What is a knowledge system?

Recorded webinar transcript

Dr Cathy Buntting

Ngā mihi nui, kia ora koutou katoa. It's wonderful to have you all here, joining us this afternoon.

My name is Cathy Bunting, and I'm the director of the Wilf Malcolm Institute of Educational Research at the University of Waikato, and also the very proud director of the Science Learning Hub. And it is my pleasure to introduce you to today's webinar and our guests, and to welcome you to this session today.

For those of you who are not familiar with Science Learning Hub, we're a vast, trustworthy, online resource, funded by New Zealand government to tell the stories of New Zealand Science.

Our resources are written for New Zealand teachers and students, but they are accessed internationally and by wider communities, well beyond the education sectors.

Today our focus is on, what is a knowledge system?

It's a concept that is becoming increasingly talked about. And Rosemary and Pauline, I really welcome you and thank you for the time you have spent thinking about this and preparing to share your thoughts with us today. I know that you both see yourselves as being on a learning journey, and I'd like to acknowledge you both for the learning you do and the way you share it, and also acknowledge our webinar participants.

Thank you for making the time in your day to spend time with us learning together. Many of you contributed really thoughtful and insightful questions when you registered, and I know that they've been part of Rose's and Pauline's thinking as they've put this webinar together, although they will probably tell you "this is just the start".

We've got an hour together, and we obviously can't talk about everything within that space. Because time is precious, I'm just going to hand straight over to you, Rose and Pauline. I am looking forward to this webinar, along with everyone else who has joined us today. Ngā mihi, ki a kōrua.

Pauline Waiti

Kia ora Cathy. Te kōrero tuatahi ka mihi tēnei ki a koutou mā kua tae mai nei ki tēnei hui ki te whakaronga ki ngā whakaaro o māua ko Rose. Ka rere ngā mihi ki a koutou, ki o koutou karangaranga maha. Ko te tāmanako ka noho pai koutou me ōu koutou whānau, haumaru ai ki tēnei wā o te Hōtoke, ko Hereturikōkā. Mēna kei kōnei rāua, he mihi tēnei hoki ki ngā mātanga e rua ko Dr Mere Roberts rāua ko Dr Georgina Stewart.

Ko rāua nei i pare i te huarahi o tēnei kaupapa, te mātauranga o ngā tūpuna mai rā anō. Kia koutou hoki ngā kaiako, koutou mā e mahi ana i roto i ngā kura katoa ia rā, ia rā i mua i ngā kanohi o ōu tātou tamariki mokopuna, he mihi kau ana ki a koutou katoa. Huri rauna i te rūma nei ki a koutou katoa, tēna koutou, tēna koutou, tēna koutou katoa. Ka huri au ināianei ki te tuku karakia, he karakia poto mō tātou katoa i te ahiahi pō nei. Ko Rangi ki runga, ko Papa ki raro Ko te whānau Atua i waenganui. Manaaki mai, tiaki mai mātou i roto i tēnei mahi o mātou i tēnei rangi. Haumi e, hui e, taiki e.

What is a knowledge system? This kārero that Rose and I have put together, is a starter for people to think about how, we can manage, a new way of doing things in our, in our schools and kura.

If you could just go to that second slide, Cathy. So why even ask the question about what a knowledge system is? I was in the involved ministry's advisory group for the

review of NCEA, and I was really excited with the mana ōrite imperative that came out of this review, particularly as it validated what was already happening in many kura.

I found mātauranga Māori was safe in these settings. When I, however, realised that this imperative was to be applied across both curriculum, Māori medium and English medium, I got a bit nervous. And, I suppose the question that I asked myself was, how could we ensure the mana and value of mātauranga Māori could be maintained outside of te ao Māori? So within te ao Māori, it is safe, but outside which is what we are proposing, we get a bit nervous about that. So, the knowledge system approach, and this is from, time spent with Rosemary and Sara Tolbert and, Bronwen Cowie, and our thinking the knowledge system approach seems to address the concerns that I initially had, where mātauranga Māori sits alongside Western science knowledge, as two separate bodies of knowledge. As it is taught in the school curriculum. So we are not trying to mix them up, or make one what it isn't. We're approaching this from a two-knowledge system basis. So this is what the kaupapa of our kōrero is and let our journey begin.

