## Appendix A (Patterns of Performance and Progress)

Percentages of students in each year group as a function of gender, ethnicity, school decile band, and framework stage for each domain on the Diagnostic Interview (NumPA) in 2004

| Year | 1 | 2 | 3 | ENP | 4 | 5 | 6 | ANP | 7 | 8 | INP |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| (Number of students) | (7793) | (8197) | (8516) | (24507) | (10013) | (9868) | (9959) | (29840) | (8374) | (7306) | (15680) |
| Gender |  |  |  |  |  |  |  |  |  |  |  |
| Girls | 48.3 | 48.5 | 48.6 | 48.5 | 49.1 | 48.2 | 48.7 | 48.7 | 49.9 | 50.7 | 50.3 |
| Boys | 51.7 | 51.5 | 51.4 | 51.5 | 50.9 | 51.8 | 51.3 | 51.3 | 50.1 | 49.3 | 49.7 |
| Ethnicity |  |  |  |  |  |  |  |  |  |  |  |
| European | 64.7 | 62.5 | 61.9 | 63.0 | 59.7 | 59.1 | 59.2 | 59.3 | 58.9 | 58.2 | 58.6 |
| Māori | 17.3 | 17.6 | 18.4 | 17.8 | 18.7 | 19.5 | 18.2 | 18.8 | 24.5 | 24.6 | 24.6 |
| Pasifika | 8.5 | 9.1 | 10.2 | 9.3 | 11.3 | 10.9 | 11.2 | 11.2 | 9.5 | 10.0 | 9.7 |
| Asian | 5.8 | 6.3 | 5.6 | 5.9 | 5.9 | 5.9 | 6.4 | 6.1 | 3.6 | 3.4 | 3.5 |
| Other | 3.8 | 4.5 | 4.0 | 4.1 | 4.4 | 4.7 | 4.9 | 4.7 | 3.6 | 3.8 | 3.7 |
| School Decile Band |  |  |  |  |  |  |  |  |  |  |  |
| Low (1-3) | 20.1 | 22.1 | 25.8 | 22.8 | 26.6 | 29.4 | 29.7 | 28.5 | 28.4 | 31.5 | 29.8 |
| Medium (4-7) | 38.3 | 36.4 | 35.7 | 36.8 | 37.8 | 38.9 | 37.4 | 38.1 | 49.3 | 48.5 | 48.9 |
| High (8-10) | 41.6 | 41.5 | 38.4 | 40.5 | 35.6 | 31.8 | 32.8 | 33.4 | 22.2 | 20.0 | 21.2 |
| Addition/Subtraction |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0: Emergent | 15.7 | 3.2 | 1.7 | 6.6 | 1.7 | 0.9 | 0.9 | 1.2 | 0.9 | 0.7 | 0.8 |
| 1: One-to-One Counting | 29.8 | 14.6 | 4.9 | 16.1 | 1.6 | 0.7 | 0.4 | 0.9 | 0.3 | 0.2 | 0.2 |
| 2 Count All with materials | 43.7 | 39.5 | 17.8 | 33.3 | 5.3 | 2.2 | 1.1 | 2.9 | 1.0 | 0.4 | 0.7 |
| 3 Count All with imaging | 8.5 | 20.2 | 14.2 | 14.4 | 5.5 | 2.9 | 1.3 | 3.3 | 1.2 | 0.8 | 1.0 |
| 4: Advanced Counting | 2.2 | 19.4 | 46.3 | 23.3 | 48.9 | 40.7 | 34.2 | 41.3 | 27.4 | 21.6 | 24.7 |
| 5: Early Additive P-W | 0.2 | 3.0 | 14.5 | 6.1 | 32.6 | 43.6 | 46.6 | 40.9 | 46.2 | 44.4 | 45.4 |
| 6: Adv. Additive P-W | 0.0 | 0.2 | 0.6 | 0.3 | 4.3 | 9.0 | 15.5 | 9.6 | 23.0 | 31.9 | 27.1 |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0: Emergent | 2.0 | 1.0 | 0.1 | 1.0 | 0.2 | 0.2 | 0.1 | 0.1 | 0.3 | 0.3 | 0.3 |
| 1: One-to-One Counting | 9.6 | 2.7 | 0.9 | 4.3 | 0.3 | 0.1 | 0.1 | 0.2 | 0.1 | 0.0 | 0.1 |
| 2 Count All with materials | 42.6 | 16.8 | 4.9 | 20.9 | 1.6 | 0.8 | 0.3 | 0.9 | 0.4 | 0.1 | 0.3 |
| 3 Count All with imaging | 25.9 | 20.2 | 7.2 | 17.5 | 2.3 | 1.1 | 0.5 | 1.3 | 0.6 | 0.4 | 0.5 |
| 4: Advanced Counting | 17.7 | 44.0 | 47.2 | 36.8 | 32.5 | 22.1 | 16.2 | 23.6 | 14.0 | 8.3 | 11.4 |
| 5: Early Additive P-W | 2.1 | 14.4 | 35.4 | 17.8 | 49.7 | 52.3 | 46.3 | 49.4 | 43.4 | 35.6 | 39.8 |
| 6: Adv. Additive P-W | 0.1 | 0.8 | 4.3 | 1.8 | 13.3 | 23.4 | 36.5 | 24.4 | 41.2 | 55.1 | 47.7 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Multiplication/Division |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| Not given | 98.6 | 84.0 | 46.7 | 75.7 | 17.8 | 7.9 | 4.7 | 10.2 | 3.9 | 1.9 | 3.0 |
| 2-3: Count All | 1.1 | 9.2 | 21.9 | 11.0 | 17.3 | 11.7 | 7.9 | 12.3 | 4.9 | 3.5 | 4.2 |
| 4: Advanced Counting | 0.3 | 5.8 | 24.9 | 10.7 | 43.3 | 39.8 | 31.2 | 38.1 | 24.1 | 17.0 | 20.8 |
| 5: Early Additive P-W |  | 0.9 | 5.4 | 2.2 | 15.4 | 25.0 | 29.5 | 23.2 | 30.6 | 30.2 | 30.4 |
| 6: Adv. Additive P-W |  | 0.1 | 1.1 | 0.4 | 5.5 | 13.3 | 21.5 | 13.4 | 28.3 | 32.8 | 30.4 |
| 7: Adv. Mult. P-W |  | 0.0 | 0.0 | 0.0 | 0.8 | 2.2 | 5.2 | 2.8 | 8.3 | 14.5 | 11.2 |


