



Science Teachers Association – K-10 Draft Syllabus Analysis, September 2023

Background

The Science Teachers Association NSW exists to advance the profession in NSW through the provision of quality professional development, information and advocacy for primary and secondary science educators. A strong science education is essential so that every school leaver has an understanding of the core concepts and the nature and practice of science, particularly the ability to think scientifically. We aspire to a society founded on the development of scientific language, logic and problem solving producing scientifically literate adults.

This paper was developed by a STANSW Think Tank, which was convened on 21 and 28 August to analyse the new draft syllabuses. It sets out our feedback on the K-6 Science and Technology Syllabus (Draft 1) and the 7-10 Science Syllabus (draft 2).

1. K-6 Science and Technology

Overarching Issues

- We like the focus on the “doing” in this syllabus.
- We see that there will need to be significant support and professional learning provided to teachers to allow them to teach the syllabus in the correct manner.
- The new syllabus seems to lose the STEM focus of the previous syllabus; the best time to do STEM is in Primary.
- 75% of outcomes are skills and 25% outcomes are content which is not reflected in the content statements. A greater focus is needed in the first-hand investigations.

- **We must have clarification on whether the K-6 content is mandatory.** Currently secondary schools take students from many feeder schools. If the content is optional, there will always be issues in year 7 getting all students up to the basic level of understanding of content or skill. This needs to be addressed.
- The syllabus should explicitly state the intent of the content in terms of depth or breadth. Inform teachers how much discretion they have.
- The strength of the Design and Produce outcomes from the current syllabus has been lost in this new structure. This is a backward step for STEM education.
- The examples in the footnotes are a good guide as to what is expected.
- Energy and force should be the noun. E.g. heat energy and light energy or a push force should always be together.
- The confusion between “*properties*” and “*characteristics*” of materials needs to be addressed, as “*properties*” has a specific meaning in science.
- There is a huge jump in expected concept knowledge from Stage 3 to Stage 4.

Focus Areas

The use of the focus areas to support teachers in planning and programming units of work is a positive step which invites teachers to be a part of the process.

ES1 - Observations and questions spark curiosity

Observations and questions initiate design and digital solutions (Could we consider creativity here somewhere?)

S1 – Investigations of changes in our world provide knowledge and understanding

Design and digital solutions are created through knowledge and understanding

S2 – Physical and living systems depend on energy

Design processes and digital systems create solutions

S3 – Knowledge of our world and beyond inspires sustainable solutions

Design and digital technologies engineer sustainable solutions

Rationale

Clear rationale with a focus on science. Needs to have a greater focus on how students use what they have learnt in science and apply it develop solutions to real work problems within the technology "side". Digital solutions and iterations need to be considered.

Aim

- The aim is clear and broad but does not include the inclusion of skills.
- Recommend changing the third dot point to “the ability and desire to use their knowledge and skills in these subjects to participate in society as scientifically and technologically literate and engaged citizens”.

Table of outcomes

- We appreciate the table of content but would like to see a further development of skills over the stages.
- Stage 3 outcome - “*creates written texts to communicate understanding of scientific and technological concepts and processes*”. We recommend changing to “*creates ~~written~~ scientific and technological texts to communicate understanding of concepts and processes.*”
- We recommend the addition of a first column classifying the aim of the row. i.e., what is each row exploring. e.g. Row 1 *Science knowledge and understanding*; row 2 *Questioning and predicting*.

Support Document

- Support document should include guidance about assessment.
- We recommend inclusion of a dot point about the disposition of teachers. Eg *Critical Thinker; Lifelong Learner*.

- Within the support document we need to ensure that Tier 2 and Tier 3 vocabulary is taught throughout the syllabus. We are assessing how the students can communicate like a scientist.
- Support document must clarify that skills are to be taught in conjunction with content, and not in isolation.

Outcomes and content for Early Stage 1

- Great links to mathematics.
- MAE-DATA-01 – Students make predictions as part of this outcome. **We strongly recommend** having predictions as part of the Science syllabus
- We recommend assuming the links to English will be added.
- We LOVE the idea of table example given in the foot notes. We recommend that the content in the table is correct science. E.g. 'How it eats' is incorrect.

Living things have features that help them survive in their environment.

