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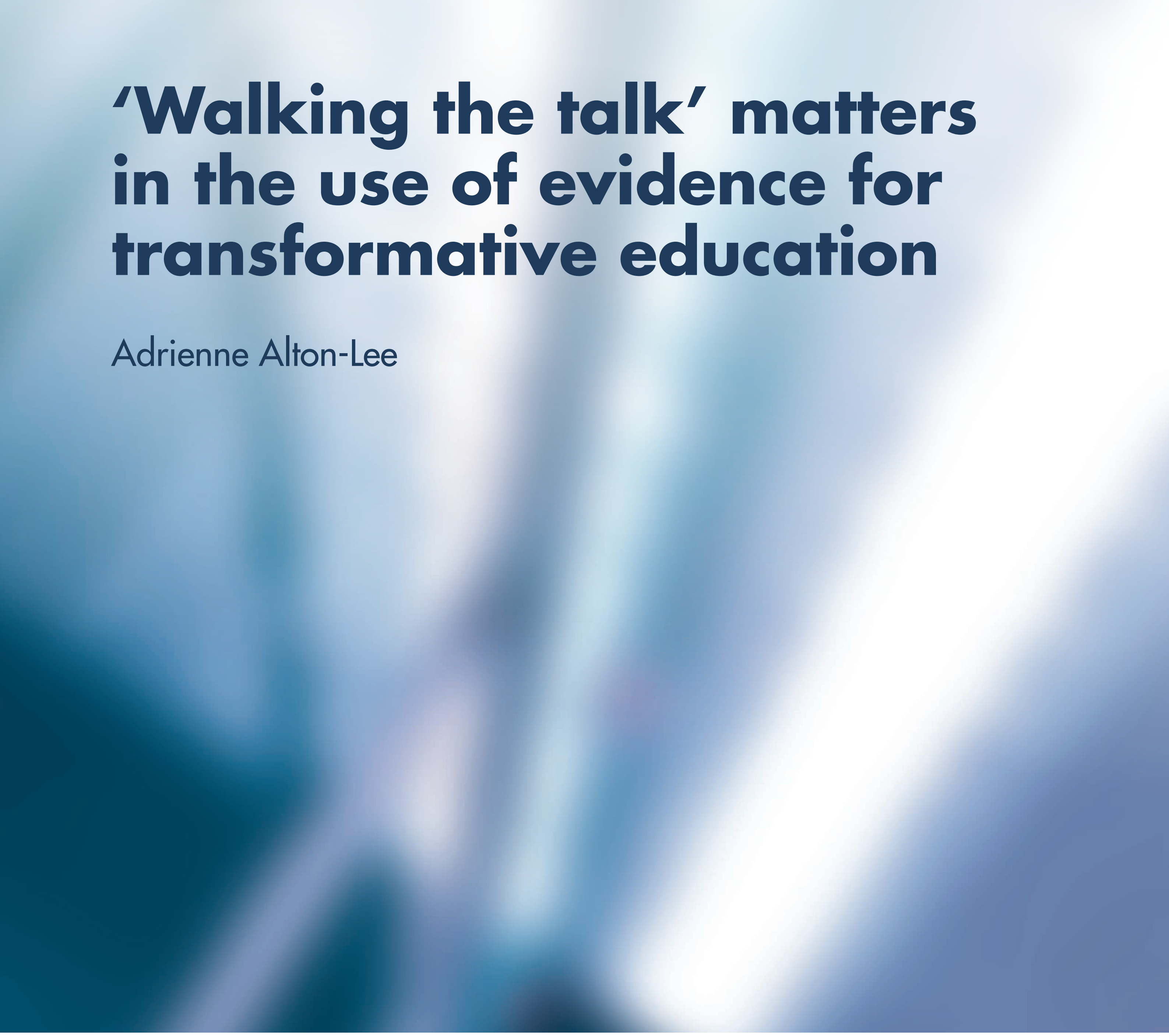

‘Walking the talk’ matters in the use of evidence for transformative education

Adrienne Alton-Lee

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Introduction

The International Bureau of Education of UNESCO (IBE-UNESCO) proposes

> *an urgent call for deep rethinking of the curriculum, its conceptualisation, its positionings and its processes, to enable the design of future curricula that will not only respond effectively to current and imminent changes, but more importantly, that will become catalysts for further change throughout the 21st century.*
>
> (Marope, 2017)

In this think piece, I respond to the urgent call for transformative change in education.

I sound a caution about how important it is to attend to evidence about the **how** to achieve the goals for which there is urgency for a different kind of outcome; both locally and globally. Given such urgency, action is a priority. There is too much at stake to invest in well-intentioned action that will likely lead to counterproductive outcomes. I provide three examples of hidden curricular effects that highlight the importance of evidence of impact on learners of their educational experiences. Change is needed.

In the final section I highlight an innovation that accelerates improvement across simultaneous success trajectories[1] for competences identified as critical by IBE-UNESCO.

Competences for a changing future

Curricula[2] are increasingly being updated by (those representing) communities, nations and more recently, global alliances, to enable education to better serve rapidly changing local and global contexts. In 2015, participants from 160 countries agreed to 17 global goals in the 2030 Agenda for Sustainable Development.[3] (UNESCO et al, 2016) That agenda includes outcomes and implementation targets for quality education, reduced inequalities, climate action and peace, in an age when digital innovation is variously and rapidly changing human activity. The 2030 agenda affords priority to an 'anticipatory competence: the ability to understand and evaluate multiple futures – possible, probable and desirable, to create visions for the future, to apply the precautionary principle, to assess the consequences of actions and to deal with risks and changes'.

In their 2017 paper *Competences for the Fourth Industrial Revolution: A Global Reference for Curricular Transformation*, Marope and Griffin highlight the need for education systems to better serve the development of science, technology, engineering and mathematics. They highlight the press for competences; not content knowledge only. They note the lag in the capacity of education systems to meet escalating demands in a digital age for 'a wider range of multifaceted, multi-disciplinary, complex and integrated competences' required for new kinds of work.

Importantly, Marope and Griffin identify areas of emerging convergence of views about the competences that matter most. Primacy has been afforded to critical thinking, integrative problem solving, deep learning, communication, creativity, collaboration (teamwork), self-management, and global citizenship by UNESCO, the World Economic Forum, Google's Economist Intelligence Research Unit, and the New York Academy of Sciences.

The size and pace of change needed is a central theme emerging also out of the Global Education Innovation Initiative led out of Harvard University. MacCormack (2017) proposes that the required ongoing change is of such an order that the debate should move beyond talk of the 21st century and refer to this new age as 'The Age of Change'.

