Achieving Parity for Māori and Pasifika – the University Sector View

Part 2 - Implementation

Preamble

In August 2018 the Vice-Chancellors and the Chief Executives of the Ministry of Education, the TEC, NZQA, and MBIE considered and broadly endorsed a UNZ Discussion Paper on Parity Targets.

This August discussion paper used an analysis comparing the gap in achievement between Māori and European Pākehā at seven stages – from the proportion of students retained at school to year 13 through to post-university graduate outcomes.

The August paper compared achievement of Māori with European Pākehā for two reasons;

1. To keep the paper short. The paper was for a conversation between Chief-Executives and Vice-Chancellors and needed to be illustrative rather than comprehensive. And,
2. Because comparing Māori educational achievement against overall population achievement is problematic due to factors such as (a) Pasifika participation and achievement also being an issue at all levels and dragging down averages, and (b) atypical results for Asian students, where UE completion rates and university participation are much higher than the average, but university completion typically lower.

The paper also focussed on Māori and Pasifika achievement (eg took an ethnicity approach) because it was about suggesting a better way of addressing TEC Parity Targets which are focussed on lifting Māori and Pasifika participation and achievement rates in tertiary education. In reality, most of the findings of the August paper, if implemented across the school and university system, would also lift participation and achievement rates for all other groups of students. Those recommendations specific to students coming to university direct from school, would also benefit adult learners - those who come to university after time in the workforce.

Both the August Discussion Paper and this paper look at the particular role the university sector can play in realising parity of outcomes for Māori and Pasifika students who reach university, and in supporting parity of outcomes for Māori and Pasifika back in the compulsory sector. Many of the proposals could also be applied to the ITP, Wānanga, and PTE sectors.

The term 'Parity' is used through both papers because it is the term used by the TEC. We use it to indicate the achievement of 'equitable outcomes' for Māori and Pasifika.

The August discussion paper analysed the academic performance of Māori, Pasifika, and European Pākehā students and found that success rates at university were pretty much the same after accounting for their academic preparedness – the strength of their University Entrance and NCEA 3 grades from school.

The August paper found that the best way to achieve genuine parity of outcomes for Māori and Pasifika was for all parts of the system to work together to lift achievement in the compulsory schooling system. The analysis suggested that no individual part of the education system could deliver parity by itself – but parity is possible if all parts of the system are coordinated and collaborate effectively.

Nine recommendations were made. They are listed below, but clustered differently to reflect the way they are discussed and analysed in this second discussion paper;

1. Have one Government strategy, one set of goals, and a single role with overall responsibility for driving successful delivery.

2. Have an agreed set of risk-weighted measures and track the performance of individual schools and universities against at least 2-3 measures, including outcomes for students after they leave the institution. Risk-weighted measures need to be adjusted for factors such as academic preparedness.

3 & 4. Increase the capacity of all schools to make the full NCEA curriculum available to students through capable and appropriately qualified teachers. This could include;

   a. Attracting more STEM and Te Reo Māori and Pasifika qualified graduates to the teaching profession and, more particularly, to teaching in rural and lower-socio-economic schools. This would be partially aimed at increasing numbers of Māori and Pasifika entering professions such as law, engineering, education, and medicine where they have traditionally been under-represented but over-represented in terms of adverse outcomes within those systems.
   b. Funding and operational arrangements for schools to purchase specialist teaching services from universities (extending aspects of the Communities of Learning model)
   c. Extending existing university-run programmes to bring STEM students at schools to universities for part or all of their NCEA curriculum where schools struggle to deliver part of all of the curriculum with existing staff and facilities.

5 & 6. Better pathways planning for high-potential Māori and Pasifika at school at risk of underachievement.

   a. Work with learners and their families to develop and implement individual study and career plans.
   b. Extend STAR type university familiarisation programmes so more Māori and Pasifika gain confidence with universities and are more likely to aspire to university study.

7. Addressing issues around foundation and bridging programmes to ensure they are adequately resourced and more attractive to the students who will benefit most from them. Excluding them from fees free entitlements.

8. Formally evaluate more of the initiatives underway to lift participation and achievement. Find what works. Share effective and ineffective practice and mainstream effective practice nationally.

9. The Crown to invest more in the initiatives outlined above, where a compelling investment intervention logic business case is made on the middle to long term social and economic returns from lifting achievement by Māori and Pasifika.

This paper looks at each area above and makes specific recommendations based on relevant literature and the real-world results of evaluated programmes and activities already operating in part or all of the university sector.

The costs and benefits of each recommendation are estimated to give a sense as to whether a programme of this sort could be justified purely on an economic basis.

This paper reflects work by the university sector for the Cycle 6 Enhancement Theme *(Access, outcomes and opportunity for Māori students and for Pasifika students)*. The paper has been developed under the oversight of the New Zealand Vice-Chancellors' Committee, Te Kāhui Amokura, Komiti Pasifika, the Deputy Vice-Chancellors (Academic), and the Planning Directors of the eight universities.

What would parity look like if we achieved it?

All figures are based on an analysis of young people whose final year at school was 2009. For the purposes of this paper, we suggest that an indication that parity has been achieved will be when the proportion of Māori and Pasifika successfully completing degrees matches the proportion of European Pākehā completing degrees (36.8%).

As shown in the table below, using the definition above, achieving parity would result in approximately another 3,800 Māori and 1,707 Pasifika graduating annually from universities.

2009 School Leavers	Formula	Total	Pākehā	Māori	Pasifika
Total leavers	a	58,685	38,270	11,590	5,875
Retained to year 13 and/or attained UE	b	41,740	27,935	6,220	4,225
Left with UE		20,450	15,315	1,495	890
Attained more than 30 NCEA credits in Level 3 STEM		9,095	6,590	395	220
(Attained UE through Non-NCEA qualifications)		*1,210*	*710*	*30*	*15*
Entered University degree study or above by 2011		18,300	13,240	1,265	865
Passed at least 85% of first year courses		12,705	9,650	695	360
Completed a degree qualification or higher within 6 years	c	13,880	10,280	765	455
Not completed and still enrolled after 6 years		1,115	710	120	100
Parity target as % of European school leavers graduating	d=c/b		36.8%		
Additional Māori & Pasifika graduating if parity achieved	e=(d*a)-c			3,803	1,707

What is parity worth in social and economic terms?

The following analysis is indicative rather than definitive.

It is highly problematic estimating the benefits from achieving parity given uncertainty in calculating the counterfactual – what outcomes would these young Māori and Pasifika realise if they were not on a university pathway? For example, a bright high-potential Māori school leaver might enjoy a perfectly satisfying and successful career in the trades.

For the purposes of this analysis, we have taken the average earnings of European Pākehā, Māori, and Pasifika five years after completion of their final highest qualification (ranging from school only to PhD) and have assumed that the average economic benefit is the difference between median earnings for those with a degree and those without.

From analysis done by Universities New Zealand in 2015 using Census 2013 data for the entire working age population, we know that the weighted average additional income over the average working life of a person with a degree versus someone without a degree was $1.22m ($1.39m in inflation adjusted 2018 dollars).

After discounting this figure by 3% to account for some of the risk associated with time out of the workforce to pursue studies, the net present value (NPV) additional discounted income was $460,000 ($522,000 in inflation adjusted 2018 dollars).

We assume this $522,000 is the individual average lifetime economic benefit to Māori or Pasifika youth who gain a degree post-school.

From the same analysis, we know that the NPV (3% discount rate) of tax paid by degree holders to the Government is $105,600 ($120,000 in inflation adjusted 2018 dollars) over their working lives in just income tax. This does not include likely Government income from other sources such as company tax and GST.

As shown in the first Discussion Paper on Parity, we know that employment and earnings outcomes for people with degrees are broadly similar irrespective of ethnicity.

The social and cultural (non-economic) benefits of a university education are even harder to calculate. The most recent analysis of the non-economic benefits of a university education is McMahon's 2009 meta-study[1] that calculated private non-economic benefits to be around 122% more than the economic benefits and the societal non-economic benefits to be 89% more than the economic benefits.

Private benefits in McMahon's study included better health, longer life-expectancy, better education, life, and wellbeing for children, better outcomes for non-degree qualified partners, ability to live in a nicer house in a better area with better access to recreation and entertainment, etc.

Public benefits in McMahon's study included increased political stability, higher social cohesion, lower costs for justice, health and welfare, more private investment, and intergenerational benefits.

For the purposes of this paper we assume that the $120,000 per graduate of additional discounted tax revenue represents the public benefit to be gained from achieving parity for Māori and Pasifika.

All investment recommendations are made with this figure in mind;

If parity was achieved and another 3,800 Māori and 1,707 Pasifika were getting a degree each year, these 7,300 graduates would generate another;

- $123m new income annually into the Māori economy *($1.39m x 3,800 ÷ 43 year working life)* growing to a cumulative $5.3bn in time *($123m x 43 years)* before accounting for demographic growth in the Māori population.
- $55m new income annually into the Pasifika economy *($1.39m x 1,707 ÷ 43 year working life)* growing to a cumulative $2.37bn in time *($55m x 43 years)* before accounting for demographic growth in the Pasifika population.
- $10,661 of additional (not discounted) income taxes per year on average per graduate *(average income tax take per degree-qualified graduate is $728,516 over a 43 year working life = $16,9452 per year versus person without a degree where average income tax take over a 47 year working life is $295,201 = $6,281 per year).* This is a very crude approximation and ignores a range of factors such as Working for Families credits, chance of being out of work or working part time for periods of a career, etc). For 5,507 new graduates this is $34.5m of additional tax revenue annually with a much larger cumulative amount over time.