Dr Rosemary Hipkins

Okay, so I'll pick up from Pauline, at this point and just give you some definitions here.

It's almost lost on the bottom of my screen, but afterwards you'll be able to see the hyperlink to the paper that these definitions have come from.

And it's actually a paper written by a group of scientists, with an interest in sustainability and future thinking. It just says Fazey et al. on the screen, but there's actually 181 authors on this paper, which I think is a bit of a record.

It's a fascinating little paper, but this is how they define what a knowledge system is. And there is actually a very big body of literature about knowledge systems, but most of it is not in education.

It's in the sciences, it's in the social sciences, it's in economics, it's in psychology, even it's in other fields, but very little in education, which is why for us, it's quite an unfamiliar idea.

But you can see here just from these few quotes that we've chosen, that it is, we are able to define it, and on that basis, we can go ahead and start to explore how it looks different in science and in mātauranga Māori.

Thanks Cathy. We'll flip to the next slide.

So, what I want to briefly introduce you to is this thing called the CMP model and have a few characteristics of systems, complex systems, that is, this doesn't only apply to knowledge systems, it applies to ecosystems and social systems and all sorts of other systems. But people who work in science education research have used this model a lot. They call it the CMP model; components, mechanisms, phenomena.

But you'll see that I've written it the other way round on the slide and put phenomena at the top.

And that's because when they're devising learning activities for the classroom, people who work with this model always start with phenomena.

So just to give you one example, one research group who were working with students in an upper primary school class, were looking at an aquarium in the classroom as a system, and the phenomenon that they started with was that the fish had died. Anybody who keeps fish in an aquarium will know this phenomenon, I'm sure.

But from there they were able to unpack what are the pieces of the system and what are the mechanisms that hold them together. So that's a model that applies to knowledge systems generally.

Here, what I've tried to do on the, as I made this slide, was to say, how does that apply to knowledge as a system?

We know what phenomena are, but what the research literature says in the peace and green come from the Fazey paper.

And they say that all sorts of context affect how our knowledge systems play out and develop the components of a system. Obviously, in an aquarium, it's fish and weeds and things like that. In a knowledge system, it's ideas and experiences captured in words and phrases, but also the institutions, the structures, the assumptions, the values, the standards – all the things that operate to make that knowledge system what it is.

And the mechanisms are the things that help the pieces of the system interact with each other. So if we think about ideas and experiences, forms of logic and explanations are the mechanisms that hold those pieces together. And in a knowledge system, generally, the mechanisms include the way that knowledge is validated, communicated, applied.

That's a very quick crash course in this idea that a knowledge system has all these pieces to it.

But I hope that helps you to give some idea of the form of them, because what we're going to do now is unpack them a little bit.

So hopefully the examples will help it to make more sense.

And the interesting thing is, when we started putting the slides together, we had them in a completely different order than the order that you're going to see them in today. And we, thought we'd almost got to the point where we had the components of the PowerPoint assembled, and then with horror, I realised that I'd done exactly that thing that science teachers usually do – I'd started with the components, I had different pieces, and, I just said, because the research says that you should start with the phenomenon.

And it was so automatic to me to unpack by starting with the components that we were quite a long way down the track before I even realised what I had done. And we went back and we reordered them.

So we are going to unpack by starting with a phenomenon, and we've chosen one that has resources on the Science Learning Hub, and that's the aftermath of the *Rena* disaster.

Thanks Cathy.

So let's start with science, as a complex knowledge system. Now, here's a little concept map. I picked it because I thought it would show these components that I've just been talking about, but had other reasons too.

One of the reasons was I wanted a little map that bought interconnection with each other, some ideas from biology, some ideas from chemistry, some ideas from physics.

Potentially, in those three different coloured circles, you could unpack those and put layers and layers of components into them. And I thought, yeah, well, we know the phenomenon. We could imply this concept map to that phenomenon to figure out what's going on in the swamp, that made it look as sick as it did. And I thought it was straightforward. I thought, yep, everyone will get that, I won't have to unpack that because that's all obvious.

And then I looked at it more closely and I thought to myself, what about the mechanisms, the bits that connect the components together? And I thought, gosh, how is it that life webs modify energy flows? How is it that life webs alter the way that matter cycles?

