Literacy and Numeracy Assessment (LNAT) tool reading progress for targeted Wintec learners in 2019

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Summary

Main aim
The main aim of this report is to track reading gains achieved by targeted 2019 students at Waikato Institute of Technology (Wintec). Tracking is required by the Wintec LN Policy (Revised, 2018) to ensure we meet Tertiary Education Commission (TEC) funding requirements.
Data collection and analysis
We generated a composite data set, applying the multi-year testing requirement referred to by the Tertiary Education Commission (TEC, 2012, 2017a, b) as the sequence concept. To compare initial and progress reading assessment scores, we manually set up a multivariate layout. We report on learners' step-based progress to exemption levels for reading. Of the targeted reading cohort (N=557), 40.4% of learners (n=225) progressed to exemption level (step 4 or higher). We used cross-tabulations to report on reading progress by ethnicity, school/centre of study at the institute and enrolment type. To establish whether learners achieved statistically significant gain in reading, we used a matched-pairs t-test to compare initial and progress scale scores for the full cohort. To complete the picture, we replicated TEC's (2012) algorithm for calculating gain to illustrate that these results under-reported learners' reading progress.
Findings and discussion
Our findings showed that the full cohort achieved reading levels at or above the Tertiary Education Commission's (TEC's) targets (TEC, 2015). We replicated past reports (Greyling, 2017; Greyling & Ahmad, 2019) showing that the TEC's LNAT algorithm under-reported progress. Instead, we argued, cross-tabulations of initial and progress step scores provided a far more positive account of students' reading progress. Our findings also showed that Pasifika learners performed at levels significantly below those of other ethnicities. Waikato Trades Academy (WTA) and Māori and Pasifika Trades Training (MPTT) students performed at lower levels than other groups yet achieved significant progress.
Conclusions and Recommendations
We concluded that current LN practices continued to yield consistent and positive results. Outcomes could be improved by pursuing a more joined-up system of teaching, learning and support as suggested in the report on the 2018 cohort's progress (Greyling & Ahmad, 2019). Specific attention has to be paid to

- Pasifika ways of being, doing and learning to improve outcomes for them following a collaborative approach with stakeholders responsible for teaching, learning and support.
- Waikato Trades Academy (WTA) and Māori and Pasifika Trades Training (MPTT) who have performed at levels slightly below other enrolment types, specifically to improve the proportions of learners who achieve exemption-level scores.

Introduction

The Wintec LN Policy (2018) stipulates that the reading and numeracy performance of targeted learners at the institute have to be tracked and that the relevant findings be reported. These requirements are based on the 2015 TEC LN policy refresh targets set for 2015-2019 (TEC, 2015).

This report captures the following perspectives on learners' LN progress for the 2019 academic year:

- **Scale-based paired t-test comparisons** of the targeted learners' performance.
- **Step-based reading gains** for the targeted learners (level 1 to level 3, including Waikato Trades Academy [WTA] and Māori and Pasifika Trades Training [MPTT]).
- **The step-based reading gains** are disaggregated as follows:
    - By Ethnicity (Māori = 1; Pasifika = 2; Pākeha/NZ European = 3; Other ethnicities = 4).
    - By Centre (Centre for Business and Enterprise [CBE] = 1; Centre for Education and Foundation Pathways [CEFP] = 2; Trades, including Centre for Engineering and Industrial Design [Trades & CEID]

= 3; Centre for Science and Primary Industries [CSPI] = 4; Centre for Sport Science & Human Performance [CSSHP] = 5; and School of Media Arts [SMA] = 6).

- By Enrolment Type (SAC-funded = 1; MPTT =2; WTA = 3; Youth Guarantee [YG] =4 and International students =5)).

- **Progress analysis**, based on the LN assessment tool (LNAT) algorithm, is reported, including the contentious classifications of step 4 and step 5 learners whose progress was not deemed to be statistically significant. As in the 2017 and 2018 reports (Greyling, 2017; Greyling & Ahmad, 2018), we note the contestable and incorrect classifications.

Data collection and analysis

We used the following process to collect and collate our data:

- **Official data:** The 2019 Single data return (SDR) file for the cohort of Wintec students was used to identify the targeted students for the academic year. Joining this file with an LNAT data download of reading scores for the period 2016 to 2019, we addressed the sequence concept which allows for multi-year assessment. Using a multi-year download of reading results allowed us to eliminate from the data-set those students who had already achieved the threshold level of step 4 for reading.
- **Sequence concept:** For the period of 2016 to 2019, we took the first assessment as the initial baseline reading score, and then selected the next best score for each student as the progress score.[1]
- **Data matching & multivariate layout:** We then removed the redundant scores so that the remaining scores could be paired for each student. This means that each row of student data contained the initial and the progress score for the same student. This multivariate layout allowed us to perform paired t-tests and cross-tabulations, as well as multivariate analysis of the variables in the data set. In this report, we do not replicate the multivariate analysis of the 2018 report; however, the data set was prepared with that possibility in mind.
- **LNAT progress calculation in Excel**: We replicated the algorithm in Excel to calculate statistically significant gain for the learners who had to be re-tested at the institute:
  - **Calculating Gain Score:** Calculate Gain Score where **Gain Score** = Progress Scale Score - Initial Scale Score.
  - **Calculating Gain Score Error**
    - Square the standard error values for initial and progress scores.

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[1] . The sequence concept is specified in a Tertiary Education Commission (TEC) guideline document (TEC, 2017). We could not find an easy way of operationalising the sequence concept. As for the 2017 and 2018 reports, we used a three-year period prior to the year under scrutiny as our period of relevant data (2016 to 2018) to identify baseline scores. Data from these years were selected for students enrolled in 2019, with the first score taken as initial score and the next highest score for the period 2016-2019 as the progress score. We acknowledge the LNAT administrator at Wintec, Charlene Kirikiri, who performed various multi-year data-matching steps, using Tableau Software (Tableau Desktop, 2019), to identify the relevant data, based on the 2019 Single Data Return file and LNAT website data. Her data-management skills allowed us to develop a multivariate data layout for the t-test and cross-tabulations in this report.

- Add the squared values for Total Standard Error values calculated in the step directly above.
- Calculate the Square Root of the total obtained in step 3 – the so-obtained value is known as **Gain Score error.**

- **Calculating statistically significant gain**
  - Multiply the Gain score error calculated in the section above by the constant, 1.645.
  - Statistically significant gain is defined as follows: Gain Score Error x 1.645 < Gain Score.

Algorithm summarised:[2]

Gain score = Progress Scale Score – Initial Scale Score

Gain Score Error = $\sqrt{a^2 + b^2}$ where a^2 = standard error for initial assessment, and b^2 = standard error for progress scale assessment.

Statistically significant gain is where Gain Score > Gain Score Error x 1.645, where the so-obtained value is [+]).

Findings

In general, the findings show that the institute met the targets set by the TEC in their 2015 refresh policy (TEC, 2015). Using the TEC's LNAT progress calculation, 25% of students achieved statistically significant gain. However, we show in our findings that the LNAT progress calculation algorithm under-reports the institute's success. When the TEC guideline of a step-4 exemption was used as the target, we found that 40.4% of targeted Wintec students achieved this level. In the sections that follow we report our t-test results and a series of cross-tabulations to show the positive shifts in reading development. We focus specifically on ethnicities, centres/schools and enrolment types. In the last section we replicate the LNAT algorithm, followed by a cross-tabulation of progress step by gain score (0= no statistically significant gain; 1 = statistically significant gain).

Statistically significant progress for the full cohort

The t-test results show that statistically significant gains were achieved. The paired samples t-test yielded the results reported in Table 1 (means, standard deviations and standard error means):

Table 1: Paired Samples Statistics for Wintec Cohort (N=557)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Progress scores	590.81	557	66.654	2.824
	Initial scores	542.98	557	54.502	2.309

The mean score for Progress assessments (a score of 591) is 17 points (1.7%) below the exemption threshold of step 4. The standard deviation of 73.7 shows that a significant number of learners scored at step 4 (scale score >608) or higher. The students whose details were included achieved a score of step 3 or lower in their initial reading

[2] . The main concern about the algorithm is that the term b^2, which is the standard error for the progress assessment, is often higher when learners score at higher steps where items test the targeted reading constructs with less precision. This inflates the total gain score error, and the result of the square root. This elevates the threshold value for identifying statistically significant gain. Table 10 shows the level of misclassification: 64.5% (122) of 188 students who achieved step-4 scores were found not to have achieved statistically significant gain.

assessment. Table 2 reports the results of a paired t-test which shows that the difference of 48 points (i.e. progress of 4.8%) is deemed to be statistically significant (t-value = 15.3, df=556; p<0.00). A medium to large effect size is observed (i.e. the gain score/standard deviation = 0.62) (Cohen, 1988).

