

Specific suggestions put forward in the Questionnaire responses

For each of the following suggestions, indicate whether you think it should be C (Clarified), I (Ignored), or (Changed). Add notes if you like. Please return your appraisal to me and we will collate for our F2F hui.

		C-I-△
<p>Q2: The relationship with te ao Māori section makes it clear how Science and mātauranga Pūtaiao are related.</p>	<p>statements throughout, especially the Big Ideas, such as '...thus enabling their participation in society'...should be 'society and the environment'. This would bring mātauranga Pūtaiao right up into the heart of the big ideas.</p>	
	<p>I think a diagrammatic representation may be helpful here - for example how does "science" fit into a te ao Māori perspective?</p>	
<p>(LM=learning matrix)</p>	<p>In LM under subheading of What does this look like at Curriculum Level 6? is the statement "...students begin to understand the nature of mātauranga Pūtaiao and the nature of Science.". Do they 'begin' to do this at Level 6? - should have begun this at Level 1/2. - word needs to change to better reflect the 11 years of learning and making meaning that has gone before. This level is potentially the last level of learning for many students as a significant proportion of Y11 students will not elect specialist sciences in Level 7+. This word needs to describe more than the beginning.</p>	
<p>Q3: The introduction to the Learning Matrix explains its structure and how it can be used.</p>	<p>Big Ideas and the Matrix are written as outcome descriptors, indicated by verbs "investigating", communicating etc. Reword these???</p>	
<p>Q4: Big Idea 1 - Investigating in Science reflects a Big Idea of Science at Level 6 of the New Zealand Curriculum.</p>	<p>If the expectation in this Big Idea is that the Mātauranga Pūtaiao AND science is used to generate and evaluate knowledge, then it must also be a stated expectation in the AS 1.1. Standard uses "MAY" whereas LM uses "AND" – need to clarify that the idea is inclusive but assessment is not? TF</p>	
	<p>"the rigour of the evidence generated. All steps are important to ensure the findings of an investigation are robust and fit for purpose" is above level 6 and language is inappropriate. To evaluate the rigour of the evidence involves a lot of statistical analysis and is beyond L6. Use reliability or accuracy - such words are better aligned with the terminology used in the science field.</p>	
	<p>The lack of the word 'practical' in the title</p>	
<p>Q5: Big Idea 2 - Use Science to engage in real world issues reflects a Big Idea of Science at Level 6 of the New Zealand Curriculum.</p>	<p>definition of "engage"... It would easily be better if there was an option for an action, and if that option was taken, that action then to be critiqued. But if there was no action taken (and that's just fine any many circumstances) then an explanation of why.</p>	
	<p>resist the 'creep downwards' of topics. e.g. Climate change, ocean acidification - best done at L2 or L3. Once over lightly at L1 of some topics can often desensitise students to the complexities at L2 or L3. - make sure that there are lists of topics that are L1 appropriate. -make sure that students learn how to effectively decode useful</p>	

