Vicphysics Teachers' Network
Notes for Consultation Forum

Program

10:00 Session 1: Options and key knowledge applications versus context and Socio-scientific Area of Study.
What is achieved by proposed changes? What is lost? Alternatives? Is a separate socio-economic area of study of value? (45 min)

11:00 Session 2: Key Knowledge Content and Key Skill changes:
Moving Light as a Wave into Unit 2, Relativity as an area of study in Unit 4, changes to skills (45 min)

12:00 Session 3: Assessment: Increase in range of tasks for Units 1 & 2, reduction of range of tasks for Units 3 & 4, change in weighting (30 minutes). Groups focus on either Units 1 & 2 or Units 3 & 4.

1:30 Session 4: Critique of / Feedback on key knowledge curriculum elements in all four Units. Appropriateness? Correctness? (45 min) Groups focus on either Units 1 & 2 or Units 3 & 4.

2:30 Session 5: Critique of/feedback on selected elements of Characteristics of Study, Cross-study skills, Terms used in Study (45 min)

The review of VCE Physics focused on:

- the range of learners and learner needs in undertaking VCE Physics, including those aspiring to post-secondary pathways
- progression of the Victorian Curriculum F–10 Capabilities and Cross-curriculum priorities
- clearer definitions of key terms in the study design
- content reduction and sequencing
- flexibility and choice through options across Units 1 and 2
- increased contemporary physics applications
- assessment weightings and assessment task types.

Contents

Session 1: Options versus Contexts and Socio-scientific AOS

Flexibility and Choice

How are flexibility and choice addressed in the study design? **Current**: ● 12 optional units forming AOS 2 in U2 ● To achieve outcomes, students "draw on" large number of Key Knowledge dot points that include concepts and applications. **Proposed**: ● Remove optional units and replace with contexts in each area of study. ● Reduced application type dot points	**Advantages of proposed changes**	**Disadvantages of proposed changes**
Do proposed changes increase and/or improve flexibility and choice?	**Yes** – because …	**No** – because ….
Suggestions for improvements to proposed changes		

Inclusion of Contemporary Content

Note that the Review states that an intention of the proposed changes is to address the question "How does studying VCE Physics contribute to students becoming global citizens"

How does study design contribute to becoming global citizens (scientifically literate, aware of and able to critique effect of physical phenomena on environment and human life) **Current:** ● Key knowledge dot points include applications of Physics relevant to environment and human quality of life ● Key knowledge dot points include application of fundamental Physics principles to everyday phenomena including operation of devices and machines **Proposed**: ● Remove optional units and replace with contexts in each area of study ● Include an AOS which is a research project on a socio-scientific issue related to thermal or nuclear physics or electrical energy	**Advantages of proposed changes**	**Disadvantages of proposed changes**
Do proposed changes increase the depth and/or breadth of application of physics to social contexts in the study design?	**Yes** – because …	**No –** because ….
Suggested improvements to proposed changes		
Do proposed changes increase capacity for students to become global citizens?	Yes – because ..	No – because …

Suggested improvements to proposed changes that facilitate capacity	

Options versus Contexts

How do proposed contexts compare with the content in current options and current key knowledge dot points?	**Advantages of contexts**	**Disadvantages of contexts**
Do proposed changes increase the depth and/or breadth of application of physics to social contexts in the study design?	**Yes** – because …	**No –** because ….
Do the contexts require content that is included in the relevant AoS? e.g human vision is included as a context, but image formation is not covered.	**Yes** – because …	**No –** because ….
Suggested improvements to proposed changes		

Session 2: Key Knowledge Content changes:

Moving Light as a Wave into U2, Relativity as an area of study in U4

Statement	**Advantages of proposed changes**	**Disadvantages of proposed changes**
Main key knowledge content changes: **Current:** Light as a Wave in U4 Special relativity content limited **Proposed:** ● Move Light as a Wave to U1 ● Condense current thermal physics and space and matter into one AOS ● Remove Big Bang Theory ● Expand Special relativity and add General Relativity to U4		
Do proposed content changes improve sequencing of study design?	Yes, because	No, because
Suggested improvements to proposed changes		
Do proposed content changes achieve aim of content reduction?	Yes, because	No, because
Suggested improvements to proposed changes		