- We recommend defining an 'observation'.
- Point 3 – We recommend changing the sentence to - "Observe flowers, fruit, leaves, roots and stems of plants, then use labelled pictures and written simple sentences to record and compare their characteristics."
- Point 6 – Can we change the sentence to - "Identify the basic needs of plants and animals" (add to footnotes – basic needs of animals - air, water, food and shelter. Plants need air and water).
- Great natural progression evident from living things to materials.
- Point 8 – Remove "Asks Questions" as the sentence doesn't make sense in practice.

Objects are made of materials that have observable properties

- Point 3 – Can we change to "Asks questions about materials and their use in everyday objects"

Observations and questions initiate design and digital solutions

- Point 4 – Is not appropriate. ‘ Explore how traditionally Aboriginal and Torres Strait Islander Peoples design and use tools for specific purposes. “

Outcomes and content for Stage 1

Living things change over time

- Point 1 – We recommend adding ‘life cycles’ in living things (rather than measure and record changes that occur).
- Point 3 – This point does not align within the continuum of ideas. Fossils are too abstract in Stage 1. *Evidence that environments have changed* is not introduced until stage 3, and extinction is not introduced until Stage 4. Can we change to - Animals in the past were different to the animals we have now. In the corresponding footnote reference could be made to dinosaurs and megafauna.

Properties of materials affect their use

- Point 2 mentioned observable properties don’t change when materials are changed. This is a huge problem in primary science by using the word ‘properties’. In science “properties” has a very specific meaning, e.g. BP, conductivity etc. However, children need to understand the *characteristics* of materials so that if one characteristic of a material is changed (e.g. crushed sand vs rock) the *properties* of the material does not change.
- Point 4 – Is not appropriate. Change to “Describe how traditional Aboriginal and Torres Strait Islander Peoples used natural materials for specific purposes based on their properties”.

Objects move in different ways depending on what is done to them

- Point 1 - Change 'make things move, stop moving or change direction', because this is scientifically inaccurate. What it should be is that a force can make objects: start moving, stop moving, change speed or change direction (or change shape/deform).
- Footnote 19, just note that with forces, it is very hard to identify/isolate one effect on the other (in investigations).
- Please also change 'pushes, pulls and friction', because this implies friction isn't one of these. 'Effects of forces' is better, and then footnote friction

The Sky is our window to the Universe

- The support document needs to be very clear about what is taught in this topic as teachers will see the words, universe earth, moon, sun and get a bit too advanced and introduce misconceptions.
- Point 2 – is not age appropriate for Stage 1; this should be pushed to Stage 2.
- We like Point 3 and how it focuses on something that is real to the students and special to our “corner of the world”.
- Point 6 – Inappropriate for Stage 1 as planets have not been mentioned before. Move to stage 2 – the sun is the centre of our solar system.

Outcomes and content for stage 2

Living things depend on energy and materials to survive

- Point 1 – An ideal point for a fair test. We recommend changing to “*A habitat is a place where living things live, and contains nutrients, plants and animals.*” The support document should show examples.
- Point 2 – to ensure this is completed as a hands-on task rather than a comprehension task could we change the point to “conduct a firsthand investigation to compare the observable matter in garden soil, sand and loam”.
- Point 3 and Point 4 can be subsumed into 1 statement.

- We recommend including another point identifying the movement of energy from the sun through plants into animals in food chains. Example 32 would then fit into this point (rather than point 3).
- Example 33 could be an example of the new combined Points 3 and 4. The example does not fit for a food chain.
- Point 5 – replace with “Recognise that the sun is the most important source of energy for all plants, and that animals get their energy from plants or other animals”

Energy is required to change the properties of matter

- Point 1 – We like the definition of matter.
- Point 2 – We like this point very much. Example 35 – We recommend changing the example to not include mercury.
- Point 3 – We have a safety concern of students testing water from a solid to liquid to gas and back again. Teacher demonstration for liquid or using the sun’s energy to change a solid into a liquid etc.
- Point 5 and footnote 36 – We recommend this being removed and taught in stage 4 where the teachers have the knowledge to teach particle theory correctly.