	diagrams, data and images and that they can relate these to what they are learning.	
	The phrasing "evidence based opinion" needs to be changed, the wording in the curriculum is better - "evidence based conclusion".	
Q6: Big Idea 3 - Science as a Human Endeavour reflects a Big Idea of Science at Level 6 of the New Zealand Curriculum.	The statement: "Developments in culture, history, technology, and philosophical viewpoints have changed what science can explain" should be flipped to say: "that scientific explanations can change cultural, historical, technological, and philosophical viewpoints"	
Q8: The Knowledge Big Ideas from the contextual strands (in the column on the left of the Learning Matrix) reflects the important "content" of Science at Level 6 of the New Zealand Curriculum.	the label "Knowledge Big Ideas" is only explained/used once in the pre-amble to the Matrix. Use this more consistently in the document instead of trying to work out the difference between OF and ABOUT. <i>Implement this. TF</i>	
	Why not put the AO's at the tops of each column and then an explanation of them. Experienced teachers have been using the AO's for years and the explanations could be used to further expand the intention. This ensures that the matrix aligns with NZC, keeps language consistent, and reduces the issue of teachers having to compare two documents to try and understand what is being asked of us to teach students. <i>Clarify that this is instead of the AOs? TF</i>	
	need a comprehensive set of concept statements for each of the four "content" strands if we are to really be able to say that we have established the Significant Learning for science at Level 6.	
	I like the Material World linked Big Idea of Matter because the points underneath it have an underlying theme directly related to the Big Idea title in bold moving from observations at a macroscopic level to a microscopic level. This is a fundamental skill in Material World endeavors. The teacher can design learning experiences that revisit these ideas over and over throughout the year no matter what the context. This will give students many opportunities to develop a deep understanding of this significant learning. Long has research on memory, learning, and understanding told us that this is the best way to encourage long-term memory, deep understanding, and fewer misconceptions in learners. The other Big Ideas are so detailed that teachers will only design learning experiences giving students one opportunity to make meaning. Students will be forced to rote learn, teachers will complain that even though students passed the standard, they don't remember anything going into the next year and that they never have time to actually get into learning, revisit it, and find misconceptions, let alone address them.	
Living World:	The focus seems to be solely on genetics. Missing life processes and wider ecology. Ecology feels like it would be important in Mātauranga Pūtaiao.	
	'At the population level, process of evolution drives the diversity of life' is a statement in one of these big ideas. Evolution ONLY operates on individuals! NOTHING 'drives the diversity of life' - diversity just is.	
	Specifically to do with living sciences - there is no mention of life processes within the matrix however is one of the 3 key bullet	

	<p>points within the NZC. Instead the statement all living things are interconnected has been stated to be about genetics. The term interrelated is itself better used regarding ecosystems and the interactions between species. Instead the first section should be something like all living things have similarities. This is an important aspect of the NZC as it allows students to understand how living things survive and therefore often allows them to understand how their own bodies work. Also if students don't understand the process of photosynthesis for example, then they cannot understand the threat of deforestation to other species or the role plants can play in carbon fixation. The heavy focus on genetics seems to reflect the L1 genetics external rather than reflecting the NZC which places genetics under evolution. Therefore genetics and evolution aspects should be simplified under one heading within the matrix to better align to the NZC</p>	
	<p>Biology examples focus on content that has typically been above L6, for example discussing selective breeding or genetic manipulation has previously been NCEA L3 content. I do not believe that these topics could be done well enough, clearly or simplified without causing significant misconceptions to facilitate learning. Therefore the examples need to be re-written to ensure they align with the NZC and provide teachers with proper guidance of the appropriate learning that could take place as there are no longer content assessments that would provide an indication of the appropriate level of learning.</p>	
	<p>an understanding of life process and ecology is extremely important in Mātauranga Pūtaiao, and can be seen in both kaitiakitanga and tikanga. Examples include: how the tikanga of harvesting harakeke relates to the life process of the plant; Iwi resource management for things like eeling, and how it relates to the life process of the eels, and their role in the ecosystem. These contexts are probably some of the richest areas for exploring Mātauranga Pūtaiao. Also, most pseudoscience in the health and wellness sector relate to a misunderstanding of life processes (eg. Detox diets).</p>	
Material World:	<p>needs to go into more depth. There seems to be a misalignment between the main contextual idea (all matter is made of particles), and the examples given. Dyes sound like a cool context, but the chemistry of dyes is more complex than what I would think to look at for L6. Same with the chemistry and toxicology of 1080. I think the kaimoana example is good. Ernest Rutherford's contribution to the model of the atom would be a good one to include as well (not Mātauranga Pūtaiao, but NZ related).</p>	
	<p>This seems too simplified. Matter is made up of v. small particles is L3-4 of the curriculum, not L6. I also feel like this is the harder strand to link with Mātauranga Pūtaiao, would be good to have more examples of this as the ones mentioned are not super inspiring to me.</p>	
	<p>not too sure how a L1 student could understand the chemistry of 1080? - apart from its solubility perhaps.</p>	
Physical World	<p>I commend that there is one bolded significant learning and suggest that it is kept. All under it should go! Again, it is a very specialist list better placed in a specialist course NCEA Level 2+. It is a very western/reductionist list of items to learn rather than concepts to understand. None of the small font lists under this Big Idea encourage the exploration of energy in our universe or exploration of energy transformation and transferal in multiple</p>	

