

He aratohu hangarau

Technical guide

PAT Pānui
PAT Reading
Comprehension

PAT

PROGRESSIVE ACHIEVEMENT TEST

 **NZCER**
Rangahau Mātauranga o Aotearoa

The refreshed PAT Pānui assessments are available online through NZCER Assist (<https://www.nzcerassist.org.nz/login>).

The previous version of the PAT Reading Comprehension assessments (paper-based and online) will not continue to be supported from 2025.

Mō ngā pātai me ngā tohutohu For questions or advice

E-mail assessmentservices@nzcer.org.nz or call Assessment Services on (04) 802 1630

Mō te tautoko me ngā raraunga puta noa i te kura For support with school-wide data

E-mail educationadviser@nzcer.org.nz or call Education Advisers on (04) 802 1386

Kupu whakataki Introduction

This technical guide had two purposes:

1. To describe the processes used to develop and validate the refreshed PAT Pānui | Reading Comprehension (PAT Pānui) assessments.
2. To provide an overview of the psychometric properties of the refreshed PAT Pānui tests.

The guide is intended for teachers, principals, administrators, and other users of the PAT Pānui test. It complements the information provided in the PAT Pānui kaiako guide.

He aha ngā whakamātautau PAT Pānui kua whakahoutia? **What are the refreshed PAT Pānui tests?**

The PAT Reading Comprehension tests have been updated and refreshed to produce a new set of tests. The content has been renewed, the overall look of the tests updated, and additional design features added to make the tests more accessible and inclusive of a broader range of ākonga. Seven comprehension tests are designed for use with ākonga in Years 4 to 10. The tests can be administered online and used with classes or with individuals. (Paper tests will be available for use in 2025.) Results from the new tests can still be compared with results from the 2008 version.

The NZCER Assist platform (<https://www.nzcerassist.org.nz/login>) is used to manage the administration, marking, and reporting of the test. The platform can be used to generate a wide range of reporting at the individual, group, and school level. Scores from each of the tests can be converted to a location on the PAT Pānui comprehension (*patc*) scale, which is also qualitatively described. This means that scale scores can be linked to a description of the kinds of reading comprehension capabilities that are typically associated with scoring at different parts of the scale. Scale scores are supplemented with normative information in the form of stanines so that test results can be compared with the scores of a nationally representative reference group at specific year levels.

Te whakarewanga tuatahi Piloting

Before the PAT Pānui trial an extensive development and piloting process was completed. This consisted of the following components.

1. Reviewing existing PAT Reading Comprehension materials to determine which texts and questions needed updating or replacement.
2. Drafting replacement texts and associated questions. This included input and systematic reviews from subject matter experts with knowledge and understanding of ākonga Māori and Pacific learners.

3. Small-scale piloting of the first round of materials, including pilot assessments and user experience questionnaires for students and teachers.
4. Psychometric analysis of pilot assessment data, statistical analysis of user experience data, and incorporation of these into the refinement of the materials.
5. Small-scale piloting of the refined materials, again including pilot assessments and user experience questionnaires for students and teachers.
6. Psychometric analysis of pilot assessment data, statistical analysis of user experience data, and incorporation of these into the further refinement of the materials.

This development and piloting process ultimately contributed to a collection of texts and associated questions that were already of good quality before any medium-scale trials.

Te whakamātautau Trialling

The material developed through the piloting process described above was used in a large-scale trial in 2023. The purpose of the PAT Pānui trial was to use draft test materials to collect enough data to allow psychometric analysis of those materials. This makes sure that the final tests, texts, and items are psychometrically robust, and that the tests are appropriately targeted. An important aspect of the trial was to calibrate the new material onto the PAT Pānui Rasch measurement scale. This would allow student performance on the new material to be compared both with performance on the existing PAT Pānui assessments and with the existing national norms. Note that the trial was not designed to establish new norms.

Ngā raraunga whakamātautau Trial data

A total of 4,305 students across 36 schools participated in the PAT Pānui trial. Of these 36 schools:

- 18 were high SES (decile 8, 9, 10, or private schools in 2022)
- 10 were mid SES (decile 4, 5, 6, or 7 in 2022)
- 8 were low SES (decile 1, 2, or 3 in 2022).

Different students were administered different test forms. There were three types of forms.

