

Unleashing the full potential of teachers: Personal ecologies and funds of knowledge/identity as resources for curriculum making

Bronwen Cowie and Maurice M. W. Cheng

University of Waikato

Nick Bryant

Matamata College

In this paper we take a credit/asset view of the breadth of knowledge and expertise that teachers have to contribute to curriculum and curriculum making from their everyday and professional experiences. We argue and illustrate the value of teachers grounding their funds of knowledge and identity in designing curriculum that connects with their students and the local context. Teacher funds of knowledge and identity are part of their personal learning ecology. Barron (2006) defines this as encompassing the ideas/knowledge, relationships, and material and virtual resources that people draw on within and across their everyday lives. The ability to mobilise a personal ecology that goes beyond academic or formal/professional knowledge would seem to be a crucial capability for teachers as they localise curricula. Even more so when teachers aim to do this in ways that foster engagement, develop agency and progress student 'achievement.' We offer suggestions for researchers, school leaders and teachers interested in exploring the nature and use of funds of knowledge/identity within a learning ecology framing.

Scoping the current context

In this contribution we take a credit or asset view of the breadth of knowledge and expertise that teachers have to contribute to curriculum and curriculum making from their everyday and professional lives. In adopting this position, we aim to challenge the deficit views of teachers that often prevail in social media and social forums where the quality of teaching and teachers is constantly questioned (Daliri-Ngametua et al., 2022; Mayer, 2021; Mockler, 2022). Credit/asset/resource views focus on strengths and interests as possibilities for innovation, imagination and action (Gray et al., 2022). They acknowledge capabilities are dynamic, distributed, shaped, and informed by the context. In adopting a credit or asset view of what teachers bring to curriculum making, we recognise that 'who they are' and 'what they know and do' beyond academic or professional contexts has value and relevance in the design of curriculum that takes account of the local context and student equity and diversity. We argue and illustrate that funds of knowledge and identity (Esteban-Guitart & Moll, 2014) as components of teachers' personal learning ecology (Barron, 2006), can inform and enrich curriculum, pedagogy, and teacher satisfaction.

Framing our proposition

Writing in the mid-1980s, Shulman (1986, 1987) argued teaching requires a sophisticated professional knowledge that includes knowledge of content and curriculum and pedagogical content knowledge (PCK). He introduced and described PCK as the ‘special amalgam of content and pedagogy’ that was required for teaching a learning area. Shulman (2015) explains that while one motivation for developing PCK was to better prepare teachers, its development was also a policy and ideological claim: “PCK is an attribute that teachers develop, and it cannot be found among mere subject matter experts or among those who are “good with kids” (Shulman, 2015, p. 11). To reiterate, Shulman’s introduction of PCK was a policy claim about what was special about teachers and how they ought to be regarded and respected. PCK has been the focus of an active and sustained programme of development (e.g., Berry et al., 2015, pp. 3-13). However, there has been an expansion in our understanding of the capacities and disposition teachers need if they are to provide rich opportunities for personally relevant learning and engagement for a wide variety of students. We propose that the notions of a personal learning ecology and teacher funds of knowledge offer an additional way to acknowledge and make visible the breadth of knowledge and experience teachers need and bring to teaching. This approach values and brings forth a full set of skills and knowledge of teachers. It also attends to the affective and motivational attributes of teaching.

The notion that individuals have and can usefully develop personal ecologies that support learning and action was put forward by Barron (2006) to explain adolescent self-sustained learning in and out of school. Barron defined a learning ecology as the set of contexts found in physical or virtual spaces that provide opportunities for learning, where “each context comprises a unique configuration of activities, material resources, relationships, and the interactions that emerge from them” (p. 195). Learning ecologies can span the different spaces and contexts that exist simultaneously across a person’s life-course, as well as the different spaces and contexts that a person experiences throughout their life-course (Barnett & Jackson, 2019). Based on their systematic review, Sangrá et al. (2019) propose there is value in developing learners’ awareness of their learning ecologies as a way of empowering them and encouraging them to engage in agentic practices. The notion of learning ecologies highlights the inter-relationships between the contexts of people’s lives, where learning in one context can prompt and support learning opportunities in another context, and that people can seize every opportunity in diverse contexts to advance their learning. In the teacher education literature, learning is commonly contextualised across university and school/classrooms (Akiba & LeTendre, 2018) (the top two cells of Figure 1 below). We propose teacher learning and sources of knowledge can go beyond these two contexts and include their everyday life experiences (as in the other cells of Figure 1). Awareness that the knowledge and experience we develop over time can be of use across contexts aligns well with the idea of funds of knowledge and identity as teachers acquire much of their knowledge related to teaching, knowingly or not knowingly, through their own learning ecologies which span and transcend formal and informal contexts. In this article we propose teacher consideration of the funds of knowledge and identity that reside in various contexts of their learning ecologies can be a powerful and generative source of imagination, agency and action in curriculum making.