Session 3: Assessment Tasks and Weighting

Assessment: Increase in arrange of tasks for Units 1 & 2, reduction of range of tasks for Units 3 & 4, change in weighting

Units 1 and 2

Units 1 & 2 There is an increase from 11 to 16 possible tasks. Most current ones now have a more specific title, some are unchanged. There are a number that address practical activities in different ways. Also there a few new ones. The reflective learning journal does not seem to have an equivalent and the word 'test' has been deleted, but there is still 'problem-solving'.	**Pros:**	**Cons**
Are the tasks related to practical activities sufficiently distinct?	Yes, because	No, because
Is there overlap between some of the tasks?	Yes, because	No, because
Is there any point in removing the word 'test'?	Yes, because	No, because
Suggested improvements to proposed changes		
Do proposed tasks increase the assessment load on students and teachers?	Yes, because	No, because
Suggested improvements to proposed changes		

Units 3 & 4

Units 3 & 4 The number of tasks has been reduced from 11 to 5. There is also no problem-solving task that could be configured as a test	**Pros:**	**Cons**
Should there be a problem solving task?	Yes, because	No, because
Are there any of the deleted tasks that should be retained?	Yes, because	No, because
Should any of the new tasks proposed for Units 1 & 2 be included?	Yes, because	No, because
Suggested improvements to proposed changes		

Task Weightings

Weighting of Tasks The Outcomes for Unit 3 are still equally weighted, but 40 marks for each now and 30 before. The Outcomes for Unit 4 are weighted differently both currently and in the proposed design. Currently the marks are 30, 30 and 35. Whereas the in the proposed design they are 40, 35, 40. The exam is now worth 50% instead of 60%, but the contributions of each Unit to the overall study score have also changed relatively. Currently the proportions are Unit 3: 21%, Unit 4: 19% and exam 60%. The proposed breakdown in 27%, 23%, 50%. This is a slight shift towards Unit 3. Also the total marks for the two Units is inconsistent with the weightings for the study score	**Pros:**	**Cons**
Are the changes significant?	Yes, because	No, because
Should there be comparability between the total marks for the units and their contribution to the study score?	Yes, because	No, because
Suggested improvements to proposed changes		

Session 4: Critique of key knowledge curriculum elements

Critique of / Feedback on key knowledge curriculum elements in all four Units. Appropriateness? Correctness?

Unit 1

Unit 1	Advantages of proposed changes	Disadvantages of proposed changes
Deletions ● Zeroth and 1st Laws of Thermodynamics ● Cooling results from evaporation ● Wien's Law, Stefan-Boltzmann Law ● Details of Greenhouse Effect ● Origin of the atoms section ● Quarks, neutrino, Higgs boson, leptons, baryons, etc ● Antimatter and annihilation with matter ● $E = mc^2$moved to Unit 4 ● Production of light Additions ● Generalised points on internal energy, and Greenhouse Effect		
Do the proposed key knowledge elements appropriately address the outcome of the area of study? (number of elements, depth, breadth)	Yes, because	No, because
Suggested improvements to proposed changes		

Unit 2

Unit 2	Advantages of proposed changes	Disadvantages of proposed changes
Deletions: None Additions Motion: ● Types of forces on structures ● Analyse translational forces and torques ● Young's modulus, stress, strain ● Compare materials Investigations: ● Addition of terms such as fieldwork, correlational studies, classification and identification, etc as examples of possible activities ● Use of verbs as key words in dot points		
Is there too much content in the proposed Motion Area of Study?	Yes, because	No, because
Are the new terms for activities relevant to secondary physics? Note that such terms have not been includedin the Unit 4 Investigations AOS	Yes, because	No, because
Suggested improvements to proposed changes		