	<p>contexts because the contexts are very specifically listed eg. doing work, heat energy, wave motion. I suggest replacing the small font list with a description that encourages students to explore energy 'trends' (from Level 6 AOs in NZC), its transformation, and transferal in many different parts of our universe and planet with many forms of energy, not just waves, and heat. This will allow a more inclusive approach of Mātauranga Pūtaiao and other knowledge systems and open opportunities for students to explore energy in many more contexts such as chemical, biological, our Solar System, and Earth's climatic systems as well as physical systems.</p>	
	<p>I never liked how this was written in the NZC. The matrix seems to be missing electricity, magnetism, and atomic physics.</p>	
	<p>Change the language used - A FORCE is required to do work! (Work done is the energy transformed/transferred)</p>	
	<p>The physics is a bit if a mashup. This could be properly integrated - eg: by linking force and energy by noting that work is the transformation or transfer of energy. But really, most of these ideas (as expressed) are below level 6 and will have been taught in Y9 or Y10.</p>	
	<p>The big bang is not mentioned - this is certainly a big idea of science!! earth sciences - it is completely missing anything relevant to Investigate the external and internal processes that shape and change the surface features of New Zealand. This is extremely relevant, i.e. white island eruption, coastal erosion, kaitiakitanga</p>	
	<p>needs to look at more than just energy. Most teachers teaching L6 will not be physicists, so it is important to break this down in a way that it is easy for us bio and chem trained teachers to understand.</p>	
	<p>Deciding which "content" is most important is absolutely essential. It is not enough to put out airy statements about conservation and transformation of energy, for example. The SEG must now do the much harder work of thinking through the key content and concept students must learn</p>	
PE&B	<p>I think everything from the NZC is covered in this one, but it is not super clear. Does it need to be simplified to two? or can we keep the three aspects listed in the NZC?</p>	
	<p>Universe - missing anything about universe changing over time. This is not in the curriculum at level 6. - could say 'Space systems have an effect on earth systems'. this is good for Mātauranga Pūtaiao - good connectedness</p>	
	<p>There is nothing in there about the broader universe, or how Earth affects the Sun and Moon or how the Sun and Moon affect the Earth in other ways. If you wish to focus the changes in the universe to a 'local' context, I understand why Earth is the focus, but I suggest opening this to include how Earth affects the Sun and Moon and to ways, the Sun and Moon affect Earth in general, both physically and biologically. That will fit better with the generalist nature of NCEA Level 1 and enable ideas from Mātauranga Pūtaiao eg. mahinga kai species migrations being affected by Sun and Moon.</p>	
Q11: Please comment on how the Learning Matrix could be improved.	<p>If Mātauranga Pūtaiao is important to incorporate, surely it should be included specifically in the Big Ideas for the Material World and Physical World. At the moment it is only specifically mentioned in The Living World and Planet Earth and Beyond Big Ideas.</p>	