As local, national and global communities identify urgency for progress on new goals and competences, it matters that policy makers, bureaucracies, educators and communities can create educational opportunities to advance progress on these aspirations. In advancing a vision for 'making education for all relevant at scale' Reimers (2017) identifies the challenge to be addressed when there are 'emerging notions of what competences matter, but not widespread consensus on either goals or instructional practices to achieve them'.

> the required ongoing change is of such an order that the debate should move beyond talk of the 21st century and refer to this new age as 'The Age of Change'

The caution: 'Know thy impact'

Formal education can make a difference not just for individuals, but also for social cohesion, economic growth and adaptation. Or, education can influence student learning and attitudes in ways that are counterproductive to valued goals. Unintended negative effects can result, despite agreed goals and the best intentions of all involved.

Environmental sustainability: Curricula for a future

> *[E]nvironmental degradation, biodiversity loss, disruption caused by natural disasters and climate change are a litmus test for the global community. More than ever this is a time when education can – and must – play a decisive role in providing learners across the world with the knowledge, skills and values to discover solutions to today's sustainability challenges.*
>
> (Director General of UNESCO, 2014, p 3)

Transforming Our World: The 2030 Agenda for Sustainable Development is an agreement across countries, which has made education for environmental sustainability a goal. Teachers in many nations have long been teaching about the effects of pollution and the importance of environmental sustainability for human life and wellbeing.

Children's understandings, attitudes and behaviour can be influenced in negative ways in curricula designed to advance valued outcomes (Aitken and Sinnema, 2008; Sinnema and Aitken, 2012). In one longitudinal study (Alton-Lee and Nuthall, 1990) of the effects of teaching about pollution, the results indicated that while their scientific knowledge increased, the children had, by the end of the teaching unit, apparently become less concerned about pollution than they were before the unit.

A moment-by-moment analysis of the children's opportunity to learn revealed that they did indeed express more and more concern as they learned about the consequences of pollution for the environment and for their own and others' lives; but each time a student queried the teacher about how they could make a difference, he explained why their ideas were not practicable. He explained that at that time it was not feasible for the school to have a recycling provision; a time in the 1970s when few New Zealand schools had such provision. He focused on the knowledge building.

What the children 'learned' is that pollution is concerning and harmful, but there is nothing they could do about it. Instead of a sense of agency, the change data indicated that learners across three classes developed a response of learned helplessness. Many explained their post-unit responses that pollution does not matter because 'there is nothing I can do about it'.

A similar effect occurred in a unit designed to develop children's understanding of the importance of conservation for endangered animals. What they learned visibly affected the children. One student closed her eyes from time to time. When observational data was matched to concurrent curriculum content it emerged she consistently closed her eyes whenever the class discussion was about the death of animals.

When asked if it would matter if all of the elephants in the world died out many children reported 'no strong feeling', despite their teachers' aim to develop the children's understanding of the plight of endangered animals. The learning of those students who responded that it would matter was importantly illuminated by their explanations in later interviews about their test responses. They explained that it would matter because elephants are important for carrying wood and people need their skins for clothing. The children had not been taught that elephant skins are used for clothing. Their attitudinal changes reflected the schema driving their prior learning about animals (utility for human use), which had previously characterised their curriculum learning; humans get milk from cows, wool from sheep, and meat from farm animals.

The teachers participating in this early research were astounded by the findings, which were contrary to curriculum intentions, their own objectives, and their own perceptions of student outcomes. Such dissonance indicates that if education is to take an efficacious role in securing a sustainable future, 'know thy impact' (Hattie, 2012) matters. Evaluation methodologies confined to teacher reporting, while crucial, may be insufficient to inform policy decisions. The real impact of curricula goals and well-intentioned teaching may remain invisible.

Different pedagogical approaches are required for these new global goals; pedagogical approaches that not only develop curriculum understandings but also involve and support children in taking effective action so that they experience a sense of agency.

Curricula for a future: Pedagogies for 21st century competences

Different pedagogical approaches are required for these new global goals; pedagogical approaches that not only develop curriculum understandings but also involve and support children in taking effective action so that they experience a sense of agency.

A New Zealand evaluation of professional learning for education for sustainability (Eames et al, 2010) found participatory action to be an increasing focus, but frequently difficult to realise in practice. These evaluators' findings foreshadowed the findings of the final report on the UN Decade of Education for Sustainable Development (2005–2014) (UNESCO, 2014). Multi-stakeholder partnerships for whole-of-system change were particularly effective. At the core of educational change, emerging research indicated that critical thinking and problem based learning approaches were better. These pedagogical approaches needed to be integrated with learner opportunities to participate in strengthening sustainable development practices in their surrounding communities. Effective implementation required capacity building for policy, curriculum development, leadership, assessment expertise, and 'most importantly, teachers' (p 11).

Equity, inclusion and peace: Curricula for a future where diversity is a resource

> *Both formal and informal curriculum are powerful catalysts for social change and transformation. Curricula can change attitudes and mindsets. Examples include social positions towards strategic gender roles, women in STEM, racial groups, sexual orientation … Curricula can construct and deconstruct social order. Care has to be taken to ensure that curricula support desirable social order marked by equity and inclusion, gender equality, justice, respect for human rights, peace, responsible citizenship*
>
> Marope, 2017, p 10.

There is a growing accord in international debate that curricula goals need to prioritise respectful social skills, communication and collaborative competences. The goal to build stronger collaborative skills at every level of education systems has become an increasing focus for policy makers, economists and business leaders. Indigenous leaders have identified relationship building as critical to effective change. The authors of New Zealand's *School Leadership and Student Outcomes: Identifying What Works and Why? Best*

Evidence Synthesis (Robinson et al, 2009) found the ability to build relational trust to be crucial for sustained improvements in learner outcomes.

Bullying and exclusion as core business in schooling: Why pedagogy matters

The New Zealand school curriculum for a decade now has afforded priority to learner competency in relating to others (Ministry of Education, 2007). A growing body of evidence on cyber-bullying suggests that aspirations for relational competences and character qualities continue to be a priority. An informative outcome measure for inclusion and the competency of relating to others is the frequency of student experiences of bullying at school.

Results from the Programme for International Student Assessment studies (OECD, 2017), and the Trends in International Mathematics and Science Studies (Mullis et al, 2016), reveal continuing high prevalence of bullying in New Zealand schooling over the past decade, despite the new prominence afforded 'relating to others' in the 2007 curriculum.

Research on the hidden curriculum or the 'lived curriculum' as experienced by children has consistently challenged a common view that bullying is a behaviour influenced only by the children's families and communities; not something occasioned by formal education. Yet even teaching in social studies or civics intended to strengthen 'tolerance' and understanding about human diversity, can have the opposite effect, as explained in the New Zealand *Effective Pedagogy in Social Sciences/Tikanga ā Iwi Best Evidence Synthesis [BES]* (Aitken and Sinnema, 2008; Sinnema and Aitken, 2012).