Table 2: Paired Samples Test Results for Wintec Cohort (N=557)

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Progress – Initial scores	47.826	73.738	3.124	41.689	53.963	15.307	556	0.000

These results are consistent with those obtained in 2017 (Greyling, 2018) and 2018 (Greyling & Ahmad, 2019). The same cautions are repeated. Although the effect size of 0.62 signals positive growth, we cannot unequivocally attribute this growth to tutors' embedded reading strategies, natural growth and/or some other factor. An experimental design would be needed to unravel the cause-and-effect relationships, or stated more cautiously, explore the levels of association that may obtain, say, between the variables entered into a model of analysis and the dependent variable (gain score expressed as a scale score).

Step-based reading progress for the full cohort (N=557)

In Table 3, the cross-tabulation findings for the cohort show the distribution of progress steps against initial step score. The cross-tabulation captures these shifts (either up or down the steps of the reading progressions):

Table 3: Distribution of progress step against initial reading step for targeted Wintec students (N=557) (2019)

Initial step x Progress step			Progress step						Total
			1	2	3	4	5	6	
Initial step	1	Count	1	8	13	3	0	0	25
		% within Initial Step	4.0%	32.0%	52.0%	12.0%	0.0%	0.0%	100.0%
		% within Progress Step	12.5%	10.7%	5.2%	1.6%	0.0%	0.0%	4.5%
		% of Total	0.2%	1.4%	2.3%	0.5%	0.0%	0.0%	4.5%
	2	Count	1	23	64	32	3	1	124
		% within Initial Step	0.8%	18.5%	51.6%	25.8%	2.4%	0.8%	100.0%
		% within Progress Step	12.5%	30.7%	25.7%	17.0%	9.4%	20.0%	22.3%
		% of Total	0.2%	4.1%	11.5%	5.7%	0.5%	0.2%	22.3%
	3	Count	6	44	172	153	29	4	408
		% within Initial Step	1.5%	10.8%	42.2%	37.5%	7.1%	1.0%	100.0%
		% within Progress Step	75.0%	58.7%	69.1%	81.4%	90.6%	80.0%	73.2%
		% of Total	1.1%	7.9%	30.9%	27.5%	5.2%	0.7%	73.2%
Total		Count	8	75	249	188	32	5	557
		% within Initial Step	1.4%	13.5%	44.7%	33.8%	5.7%	0.9%	100.0%
		% within Progress Step	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	1.4%	13.5%	44.7%	33.8%	5.7%	0.9%	100.0%

These results show that

- 33.8% of students (n=188) who scored at Step 3 or lower on the initial assessment progressed to step 4.
- 5.7% of these students (n=32) progressed to step 5.
- 0.9% of the cohort (n=5) progressed to step 6.
- 40.4% of the cohort (n=225) progressed to step 4 or higher.

A large proportion of learners who scored at steps 1 and 2 on initial assessments also showed surprising step jumps. For example, 29% of students (n=36 [of 124]) who scored at Step 2 obtained exemption-level scores at step 4 or higher when progress assessments were administered.

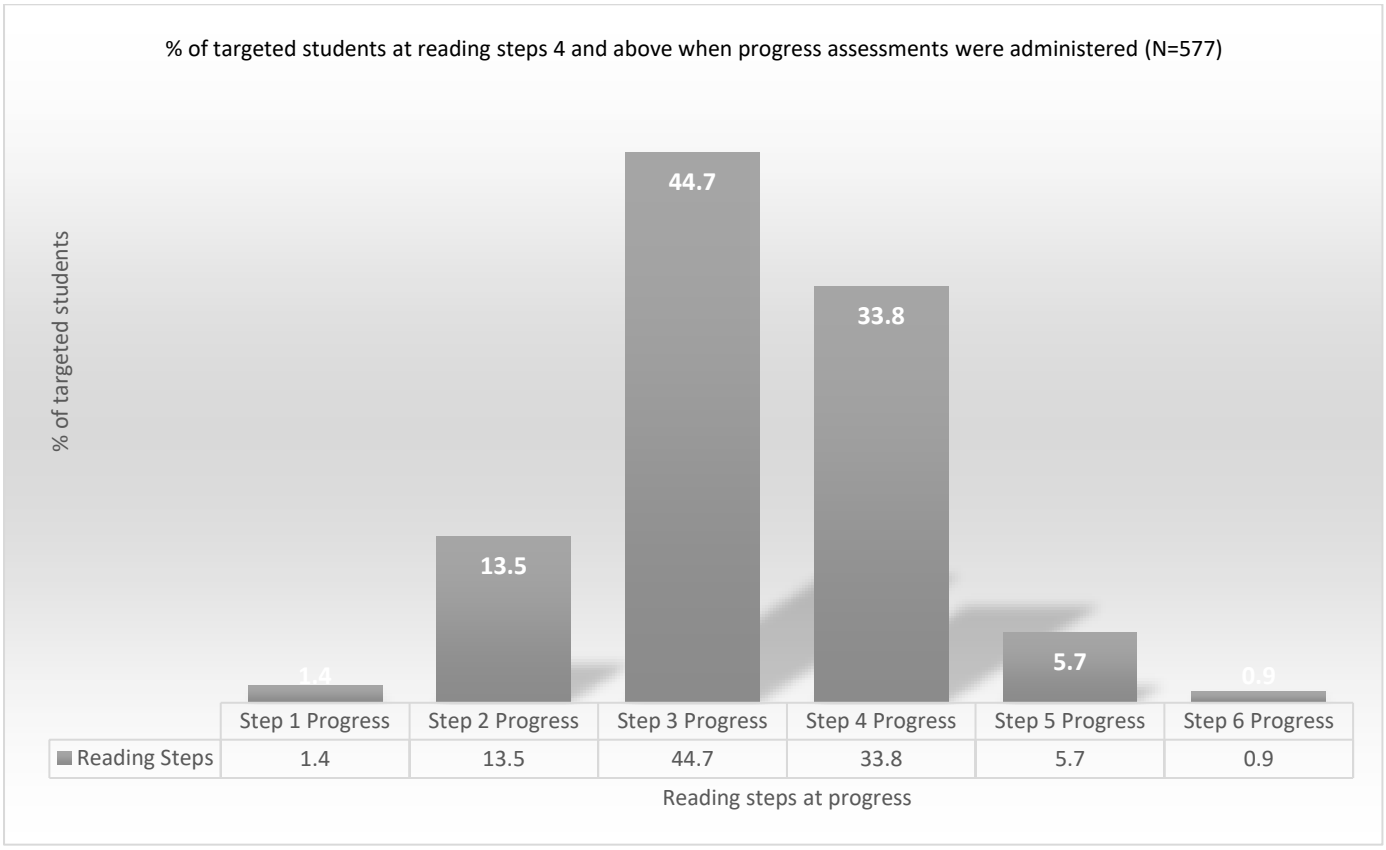

Figure 1: Distribution of progress reading scores for targeted Wintec students at step 3 or lower at the start (N=557)

Of the cohort, 85.1 % (n=494 of 557) achieved step 3 or higher on reading. At step 3, the distance between the students' level of reading skill and the reading demands is such that they have a reasonable chance of completing their vocational studies successfully. Anecdotally we have found that learners whose reading scores are at step 1 on initial assessments find the distance between their level of reading skill and the level needed for course completion too challenging. The LN team has consistently recommended that such students first spend some time on basic language and literacy development before they embark upon vocational studies.

Step-based analysis of learner reading progress by ethnicity

We replicated the cross-tabulations and bar graphs for four ethnicities represented in the cohort. These were specified earlier as Māori (category = 1); Pasifika (category = 2); Pākeha/NZ European (category = 3); and other ethnicities (category= 4). Our approach is to report distributions of progress step scores for each ethnicity. These appear below:

Step-based analysis of reading progress for Māori learners

The distribution of progress scores for learners who obtained scores at step 3 or lower on initial assessments is reported in Table 4:

Table 4: Distribution of reading progress step by initial reading step for targeted Māori students (n=233) at Wintec (2019)

Ethnicity: Māori				Progress Steps 1	2	3	4	5	6	Total
1	Initial Step	1	Count	1	5	6	0	0	0	12
			% within Initial Step	8.3%	41.7%	50.0%	0.0%	0.0%	0.0%	100.0%
			% within Progress Step	33.3%	17.2%	6.1%	0.0%	0.0%	0.0%	5.2%
			% of Total	0.4%	2.1%	2.6%	0.0%	0.0%	0.0%	5.2%
		2	Count	0	7	31	21	2	0	61
			% within Initial Step	0.0%	11.5%	50.8%	34.4%	3.3%	0.0%	100.0%
			% within Progress Step	0.0%	24.1%	31.3%	24.7%	12.5%	0.0%	26.2%
			% of Total	0.0%	3.0%	13.3%	9.0%	0.9%	0.0%	26.2%
		3	Count	2	17	62	64	14	1	160
			% within Initial Step	1.3%	10.6%	38.8%	40.0%	8.8%	0.6%	100.0%
			% within Progress Step	66.7%	58.6%	62.6%	75.3%	87.5%	100.0%	68.7%
			% of Total	0.9%	7.3%	26.6%	27.5%	6.0%	0.4%	68.7%
	Total		Count	3	29	99	85	16	1	233
			% within Initial Step	1.3%	12.4%	42.5%	36.5%	6.9%	0.4%	100.0%
			% within Progress Step	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
			% of Total	1.3%	12.4%	42.5%	36.5%	6.9%	0.4%	100.0%

Table 4 shows that of the 233 students

- 43.8% (n=102) improved their scores to the exemption threshold of step 4 or higher, performing above the full cohort's 40.4%.
- 36.5% (n=85) improved their scores to step 4.
- 6.9% (n=16) improved their scores to step 5, while 0.4% (n=1) improved to step 6.
- 13.7% (n=32) remained at steps 1 and 2 which constitute the at-risk category – this number is lower, albeit marginally, than the full cohort's 14.9% (n=83) (See Table 1).