	Some content needs to be compulsory nationwide. <i>Need to clarify our expectation that it is all covered somewhere before the end of Year 11 TF</i>	
	I would like if the Knowledge Big Ideas were easier to pick out - formatting	
	...click on some parts of the learning matrix to see how they all connect to a 'unit' of work. Most teachers have not considered a curriculum like this, as they teach through content alone, and so some exemplars would be useful <i>Something to think about later on when LM goes onto new website and hyperlinks to resources (such as SLH) are feasible TF</i>	
Q13: The internal and external modes allocated to each standard are appropriate for the key outcomes in that standard.	interesting to see a comment that assessment will not privilege those with literacy skills yet four reports are required. Further examples showing options besides writing might help teachers veer away from writing-intensive assessments.	
	retain some sort of external examination / modular test that is stand across the country.	
	a return to the NOS strands and have some content in the externals mixed in with something like what English has with unfamiliar text. Students can evaluate the text scientifically using their understanding of science.	
Science Achievement Standard 1.1 – Use a range of scientific investigative approaches		
Q15: The Title provides a general summary of the requirements for this standard.	Need the word “practical” in the title	
Q16: The Achievement Criteria sufficiently specify the requirements for the award of each grade.	The standard would benefit from having clearer requirements for what each investigative approach needs in terms of conventions, process, the types of questions it can answer, and the kinds of evidence collected. <i>These will be in the TLAG TF</i>	
	would prefer to see: Merit: Use and explain a range of scientific investigative approaches Excellence: Use, explain and evaluate a range of scientific investigative approaches	
	How many investigations constitute a range? (2, 3, 4 or 5? - does 2 fair test and 2 pattern seeking count?) Do all need to be linked to a single context? What if they do one really poorly but three others really well? What if students move schools? <i>Clarify and advise? TF</i>	
Q17: The Explanatory Notes clarify and explain the standard.	Some further guidance around the processing of data would be helpful viz acceptable number of repeats acceptable number of data points treatment of rogues linear or curved data terminology around variable control suitable graph formats use of software for graphing use of simulations to gather data.....	
	Scientific conventions might be better defined	

	More specificity in types of methods available for assessment would be useful, including specific examples.	
	A requirement for an investigation to be related to a level 6 content AO should be included.	
	If the expectation in the Big Idea is that the Mātauranga Pūtaiao AND science is used to generate and evaluate knowledge, then it must also be a stated expectation in the AS 1.1.	
Q19: The possible contexts and activities for teaching and assessment are appropriate for exemplifying this AS.	Many of the contexts are too complex. For example, ocean acidification at NCEA level 1 will be very simplistic as they haven't even started equilibrium yet.	
Q20: Please provide some suggestions that might be useful for the Subject Expert Group (SEG) in further developing internal assessment activities for this standard.	<p>One question could be used for 1.1 and 1.2 (presumably you can do both at once). E.g. Which is better for antibiotic use- manuka honey or standard antibiotics?</p> <p>Could involve fair testing with agar plates</p> <p>Investigation of water use for the growth of trees/production of honey c.f. production of penicillin as well as total energy costs.</p> <p>Observation of concentration vs effect</p> <p>Creation of questionnaire and data collection of prevalence of use in student population including compliance questions re finishing a course of treatment</p> <p>Researching views held in the community about each type of treatment</p> <p>Researching antibiotic resistance of each treatment</p> <p>Another possible context could be pattern seeking in terms of succession, stratification or zonation - similar to the L2 Bio Ecology internal. This could be linked to issues such as sand dune erosion or rocky shore degradation due to climate change.</p>	
	You have used an exemplar for 1.1 that is a significant real world issue and then another world issue for 1.2. I suggest using an exemplar for 1.1 that is not an environmental issue but a more focused scientific one.	
	It might be beneficial to point out different places that external engagement (e.g. community groups, iwi, scientific organisations) might be beneficial to the activity.	
	If you are going to supply exemplars can I suggest you do NOT use an NZ context. If for example, you use the 1080 debate, then schools that would naturally use that context may be unable to because it's the exemplar. If you were to give an Australian exemplar such as the causes and consequences of the recent/current bush fires then we can see appropriate work in a fairly familiar situation without losing opportunities to engage students. Another option is to do something really obscure or extremely site specific - eg Auckland Islands for a context.	
	Find a way to get the least obvious areas within the context strands to fit the standard to show how flexible it really is. Try and make assessment examples that include the newer additions (eg applying a mātauranga Māori framework) as people won't be sure of what you mean by this.	
	Make sure there are examples for schools that are not living on the coastline. Give ideas for investigations that can be carried out in field trips or school grounds that do not require extra funding. Be good for schools to have data base of organisations that will help them set up real life investigations so that students know that their	