In a study (Alton-Lee and Nuthall, 1995) of the practice of one well-intentioned New Zealand teacher, microphones recording each child's responses to such a social studies unit revealed a hidden curriculum. The teacher was using the example of New York as a multicultural city. In a class lesson he gave a quick introduction to the history of New York.

> *Teacher: When White men first came, they found Indians … They were called Manhattan Indians. Because White people, Europeans, we were…*

What followed the word 'we' demonstrated the impact of the teacher's inadvertent 'othering' of Ricky, a Māori student in the class. His best (White) friend, Joe, instantaneously leveraged the 'othering' to quietly chant racist slurs, eventually kicking his Māori friend, and repetitively chanting 'God, you're dumb' as the teacher now aware of the altercation, required Ricky, the Māori child, to leave the lesson for his 'bad behaviour'. Joe was correctly confident that only he would be believed. This was a kind teacher, using social studies to teach tolerance (Alton-Lee et al, 2000).

However, when kind teachers from the dominant culture inadvertently position indigenous students as not part of the 'we' of classroom discourse, curriculum can become a vehicle for 'othering' and exclusion, and a hidden trigger for bullying and violence.

Unknowing racism and inadvertent deficit attributions to under-served learners, even when policy or professional intentions are to advance equity, remain a challenge. One of the findings of the *New Zealand Teacher Professional Learning and Development: Best Evidence Synthesis* (Timperley et al, 2007) was that professional collegial

Unknowing racism and inadvertent deficit attributions to under-served learners, even when policy or professional intentions are to advance equity, remain a challenge.

interaction focused on student outcomes can help teachers integrate new learning into practice. It was one of the most consistent findings across the source studies; emerging as an important but insufficient factor.

Timperley et al (2007) also reported a range of studies where policy had invested substantially in structured professional learning groups to address issues of equity with neutral or even negative results. Their findings indicated that collaboration for equity can 'reinforce existing deficit thinking and structural inequalities. Those who held alternative theories and could have served as a resource for the group's deliberations were marginalised.' (p 201)

To achieve the social justice, equity and excellence sought it will be crucial for education systems to learn from those who have the most expertise about the transformative action needed. Indigenous leadership and expertise in New Zealand has brought about extraordinarily accelerated, transformative and sustained change for Māori succeeding as Māori in New Zealand mainstream secondary schools with positive flow-on effects for all students (Berryman and Bishop, 2013; Bishop et al, 2010; Alton-Lee, 2015a).

To achieve the social justice, equity and excellence sought it will be crucial for education systems to learn from those who have the most expertise about the transformative action needed.

Te Kotahitanga Phase 5 was the research and professional development program that led to the achievement of Māori, as measured by upper secondary qualifications, to improve at around three times the rate in Te Kotahitanga schools, as the rate for matched-comparison students. The intervention, well-implemented, transformed pedagogy, relationships, leadership and professional learning.

The qualitative data of student voice were an ongoing driver in this complex intervention. At the outset of Phase I the feedback from Māori was compelling (see Box 1).

The feedback from Māori students in Phase 5 schools was dramatically different (see Box 2).

Box 1. Feedback to Phase 1

- *She makes me feel like I've got a dumb name and I'm dumb.*
- *When I started at this school I had a Māori name [Hinemaia] but none of the teachers could say it so now I'm Tania.*
- *They shame us in class.*
- *Most of the teachers don't like teaching the dumb streams.*

Box 2. Feedback to Phase 5

- *It's like the opposite of racism in this school.*
- *It's a real good feeling being Māori.*
- *We are relaxed. We can be ourselves.*
- *They treat us like we're their kids.*
- *It's not like they blame you. They blame themselves. They take it personally that it is their fault. They think they are teaching you badly.*

Te Kotahitanga sounded a warning for those relying on high expectations, aspirational curricular or policy goals, or care alone, for educational change. Teachers who professed care and high expectations for Māori students without following through with effective pedagogy left Māori students feeling 'patronised, belittled and left adrift' (Bishop et al, 2014). High expectations without transformative action had a long-term cost. Students blamed themselves for their failure.

By Phase 5, Te Kotahitanga was a compelling demonstration, to scale (16 secondary schools), of the power of a complex professional development and research intervention to deliver simultaneous success trajectories for

Māori. **Achievement and identity matter** (Alton-Lee, 2015b). See the evidence in action video, Rawiri's Speech at www.educationcounts.govt.nz/topics/BES/useful-links-and-publications/disciplined-innovation-for-equity-and-excellence-in-education-learning-from-maori-and-pasifika-change-expertise.

One of the reasons advanced for not affording priority to 21st century competences for social transformation, is that these are too hard to measure. Indigenous leaders Associate Professor Mere Berryman and Professor Russell Bishop also developed an assessment tool to make it readily feasible for schools to obtain systematic baseline and change data on student experience of identity and learning at school. The tool is called Rongohia te Hau.

A core item in this tool is the question 'It feels good to be (Māori /my culture) in this school Always/Mostly/Sometimes/Hardly Ever/Never'.

The Te Kotahitanga professional development did not reach the primary level of schooling in New Zealand.

In a 2010 discussion about whether or not racism is still a challenge in New Zealand education, one young teacher explained to her primary school colleagues that after his first week at school, her five-year old son asked his parents: 'How can I make my skin white?' (Alton-Lee, 2015a). Business as usual is not okay and the expertise for, and the 'how' of accelerated improvement matter.

In Berryman's words: *'Learn from and with these children, so that we all can stand tall.'*

Equity, inclusion, and stratification practices in formal education

Lived curriculum can subvert curriculum goals through organisational processes. There have been persuasive voices for ability grouping as a way of schools and teachers differentiating to meet learner needs. As further evidence has become available, the negative effects of ability grouping in education have been increasingly identified.

As further evidence has become available, the negative effects of ability grouping in education have been increasingly identified.

In an early review of available evidence, Gamoran (1992) advised school leaders to move to more heterogeneous and flexible grouping practices.

> *Ability grouping rarely benefits overall achievement, but it can contribute to inequality of achievement, as students in high groups gain and low-group students fall farther behind. The more rigid the tracking system, the more likely these patterns are to emerge.*
>
> (p 1)

From their cross-country analysis of international assessments, Hanushek and Woessmann (2006) concluded that

> *The results suggest that early tracking increases educational inequality. While less clear, there is also a tendency for early tracking to reduce mean performance. Therefore, there does not appear to be any equity–efficiency trade-off.*
>
> (p 1)

A 2015 analysis (Schmidt et al, 2015) of the Programme for International Student Assessment data found that stratification through tracking, streaming and ability grouping significantly influences student opportunity to learn from the curriculum.