| Year | 1 | 2 | 3 | ENP | 4 | 5 | 6 | ANP | 7 | 8 | INP |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Muliplication/Division cont. | (7793) | (8197) | (8516) | (24507) | (10013) | (9868) | (9959) | (29840) | (8374) | (7306) | (15680) |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| Not given | 87.5 | 53.6 | 19.8 | 52.7 | 6.8 | 3.7 | 2.3 | 4.2 | 1.5 | 0.8 | 1.2 |
| 2-3: Count All | 5.8 | 12.1 | 12.0 | 10.1 | 6.1 | 3.2 | 2.0 | 3.8 | 1.9 | 1.1 | 1.5 |
| 4: Advanced Counting | 6.0 | 27.4 | 43.1 | 26.1 | 37.3 | 24.8 | 15.3 | 25.8 | 12.1 | 7.3 | 9.9 |
| 5: Early Additive P-W | 0.6 | 5.9 | 17.5 | 8.2 | 28.7 | 30.0 | 26.2 | 28.3 | 24.1 | 19.7 | 22.0 |
| 6: Adv. Additive P-W | 0.1 | 1.0 | 6.8 | 2.7 | 17.4 | 29.6 | 36.1 | 27.7 | 38.0 | 37.3 | 37.7 |
| 7: Adv. Mult. P-W |  | 0.1 | 0.6 | 0.3 | 3.7 | 8.7 | 18.2 | 10.2 | 22.4 | 33.8 | 27.7 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Proportion/Ratio |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| Not given | 98.7 | 84.2 | 46.8 | 75.8 | 18.5 | 8.1 | 4.9 | 10.5 | 4.5 | 2.5 | 3.6 |
| 1: Unequal Sharing | 0.8 | 6.7 | 17.0 | 8.4 | 15.1 | 11.1 | 8.1 | 11.4 | 5.4 | 3.5 | 4.5 |
| 2-4: Equal Sharing | 0.5 | 8.6 | 32.9 | 14.5 | 50.5 | 49.8 | 41.1 | 47.1 | 32.7 | 26.3 | 29.7 |
| 5: Early Additive P-W | 0.0 | 0.4 | 3.1 | 1.2 | 12.7 | 22.4 | 27.7 | 20.9 | 29.2 | 28.2 | 28.7 |
| 6 Adv. Additive P-W |  | 0.0 | 0.2 | 0.1 | 2.5 | 6.8 | 13.1 | 7.5 | 19.1 | 24.0 | 21.4 |
| 7: Adv. Mult. P-W |  | 0.0 | 0.0 | 0.0 | 0.6 | 1.8 | 4.6 | 2.4 | 8.0 | 12.6 | 10.2 |
| 8: Adv. Proportional P-W |  |  |  |  | 0.1 | 0.1 | 0.5 | 0.2 | 1.0 | 2.8 | 1.8 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| Not given | 87.6 | 53.6 | 20.6 | 53.0 | 7.1 | 4.2 | 2.4 | 4.5 | 1.9 | 1.0 | 1.4 |
| 1: Unequal Sharing | 2.9 | 6.3 | 6.6 | 5.3 | 3.8 | 1.7 | 1.2 | 2.2 | 1.1 | 0.6 | 0.9 |
| 2-4: Equal Sharing | 9.1 | 35.7 | 52.4 | 33.0 | 46.1 | 32.5 | 22.0 | 33.6 | 19.1 | 13.1 | 16.3 |
| 5: Early Additive P-W | 0.4 | 3.8 | 16.3 | 7.0 | 29.1 | 34.8 | 32.7 | 32.2 | 28.8 | 23.5 | 26.3 |
| 6 Adv. Additive P-W | 0.1 | 0.5 | 3.5 | 1.4 | 10.4 | 18.9 | 25.2 | 18.2 | 26.8 | 29.0 | 27.9 |
| 7: Adv. Mult. P-W |  | 0.1 | 0.5 | 0.2 | 3.2 | 7.4 | 14.4 | 8.3 | 17.9 | 23.4 | 20.5 |
| 8: Adv. Proportional P-W |  |  | 0.0 | 0.0 | 0.3 | 0.5 | 2.2 | 1.0 | 4.3 | 9.3 | 6.7 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| FNWS |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0 Emergent FNWS | 11.2 | 2.4 | 1.4 | 4.9 | 1.9 | 0.7 | 0.6 | 1.1 | 1.3 | 1.2 | 1.2 |
| 1 Initial FNWS to 10 | 27.8 | 7.7 | 2.1 | 12.2 | 0.6 | 0.2 | 0.1 | 0.3 | 0.1 | 0.0 | 0.1 |
| 2 up to 10 | 33.1 | 20.5 | 6.1 | 19.5 | 1.6 | 0.5 | 0.3 | 0.8 | 0.3 | 0.2 | 0.2 |
| 3 up to 20 | 19.5 | 27.7 | 14.1 | 20.4 | 4.5 | 2.4 | 1.2 | 2.7 | 1.1 | 0.5 | 0.8 |
| 4 up to 100 | 7.6 | 34.8 | 48.4 | 30.9 | 36.6 | 23.4 | 14.0 | 24.7 | 10.2 | 6.5 | 8.5 |
| 5 up to 1000 | 0.8 | 6.6 | 26.6 | 11.7 | 50.3 | 61.8 | 63.0 | 58.4 | 58.0 | 51.2 | 54.8 |
| 6 up to $1,000,000$ | 0.0 | 0.2 | 1.2 | 0.5 | 4.5 | 11.0 | 20.7 | 12.1 | 29.1 | 40.4 | 34.3 |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0 Emergent FNWS | 1.9 | 1.9 | 0.9 | 1.5 | 1.4 | 0.6 | 0.7 | 0.9 | 0.8 | 0.7 | 0.7 |
| 1 Initial FNWS to 10 | 5.4 | 0.8 | 0.3 | 2.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2 up to 10 | 16.5 | 4.0 | 1.0 | 6.9 | 0.3 | 0.2 | 0.1 | 0.2 | 0.1 | 0.0 | 0.1 |
| 3 up to 20 | 33.9 | 15.7 | 4.5 | 17.6 | 1.3 | 0.7 | 0.4 | 0.8 | 0.4 | 0.2 | 0.3 |
| 4 up to 100 | 35.9 | 48.5 | 34.4 | 39.6 | 17.6 | 8.7 | 5.0 | 10.5 | 4.1 | 2.0 | 3.1 |
| 5 up to 1000 | 6.2 | 27.4 | 51.5 | 29.0 | 62.5 | 58.8 | 47.6 | 56.3 | 40.7 | 29.5 | 35.5 |
| 6 up to 1000000 | 0.2 | 1.7 | 7.4 | 3.2 | 16.8 | 30.9 | 46.4 | 31.4 | 53.8 | 67.6 | 60.2 |