Unit 3

Unit 3	Advantages of proposed changes	Disadvantages of proposed changes
Deletions Fields: No change Electricity: No deletions Motion: ● Relativity moved to separate AoS ● Total mass-energy ● Energy in nuclear fusion Additions Electrical energy: ● PV cells and the need for inverters Motion: None Unit 4 Relativity ● Limitations of classical mechanics for very fast motion ● Michelson-Morley experiment ● Simultaneity ● Length of particle accelerators ● Atomic clocks in relative motion ● Energy-mass relationship ● Principle of equivalence ● Effect of gravity on light path ● Time dilation due to gravity ● Gravitational waves, detection and evidence of massive events		
Should the order of the Areas of Study be changed to put motion before Fields?	Yes, because	No, because
Should general relativity be included if it only descriptive?	Yes, because	No, because

Suggested improvements to proposed changes	

Unit 4

Unit 4		
Deletions Wave-like behaviour of Light ● Types of waves ● Interference of mechanical waves ● Doppler Effect ● Diffraction of mechanical waves ● Polarisation Light and matter ● Heisenberg Uncertainty Principle ● Classical laws not appropriate at very small scale Additions Unit 1 Light ● Formation of rainbows, mirages ● Scattering of light and wavelength	Pros: Cons:	Pros: Cons:
Should image formation be included in Unit 1 Light?	Yes, because	No, because
Are dot points on mechanical waves, eg resonance and standing waves out of place in an AoS on Light (Unit 4)?	Yes, because	No, because
Suggested improvements to proposed changes		

Session 5: Critique of Cross-study skills, Characteristics of Study, Terms in Study

Critique of/feedback on selected elements of Characteristics of Study, Cross-study skills, Terms used in Study

Characteristics of Study	Advantages of proposed changes	Disadvantages of proposed changes
Current: Characteristics such as 'Use of verbs in key knowledge' included in the Advice to Teachers. **Proposed:** ● Key science skills have expanded to include linearising data and analysis of socio-scientific issues ● Cross-study skills expanded to include information on Critical and Creative Thinking, dotpoints on Ethical understanding and guidance on Individual and collaborative scientific endeavour and expectations regarding inclusion of Aboriginal and Torres Strait Islander knowledge, cultures and history ● Characteristics (verbs hierarchy and treatment of data (new)) are included in Study Design. ● Term used expanded to include definitions of measurement terms, errors and uncertainties		
Do the proposed changes assist teachers and students with the appreciation of the active verbs in dot points.	Yes, because	No, because

Do the proposed changes assist teachers and students with the analysis of data?	Yes, because	No, because
Are the proposed changes to cross-study skills with regard to Ethical understanding and analysis of socio-scientific issues appropriate?	Yes, because	No, because
Suggested improvements to proposed changes		

Cross Study Skills	Advantages of proposed changes	Disadvantages of proposed changes
Current: Key science skills are listed in a table and contextualised for VCE Physics **Proposed:** The titles of some skills have been changed and many of the annotations have been changed so that they are not specific to VCE physics, e.g 'correlational study, fieldwork and literature review'		
Are the proposed changes adequately contextualised for VCE Physics?	Yes, because	No, because
Suggested improvements to proposed changes		
Terms	Advantages of proposed changes	Disadvantages of proposed changes
Current: Terms used in the Study are in the Advice to Teachers **Proposed**: Terms used in the Study covers clarification of terms such as 'force due to gravity' and terms associated with measurement.		
Should the term 'True value' be changed to a more realistic term such as 'Accepted value'?	Yes, because	No, because
Suggested improvements to proposed changes		