They conclude that the explanation for around a third of the achievement effect in mathematics attributed to low socio-economic status of student families lies with stratification policies affecting opportunity to learn.

> *Our findings suggest that in most countries, the organization and policies defining content exposure may exacerbate educational inequalities.*
>
> (p 371)

Learn how to handle heterogeneity – teach heterogeneous classes effectively.

Hattie (2012) has identified negative effects when learning is organised by early labelling, concluding from meta-analytic results a large 0.61 effect size for 'not labelling' students. Concerningly, when labelling and stratification are core to educational provision, the conditions are ripe for peer bullying.

Hattie et al (2017) recently stated the following, about the mounting evidence from meta-analytic studies.

> *There is no evidence to suggest that rigid ability grouping over long periods of time will yield breakthrough results. The effect size of ability grouping is negligible in terms of impact, yet it remains common in many schools. As typically implemented, the greatest effects of ability grouping are to disrupt the learning community, socially ostracise some learners, and compromise social skills … Effects on minority students are much more serious, with more minority students likely to be in lower ability classes, destined to low performance based on low expectations, and often with the least effective teachers.*
>
> (p 228)

The PISA (Martin, 2016) and TIMSS studies (Caygill et al, 2016), an Education Review Office Report (Education Review Office, 2013) and other studies (Anthony and Hunter, 2017) have shown New Zealand to be widely using streaming, stratification and ability grouping. Professor Glenda Anthony, lead author of the *Effective Pedagogy in Mathematics/pāngarau Best Evidence Synthesis [BES]* (Anthony and Walshaw, 2007; 2009) has highlighted the growing evidence (Anthony and Hunter, 2015; 2017) of concerning prevalence and effects of ability grouping and streaming in New Zealand mathematics teaching. There is evidence from national monitoring that further stratification, through the use of teacher aides rather than qualified teachers, to work with the lowest achieving students, has become a prevalent practice in New Zealand (EARU, 2015).

As evidence about effects of stratification, streaming or tracking of students by ability has become more compelling through access to evidence in the Programme for International Student Achievement (PISA), these findings are being brought to the attention of policymakers. Schleicher (2014) sent a significant policy message to participating countries– 'Reduce Early Tracking' – in the OECD Publication: *Equity, Excellence and Inclusiveness in Education: Policy Lessons from Around the World.*

Inequality through streaming was again a focus in an OECD publication reporting PISA findings that within-school or within-class ability grouping can reduce opportunities to learn for disadvantaged students (OECD, 2016). Their recommendation for policy and practice was clear. For a more equitable outcome, education systems need to learn how to handle heterogeneity – teach heterogeneous classes effectively.

Mathematics education for equity, excellence, wellbeing and inclusion for the age of change

The importance of mathematics competences for life and work is widely agreed. Educational economists have identified significant benefits for countries that lift mathematics achievement. After analysing the relationship between national cognitive skills gains in mathematics and science on international assessments, economic outcomes, and causation under different economic scenarios, Hanushek and Woessmann reported in 2012 that educational improvements in mathematics and science could lead to 'enormous changes in the economic outcomes for a country'. They point out that 'if the true causal impact of skill differences were only half as suggested by our estimates, we would still be left with extraordinarily large policy opportunities'.

Lifting achievement in primary mathematics education has become a priority for Government in New Zealand since the release of the 2014/15 TIMSS results. The results showed the New Zealand mean national Year 5 achievement score to be lower than the international scale centrepoint (500) at 491. Results revealed more than a quarter of Māori learners, and almost a third of Pasifika learners, to be below the low international benchmark, meaning that they had not demonstrated the ability to complete a reasonable number of the simplest mathematics tasks (Caygill et al, 2016).[4]

Shifting the practice of education from ability grouping to the effective teaching of heterogeneous groups of learners, to develop multiple valued competences to scale, is an enormous challenge for the New Zealand education system. The institutionalisation of ability grouping and stratification requires what has been called a 're/invention' of pedagogy rather than an intervention.[5] The global movement to foreground the urgency of change that can deliver on the competences and improvement needed, provides a significant opportunity to reflect on social investment decisions.

Transformative expertise

Associate Professor Roberta Hunter, of Massey University, has developed in New Zealand a transformative pedagogy for deep learning in mathematics, through the effective teaching of heterogeneous groups: Developing Mathematical Inquiry Communities (DMIC) (Hunter, 2007; Hunter, et al, 2016a). The initial internationally award winning implementation of this innovative approach is featured in a BES Exemplar.[6] To hear directly from Associate Professor R Hunter, teachers, leaders and students, and a Māori elder explaining this approach to the use of heterogeneous groups, see the introductory video *Developing Mathematical Inquiry Communities.*[7]

Associate Professor R Hunter brings not only her mathematics education knowledge, and expertise as a teacher educator, but also her cultural expertise as a Cook Islands New Zealander (her mother was born in Aitutaki) to the leadership of this culturally responsive work.

The approach has been developed to scaffold improvement on a range of competences: communication, critical thinking, integrative problem solving, creativity, collaboration (teamwork), and self-management. The competences are developed through, and with, a core focus on accelerated improvement in mathematics. The competency set closely matches the emerging consensus about crucial competences for the 4th industrial revolution, or the new age of change.

Hunter's work built on a range of research and development that has demonstrated accelerated achievement for diverse learners in heterogeneous groups. For example, Complex Instruction, a high-impact collaborative skill-building approach for working with heterogeneous learners in multilingual classrooms, initially developed at Stanford University (Cohen and Lotan, 1997; 2014). This innovative approach – affording as much weight to building communication, social, and collaborative competences as to learning curriculum content – was tailored for mathematics teaching and progressively scaled, in work in the UK and the US led by Professor Jo Boaler (2016).

To make the problems relevant and compelling to learners, the teachers are required to design problem tasks that create educationally powerful connections to the lives of students.

Very high-performing in mathematics achievement, Singapore has drawn upon Hunter's work, in its press to strengthen integration of 21st century competences and social and emotional wellbeing through every strand of enacted curriculum (Tee Ng, 2017), including mathematics learning.

Professional learning

While the intensity and scope of different implementations have been constrained by funding and support, the comprehensive DMIC professional development model, variously activated through different implementations, reflects and advances the findings of high-impact professional development in the New Zealand *Teacher Professional Learning and Development: Best Evidence Synthesis* (Timperley et al, 2007; Timperley, 2008).

Two features combining best evidence in action videos, with underpinning papers, are available online.[8] The videos are short and provide perspectives from all involved. In what follows, I indicate where specific videos illuminate specific processes.