And you know, you can answer that question of course, and it's not actually that difficult to answer, if you've got a flexible knowledge of the science fields that are implicated, but

you can't answer it in a phrase or a sentence. You have to write a paragraph at least, to write a reasonably satisfactory answer. And thought to myself, we do this all the time in science – no wonder some kids don't get it and find it really difficult.

We all just take a mechanism and we'll give it a one word name and it implies so much else that sits underneath it. But that's one of the things about sciences and knowledge system that makes it very efficient for scientists to communicate with each other. It's hard for science educators, but it's brilliant for scientists, so, you get a sense, the more you unpack this idea that you can see why science learning is really tricky for some kids. Anyway, that's enough about that for now, I'm going hand back to Pauline to talk about the swamp phenomenon from the perspective of mātauranga Māori.

Pauline Waiti

Okay. So as you can read there, Dr Kepa Morgan introduces a consideration of mauri when we are looking at the degradation of the swamp system.

The use of the word mauri or the consideration of mauri foregrounds a Māori worldview. And, here it's been used as an environmental indicator. He developed a tool, where you could measure mauri moe, mauri noho, as well as mauri tā mauri ora. And the engagement with the tool promotes engagement with, you know, the signs of the health of the, the environment of the taiao according to a Māori worldview.

So it clearly shows a different way of looking at the disaster and how to, you know, restore it, but equally as valid,

It sits alongside what Rose was talking about in the previous slide.

This slide, reinforces the idea that there might be elements of each knowledge system that do not have direct equivalence in the other one and concepts such as Māori wairua, whakapapa, and kaitiakitanga, are some of those concepts.

Considering the systems approach, this means that bringing them together requires thoughtful, and careful consideration. We can't just take, you know, this wairua thing and implant it into another knowledge system.

We, I suppose, you know, the thing that I really agree with this approach is, is that the mātauranga Māori maintains its own integrity.

So bringing these concepts together between the knowledge systems has to be carefully thought out and never assimilated. And as many science groups are now working to bring knowledge systems together, there are a number of Māori scientists who have been pushing the boundaries of science already, to ensure that mātauranga Māori is considered and valued in their work.

And just to name a few that some of you might know personally or come across – Ocean Mercier, Dan Hikuroa, Jamie Ataria, Garth Harmsworth, to name but a few of them.

So this is work that, in the actual area of science that these Māori scientists have been pushing the boundaries on for many years now.

Now this, this slide is an example of unpacking a complex system by looking at kaitiakitanga. This can't be considered without engagement of the concepts of Māori tapu and rāhui and mana. So Māori mana, tapu and rāhui, they determine the actions of kaitiakitanga, they determine the actions or the practice that it's going to happen.

The temporal dimension is a key difference from the science knowledge system.

The past, present and future, interlock for Māori and action today is informed by the past, and informs the future is a good way to describe that.

And another key difference is singled by the word, mauri, where all things are related and tangata positioned within the system. This comes from our understanding of

whakapapa and I don't even know if this is a word, belongingness, to ensure that we don't upset the balance of the taiao as humans.

So I think you know, the question asked there about not appropriating or simulating words from one knowledge system direct to another, is important.

And we've had examples of that happening in the science space, in some NCEA developments. And, the ideas that separate knowledge systems have separate words and their meanings have to maintain their integrity, and particularly when you're looking at a knowledge system like mātauranga Māori.

We're between a rock and a hard place in terms of Māori because we want students to have an understanding of mātauranga Māori, but there was a tension about how much, how much we divulge or what we are expecting people to do in order to truly understand the meaning of those concepts.

Thanks, Rose.

Dr Rosemary Hipkins

Okay, back to me and, flipping back from, mātauranga Māori to the sciences. Science is a knowledge system, and this will be an utterly familiar diagram to anybody, or sort of, who's ever looked at a science textbook.

The word effusion was new to me, I confess, or if I'd known it in the past, I'd forgotten it. But I put this little model up here because it displays a couple of very characteristic things about science as a knowledge system that are very, very different from the holistic model that we just looked at with kaitiakitanga.

In the centre of it and so you can see here that the little blue dots are particles and that they're going to be moving in the ways that are indicated.