What would it take to achieve parity?

The rest of this paper outlines how the nine recommendations of the original UNZ Discussion Paper should be implemented. Implementation is envisaged as going forward under five overlapping and mutually reinforcing clusters;

1 Cluster 1: Get the key foundations in place for lifting participation and achievement.
2 Cluster 2: Extend existing proven interventions for Māori and Pasifika at university. Lift Māori and Pasifika university completion rates.
3 Cluster 3: Data-supported, culturally appropriate support to lift achievement in schools.
4 Cluster 4: Address the ability of schools to deliver the full senior-school STEM curriculum.

[1] McMahon, Walter W (2009). Higher Learning, Greater Good: The Private and Social Benefits of Higher Education. Baltimore: The Johns Hopkins University Press.

5 Cluster 5: Grow the pool of teachers with specialist STEM, Te Reo Māori, and other hard-to-fill senior-school curriculum knowledge.

Cluster 1 is the only cluster that must be done in some form as it builds the foundations for success in all other clusters. The other clusters are ordered from easiest/lower cost, to hardest and/or most problematic and/or expensive.

The clusters have three broad areas of effort running through them;

1. **Evidence** - Metrics, business analytics, monitoring and evaluation to identify good (and bad practice)
2. **Student Pathways Planning** - Tools, resourcing, and good practice standards to support pathways planning for students at school at risk of under-achieving.
3. **Additional targeted support for students** - New funding for a range of activities targeted at lifting aspiration and achievement and at supporting pathways and transitions through the education system.

Some clusters are largely Government led and driven, some are largely school-led and driven, and others are largely university-led and driven (noting that a number of these initiatives could also be led by the ITP, Wānanga, and/or PTE sectors).

In order to keep this paper from becoming too lengthy some analysis has been moved to appendices.

Cluster 1 *(Government led and driven recommendations)*: Get the key foundations in place for lifting participation and achievement.

Parity can only be achieved if there is a sustained middle to long-term whole-of-Government approach that harnesses the entire school and tertiary education system effectively.

1.1 <u>One plan and one point of accountability.</u>

For this complex long-term programme to work, it should have one senior role with primary accountability for designing, implementing and coordinating the various workstreams and initiatives that will individually sit across a range of Government agencies. It should also necessarily have a programme strategy and plan for developing and implanting the suite of workstreams and initiatives.

Agencies that need to be involved and coordinated	Degree of involvement
Ministry of Education	Extensive
Tertiary Education Commission	Extensive
New Zealand Qualifications Authority	Moderate
Education Review Office	Moderate
Statistics New Zealand	Minor

This role should ideally be a dedicated (sole-focus) Deputy Secretary level role within the Ministry of Education. The role should have a day-to-day reporting line to the Secretary of Education, but would benefit from having a steering group comprising relevant Ministers, public-sector Chief Executives, senior officials, representatives from education sector peak bodies, and other stakeholders. Bringing together relevant ministers, and senior officials, with the parts of the system with responsibility for successfully implementing the strategy will ensure top-down support and mandate and make it more likely that political, policy, and operational impediments to successful implementation can be quickly and effectively addressed.

Cost: probably $0.5m for a new Deputy Secretary role with small support office and project funding. Most other costs can be covered by re-tasking existing Ministry of Education and TEC staff and resources focussed on parity and lifting achievement for Māori and Pasifika.

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The programme plan will encompass design, delivery, review, and refinement of all other recommendations in this paper (recommendations 1.2 to 5.2).

1.2 Performance measurement.

As indicated in the first UNZ Position Paper on Parity Targets a more sophisticated set of performance measures should sit at the heart of a long-term programme. The current Education Performance Indicators only provide a relatively simplistic set of performance measures. We recommend replacing them with a performance management system that has five elements;

a. **Multi-factor cohort-based** – we suggest that each school and tertiary education provider should have a set of measures tracking each cohort (year) of students as they progress through each part of the system and on to the next stage of their lives. For schools, we would suggest the following measures broken down by ethnicity and risk weighting (see next section);

    i. Started year 11 (to get a baseline population)
    ii. Started year 13
    iii. Completed NCEA Level 3
    iv. Left school with University Entrance
    v. Attained 30 or more credits in Level 3 STEM.
    vi. Not in employment, education or training one year after leaving school.
    vii. In education or training towards a two-plus year qualification one year after leaving school.
    viii. If in education or training one year after leaving school, successfully completed at least 85% of the courses during their first year of post-school studies.

b. For universities we would suggest the following measures broken down by ethnicity.

    i. Proportion of students with UE enrolled in a degree-level programme one year after finishing school.
    ii. Passed at least 85% of first year courses during first year enrolled at the university.
    iii. Completed a degree qualification within four years of first enrolling (full time students only)
    iv. In degree-level employment 36 months after graduating.

c. **Risk weighted** – metrics are adjusted to reflect elements that are seen as most predictive of high, medium, and low risk of under-achievement. For universities, this would mainly be the student's 'Academic Preparedness Score[2]' at point of entry into university. For schools, this could be some combination of factors such as school performance and engagement and/or socio-economic background, etc.

    Note that much of the data (pass rates at course level) required to generate risk-weighted measures are only held in the Student Management Systems of schools and tertiary education providers. Either (a) education providers and Government would need to work together to generate this reporting, or (b) more information would need

[2] See the August 2018 UNZ Discussion Paper on Parity Targets for a definition of the Academic Preparedness Score. In short, it is calculated from a students' NCEA results weighted upwards for the number of credits with Excellence or Merit.

to be gathered through the Single Data Return process to enable centralised reporting with strong protections and limits put around what the additional data can be used for. This would not be a big change – it would mostly be collecting information already held by providers.

d. **Longitudinal** – The performance of cohorts should be compared over time to get a sense as to whether a school or tertiary provider's performance is improving, holding, or worsening.

e. **Comparing providers against other comparable providers** – We suggest that the performance of schools in lifting aspiration and achievement for their students should be via a gap analysis – where the gap (positive or negative) is a comparison with other relevant benchmark schools with a similar profile. Benchmark schools might be as simple as size and decile – eg a small decile 1 school would be compared against all other small decile 1 schools. However, care would need to be taken that benchmarks did not perpetuate under-performance by providers. In the long term, post-school outcomes for students should be the same regardless of school decile.

f. **Indicative-only** – metrics should be used to broadly indicate where a school or tertiary education provider's performance appears to be particularly good, particularly poor, or broadly in line with comparable other institutions after accounting for risk weightings and longitudinal trends. We suggest using quartiles *(there is an example of what this might look like later in this paper in the section 'Context for Clusters 3, 4 & 5')*. It should inform where further investigation or intervention might be warranted and where monitoring and evaluation might be valuable. Metrics should not be published in ways that would allow construction of league-tables given the high likelihood that comparisons would not ever accurately factor in all the variables that account for performance of one school or tertiary provider relative to any or all others.

Cost: probably minor even if the amount of data gathered through the Single Data Return process was extended to support the production of Risk-Weighted reporting. Most other data and analyses already exist between the Ministry and TEC and existing TEC reporting tools could easily serve up metrics and analyses using existing Business Intelligence capacity. The only data that doesn't currently sit within education system provider systems or Government datasets (other than the Census) is the mapping of job titles to standard ANZSCO job classifications to support the assessment of whether or not degree-qualified graduates are in degree-level employment. There would be significant value in having Statistics NZ address this gap in the datasets at some point.

1.3 Systems, processes, and good practice guidance to support schools to lift ambition and achievement for their students.

Government has already funded a range of pilot programmes such as the University of Auckland's Starpath Project, and the Ministry of Education's Te Kotahitanga. These programmes show that aspiration and achievement can be significantly raised through;

a. Lifting teaching quality through the professional development of teachers (Te Kotahitanga)

b. The use of culturally appropriate pedagogy (Te Kotahitanga)

c. Involvement of families and (at university) wraparound support in halls of residence.

d. Capable and engaged teachers who hold and encourage high aspirations for their students and who create meaningful relationships with their students (Starpath),

e. Clear NCEA pathways that enable students to fulfil their aspirations and the ability of schools to offer the full NCEA curriculum (Starpath).

f. Data that allows teachers and schools to track student performance and to identify potential or actual issues around engagement and achievement (Starpath).

We also know that there are culture-specific factors that need to be addressed to meaningfully lift participation and success rates for both Māori and Pasifika students. For example, for Pasifika students, their aspirations are heavily influenced by what is happening in the wider community (eg church) and in their families. Support by families and/or key community groups can be critical to committing to and succeeding at university. Similarly, the research[3] for Pasifika indicates that other factors for success include;

- Higher levels of engagement when curriculum content reflects their own Pasifika experiences and knowledge base – not common across university programmes.
- Overcoming issues around the digital divide. Students from low socio-economic backgrounds are more likely to lack access to IT devices and the internet. They are therefore more likely to struggle in enrolling on-line, gathering information, and accessing learning platforms.

There are many challenges to successfully mainstreaming these sorts of findings across the entire secondary school system. These include the more fundamental issues around socio-economic status and the affect this has on learning, school subject choices, post-school choices, and aspirations more generally. Nevertheless, the following are recommended as early objectives;

a. The Starpath programme identified metrics that improve the chances of teachers being able to identify students at risk of underachieving early and to put interventions in place. It also developed resources and guidance for optional adoption. Starpath did not, however, develop a standard tool for schools. We suggest that a standard tool be developed and its adoption be strongly encouraged and supported nationally. Starpath identified that it took teachers time to enter data and that many schools lacked the capability to effectively analyse the data. This capacity would need to be built over time across the school system – even if on a shared basis across groups of schools.

b. Based on Universities New Zealand work with the Ministry of Education's Vocational Pathways project and work on its own Graduate Outcomes tool, Universities New Zealand considers that students typically fit into one of three categories when considering post-school options;

    i. Don't know or unrealistic (eg, pop star) – these are students who need guidance that will keep as many post-school options open as possible.

    ii. Partly defined (I want to go to university, or into a trade, but I'm not sure what I want to study/learn) – these are students who need advice on what will prepare them most effectively as they get approach the end of their time at school.

    iii. Highly defined (I want to be an accountant. I want to be a plumber) – these are students who need advice on what will best prepare them for their choice, but that will also leave them with options if they change their mind, or later find it wasn't the right option after all.