	investigations may contribute to something more than just credits? State of environment reports and citizen science projects?	
	Clarify where group assessment might be feasible and valid here	
Science Achievement Standard 1.2 – Explore a real-world issue and devise a local, science-informed action.		
Q21: The Title provides a general summary of the requirements for this standard.	Many real world issues don't have a local science informed action. If you want people to go for this we need a list of, say, 20 examples that will work anywhere in NZ, not just towns with industry or universities or an iwi that wants to be involved with a school. <i>Need exemplification to show what local impact might look like for some big issues. TF</i>	
Q22: Achievement Criteria sufficiently specify the requirements for the award of each grade.	“Evaluate a real-world issue and devise a local, science-informed action.” - implies that the evaluation/justification is on the issue whereas the explanatory notes say they should be justifying the action. It would make more sense to say “Analyse a real-world issue and devise and evaluate a local, science-informed action.”.	
	Possible alternate wording: Achievement - Describe fully a real-world issue and devise a local science-informed action	
	so, do they actually have to carry out the action or, like the title suggests, do they just have to come up with (devise) the action.	
	What's the difference between 'identifying' and 'examining'? What does the difference look like in explaining compared to justifying?	
Q23: The Explanatory Notes clarify and explain the standard.	Explanatory note 1, bullet point 6, explaining the action taken... should be explaining how the suggested action links to the scientific evidence. <i>This would bring in use of content knowledge to explain phenomenon ☺TF</i>	
	This assessment is just social studies camouflaged as Science. Make it actual evidence based, concept acquiring, real world phenomenon explaining, science.	
	Why is an action is needed? Why could students not report on the issue, the science behind it, and the scientific merits of the various perspectives involved without needing to tack on an action at the end? The focus on taking action places too much burden on our students and on teachers. The “action” seems like it is shoe-horned in.	
Q25: The possible contexts and activities for teaching and assessment are appropriate for exemplifying this standard.	Use conceptually smaller topics rather than a larger one e.g. rather than the big plastic pollution in the ocean - just stick to microfibres or microbeads. There are many facets to this topic - why doesn't plastic break down, why can't it be easily recycled, how does it get from the land to the middle of the ocean, how do microbeads and microfibres affect food chains, why are so many seabirds dying etc etc.	
	Examples for teachers on what sort of actions that could be taken would be good.	
	Should have contexts with emphasis on the Physical and Material Worlds as well.	
Q26: Suggestions that might be useful for the SEG in further developing internal assessment activities for this standard.	On page 29 in the top paragraph there is a specific requirement for the action's explanation to include the point of view or perspective of mātauranga Pūtaiao. While leaving the option open is entirely appropriate. Requiring this is wrong. It is dependent on the context, student's world view and situation. INSERT “WHICH MAY INCLUDE...”	
	Change them to read: applying a comprehensive understanding of XX to inform an action related to a real world issue...	