And there are several features of science as a knowledge system that this

diagram illustrates, which are important to understand, I think. That word in red at the bottom there, nominalisation, I was actually talking about it before without using the word, but here I'll use the word directly. If you think about diffusion, well, we all know that that diagram shows diffusion if we've got a science background, but you can't explain what that means in a single phrase or even a sentence.

And that's true of all the I-R-N words. I mean, you could make a list of them, you could sit here for the rest of the webinar, making a list of them. There's so many of them, and all of them have this characteristic that they describe a whole process, but they capture it in a single word,

which once people understand that single word makes communication, very efficient for scientists to use.

But again, it makes it tricky, tricky, tricky for science education, for teachers because, you know, you could show a student a diagram like that, and maybe you could imagine a multiple-choice question in a test, what process is this?

And have a list of four say of which diffusion is one, they circle the right one. You assume they understand what it means, but they couldn't necessarily describe what that means at all, or they would describe it in very different ways.

Tony, I saw your comment flick up there about non-agentics, so I'm just about to talk about that. I know there's quite a lot of primary teachers in the room this afternoon and if you asked, young children to explain what's going on here, they would probably say that the particles want to go

where there aren't so many of them. They'd use an anthropomorphic explanation – other words, they'd give some agency to the particles to behave as they wanted to behave.

But a scientist of course would disagree with that and say that in any phenomena like this, the particles are non-agentic, they're simply going from where there are more of them, to where there are less of them by a random process, by which they arrive at that more even distribution.

And don't ask me to explain the bottom one because like I said, it was a new term to me.

But this is a very significant difference between science as a knowledge system, and mātauranga Māori as a knowledge system, because in my limited understanding, living and non-living things have agency, in the Māori worldview.

But that's certainly not the way that science views things, even though we use that sort of worldview anthropomorphically when we're communicating ideas with young children all the time.

Just another thing that makes it tricky. Okay, now we're going to use cosmic phenomena as our next context and flipping on, because I can see that times marching along. So many phenomena, we go back to the level of phenomena for a knowledge systems. Again, they exist at scales that are too big or too small to be directly observed. And these sort of phenomena, create challenges because very different sorts of explanations for them are created in the two knowledge systems. So in science, the overall aim of inquiries is to explain them.

And new explanations emerge as new technologies emerge, both at very large and very small scales.

But in mātauranga Māori, they tend to be explained as narrative stories. Pauline, I don't know if you want to say something about this or if the point is obvious and we should skip on.

Pauline Waiti

Oh no, I think it probably is just the narrative stories, you know, ngā kārero tuku iho we are presenting, the knowledge that's been developed and continues to be developed over time.

Dr Rosemary Hipkins

That point about the aim being to convey wisdom, that's very clear in the research literature about knowledge systems, as a difference between all indigenous knowledge systems and science, which makes no claim to wisdom.

Pauline Waiti

I just wanted to point out that the narrative stories are, the use of the term stories is sometimes unsettling for Māori, just because you know, it's a methodology to transfer knowledge from one place to another, from one generation to another.

So that's why sometimes we get nervous about that word; stories, but they are narratives and they do represent actual, the knowledge that, you know, the interpretations that our tūpuna have made about the world about them. Yeah.

Dr Rosemary Hipkins

Actually stories is a word that conveys very different meanings in a Eurocentric knowledge system then it does in indigenous ones, isn't it?

You can see how easy it is for the systems to talk past each other and miscommunicate.

We better march on or we going to run out of time. We're probably going to anyway.

So, just one more example to illustrate the differences between these two systems. My six-year-old grandson asked me this question in the school holidays: where do names come from, who decides? And I just changed that second – I thought it was a brilliant

question for a six-year-old – I just changed that second question a little bit to 'who decides how things get grouped', because this is another very substantive difference between the way these knowledge systems organise and express knowledge.

So in the science knowledge system, the categories that group components are organised around science concepts and theories, and the phenomenon, if you like.

The context that we've got here is tuatara. And in the science knowledge system, they're seen as living fossils, because the way that things are grouped and classified in the Linnean system, which is showed in the image, the inverted triangle image there, is predicated on the theory of evolution. But I'll let Pauline talk about the mātauranga Māori knowledge system.