A core strand of this work requires teachers to understand the big mathematical ideas, and to understand mathematics progressions. Teachers are required to engage in applied professional learning to ensure that their planning and pedagogical actions are informed by cognitive science about the ways in which children learn mathematics.

Teachers are required in their planning to anticipate the misconceptions the students are likely to bring to their learning. A member of the Massey team, Dr Jodie Hunter, completed an award-winning doctoral study (2014) on the development of early algebraic thinking in children, investigating both the changes in children's and teachers' learning. The approach requires very high expectations for students, but advances the processes necessary to scaffold both students and teachers to meet those expectations.

A major focus of the approach is teacher planning and design of successive problem tasks. See the video *Problem and Launch*.[9] To make the problems relevant and compelling to learners, the teachers are required to design problem tasks that create educationally powerful connections to the lives of students. See the video *Learning for Life*.[10]

Building student and teaching capability for productive participation in heterogeneous groups

An introduction to this issue is provided in the two videos *Mixed Ability Grouping*[11] and *It's a Journey*.[12]

After the development of the mathematical problem tasks, the DMIC approach requires teachers to

- become proficient in the initial whole-class 'launch';
- develop student capacity in social norms to scaffold intense mathematical engagement;
- carefully observe the group work in progress to track progress, so that such observations can in turn inform class discussion and task design, going forward; and
- lead the final whole-class lesson where each group reports back and the whole-class discussion is designed to support all students to make connections to the big mathematical idea that is the focus of the learning.

Teachers are required and supported to build specific communication and collaborative skills for mathematical argumentation.

Building social norms is the foundation for the heterogeneous groups to function for all students. The teachers and children in the *Group Norms*[13] and *Learning Together*[14] videos explain.

For many children, especially Pasifika students (Hunter, 2013), actively participating in mathematical argumentation is a big change. Argumentation is viewed as 'not polite'. To support the change in behaviour for children whose families may see good behaviour as silent behaviour, and arguing as bad behaviour, this aspect of the approach is called 'friendly arguing' (Hunter and Anthony, 2011).

Negotiating this change requires partnership work with parents to be respectful of family values, while also allowing that in this kind of learning context 'friendly arguing' is a good thing to do. For silent or previously marginalised children, the change involved can be significant. Both high achievers and low achievers benefit from the opportunity to communicate elaborated explanations. An early seminal research review found that giving an explanation of an idea, method, or solution in mathematics was more positively related to the achievement of the giver than the listener but, as students learned to use elaborated explanations, everyone benefitted (Webb, 1991).

For teachers, the change from talking to listening can be a big shift, as explained in *Learning to Listen*;[15] but the listening is critical to inform next steps, task design and strategies to realise productive collaboration for the children (Civil and Hunter, 2015).

Both high achievers and low achievers benefit from the opportunity to communicate elaborated explanations.

In-class modelling, co-construction and mentoring

Part of the reason for the possibility of such change is the nature of the in-class mentoring model that characterises this re/invention of practice. Mentors model for teachers in their own classes how to work differently with children, creating dissonance as teachers realise their expectations have been far too low for their students.

In-class mentoring includes videoing teacher practice to support focused teacher inquiry and reflection, and track the pedagogical change.

The mentors actively intervene, calling a pause in the lessons and then co-constructing changed practice with teachers. For most teachers, the initial experience is tough. At the outset teachers experience great dissonance, identified by one principal as the 'learning pit.'[16] However, teachers typically grow to treasure this process.

See *Culturally Responsive Pedagogy*[17] and *The Professional Learning and Development Approach*.[18]

Sustainability and ongoing improvement are advanced by applied teacher and leader postgraduate study from the second year of implementation.

Transformative pedagogical leadership: Walking the talk and talking the walk

A critical success factor for the in-class change work has been found to be the early development of the school principal's knowledge and understanding of the approach.

Rates of teacher change are linked to how rapidly the principal and other senior leaders shadow the mentors in the work they are doing with teachers. For principals working long hours this is a big challenge; but the potential leadership change is the foundation for a wide range of changes in administrative decisions coherent with the conditions needed for change (Robinson et al, 2009). Such changes affect degree of impact on student outcomes. The new knowledge enables effective pedagogical leadership, and supports the principal to integrate coherent, collaborative and distributive leadership practices into business-as-usual practice.

Rates of teacher change are linked to how rapidly the principal and other senior leaders shadow the mentors in the work they are doing with teachers.

Dr J Hunter (2012) has developed a model of collaborative lesson study that the Massey team are supporting schools to use. Scaffolding this strategy as a core collaborative practice in schools is a significant lever for effective professional collaboration for sustainability and ongoing improvement. See the video *Teacher Development*.[19]

The development of effective mentors

The strategy for mentor development and supervision has been an area of focus for Associate Professor R Hunter, in order to find a viable way to enable further reach of this complex and labour-intensive relational change process (Hunter et al, 2016b).

Mentors are only drawn from classroom teachers who have demonstrated competence in the approach, then demonstrated capacity to shift their focus from the children to the teachers as their learners. Mentors who fall back to modelling the approach with children do not achieve the same acceleration as those who are able to press for rapid learning in teachers.

Wider reach will require productive collaboration across schools. One video[20] highlights an early endeavour to build on significant findings from Te Kotahitanga, to use structured collaborative leadership strategy across three schools. This collaborative strategy illustrates leadership mentoring by Associate Professor R Hunter. She provides feedback on progress, and then pushes the school leaders to the next level. However, one of the principals is facilitating the collaborative meeting, and they are taking a joint problem solving approach to advancing and institutionalising DMIC change work (see *Strategic Change Leadership Meeting*).[21] The video also illustrates a point in the process where principals reflect on how they can build the capacity of teacher aides to better support the process.

Parent involvement for reciprocal learning

The implementation of DMIC does not fit easily with traditional policy models, as it requires involvement of parents in initial workshops, so they can learn about the new approach to mathematics learning and teaching and the social norms. The workshops also provide a forum for teachers to strengthen their connections with parents and caregivers, so they can better draw upon family funds of knowledge, to design tasks that forge educationally powerful connections with the diverse lives of the children they teach. This process is designed to strengthen relational trust, with direct impact on children's achievement.

Leadership capacity to build educationally powerful connections with the families and communities of the diverse students in their schools has been identified as a significant area of weakness, and of opportunity for transformative change in the *School Leadership and Student Outcomes: Best Evidence Synthesis* (Robinson et al, 2009). The approach also enables a process to counter a lasting negative effect of parent 'help with homework', apparent in a New Zealand longitudinal study and other research featured in Chapter 7 of that synthesis.