	Try to find an issue that isn't commonly used for the second possible activity. If diabetes was to be continued with, then the focus could better go onto kidney function to allow teachers to continue to teach the content of the 'Life-Processes' assessment. Vaping and lung health is important. What about 'borrowing' from the current Life-Processes assessment and do something on movement and sports injuries? This was recently highlighted in the news with basketball having a massive increase in injuries.	
	teachers, especially new ones, need clarification about the boundary between 'helping' and giving too much help - Teachers will often give less help rather than too much because they are worried that they are giving away answers - okay for the teacher to give good relevant background before assessment is started. How much scaffolding is appropriate?	
Science Achievement Standard 1.3 - Describe attributes of Science that contribute to the development of scientific ideas and processes.		
Q27: The Title provides a general summary of the requirements for this standard.	AS 1.3 name is overwhelming. The choice of wording seems over-complicated, and unnecessarily confusing, particularly the use of the word attributes and scientific processes. Are you just asking students to describe how a historic science idea was formed? <i>Clarify TF</i>	
Q28: The Achievement Criteria sufficiently specify the requirements for the award of each grade.	The phrase 'attributes of Science' initially seems great and I get the idea here. You want these three statements to be pithy and say what is needed but then you list in Ex Note 2 the three kinds of attributes: people engaging in science, science, and mātauranga pūtaiao. One of the listed kinds of attributes is called science and so the achievement criteria only refer to this one kind. Somehow, it would be good for the wording to reflect that students need to draw from all the attributes of science. Perhaps the Expl Note might read "Attributes of Science include the following 3 categories: attributes of people engaging in science, attributes of mātauranga pūtaiao, and attributes of western science". These 3 categories would be followed by their bullet points as you already have.	
Q29: The Explanatory Notes clarify and explain the standard.	Good exemplars will be needed for this standard because students may understand how to do a linear 'development' but will need exemplars of the connecting 'attributes'. The rationale helps for the why but not the how.	
Q30: The Mode of Assessment (internal/external) is appropriate.	I would prefer to see it assessed by examination or CAT with resource material provided (the English unfamiliar texts standards may serve as a bit of a guide as to the intent of the exam). <i>NZQA feedback will help us here TF</i>	
	How will the student that can show this knowledge be penalized if they write in bullet points or as a flow diagram rather than sentences and paragraphs?	
	The concept of using multiple modes for assessment, such as video/podcast/oral presentation needs to be made clearer - the 'structured report' format doesn't imply that other modes of assessment beyond writing are available to students.	
Q31: Please provide some suggestions that might be useful for the SEG and NZQA in further developing external	This new AS 1.3 is so different from anything we've had previously. Some ideas might include: The development of mahinga kai knowledge in ancestral Māori peoples migrating to the new lands of Aotearoa through to modern times. Explore the changing understanding of nature of matter over time illustrating that scientific knowledge changes based on new	

assessment activities for this standard.	evidence and understandings eg: from Earth Wind Fire Water, to phlogiston, elements, atoms, subatomic particles etc Others: Discovery of DNA, Alan McDiarmid and electric plastics, Rutherford and the atom	
	Contexts involving the funding and politics of science would benefit from being explicitly referenced as possibilities. This standard would also allow for the role of international collaboration in Science and issues associated with publishing negative results to be addressed.	
	There should be a way of sharing case studies between schools/teachers, to build up a repository of appropriate level resources for teachers.	
Science Achievement Standard 1.4 - Interpret scientific claims in publicly communicated information.		
Q33: The Achievement Criteria sufficiently specify the requirements for the award of each grade.	In explanatory note 1, evaluating: Change to - Evaluating scientific claims in publicly communicated information ALSO involves (This will then include the requirements for Merit as well)	
Q34: The Explanatory Notes clarify and explain the standard.	The risk is run that students are distracted by pseudo-science and false claims and that they aren't getting the excellent grounding that will come from the other standards.	
	Perhaps Interpret could be distinguish/identify etc	
	In the rationale it states that both Science/mātauranga Pūtaiao and pseudoscience examples are expected, but this is not mentioned in the explanatory notes.	
	explanatory note 1, bullet 6 - what does it mean to "make a judgement about the claims" not clear what is expected there.	
Q35: The Mode of Assessment (internal/external) suggested for this achievement standard is appropriate for the standard.	Maybe if it was a load of supplied data and students were to interpret it - answer questions - analyse it... But NOT in current proposed format. One way to make this fit better as an external would be to include some content knowledge questions with short and medium length answers AND an unfamiliar text that students need to analyse.	
Q36: Please provide some suggestions that might be useful for the SEG and NZQA in further developing external assessment activities for this standard	This assessment seems similar the English assessment 90854 (Form personal responses to independently read texts, supported by evidence), with a science context. Obviously we are not looking for a personal response in this assessment, but a scientifically justified one. This English assessment is worth four credits, and requires 6 written responses over the course of a year (as well as reading at least 2 novels). 6 credits to read and respond to 3 pieces of science communication seems too much. Should be 4 credits, and give more credits to science 1.2.	
	Some possible activities might include the following contexts: The information available to public on the recent Wuhan Palm oil production and the uses of palm oil Why Rahui is placed on some mahinga kai sites The energy efficiency of household appliances The 'Low Fat' label on foodstuffs	