Pauline Waiti

It entirely makes sense to Māori that tuatara belong to the realm of Tāne as a protector.

Knowing how the tuatara have survived 60 million years, I'm wondering if our tūpuna knew that somehow, maybe? Just as a thought.

There have to be reasons why our tūpuna afforded the tuatara the mana that they have. And so I think that's an important thing to think about when these, these sorts of you know, when we see these sorts of relationships and stuff, there will be reasons why they did that.

And I don't know them at the moment so, but that's the thought we should have: ah, I wonder why they did that? But what was it that they saw that made them decide that? That they're, you know, protectors of the realm of Tāne. Some things can be, would be quite obvious about where they, where their habitat is and all that type of thing, things that they'd observe, but what else did they know? What else did they see?

Dr Rosemary Hipkins

So moving on, and we are going to have to skip fairly quickly over this next bit, but as well as having a structure which is captured in the CMP model; components, mechanisms, and phenomena, complex systems have particular ways that they behave, which are quite unfamiliar ways of thinking, if you haven't studied complexity. And I tried to think about some of those and we're only going to talk about one of them today.

There's a lot more that you can think about here. If, if you want to read the book that I recently wrote about this, we are just going to talk a wee bit about 'emergence,' the first one there.

So one of the things that complex systems do is they can behave quite unpredictably and something that nobody expected at all and hasn't seen before, emerges and changes how everything gets seen from then on.

And on the next slide, we've got an example of that in the science knowledge system. And this example – what emergence tends to get called in the science knowledge system is a 'paradigm shift.' So this example, again, it's off the Science Learning Hub, is the, the shift from thinking about phlogiston which isn't even a thing that scientists think now, but when oxygen was discovered and combustion was just discovered, the chemistry of fire, as it says here, a whole lot of things shifted and changed.

And people understood a lot of phenomena in a different way because of all these interlinked new discoveries.

And I was really interested to see that when the Science Learning Hub put this resource together to make it understandable and to make the timeline work and hold the pieces together, they started with a phenomenon. And the phenomenon that they started with this – fire, I thought that was lovely. And, this is only a tiny snip of it. There's a lot more on the website, but science as a knowledge system undergoes periodically these big upheavals when new discoveries are made. Probably in our lifetimes, one of the biggest

shifts was, well, when I was at university, certainly the confirmation of plate tectonics, which changed the way a whole lot of phenomena were understood.

And even more recently than that, the huge debates between the gradualists and the catastrophists over how, the trajectory of life on earth evolved.

So this is an ongoing thing, it doesn't stop at any period in time.

I see Mike's put DNA too. Yeah, that was a biggie, Mike. I don't know why I didn't even say that one. When of my first degree was in genetics.

Anyway, moving right along. Pauline, I think the next slide's yours.

Pauline Waiti

Okay. So, the quote reinforces the idea that, mātauranga Māori knowledge is a past, present and a future, that it's continually being used, adapted, and incorporated into people's lives. And it, it's back to that kōrero we had before about knowledge from the past being used today and for the future.

And the two resources, the books that are shown in the photo – I'll try and keep this brief, but I want to make sure I get the point in.

A few years back, just before Covid hit, a Māori scientist from Manaaki Whenua approached me to work alongside the Science Learning Hub, on these resources that have been developed, about restoration of the wetlands.

These are the second two resources. Our second two books. The first book was, it was written and it was a restoration handbook for freshwater systems. And it had no, what we realised was that there was no voices of hapū or iwi in that book. So the *Voice of the Wetland* was the second book, that handbook that was produced.

And we made sure to get, include Māori hapū and iwi who were working on, on projects and restoration. And it was realised quite quickly that the, the projects were determined by science. And so the priorities were those of, of science and not of the people who were working on the land and living on the land. So the third book was written, *Kei konei tonu au*, and that involved, allowing, iwi and hapū to determine what they wanted to do with their wetlands.

And because the realisation was that the voice of a lot of the older people who lived, and prospered in wetlands, you know, many, many years ago, their voices weren't being heard.

So it was sort of like, oh, hurry up, we better get to making sure we capture those that were still alive and bring back that old knowledge. So, I suppose the, the point of all that is that, the old knowledge is really important to bring back.