    NCEA offers a wide range of unit standards and achievement standards that lead to a student gaining credits. In concept the New Zealand curriculum drives what is taught and the achievement standards determine what is assessed. In reality, schools assemble quite a wide range of unit and achievement standards within the broad curriculum.

[3] https://ako.ac.nz/assets/Knowledge-centre/NPF-10-001A-Pasifika-Learners-and-Success-in-Tertiary-Education/6d7e53028e/RESEARCH-REPORT-Educational-Practices-that-Benefit-Pacific-Learners-in-Tertiary-Education.pdf

There is so much flexibility that students can end up with the required number of credits to gain NCEA 3, but the credits do not necessarily result in the student gaining a coherent set of credits, or the necessary background knowledge, to support their desired post-school pathway(s).

Discussions at the recent university-sector workshop feeding into the review of NCEA suggested that NCEA credits could usefully be thought of as belonging to one of three categories (noting this is not language used by NZQA);

i. Pre-requisite credits – these are credits you have to have as a minimum entry requirement in a particular tertiary education programme of study (such as credits in electromagnetism to get into engineering), or the basic knowledge a student needs to be likely to be sure of successfully completing first year studies in a field of study that expects to be building upon applied knowledge gained at school (such as physics, or chemistry).

ii. General academic credits – these are credits that will directly prepare a student for successful study at a university – credits that often include academic writing, research, self-directed learning, external assessment, etc.

iii. Other credits – these are credits that will assist with other non-academic post-school pathways.

It is a significant challenge providing careers guidance and guidance around study options given young people's goals and aspirations change over time – but the goal should be careers guidance and NCEA curriculum that keeps as many realistic pathways open as possible.

c. The Tertiary Education Commission is currently developing systems to improve the delivery of careers advice into schools. We suggest that the scope of this project be formally extended to encompass the delivery of pathways advice into schools – where pathways advice includes helping students understand the study choices they should be taking so as to end up with coherent and useful NCEA and UE results that lead to optimal career outcomes.

d. Government should support the use of these systems with standards, guidance, and training to maximise their effectiveness. If the TEC will be responsible for providing pathways advice into schools, it should also have responsibility for defining professional standards associated with their use.

e. The traditional 'Careers Advice' functions within schools should be repositioned so they can better support teachers and parents in providing 'pathways' advice in culturally appropriate ways.

f. The information generated through pathways planning should feed back to schools to inform decisions around what NCEA curriculum is offered and decisions around how it is designed to best position students for their post-school options.

g. The TEC should also work with the Ministry of Education and schools to develop a standard tool to help with tracking student performance and identifying those at risk of under-achieving. This particular recommendation is covered in more detail under Cluster 3.

h. The university sector can assist the TEC in identifying the sorts of NCEA unit and achievement standards that individually and collectively would best support particular pathways.

i. A key related goal must be to ensure that students who may be on a pathway that includes degree-level study gains sufficient literacy through NCEA that they are able to craft and present arguments in writing. A recent investigation of Pasifika students by Victoria University of Wellington (Bronwyn Woods, School of Education) found that many students entering university were struggling and failing to cope academically when faced with essay-style questions because their NCEA and UE credits did not provide them with sufficient preparation.

Cost: this will require additional resourcing to implement new tools and systems and to roll them out in a supported effective way.

The TEC is currently resourced for developing tools to support pathways advice into schools. They also have the mandate to define standards for providing careers advice in schools and to direct how this advice is delivered.

The TEC is not resourced for doing more than this at this stage, but they also share the view that the model above (steps c-h) is a logical and desirable extension of their current mandate and work programme.

It would take $1-$2m for the TEC to formally scope up options and to develop a business case for implementing everything outlined above in steps h-m. Until options have been identified, evaluated and costed, it is not possible to estimate likely costs associated with implementation and operation. However, they are likely to be in the $10-$20m range for implementation and then ongoing operating costs to provide support into schools and for maintaining and developing systems.

1.4 Monitoring, evaluating, and sharing good (and bad) practice.

This programme is likely to be most successful if it is supported by business intelligence and evaluation.

a. Monitoring – there should be continuous collection of the information necessary to assess performance of all parts of the system individually and collectively.

b. Business intelligence – there should be capacity to analyse information generated through performance reporting to identify potential good (and poor) practice and to identify areas that may warrant monitoring and/or formal evaluation.

c. Evaluation – All new innovative initiatives should undergo formal evaluation at least once after they have been operating for a year or more. Results should inform the design or implementation of other similar initiatives and should inform good practice guidance provided to the wider education system.

For the schooling sector business intelligence and evaluation responsibility should rest with the Education Review Office. For the higher education sector, this should sit within the TEC.

For the TEC, there would be significant value in the TEC contracting evaluation of programmes and the development of good practice guidance out to Māori and Pasifika post-doctoral graduates and early career academic staff. This would grow knowledge within the university sector, encourage the sharing of good-practice across the sector, and grow the academic linkages and capacity of the sector to work with and meet the needs of Māori and Pasifika communities.

Cost: this should be largely cost neutral as it is redirecting existing ERO and TEC monitoring and evaluation activity.

If evaluation and development of good practice material was commissioned by the TEC from the university sector, this would need additional funding. We suggest around $300,000 a year

would allow for evaluation of 5-6 initiatives annually. The number of novel and new types of initiative are unlikely to exceed that in any given year.

Cluster 2 *(University led recommendations)*: Extend existing proven interventions for Māori and Pasifika at university. Lift completion rates.

2.1 Continue equity funding at about current levels to enable culture-specific induction and support for Māori and Pasifika students and to support some innovation and development of new approaches in the margins.

In the August UNZ Discussion Paper on Parity Targets it was noted that a recent stocktake of 7 of New Zealand's 8 universities identified that current equity funding ($320 per Level 7 Māori and Pasifika EFTS and $444 per postgraduate Māori and Pasifika EFTS) was being actively applied to lifting participation and achievement by Māori and Pasifika. 341 initiatives were identified across the 7 universities including;

- Initiatives to familiarise Māori and Pasifika with university and to help put them on a university pathway.
- Initiatives to provide teaching programmes to Māori and Pasifika in schools where teacher skill gaps meant some parts of the senior school could not be offered.
- For providing bridging or foundation support where a student was close to, but not quite at, the standard required for successfully commencing first year studies.
- For providing culturally appropriate induction and support, particularly during the first weeks or months at university.
- Increasing recruitment, retention, and successful completion rates of Māori and Pasifika in fields where Māori and Pasifika are traditionally under-represented (such as medicine, law and engineering).
- Commuting or travel grants to make university more accessible and affordable to Māori and Pasifika students.

These initiatives are all worthy and most would either not exist or be at a much smaller scale without Equity Funding. Equity funding allows universities to try new ways of supporting Māori and Pasifika students successfully into and through university. It should be at least maintained at current levels and increased if Government would like to encourage more innovation and activity across these areas within universities.

2.2 Where university is an option, but not something the student understands, provide familiarisation programmes with support from the university sector.

Universities already offer familiarisation visits to schools but involvement is optional and rarely structured into school pathways advice to students. The number of familiarisation opportunities provided by universities and the sorts of programmes that can be offered to visiting students are both constrained by the fact they are funded out of other baseline funding – such as SAC and Equity funding.

Where there are students for whom university could be a viable option, there should be at least one familiarisation visit so they are able to better understand university as an option alongside their other choices.

We recommend TEC offer some additional funding to supplement funding already allocated by universities. We suggest around $100 per student would facilitate a much more comprehensive

and structured approach to transporting students to and from their local university and providing them with a meaningful university experience.

Cost: assuming another 10,000 or so students visiting their local university, this would represent an additional cost of around $1m annually.

2.3 Foundation programmes.

There are around 23 foundation programmes operating across the eight universities. They take in around 1,700 students annually and have pass rates that range typically from around 50% to 70%.

- The majority of foundation programmes are for students who do not have University Entrance but are perceived as being able to get to the equivalent of University Entrance with a 6-12 month foundation programme.
- Some foundation programmes are more narrowly focussed – for example getting students to the minimum required knowledge to successfully enter degree level study in fields such as physics, medicine, or commerce.
- A small number of foundation programmes are delivered via an intensive 12-18 month programme that results in a student completing all the courses for the first year of a degree programme and, upon graduation, entering university at second year.

In an ideal world, every student wanting to get to university would leave the school system fully prepared for university studies. That is not the reality however and a proportion of students are likely to continue to need a foundation programme of some sort for the foreseeable future.

We also have a lot of mature students who are a long time out of school and who just won't succeed at university without a foundation programme.

There are currently three main issues associated with foundation programmes;

1. **Resourcing** – foundation programmes are generally set at around level 3 on the qualifications framework. They typically receive SAC funding of around $6,295 per student per year plus student fees.