| Year | 1 | 2 | 3 | ENP | 4 | 5 | 6 | ANP | 7 | 8 | INP |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | (7793) | (8197) | (8516) | (24507) | (10013) | (9868) | (9959) | (29840) | (8374) | (7306) | (15680) |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0 Emergent BNWS | 38.3 | 8.2 | 2.6 | 15.8 | 2.3 | 1.0 | 0.8 | 1.4 | 1.6 | 1.4 | 1.5 |
| 1 Initial BNWS from 10 | 21.3 | 13.1 | 4.7 | 12.8 | 1.2 | 0.4 | 0.1 | 0.6 | 0.2 | 0.1 | 0.1 |
| 2 back from 10 | 29.7 | 33.6 | 15.2 | 26.0 | 4.6 | 1.7 | 1.0 | 2.4 | 0.4 | 0.4 | 0.4 |
| 3 back from 20 | 6.7 | 15.7 | 12.1 | 11.6 | 5.5 | 2.7 | 1.2 | 3.1 | 1.4 | 0.5 | 1.0 |
| 4 back from 100 | 3.5 | 22.9 | 38.4 | 22.1 | 32.3 | 24.2 | 16.4 | 24.3 | 13.0 | 8.8 | 11.0 |
| 5 back from 1000 | 0.5 | 6.3 | 25.9 | 11.3 | 49.7 | 59.6 | 61.1 | 56.8 | 54.9 | 49.5 | 52.4 |
| 6 back from 1000000 | 0.0 | 0.2 | 1.2 | 0.5 | 4.3 | 10.4 | 19.5 | 11.4 | 28.4 | 39.3 | 33.5 |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0 Emergent BNWS | 6.1 | 2.5 | 1.2 | 3.2 | 1.5 | 0.8 | 0.8 | 1.1 | 1.3 | 1.4 | 1.4 |
| 1 Initial BNWS from 10 | 10.1 | 2.7 | 0.9 | 4.4 | 0.3 | 0.2 | 0.1 | 0.2 | 0.1 | 0.0 | 0.1 |
| 2 back from 10 | 31.7 | 12.3 | 3.5 | 15.4 | 0.9 | 0.4 | 0.2 | 0.5 | 0.1 | 0.1 | 0.1 |
| 3 back from 20 | 22.4 | 14.8 | 6.0 | 14.1 | 2.1 | 0.8 | 0.5 | 1.1 | 0.5 | 0.2 | 0.4 |
| 4 back from 100 | 23.6 | 39.7 | 32.3 | 32.0 | 18.5 | 10.7 | 6.0 | 11.8 | 5.2 | 3.0 | 4.2 |
| 5 back from 1000 | 5.9 | 26.2 | 49.0 | 27.7 | 60.2 | 57.7 | 47.6 | 55.2 | 39.8 | 29.2 | 34.8 |
| 6 back from 1000000 | 0.2 | 1.7 | 7.2 | 3.1 | 16.5 | 29.4 | 44.8 | 30.2 | 52.9 | 66.1 | 59.1 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Numeral ID |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| N/A | 2.0 | 15.0 | 54.1 | 24.5 | 81.6 | 91.8 | 94.8 | 89.3 | 94.1 | 94.5 | 94.3 |
| 0 Emergent | 27.5 | 3.5 | 0.4 | 10.1 | 0.5 | 0.4 | 0.4 | 0.4 | 0.2 | 0.3 | 0.2 |
| 1 Numerals to 10 | 36.0 | 14.8 | 2.9 | 17.4 | 0.5 | 0.2 | 0.1 | 0.3 | 0.1 | 0.0 | 0.1 |
| 2 Numerals to 20 | 17.0 | 15.0 | 3.9 | 11.8 | 1.2 | 0.4 | 0.2 | 0.6 | 0.2 | 0.2 | 0.2 |
| 3 Numerals to 100 | 15.1 | 37.8 | 21.3 | 24.8 | 5.6 | 1.9 | 0.8 | 2.8 | 0.9 | 0.6 | 0.8 |
| 4 Numerals to 1000 | 2.3 | 13.8 | 17.4 | 11.4 | 10.7 | 5.3 | 3.8 | 6.6 | 4.5 | 4.4 | 4.5 |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| N/A | 8.7 | 35.7 | 73.6 | 40.3 | 89.5 | 94.8 | 96.3 | 93.5 | 95.2 | 95.3 | 95.2 |
| 0 Emergent | 4.0 | 0.4 | 0.1 | 1.4 | 0.4 | 0.3 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 |
| 1 Numerals to 10 | 13.7 | 2.7 | 0.5 | 5.4 | 0.2 | 0.1 | 0.0 | 0.1 | 0.0 |  | 0.0 |
| 2 Numerals to 20 | 17.0 | 4.9 | 1.0 | 7.4 | 0.3 | 0.2 | 0.1 | 0.2 | 0.1 | 0.0 | 0.0 |
| 3 Numerals to 100 | 41.2 | 25.8 | 7.4 | 24.3 | 1.7 | 0.7 | 0.3 | 0.9 | 0.4 | 0.2 | 0.3 |
| 4 Numerals to 1000 | 15.3 | 30.6 | 17.4 | 21.1 | 7.9 | 4.0 | 3.1 | 5.0 | 4.0 | 4.3 | 4.2 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Fractions |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| Not given | 98.7 | 84.3 | 45.6 | 75.4 | 17.3 | 7.1 | 3.6 | 9.4 | 4.0 | 2.2 | 3.2 |
| 2-3 Unit fracts not recog | 1.2 | 14.9 | 46.5 | 21.5 | 47.4 | 37.9 | 28.0 | 37.8 | 16.9 | 11.8 | 14.5 |
| 4 Unit fractions recog. | 0.1 | 0.7 | 5.9 | 2.3 | 21.1 | 27.9 | 30.2 | 26.4 | 27.4 | 25.1 | 26.3 |
| 5 Order unit fractions | 0.0 | 0.1 | 1.9 | 0.7 | 12.8 | 23.4 | 29.6 | 21.9 | 34.5 | 33.8 | 34.2 |
| 6 Coord. num'r/denom'r |  | 0.0 | 0.1 | 0.0 | 0.9 | 2.5 | 5.4 | 2.9 | 10.9 | 15.4 | 13.0 |
| 7 Equivalent fractions |  |  | 0.0 | 0.0 | 0.4 | 0.9 | 2.3 | 1.2 | 4.4 | 7.6 | 5.9 |
| 8 Order fractions |  |  |  |  | 0.1 | 0.3 | 0.8 | 0.4 | 1.9 | 4.0 | 2.9 |