Energy can be transferred through light and sound

- This content heading is inaccurate. It must be changed to “Energy can be transferred as light and sound”.
- We like this content area and can imagine how fun this would be for both the students and teachers.
- Support document must include information about the difference between force and energy.

The effects of Earth’s internal and external energy shape its surface.

- We are concerned that 4 out of the 5 content points begin with describe.

- Point 2 – We recommend removing the term asthenosphere as it may will make teachers fearful of teaching this point if they do not understand the term.
- Point 3 - explicitly mention Earthquakes and Volcanos
- Point 5 – We recommend moving this to stage 1 - ‘Planet Earth is our home’?

The Sun is the centre of our solar system and provides our world with energy.

- Heading is problematic. Recommend removing ‘...and provides our world with energy’ as it is included in Living things.
- Again, we are concerned that 4 out of the 5 content points begin with describe.
- Point 1 Recommend deleting ‘seasons’ and include day and night. Also remove the ‘tilt’ and add to stage 3.
- Use the term energy as a noun with an adjective e.g., light energy, sound energy, heat energy.

Outcomes and content for Stage 3

Living things may change over millions of years, in response to their environments.

- There is an inconsistent use of ecosystem vs environment through the point.
- Point one – Can we add the term adaptations – Observe adaptations of plants and animals and suggest how these may allow them to survive in their environments.
- Footnote 53 can we add koalas have 2 thumbs?
- Footnote 54 is currently covered in stage 6 Biology.
- Add a new point from stage 1 “Examine evidence of living things that no longer exist”.

A fixed amount of useable matter makes up all the material on Earth

- Introducing the term 'sustainably' here could cause students to think that recycling and compost is what sustainability is about. Sustainability is about reducing our resource use. We recommend a statement to define sustainability.
- Re recommend inclusion of compostable as well.

Electricity is a form of energy and causes change

- A lot of PL and support will be needed in this topic.
- Point 4 – Could it be changed to – Develop testable questions, identify variables and conduct fair tests.
- Turbines produce electricity. This word is incorrect as in this context, the students are designing a windmill. It is noted that the Australian Museum uses this term incorrectly.
- Students building circuits introduces potential equity issues as some schools will not have access to the resources necessary. Leave it in stage 5.

Our solar system is a part of one of billions of galaxies in the universe.

- This is an exciting concept to teach but will need support to do so correctly OR leave in stage 5. How can this topic be moved from 15-year-olds down to 11-year-olds. Stage 3 students are still concrete learners and are unable to cope with the magnitude of scale and size that astronomy at this level requires.

2. 7-10 Science Syllabus

Overarching Issues

Pitching

In general, the level of content knowledge is much higher than previously expected. Many items from stage 6 are now covered in stages 4 and 5. The content-heavy focus is not considered beneficial for most learners, for the following reasons:

- Cognitive load and cognitive density too high, leading to a lack of mastery and therefore disengagement
- Content focus rather than context focus reduces student engagement
- The syllabus will be difficult to differentiate for a range of learners.

All of these factors could contribute to further attrition in science that we have seen already over decades.

Structure of focus areas

Much of the content in “Observing the Universe”, “Data Science 1” and “Data Science 2” repeats skill descriptors already covered as Working Scientifically skills, without adding either content or context. These need significant restructuring.

Narrow definition of ‘practical’

Opportunities for hands-on, active learning, and for practicing the skills of scientific inquiry, are critical aspects of science education. Therefore, the encouragement to include 50% practicals is welcomed. However, a much more nuanced approach is needed when defining practical. There are many dimensions of a learning experience that may determine whether something should be considered a practical (See Mitchell &

Carbone (2011), *Typology of active learning*: <https://doi.org/10.1016/j.ijer.2011.05.001> While this is not science-specific, it demonstrates the multi-dimensional nature of learning activities).

When specifying practicals, does this refer to:

- Experiments only? Or also demonstrations, observations, and physical models?
- Wet-lab or hands-on only? Or do computational experiments count too? What about data analysis?
- Any form of active learning? Anything that develops working scientifically skills? Does writing a lab report count?

If setting a threshold, we need to be very specific about what's included. Giving students a rich and robust understanding of the difference can also help them understand the nature and practice of science.