We're lucky we didn't lose it, but it's those that hold centuries of connection to the landscape who are the architects for the future of repo and why this production, and sort of the production of these handbooks represents, you know, a good case study of what, I suppose, do I use the word colonisation, but I am, has done to our, our taiao, but it also represents solution making and working together to make sure that we don't go back where we've been. Kai pai.

Dr Rosemary Hipkins

So, thank you Pauline. And I, I think probably another thing that's important to say, sometimes we hear people say that mātauranga Māori is a fossilised knowledge system that's caught in the past, and it's really important to push back against that because both of these are dynamic living knowledge systems. And Pauline's story is an example of that.

So just very quickly in a couple of minutes, the Mana Ōrite initiative says equals status is to be given to these two knowledge systems. So I think, I hope the message that we've

conveyed through our presentation today is that each of them is to be judged according to its own internal integrity and fitness for purpose.

And that you can't appropriate the distinctive features of one into another one. And even if people mean well, if they appropriate mātauranga Māori into science, it's a form of recolonisation and we should not do it.

Another point that people sometimes get mixed up about equal status doesn't necessarily imply equal time. So we hear some teachers saying, I don't have enough time now. How can I give up half that time?

Some of the efforts where people have put concepts from mātauranga Māori inappropriately into science, it's when they haven't had a legitimate reason for doing so.

They've been well intentioned, but logically the phenomenon that they're looking at, if they're even looking at a phenomenon, is not one where there's a fit. And there's differences in the worldview.

So equal status doesn't imply equal time. They get bought together when there's a reason to do so. Do you want to add to that Pauline?

Pauline Waiti

No, no, I think you've explained that really well. Each to their own. Their own value.

Dr Rosemary Hipkins

Yeah, that's right. Which is what the Ōrite initiative intended.

So I think that we're down to the last slide. Thank you for sticking with us at this time of night everyone, and we have left some time for questions.

Just to recap where this idea came from, we wrote this little design discussion in enduring competencies for designing science learning pathways.

We didn't intend it to be a framework per se. We intended it to be thought provoking for the curriculum writing team and for the NCEA team, and perhaps give them some common ground where they could meet in the middle, given that the NCEA change package, as we know, is not in a logical sequence with the curriculum refresh. It's running ahead of it for reasons that are out of the control of, the groups working on either of those.

And so we developed four enduring competencies, and this is what we said about this one, which was having two knowledge systems to draw on.

And we deliberately positioned it as something that's very precious and special for us in Aotearoa New Zealand, because we're the only country who's got this specific one as a taonga of us to draw on.

And if we can educate our young people to have these two knowledge systems, then that's really going to help them to understand their place in the world, to understand the complexity of knowing nature and to live as ethically and responsibly as they can, which I think everybody would hope would be an outcome, I hope everybody would hope, would be an outcome of their schooling.

One of the things that I, invite people to think about is we know those of us who are tauiwi, we know that Māori is not our knowledge system. We've got a lot to learn about it. It's different from the system that we were raised in and embedded in, but the challenge for us is that the system that you're in is not so visible to you. And so one of the things that's really precious about having these two, is that mātauranga Māori can hold up a mirror for us to actually see the features of science as a knowledge system more sharply.

We've always had the nature of science component in the curriculum, but it's one of the things that people have struggled with, because a lot of you who are listening like me

will have a science degree, and there was never a nature of science component in it. It's something that we've had to learn.

In my case, when I did my master of education, people come to it in different ways, but this taonga that is having the two, not only helps us to understand a different worldview, it actually helps us to understand our own one better as well. And that's the hope, anyway. That's the vision.

Pauline, I'll just pass back to you. Yeah.

Pauline Waiti

I'm not sure if Georgina's, a part of the webinar. She was signed up. I'm not sure if she's there.

Dr Rosemary Hipkins

She's posted a couple of posts, so she's in the room.

Pauline Waiti

Oh, okay. Georgina, I just want to refer to your, your article on radio Waatea, where a couple of things that you said of course are, are fabulous.

What this curriculum is doing, referring to the curriculum refresh is quite revolutionary and is teaching complex systems, thinking.

It's using mātauranga Māori quite appropriately as a knowledge system that is different from science as we teach it in the school system.