| Year | 1 | 2 | 3 | ENP | 4 | 5 | 6 | ANP | 7 | 8 | INP |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Fractions cont. | (7793) | (8197) | (8516) | (24507) | (10013) | (9868) | (9959) | (29840) | (8374) | (7306) | (15680) |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| Not given | 87.1 | 54.2 | 21.0 | 53.3 | 7.9 | 3.9 | 1.9 | 4.6 | 2.1 | 1.3 | 1.7 |
| 2-3 Unit fracts not recog. | 8.8 | 23.0 | 25.6 | 19.4 | 15.4 | 9.0 | 6.2 | 10.2 | 4.7 | 2.7 | 3.8 |
| 4 Unit fractions recog. | 2.8 | 15.4 | 27.8 | 15.7 | 27.6 | 22.6 | 17.1 | 22.5 | 17.0 | 12.0 | 14.7 |
| 5 Order unit fractions | 0.6 | 7.1 | 23.6 | 10.8 | 40.5 | 45.8 | 42.9 | 43.0 | 36.9 | 31.2 | 34.3 |
| 6 Coord. num'r/denom'r | 0.1 | 0.3 | 1.8 | 0.7 | 6.5 | 13.0 | 19.1 | 12.9 | 20.0 | 22.5 | 21.2 |
| 7 Equivalent fractions |  |  | 0.2 | 0.1 | 1.6 | 4.1 | 8.3 | 4.7 | 12.0 | 17.5 | 14.6 |
| 8 Order fractions |  | 0.0 | 0.1 | 0.0 | 0.5 | 1.6 | 4.5 | 2.2 | 7.2 | 12.7 | 9.8 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Place Value |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0-1 Emergent | 50.8 | 22.0 | 8.5 | 26.5 | 4.6 | 1.8 | 1.2 | 2.5 | 5.0 | 6.3 | 5.6 |
| 2-3 One as a unit | 47.3 | 61.0 | 45.0 | 51.1 | 21.9 | 11.1 | 6.0 | 13.0 | 5.5 | 2.8 | 4.2 |
| 4 Ten as counting unit | 1.9 | 15.7 | 38.5 | 19.3 | 47.4 | 42.5 | 32.7 | 40.9 | 23.7 | 17.4 | 20.8 |
| 5 Tens in nos. to 1000 | 0.0 | 1.1 | 7.2 | 2.9 | 21.7 | 34.2 | 39.1 | 31.6 | 34.7 | 32.9 | 33.9 |
| 6 Ts , Hs, Th whole nos. | 0.0 | 0.1 | 0.8 | 0.3 | 4.1 | 9.7 | 17.9 | 10.5 | 24.2 | 29.6 | 26.7 |
| 710 ths in decimals/order |  |  | 0.0 | 0.0 | 0.3 | 0.7 | 2.8 | 1.3 | 5.7 | 8.0 | 6.8 |
| 8 Decimal conversion |  | 0.0 |  | 0.0 | 0.1 | 0.1 | 0.3 | 0.2 | 1.2 | 2.9 | 2.0 |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0-1 Emergent | 16.1 | 6.7 | 2.0 | 8.1 | 2.1 | 0.8 | 0.6 | 1.2 | 2.0 | 2.6 | 2.3 |
| 2-3 One as a unit | 62.2 | 40.5 | 21.1 | 40.7 | 8.6 | 3.8 | 2.2 | 4.9 | 2.0 | 0.9 | 1.5 |
| 4 Ten as counting unit | 20.7 | 44.0 | 47.1 | 37.7 | 34.3 | 22.9 | 14.4 | 23.9 | 11.2 | 6.7 | 9.1 |
| 5 Tens in nos. to 1000 | 0.8 | 7.5 | 24.4 | 11.3 | 40.1 | 43.9 | 38.2 | 40.7 | 31.0 | 24.5 | 28.0 |
| 6 Ts , Hs, Th whole nos. | 0.1 | 1.2 | 5.2 | 2.2 | 13.3 | 23.8 | 32.1 | 23.1 | 34.5 | 36.4 | 35.4 |
| 7 10ths in decimals/order | 0.0 | 0.0 | 0.2 | 0.1 | 1.2 | 4.1 | 10.2 | 5.2 | 14.0 | 18.8 | 16.2 |
| 8 Decimal conversion |  |  | 0.0 | 0.0 | 0.3 | 0.6 | 2.3 | 1.1 | 5.3 | 10.0 | 7.5 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Basic Facts |  |  |  |  |  |  |  |  |  |  |  |
| Initial Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0-1 Non-grouping w 5 | 94.8 | 79.5 | 46.9 | 73.0 | 22.3 | 10.3 | 6.5 | 13.1 | 12.2 | 11.5 | 11.8 |
| 2-3 Within/w. 5, w'in 10 | 4.5 | 14.8 | 25.6 | 15.3 | 23.1 | 14.7 | 9.3 | 15.7 | 6.6 | 4.3 | 5.5 |
| 4 Add'n w. 10s/doubles | 0.7 | 5.4 | 23.5 | 10.2 | 35.3 | 30.7 | 23.2 | 29.7 | 16.0 | 11.9 | 14.1 |
| 5 Addition facts | 0.0 | 0.2 | 3.3 | 1.2 | 15.6 | 29.2 | 30.4 | 25.1 | 25.3 | 24.2 | 24.8 |
| 6 Subtr'n \& mult'n facts |  | 0.0 | 0.6 | 0.2 | 3.0 | 12.8 | 24.1 | 13.3 | 29.0 | 31.8 | 30.3 |
| 7 Division facts |  | 0.0 | 0.0 | 0.0 | 0.6 | 2.1 | 5.6 | 2.8 | 9.9 | 12.7 | 11.2 |
| 8 Common factors/multiple |  |  |  |  | 0.0 | 0.2 | 0.9 | 0.4 | 1.0 | 3.7 | 2.2 |
| Final Stage |  |  |  |  |  |  |  |  |  |  |  |
| 0-1 Non-grouping w 5 | 61.7 | 33.5 | 13.6 | 35.5 | 6.9 | 2.6 | 1.9 | 3.8 | 5.8 | 5.5 | 5.7 |
| 2-3 Within/w. 5, w'in 10 | 28.1 | 29.5 | 18.4 | 25.2 | 9.3 | 5.5 | 3.1 | 5.9 | 2.3 | 1.3 | 1.9 |
| 4 Add'n w. 10s/doubles | 9.7 | 31.3 | 43.0 | 28.5 | 32.4 | 18.9 | 10.9 | 20.8 | 8.2 | 5.2 | 6.8 |
| 5 Addition facts | 0.4 | 5.0 | 20.0 | 8.8 | 34.0 | 35.5 | 27.9 | 32.5 | 22.0 | 15.9 | 19.2 |
| 6 Subtr'n \& mult'n facts | 0.1 | 0.6 | 4.6 | 1.8 | 14.0 | 27.3 | 34.2 | 25.1 | 32.3 | 32.0 | 32.1 |
| 7 Division facts | 0.0 | 0.0 | 0.4 | 0.2 | 2.9 | 8.9 | 17.7 | 9.8 | 23.3 | 26.6 | 24.9 |
| 8 Common factors/multiple |  |  | 0.0 | 0.0 | 0.5 | 1.3 | 4.4 | 2.1 | 6.1 | 13.4 | 9.5 |