1. Test forms 1, 2, 3, 4, 5, 6, and 7 were intended to be draft versions of the refreshed PAT Pānui tests.
2. Test forms 1.5, 2.5, 3.5, 4.5, 5.5, and 6.5 were intended to support item analysis and vertical linking of the PAT Pānui tests. Test form 1.5 was made up of half of test form 1 and half of test form 2; test form 2.5 was made up of half of test form 2 and half of test form 3; and so on.

¹ Decile was used as a proxy for socioeconomic status because this was what was available as an socioeconomic indicator at the time the sample was drawn. The equity index became available for use shortly thereafter.

3. Test forms 1m, 2m, 3m, 4m, 5m, 6m, and 7m were intended to support linking of the new PAT Pānui tests with the existing ones. Test form 1m was made up of half of test form 1 and half of the existing PAT Reading Comprehension Test 1; test form 2m was made up of half of test form 2 and half of the existing PAT Reading Comprehension Test 2; and so on.

Table 1 and Table 2 describe the PAT Pānui trial data. Table 1 describes the distribution of students by school socioeconomic status and year level. Table 2 describes the distribution of students by school year level and test form. Table 1 and Table 2 show that:²

- students from high socioeconomic status schools made up the largest proportion of participating students
- several hundred students participated in the trial from each of year levels 4 to 10
- year level 9 had the fewest participating students, and year level 5 the most.

Ripanga 1 Tauanga o ngā ākonga mā te tūnga ohapori (SES) me te taumata ā-tau

Table 1 Count of students by school socioeconomic status (SES) and year level

Year level	Low SES (deciles 1, 2, 3)	Mid SES (deciles 4, 5, 6, 7)	High SES (deciles 8, 9, 10, NA)	Total
4	100	139	437	676
5	171	202	380	753
6	153	165	390	708
7	94	162	349	605
8	107	217	378	702
9	107	71	182	360
10	113	103	285	501
Total	845	1059	2401	4305

² The PAT Pānui trial data contained one student record from a student who reported being in Year level 3. This student's data is included with that of students in Year level 4.

Ripanga 2 Tauanga o ngā ākonga mā te taumata tau me te puka whakamātautau

Table 2 Count of students by year level and test form

Test form	Year level 4	Year level 5	Year level 6	Year level 7	Year level 8	Year level 9	Year level 10	Total
1	213	0	0	2	0	0	0	215
1.5	254	212	4	0	0	0	0	470
1m	209	1	1	0	0	0	0	211
2	0	209	1	0	0	0	0	210
2.5	0	138	136	0	0	0	0	274
2m	0	192	2	1	0	0	0	195
3	0	0	208	0	0	0	0	208
3.5	0	0	144	120	1	0	0	265
3m	0	0	212	0	0	0	1	213
4	0	1	0	192	1	1	0	195
4.5	0	0	0	118	120	0	0	238
4m	0	0	0	166	0	0	0	166
5	0	0	0	5	298	0	0	303
5.5	0	0	0	0	81	90	0	171
5m	0	0	0	1	201	0	0	202
6	0	0	0	0	0	100	1	101
6.5	0	0	0	0	0	77	157	234
6m	0	0	0	0	0	92	0	92
7	0	0	0	0	0	0	211	211
7m	0	0	0	0	0	0	131	131
Total	676	753	708	605	702	360	501	4305

Tātaritanga tūemi Item analysis

A range of psychometric analyses were applied to the PAT Pānui trial data (from all test forms) to ensure that the quality of the new items and tests was high.

We analysed:

- item discrimination—the extent to which each item is able to distinguish between students' reading comprehension

- distractor performance—the extent to which distractors (incorrect response options) are selected across a range of student comprehension levels
- the distribution of item difficulties by test—the spread of item difficulties across a test relative to student reading comprehension levels
- differential item functioning—the extent to which each item functions differently for different groups of students.

Three items were removed from the PAT Pānui tests prior to calibration and linking because of poor performance in one or more of these analyses. A small number of the remaining items had minor edits prior to calibration and linking.

Te tauine me te hononga Calibration and linking

We used a test-by-test approach to locate the relative difficulties of the items in each new PAT Pānui test on the PAT Reading Comprehension scale that was originally established in 2008. The process of locating item difficulties on a scale is often referred to as item calibration.

Our approach to item calibration involved combining the trial data for each new test with the trial data collected using the test forms designed to link the new tests with their 2008 counterparts (Forms 1m, 2m, etc). For example, data collected using the new Test 1 and Test 1m were combined into one joint data set.