And I think there is a difference between how we teaching science in the school system and science itself as a body of knowledge. And, she sees in terms of how we feel about mātauranga in this space, I see this as the opening of a door, not a prescription to teach mātauranga necessarily, but an opportunity for teachers who are motivated to embrace some new thinking, challenge their own ideas and understandings.

What this proposal is doing is putting up mātauranga as a useful comparison that actually acts like a mirror that reflects the nature of science back to us, which is what you were talking about Rose, and helps us to teach and learn about how science really works as a body of knowledge.

These proposed proposals seek to improve science, they're not seeking to damage or vandalise science.

So I thank you Georgina for your words, really important.

Dr Cathy Buntting

And Pauline and Rose, thank you for your words. You've covered a huge amount of territory.

There is a lot of chat and questions, some of it around particular themes. So I,

I just want to go back first to the slide about, this one: that the concept of Māori belongs to the mātauranga Māori knowledge system, and concepts such as wairua, whakapapa, and kaitiakitanga, also belong to the mātauranga Māori knowledge system.

And Mike Stone has asked a question, so are you suggesting that we shouldn't use these kupu, these words, mauri, kaitiakitanga etc., when talking about Western science approaches?

Pauline Waiti

I'm suggesting you don't.

Dr Rosemary Hipkins

And I'm backing that up.

Yeah, that they have a whole different set of assumptions, values, connections underneath them, and you can't just drop them from one system into the other one, any more than you can take ideas like osmosis, say just off the top of my head, and drop them straight into mātauranga Māori. It wouldn't make sense to science people to do that, that way, so equally, it shouldn't make sense the other way.

Dr Cathy Buntting

So one of the things you've made very clear through your presentation, I think, is that they are two different knowledge systems, being held alongside each other.

There are some questions about imposing pressure on students to learn those, we'll come to that, but first I want to just pick up on Tony Cairn's question, which is why teach mātauranga Māori in science? Why not teach it as a separate, but equal knowledge system? Why not just leave them as separate, unless they enlighten each other?

And I'm wondering if there's a clue there at the end of the question.

Dr Rosemary Hipkins

Yeah, I'd say there's a clue.

Pauline Waiti

I think if you're talking about two different knowledge systems and they are four different views of the world, I think that's the approach to take.

And if, your actions and the decisions you make in your environment are determined by your view of the world that you are living in, and it's informed by these two different knowledge systems. So a mātauranga Māori worldview, and a science, pure science worldview, they're different worldviews that determine different actions.

Dr Rosemary Hipkins

I would just add to that, but if you're exploring complex issues like climate change, say pandemics, you know what, whatever it might be, if you're exploring those with students, then it's actually, it's not sufficient just to look at science knowledge of, well, we've seen, just in what's happened over the course of the pandemic, for instance, not only is science knowledge not sufficient, too many people have actually cast it aside.

And we've got to do better about teaching our young people how and when to draw on different perspectives and what gives knowledge its authority and status, which is one of the things that a knowledge systems approach can help them to do.

But it would never work if you said science is the only way to understand the world, because people would just reject that as too authoritarian.

Pauline Waiti

As well as saying mātauranga Māori is the only way to view the world.

Dr Rosemary Hipkins

Yeah, absolutely.

Dr Cathy Buntting

Which connects with something that David Lillis has added into the chat about, what about other knowledge systems, Pacific, Asian, etc. why deliver one form of traditional knowledge but not others?

Pauline Waiti

I suppose our priority in New Zealand and Aotearoa New Zealand is to introduce, is to talk about mātauranga Māori, as the indigenous knowledge of New Zealand.

But in work that we do and current work that I'm doing in the pūtaiao space, we, we acknowledge, we do learn about other indigenous knowledge systems. And to be honest, we learn about the indigenous knowledge systems of indigenous people who have been colonised, to keep the parity going.

Dr Rosemary Hipkins

I guess if you compare it with learning languages, say people who've got two languages find it much easier to learn more than people who've only got one. So, you know, two is a great basis to start from, but it would be, found unnecessarily bounding to the worldviews of our young people if we limited to them to that. And of course, our classrooms are much more multicultural and there are, young people from many different cultures there. And if you, if you go to the definition that's in the enduring competencies book, it explicitly explains, that this is about many knowledge systems, but our primary focus to get the idea of it, is on the two that are our two that belong to us here at home.