## Appendix B (Patterns of Performance and Progress)

Table B1
Percentages of Year 0-8 Students as a Function of Gender, Ethnicity, and School Decile Band in 2004 and 2003

|  | Gender |  |  |  |  |  |  |  | Ethnicity |  |  |  | Decile Band |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Boys | Girls | European | Māori Pasifika | Asian | Other | Low | Mid | High |  |  |  |  |  |  |
| 2004 | 51.0 | 49.0 | 60.4 | 19.7 | 10.2 | 5.4 | 4.3 | 26.8 | 40.0 |  |  |  |  |  |  |
| 2003 | 51.0 | 49.0 | 57.8 | 23.6 | 9.7 | 4.7 | 4.1 | 35.6 | 37.9 |  |  |  |  |  |  |

Table B2
Percentages of Year 0-8 Students at Each Framework Stage for_Addition/Subtraction as a Function of Gender, Ethnicity, and School Decile Band in 2004 and 2003

| Year | Gender |  | Ethnicity |  |  |  | Decile Band |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Boys | Girls | Europe | n Māori | Pasifika | Asian | Low | Mid | High |
|  | 2004 |  |  |  |  |  |  |  |  |
|  | (35740) | (34286) | (42331) | (13801) | (7120) | (3794) | (18132) | (27064) | (22488) |
| Initial Stage |  |  |  |  |  |  |  |  |  |
| 0-3 | 29.1 | 28.4 | 28.0 | 29.7 | 32.3 | 26.6 | 30.2 | 27.0 | 30.0 |
| 4 AC | 28.4 | 34.3 | 29.3 | 34.9 | 39.4 | 25.5 | 35.9 | 30.6 | 29.0 |
| 5 EA | 30.1 | 29.4 | 31.2 | 27.6 | 23.6 | 33.0 | 26.5 | 31.3 | 30.4 |
| 6 AA | 12.5 | 7.9 | 11.5 | 7.8 | 4.7 | 14.9 | 7.5 | 11.1 | 10.6 |
| Final Stage |  |  |  |  |  |  |  |  |  |
| 0-3 | 16.8 | 16.5 | 16.0 | 18.0 | 19.7 | 13.2 | 17.3 | 16.5 | 16.7 |
| 4 AC | 23.3 | 27.7 | 23.5 | 28.5 | 33.9 | 21.3 | 30.3 | 23.9 | 24.2 |
| 5 EA | 35.1 | 37.3 | 36.6 | 36.1 | 34.3 | 34.7 | 35.3 | 36.9 | 36.1 |
| 6 AA | 24.8 | 18.5 | 23.8 | 17.4 | 12.1 | 30.7 | 17.0 | 22.7 | 23.0 |
|  | 2003 |  |  |  |  |  |  |  |  |
|  | (70823) | (68004) | (80249) | (32784) | (13523) | (6566) | (48063) | (51187) | ((35648) |
| Initial Stage |  |  |  |  |  |  |  |  |  |
| 0-3 | 32.8 | 32.9 | 30.6 | 35.0 | 42.8 | 28.5 | 36.3 | 30.9 | 31.7 |
| 4 AC | 29.5 | 35.1 | 30.8 | 35.6 | 36.1 | 26.5 | 35.0 | 32.0 | 29.0 |
| 5 EA | 26.7 | 25.0 | 28.1 | 23.6 | 17.3 | 28.0 | 22.3 | 27.4 | 28.1 |
| 6 AA | 11.0 | 7.0 | 10.6 | 5.8 | 3.8 | 16.9 | 6.4 | 9.7 | 11.2 |
| Final Stage |  |  |  |  |  |  |  |  |  |
| 0-3 | 20.6 | 20.9 | 18.3 | 23.5 | 31.0 | 16.3 | 24.8 | 19.3 | 17.7 |
| 4 AC | 23.9 | 28.3 | 24.3 | 28.3 | 32.3 | 22.0 | 29.0 | 24.9 | 23.9 |
| 5 EA | 34.3 | 35.1 | 36.2 | 34.4 | 27.7 | 33.1 | 32.2 | 36.0 | 36.3 |
| 6 AA | 21.2 | 15.7 | 21.2 | 13.8 | 8.9 | 28.6 | 14.0 | 19.8 | 22.1 |