In any change to the use of heterogeneous grouping practices in education, in a system where ability grouping and streaming have become widespread, communication with parents is critical. For parents, whose children are high-achieving, the use of heterogeneous groups can be a concern. They need to know that all learners will benefit from the innovative pedagogy.

The process of teachers connecting to the lives and families of their students continues to be critical, for teacher learning and practice that does result in educationally powerful connections for diverse learners. As Associate Professor R Hunter says, it is not about 'allocating identities' to children; it is about connecting to their identities as a resource for equity, inclusion and excellence.

Partnership work with parents has implications for strengthening dynamic learning partnerships between schools and their communities. See the video *A Parent's Perspective*,[22] as parent Lui Tupuola explains his surprise about the change in his son, and the inspiration it provided for his proactive follow-up to support the change work.

A tool for scaffolding and assessing simultaneous success trajectories

A significant tool used in the implementation of the DMIC approach is the Mathematics Communication and Participation Framework.[23] An early version of this tool is depicted in *BES Exemplar 1*, p 13).[24]

This framework integrates the simultaneous progressions required for behaviours exemplifying multiple competences: mathematical thinking, oral language, participation, collaboration, critical thinking and problem solving. So, while the focus is on mathematics, social skills are much more than a 'nice to have' goal, assumed to be addressed elsewhere in the curriculum. The teachers can draw upon the framework, to scaffold specific progressions for participatory actions and communicative actions, integrated with increasingly complex mathematical competences. The Massey team works with schools to develop the framework further.

The use of these progressions supports both pedagogical development and formative assessment. Importantly, the tool supports productive inquiry, but is a guide to pedagogical design, not a replacement for it. The framework is a tool that informs, rather than creates goal displacement, for highly effective pedagogy using rich tasks and collaborative group learning.

The integration of progressions for multiple competences is a game-changer for delivering on these valued competences, but requires tireless groundwork to teach rather than falsely assume the skills of productive collaboration.

Long-standing evidence about opportunity to learn suggests that, until such multiple success trajectories are integrated into student learning across the curriculum, the new global goals for education may remain aspirational.

The original implementation ... enabled extraordinary gains in mathematics achievement, by middle primary students in two classes, in a school serving a low socioeconomic community.

Expertise for transformative change: Outcome Evidence

The original implementation led by Associate Professor R Hunter enabled extraordinary gains in mathematics achievement, by middle primary students in two classes, in a school serving a low socioeconomic community.[25] The qualitative data in the initial study signalled a rare change also in the ways in which students came to relate to one another. This was illustrated when 10-year old Wiremu advised a male peer in his collaborative group to behave more respectfully towards a female peer: *'Don't dis' her man when she's taking a risk'*. Because Hunter was the recipient of a Teaching and Learning Research Initiative grant, that enabled this innovative work to develop in one school.

Evaluation of initiatives to extend DMIC to scale were measured, as required, by assessments using teacher judgements of progress on national standards for mathematics; but meaningful assessment was difficult using these relatively new measures. An early sign of the success of DMIC was the apparent drop in student achievement as teacher mathematical knowledge increased and judgements became more accurate. Despite this effect and much variability of implementation, a comparative analysis, after one year of intervention, showed gains in students attaining national standards (7.9 per cent) in five DMIC schools to be more than twice those in non-participating schools in the same decile bands in the same area (3.1 per cent) in 2014.[26] For insight into the process behind the schools forging early change, see the videos *Impacts*[27] and *Perspectives*.[28]

Available funding to date has been focused on national standards achievement. In what follows, I report change data gathered in two exceptional implementation opportunities, which afforded the possibility of assessment using other tools to capture progress on a range of 21st century competences that are a focus of this innovative approach.

After preparation, a 2015 capacity building project was advanced for three schools in Porirua East, Wellington. These schools serve communities identified as in the lowest socioeconomic decile for feeder communities in New Zealand (decile 1 schools).

Simultaneous success trajectories for teachers and students: Emerging evidence

The findings for the first year of implementation demonstrated accelerated improvement for the range of outcomes sought from the intervention. Importantly, it was possible to introduce the use of a standardised test to triangulate with teacher judgements. It was also possible to use assessment tools, including Rongohia Te Hau, and items from the TIMSS bullying indicators to consider impact on student identity and bullying. The Massey team, including Professor Glenda Anthony, also progressively gathered qualitative data on the change process. The experience from the perspective of teachers is explained in the video *Fundamental Shifts*.[29]

A 2015 independent report on the change data, by Professor Elham Kazemi (Geda and Phil Condit Professor in Math and Science Education, University of Washington, WA), explains the findings as follows.

> *Early evidence … shows shifts in teachers' focus on big ideas and problem solving in maths, changes in teaching to heterogeneous groups instead of ability grouping students, improvement in enjoyment and collaboration among teachers and students, and growth in cultural responsive pedagogies. Teachers are showing shifts in raising expectations for student learning and in turn expectations for their own professional learning. Teachers are reporting shifts in what they view as their strengths in teaching, from a focus mostly on teaching skills in math to really knowing their students as learners and teaching to big ideas, posing better tasks, and supporting student metacognition through orchestrating discussions.*
>
> *Students are reporting expanded views of what is mathematics, viewing mathematics not just about using four operations and learning times tables but also about problems, thinking, and ideas.*
>
> *Early achievement data also shows acceleration in student achievement, well over an average year's growth, in particular classes in Years 4, 5, and 6. As teachers continue to develop their pedagogies especially in younger years, we expect to see successive gains reflected in the Year 4–6 cohort.*
>
> *The baseline data indicated that there were children who, in mathematics, 'never' or 'hardly ever' felt good to be Māori, or Samoan, or their own (other) culture. This is changing. For example, Māori, Samoan, Cambodian and Iraqi students in Porirua East have explained:*
>
> *'I feel proud in my maths lesson today by carrying my family with me'*
>
> *'I felt bad 'cause people tease my culture… (in maths now) I feel normal' and*
>
> *'to be Samoan today in maths was awesome'.*
>
> *The percentage of students who never or hardly ever felt good to be their culture (in mathematics) dropped from 8.6 per cent to 3.3 per cent over the seven-month early implementation period.'*
>
> (Kazemi, 2015)

Kazemi also highlighted the early change data in these three Porirua East schools showing substantive reductions in bullying, from

- 23.5 per cent to 10.4 per cent of students reporting they were made fun of or called names at least once a week;

- 15.1 per cent to 5.5 per cent of students reporting they were left out of activities at least once a week; and from
- 20.5 per cent to 7.4 per cent of students reporting being hit, kicked or hurt by other students at least once a week.

These are the kinds of changes that are indicative of a lived curriculum that is enabling children, from the poorest socio-economic communities, to benefit from the kinds of competences UNESCO is reflecting are the competences needed for the future.