   Student fees were all locked in place in the mid-2000s and subsequent increases have been through the Annual Maximum Fee Movement (AMFM) mechanism. If a student fee was set low by a university as a deliberate subsidy at the time fees were locked in place, it has remained low ever since. So, for example, fees for foundation programmes at the University of Auckland are now $700 a year, where they are $3,000 at the adjacent Auckland University of Technology.

   By their nature, foundation programmes require considerably more support for students than can be covered by current SAC funding and student fees. This is why pass rates for foundation programmes remain low. Where a university can afford to apply significant additional resourcing (for example foundation programmes for medical studies where there is significant private funding available to supplement SAC and student funding) then pass rates rise significantly.

   We recommend that SAC funding rates for foundation programmes be increased to around $10,000 per student and all universities be able to charge the same maximum student tuition fee of $3,000 for a full year programme.

2. **Fees-free policy** – At present foundation programmes exceed 60 credits of study and are therefore counted as first year studies for the purposes of the fees free policy. This creates a disincentive for students to take foundation studies as it costs them both an extra year and

free fees in their first year of actual university studies. If they don't take foundation studies they are significantly more likely to struggle and/or fail academically in first year.

We recommend that foundation programmes not be counted against a student's first-year fees free eligibility.

3. **Stigma** – many students are reluctant to take foundation programmes because of a perception that it will mark them out as being somehow less capable or not as clever as other university students. We recommend that these programmes be relabelled as 'pathway', or 'pre-degree programmes'.

Māori and Pasifika are proportionately more likely to need and/or benefit from foundation programmes given they are currently disproportionately doing their schooling at lower decile schools where academic preparedness is consistently lower.

Removing barriers to participating in foundation programmes will assist in growing numbers of Māori and Pasifika able to get to university and to complete successfully.

Cost: We expect the demand for foundation programmes may grow in future if other initiatives in this paper are successful and a larger number of Māori and Pasifika aspire to studying at university. If numbers of students increased from the current 1,700 to around 2,000 and SAC funding increased to $10,000 per student, likely additional cost to the Crown would be in the range of $8m annually.

2.4 Increase first year academic and pastoral support to students where it is more likely students will struggle academically.

The initial UNZ discussion paper on Parity Targets found;

- The best predictor of whether a student will successfully complete their degree at university is whether they successfully pass at least 85% of their papers in first year.
- The best predictor of whether they will get this 85% pass rate is their Academic Preparedness Score (APS). The APS is calculated from a student's NCEA results[4]. Universities consider an APS score below 130 as indicating a student will struggle without significant academic support. An APS between 130 and 150 also indicates risk and higher chance of support being required.
- An average of $4,000 per student is needed in support in first year to make it more likely that a student with an APS below 130 is likely to successfully complete first year studies. An average of $1,000 per student is needed to achieve similar outcomes for students with an APS of between 130 and 150.

Based on the figures above, UNZ estimates it would take approximately $7m a year to bring first year Māori and Pasifika student pass rates up to similar levels as those of European Pākeha students *(See Attachment 2.4 in the Appendix for the calculations)*.

If this $7m was invested and it achieved the goal of lifting first year pass rates for Māori and Pasifika to the same 73% rate of European students, we would expect to see;

- Māori: a lift in first year pass rates to 73% from current 55% pass rates would see another 227 Māori succeeding annually.

[4] Academic Preparedness Score (APS) is calculated off the best 80 credits a student is awarded at Level 3 NCEA (with no more than 24 credits maximum per subject). The maximum a student can score is 320 based on 4 points for each Excellence credit, 3 points for each Merit credit, and 2 points for each other credit.

- Pasifika: a lift in first year pass rates to 73% from current 41.6% pass rates would see another 270 Pasifika succeeding annually.

Note that this same level of support could be extended to all students – not just Māori and/or Pasifika to lift overall success rates for students attempting university. If the same funding support was made available to all students, the cost would rise from $7m to $18.3m

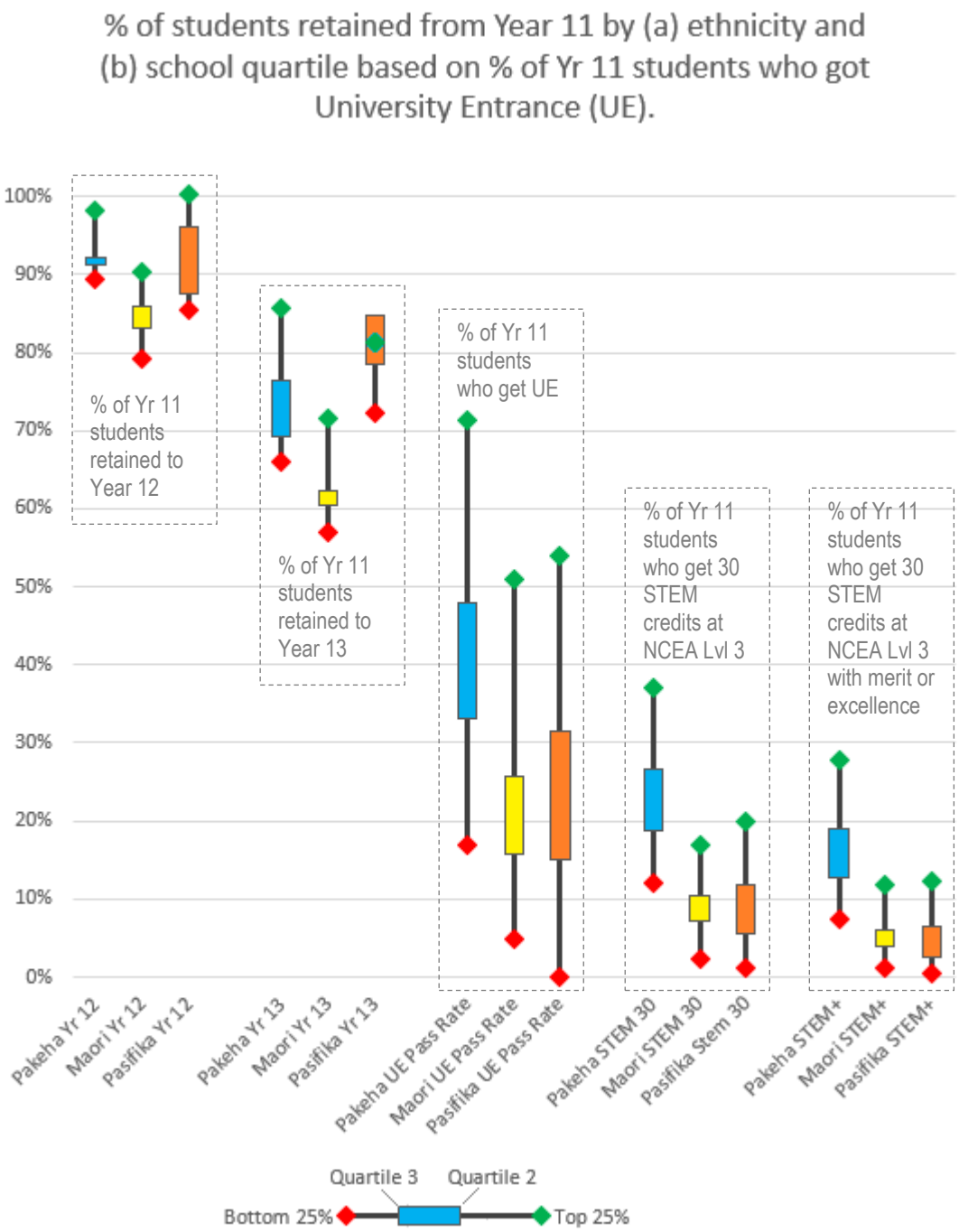
Context for Clusters 3, 4 and 5

Ahead of considering the recommendations under the remaining clusters, some context about achievement for Māori and Pasifika in the schooling system is useful.

To provide this context, we have used a University Entrance (UE) Proxy Measure to identify schools that are potentially out-performing or under-performing. This UE proxy measure is calculated by the proportion of Year 11 students who get University Entrance. So, if a school had 100 year 11 students and 20 of them gained UE two years later in Year 13, that school's UE Proxy Measure is 20% (20÷100). We then sorted schools into quartiles by their UE Proxy Measures.

Looking at the UE Proxy measure first, the results are on the next page. In reading this table note that;

1. There are five gaps measured – (1) percentage of year 11 students retained to year 12, (2) percentage of year 11 students retained to year 13, (3) percentage of year 11 students who get UE, (4) percentage of year 11 students who got 30 STEM credits at NCEA 3, and (5) percentage of year 11 students who got 30 STEM credits at NCEA 3 with merit or excellence.
2. Each gap has separate results for European/Pākehā (blue bars), Māori (yellow bars), and Pasifika.
3. Each bar shows;
    a. Green diamond – the average percentage of students in the top quartile of schools.
    b. Rectangular bar – the top of the bar shows the average for the second best quartile of schools and the bottom of the bar shows the average for the third best quartile of schools.
    c. Red diamond – the average percentage of students in the bottom (worst) quartile.



From looking at this, the following can be seen;

- Relatively fewer Māori are retained at school after year 11 than is the case for Pākehā or Pasifika students.
- Pasifika are more likely to be retained through to year 13, but then achieve less in Year 13.
- UE and STEM achievement rates for Māori and Pasifika are significantly below those of European Pākehā students.

Though STEM achievement by itself does not necessarily lead to better outcomes for Māori or Pasifika students, comparatively lower levels of STEM achievement are closing off the option of certain professions and career paths – in areas such as medicine, engineering, design, architecture, and information technology.

Cluster 3 *(Government and school sector led recommendations):* Analytics informed support for students and sharing good practice in curriculum design and delivery.