“...in context”

Tacking contexts to the end of a unit encourages a content-driven approach that leads students to disengage. We recommend putting the “in context” content groups at the beginning of each focus area. This will encourage teachers to integrate them across units of work rather than treating application as an afterthought.

Data book

- We recommend the databook contains definitions of validity and reliability for first and secondary research. Currently this is highly contested all around the state.
- We recommend the databook contains a more useful definition of when to draw a line of best fit. Currently it is also very misunderstood around the state.
- We recommend removing all Stage 6 chemistry from the databook.

Evidence Base

- Was the provided list a reference list or a bibliography? We don't want a bibliography.
- Point 4 by one author recommends multidisciplinary approach. Care must be taken with this as a scientist in practice would not be expected to know all science subjects. Instead, they would collaborate with other experts in their field. A biologist would work with an astronomer for example. If we interweave scientific concepts students risk missing the main focus.

Reforms evident in the syllabus

- A clear learning progression is needed from K-12, not just 4-5.

Organisation of Science 7 – 10

- We recommend the addition of numbers for each focus area
- We recommend a statement that explains if it is expected the Focus areas are taught in order or can be moved around.
- We recommend change name from “Forces and magnetism” to “Forces” because magnetism is an example of a force.
- We recommend atomic structure be moved back to stage 5
- We recommend changing name from ‘energy use’ to ‘energy’

Working scientifically

- Paragraph 2 implies scientific inquiry is the only way students learn science. This is incorrect. It is one strategy that is used when appropriate and within inquiry there are a wide range of levels. This statement shows a lack of understanding of scientific inquiry.

Rationale

- We recommend the addition of understanding into paragraph 1
- We recommend the inclusion of values back into science.

Discipline specific analysis

The detailed analysis below was conducted by STANSW's expert teachers and academics from each discipline. These professionals formed working groups for the purpose of reviewing and making recommendations on the new syllabus. Their insights are presented below.

Chemistry

Stage	Item	Issue	Recommendations
Stage 4	Atoms not mentioned until Year 8 Focus area.	Missing content	Add introduction to what an atom is in Separating Mixtures topic
	Formula for Density incorrect - $d = m/v$	Error	Change to V (volume)
	No capitals when and only for the symbols naming elements e.g footnote 42 - "C is Carbon, Mg is Magnesium. Some symbols use the Latin name of the element to determine the symbol, such as Fe (Ferrum) for Iron, Na (Natrium) for Sodium, W (Wolfram) for Tungsten."	Error	Adjust

Select appropriate equipment to measure the density of water and other substances, and record the results in a table to compare the calculated density with SI data	Clarity on SI data – where to access information	Density needs to be in the comment formulas data book Coordinate equations with stage 4 Maths? Select appropriate equipment This will be teacher identified or a list need to be provided
Describe how solutions can be modelled using particle theory	Clarity as to the depth of understanding	Stage 5 once ions are done
Order of presentation of topics	Sequence issues	Periodic table should be first then solutions and mixtures
Outline patterns and relationships found in the periodic table, including valency	Valency - Inappropriate level for understanding	Reactivity across PT metals/non metals – observations MOVE valency to stage 5/6
Explain how observations made possible by new technologies have led to a more detailed understanding of atomic structure	Hidden content or error? Move to stage 5	Foot note 39 – Scanning electron microscopes (SEM) to observe topography; alpha and beta particle detectors revealing that atoms are mostly empty space. Stage 5
Describe the elemental composition of the Earth, and one or more other planets	Move to Geological Change	Addition to rocks – leads into minerals once PT has been taught
Undertake experiments to identify the indicators of physical and chemical changes 47 ▪		Needs to be taught before respiration/photosynthesis
Describe in written texts the changes that take place in a chemical reaction, including initial and final observations, and word equations 48		
FA4 Solutions and Mixtures Dot point 2	Phase changes unnecessary for stage 4	Use change of state.
FA4 Solutions	Solubility is stage 6	Remove the dot point on measuring solubility