Table B3
Percentages of Year 0-8 Students at Each Framework Stage for_Multiplication/Division as a Function of Gender, Ethnicity, and School Decile Band in 2004

| Year | Gender |  | Ethnicity |  |  |  | Decile Band |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Boys | Girls | European | Māori | Pasifika | Asian | Low | Mid | High |
| Initial Stage |  |  |  |  |  |  |  |  |  |
| Not Given | 31.8 | 31.2 | 31.1 | 31.6 | 34.9 | 29.1 | 32.5 | 30.0 | 33.0 |
| 2-3 | 9.5 | 10.6 | 9.0 | 11.4 | 14.3 | 9.2 | 12.0 | 9.4 | 9.6 |
| 4 AC | 23.2 | 26.2 | 23.5 | 27.6 | 27.8 | 20.8 | 27.2 | 24.4 | 23.1 |
| 5 EA | 17.0 | 17.9 | 18.1 | 16.9 | 14.6 | 18.3 | 16.2 | 18.5 | 17.2 |
| 6 AA | 13.8 | 11.5 | 14.0 | 10.2 | 7.4 | 15.8 | 9.7 | 13.7 | 13.2 |
| 7 AM | 4.7 | 2.6 | 4.3 | 2.3 | 1.1 | 6.7 | 2.4 | 4.1 | 3.9 |
| Final Stage |  |  |  |  |  |  |  |  |  |
| Not Given | 20.5 | 20.5 | 20.2 | 21.0 | 23.4 | 16.7 | 20.4 | 20.7 | 20.8 |
| 2-3 | 5.2 | 5.8 | 4.7 | 6.5 | 8.0 | 5.4 | 6.8 | 4.7 | 5.3 |
| 4 AC | 21.1 | 23.6 | 20.8 | 25.1 | 28.0 | 18.5 | 25.7 | 21.0 | 21.8 |
| 5 EA | 18.9 | 20.9 | 19.5 | 20.9 | 21.1 | 18.6 | 21.1 | 19.7 | 19.2 |
| 6 AA | 21.7 | 20.6 | 22.6 | 19.2 | 15.5 | 23.8 | 18.9 | 22.5 | 21.0 |
| 7 AM | 12.6 | 8.6 | 12.2 | 7.5 | 4.0 | 17.0 | 7.0 | 11.4 | 11.9 |

Table B4
Percentages of Year 0-8 Students at Each Framework Stage for Proportion/Ratio as a Function of Gender, Ethnicity, and School Decile Band in 2004

|  | Gender |  | Ethnicity |  |  |  | Decile Band |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Year | Boys |  | Girls |  | European Māori | Pasifika | Asian | Low | Mid | High

Table B5
Percentages of Students at Framework Stages for Addition/Subtraction at the End of the Project as a Function of Ethnicity and Gender in 2004 and 2003

| Final Stage | European |  | Māori |  | Pasifika |  | Asian |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls |
|  |  |  |  | 200 |  |  |  |  |
| No. of students | (21391) | (20940) | (7212) | (6589) | (3605) | (3515) | (1969) | (1825) |
| 0-3 | 16.1 | 16.0 | 18.5 | 17.5 | 20.7 | 18.6 | 13.0 | 13.4 |
| 4 AC | 21.1 | 26.0 | 26.9 | 30.1 | 32.6 | 35.2 | 18.1 | 24.8 |
| 5 EA | 35.3 | 38.0 | 35.4 | 36.8 | 34.1 | 34.5 | 33.0 | 36.6 |
| 6 AA | 27.6 | 20.0 | 19.1 | 15.6 | 12.6 | 11.6 | 35.9 | 25.2 |
|  |  |  |  | 200 |  |  |  |  |
| No. of students | (42518) | (39556) | (17043) | (15741) | (6782) | (6741) | (3382) | (3184) |
| 0-3 | 17.8 | 18.7 | 23.7 | 23.2 | 31.7 | 30.3 | 15.9 | 16.6 |
| 4 AC | 21.6 | 27.1 | 26.8 | 29.9 | 31.3 | 33.4 | 20.0 | 24.1 |
| 5 EA | 35.6 | 36.8 | 34.4 | 34.5 | 27.8 | 27.6 | 32.4 | 33.8 |
| 6 AA | 24.9 | 17.4 | 15.1 | 12.4 | 9.1 | 8.7 | 31.6 | 25.4 |

Table B6
Percentages of Students at Framework Stages for Multiplication/Division at the End of the Project as a Function of Ethnicity and Gender in 2004

|  | European |  | Māori |  | Pasifika |  | Asian |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Final Stage | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls |
| Not Given | 20.2 | 20.3 | 21.2 | 20.7 | 24.4 | 22.5 | 16.3 | 17.2 |
| 2-3 | 4.3 | 5.1 | 6.5 | 6.5 | 7.4 | 8.6 | 5.1 | 5.8 |
| 4 AC | 19.1 | 22.6 | 24.7 | 25.4 | 28.4 | 27.7 | 16.5 | 20.7 |
| 5 EA | 18.5 | 20.5 | 19.7 | 22.1 | 20.6 | 21.5 | 16.7 | 20.6 |
| 6 AA | 23.5 | 21.7 | 19.2 | 19.1 | 15.0 | 16.0 | 23.9 | 23.7 |
| 7 AM | 14.4 | 9.9 | 8.6 | 6.2 | 4.3 | 3.8 | 21.6 | 12.1 |

Table B7
Percentages of Students at Framework Stages for Proportion/Ratio at the End of the Project as a Function of Ethnicity and Gender in 2004

|  | European |  | Māori |  | Pasifika |  | Asian |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Final Stage | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls |
| Not Given | 20.4 | 20.6 | 21.4 | 21.0 | 25.1 | 22.8 | 16.5 | 17.7 |
| 1 Unequal | 2.7 | 2.2 | 4.3 | 3.8 | 3.8 | 3.4 | 3.8 | 3.6 |
| 2-4 Equal | 26.0 | 29.3 | 32.5 | 32.3 | 36.1 | 38.0 | 24.8 | 28.5 |
| 5 EA | 21.1 | 22.5 | 22.4 | 25.0 | 22.2 | 22.4 | 18.7 | 20.9 |
| 6 AA | 15.8 | 15.1 | 12.5 | 12.9 | 9.3 | 10.8 | 17.5 | 17.1 |
| 7 AM | 11.0 | 8.5 | 5.8 | 4.3 | 3.2 | 2.4 | 13.3 | 9.8 |
| 8 AP | 3.0 | 1.7 | 1.2 | 0.7 | 0.4 | 0.2 | 5.4 | 2.3 |

