National Curriculum Background

- **1989** Education Ministers issue ‘common goals for schooling’.

- **2004** Federal Government investigates an Australian Certificate of Education

- **2006** Federal Government commissions a mapping of senior subject content – **PHYSICS >90% IN COMMON**

- **2008** Melbourne Declaration on Educational Goals for Young Australians led to the creation of the National Curriculum Board (now ACARA).
ACARA Curriculum Development

**Phase 1:** development of the national curriculum K-12
2009-2012
- English
- Mathematics
- Sciences
- History

**Phase 2:** development of the curriculum for
- Languages
- Geography
- The Arts

**Phase 3:** Design and technology, health and physical education, ICT, economics, business and civics and citizenship.
All national curricula incorporate 10 general capabilities:

- literacy
- numeracy
- information and communication technology
- thinking skills
- creativity
- self management
- teamwork
- intercultural understanding
- ethical behaviour
- social competence.
Where appropriate, curricula embed 3 cross-curricula dimensions:

• Indigenous history and culture
• A commitment to sustainable living
• Asia and Australia’s engagement with Asia.
All science curricula based on the 3 strands:

- Science Understanding (SU)
- Science Inquiry Skills (SIS)
- Science and Human Endeavour (SHE)

(Pressure from many lobby groups for less content and more depth)
Example SU strand development of energy concept:

**Year 1:** Light and sound are produced by a range of sources and can be sensed

**Year 5:** Light from a source forms shadows and can be absorbed, reflected and refracted

**Year 6:** Electrical circuits provide a means of transferring and transforming electricity. Energy from a variety of sources can be used to generate electricity

**Year 9:** Forms of energy can be transferred in a variety of ways through different mediums

**Year 10:** Energy conservation in a system can be explained by describing energy transfers and transformations
Senior Science Courses

• Physics
• Chemistry
• Biology
• Environmental Science

V1 released March 2010 for public consultation.
V5 approved by state ministers and released Dec 2012
Physics Curriculum Development (2009-2012)

- Minimum knowledge and skills
- One 2 unit course only
- No elective material
- Suitable for continuing and non-continuing students
- No preferred teaching methodology
- ‘Future proofed’ – i.e. Based on fundamental (stable) science
- Contexts and applications left to the jurisdictions
SU in National Physics Curriculum

Year 11:

• Thermal, Nuclear and Electrical Physics
• Linear Motion and Waves

Year 12:

• Gravity and Electromagnetism
• Revolutions in Modern Physics (quantum theory and special relativity)
### Science Understanding

<table>
<thead>
<tr>
<th>Science Understanding</th>
<th>Examples in Context</th>
<th>Mathematical representations and relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Special relativity</strong></td>
<td></td>
<td>$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$</td>
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<tr>
<td>Observations of objects travelling at very high speeds cannot be explained by Newtonian physics (for example, the dilated half-life of high-speed muons created in the upper atmosphere, and the momentum of high speed particles in particle accelerators) (ACSPH129)</td>
<td></td>
<td>$l = l_0\sqrt{\left(1 - \frac{v^2}{c^2}\right)}$</td>
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<tr>
<td>Einstein's special theory of relativity predicts significantly different results to those of Newtonian physics for velocities approaching the speed of light (ACSPH130)</td>
<td></td>
<td>$p_v = \frac{mv}{\sqrt{1 - \frac{v^2}{c^2}}}$</td>
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<tr>
<td>The special theory of relativity is based on two postulates: that the speed of light in a vacuum is an absolute constant, and that all inertial reference frames are equivalent (ACSPH131)</td>
<td></td>
<td>$\Delta E = \Delta mc^2$</td>
</tr>
<tr>
<td>Motion can only be measured relative to an observer; length and time are relative quantities that depend on the observer’s frame of reference (ACSPH132)</td>
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<td>Relativistic momentum increases at high relative speed and prevents an object from reaching the speed of light (ACSPH133)</td>
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<td>The concept of mass-energy equivalence emerged from the special theory of relativity and explains the source of the energy produced in nuclear reactions (ACSPH134)</td>
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</table>
No specific contexts specified in SHE

Science as a Human Endeavour (Units 1 & 2)

Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility (ACSPH009)

Development of complex models and/or theories often requires a wide range of evidence from multiple individuals and across disciplines (ACSPH010)

Advances in science understanding in one field can influence other areas of science, technology and engineering (ACSPH011)

The use of scientific knowledge is influenced by social, economic, cultural and ethical considerations (ACSPH012)

The use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences (ACSPH013)

Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions (ACSPH014)

Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability (ACSPH015)
Sequentially developed inquiry skills explicitly stated

**Content Descriptions**

**Science Inquiry Skills**

Identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes *(ACSPH045)*

Design investigations, including the procedure to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics *(ACSPH046)*

Conduct investigations, including the manipulation of devices to measure motion and the direction of light rays, safely, competently and methodically for the collection of valid and reliable data *(ACSPH047)*

Represent data in meaningful and useful ways, including using appropriate SI units and symbols; organise and analyse data to identify trends, patterns and relationships; identify sources of random and systematic error and estimate their effect on measurement results; identify anomalous data and calculate the measurement discrepancy between the experimental results and a currently accepted value, expressed as a percentage; and select, synthesise and use evidence to make and justify conclusions *(ACSPH048)*
How does the NSW draft syllabus (incorporating the NC) differ from the existing NSW syllabus?

- No Option topic
- 2 units (with 2 modules in each) to be covered rather than 4 independent units in yr 11 and yr 12
- 15 hour depth study in yr 11 and yr 12
- Specific contexts no longer mandated
- Reduced emphasis on sociology and history
- Increased emphasis on numerical analysis and directed inquiry
How has the content changed?

Year 11

Removed:
• AM, FM, EMR spectrum communication problems, mobile phone (TV radar), digital analogue, GPS and other technologies.
• Sociology/history of development of current electricity, electricity in home circuits and home electrical safety devices
• Car Safety, forces involved with changing a car’s velocity.
• The Cosmic Engine unit

Added:
• Inclined planes, 2-D linear motion and statics
• Elastic potential energy, simple harmonic motion
• Resonance, beats and Doppler effect
• Simple thermodynamics – heat transfer, specific and latent heat
• Coulomb’s law, Kirchhoff’s laws, solenoid equation
• DEPTH STUDY
Year 12

Removed:
• History of projectile motion, space travel, rockets
• Variations in g around the Earth, gravity assist,
• Earth’s rotation and orbital motion on satellite launch
• Re-entry and landing spacecraft
• Battle of the currents, galvanometer, loudspeaker, energy transformation is the home.
• Cathode ray debate, Semiconductors, superconductors, hertz’s experiment
• Entire Option topic

Added:
• Angular velocity
• Total energy of a satellite
• Faraday’s Law
• Light model – diffraction, young’s experiment, polarisation, H/R diagram
• More examples of special relativity
• Basic atomic model development to Bohr model including deBroglie
• Basic nuclear physics including binding energy, radioactivity, fission and fusion
• Basic overview of fundamental particles and forces in standard model
Broad overview of consultation?

Depth Study?