	Example 21		Old fashioned. Dataloggers are better for this now.
Stage 5	First point in Focus area – Materials - Explain how the first elements were formed after the Big Bang <ul style="list-style-type: none"> Investigate and outline how minerals and resources are used in Australia⁷⁸ Explain how Aboriginal and/or Torres Strait Islander Peoples used resin for a wide range of purposes⁷⁹ Evaluate in a written text the environmental impact of extracting and using a named resource 	Move to more relevant sections Needs more detail	Would flow into Focus area Materials in context Could be elaborated to include a link to natural resources found in the universe and planet Earth.
	There are many types of simple organic molecules – what is the cut off? Is it matched to the ones mentioned in the data book.	Link to data book	A footnote to outline the main ones required.
	Plastics: identify the raw materials used to make plastics	Add	Maybe footnote the raw materials to use plastic
	Reaction Chemistry Chemical reactions	Link to Data book	Common compounds, reaction types, pH indicators etc Indicate the use of solubility tables and activity series of metals in the syllabus, not just the data book
	Nuclear decay reactions	missing	Put the alpha and beta decay equations in the examples

	Amercium is miss spelt in examples 114	error	Americium
	FA Materials: resources	What is the connection between these dot points. Big bang, minerals, resins and evaluating the impact of extract resources.	These would sit better in other places
	FA: material Chemical reactions	Are we only doing combustion reactions? Where are the others? Only neutralisation.	Where are the acid + metal, acid + carbonate and decomposition reactions? Doing more at a lower level is better than doing 2 at such a deep level.
	Environmental sustainability: impacts of present day climate	We are doing pH but we haven't introduced acids and bases (do neutralisation later in reaction chemistry)	
	FA Reaction chemistry	Balanced chemical equations with states	Students currently struggle with word equations for the reactions we do in the current syllabus. Stage 6 only

Overall Feedback

Stage 4 is general well liked. We are worried about timing for year 10 Reaction Chemistry and nuclear reactions time wise. We are also concerned about the creep down from stage 6 rather than the preparation for stage 6.

Physics

Stage	Item	Issue	Recommendations
Stage 4	Focus Area 'Observing the universe'	Inappropriate context	Astronomy was requested to be reinstated and this effort is underwhelming. The nature and practice is not best suited here. The N&P should be throughout all Focus Areas not in one only.
	This FA could not be programmed as an engaging contextual unit of work.	The direction of the FA is not about the universe, it is about the nature and practice of science with a scattering of astronomy,	It is looking at everything and does not have a particular direction. The FA should be an authentic context of astronomy as there is a significant need for this topic to deliberately counteract so many misconceptions explicitly.
	Telescopes would be needed for 'Practice of science' dot point 3	Equity issue for schools	Observations made with senses is primary skill.
	Why are there biology examples and microscopes in the examples Example Pt 2	Multidisciplinary issues	Confusing for students.
			Give us a definition of precision, accuracy, reliability and validity for both secondary and primary research
			Have 'seasons' in secondary ONLY NOT in primary
	Big numbers of astronomy must go into the data science but with a more interesting title.	Data science will get lost unless it has a context to carry it,	Link astronomy with data science instead and change 'data science' to 'observing the universe.'

	Outline why – Nature of science dot point 3	Wording	Outline examples of situations of science resulting from collaboration and building on others. Need example.
	Nature of science – dot point 5. What does this point mean?	Incorrect Unknown what this means.	Does not make sense. Reword to ‘explore images of the planets against the background stars across time. Does this mean retrograde motion or different orbital velocities and length of year. If so, it would be better in data science. If not, ??? Move to ‘practice of science’.
			This FA is missing all the interesting and contemporary topics that engage stage 4 students.
	As an Interdisciplinary FA it would need to have a name change.		Make it more like the other FA and spread the N&P across all FA.
	FA 2		
	Why name one example in the heading	change	Just call it Forces.
	Are machines still relevant?		
	Forces in Action: Dot point 3	Error – remove.	Energy is the ability to do work. This is a stage 6 concept.
	Cultural knowledge	Why just weather and stars there is so much more that Aboriginal and Torres Islander people did about observing the universe.	Include seasonal calendars, space objects other than stars