The combined data sets were analysed using the Rasch model³ to determine an initial calibration for each item. The calibrations for items from 2008 were then examined. Those that had retained their relative item difficulties were designated as linking items. The initial calibration values for all items were then adjusted so that the new average item location for the 2008 linking items was the same as their average location on the original 2008 scale.

After all the new items had been located on the PAT Reading Comprehension scale, a small number of items were shifted between tests to ensure that each test form was well targeted to its intended year level.

The calibrations for the final set of items in each new test were used to construct look-up tables that could be used to convert raw scores on the new tests to scores on the PAT Reading Comprehension scale.

Update to the calibrations based on 2024 data Whakahounga ki ngā tauine i runga i ngā raraunga o te tau 2024

A second calibration exercise was undertaken at the end of 2024. This exercise took advantage of data collected from schools that had administered the new and old tests through the NZCER Assist platform. Additional data were also collected separately using forms that linked the new and old tests (Tests 1M to 7M). Table 3 shows the number of students who completed each of the linking tests by year level.

³ To learn more about the Rasch model, see, e.g. Bond, T. G., & Fox, C. M. (2007). *Applying the Rasch model: Fundamental measurement in the human sciences* (2nd ed.). Lawrence Erlbaum Associates Publishers.

Ripanga 3 Te maha o ngā rekoata raraunga e wātea ana mō te mahi tauine tuarua mā ia taumata whakamātautau

Table 3 Number of data records available for the second calibration exercise by test level

Test level	Year level	Pānui test records	Reading Comprehension test records	Linking test records
1	4	2618	13359	439
2	5	2681	13859	487
3	6	2898	15092	534
4	7	3446	18697	561
5	8	3479	16680	550
6	9	2779	14637	439
7		1820	10983	550

The second calibration exercise was also carried out test by test. At each test level, an analysis file was constructed made up of 1000 randomly chosen records from data collected using the new test form; 1000 randomly selected records from data collected using the original 2008 form; and all data collected using the appropriate linking form. The combined data set was analysed using the Rasch model to ascertain the relative difference in the average item difficulties for the old Reading Comprehension and new Pānui tests. The items from the new test were then located on the PAT Reading Comprehension scale so that the relative difference between the two tests was maintained.

Te tohanga ā-motu o te ekenga paetae ākonga **National distributions of student achievement**

Table 4 shows the national distribution of achievement in PAT Pānui for each of student year levels 4–10. These were established in the previous version of the PAT: Reading manual.⁴

In the table, “N students” refers to the number of students used to estimate the corresponding mean and standard deviation.

⁴ Darr, C., McDowall, S., Ferral, H., Twist, J., & Watson, V. (2008). *Progressive Achievement Test: Reading, Teacher manual* (2nd ed.). New Zealand Council for Educational Research.

Ripanga 4 Te tohanga o te ekenga paetae ākonga mā te taumata ā-tau

Table 4 Distributions of student achievement by year level

Year level	Mean (patc)	SD (patc)	N students
4	28.8	15.2	1442
5	35.8	13.2	1432
6	45.0	12.7	1439
7	53.2	12.6	2086
8	60.4	12.3	1814
9	67.0	12.2	2204
10	76.5	12.4	1903

Ngā āhuatanga o ngā puka whakamātautau i whakaotingia 1-7

Properties of finalised test forms 1-7

Table 5 shows the psychometric properties of the finalised test forms. It shows:

- N items—the number of items in the finalised test form
- Mean item difficulty (patc)—the average difficulty of the items in the test form
- SD item difficulty (patc)—the standard deviation of the difficulties of the items in the test form
- Cronbach's Alpha (KR-20)—a measure of reliability based on the internal consistency among the items in the test.

Test form	N items	Mean item difficulty (patc)	SD item difficulty (patc)	Cronbach alpha (KR-20)
1	36	27.2	6.9	0.91
2	36	33.2	7.7	0.88
3	35	41.0	9.3	0.88
4	41	48.2	6.3	0.90
5	41	54.7	7.9	0.88
6	41	62.4	8.7	0.89
7	42	70.5	6.9	0.90

Table 6 compares the mean test difficulty of the PAT Pānui tests with the difficulty of the 2008 PAT Reading Comprehension tests.