3.1 Business analytics to support student achievement at school

As previously outlined (see Recommendation 1.3), the Government and education sector has already learned a lot about using data-driven, culturally appropriate support in schools to lift achievement.

It is recommended that the TEC's work in generating tools and setting standards for delivering pathways advice and planning in schools, should be extended further over time beyond just careers advice. Under overall Ministry of Education direction, the schooling system should comprehensively move to operating so they have;

a. Centrally delivered tools for pathways planning include (Starpath type) functionality that allow schools to track which students are on their pathway and which are not on track or at high risk of going off-track.
b. Skills and resources to successful operate analytics and to provide support to students where required.
c. Good practice guidance, professional support, and overall monitoring for the adoption and successful use of this functionality.
d. Teachers that are fully prepared and supported to deliver teaching in a culturally appropriate context.

Curriculum for initial teacher education would require amendment so all new teachers entered the profession with appropriate training and knowledge around all of the above and this is supported by ongoing professional development. Universities can contribute to design and delivery of this amended curriculum.

Cost: Scoping of the costs to develop, implement and support tools should be done by the TEC (with the Ministry) as a part of Recommendation 1.3. The same scoping work should identify options for implementation that will mitigate risk around trying to deploy to thousands of teachers across more than 400 schools too quickly. Implementation may therefore be incremental focusing initially on particular regions, particular schools (particularly lower decile), and particular streams within schools.

3.2 NCEA and UE Lessons and good practice are shared across schools – including the design and development of core NCEA curriculum.

Central Government business analytics functions should take a key role in identifying, sharing, and fostering adoption of sharing good practice where schools appear to have curriculum that is delivering both (a) high levels of student engagement/retention, (b) good completion rates, (c) good post-study outcomes for the students.

Cost: this should be largely or wholly able to be done within current resourcing using existing vehicles via the Ministry of Education, Tertiary Education Commission, and Education Review Office.

If Government wanted to be more ambitious, there could be benefit in having a small centrally administered fund for evaluating and documenting good practice by academic staff in Colleges of Education. Learnings from these evaluations could therefore be spread widely in academic circles and assist in shaping initial teacher training. A fund for expenditure of around $200,000 annually would be a useful start.

Cluster 4 *(University and school sector joint recommendations)*: Address the ability of schools to deliver the full senior-school STEM curriculum.

Ensure students have access to enough of the NCEA curriculum to keep all sensible pathway options open.

Where schools are unable to offer some part of the NCEA curriculum (Years 11-13) to an appropriate standard by themselves, and/or existing options are not appropriate (such as correspondence school, or sharing a teaching with another school, or attending classes at a nearby school), offer one or more of the following;

4.1 Universities delivering NCEA curriculum into secondary schools

There are not a lot of examples of where a university has worked directly with schools to support the delivery of the NCEA curriculum. One of the most successful programmes known is that of Massey University's Pūhoro STEM Academy[5].

Massey University's Pūhoro STEM Academy was implemented in 2016. In that year it took 97 Maori students from eight schools in the Manawatu and Bay of Plenty regions. The students were not required to have any particular level of prior academic achievement or knowledge in the sciences, but they had to have an interest in science and had to participate in and sit a minimum of three of the required external science achievement standards at NCEA Levels 1-3.

The student's whānau were also invited to register with the programme to grow awareness and interest in the sciences.

The programme supported the delivery the of the year 11-13 NCEA science curriculum. Some of the programme was delivered at schools. Some of the programme involved field trips to industry partners to contextualise what students were learning. Students also did tutorials, laboratory visits, and at least one STEM experience on the Massey University campus.

Pūhoro students not only reached parity of achievement but exceeded the nationwide pass rate of non-Māori students in the core science Achievement standards – Physics, Chemistry and Biology. The nationwide pass rate in 2016 for NCEA Physics AS90940 for the Pūhoro students was 76% compared to 74% for non-Māori. The Pūhoro students pass rate in NCEA Chemistry AS90944 was 87% in comparison to the nationwide pass rate for non-Māori which was 67%. Pūhoro students also achieved a 76% pass rate in NCEA Biology AS 90948 compare with 72% for non-Māori.

The programme has since been extended to include another eight schools – most in the greater Auckland region.

Annual cost is around $250,000-$300,000 – with funding contributed by Massey University, Our Land and Water National Science Challenge, NZQA, Palmerston North City Council, Te Tumu Paeroa.

This sort of approach could be adapted and offered to schools by universities around New Zealand. Note that this programme only supports the delivery of NCEA curriculum by schools – it does not replace it.

Cost: Overall cost cannot be reliably estimated with knowing likely demand, but the Pūhoro STEM Academy has been successfully operating with resourcing of around $2,500 per student. We suggest an initial allocation of $1.5m-$2.5m would allow the programme to grow to cover

[5] More information on the Pūhoro STEM Academy is available here; - http://www.massey.ac.nz/massey/learning/colleges/college-of-sciences/students/puhoro-stem-academy/puhoro-stem-academy_home.cfm

another 600-1000 students nationally. Further funding increases would be subject to an assessment of demand and an evaluation of results.

4.2 Send the student (or students) to a university for teaching involving specialist equipment or facilities. Or;

4.3 Send the student (or students) to a regional hub for teaching involving specialist equipment or facilities where there is no university within a reasonable distance.

An alternative to having universities provide teaching into schools is bringing students to a university or regional hub where schools lack the laboratories or workshops required to deliver relevant parts of the curriculum and/or are struggling to deliver STEM NCEA curriculum.

This is an approach that the University of Waikato has been experimenting with and refining since 2016 through its *Te Ara ki Angitū: Pathways to Excellence* programme.

This programme was established by the University with schools across the Waikato region to improve transitions to university. School students were able to join the programme and attend a day of studies each week at the University. The programme was aimed at all students – not just Māori and/or Pasifika.

The university pays for five buses to run on fixed routes on specified days each week. Buses travel at most 70 minutes each way and are timed to arrive at the University by 8.45am enabling students to take a full day of classes between 9am and 5pm. The annual cost of operating these five buses is around $320,000.

In 2017, 176 students registered with the service – for an average cost of $1,800 per student. Similar numbers are reported for 2018.

The programme has not been formally evaluated, but the University reports that it has succeeded in key objectives;

- Increasing the proportion of students wanting to go to university.
- Increasing the preparedness of students for university.
- Improving the transition of students into the university environment.

The Appendix to this paper (Appendix 1: Recommendations 4.2 and 4.3) has analysis on what it might cost to develop a nation-wide programme targeted at the 204 high schools whose NCEA 3 results for Māori and Pasifika students are below the national median. Of these 204 schools, 75% are in the bottom three deciles and 38% of their Year 11-13 roll are Māori and 20% are Pasifika. Between them they have 40,500 students in Years 11-13.

A programme of this sort could be targeted more widely or narrowly, but the analysis in the Appendix is illustrative of the sort of costs and benefits that might be achieved from one approach. This analysis indicates;

1. Universities could serve as regional teaching hubs for around 96 (47% of the 204 below average) schools, covering around 64% of all of the 40,500 students.
2. 103 schools are more than 110 kilometres from a university. Larger high-schools or ITPs could be used as regional teaching hubs in these areas. Around 14 hubs would be required to provide coverage to the rest of New Zealand (leaving less than 1% of students outside the coverage area of a university or regional teaching hub).

The cost of each individual university or regional teaching hub would be broadly similar at around $3.8m to build with ongoing operating costs of around $0.5m annually.

A national network of university and regional teaching hubs would represent a significant investment, but it would be a way of delivering curriculum more efficiently and effectively than

is possible across hundreds of schools where access to qualified teachers and teaching facilities is a challenge *(see section 5.2 below)*.

Cluster 5 *(Government and schooling system recommendation)*: Grow the pool of teachers with specialist STEM, Te Reo, and other hard-to-fill senior-school curriculum knowledge.

The object of this recommendation is to provide options that make it easier over time for schools to recruit and retain teachers with subject-matter expertise where recruitment and retention has traditionally been problematic.

5.1 Understand the capacity of secondary schools to deliver NCEA STEM and Te Reo Māori curriculum.

There does not appear to be any reliable national analysis indicating (a) which schools are unable to deliver specialist curriculum (in subjects like information technology, physics, chemistry, Te Reo Māori, etc) because they lack suitably qualified teachers, (b) which schools are delivering specialist curriculum via teachers without any formal qualification or training in that subject. This makes it difficult to understand the size or nature of skill gaps facing secondary schools.

We recommend this be quantified and tracked over time through a periodic national survey of secondary schools.

5.2 Revise the incentives required to attract qualified STEM and Te Reo Māori, and Pasifika graduates into the teaching profession.

From Ministry of Education provided data, we know there were 431 secondary schools in 2017 with at least one student enrolled in year 13 and, of those, 384 secondary schools had more than 5 students.

From looking just at people who self-identified as secondary school teachers in the 2013 Census;

- 76% were teaching with a Bachelor of Education (BEd) qualification and/or with another qualification in a non-science or technology field (such as the humanities, or health, or hospitality).
- Just under 1% had an information technology degree (159 teachers in total)
- 18.6% had a science qualification – including 264 in physics, 462 in chemistry, 879 in biology.

We know that a starting salary for a degree-qualified teacher new to the profession is currently $51,200 (Lvl 7 qual) to $53,200 (Lvl 8 qual) rising in time to $78,000. Subject to secondary school teacher pay negotiations, the ranges may rise over time to a maximum of $85,000.