	Force diagrams	Are these free body diagrams? Should they include magnitude and direction or just direction	Be more explicit about the details required in the force diagram.
	Example 7 mentions electrical	Where is the electrical field get taught does this refer back to electro-static force . This is hidden content.	Use consistent words please
	barcycentre	Why over-complicate	Use the word centre of gravity
	Magnetosphere	This is a bit random. Do we need to teach the rest of the atmosphere. Is this hidden content?	Can we have other common everyday uses of magnets. Which can also link with simple machines.
	Machines seems tacked on	Does it need to be there?	It can go if you looking for something to cut
	Forces and magnetism in context	Also feels forced	Make this part of the content.
	FA3 Change – Energy transfers Use representations to illustrate energy transformations including how radiant energy from the sun creates wind and solar energy on Earth, which can then be transformed to electricity in the home	What does this actually mean? Is it even correct.	This should be removed or simplified
	Testable prediction	What is this? Is it a new word?	A hypothesis is a testable statement that can be shown to be correct or not depending on the evidence. A prediction is a statement about what might happen.

Stage 5	FA 'Waves and Motion dot point Talks about F, m & a without spelling out conduct an experiment for Newton's 2 nd Law	Unnecessary vagueness – goes against approach explicit content	Classic differentiation. Not needed for core students.
	Seven equations in the syllabus Speed, acceleration, waves speed ohmn's law, density,		
	Waves Dot point 2	Reword an incorrect statement	<i>"Use the wave model to explain how the energy is transferred without the net transfer of particles."</i>
	Waves	Error	EM waves are transverse waves. Add a statement <i>"Compare the different wave forms of the EMS"</i> .
	Waves	Incomplete	Describe the features of waves, including frequency, period, speed, wavelength and amplitude. Add scattering to an example of behaviour of waves
	Programming will be problematic	Duplication of ideas	Separating waves, from sound light causes duplication of ideas
	Change Waves title		New title: Common properties of waves (This will prevent the duplication of ideas.)
	Only males can play didgeridoo	This is cultural insensitive and tokenistic. It is not sensible to cover this here.	Remove or add a warning of cultural significant. Change to be a generic 'investigate and.....on the transfer of sound energy in musical an

			communication instruments e.g. Aboriginal and Torres Strait islander, other cultures,. Why use emu caller?
	Light waves	Did dot point 1 require the brain's involvement?	Remove the word 'response'.
	Motion dot point Vector analysis	Remove	
	Valid and reliable data?	Why not accurate and precision as well	The is a hang-over from the last syllabus. Can we add accurate or remove reliable. To be valid, your experiment needs to be both reliable and accurate.
	Energy	Is pretty good. Fills some gaps	
	Vector analysis	Where is the parallel content in maths syllabus? The reintroduction of a mathematical quantitative approach is good however, vectors are a step too far	This is very difficult, will students have the maths for this – does this need to be there. Stage 6
	Light waves	What level. This is a revisit of Stage 2 Science	What sets this apart from the stage 2 content?

Overall Feedback

- The WS skills outcomes identified at the top are good and help teachers and should be used in K-6 as well.
- Focus Area 1 needs significant work
- Incorrect symbols for density, and volume in Chem stage 4 which will cause an issue for velocity/speed equation.

- A lot of incorrect science in Waves and Motion.
- Move some content back to stage 6
- Positioning Energy as first topic in Year 9 and Waves and motion as 2nd last topic in year 10, will create challenges for senior subject selection for Year 11 and may hinder senior physics selection in the future.
- Maybe the more advanced content can be there but as non-mandatory advanced content. Bring back additional content! The syllabus should be about the bare minimum with suggestions for more.

Biology

Stage	Item	Issue	Recommendations
Stage 4	Body systems - Clarity regarding 'compare rep. Of organ sys. To communicate inputs etc'	Error	Compare 'models' of organ systems to communicate etc
	Ecosystems – inv factors leading to species extinction etc	Equity	Clarity over GEO syllabus
	Cells & classification – local habitat	Error	What constitutes local? I.e. school suburb?
	Cells – draw single-celled organisms observed under a microscope; conduct investigation using prepared slides	Equity	Ensure images / online-versions are available on the chance that some schools may not have sufficient resources; I.e. even a simulation that could aid in meeting this outcome
	Cells – conduct & document a prac using established types of text + text structures	Error -Inappropriate wording	Add clarity – is this saying 'conduct and document a scientific report (according to convention)?'