Kazemi concluded that

> *The quality of professional education and mentorship led by Dr Bobbie Hunter and Dr Jodie Hunter and their team from Massey University serves as an international exemplar of the highest quality.*
>
> (2015)

If the focus on new competences is to deliver, not only for students, but also for overburdened teachers, an integrative and effective approach is crucial.

The significance of pedagogical re/invention that improves mathematics and decreases bullying

While all of these changes for students are important, the reduction in bullying effect matters greatly for New Zealand.

In the Trends in International Mathematics and Science Study in 2010/11 findings, in only one country was bullying significantly more frequent than in New Zealand for middle primary students. The 2014/2015 TIMSS findings signalled very high prevalence of bullying and urgent need for change: 44 countries reported significantly lower bullying rates than New Zealand (TIMSS, 2015).

The latest international assessments indicate that the bullying problem is not diminishing as New Zealand students get older. Fifteen-year-old New Zealand students experience the second highest frequency of bullying behaviours in the recently released PISA report that showed 51 countries to have lower frequencies of student bullying (OECD, 2017).

Just putting the relating, participating and contributing competences at the heart of formal curriculum, without attending to the lived culture of schooling, has been to insufficient effect. The New Zealand context of high use of ability grouping and high rates of student bullying indicate that a traditional perspective on bullying interventions will not be sufficient.

However, unless policy is attending to the value of simultaneous success trajectories in transformative change work, such data can be bypassed. If the focus on new competences is to deliver, not only for students, but also for overburdened teachers, an integrative and effective approach is crucial.

Indigenous partnership for equity and excellence

Laurie Loper, an indigenous elder and experienced educational psychologist, funded an iwi (tribal) partnership implementation of the Developing Mathematical Inquiry Communities approach in Shirley School in Christchurch in 2016: *Hangaia Te Urupounamu Pāngarau Mō Tātou.*[30]

The first best evidence in action video,[31] recorded early in this partnership implementation, is one of the most illuminating videos because the children remember how it was before as they and their teachers are astonished by the change they experience.

One teacher explains how their starting place was mathematics as a culture-free area of curriculum. The relevant video[32] explains the magnitude of the shift to a partnership and culturally responsive approach to mathematics.

This implementation enabled accelerated mathematics achievement and curriculum transfer effects for younger students and steady progress for the older students.

Four of the eight Māori students who reported being hit or hurt by other students at least once a week no longer reported that frequency of violence in the Time 2 data. There was also a positive change in the percentage of Māori students who reported being made fun of or called names at least once a week, from over a quarter of Māori students 27.5 per cent to 20 per cent.

There were modest positive changes in the sample of students feeling good to be their culture in mathematics, with a decline from 12.8 per cent to 7.5 per cent of students never or hardly ever feeling good to be their culture.

There was a marked change for some Ngāi Tahu students in their feelings about being Māori at school, in the initial and final interviews.

May 2016

> *'I'm from New Zealand but I've got Māori in me.'*
>
> *'I'm just from New Zealand and it feels the same.'*

November 2016

> *'I am New Zealand Māori and it's good.'*
>
> *'Not very much but a little bit Māori … I don't think it really matters because you're still people and you don't really get judged.'*
>
> *'I'm part Māori and I'm part English… and it's good because I know Māoris are smart'.*

The *Geometry – Connections: Tapa, Siapo, Ngatu* video[33] highlights the extraordinary change leadership within the school, as a senior leader in the school reflects that even their best attempts to be culturally responsive can have unintended negative effects. This video illustrates the magnitude of teachers' change, as they learn to draw upon the funds of knowledge of the children and their families to create educationally powerful connections for learning.

The video *Voice and Confidence*[34] features the voice of students who, prior to this change in their classroom experience, had remained silent in mathematics.

The Professional Learning Development Approach[35] explains knowledge building, in-class co-construction and mentoring from the perspective of the children, the teachers and the principal after the first year of implementation. The *Lifting Expectations* video[36] features the staff for the older classes, reflecting on how different is the achievement level of students coming into their classes in the following year, and the step up they see themselves taking to sustain the trajectory achieved.

Resilience

As explained at the outset of this paper, the 2030 Sustainable Development Goals afford urgency and focus for competences for an uncertain future and for system leadership in times of sudden change such as natural disasters. For many communities, an uncertain future is here – affording even greater urgency to the role of education in developing resilience, social-emotional competences and problem solving skills.

Shirley Primary School was in a process of rebuild following the loss of its school

For schools and communities managing significant disruptions in everyday life there is even greater importance of pedagogical approaches that support student wellbeing and build social emotional competences and resilience.

buildings in the magnitude 6.3 earthquake that struck the region in February 2011. The surrounding community was subjected to repeated flooding.

Staff and students were in temporary, crowded teaching spaces, alongside a noisy building site, until a planned move in 2017. The school experienced rapid roll growth following the closure of two neighbouring schools after the earthquake. The school had high levels of transience and roll churn, with families variously leaving or arriving in the context of the city rebuild. The school population had rapidly diversified with more than 22 cultures represented in the students. Many staff, including the principal, were managing earthquake damage to their own homes. By 2016 there had been over 16,000 earthquakes aftershocks.

In 2016, a research team who had been carrying out longitudinal research on children's wellbeing, behaviour and stress before the Christchurch earthquake, reported Post Traumatic Stress Symptoms in children aged 24 months and younger at the time of the 2011 earthquake to be far more prevalent (20.7 per cent) than those for a pre-earthquake, baseline group (8.8 per cent) (Liberty et al, 2016). Problem behaviour was also significantly more prevalent.

The findings indicated a developmental vulnerability for children who were babies at the time of the catastrophic Christchurch earthquakes. The study found that the cohort of children who were older when the earthquakes struck were not so affected. The most affected cohorts were the new entrant and junior children at Shirley Primary School at the time of the Hangaia Te Urupounamu Pāngarau Mō Tātou implementation. While not specifically identified, children who had been diagnosed with earthquake-related behaviours featured in the videos, to illustrate the power and significance of the social-emotional support experienced by these children as a consequence of the DMIC approach.

The day the in-school professional learning commenced, in the January holiday break before new school year start, a magnitude 4.1 earthquake created fear as staff members and local participants urgently made contact to ensure their own children and families were safe.

When Shirley school staff were gathering Time 2 data, managing the final month of the school year, and preparing for the imminent move to a new school building, on 14 November the magnitude 7.8 Kaikoura earthquake struck New Zealand.

For schools and communities managing significant disruptions in everyday life there is even greater importance of pedagogical approaches that support student wellbeing and build social emotional competences and resilience.