We noted that Māori students (43.8%) outperformed Pākeha/NZ European students (42.2%) (reported in Table 6 below), albeit marginally.

These results are represented graphically in Figure 2.

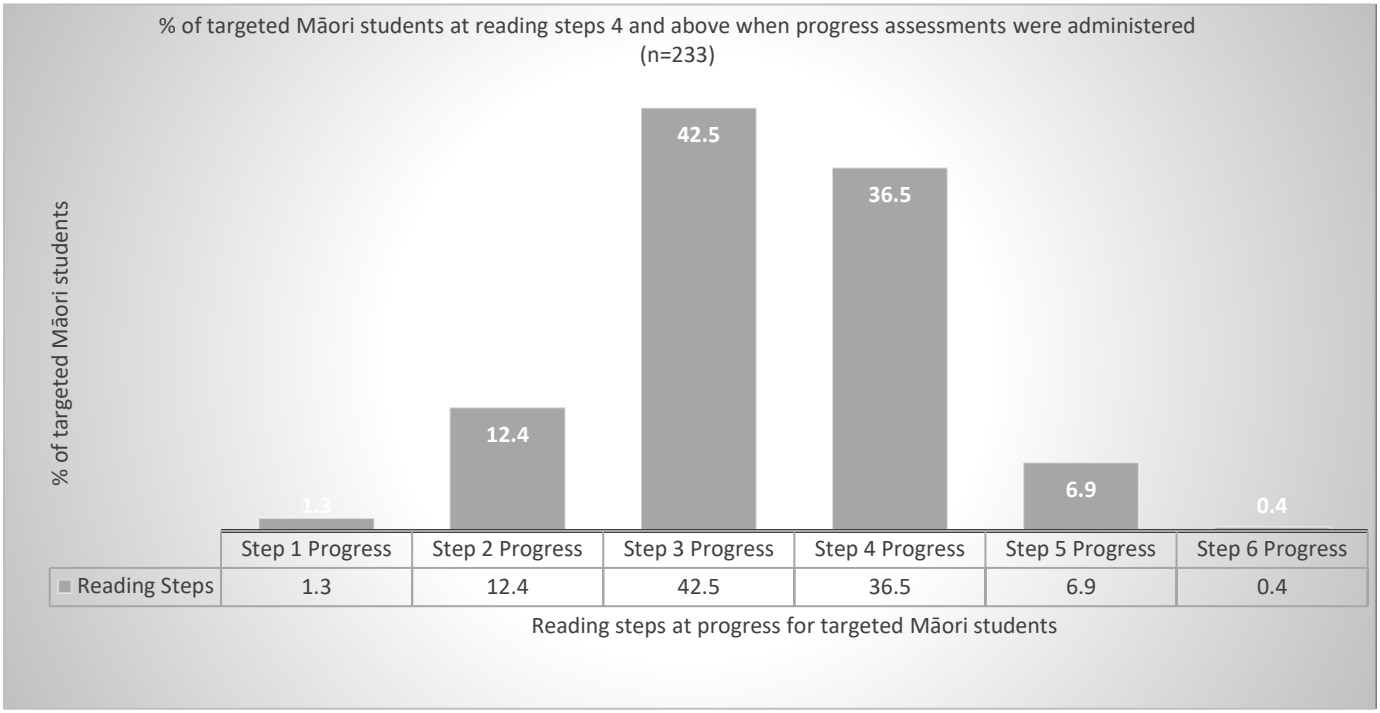

Figure 2: Distribution of progress reading scores for Māori students at step 3 or lower at the start (n=233)

When the progress assessment was administered, 86.3% of the targeted Māori students scored at step 3 or higher which is deemed to be the level of reading skill required to have a reasonable chance of success in completing their programmes. The TEC threshold level for exemption is step 4.

As an aside, cross-tabulations also provide information about students whose performance remains below the step-4 threshold for exemption. The format of the cross-tabulations allows us to access a head count, the proportion of learners who remained at steps 1 to 3 (i.e. a row-based percentage based on students' initial assessment status) and the proportion of learners for each progress reading step (i.e. a column-based percentage based on students' progress reading step status).

Step-based analysis of reading progress for Pasifika learners

The distribution of progress scores for Pasifika learners who obtained scores at step 3 or lower on initial assessments is reported in Table 5. As we have pointed out, the proportion of Pasifika learners who progressed elicited concern. These numbers are significantly below those of the other ethnicities, as well as the full cohort of students.

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Table 5: Distribution of reading progress step against initial reading step for targeted Pasifika students (n=48) at Wintec (2019)

Ethnicity: Pasifika				Progress Steps 1	2	3	4	5	6	Total
2	Initial Step	1	Count	0	0	3	0	0	0	3
			% within Initial Step	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
			% within Progress Step	0.0%	0.0%	11.5%	0.0%	0.0%	0.0%	6.3%
			% of Total	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	6.3%
		2	Count	0	4	5	1	0	0	10
			% within Initial Step	0.0%	40.0%	50.0%	10.0%	0.0%	0.0%	100.0%
			% within Progress Step	0.0%	36.4%	19.2%	10.0%	0.0%	0.0%	20.8%
			% of Total	0.0%	8.3%	10.4%	2.1%	0.0%	0.0%	20.8%
		3	Count	0	7	18	9	1	0	35
			% within Initial Step	0.0%	20.0%	51.4%	25.7%	2.9%	0.0%	100.0%
			% within Progress Step	0.0%	63.6%	69.2%	90.0%	100.0%	0.0%	72.9%
			% of Total	0.0%	14.6%	37.5%	18.8%	2.1%	0.0%	72.9%
	Total		Count	0	11	26	10	1	0	48
			% within Initial Step	0.0%	22.9%	54.2%	20.8%	2.1%	0.0%	100.0%
			% within Progress Step	0.0%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%
			% of Total	0.0%	22.9%	54.2%	20.8%	2.1%	0.0%	100.0%

These results show that of the 48 Pasifika students

- 22.9% (n=11) improved their scores to the exemption threshold of step 4 or higher.
- 20.8% (n=10) improved their scores to step 4.
- 2.1% (n=1) improved their scores to step 5, while none improved to step 6.
- 22.9% (n=11) remained at step 2 (with none at step 1) which constitutes the at-risk category.

Although these numbers elicit concern, we note too that 72.9% (n=35) of the 48 students achieved a step 3 on reading. This suggests that with some exposure to LN-embedding and other opportunities for learning, Pasifika learners achieved scores that allowed them to obtain step 3 which is closer (in terms of our distance analogy) to having developed adequate general language and literacy skills to be able to embark upon studies of a more technical and vocational nature.

These results are represented graphically in Figure 3.