Figure 1. Learning ecology (based on Barron, 2006)

The notion of funds of knowledge was first developed as a way of countering deficit views of Mexican students and their families in Arizona. Funds of knowledge are “based on a simple premise that people are competent and have knowledge, and their life experiences have given them that knowledge” (González et al., 2001, p. 115). A person’s funds of knowledge include the “historically-accumulated and culturally-developed bodies of knowledge and skills essential for household or individual functioning and well-being” (Moll et al., 1992, p. 133). Consequently, funds of knowledge research “speaks back to the neoliberal and deficit discourses permeating education ..., seeking a way to recognise and value capabilities” (Hedges, 2022, p. 80). Building on the notion of funds of knowledge, Esteban-Guitart put forward the notion of funds of identity. From a funds of identity perspective, people select lived experiences and practices that are significant and meaningful to them and use them as cultural resources to develop their identity (Esteban-Guitart, 2021). Five types of funds of identity have been identified by Esteban-Guitart and Moll (2014). These span a person’s life experiences and are: geographical, referring to meaningful spaces (a river, a landscape, a mountain, a town, a city, a country or a nation); social, referring to significant and relevant people in one’s life; cultural, referencing to language and artifacts; institutional, referring to social institutions; and practical, referring to meaningful social activities for a person such as sport, music or work” (Esteban-Guitart & Moll, 2014, p. 38).

There is an extensive body of research that illustrates the value of inviting in and including student and community funds of knowledge as a resource in curriculum; however, very few researchers have directly explored the nature and possible contribution of teachers’ funds of knowledge and identity. The notion of teacher funds of knowledge can be traced to

Andrews et al.'s (2005) Home School Knowledge Exchange Project. They proposed that mathematics teachers used knowledge developed through parenting, their religious and ethnic backgrounds, and community participation to inform their teaching. Hedges (2012), a New Zealand scholar, is widely cited in discussions of teacher funds of knowledge. She proposed teachers' life experiences provide them with informal knowledge they can draw upon, often unconsciously, in their teaching. Hedges identified three categories for teacher funds of knowledge: personal and family-based (lived experiences and beliefs); professional (experiences and relationships with children in informal and educational settings); and community-based funds of knowledge (sociocultural, historical and popular culture experiences). This framing is extended by Karabon (2021), Spiteri (2022), and Qi and Mullan (2023) who argue teacher funds of knowledge influence and inform their decision-making. In agreement with these scholars, we propose these sources of informal, interests-related learning are rich with curriculum and pedagogical possibilities. Our view aligns with Karabon (2021) who points out that student teachers in her study "do not 'turn off' their lived experience filter when making pedagogical and curricular decisions" (p. 8), and hence a dominant focus on theoretical knowledge over dispositions and cultural assets of teachers potentially leads to an unbalanced, unrealistic, and unhealthy professional identity. Mirroring the compelling argument made by Bishop (2000) that students suffer when they need to leave who they are at the school gate/classroom door, Karabon asserted the identity development of the English Foreign Language teachers in her study would be restricted if they needed to leave the breadth of who they were at the classroom door. Hence, we propose that teachers should not need to leave part of who they are at the school gate – our proposal is that teachers' funds of knowledge and identity have a role to play in curriculum making that is creative, responsive, and locally relevant.

Shin et al.'s (2021) investigation of student teachers' approaches to the design of 'making' activities offers a useful insight into the potential of explicit attention to teachers' funds of knowledge and identity. The student teachers in their study had and used their diverse funds of knowledge to develop activities that were connected to their interests, aspirations and/or life experiences. They leveraged their funds to position themselves as experts in the university classroom context when they shared the teaching activities they had developed in ways that supported mutual learning. Their funds of knowledge acted as a significant resource in opening up new possibilities and the development of creative ideas and solutions within the making process. Shin and colleagues proposed that student teachers using their funds of knowledge in their making projects led to more inclusive experiences, and their students reported feeling empowered because this positioned them with some authority. Hancock et al. (2019) identified that teacher selection of unit topics was framed by issue relevance, existing resources, and their passions. Teachers' passions were a common entry point for unit development. Hancock and colleagues found that when a teacher voiced a strong passion, they often recruited others to their interest.