Table B8
Percentages of Students Who Progressed to a Higher Stage for Addition/Subtraction as a Function of Initial Stage, Gender, Ethnicity, and School Decile Band (2004 and 2003)

| Initial Stage | Gender |  |  | Ethnicity |  | Asian | Decile Band |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Boys | Girls | European | Māori P | asifika |  | Low | Medium | High |
| 2004 |  |  |  |  |  |  |  |  |  |
| Stages 0-3 | (10397) | (9742) | (11869) | (4094) | (2300) | (1008) | (5476) | (7313) | (6741) |
| To stage 4 | 34.3 | 36.2 | 35.3 | 34.6 | 34.4 | 37.0 | 35.9 | 33.1 | 37.2 |
| To stage 5 | 8.2 | 6.2 | 7.6 | 5.5 | 5.5 | 12.5 | 6.9 | 6.6 | 7.2 |
| To stage 6 | 0.8 | 0.5 | 0.7 | 0.6 | 0.1 | 1.4 | 1.4 | 0.2 | 0.3 |
| Total | 43.3 | 42.9 | 43.6 | 40.7 | 40.0 | 50.9 | 44.2 | 39.9 | 44.7 |
| Stage 4 | (10143) | (11760) | (12397) | (4813) | (2806) | (966) | (6505) | (8286) | (6520) |
| To stage 5 | 48.0 | 46.1 | 49.3 | 44.3 | 40.5 | 48.0 | 42.6 | 47.7 | 50.0 |
| To stage 6 | 5.6 | 4.2 | 5.0 | 4.6 | 3.3 | 7.5 | 4.4 | 4.5 | 5.6 |
| Total | 53.6 | 50.3 | 54.3 | 48.9 | 43.8 | 53.5 | 47.0 | 52.2 | 55.6 |
| Stage 5 | (10747) | (10066) | (13198) | (3815) | (1682) | (1253) | (4796) | (8460) | (6839) |
| To stage 6 | 35.7 | 31.3 | 34.8 | 29.4 | 27.3 | 41.6 | 30.4 | 33.1 | 35.5 |
| 2003 |  |  |  |  |  |  |  |  |  |
| Stages 0-3 | (23215) | (22364) | (24572) | (11471) | (5785) | (1870) | (17424) | (15801) | (11283) |
| To stage 4 | 32.0 | 33.8 | 34.5 | 30.4 | 28.9 | 35.9 | 30.8 | 32.5 | 37.1 |
| To stage 5 | 6.9 | 4.8 | 6.5 | 4.9 | 4.2 | 7.7 | 4.8 | 6.2 | 7.1 |
| To stage 6 | 0.6 | 0.5 | 0.7 | 0.3 | 0.2 | 1.9 | 0.2 | 0.4 | 0.9 |
| Total | 39.5 | 39.1 | 41.7 | 35.6 | 33.3 | 45.5 | 35.8 | 39.1 | 45.1 |
| Stage 4 | (20907) | (23902) | (24685) | (11679) | (4876) | (1743) | (16830) | (16404) | (10340) |
| To stage 5 | 50.3 | 47.2 | 51.5 | 46.5 | 39.1 | 50.3 | 44.4 | 50.1 | 54.1 |
| To stage 6 | 4.8 | 4.0 | 4.6 | 4.2 | 3.2 | 6.0 | 4.2 | 4.4 | 4.7 |
| Total | 55.1 | 51.2 | 56.1 | 50.7 | 42.3 | 56.3 | 48.6 | 54.5 | 58.8 |
| Stage 5 | (18895) | (16995) | (22516) | (7734) | (2346) | (1841) | (10732) | (14020) | (10032) |
| To stage 6 | 33.9 | 29.9 | 33.7 | 28.7 | 24.1 | 35.7 | 29.3 | 32.8 | 34.0 |

Table B9
Percentages of Students Who Progressed to a Higher Stage for Addition/Subtraction as a Function of Initial Stage, Ethnicity, and Gender in 2004 and 2003

| Initial Stage | European |  | Māori |  | Pasifika |  | Asian |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls |
| 2004 |  |  |  |  |  |  |  |  |
| Stages 0-3 | (6081) | (5788) | (2178) | (1916) | (1205) | (1095) | (509) | (499) |
| To stage 4 | 34.4 | 36.2 | 34.1 | 35.2 | 33.4 | 35.6 | 34.6 | 39.5 |
| To stage 5 | 9.0 | 6.2 | 5.9 | 5.0 | 5.4 | 5.7 | 14.3 | 10.6 |
| To stage 6 | 1.0 | 0.4 | 0.6 | 0.6 | 0.1 | 0.2 | 1.4 | 1.4 |
| Total | 44.4 | 42.8 | 40.6 | 40.8 | 38.9 | 41.5 | 50.3 | 51.5 |
| Stages 4 | (5563) | (6834) | (2352) | (2461) | (1340) | (1466) | (433) | (533) |
| To stage 5 | 51.0 | 47.9 | 44.6 | 44.1 | 41.2 | 39.9 | 49.0 | 47.3 |
| To stage 6 | 6.1 | 4.1 | 5.1 | 4.1 | 2.8 | 3.9 | 9.5 | 5.8 |
| Total | 57.1 | 52.0 | 49.7 | 48.2 | 44.0 | 43.8 | 58.5 | 53.1 |
| Stages 5 | (6712) | (6486) | (2018) | (1797) | (882) | (800) | (668) | (585) |
| To stage 6 | 37.4 | 32.1 | 30.1 | 28.7 | 28.1 | 26.4 | 45.4 | 37.3 |
| 2003 |  |  |  |  |  |  |  |  |
| Stages 0-3 | (12274) | (12298) | (5997) | (5474) | (3003) | (2782) | (981) | (889) |
| To stage 4 | 33.7 | 35.4 | 29.4 | 31.5 | 28.5 | 29.3 | 34.7 | 37.2 |
| To stage 5 | 7.7 | 5.3 | 5.5 | 4.3 | 5.1 | 3.2 | 10.1 | 5.1 |
| To stage 6 | 0.7 | 0.6 | 0.3 | 0.2 | 0.2 | 0.3 | 2.4 | 1.3 |
| Total | 42.1 | 41.3 | 35.2 | 36.0 | 33.8 | 32.8 | 47.2 | 43.6 |
| Stage 4 | (11189) | (13496) | (5765) | (5914) | (2306) | (2570) | (785) | (958) |
| To stage 5 | 54.0 | 49.4 | 47.3 | 45.8 | 39.8 | 38.4 | 50.8 | 49.8 |
| To stage 6 | 5.3 | 4.1 | 4.4 | 4.1 | 2.9 | 3.4 | 6.6 | 5.5 |
| Total | 59.3 | 53.5 | 51.7 | 49.9 | 42.7 | 41.8 | 57.4 | 55.3 |
| Stage 5 | (11815) | (10701) | (4157) | (3577) | (1196) | (1150) | (957) | (884) |
| To stage 6 | 35.9 | 31.2 | 30.1 | 27.1 | 24.0 | 24.2 | 36.8 | 34.5 |

