

## **Year 11 Lecture – Freefall**

**Wednesday 3-5pm (Feb 28), Friday 1-3pm (Mar 2)**

I observed the same lesson content being taught to two different classes.

The lesson covered the subject of Free Fall. The structure of the lesson was as follows:

- A story of Galileo dropping objects from the Tower of Pisa challenging the accepted view of the time that a heavier object falls faster than a lighter one, with Zahra acting out the part, dropping objects to demonstrate (a textbook and a formula sheet, in different configurations)
- A discussion around the definition of freefall.
- Videos demonstrating the Galileo experiment on the moon, and in a large evacuated chamber. (This apparently occurred at the end of the class on the Wednesday session)
- A small amount of written notes.
- A discussion about velocity and acceleration vectors of objects in motion, with a student involved in the examples. This section ended with students discussing with their neighbour if you could be accelerating while at rest, and why.
- A 5 minute break (at the midpoint)
- A diagram of an object at different points in it's flight while moving up and down is drawn on the board, and copied down by students for Zahra to work through as an example on the board. Example based on applying all of the concepts discussed in the first half of the class.
- In the last half hour of class, after the worked example was completed, calculators were brought out to perform a series of calculations applying the concepts covered over the past hour and a half.

The style of delivering content was varied across the lesson, and didn't remain in any one style for long, compassing use of telling stories and imaginable scenarios, acted out examples by Zahra and the students, audio-visual presentations in the form of videos, visual written examples, written notes, and student discussions. (APST 1.2, 1.5, 3.2, 3.3, 3.4, 4.2)

The order in which Zahra unpacked the topic was effective – starting with the general physics concepts that are somewhat observable, and using an a story to convey this, made the beginning of the lesson friendly and approachable, and once the core ideas were established, subsequent examples and styles gently focused on specific concepts, and allowed students to be challenged on specific ideas on the edge of their understanding. (APST 1.5, 2.1, 2.3, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5)

Students were involved in every part: (APST 4.1)

- In the story, they took the part of Galileo's audience by counting down from 3 for each drop of the pair of objects.
- In the discussion of freefall, Zahra dropped, threw up, threw down, and threw a whiteboard marker in an arc, asking the class if they thought each example was an example of freefall, before correcting them at the end by telling them that all were examples of freefall
- While writing notes, Zahra would prompt the class for certain keywords before finishing sentences to assess and correct their understanding.
- A student was involved in demonstrating the difference in direction of acceleration and velocity vectors by standing out the front and point their arms in different directions, based on the example. This part was also involved the rest of the students offering suggestions.
- In the worked example, Zahra intentionally made mistakes in how she drew vectors, immediately calling out the fact she had made a mistake and got the students to tell her what the mistake was.
- The final part of the lesson was performing calculations.

This prompted students to remain alert for the entire session, which was assisted by the variation in presentation across the lesson. The amount of involvement of students allowed Zahra to offer useful praise throughout the lesson, even involving the class in the praise in the case of praising the student involved in demonstrating the direction of vectors in front of the class. (APST 1.1, 3.5, 4.1, 4.3)

Something interesting that may have also helped was Zahra's motion in the class. She taught both out in front of the class, but also along the side of the classroom. This may have done two things – it makes Zahra's presence felt due to her proximity by two thirds of the class, not just the front row, and it also causes the class to have turn and track her movement, encouraging students to remain alert or become more easily noticed as not paying attention. (APST 3.5, 4.3)

The story of Galileo was threaded throughout the whole lesson, with Zahra linking the later examples back to the story, keeping every new concept relevant to everything covered prior. Other links were made to past studies, like linking the videos to discussion of relativity, or using the same student who had demonstrated a similar concept previously. (APST 1.2)

The type of student involved helped give Zahra immediate feedback of student understanding, by getting them to prompt keywords, and making intentional mistakes and getting students to spot them. This allowed her to fix misunderstandings after the content had been explained (APST 5.1, 5.2)

Behaviour was effectively managed across the session – the first five minutes of the lesson, and after the break, were used to check in with students on homework from previous classes, and set new homework, also providing time for students to settle, latecomers to arrive, and allowing Zahra to enforce the relevant class policies without having to distract from the commenced lesson – At the start of the class, there was a student to turn up late, and another to not have brought their calculator, and Zahra was able to talk to the late student while the class checked in with each other about the homework task. Improper use of phones in class was also managed during the class effectively, in this instance, calling attention to it, enforcing the class policy by confiscating it, and redirecting the student to the current task. (APST 3.5, 4.3)