Recently, Alvarez et al. (2023) argued the potential of a funds of identity as an approach that supports epistemic justice because students' knowledge and experience are affirmed and valued. Alvarez and colleagues identified imagination and agency as central to meaning making and envisioning new possible futures within a funds of identity approach. They note that teachers create and maintain professional identities related to the disciplines they teach and point out less attention has been paid to how teachers' funds of identity might assist

them to connect the curriculum more effectively to their students' ideas and interests. They illustrate the value of teachers collaborating to explore their everyday interests and passions asserting that epistemic justice is served when student and teacher knowledge and identity are valued as resources for curriculum.

Funds of knowledge in practice

Current curriculum policy in Aotearoa New Zealand is emphasising the value of and need for schools and teachers to localise the curriculum. That is, to design curriculum and learning activities that are responsive to the priorities, preferences, interests and needs of the school community. This aligns with advice by Penetito (2008) that we begin our curriculum with where our feet stand and get to know the people and place where we are. In our work we have sought to explore how teachers could develop place-based socioscientific issues teaching units, with place-based units drawing on and valuing Mātauranga Māori (Cheng, 2023). Teacher funds of knowledge and relationships have emerged as a thread underpinning our collaborative work. Here we detail how this focus played out in one secondary school for one teaching unit in a science department led by the third author, Nick Bryant:

At the time of this example Nick was the Head of Science Department of a large urban school (not his current school) and the Science and Mathematics Departments had agreed to work together to integrate their subject areas. The science team decided to focus on plants within the biology learning area; the mathematics team were interested in sourcing and analysing authentic data. Teachers were encouraged to investigate areas of interest with their classes, in particular, areas where they could leverage their own funds of knowledge. Alongside this, there were student investigations using consistent contexts and techniques between all classes to allow the collection of large, authentic data sets.

In line with our project agenda, Nick was actively exploring the inclusion of Mātauranga Māori in his teaching. He decided to focus on harakeke (flax) because of its local prevalence and historical use. There was also a clear link between harakeke and the stories of the local whenua (land) by mana whenua (people of the land). Nick was able to draw on his background and funds of knowledge and identity to inform and enrich this focus – his mother is a skilled Māori weaver with extensive knowledge of harakeke and its preparation for weaving.

With his class Nick focused on: (i) the uses of harakeke in weaving – Nick shared the korowai (cloak) that his mother had woven for his Master's graduation with his Year 10 class; (ii) the extraction of muka (flax fibre) from harakeke using mussel shells. Nick shared muka that his mum had prepared with the class; (iii) the various uses of muka for fishing lines and other bindings; (iv) contemporary uses of muka (e.g., as baby clothes and fashion items); and (v) a scientific investigation of the tensile strength of muka in which the pooled results of the whole class were represented as a correlation (number of fibres vs. tensile strength) graph. These data were collated with other classes' investigations and students explored the data as part of their maths classes.

Reflecting on the wider impact of the unit, Nick commented that “It was some of the quieter teachers, the ones that don’t speak up who were probably the most enthusiastic about it. Which was cool. Yeah. Really, really cool.” He explained that a teacher who had been born in Fiji had invited him to her class to see “really engaging science ... because she was so proud of what was said” (Nick midyear interview). She had made links to the preparation of fibre from taro plants within her family with the process Māori used. From her, Nick learned about how strands were traditionally combined by rolling them on the thigh. This teacher showed her class a necklace, made of taro plant fibres, that was a family heirloom. Another teacher had pursued their interest in te ao Māori within the unit, sharing waiata, whakatauki and te reo Māori related to traditional ways of harvesting and preparing harakeke/muka for use. Yet another teacher had a long-term interest in birds, including those in a local bush area. He linked this interest to plants as part of the theme of localised ecology and his class visited the area as part of contextualising their learning within his interests. Students completed a bird survey and compared data from this with data from a bird survey at the school.