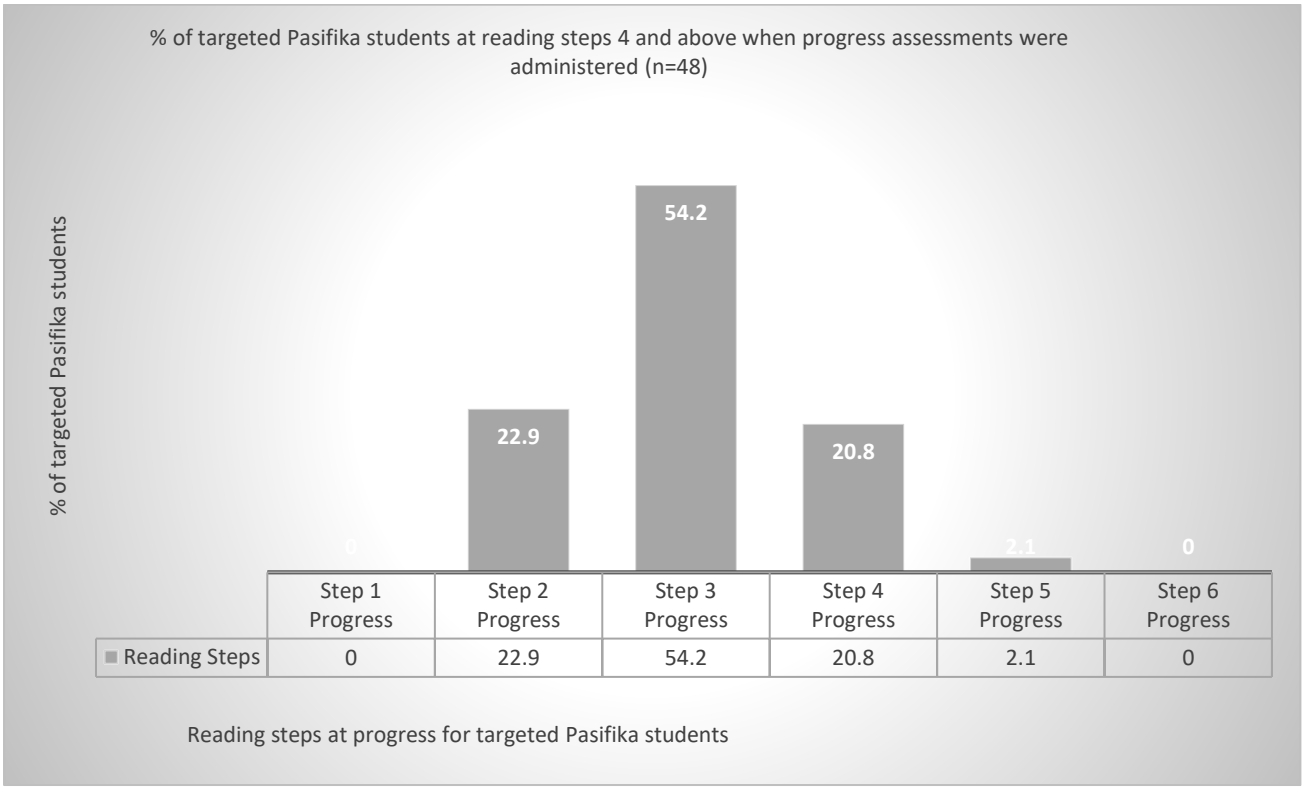


Figure 3: Distribution of progress reading scores for Pasifika students at step 3 or lower at the start (n=48)

These results indicate that

- a significant proportion of Pasifika learners remained at step 2 (22.9%; 11) of the reading progressions which was 8% worse than the full Wintec cohort at 14.9% (83 of 577 students), or 9.2% worse than Māori students at 13.7% (32 of 233 students).
- no students were at the ends of the distribution, with no step 1s nor step 6s recorded.
- Pasifika students were at the lowest level of reading performance and were therefore the most vulnerable of the four ethnic groups.

It is clear that we need to consider carefully how we deal with Pasifika learners' needs. We need to consider Pasifika ways of being and doing in the context of the programmes in which these students are active. A contextual analysis is needed to uncover the complicated factors that impact on their performance.

Step-based analysis of reading progress for Pākeha/New Zealand European learners

The distribution of progress scores for these learners who obtained scores at step 3 or lower on initial assessments is reported in Table 6. We referred earlier to these findings when we referred to Māori students marginally outperforming Pākeha/New Zealand European students.

Table 6: Distribution of reading progress step against initial reading step for targeted Pākeha/New Zealand European students (n=205) at Wintec (2019)

Ethnicity: Pākeha/New Zealand European				Progress Steps 1	2	3	4	5	6	Total
3	Initial Step	1	Count	0	2	1	1	0	0	4
			% within Initial Step	0.0%	50.0%	25.0%	25.0%	0.0%	0.0%	100.0%
			% within Progress Step	0.0%	7.4%	1.1%	1.4%	0.0%	0.0%	2.0%
			% of Total	0.0%	1.0%	0.5%	0.5%	0.0%	0.0%	2.0%
		2	Count	0	11	20	7	0	1	39
			% within Initial Step	0.0%	28.2%	51.3%	17.9%	0.0%	2.6%	100.0%
			% within Progress Step	0.0%	40.7%	22.7%	9.7%	0.0%	25.0%	19.0%
			% of Total	0.0%	5.4%	9.8%	3.4%	0.0%	0.5%	19.0%
		3	Count	4	14	67	64	10	3	162
			% within Initial Step	2.5%	8.6%	41.4%	39.5%	6.2%	1.9%	100.0%
			% within Progress Step	100.0%	51.9%	76.1%	88.9%	100.0%	75.0%	79.0%
			% of Total	2.0%	6.8%	32.7%	31.2%	4.9%	1.5%	79.0%
	Total		Count	4	27	88	72	10	4	205
			% within Initial Step	2.0%	13.2%	42.9%	35.1%	4.9%	2.0%	100.0%
			% within Progress Step	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
			% of Total	2.0%	13.2%	42.9%	35.1%	4.9%	2.0%	100.0%

These results show that of the 205 students

- 42.0% (n=86) improved their scores to the exemption threshold of step 4 or higher, performing above the full cohort's 40.4%, but marginally below the finding of 43.8% for Māori learners.
- 35.1% (n=72) improved their scores to step 4 compared to 36.5% (n=85) of Māori students.
- 4.9% (n=10) improved their scores to step 5 compared to 6.9% (n=16) of Māori students.
- 15.2% (n=31) remained at steps 1 and 2 which constitute the at-risk category – for Māori students, 13.7% (n=32) scored at these levels.

Another way of interpreting the data in the table is to compare the initial assessment step 1 and step 2 totals with those of the progress assessment. These show that at the start 43 students (39 + 4) achieved scores at these two steps, while the equivalent count was 31 for the progress step assessment. This means that 12 fewer students were in these categories at the end. We cannot conclude that the same 4 students who scored at step 1 repeated this feat on the progress assessment. Closer inspection of the data-base would be needed to conclude who the 4 students were in each case. Given the structure of the data file, such an analysis is possible but detailed discussion was viewed to be outside the scope of this report.

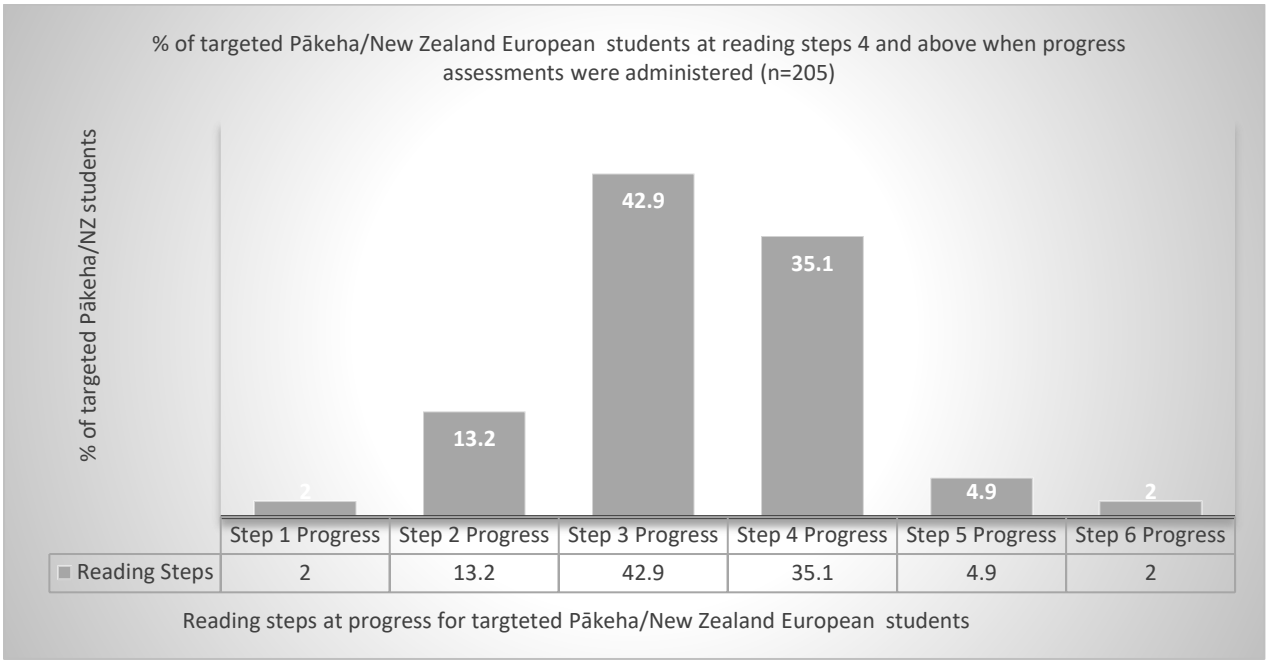


Figure 4: Distribution of progress reading scores for Pākeha/New Zealand European students on step 3 or lower at start (n=205)

These results also show that 84.8% of learners obtained scores at step 3 or higher. This is yet another reason for using cross-tabulations as they allow us to see how learner step scores are distributed and the shifts that occurred between initial (time 1) and progress (time 2) assessments.