In the best evidence in action video, *Resilience*,[37] Principal Kylie Piper demonstrates extraordinary leadership of the implementation of Hangaia Te Urupounamu Pāngarau Mō Tātou, and her approach to using the earthquake effects as an opportunity to support all of their learners to develop resilience.

What does it take to implement sustainable change for ongoing improvement?

Across the DMIC implementations, teachers report that the new social and communication norms are reaching beyond the mathematics. Principals have reported that the intense communication focus has been transformative of oral language development in the school, accelerating progress in literacy, including digital literacy.

The estimate is that, for a school to achieve sustainability for ongoing improvement in this approach, a three- to four-year strategically resourced change process is required to sufficiently institutionalise the changes. Contextual factors are salient. Teacher turnover can mean starting again. Because the Massey University team seek to work with schools with highest need from lowest socioeconomic communities, issues such as student transience pose significant challenges for effective inclusion. For wider reach, it is crucial that collaborating schools develop and share new mentors, a strategy that requires a strong collaborative culture across schools.

In the context of his leadership role in Harvard University's outreach Global Education Innovation Initiative, Reimers (2017) concludes as follows.

> *The concerns over the question of change at scale therefore stem not from the inability of schools to change, or even to change at scale, but from an insufficient understanding of the process through which schools change at scale and the consequent limitation in our capacity to manage their future evolution.*
>
> Location 149

Many of the essential features for sustainable implementation for ongoing improvement across simultaneous success trajectories do not fit with current policy thinking or investment. The challenge for policy makers and partners is to understand such extraordinary opportunity to advance 'walk the talk' progress on critical curriculum competences, and to find a way to support ongoing scale-up across schools.

Endnotes

1. I am indebted to Associate Professor Mere Berryman, of the University of Waikato for use of her phrase, ‘simultaneous success trajectories’ which she created in the context of her seminal role in transformative change in New Zealand education. Along with Professor Russell Bishop, Associate Professor Mere Berryman developed Te Kotahitanga; a World Innovation Summit in Education Award winning intervention.
2. Local and national curricula are statements of the aspirations of those contributing to and consulted in curricula development for outcomes from formal education. New Zealand has prided itself on extensive consultation that has informed curricula in both early and school learning and has afforded priority to develop competences in its education agenda.
3. UNESCO together with UNICEF, the World Bank, UNFPA, UNDP, UN Women and UNHCR organised the World Education Forum 2015 in Incheon, Republic of Korea, from 19 – 22 May 2015. Over 1600 participants from 160 countries, including over 120 Ministers, heads and members of delegations, heads of agencies and officials of multilateral and bilateral organisations, and representatives of civil society, the teaching profession, youth and the private sector, adopted the Incheon Declaration for Education 2030, which sets out a new vision for education for the next fifteen years.
4. In the TIMSS results for 2014/2015 the mean mathematics achievement for Māori was 451 and the mean for Pasifika was 439.
5. ‘Re/invention’ is the term used by the Massey University Developing Mathematical Inquiry Communities team, Associate Professor Bobbie Hunter, Professor Glenda Anthony and Dr Jodie Hunter.
6. See www.educationcounts.govt.nz/__data/assets/pdf_file/0011/107111/BES-Exemplar1.pdf. The original BES exemplar was quality assured by Professor Emerita Courtney Cazden of Harvard University.
7. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/01-developing-mathematical-inquiry-communities.
8. For the full sets see Developing Mathematical Inquiry Communities at www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/introduction and Improvement in Mathematics Education: Evidence in Action Hangaia te Urupounamu Pāngarau Mō Tātou at www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/introduction.
9. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/05-problem-and-launch.
10. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/10-learning-for-life.
11. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/04-mixed-ability-grouping.
12. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/13-its-a-journey.
13. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/09-group-norms.
14. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/11-learning-together.
15. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/06-learning-to-listen.
16. Coined by James Nottingham. www.jamesnottingham.co.uk/learning-pit/.
17. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/14-culturally-responsive-pedagogy.
18. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/03-the-professional-learning-and-development-approach.
19. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/07-teacher-development.
20. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/03-strategic-change-leadership-meeting.
21. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/03-strategic-change-leadership-meeting.
22. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/02-a-parents-perspective.
23. Work of Hunter, R (2007) *The Mathematics Communication and Participation Framework: An outline of the communicative and participatory actions teachers facilitate students to engage in to scaffold the use of reasoned collective discourse*. This framework was informed by the work of Wood and McNeal (2003).

24. www.educationcounts.govt.nz/topics/BES/resources/bes-exemplars.

25. The effect sizes for the gains in both classes were very large: $d = 2.39$ and $d = 2.53$ using Cohen's d.

26. Unpublished analyses carried out for the Iterative Best Evidence Synthesis Programme by Shane Martin in 2014 and 2015. Analyses replicated by three analysts in the Evidence, Data and Knowledge Group of the New Zealand Ministry of Education.

27. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/08-impacts.

28. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/12-perspectives.

29. www.educationcounts.govt.nz/topics/BES/developing-mathematical-inquiry/15-fundamental-shifts.

30. The James Stewart Loper Bequest was established by Laurie Loper to advance evidence based intervention to help accelerated improvement and social justice for Ngai Tāhu children succeeding as Māori and for all students.

31. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/introduction.

32. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/02-cultural-identity.

33. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/05-geometry.

34. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/04-voice-and-confidence.

35. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/03-the-professional-learning-and-development-approach.

36. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/07-lifting-expectations.

37. www.educationcounts.govt.nz/topics/BES/hangaia-te-urupounamu-pangarau-mo-tatou/06-resilience.

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Adrienne Alton-Lee

About the Author

Dr Adrienne Alton-Lee is Chief Education Adviser, Iterative Best Evidence Synthesis [BES] Programme, Hei Kete Raukura, Evidence, Data and Knowledge Group, New Zealand Ministry of Education. Her research interest is in the collaborative generation, dissemination and use of syntheses of evidence about what works and why to strengthen the evidence-base informing policy, research and practice in education. Her current focus is on the role of systemic research and development as a catalyst for transformation in education.

About the Paper

This paper was originally prepared for the New Zealand Ministry of Education, the Education Council of Aotearoa and the IBE-UNESCO Project: Rethinking and Repositioning Curriculum in the 21st Century: A Global Paradigm Shift. Dr Alton-Lee responds to the call by IBE-UNESCO for transformative change in education, urging attention to evidence on **how** to achieve urgent goals for different kinds of outcome; both locally and globally. Action is a priority, she argues, but we must not invest in well-intentioned action that might lead to counterproductive outcomes. In the final section she highlights an innovation that accelerates improvement across simultaneous success trajectories for competences identified as critical by IBE-UNESCO.

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