According the 2013 Census, the average income for degree-qualified teachers aged 30-39 working full time was $56,400 ($60,235 in 2018 adjusted for inflation). By contrast the average income for people aged 30-39 with a physics, or mathematics degree was $73,000 ($78,000 in 2018), or $64,400 ($68,800 in 2018) for a chemistry degree, or $62,000 ($66,216 in 2018) for a biology degree, or $75,000-$80,000 ($80,100-$85,400 in 2018) for an IT degree.

Universities New Zealand has heard from the Secondary Principals Association that;

- There is a nationwide shortage of STEM qualified teachers. Most are clustered in the larger cities. They are producing the vast majority students who get good UE results in STEM subjects and who go on to study STEM at university. The small proportion that then choose to go into teaching tend to prefer to work in cities (per their upbringing). This creates a virtuous cycle for cities, but a vicious cycle of under-performance for schools outside of major urban areas.

- Cost of living in some areas (such as Auckland and Queenstown) make it difficult for early-career teachers to be able to afford to start careers in these locations. The profession is even-more dominated by older teachers in these places.
- There is significant insecurity of employment for many early career teachers – who can spend their first one or two years in the profession in relieving and temporary roles. This also makes the profession less attractive.

There are a number of alternatives that could be considered – but most really come back to the fact that STEM-qualified graduates can earn a lot more outside of the teaching profession and this needs to be addressed before issues of recruitment and retention can be addressed. Options that could be considered individually or in combination include;

a. Pay an additional $10,000 to $15,000 for teachers with a STEM degree in addition to their teacher qualification ($20,000 for ICT and physics).

b. Provide a guarantee of employment for up to three years following graduation for teachers who successfully complete initial teacher training and enter the profession with a STEM or Te Reo Māori tertiary qualification.

c. Write down student loan balances for STEM or Te Reo qualified teachers who spend their first 2-5 years in in schools with hard-to-fill roles requiring specialist qualifications.

d. Reverse scholarships into a KiwiSaver account providing the equivalent of annual fees and living allowances during each of a teacher's first 5-6 years in the profession.

Cost: A national survey to understand the number of suitably qualified teachers available to schools for delivering the NCEA curriculum should be able to be run periodically using existing Ministry of Education resources. Until the gap in qualified teachers is known across the schooling system, it is difficult to estimate the best options and consequential costs of amending incentives to attract qualified STEM and Te Reo Māori graduates into the teaching profession.

Implementation Strategy

Three implementation approaches are proposed with a broad estimate of costs. The three options are;

1. **Minimum meaningful approach**
   This would deliver a good foundation for future development. For initial investment of around $11.2m and ongoing annual funding of approximately $9.7m ($50m total over five years) New Zealand would see;
   a. A single point of accountability in Government for pursuing parity (funded out of existing resources).
   b. Analysis leading to a business case showing what would need to be done to align school careers advice, advice to students on NCEA choices, and information for schools to determine likely demand for NCEA curriculum.
   c. A retargeting of existing monitoring, analysis, and evaluation to assist in identifying and sharing good practice.
   d. Significant improvement in the completion rates for students completing foundation programmes.
   e. Some targeted additional support for first year Māori students whose academic preparedness is relatively low.
   f. Extending the existing Waikato University *Te Ara ki Angitu: Pathways to Excellence* programme to bus school students to university for teaching where their own school

struggles to offer some part of the curriculum. Evaluating this programme to determine whether it could be extended nationally.

g. A better understanding of the teacher workforce available to secondary schools to understand where there are skill shortages and/or where schools are having to deliver curriculum without suitably skilled teachers.

2. Intermediate approach

In addition to building the foundations for a more systematic approach to parity, this would support implementation of some of the less expensive options and piloting or prototyping of other options. For initial investment of around $33m and ongoing annual funding of approximately $25.7m ($136m total over five years) New Zealand would see;

a. Create a single new properly resourced point of accountability in Government for coordinating the parity programme.
b. A business case showing what would need to be done to align school careers advice, advice to students on NCEA choices, and information for schools to determine likely demand for NCEA curriculum. Some additional funding for prototyping and piloting solutions into schools.
c. Additional monitoring, analysis, and evaluation to identify and share good practice.
d. More Māori and Pasifika school students visiting universities to help inform their post-school aspirations.
e. More Māori and Pasifika students successfully taking up and completing foundation programmes where they would otherwise struggle at university.
f. Some targeted additional support for all first year Māori and Pasifika students whose academic preparedness is relatively low.
g. Formal evaluation and sharing of good practice from schools whose NCEA results appear better than average.
h. Universities providing some teaching out to nearby schools which lack the staff to offer the full senior-school curriculum themselves.
i. Extending the existing Waikato University Te Ara ki Angitu: Pathways to Excellence programme to bus school students to university for teaching where their own school struggles to offer some part of the curriculum. Creating three more similar programmes – ideally one at a university in Auckland and two more in under-served regions such as Gisborne and Rotorua.
j. A better understanding of the teacher workforce available to secondary schools to understand where there are skill shortages and/or where schools are having to deliver curriculum without suitably skilled teachers.

3. Comprehensive and ambitious approach

In addition to delivering everything in the Intermediate Approach, this would support full implementation of all initiatives for all students and schools. This would require initial investment of around $132m and ongoing annual funding of approximately $79m ($450m total over five years).

A summary of what is envisaged in each approach is shown in the table below. The costs are summarised in a table in Appendix 2.

Recommendations	Minimum meaningful approach	Intermediate approach	Comprehensive & ambitious approach
1.1 One plan & one point of accountability in Government	Proceed with existing officials $0	New or re-tasked Deputy Secretary Role. $0.5m ongoing annual.	As for intermediate approach. $0.5m
1.2 Develop performance measures	Proceed with existing TEC resources $0	As for minimum $0	As for minimum $0

Recommendations	Minimum meaningful approach	Intermediate approach	Comprehensive & ambitious approach
1.3 Systems, processes, and good practice guidance to support schools to lift ambition and achievement for their students	Refocus existing careers work as pathways advice. $0. Invest in business case to scope and cost systems for NCEA and pathways planning. $1.5m	As for minimum plus some prototyping and piloting of system options following the business case. $2.5m + $0.5m in outyears	As for intermediate, but also funding to implement system changes and processes to support NCEA plans for students and information for schools planning what curriculum to offer at Years 11-13. Note that this allows for implementation of recommendation 3.1 – data driven approaches to lift achievement in schools. $4.0m + $1.5m in outyears.
1.4 Monitoring, evaluating, and sharing of good (and bad) practice.	Refocus existing ERO and TEC resourcing $0	Have Māori and Pasifika academic staff in universities do evaluations and development of good practice guidance. $0.3m ongoing annual.	As for intermediate. $0.3m ongoing.
2.1 Maintain equity funding at current levels	$0	$0	$0.0m
2.2 Extend the availability of university familiarisation programmes	Do nothing given there are no pathways programmes to hang activity off. $0	Provide $100 per student attending a familiarisation visit where the university bears all costs. $1m ongoing annually.	As for intermediate. $1m ongoing annual.
2.3 Foundation programmes???	Adjust SAC funding and student fee rates for current foundation students. $5m ongoing.	As for minimum option but allow for increased student numbers. $8m annual ongoing.	As for intermediate. $8m annual ongoing.
2.4 Increase academic support provided to first year students with relatively low Academic Preparedness	Provide additional support only to low Academic Preparedness Score (APS) Māori students. $3.7m annually ongoing.	Provide additional support only to low APS Māori and Pasifika students $7.0m annually ongoing.	Provide additional support to all low APS students regardless of ethnicity $18.3m annual ongoing.
3.1 Data-supported, culturally appropriate support to lift achievement in schools	Do nothing. This approach has already been piloted via Starpath. $0	Implement the system and processes scoped and costed in recommendation 1.3, but limit rollout to lower decile schools with lower levels of NCEA and UE achievement. Costs are additional to those in 1.3. $1.0m to implement and $1.0m annually to operate.	As for intermediate but deploy to most or all schools. $5.0m to implement and $2m a year to operate.
3.2 Share lessons and good practice around NCEA curriculum across schools.	This should be doable within current resourcing. $0	Small fund for evaluation and sharing of good practice by university academics $0.2m annually.	As for intermediate $0.2m annually.
4.1 Universities delivering NCEA curriculum into schools.	Do nothing. $0	Funding for an additional 600 students nationally. $1.5m annually.	Funding for an additional 1,000 students nationally. $2.5m annually.

Recommendations	Minimum meaningful approach	Intermediate approach	Comprehensive & ambitious approach
4.2 Send students to a university for some teaching (mainly STEM)	Fund and extend the current Waikato programme. Potential student demand is over 1,200 students, but current take up is around 176 students annually. See if this could be grown with appropriate support from Government and schools. Evaluate and share practice once the model is better proven. Assume growth to 500 students and a cost of around $1m.	Pilot one regional hub in Auckland. Capital cost would be $3.8m and annual hub operating cost would be $0.5m. Cost of bussing, say, 1,000 students between the hub and their schools would be $1.8m annually ($1,800 per student) and around 40% (on average) would need an $800 laptop for an additional $0.32m.	Capital cost across the eight universities to create regional STEM teaching hubs would be around $38m with ongoing operating costs of $5m annually. Cost of bussing around 10,000 students between their school and the hubs would be around $18m annually ($1,800 per student per year). On average 40% of students would also need to have an $800 laptop provided for an additional $3.2m annually.
4.3 Where specialist STEM curriculum cannot be delivered at a school or at a local university, send students to regional hubs.	Do nothing. $0	Pilot two regional hubs – one in Gisborne and one in Rotorua. Capital cost would be $7.2m and annual hub operating cost would be $1.0m. Cost of bussing, say, 1,000 students between the hub and their schools would be $1.8m annually ($1,800 per student) and around 40% (on average) would need an $800 laptop for an additional $0.32m.	Capital cost of 14 regional STEM teaching hubs would be around $53m with ongoing operating costs of $7m annually. Cost of bussing around 5,700 students between their school and the hubs would be around $10m annually ($1,800 per student per year). On average 40% of students would also need to have an $800 laptop provided for an additional $1.8m annually.
5.1 Understand the capacity of secondary schools to deliver NCEA STEM and Te Reo Māori curriculum.	This can be done within current Ministry of Education resources. $0	As for minimum. $0	As for minimum. $0
5.2 Grow the pool of teachers able to deliver senior school curriculum in STEM and Te Reo Maori.	Impossible to quantify at this stage until recommendation 5.1 is completed.	As for minimum.	As for minimum.