	FA1 – Body systems	Can't talk about multicellular until after teaching about cells.	Dot point 1 – change to ' <i>investigate the role, structure and function of ... in maintaining a human as a functioning organism.</i>
	FA1 Plant systems	Cells again	Dot point 2 and 3 – remove mention of cells and multicellular.
	FA3 Ecosystems	Ecological food pyramids	Did you mean biomass and energy pyramids?
	Example 19		Thylacine is not the best example
	FA Cells and classification Classification of plants and animals	This content needs to be moved	DP1 - should be in Living systems. DP2 – remove name and ... DP 8 Traditional Aboriginal Peoples classify...
	FA Cells and classification Cells		Remove 'bacteria from DP 9 because school microscopes are not strong enough to see them easily, DP3 – the principles of a chemical reactions have not been taught until stage 5.
Stage 5	Disease - Conduct a 1 st hand inv to determine organism response to stimuli	Unclear	What are the examples that are being expected in terms of stimuli + response?
	Examine feedback loops as a way of managing a changing environment	Error – unclear. Stage 6	Internal v external environment? Perhaps examine feedback loops, such as temp regulation, as a way of managing changing environment
	Infectious & non-infectious – use modelling techniques to show how infectious diseases can be spread	Error – clarify Currently stage 6	provide examples of modelling techniques that are appropriate + specify does 'use' mean conduct a practical? Or does it mean 'interact with'

Disease in context – example given ‘spray on skin’ is not an example of addressing a disease / disorder – this was a response to physical trauma (burns)	Error – terminology	Examples sought after should address diseases (non-infectious + infectious) <i>not</i> disorder as it is different to disease. <i>Please add more examples to show the breadth of Australian advances.</i>
DNA structure & function – relate DNA double helix structure to its function	Error – clarify	Examples given seem to be slightly off the mainstream function of DNA double helix – which could be argued as efficiency in space. <i>Explore the structure of DNA and relate this structure to its function</i>
Identify the causes and possible outcomes of DNA mutation, including cancer and heritable genetic variation	Clarity/depth	Identify that DNA can change by a process called mutation to create genetic variants that can be passed on.
Variation & inheritance – outline connections between geno/pheno types, using mono + multifactorial examples	Error – terminology	Outline how genes and traits are connected, giving both monogenic and multifactorial examples from plants and animals
Genetic technologies – genetical technology includes what?	Error - terminology	Define genetic technology w/examples - do <i>xenographs</i> count for example? -Define genetic technologies as_____ - Discuss examples of current and emerging genetic technologies being used in conservation, agriculture, industry and medicine

	Evolution + evidence of natural selection: ID + discuss recordings of aboriginal and/or torres strait islander peoples	Equity	Provide ample examples to ensure teaching is not tokenistic or limited
	Evolution + evidence of natural selection: explain why an understanding of the origins of species is important	Error	<i>Evolution is not an origin of species theory rather an explanation of continuation / change of species over time – drop this last part so it's not included.</i>

Overall Feedback

Too dense – genuinely impossible to address all adequately and with sufficient depth; enjoyable concepts to teach – wanting to consider what sufficient depth looks like

Is there geography overlap? p47

Data Science

Stage	Item	Issue	Recommendations
Stage 4	Examine the digital footprint created by different online activities to recognise the importance of engaging safely with digital technologies		Cyber safety (while important) should not be conflated with data science.
	Examine a range of sources of data and their applications	Unclear	This is too broad, and refers to all of science, not just data science.

	Scientific models	Disconnect	The definition of modelling used here is not consistent with how it is used throughout stage 4.
	Identify data and observations used by scientists for the development of the Big Bang Theory model and Outline how astronomers develop workable theories about how the Universe came to be	Inappropriate stage – students need more background knowledge to understand data about the development of the Big Bang Theory and Universe theories	Need simple computational models to introduce this concept, connected to content that can be more easily conceptualised rather than complex applications like big bang and climate
	Collecting, using and analysing datasets	Skills only	These are great outcomes for a depth study but shouldn't be treated as content descriptors. This content directly replicates the skills outcomes without applying it to a context or topic.
	Data science in context Create a model that can be used to explain an observable phenomenon	Too vague	This outcome is already covered in every stage 4 module (eg model of atom, plant structures, etc)
	Investigating questions and claims		Repeats skills outcomes without applying to context. Again, good for a depth study, but need to specify this.