Appendix 1 – Proposed Contexts

U1 AOS 1

1. Waves and radiation ● How safe are microwaves? ● How is colour perceived? ● How is radiation used in non-harmful ways? ● How is radiation utilised by society?	2. Environmental change due to global warming ● How does physics knowledge help the understanding of global warming? ● How is the change of the surface of Earth due to human activity affecting climate change? ● How can Aboriginal and Torres Strait Islander knowledge about thermal ideas inform solutions to global warming?	3. Human impact on climate change ● How can our homes be designed to be more energy efficient? ● How can our cars be designed to be more energy efficient? ● How are energy ratings for appliances determined? ● In what ways can alternative energy sources solve societal energy problems?
4. Understanding the Universe ● How does the temperature of the Universe determine the structure of matter? ● How and what do physicists know about the origins of the Universe? ● How does the standard model help physicists order, and make predictions about, the Universe? ● How can information collected from outside our Solar System be used to better understand the Universe?	5. Comparison of fusion and fission as viable nuclear energy power sources ● How do fission and fusion produce energy? ● What are the risks and benefits of using nuclear energy as a power source? ● How do fission and fusion energy compare as energy sources? ● How does nuclear energy contribute to a solution to our energy problems? ● How have advances in knowledge about nuclear energy changed society? ● How do the health and environmental risks associated with the use of nuclear fission compare with the energy benefits?	6. Radiation and the maintenance of human health ● What kinds of radiation are used in medicine? ● How is radiation used in diagnosis of illnesses? ● How is radiation used to treat illnesses? ● How do the benefits of radiation compare with the harm posed to living things? ● How are appropriate radioisotopes chosen for medical imaging?

U1 AOS 2: Electricity

1. Electrical phenomena in the human body ● In what ways does the human body use electricity to function? ● How can electricity be used to keep the human body healthy?	2. Electricity in the car ● How are DC circuits utilised in the traditional car? ● How do hybrid and electric cars use electricity? ● What impacts can the introduction of electric cars have on global warming?
3. Electricity in our homes ● How are DC circuits utilised in the home? ● Why are parallel circuits used in our homes? ● What impacts can the use of solar panels have on global warming?	4. Electricity and health care ● How does medical equipment such as a defibrillator work? ● How is electricity used to treat health issues? ● How is electricity use to diagnose illness? ● How is electric medicine used to replace drugs?

U2 AOS 1

1. Improving vision ● How does the human eye work? ● How can human vision be improved? ● How does a bionic eye work?	2. Human perception ● Why is colour used to affect mood and perception? ● How does the environment and atmosphere affect how we see things? ● Why is animal 'seeing' different from human vision? ● Why do we perceive things differently from how they are in reality? ● How do optical illusions work?	3. Observing beyond human vision ● How can we observe things that are too small to see with the human eye? ● What can be done to extend human vision?
4. Photography ● How do cameras create images? ● How do digital cameras differ from traditional cameras in the way images are generated?	5. Aboriginal and Torres Strait Islander knowledge and applications of light ● How is refraction used in hunting and recreational activities? ● Why do different ochres interact with light? ● How do Aboriginal and Torres Strait Islander Australians understand and make use of light?	

U2 AOS 2 Motion

1. Road Safety	2. The human body	3. Buildings and bridges

● How does reaction time affect collisions? ● How does impact speed affect collisions? ● What aspect of car maintenance helps to keep us safe on the road? ● How are roads designed to keep people safe?	● How are the materials of our body suited for purpose? ● What kinds of forces does the human body experience and how do they affect the body? ● How can parts of the human body be replaced by artificial materials?	● How are structures designed for safety and longevity? ● Why has the design of structures changed over time?
4. Flight ● How do heavy things fly? ● How can flight be manipulated? ● How can flight travel be made more efficient? ● How can impact of flight travel on the environment be reduced?	5. Sport ● How is physics used to investigate sport? ● How can physics understanding be used to maximise performance in sport?	6. Aboriginal and Torres Strait Islander technologies and structures ● What is the physics that explains Aboriginal and Torres Strait Islander tools and structure? ● How are materials used in Aboriginal and Torres Strait Islander structures?