Appendix 1 – detailed calculations for recommendations

Recommendation 2.4 – Lifting Māori and Pasifika Pass Rates in First Year University Studies.

The original UNZ discussion paper on Parity Targets noted that;

- Any student who successfully completes 85% of their papers during their first year at university is likely to successfully complete their degree.
- Academic Preparedness Score (APS) is the best predictor of whether a student would struggle at university. If a student could pass at least 85% of their first year courses successfully, they were highly likely to successfully complete their degree.

Academic Preparedness Score (APS) is calculated off the best 80 credits a student is awarded at Level 3 NCEA (with no more than 24 credits maximum per subject). The maximum a student can score is 320 based on 4 points for each Excellence credit, 3 points for each Merit credit, and 2 points for each other credit.

An APS score below 130 indicates relatively poor academic preparedness and, therefore, a higher risk of failing academically. An APS score between 130 and 150 indicates some risk and a higher chance the student will have a need for additional support.

A discussion with several people leading academic support functions in universities indicated that;

- A Māori student presenting with Lower APS score should more or less automatically be provided with additional mentoring and support, including an average of 3 hours of additional tuition weekly. They would budget around $3,500 to $4,500 per student to be relatively certain of getting that student to an 85% pass rate in their first year.
- For Māori students in the middle APS range additional targeted induction and orientation support was advised for all students, and that a proportion (perhaps 20%) would require additional targeted support.

Some support is already provided, but funding levels mean it is much less comprehensive than it could or should be.

The following table indicates what it might look like if additional funding was provided for the sort of targeted support that would bring first year pass rates for low APS students up to the pass rates for more academically prepared students.

- Rows 1a-1c indicate the proportion of school leavers from one cohort (those whose final year of school was 2009) whose Academic Preparedness Scores feel within high, moderate, and low risk bands.
- Row 2 shows what this would translate into in overall student numbers using the 2017 student intake into New Zealand's eight universities.
- Rows 3a-3c translate the percentages in 1a-1c into student numbers based on Row 2.
- Rows 4a-4c indicate the sort of additional funding that would be required if $4,000 (on average) was targeted to students with an APS below 130, and $1,000 (on average) to students whose APS is in the 130-150 range.

Estimate of Additional Support Required to Lift First Year Pass Rates

Academic Preparedness Scores for 2009 school leavers who entered university by 2011

1) APS	All	Māori	Pasifika	Pākehā
1a) <129 (highest risk)	15.5%	28.3%	35.5%	14.6%
1b) 130-150 (moderate risk)	13.7%	19.2%	17.3%	13.7%
1c) 151-340 (lowest risk)	70.8%	52.5%	47.2%	71.7%
2) 2017 First Year Student Numbers (approx)	24,105	2,792	2,041	16,384
3) Students by category	All	Māori	Pasifika	Pākehā
3a) <129 (highest risk)	3,746	790	724	2,386
3b) 130-150 (moderate risk)	3,293	536	353	2,251
3c) 151-340 (lowest risk)	17,066	1,466	963	11,747
4) Targeted Funding	All	Māori	Pasifika	Pākehā
4a) <129 - $3,500 per student	$14,982,185	$3,161,989	$2,896,712	$9,543,516
4b) 130-150 - $1,000 per student	$3,293,114	$535,604	$353,244	$2,250,768
4c) Total	**$18,275,298**	**$3,697,593**	**$3,249,957**	**$11,794,284**

As can be seen, if the goal was just to bring Māori and Pasifika first-year university achievement up, it would take approximately $7m a year. If this $7m was invested and it achieved the goal of lifting first year pass rates for Māori and Pasifika to the same 73% rate of European students, we would see;

- Māori: a lift in first year pass rates to 73% from current 55% pass rates would see another 227 Māori succeeding annually.
- Pasifika: a lift in first year pass rates to 73% from current 41.6% pass rates would see another 270 Pasifika succeeding annually.

Recommendations 4.2 and 4.3: Provision of STEM teaching to schools

This table provides a view of the 204 schools that had a below average proportion of students getting at least 30 credits in STEM subjects in Year 13.

Proposed service centre	Local schools	Local NCEA students (Y11-13)	% Maori	% Pasifika	Bus range (1-110kms)		Remote (more than 110kms)		School decile bands		
					Schools	NCEA students	Schools	NCEA students	Higher	Medium	Lower
Auckland Region	**56**	**14,523**	32%	43%	**56**	**14,523**	**-**	**-**	**4**	**4**	**48**
Kaitaia	12	1,170	79%	2%	12	1,170	-	-	-	-	12
Universities in Auckland	34	12,052	25%	52%	34	12,052	-	-	3	3	28
Whangarei	10	1,301	60%	3%	10	1,301	-	-	1	1	8
Hamilton & East Coast Regions	**65**	**10,134**	58%	4%	**55**	**9,472**	**10**	**662**	**3**	**5**	**57**
Gisborne	13	1,861	74%	2%	8	1,661	5	200	-	-	13
Napier	10	1,486	55%	9%	10	1,486	-	-	2	-	8
Rotorua	11	1,769	65%	4%	11	1,769	-	-	-	-	11
Taupo	5	436	72%	0%	4	247	1	189	-	1	4
Tauranga	7	1,300	54%	3%	5	1,079	2	221	-	-	7
Waikato University	19	3,282	48%	3%	17	3,230	2	52	1	4	14
Manawatu & Associated Regions	**31**	**5,102**	45%	4%	**29**	**4,742**	**2**	**360**	**-**	**8**	**23**
Massey University	16	2,931	44%	4%	14	2,571	2	360	-	4	12
Masterton	3	595	41%	5%	3	595	-	-	-	2	1
New Plymouth	4	645	42%	2%	4	645	-	-	-	2	2
Whanganui	8	931	54%	4%	8	931	-	-	-	-	8
Wellington & Marlborough Regions	**15**	**3,191**	33%	20%	**15**	**3,191**	**-**	**-**	**1**	**4**	**10**
Blenheim	1	137	28%	1%	1	137	-	-	-	1	-
Nelson	3	557	16%	1%	3	557	-	-	-	2	1
VUW	11	2,497	37%	25%	11	2,497	-	-	1	1	9
Canterbury & West Coast Regions	**23**	**5,343**	21%	6%	**22**	**5,313**	**1**	**30**	**2**	**9**	**12**
Greymouth	4	554	22%	2%	4	554	-	-	-	2	2
Timaru	2	559	13%	3%	2	559	-	-	-	2	-
Canterbury Universities	17	4,230	22%	7%	16	4,200	1	30	2	5	10
Otago & Southland Regions	**14**	**2,240**	23%	3%	**12**	**2,160**	**2**	**80**	**1**	**10**	**3**
Invercargill	7	1,316	26%	3%	7	1,316	-	-	-	5	2
Oamaru	2	129	9%	2%	1	94	1	35	1	1	-
Queenstown	1	45	18%	2%	-	-	1	45	-	1	-
Otago University	4	750	19%	3%	4	750	-	-	-	3	1
Total	**204**	**40,533**	38%	20%	**189**	**39,401**	**15**	**1,132**	**11**	**40**	**153**

Of those 204 schools;

- 153 (75%) are lower socio-economic schools in deciles 1-4.
- 40 (19.6%) or middle socio-economic schools in deciles 5-7
- 11 (5.4%) are higher socio-economic schools in deciles 8-10.

Using the Waikato Bus Model (see summary outline in the body of the paper), it is practical to bring school students to a university (or other central location) for delivery of high quality science teaching.

For the purposes of very broadly indicating costs of mainstreaming this programme nationally, we have made a number of assumptions – all of which would need careful testing and refinement if this programme was taken forward. Assumptions are;

- Universities and regional service centres could be used to deliver the majority of hands-on laboratory or workshop teaching associated with senior school science curriculum for schools that are currently not doing so successfully. We have said that this includes all schools where the proportion of students successfully getting 30 NCEA 3 STEM credits is below the national median (eg 204 schools).
- On average, we assume around 40% of students across years 11-13 might do STEM courses.
- 110km is assumed to be a maximum upper limit for students to travel to a university or regional teaching centre – approximately 90-100 minutes in each direction.