It's a good question.

Dr Cathy Buntting

Another comment from Tony, is around presupposing that teachers have the skills, the rights, the mana, and the humility to use, and he's talking specifically about the mātauranga Māori concepts and processes. But to be teaching about mātauranga Māori is a knowledge system, is going to clearly require teacher capability. And I know both of you have lots of thoughts about this.

Dr Rosemary Hipkins

I think the word humility's an important one there. I consider myself to be a baby beginner in this space. And I will freely say that I would not presume to have the authority to claim this knowledge system, not now or not ever actually. And, in my experience, if you are going on a learning journey yourself, it's great for teachers to model being learners alongside students. It's not something you necessarily want to do all the time, but it's good to model that.

I know that this is difficult and I see that Georgina put up a comment before about needing, lots more resources and it's great that we were able to find enough to get this conversation started on the Science Learning Hub already.

But obviously we do need a lot more.

Dr Cathy Buntting

Mostly linked with, oh, sorry, Pauline.

Pauline Waiti

What I was going to say is, you know, so I'm thinking about, maybe a non-Māori teacher in a classroom, and wanting you to engage with mātauranga Māori. It's been very clear, I suppose at the outset that, you as a teacher, you know, it's a journey that you, the teacher and the students can go on together.

It's like this is a situation where the teacher learns as alongside the, the students.

Just be very aware of who's in, and in doing it, not making any assumptions. So the worst thing you can do is assume that every Māori in the room, Māori child in the room, knows all this stuff. So, that's almost the worst thing you can do.

So it's about a learning journey together. And, you know, Māori kids are really, you know, as we grow up, we really notice difference even between different iwi and hapū knowledge. So, Māori kids are sort of, you know, they know about difference in knowledge, and so maybe that's something that can be, you know, grown in classrooms, the idea that there is just not one knowledge system, and become comfortable with that.

Dr Cathy Buntting

I'm keen to, to give you Rose and Pauline some time to just provide final thoughts for us. But before I do that, I just want to read out one comment which has been posted by Ian McHale.

Currently only 5% of students end up in science degrees. I suspect it, well depends on how we're defining science degrees as well.

Our current system is not connecting to our students and allowing them to see themselves in science. If we acknowledge that you can hold other knowledge systems as equally important, we may see more people able to connect.

Dr Rosemary Hipkins

Yeah.

Pauline Waiti

Ka pai.

Dr Cathy Buntting

Thank you everyone for spending an hour of a Thursday afternoon with us. Thank you for your chat, we know we haven't addressed everything.

We know that we were never going to be able to. Rose and Pauline, I leave the last words to you.

Dr Rosemary Hipkins

Well, I'm going to leave them for Pauline because I can see we are almost out of time.

And, just one thing I'd say, I would never have presumed to do this webinar without Pauline. So yeah, ka pai, thank you e hoa.

Pauline Waiti

Kia ora Rose. We go back a long way.

Dr Rosemary Hipkins

Yeah, we do.

Pauline Waiti

I just want to say, you know, I appreciate everyone who's attended the webinar. I'm appreciating that so many people are interested in what we are attempting to do in this space. And there's no way that Rose and I know everything about, you know, what to do. We are just, just having the opportunity to doing some thinking around it.

I think we have an opportunity to change education in New Zealand with the systems thinking. I think it's an extremely valid way to, to engage with mātauranga Māori, it's probably the only way that it can be done validly in our society today. So it's, really exciting, but we, appreciate everyone who's attended, and we look forward to seeing your feedback and getting other perspectives on what we've been saying, whether they agree or not, so we are open to that. But thank you everybody for attending. And I'll just do this little, because we did a little karakia at the beginning, I'll just do finish it off with this karakia whakamutungā.

E Rangi, e Papa, e te whānau Atua,

Kua mutu ā mātou mahi mō tēnei wā,

Manaakiatia mai mātou katoa, o mātou whānau, o mātou mokopuna, o mātou hoa,

Āio ki te rangi, āio ki te whenua, āio ki a tātou katoa.

Kia ora everybody. Thank you for listening to us.

Dr Cathy Buntting

Ngā mihi nui kia koutou, travel well, thank you Rose and Pauline, and thank you participants.