Step-based analysis of reading progress for learners of Other Ethnic backgrounds

The distribution of progress scores for these learners who obtained scores at step 3 or lower on initial assessments is reported in Table 7.

Table 7: Distribution of reading progress step by initial reading step for targeted other ethnicities (n=71) at Wintec (2019)

Ethnicity: Other ethnicities				Progress Steps 1	2	3	4	5	6	Total
4	Initial Step	1	Count	0	1	3	2	0	0	6
			% within Initial step	0.0%	16.7%	50.0%	33.3%	0.0%	0.0%	100.0%
			% within Progress Step	0.0%	12.5%	8.3%	9.5%	0.0%	0.0%	8.5%
			% of Total	0.0%	1.4%	4.2%	2.8%	0.0%	0.0%	8.5%
		2	Count	1	1	8	3	1	0	14
			% within Initial step	7.1%	7.1%	57.1%	21.4%	7.1%	0.0%	100.0%
			% within Progress Step	100.0%	12.5%	22.2%	14.3%	20.0%	0.0%	19.7%
			% of Total	1.4%	1.4%	11.3%	4.2%	1.4%	0.0%	19.7%
		3	Count	0	6	25	16	4	0	51
			% within Initial step	0.0%	11.8%	49.0%	31.4%	7.8%	0.0%	100.0%
			% within Progress Step	0.0%	75.0%	69.4%	76.2%	80.0%	0.0%	71.8%
			% of Total	0.0%	8.5%	35.2%	22.5%	5.6%	0.0%	71.8%
	Total		Count	1	8	36	21	5	0	71
			% within Initial step	1.4%	11.3%	50.7%	29.6%	7.0%	0.0%	100.0%
			% within Progress Step	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%
			% of Total	1.4%	11.3%	50.7%	29.6%	7.0%	0.0%	100.0%

These results show that

- 29.6% of students (n=21) who scored at Step 3 or lower on the initial assessment progressed to step 4.
- 7.0% of these students (n=5) progressed to step 5.
- None of the cohort progressed to step 6.
- 36.6% of the cohort (n=225) progressed to step 4 or higher.

These results show that students in the category 'other ethnicities' scored at a level lower than the Māori and Pākeha cohorts, yet significantly above Pasifika learners who were assessed. The performance of students from 'other ethnicities' are captured in Figure 5 below.

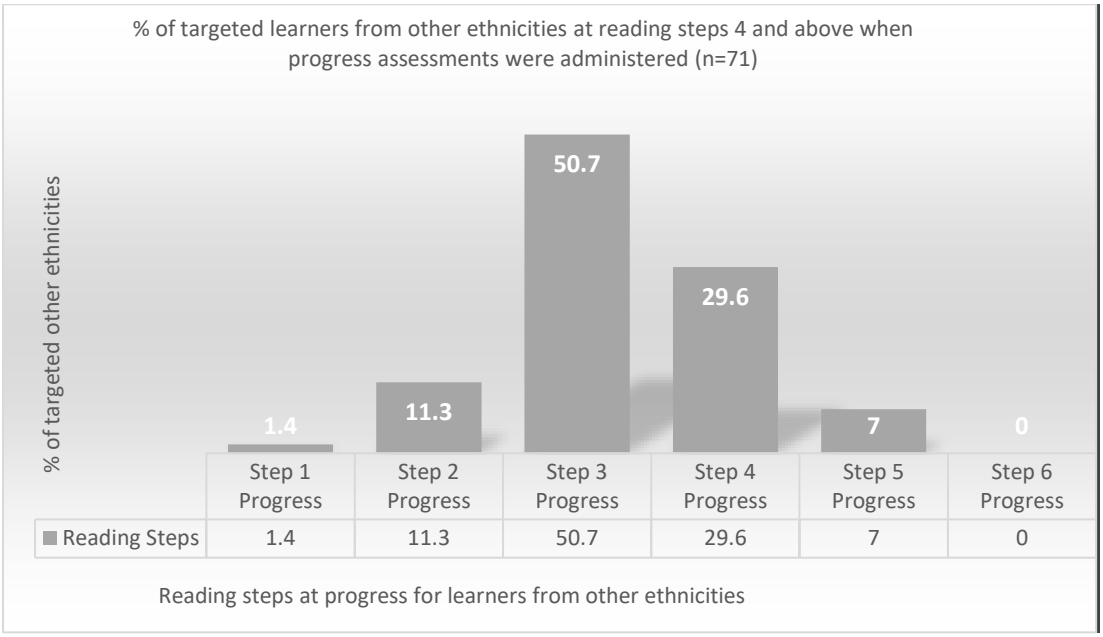


Figure 5: Distribution of progress reading scores for other ethnicities on step 3 or lower at the start (n=71)

Step-based analysis of reading progress for the different centres and schools at Wintec

The distribution of progress scores for learners in six centres at Wintec is reported below. We viewed the students in a centre or school as a sub-population (indicated as small n), and then used this number as denominator of the fraction when calculating percentages. This means that the percentages reported in Table 8 refer to the sub-populations in question.

Table 8: Distribution of reading progress step by initial reading step for Wintec Schools/Centres at Wintec (2019)

Centre:			Progress Steps 1	2	3	4	5	6	Total
1 CBE	Total	Count	0	3	16	15	2	1	37
		% within Initial Step	0%	8.1%	43.2%	40.5%	5.4%	2.7%	100.0%
2 CEFP	Total	Count	0	17	50	41	11	3	122
		% within Initial Step	0%	13.9%	41.0%	33.6%	9.0%	2.5%	100.0%
3 Trades	Total	Count	7	50	145	97	16	1	316
		% within Initial Step	2.2%	15.8%	45.9%	30.7%	5.1%	0.3%	100.0%
4 CSPI	Total	Count	1	3	23	21	1	0	49
		% within Initial Step	2.0%	6.1%	46.9%	42.9%	2.0%	0%	100.0%
5 CSSHP	Total	Count	0	1	6	6	1	0	14
		% within Initial Step	0%	7.1%	42.9%	42.9%	7.1%	0%	100.0%
6 SMA	Total	Count	0	1	9	8	1	0	19
		% within Initial Step	0%	5.3%	47.4%	42.1%	5.3%	0%	100.0%

(Centre for Business and Enterprise [CBE] = 1; Centre for Education and Foundation Pathways [CEFP] = 2; Trades, including Centre for Engineering and Industrial Design [Trades & CEID] = 3; Centre for Science and Primary Industries [CSPI] = 4; Centre for Sport Science & Human Performance [CSSHP] = 5; and School of Media Arts [SMA] = 6)

These findings show the performance of centres and schools, specifically the proportions of learners from each school or centre who progressed to exemption-level scores (Steps 4, 5 and 6) when they started out on an initial score of step 3 or lower. Graphically the distribution of scores by school or centre can be shown as follows:

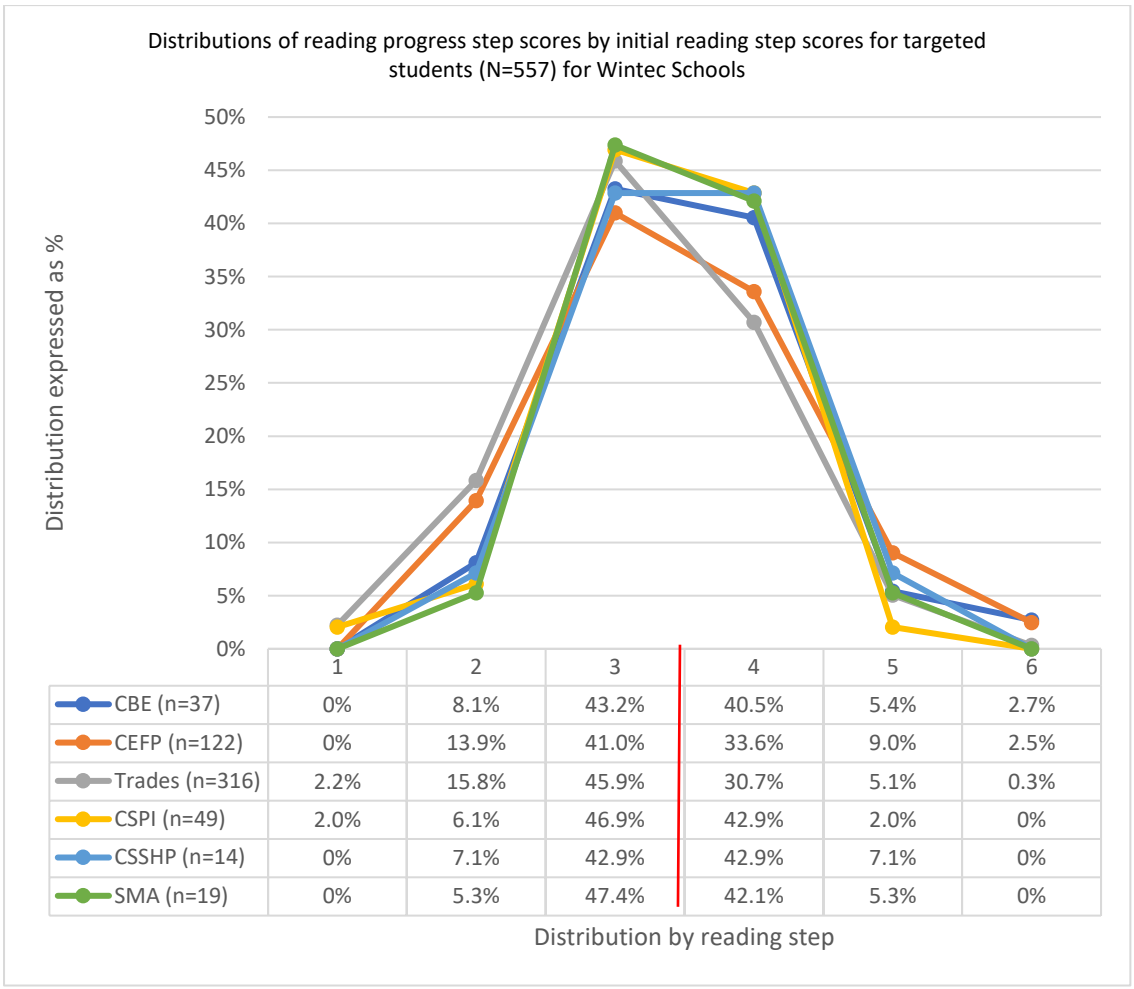


Figure 6: Distribution of % of students achieving exemption scores on progress assessments (by School/Centre)

We opted for a line chart, with the table of data included, to show that on face value the distributions were similar. A closer look showed that all centres/schools except Trades were able to achieve targets of above 40%. Put differently, more than 40% of students in these Centres/Schools started out on reading scores of step 3 or lower, but then progressed to step 4 or higher. Of the students in Trades, 36.1% achieved reading steps of 4 or higher. The blocked list shows the proportion of students progressing to step 4 or higher by Centre/School.

Proportion of students progressing to step 4 or higher by Centre/School
Centre for Business and Enterprise (CBE) (n=37): 48.7%
Centre for Education and Foundation Pathways (CEFP) (n=122): 45.1%
Trades (n=316): 36.1%
Centre for Science and Primary Industries (CSPI)SPI (n=49): 44.9%
Centre for Sports Science and Human Performance (CSSHP (n=14): 50.0%
School of Media Arts (SMA) (n=19): 47.4%

Although the Trades performance of 36.1% is somewhat lower than the rest, we have to note that this proportion is more than ten percent above the target set by the Tertiary Education Commission (TEC, 2015) for statistically significant gain (when cross-tabulations are used).

Step-based analysis of reading progress by enrolment type at Wintec

For purposes of this report, we ignore the 8 international students who were enrolled for foundation-level programmes. The low sub-sample prompted us to ignore these scores. Our purpose was to look at four main enrolment types. These categories showed that the order of performance was SAC-funded, followed by Youth Guarantee, MPTT and WTA.

Table 9: Distribution of reading progress step by Enrolment type for the Wintec cohort (N=4)(2019)

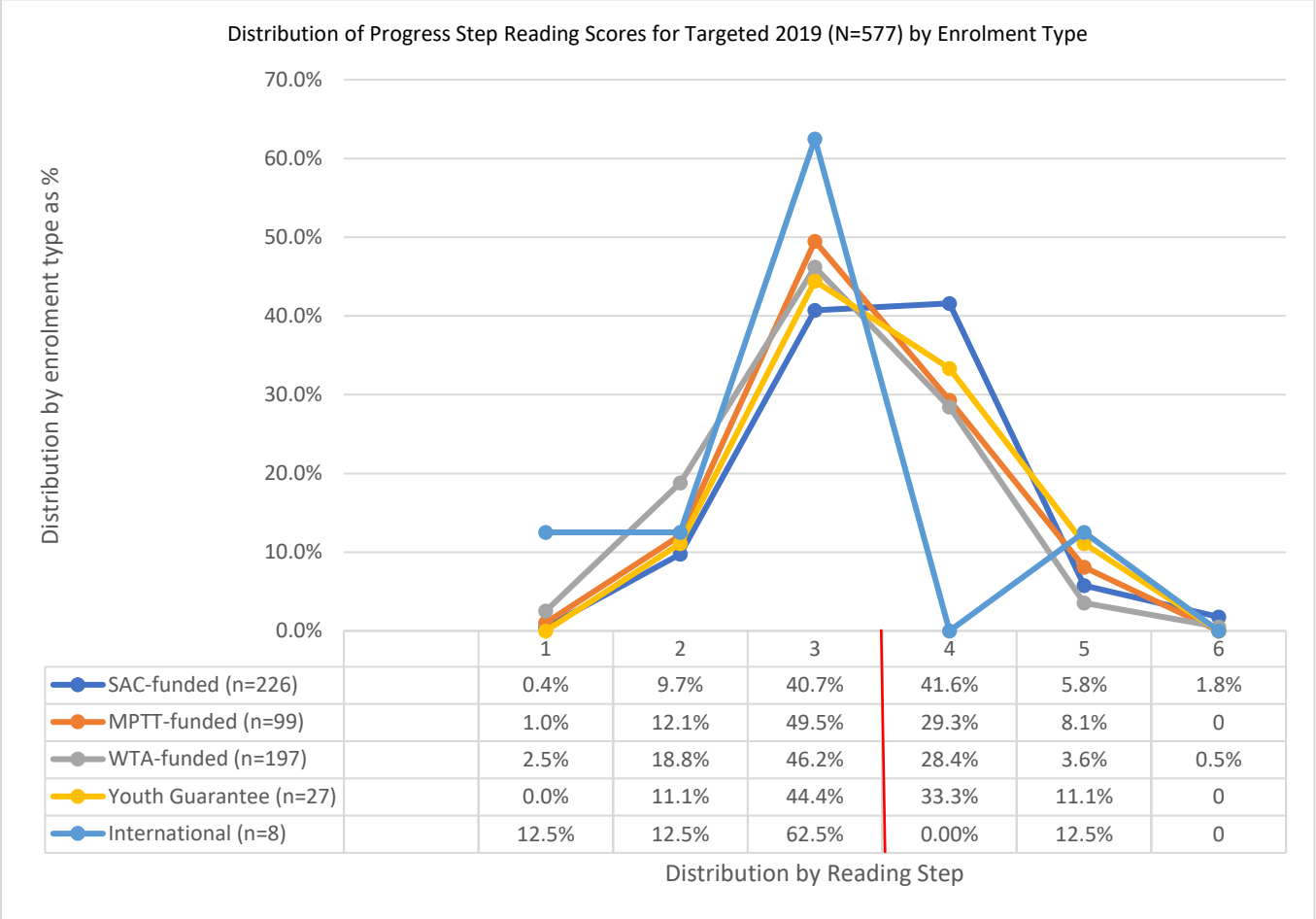
Enrolment type		1	2	3	4	5	6	Total
1.SAC-funded	Count	1	22	92	94	13	4	226
	% within Initial Step	0.4%	9.7%	40.7%	41.6%	5.8%	1.8%	100.0%
2.MPTT-funded	Count	1	12	49	29	8	0	99
	% within Initial Step	1.0%	12.1%	49.5%	29.3%	8.1%	0	100.0%
3. WTA-funded	Count	5	37	91	56	7	1	197
	% within Initial Step	2.5%	18.8%	46.2%	28.4%	3.6%	0.5%	100.0%
4. Youth Guarantee	Count	0	3	12	9	3	0	27
	% within Initial Step	0.0%	11.1%	44.4%	33.3%	11.1%		100.0%
5.International	Count	1	1	5		1		8
	% within Initial Step	12.5%	12.5%	62.5%		12.5%		100.0%

More specifically, these results show that within each enrolment type, the following exemption-level reading scores of step 4 or higher were achieved:

- 48.9% (n=111) of 226 SAC-funded students;
- 44.4% (n=12) of 27 Youth Guarantee funded students;
- 37.4% (n=37) of 99 MPTT-funded students; and

- 32.5% (n=64) of 197 WTA-funded students.

These results are also displayed as a line chart in Figure 7 below.



	1	2	3	4	5	6
SAC-funded (n=226)	0.4%	9.7%	40.7%	41.6%	5.8%	1.8%
MPTT-funded (n=99)	1.0%	12.1%	49.5%	29.3%	8.1%	0
WTA-funded (n=197)	2.5%	18.8%	46.2%	28.4%	3.6%	0.5%
Youth Guarantee (n=27)	0.0%	11.1%	44.4%	33.3%	11.1%	0
International (n=8)	12.5%	12.5%	62.5%	0.00%	12.5%	0

Figure 7: Distributions of % of students achieving exemption-level scores for progress assessments (by enrolment type) (2019)

As stated earlier, we ignored international students (n=8) because their numbers were low. We noted the presence of this group for follow-up to establish to what extent this population might grow in future.