This appears as follows;

	Below median schools	All Yr 11-13 students	New Regional Hubs	Schools Serviced by Hub	Students covered by Hub (40% of total)	Schools too far from hub	Students too far from hub.
Universities in Auckland	34	12,052		34	4,821	0	0
Waikato University	19	3,282		17	1,292	2	21
Massey University	16	2,931		14	1,028	2	144
Victoria University of Wellington	11	2,497		11	999	0	0
Canterbury Universities	17	4,230		16	1,680	1	12
Otago University	4	750		4	300	0	0
Sub Total Universities	**101**	**25,742**		**96**	**10,120**	**5**	**177**
Kaitaia	12	1,170	1	12	468	0	0
Whangarei	10	1,301	1	10	520	0	0
Gisborne	13	1,861	1	8	744	5	0
Napier	10	1,486	1	10	594	0	0
Rotorua	11	1,769	1	11	708	0	0
Taupo	5	436	1	4	174	1	0
Tauranga	7	1,300	1	5	520	2	0
Masterton	3	595	1	3	238	0	0
New Plymouth	4	645	1	4	258	0	0
Whanganui	8	931	1	8	372	0	0
Blenheim	1	137				1	55
Nelson	3	557	1	3	223	0	0
Greymouth	4	554	1	4	222	0	0
Timaru	2	559	1	2	224	0	0
Oamaru	2	129				2	52
Queenstown	1	45				1	18
Invercargill	7	1,316	1	7	526	0	0
Sub Total Regions	**103**	**14,791**	**14**	**91**	**5,792**	**12**	**124**
TOTAL	**204**	**40,533**	**14**	**187**	**15,912**	**17**	**301**

This indicates that, of the 204 schools;

- 96 are within 110km of a university. Those 96 schools have around 25,742 students enrolled in years 11-13. If 40% of the Year 11-13 students took STEM subjects, around 10,120 would need transporting to a university for the hands-on laboratory and/or workshop parts of their curriculum.

- 91 are more than 110km from a university but are close enough to a large enough cluster of other schools that creating a shared regional STEM teaching facility could be an option. Those 91 schools have around 14,791 students enrolled in years 11-13 – potentially 5,800 (40%) who might take STEM courses if offered at a regional hub. It would take 14 hubs to cover all of these students.
- 17 are located in relatively remote locations and have 1,052 students enrolled in years 11-13 – potentially around 300 students who would need to receive STEM teaching at their school or via distance education.

There are three main additional costs that need approximating to provide an estimate of the costs of implementing these recommendations.

1. **Capital and operating costs of regional teaching hubs.**

   A regional hub might have a couple of 50-60 bench laboratories or workshops for delivery of teaching in areas like physics, biology, and chemistry.

   Using Australasian university sector figures provided by the Tertiary Education Facilities Management Association, a purpose-build hub with two 55 person laboratories would require teaching space of around 5.5 sq/m per student (605 sq/m) plus ancillary space (offices and storage) of probably another 30% (180 sq/m) for around 785 sq/m of useable floor space, or 1,000 sq/m of gross floor space. At approximately $3,800 per sq/m (Ministry of Education recommended rate per sq/m), this would mean a regional training centre might cost around $3.8m to establish (capex) and with a couple of dedicated teachers and 2-3 dedicated teaching assistants, equipment, consumables, utilities, and rates, would cost approximately $500,000 to operate annually before depreciation and amortisation.

   Some regions might not need new facilities. It may be possible to improve utilisation of specialist teaching laboratories in schools in regions. It may also be possible to offset operating costs by savings from schools that prefer to have part or all of their science curriculum delivered through a regional service centre.

   For modelling purposes, we assume the following in assessing probable utilisation rates of regional hubs.

   - A NCEA credit is supposed to represent around 10 hours of teaching time. To get 30 NCEA STEM credits, a student would need 300 hours of teaching across a typical schools' 30-week teaching year.
   - With at least two laboratories in each hub, there would always be at least two 3-hour classes taking place simultaneously. Some groups of students might only stay for half a day, where others might shift from one subject in the morning to another subject in the afternoon.
   - Some classes might be full, but more likely classes will have fewer students than the maximum possible capacity. For modelling purposes, we have assumed an average of 80% - or 45 students per class.
   - We expect there would be around eighteen 3-hour science classes offered each week – two each day Monday to Thursday and one on Fridays.

   This means that a regional hub would probably be able to handle potentially 1,600 students (2 classes x 45 students x 18 sessions). Assuming a proportion of those students would do two classes in one day, actually capacity would be lower – say 1,200 able to complete science programmes in any given year across years 11-13.

   Though it would be sensible to start with just one or two regional teaching hubs to test and refine the concept, if fully implemented across 14 regions, the capital cost would be $53m, and the annual operating cost (before depreciation and amortisation and costs associated with transporting students) would be around $7m.

2. **Operating costs of teaching delivered on a university campus.**

   Individual universities may have spare capacity in laboratories and workshops to operate as regional teaching hubs without additional capital investment. However, this is unlikely given a focus by universities on managing down poorly utilised space and improving utilisation of remaining space.

   For the purposes of estimating costs, we have therefore assumed that new regional hubs would be required.

   Given that a standard teaching hub could effectively accommodate and teach 1,200 students annually, and the fact that that number would definitely be exceeded in Auckland (likely 4,800 STEM students) and Canterbury (likely 1,700 STEM students), larger teaching hubs would be required on those campuses.

   Overall, we think that the capital and operating costs of regional teaching hubs could be applied to universities where they operate a regional hub.

   The equivalent of ten regional hubs would be required

   - Four on Auckland university campuses (ideally two or three facilities spread across the Auckland metropolitan area)
   - One at Waikato University
   - One at Massey University in Palmerston North
   - One at Victoria University of Wellington
   - Two on Canterbury university campuses
   - One at the University of Otago in Dunedin.

   If fully implemented, the capital cost would be $38m and the annual operating cost (before depreciation and amortisation and costs associated with transporting students) would be around $5m.

3. **Operating costs of bussing students to and from teaching.**

   Waikato University spent around $320,000 in 2017 on running five buses on fixed routes for specified days of each year. In total, 176 students registered with the service – for an average cost of $1,800 per student. The $320,000 was a fixed amount regardless of numbers of students and actual per-student cost could be higher or lower depending upon how this scheme is implemented.

   For the purposes of modelling, we have continued to use the $1,800 per student figure.

Appendix 2: Cost estimates for the different implementation scenarios

Scenarios $m	Minimum meaningful approach						Intermediate approach						Comprehensive & ambitious approach					
Year	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**5-Yr Total**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**5-Yr Total**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**5-Yr Total**
1.1 One plan & one point of accountability in Government	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.5	$0.5	$0.5	$0.5	$0.5	**$2.5**	$0.5	$0.5	$0.5	$0.5	$0.5	**$2.5**
1.2 Develop performance measures	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**
1.3 Systems, processes, and good practice guidance to support schools to lift ambition and achievement for their students	$1.5	$0.0	$0.0	$0.0	$0.0	**$1.5**	$2.5	$0.5	$0.5	$0.5	$0.5	**$4.5**	$5.0	$1.5	$1.5	$1.5	$1.5	**$11.0**
1.4 Monitoring, evaluating, and sharing of good (and bad) practice.	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.3	$0.3	$0.3	$0.3	$0.3	**$1.5**	$0.3	$0.3	$0.3	$0.3	$0.3	**$1.5**
2.1 Maintain equity funding at current levels	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**
2.2 Extend the availability of university familiarisation programmes	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$1.0	$1.0	$1.0	$1.0	$1.0	**$5.0**	$1.0	$1.0	$1.0	$1.0	$1.0	**$5.0**
2.3 Foundation programmes	$5.0	$5.0	$5.0	$5.0	$5.0	**$25.0**	$8.0	$8.0	$8.0	$8.0	$8.0	**$40.0**	$8.0	$8.0	$8.0	$8.0	$8.0	**$40.0**
2.4 Increase academic support provided to first year students with relatively low Academic Preparedness	$3.7	$3.7	$3.7	$3.7	$3.7	**$18.5**	$7.0	$7.0	$7.0	$7.0	$7.0	**$35.0**	$18.3	$18.3	$18.3	$18.3	$18.3	**$91.5**
3.1 Data-supported, culturally appropriate support to lift achievement in schools	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$1.0	$1.0	$1.0	$1.0	$1.0	**$5.0**	$5.0	$2.0	$2.0	$2.0	$2.0	**$13.0**
3.2 Share lessons and good practice around NCEA curriculum across schools.	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.2	$0.2	$0.2	$0.2	$0.2	**$1.0**	$0.2	$0.2	$0.2	$0.2	$0.2	**$1.0**
4.1 Universities delivering NCEA curriculum into schools.	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$1.5	$1.5	$1.5	$1.5	$1.5	**$7.5**	$2.5	$2.5	$2.5	$2.5	$2.5	**$12.5**
4.2 Send students to a university for some teaching (mainly STEM)	$1.0	$1.0	$1.0	$1.0	$1.0	**$5.0**	$3.8	$2.6	$2.6	$2.6	$2.6	**$14.3**	$38.0	$26.2	$26.2	$26.2	$26.2	**$142.8**
4.3 Where specialist STEM curriculum cannot be delivered at a school or at a local university, send students to regional hubs.	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$7.2	$3.1	$3.1	$3.1	$3.1	**$19.7**	$53.0	$18.8	$18.8	$18.8	$18.8	**$128.2**
5.1 Understand the capacity of secondary schools to deliver NCEA STEM and Te Reo Māori curriculum.	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**	$0.0	$0.0	$0.0	$0.0	$0.0	**$0.0**
5.2 Grow the pool of teachers able to deliver senior school curriculum in STEM and Te Reo Maori.	Unknown	Unknown	Unknown	Unknown	Unknown	**Unknown**	Unknown	Unknown	Unknown	Unknown	Unknown	**Unknown**	Unknown	Unknown	Unknown	Unknown	Unknown	**Unknown**
Totals	**$11.2**	**$9.7**	**$9.7**	**$9.7**	**$9.7**	**$50.0**	**$33.0**	**$25.7**	**$25.7**	**$25.7**	**$25.7**	**$136.0**	**$131.8**	**$79.3**	**$79.3**	**$79.3**	**$79.3**	**$449.0**