Ripanga 6 Uauatanga whakamātautau toharite o ngā whakamātautau PAT Pānui kua whakahoutia, ina whakaritea ki ērā atu whakamātautau

Table 6 Mean test difficulty of refreshed PAT Pānui tests compared with existing PAT Reading Comprehension tests

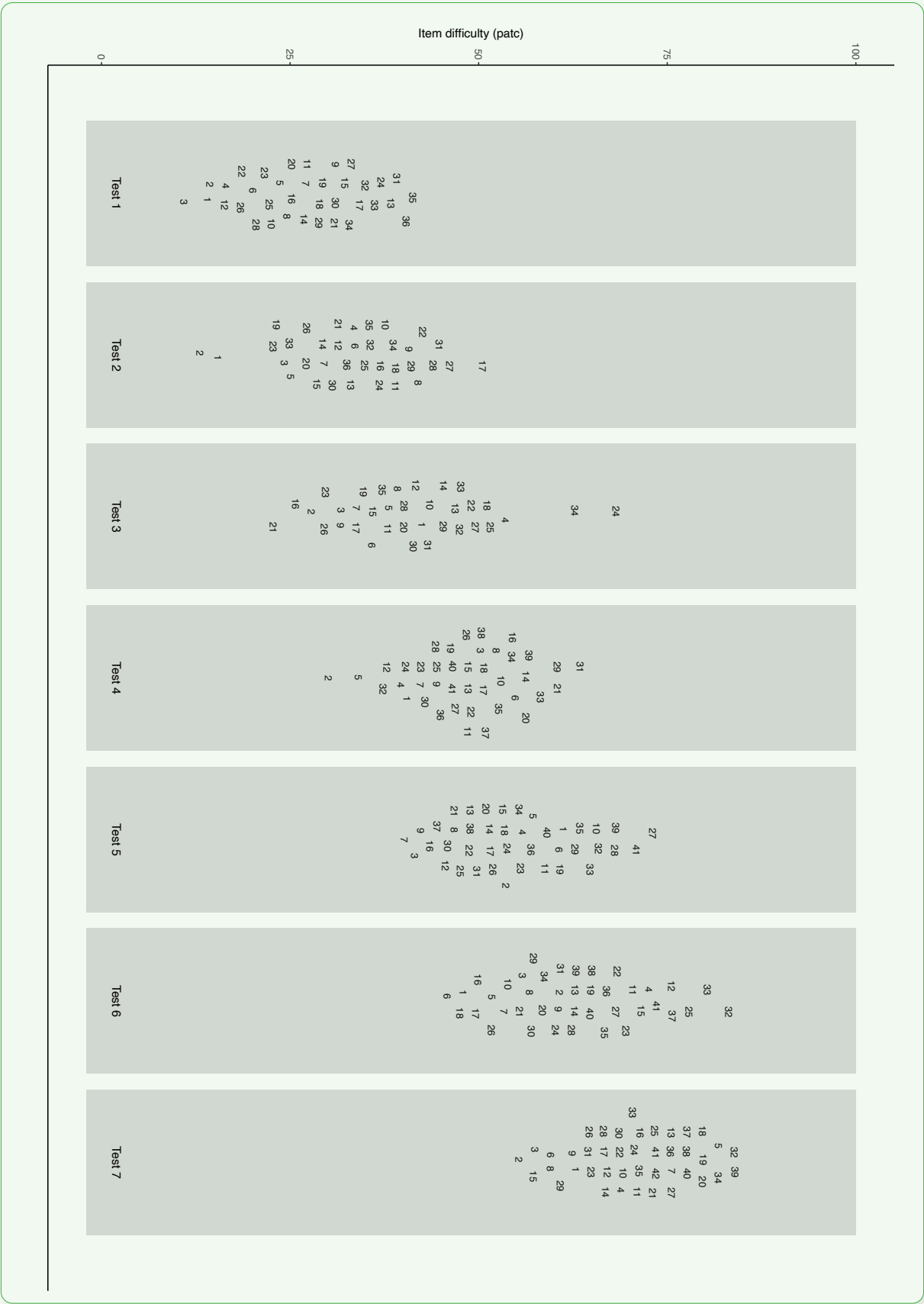
Test form	PAT: Reading Comprehension		Refreshed PAT Pānui	
	N items	Mean item difficulty (patc)	N items	Mean item difficulty (patc)
1	33	24.4	36	27.2
2	37	34.2	36	33.2
3	35	41.3	35	41.0
4	37	49.4	41	48.2
5	38	57.3	41	54.7
6	42	64.8	41	62.4
7	42	71.4	42	70.5

Figure 1 shows the item difficulties by test form. For instance, Item 2 is the easiest item contained in Test 7 and Item 35 the most difficult item in Test 1.

