U1 and U2 Course Planning

Contents

Transitioning from F-10 to VCE 1

Teaching Order in Unit 1 2

- Possible order 2
  - Comments 2
- Possible efficiencies 2
- Comments on types of content 2
- Effective teaching tools and approaches 2
- Linking Themes 3

Unit 2 3

- Motion, AOS 1 3
  - Possible case studies 3
  - Contexts for teaching 3
- Options 4
- Extended Investigation 4

Transitioning from F-10 to VCE

- Many schools have an elective system in years 9 and/or 10, meaning that background may be weaker than expected.
- If school has an accelerated program, then year 10 students taking U1 may have more gaps in background.
- Expect students to progress more slowly initially, take time to get to know them and allow them time to adjust to new expectations.
- Need to support the expectations around writing and explaining and evaluating physics. Provide opportunities to practice responding to extended answer questions and ensure that assessments include written responses as well as calculations.
- Students are usually engaged by practical work.
- Use step up/headstart program to review SI units, scientific notation, prefixes. Include some motion so that students install relevant software and introduce prac work (planning, conducting, reporting, uncertainties)
- May be able to use holiday homework to review year 10 motion concepts (only suitable if covered in year 10 at your school)

Teaching Order in Unit 1

Possible order

1. Review mechanical waves, then do thermal physics, then light, electrical then nuclear.
2. Follow SD, with radiation, thermal, nuclear then electrical, but ensure that complete AOS 1 and 2 in term 1, trimming nuclear content if necessary
3. Electricity then heat/light then radioactivity
4. Possible alternative involves mixing up U1 and U2: Motion, then Electricity, then EMF related content

Majority of responses were divided between 1 and 2.

Comments

- Start with lots of prac, then move to the more abstract conceptual content. Establish logbook concept early. General preference was for a hardcopy logbook.
- Waves and particles give good opportunity to write/explain/describe what is happening in systems.
- Use short experimental activities to stimulate curiosity and find an answer to – e.g cooling experienced as metho evaporates from wrist.
- Need to be judicious in prac choices and instructions so that have time for discussion.
- Choose an area that can be trimmed for term 1, so that can cope with interruptions to regular classroom program.
- Waves generally more appealing to girls than motion, with predominance of car related contexts.

Possible efficiencies

- Collect questions from students that can form an assessment task
- Prioritise key knowledge in Unit 1 that supports Units 3 and 4.
- Trim nuclear to 3 weeks
- Use students to carry out demonstrations – builds their skills
- Maintaining a log book means that a prac portfolio is automatically created as a basis for a SAC

Comments on types of content

Key pracs:

- Light and Heat: springs/ slinkies, ripple tanks, Snell's Law. Can musical instruments such as guitar with strobe light to illustrate standing waves
- Nuclear: half life, penetrability, M&M's, Farlabs https://www.farlabs.edu.au/
  Opportunity to develop report writing skills & incorporate secondary data
- Electricity: Parallel and Series, Ohmic and non-ohmic, Yenka https://www.yenka.com/
  Digital versus analogue meters is an opportunity to teach uncertainty

Effective teaching tools and approaches

- Use simulations and then go through theory and do pracs.

- Agree that flipped classroom allows more time for content, however requires a school culture in which students work at home.
- Get students to assess prac work
- Some schools run extra lunchtime classes for content that doesn't get covered, but supports conceptual understanding, such as sound
- Gummy bear wave machine https://www.youtube.com/watch?v=VE520z_ugcU
- Wave apparatus demo https://www.eiscolabs.com/products/ph0712

- Can use tracker for investigating the colour of an object heated up and cooling down over time.

Linking Themes

- The need to define a system.
- Electromagnetic radiation
- Energy
- Use of models in Physics

Unit 2

Motion, AOS 1

- Important to decide early what the case study will be and tailor the course to fit.
- Need to remain flexible, since unlikely the one context will support all content.

- Motion contexts could act as introductions to options U2 AoS2
- Motion topic lasts a long time Could be split? (Kinematics/Energy
- Use forces and energy 6-7 weeks including tasks on errors, tasks on notation, identify variables etc to prepare students for AOS 3, "This is training for your own investigation, and do whatever you like"

Possible case studies

- Concussion in sport
- Motion of sprinters
- Car crashes and effect of crumple zones
- Skate board park design
- Luna Park
- I fly indoor skydiving
- Wind tunnel
- Slingshot
- Aboriginal Woomera
- Curling for motion and friction
- Golf driving range
- Use of protective equipment and helmets in sport eg NFL
- F1 racing
- https://education.ufl.edu/gjones/files/2013/04/teachers_guidePhysics.pdf - This is a great guide which has lesson plans including how students can design safety device using concepts of momentum, inertia (egg protection device - dropping versus throwing at a wall)

Contexts for teaching

- Physics in sport – specifically sport on the Moon
- TAC “Wipe off 5” campaign
- Vehicles - scooters and helmets, crash protections, frictional forces, forensic analysis for skid marks / speed of crash (Humanities connections - wipe off 5km campaign, why do we have limited speed zones during school times? What's the stopping distance with reducing speed by 1km through to 20kms off? Reaction times and stopping distance, relate to types of injuries. We think linking to driving licences is an important and helpful connection to make.
  Possible excursions: “Road to zero” (Melbourne Museum) with VR tech to demonstrate crumple zones,
  https://museumsvictoria.com.au/melbournemuseum/learning/school-programs-and-resources/road-to-zero-physics-challenge/, F1 in Melboure in March 2023. Free tickets for schools, plus a range of challenges (https://www.grandprix.com.au/community/schools).

Options

- Sound and music is a good option as assists with standing waves for yr 12.
- Options can be used as preparation for the extended investigation
- Possible approach: have an explicit teaching component for key concepts and then leave students to self-direct their research

Possible approaches to combining teaching of options and AOS 3 :

1. 5-6 weeks teaching and then a week of free investigation. 2 weeks of investigation including write up.
2. 2 weeks teaching and 7 weeks of investigation (including motion).

Extended Investigation

- Investigation of 4 weeks with 2 weeks to build apparatus.
- Consider spacing out the explicit teaching of research skills with lessons leading into the EPI. eg Jane Coyle does 1 lesson per week for all of Term 3 for the EPI.
- Embed in a social context: Why is your prac useful: Justify the planning of your prac (imagine if you were going to get funding, how would you explain why your prac and its results will be useful to the society)
- Have a bank of ideas to seed student thinking and a good rubric (descriptors) to guide what they need to include
- Connect to U2 AOS 2 topic so that can go into AOS 2 more deeply.