	Pseudoscience	disconnect	This does not connect with the content before or after it. The examples given relate to multiple disciplines without connection to those topics.
Stage 5			
	Large datasets and scientific argumentation	Skills based content	This is a repeat of skills outcomes and should be incorporated into other content areas or isolated as specific guidance for a depth study.
	Conduct a univariate and bivariate analysis of a large dataset	Inappropriate	This is difficult to differentiate on its own. Better incorporated into other content (eg looking at trends and relationships in epidemiological data for disease unit)
	Data science 2 in context	Repetitive	This outcome should be addressed across the whole syllabus.

Overall Feedback

- Both Data Science modules lack grounding in content. These are really skills outcomes. They should be incorporated into other modules or depth study not taught as content.
- Data Science content is a good idea but, teachers need a specific context and more content related outcomes. Many of the outcomes in the focus area are skill outcomes which are broad and vague, and this will confuse teachers in how to teach it.
- In the Skill outcomes, data was contextualised in a different way compared with this focus area which can create confusion in how to teach using the content.
- They could be used for depth study but would need to remove the astronomy content as this would be confusing. But it adds a lot of additional restrictions to the shape of student research projects, which are already difficult for teachers to tailor to their cohort.

- Both Data Science focus areas are not equitable for all the students, many students with learning difficulties are going to struggle to access the content and it is going to be very difficult to teachers to differentiate for those students as well. Programming to cater for a range of students is going to be very difficult for teachers.
- ITE does not cover data science, and so including entire modules like this means that teachers are needing to re-conceptualise these skills. However, these introductory data science skills are already integrated into teacher’s concepts of other units, and would be more appropriately addressed in those contexts.

EES

Stage	Item	Issue	Recommendations
Stage 4	Focus area – Change Geological change Describe Aboriginal and/or Torres Strait Islander Cultural accounts that provide evidence of earthquakes and volcanoes	No other content mentioned in the subgroup is related to this content	Needs to have another content statement specific on volcanoes and earthquakes.
	Use the rock cycle to explain the geological processes that lead to the formation and transformation of different types of rocks		Specify if the geological process is a physical or chemical changes and the energy transfer in those processes
Stage 5	Identify the principles and goals of sustainability		Needs clear examples for the teachers, different parts of the world those principles are different according to their own interest

	<p>Evaluate the relationship between human activity and global temperatures, including their rate of increase and current level AND Consider evidence of how human activity is causing global temperatures to rise higher and faster than at any time known in the past</p>	<p>Repetitive content but it was paraphrased?</p>	<p>Needs only one clear statement</p>
	<p>Identify pH as the measure of acidity and compare the pH of a range of common substances to pure water⁹¹</p>		<p>Better in the chemistry focus areas than here</p>

Overall Feedback

The focus area seems to have a good flow of ideas and concepts. It needs more examples and links for the teachers.

Concluding comments

Based on STANSW's analysis, although the K-6 Science and Technology syllabus demonstrates a commendable focus on 'doing' while learning and the application of scientific principles to real-world problems, there are a number of areas that require clarification and refinement, notably in content presentation, the development of skills across stages, and specific terminologies. There is a need for continuous training and professional development for educators to facilitate the syllabus implementation, alongside a support document that clearly outlines assessment guidance, working scientifically processes, and explicit vocabulary to be integrated throughout the syllabus.



In terms of the 7-10 Science Syllabus, there are several errors and concerns that remain. The proposed content will not be accessible to all students, and this approach could potentially alienate a significant proportion of students, leaving them overwhelmed by the cognitive load or dissuaded from pursuing science in senior years. Concerns also remain about the conceptual flow and possible overlap with other subjects. It's evident that the placement of certain topics needs reevaluation to ensure coherence and progression in learning.

In summary, further work is necessary in order to develop a second draft of the K-6 syllabus, and a third draft of the 7-10 syllabus. It is important to get the syllabuses right before they are implemented, and to provide appropriate time for consultation; A two-week period was not enough for the 7-10 syllabus, and several of our members have commented on the inadequacy of this consultation period.

STANSW welcomes the opportunity to work in partnership with NESA to continue to advise and contribute to the syllabuses and their successful implementation.