Figure 2 shows the item difficulties according to the text they are associated with and the test form they are in. For example, the text Baby Jack is the second text students will meet in Test 1. It involves four items (items 6, 7, 8, and 9). Of these, item 9 is the most difficult. In Figure 2, the vertical locations of some questions have been shifted slightly to avoid overlap.

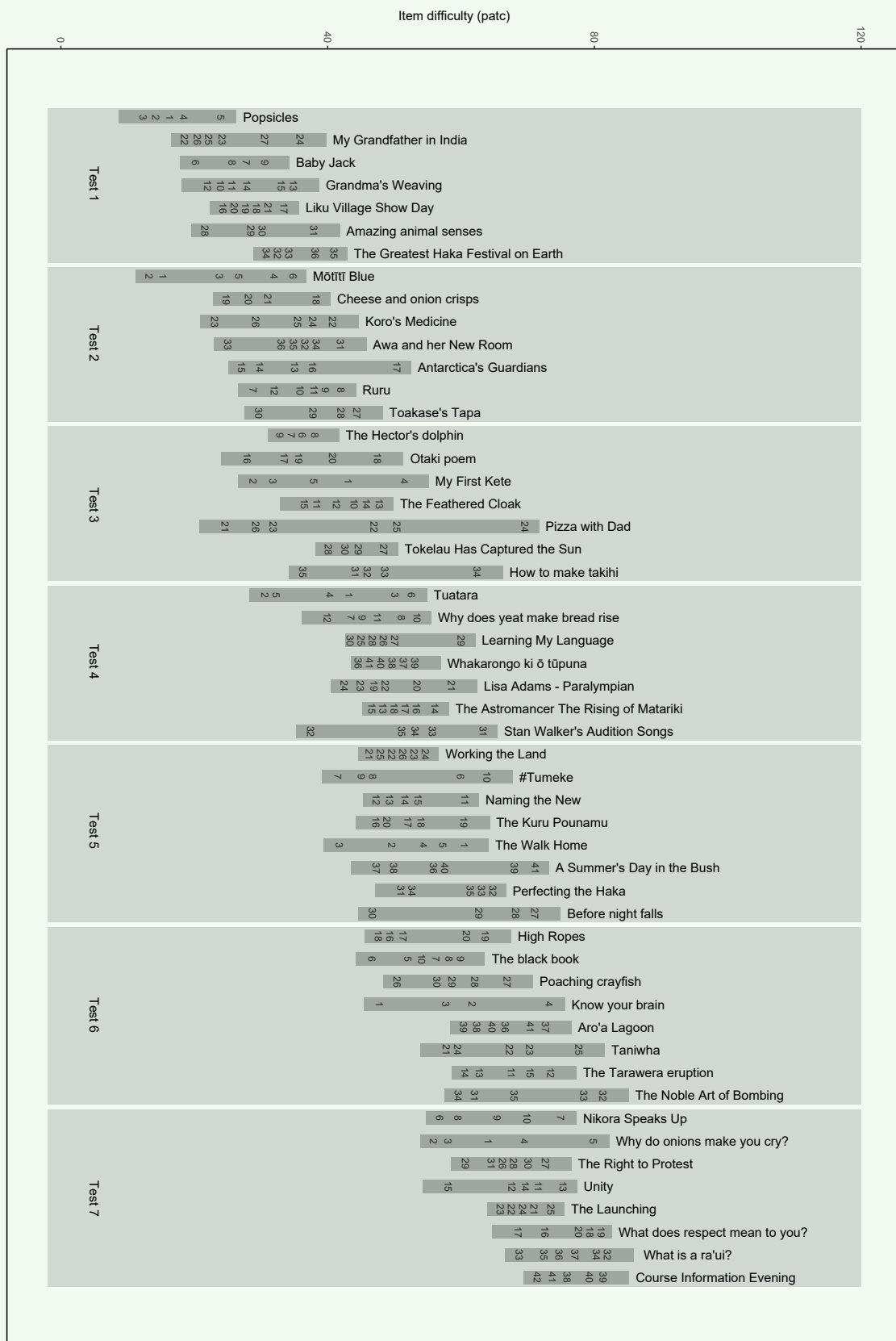
Pikitia 1 Ngā uauatanga tūemi mā te puka whakamātautau

Figure 1 Item difficulties by test form



Pikitia 2 Ngā uauatanga tūemi mā ngā kuputuhi me te puka whakamātautau

Figure 2 Item difficulties by text and test form






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