Outcomes of the LNAT progress calculation algorithm

We briefly re-state our position on the LNAT progress calculation algorithm. Our view is that the use of the standard error value for progress assessments in the equation may lead to threshold level scores for assessing gain that are inordinately high. We show in Table 10 below that 65% (125) of targeted students (n=188) who obtained step 4 or step 5 on the progress assessment were deemed not to have achieved statistically significant progress. Although the overall cohort achieved the 25% gain target (TEC, 2015), this misrepresented the success achieved by the sector (as outlined in not only the misclassifications at step 4 and step 5 of the progress calculation, but also the cross-tabulations in the various tables and their related figures).

If step 4 is set as the TEC-approved threshold level to be achieved, TEC guidance and target setting become consistent and unambiguous.

Table 10: Distribution of reading progress step by significant gain (based on the LNAT algorithm) at Wintec 2019

			Significant Gain (LNAT)		
			0	1	Total
Reading Progress: Step	1	Count	8	0	8
		% within Progress Step	100.0%	0.0%	100.0%
		% within Significant Gain	1.9%	0.0%	1.4%
		% of Total	1.4%	0.0%	1.4%
	2	Count	68	7	75
		% within Progress Step	90.7%	9.3%	100.0%
		% within Significant Gain	16.4%	4.9%	13.5%
		% of Total	12.2%	1.3%	13.5%
	3	Count	214	35	249
		% within Progress Step	85.9%	14.1%	100.0%
		% within Significant Gain	51.6%	24.6%	44.7%
		% of Total	38.4%	6.3%	44.7%
	4	Count	122	66	188
		% within Progress Step	64.9%	35.1%	100.0%
		% within Significant Gain	29.4%	46.5%	33.8%
		% of Total	21.9%	11.8%	33.8%
	5	Count	3	29	32
		% within Progress Step	9.4%	90.6%	100.0%
		% within Significant Gain	0.7%	20.4%	5.7%
		% of Total	0.5%	5.2%	5.7%
	6	Count	0	5	5
		% within Progress Step	0.0%	100.0%	100.0%
		% within Significant Gain	0.0%	3.5%	0.9%
		% of Total	0.0%	0.9%	0.9%
Total		Count	415	142	557
		% within Progress Step	74.5%	25.5%	100.0%
		% within Significant Gain	100.0%	100.0%	100.0%
		% of Total	74.5%	25.5%	100.0%

Discussion

These results showed that a medium to large effect size (Cohen's d = 0.62) was obtained for a pair-wise comparison of initial and progress assessment scores (t-test value =15.3; df-556; p<0.00) (Tables 1 and 2). The crosstabulation in Table 4 changed the focus to step scores which showed that 40.4% of targeted Wintec learners who scored below step 4 in the initial assessment, progressed to exemption-level scores of step 4 or higher.

The following are noteworthy trends:

- Māori learners performed above the group mean (40.4%): 43.8% of these learners (n=102 of 233) achieved scores of step 4 or higher.
- Pasifika learners' performance raised concern: 22.9% of targeted learners (n=11 of 48) achieved step 4 or higher. This is 17.5% below the group mean of 40.4%.
- Pākeha/NZ European performed above the group mean: 42% of targeted learners (n=86 0f 205) obtained scores at step 4 or higher.
- For other ethnicities, we found that 36.6% of the group (n=26 of 71) obtained progress scores of step 4 or higher.

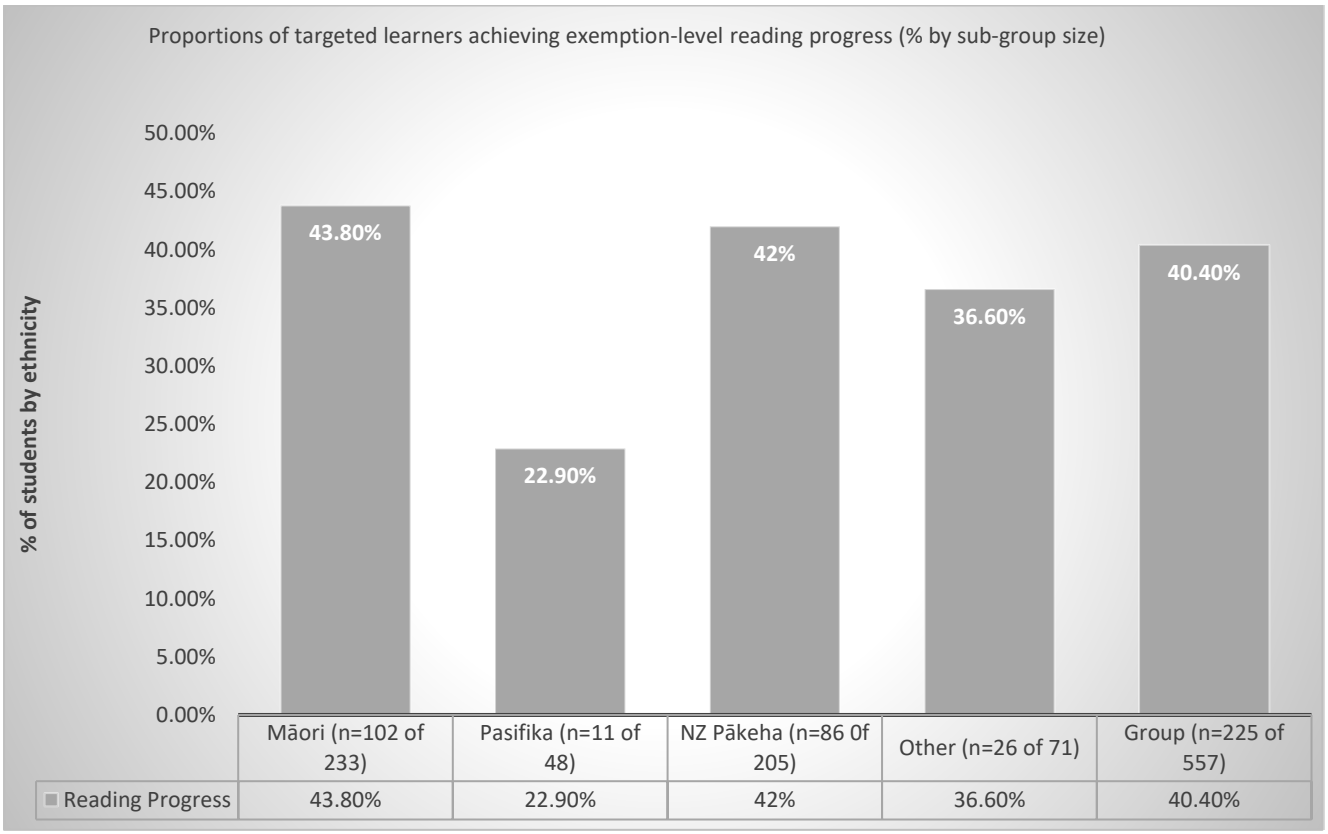


Figure 8: Proportions of targeted learners achieving exemption-level reading progress (% by sub-group)

Pasifika learners' performance raises concern as they have performed significantly below the group mean (by 18%). Collaborative reflection with stakeholders is needed to address this challenge. For all ethnicities, it would be worthwhile to explore the extent to which reading progress is associated with pass/fail performance on enrolled programmes.

We noted in earlier reports that the institute's student management system does not have a user interface to explore levels of association between LNAT performance and academic results – such activities require sophisticated data matching and programming skills (Greyling, 2015; 2017, 2019). This process is also complicated further by the current format of the LNAT data download which does not follow a user-friendly multivariate layout. However, an analysis can be undertaken as a long-term research project when rapidity of response is not an issue.