Nick also reflected that “a bunch of identified at-risk boys in our school” when surveyed about what engaged them in science, ranked “the teachers were very passionate about what they did” as central to this. He stated, “I was affirmed by that, it’s so important.” He also commented specifically on a student who did not always engage in her science class and who had been very motivated in the harakeke unit as she found herself being able to contribute her knowledge to the class and to add to her own learning. This culminated in her gaining an “Excellence” in her NCEA Science study. It seemed that this student valued the opportunity to share her knowledge resources with the class. It was also notable to Nick, and to Maurice and Bronwen as researchers, that the students were particularly interested in the information Nick relayed as having been developed with and shared by his mother. Overall, Nick expressed a sense of deep satisfaction with student responses to this particular aspect of the unit. It is an approach he has successfully pursued subsequently both individually and with colleagues.

Focus for future priorities

In this contribution we have foregrounded teacher funds of knowledge and identity as an aspect of a person’s learning ecology (Figure 1). We have provided an example of how teachers can use their funds of knowledge and identity to localise the curriculum for their students. On this occasion, and previously (Cowie & Trevethan, 2021), teacher funds of knowledge and identity emerged as important when our focus was on culturally responsive pedagogy. While Aotearoa New Zealand colleagues have provided insights into the value of attending to students’ funds of knowledge (see Cooper et al., 2023; Cowie & Trevethan, 2021; Fox-Turnbull, 2015; Hedges, 2022; Hogg, 2016; Hunter et al., 2020), less attention has been paid to teacher funds of knowledge. One possibility in relation to this, based on our interactions with prospective teachers, is that teachers may not be aware of or confident about the value of the knowledge and relationships they have formed outside their academic spheres. Qi and Mullan (2023), based on their research with community languages school teachers in Australia, lend support to this proposal. They argue the need to develop teachers’

awareness of their funds of knowledge as having value and relevance to their curriculum making and teaching practice. Future research could usefully focus on how to assist teachers to identify and consider/re-consider how their wider life experiences might support them to interrogate and re-imagine the curricula they enact. It could investigate if and how teachers sharing their funds of knowledge might lead to connections being made by and between them and their students with everyday events, activities, and ideas past, present and future. Researchers could collaborate with teachers to investigate how their funds of knowledge/identity could be deployed to localise the curriculum, and the role imagination and agency plays in this process (Alvarez et al. 2023; Hedges, 2021). Findings could be used to inform policy and professional development support aligned with the curriculum refresh emphasis on local curriculum.

The extent that teachers in Nick's team identified and employed their funds of knowledge and identity in their curriculum design stood out for Nick and for us. It was central in prompting this article. As others have found, Nick identified that support for teacher autonomy, collaboration and adaptive practice was important. Through his enthusiasm he was able to motivate his colleagues to identify and share their funds of knowledge and experience. Importantly, he was there to support them in taking the initiative and risk involved in this. It was clear that teachers benefited from coming together to explore if, and how, their interests outside of school might relate to a particular learning area. Research could usefully explore what school leadership contexts support teachers to envision and employ a funds of knowledge/funds of identity approach that also expanded their personal learning ecologies over times and spaces. This focus is particularly timely as many prospective teachers are career changers. They bring with them a wealth of knowledge and connections from industries, such as law, finance, design, media, and hospitality (Ministry of Education, 2023) that could enrich students' learning experience if they were to tap into their funds of knowledge/funds of identity.

Student response in Nick's class illustrated that him sharing his funds of knowledge created a safe space for students to share their funds of knowledge/funds of identity. This sharing enriched the curriculum and it had a positive affective impact for Nick and his students. Nick and his students gained a sense of pleasure and satisfaction when they were able to contribute their funds of knowledge to a shared common resource of ideas. This affective impact is an important contribution of the asset-based approach to curriculum making we are advocating: a funds of knowledge/asset-based approach can nurture a healthy and holistic teacher professional identity, one in which teachers do not need to leave part of who they are at the classroom door.

References

Akiba, M., & LeTendre, G. K. (Eds.). (2018). *International handbook of teacher quality and policy*. Routledge.

Alvarez, A., Teeters, L. P., Penuel, W. R., & Esteban-Guitart, M. (2023). Considerations to engage a funds of identity approach as a vehicle toward epistemic justice in educational settings. *Learning, Culture and Social Interaction*, 40.

