The first face-to-face tutorial explored how life may be detected on Mars and other planetary objects in our solar system and drew on material presented in the second on-line lecture i.e. the scientific discovery of extremophiles on Earth, what conditions can life exist and what makes a planet Earth-like and thus could harbour life. A variety of YouTube clips were used together with a series of slides/images and text points to highlight key points plus a series of inquiry activities to help students engage, explore, explain, elaborate and evaluate key ideas or concepts. Figure 1 illustrate some of the content presented in the second on-line lecture and content plus hands-on activities in the face-to-face tutorial. One of the major challenges was the lack of time Jessy and I had in designing the content for the on-line materials and assessment support, and produce resources that go beyond presenting content that is based on slide and YouTube resources.

Figure 1: Sample content

## STUDENT FEEDBACK

This unit has plenty of potential. As a student studying to become a primary teacher this unit will help me in the delivery of key concepts, even if I do not intend on teaching science this unit provides me with necessary knowledge to be able to in case. In saying this, however, I have found this unit hard to follow in terms of its varying mediums of learning. Having an online lecture and online tutorial in pdf form is troublesome as the student must engage with the material in his/her own way. Rather, the lecture and, if possible, the tutorial should be in slideshow form with audio behind it. Also the time of the lecture and tutorial should be monitored. In a physical lecture or tutorial the average time spent is one hour for each, however, often I spend up to two to three hours on each as by the time I am taking notes, reading material, reading external, online material and watching visual clips I have taken up considerably more time than in a physical (not online) unit. May I suggest modelling the online unit on a physical unit. I have, however, found the external things enjoyable and have enjoyed experimenting and demonstrating concepts. May I also suggest face-to-face tutorials every week as this would allow for better understanding of concepts. Lectures and tutorials should also be uploaded either prior to the topics commencement to allow students to work through the material at their own pace or at the beginning of each week so students are not clogged up before a face-to face tutorial.

Recently, upon beginning the moodle units, I have found myself somewhat irritated by the inconsistency of media for teaching. I think maybe either do all the unit on the moodle site or do all in an audio-assisted slide show. In saying this, however, I have found the moodle system simple to work through as well as informative. Again, I repeat that this unit has huge potential and I have thoroughly enjoyed participating in it.