Our analysis by School/Centre shows that Trades performed slightly lower than other schools; however, this outcome remains 11% higher than the TEC target (TEC, 2015):

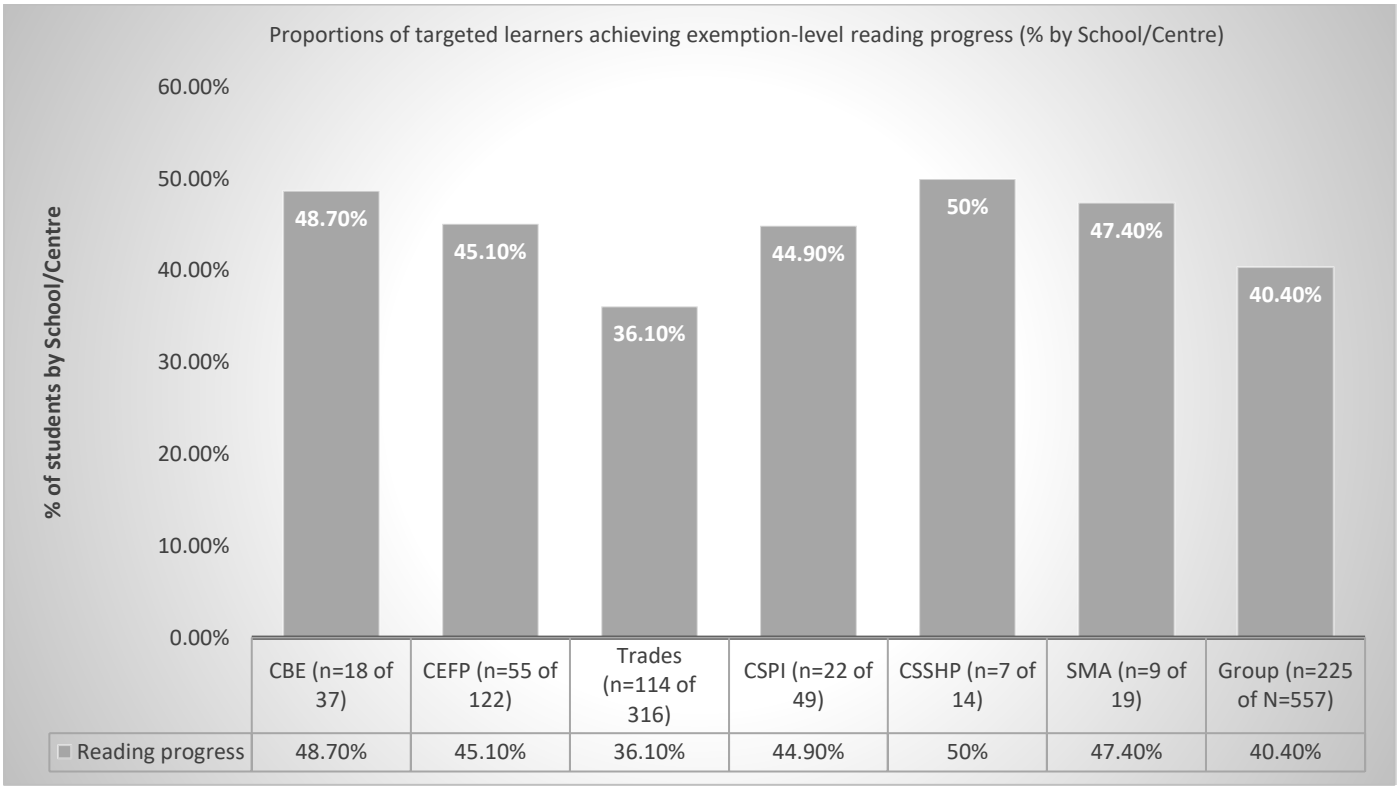


Figure 9: Proportions of targeted learners achieving exemption-level reading progress (% by School/Centre)

In Figure 10, the results for enrolment type indicate that WTA (32.5%) and MPTT (37.4%) need attention. In the 2020 report to be completed in 2021, we will be in a position to report on longitudinal performance data for the various entities we have analysed.

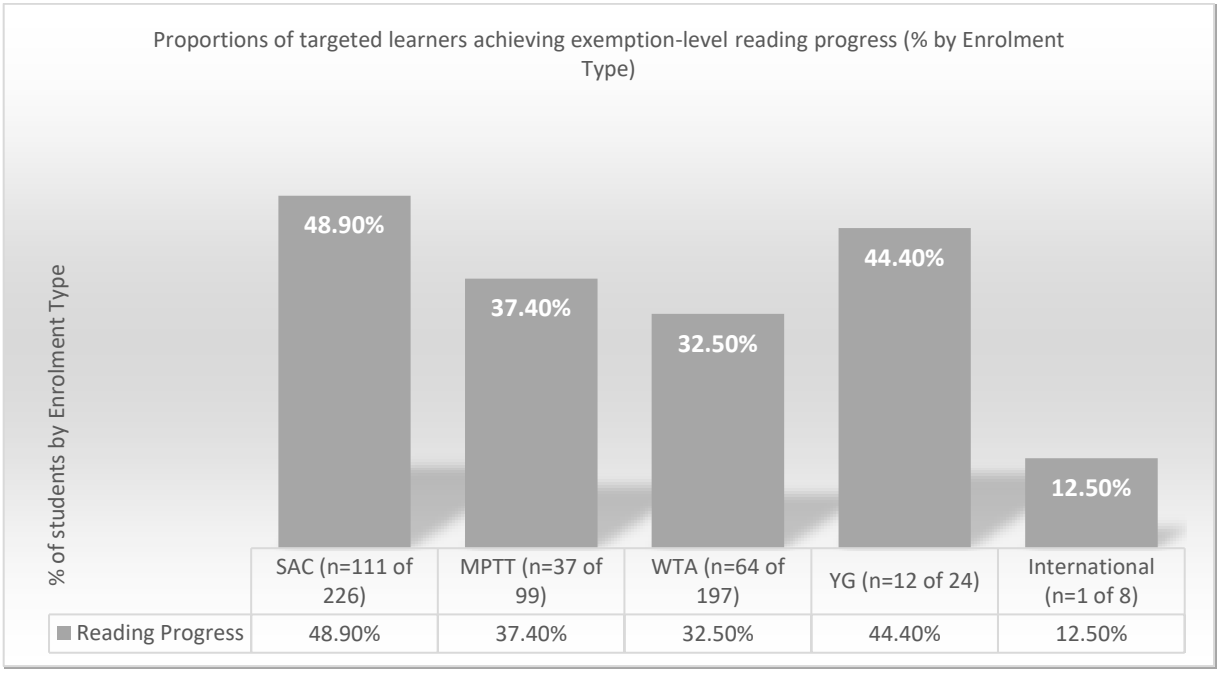


Figure 10: Proportions of targeted learners achieving exemption-level reading progress (% by Enrolment Type)

Table 10 shows that the algorithm identifies 25.5% of the cohort (142 of 557 students) as having achieved the required gain which is the target set for institutes in the 2015-2019 targets (TEC, 2015). Current TEC guidance is that students who have achieved Step 4 or higher have reached a level of literacy that allows them to be exempted from any further assessments. However, Table 10 also shows that 122 learners who achieved step 4 and 3 who achieved step 5 in the Progress assessments (22.4% of the full cohort) were deemed not to have achieved statistically significant gain. In all these cases, the second term (b^2) in the LNAT algorithm shows that the standard error for the progress assessment was very high and that this was the main reason that such a significant number of students were deemed not have achieved statistically significant gain. Thus, as learners move up the steps in their reading development, the LNAT items lose precision in assessing learner skills. Put differently, if we look at the 188 students who achieved step 4 in the progress assessment, 122 of them (65% of the step-4 group) were classified as not having achieved statistically significant gain. Our conclusion is that it is a contentious and contestable practice to set targets based on statistically significant gain (derived from the current LNAT algorithm). If current TEC guidance is that step 4 is the exemption level, then this view should inform the formulation of these targets.

Conclusions and recommendations

Our **conclusions** are the following:

- There is substantive evidence that a significant proportion of the learners who did not achieve the TEC-set target of step 4 at the start of their programme achieved exemption-level status by the end of their programme. Wintec also achieved the target set by the TEC in the 2015 refresh policy (TEC, 2015).
- Specific targets can be set for the following ethnicities:
    - Māori, NZ Pākeha and Other ethnicities achieved similar reading progress, ranging from 36.6% to 43%. Maintaining and improving current approaches to these groups should be a priority.
    - Pasifika learners have performed poorly with 22.9% achieving step gains to exemption level reading skills.
- All schools/centres except Trades had more than 40% of their targeted learners achieve at step 4 or higher. Trades with the highest number of targeted learners (n=316) achieved a 36.10% target. This remains significantly above the TEC's 25% minimum.
- Of the enrolment types, 32.5% of WTA students (n=64 of 197) and 37.4 (n=37 of 99) achieved exemption-level scores.
- The LNAT algorithm yielded anomalous and contestable outcomes. Setting targets on the basis of statistically significant gains leads to under-reporting the successes achieved by the sector. If TEC guidance of step 4 as the exemption level is adopted (or if step 4 is set as an ideal for all learners), then this anomaly may be overcome and a far more positive narrative of reading progress may be captured.

We **recommend** that

- the language, literacy and numeracy support provided to Pasifika learners' reading skills be enhanced.
- Pasifika learners' literacy needs be explored within a framework that accommodates their sociocultural values and the contexts in which they are required to function.
- for all ethnicities, centres/schools and enrolment types, LN performance be explored as a factor impacting on learner success.
- current LN practices be reviewed to improve with specific targets set on the basis of this report.
- Wintec continue to advocate for a review of the LNAT algorithm to calculate student progress; instead, we should advocate for TEC guidance and TEC LN targets to be aligned and expressed as step gains rather than the current approach.

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