<https://doi.org/10.1016/j.lcsi.2023.100718>

Andrews, J., Yee, W. C., Greenhough, P., Hughes, M., & Winter, J. (2005). Teachers' funds of knowledge and the teaching and learning of mathematics in multi-ethnic primary schools: Two teachers' views of linking home and school. *ZDM*, 37, 72-80.

<https://doi.org/10.1007/BF02655716>

Barnett, R., & Jackson, N. (Eds.). (2019). *Ecologies for learning and practice: Emerging ideas, sightings, and possibilities*. Routledge.

Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development*, 49(4), 193-224.

<https://doi.org/10.1159/000094368>

Berry, A., Friedrichsen, P., & Loughran, J. (Eds.). (2015). *Re-examining pedagogical content knowledge in science education*. Routledge.

Bishop, R. (2000). 1999 Professorial address: Nau te rourou, naku te rourou ... Māori education: Setting an agenda. *Waikato Journal of Education*, 6, 3-18.

<https://hdl.handle.net/10289/6277>

Cheng., M. M. W., (2023). Envisioning student possible selves in science: Addressing 'plant blindness' through place-based education. *Teaching & Learning Research Initiative*.

<http://www.tlri.org.nz/tlri-research/research-progress/school-sector/envisioning-student-possible-selves-science-addressing>

Cooper, M., Hedges, H., & Hogg, L. (2023). Engaging with Māori learners' and families' funds of knowledge and identity in postcolonial Aotearoa New Zealand. In M. Esteban-Guitart (Ed.), *Funds of knowledge and identity pedagogies for social justice: International perspectives and praxis from communities, classrooms, and curriculum* (pp. 86-98). Routledge.

<https://doi.org/10.4324/9781003369851-9>

Cowie, B., & Trevethan, H. (2021). Funds of knowledge and relations as a curriculum and assessment resource in multicultural primary science classrooms: A case study from Aotearoa New Zealand. In M. Atwater (Ed.), *International handbook of research on multicultural science education* (pp. 1-32). Springer International Publishing.

Daliri-Ngametua, R., Hardy, I., & Creagh, S. (2022). Data, performativity and the erosion of trust in teachers. *Cambridge Journal of Education*, 52(3), 391-407.

<https://doi.org/10.1080/0305764X.2021.2002811>

Esteban-Guitart, M. (2021). Advancing the funds of identity theory: A critical and unfinished dialogue. *Mind, Culture, and Activity*, 28(2), 169-179.

<https://doi.org/10.1080/10749039.2021.1913751>

Esteban-Guitart, M., & Moll, L. C. (2014). Funds of identity: A new concept based on the funds of knowledge approach. *Culture & Psychology*, 20(1), 31-48.

<https://doi.org/10.1177/1354067X13515934>

Fox-Turnbull, W. H. (2015). Contributions to technology education through funds of knowledge. *Australasian Journal of Technology Education*. 2(1).

<https://doi.org/10.15663/ajte.v2i1.18>

Gray, R., McDonald, S., & Stroupe, D. (2022). What you find depends on how you see: Examining asset and deficit perspectives of preservice science teachers' knowledge and learning. *Studies in Science Education*, 58(1), 49-80.

<https://doi.org/10.1080/03057267.2021.1897932>

González, N., Andrade, R., Civil, M., & Moll, L. (2001). Bridging funds of distributed knowledge: Creating zones of practices in mathematics. *Journal of Education for Students Placed at Risk*, 6(1-2), 115-132. https://doi.org/10.1207/S15327671ESpR0601-2_7

Hancock, T. S., Friedrichsen, P. J., Kinslow, A. T., & Sadler, T. D. (2019). Selecting socio-scientific issues for teaching: A grounded theory study of how science teachers collaboratively design SSI-based curricula. *Science & Education*, 28, 639-667.

<https://doi.org/10.1007/s11191-019-00065-x>

Hedges, H. (2012). Teachers' funds of knowledge: A challenge to evidence-based practice. *Teachers and Teaching: Theory and Practice*, 18(1), 7-24.

<https://doi.org/10.1080/13540602.2011.622548>

Hedges, H. (2021). The place of interests, agency and imagination in funds of identity theory. *Mind, Culture, and Activity*, 28(2), 111-124.

<https://doi.org/10.1080/10749039.2020.1833931>

Hedges, H. (2022). *Children's interests, inquiries and identities: Curriculum, pedagogy, learning and outcomes in the early years*. Routledge.

Hogg, L. M. (2016). Applying funds of knowledge theory in a New Zealand high school: New directions for pedagogical practice. *Teachers and Curriculum*, 16(1). 49-55.
<https://doi.org/10.15663/tandc.v16i1.108>

Hunter, J., Hunter, R., Tupouniua, J., & Fitzgerald, L. (2020). Implementing localised curriculum drawing on a funds of knowledge perspective: Teacher perceptions and challenges. *New Zealand Annual Review of Education*, 26, 153-161.
<https://doi.org/10.26686/nzaroe.v26.693>

Karabon, A. (2021). Examining how early childhood preservice teacher funds of knowledge shapes pedagogical decision making. *Teaching and Teacher Education*, 106.
<https://doi.org/10.1016/j.tate.2021.103449>

Mayer, D. (Ed.). (2021). *Teacher education policy and research: Global perspectives*. Springer. <https://doi.org/10.1007/978-981-16-3775-9>

Ministry of Education. (2023). Career changers find passion for teaching with in-school training. *Education Gazette*, 102(19), 4-9.

Mockler, N. (2022). *Constructing teacher identities: How the print media define and represent teachers and their work*.

Moll, L., Amanti, C., Neff, D., & González, N. (1992). Funds of Knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice*, 31(2). 132-141. <https://www.jstor.org/stable/1476399>

Penetito, W. (2008). Place-based education: Catering for curriculum, culture and community. *The New Zealand Annual Review of Education*, 18, 5-29.
<https://doi.org/10.26686/nzaroe.v0i18.1544>

Qi, J., & Mullan, K. (2023). Community languages teachers' funds of knowledge: Domains, meta-awareness and transferability. *International Journal of Bilingual Education and Bilingualism*, 26(4), 483-497. <https://doi.org/10.1080/13670050.2022.2119834>

Sangrá, A., Raffaghelli, J. E., & Guitert-Catasús, M. (2019). Learning ecologies through a lens: Ontological, methodological and applicative issues. A systematic review of the literature. *British Journal of Educational Technology*, 50(4), 1619-1638.

<https://doi.org/10.1111/bjet.12795>

Shin, M., Lee, J. J., & Nelson, F. P. (2021). Funds of knowledge in making: Reenvisioning maker education in teacher preparation. *Journal of Research on Technology in Education*, 54(4), 635-653. <https://doi.org/10.1080/15391523.2021.1908868>

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14. <https://doi.org/10.3102/0013189X015002004>

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1-21. <https://people.ucsc.edu/~ktellez/shulman.pdf>

Shulman, L. S. (2015). PCK: Its genesis and exodus. In A. Berry, P. Friedrichsen, & J. Loughran (Eds.), *Re-examining pedagogical content knowledge in science education* (pp. 3-13). Routledge. <https://doi.org/10.4324/9781315735665>

Spiteri, J. (2022). Early childhood education for sustainability in the postcolonial era: Knowledge, identity, power and voice of early childhood teachers. In *Educating for sustainability in a small island nation. International explorations in outdoor and environmental education, vol. 11* (pp. 209-224). Springer.

https://doi.org/10.1007/978-3-031-23182-7_11

Bronwen Cowie (Associate Dean Research, Te Kura Toi Tangata School of Education, University of Waikato) was a secondary school teacher of maths and physics. Her research is focused on classroom interactions, with an emphasis on Assessment for Learning in science and technology classrooms, and culturally responsive pedagogy in science education.

<https://orcid.org/0000-0003-3578-0791>

Maurice M. W. Cheng (Deputy Head of School, Te Kura Toi Tangata School of Education, University of Waikato) had been a pharmacist before he became a chemistry teacher. He is interested in cognitive, affective and cultural aspects of teaching and learning of science. He has been involved in the international comparative studies TIMSS and PISA.

<https://orcid.org/0000-0002-8483-4074>

Nick Bryant (Nga Puhī and Ngāti Whatua) is Deputy Principal at Matamata College. Nick is a member of the NCEA Subject Expert Group for Level 1 Biology & Chemistry, Level 1 Science, and Level 2 Biology. He is also part of the Mangai Māori Ropu, the group of Subject Experts who bring a Māori worldview to NCEA. Nick is a teacher-researcher on the Envisioning student possible selves in science TLRI.