## Appendix C (Patterns of Performance and Progress)

Table C1
Comparison of Average Framework Stages on Addition/Subtraction (Standard Deviations shown in brackets) for Younger Children Before the Project with Older Children Before the Project for Adjacent Year Groups in 2004

| Year <br> groups | Younger <br> students | Older <br> students | Younger <br> students <br> before project | Older students <br> before project | Diff | t value | df | Prob. | Effect <br> size |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $1 \& 2$ | 7793 | 8197 | 1.52 | $(0.94)$ | 2.48 | $(1.15)$ | -0.96 | -57.72 | 15653 | 0.000 | -0.83 |
| $2 \& 3$ | 8197 | 8516 | 2.48 | $(1.15)$ | 3.44 | $(1.20)$ | -0.96 | -53.14 | 16711 | 0.000 | -0.76 |
| $3 \& 4$ | 8516 | 10013 | 3.44 | $(1.20)$ | 4.13 | $(1.08)$ | -0.69 | -40.99 | 17344 | 0.000 | -0.58 |
| $4 \& 5$ | 10013 | 9868 | 4.13 | $(1.08)$ | 4.48 | $(0.94)$ | -0.35 | -24.40 | 19599 | 0.000 | -0.34 |
| $5 \& 6$ | 9868 | 9959 | 4.48 | $(0.94)$ | 4.69 | $(0.92)$ | -0.21 | -15.76 | 19799 | 0.000 | -0.22 |
| $6 \& 7$ | 9959 | 8374 | 4.69 | $(0.92)$ | 4.85 | $(0.94)$ | -0.15 | -11.08 | 17625 | 0.000 | -0.16 |
| $7 \& 8$ | 8374 | 7306 | 4.85 | $(0.94)$ | 5.03 | $(0.90)$ | -0.19 | -12.72 | 15564 | 0.000 | -0.20 |

Table C2
Comparison of Average Framework Stages (SDs in brackets) for Younger Students After the Project with Older Students Before the Project for Adjacent Year Groups
Addition/Subtraction

| Year <br> groups | Younger <br> students | Older <br> students | Younger <br> students after <br> project |  | Older students <br> before project | Diff | t value | df | Prob | Effect <br> size |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $1 \& 2$ | 7794 | 8197 | 2.54 | $(1.02)$ | 2.48 | $(1.15)$ | 0.07 | 3.81 | 15924 | 0.000 | 0.06 |
| $2 \& 3$ | 8197 | 8516 | 3.50 | $(1.10)$ | 3.44 | $(1.19)$ | 0.06 | 3.21 | 16678 | 0.001 | 0.05 |
| $3 \& 4$ | 8516 | 10013 | 4.24 | $(0.91)$ | 4.13 | $(1.08)$ | 0.10 | 7.11 | 18527 | 0.000 | 0.10 |
| $4 \& 5$ | 10013 | 9868 | 4.69 | $(0.84)$ | 4.48 | $(0.94)$ | 0.21 | 16.40 | 19523 | 0.000 | 0.23 |
| $5 \& 6$ | 9868 | 9959 | 4.95 | $(0.80)$ | 4.69 | $(0.92)$ | 0.26 | 21.36 | 19476 | 0.000 | 0.30 |
| $6 \& 7$ | 9959 | 8374 | 5.17 | $(0.76)$ | 4.85 | $(0.94)$ | 0.33 | 25.63 | 16041 | 0.000 | 0.38 |
| $7 \& 8$ | 8374 | 7306 | 5.23 | $(0.81)$ | 5.03 | $(0.90)$ | 0.20 | 14.22 | 14844 | 0.000 | 0.23 |

Multiplication/Division

| Year <br> groups | Younger <br> students | Older <br> students | Younger <br> students after <br> project | Older students <br> before project | Diff | t value | df | Prob | Effect <br> size |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $2 \& 3$ | 1287 | 4524 | 4.18 | $(0.77)$ | 3.73 | $(0.73)$ | 0.45 | 18.59 | 1975 | 0.000 |
| $3 \& 4$ | 4524 | 8217 | 4.45 | $(0.85)$ | 4.14 | $(0.86)$ | 0.31 | 19.67 | 9332 | 0.000 |
| $4 \& 5$ | 8217 | 9068 | 4.83 | $(0.96)$ | 4.51 | $(0.97)$ | 0.32 | 21.97 | 17158 | 0.36 |
| $5 \& 6$ | 9068 | 9485 | 5.21 | $(1.00)$ | 4.84 | $(1.04)$ | 0.37 | 24.39 | 18550 | 0.000 |
| $6 \& 7$ | 9485 | 8027 | 5.57 | $(1.01)$ | 5.12 | $(1.04)$ | 0.45 | 29.07 | 16871 | 0.000 |
| $7 \& 8$ | 8027 | 7145 | 5.71 | $(1.00)$ | 5.39 | $(1.05)$ | 0.32 | 19.34 | 14787 | 0.000 |

## Proportion/Ratio

| Year <br> groups | Younger <br> students | Older <br> students | Younger <br> students after <br> project | Older students <br> before project | Diff | t value | df | Prob | Effect <br> size |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $2 \& 3$ | 1274 | 4517 | 4.17 | $(0.59)$ | 3.75 | $(0.58)$ | 0.42 | 22.89 | 2026 | 0.000 |
| $3 \& 4$ | 4517 | 8130 | 4.37 | $(0.72)$ | 4.06 | $(0.74)$ | 0.31 | 23.20 | 9590 | 0.000 |
| $4 \& 5$ | 8130 | 9016 | 4.69 | $(0.89)$ | 4.34 | $(0.86)$ | 0.36 | 26.50 | 16820 | 0.000 |
| $5 \& 6$ | 9016 | 9454 | 5.03 | $(0.98)$ | 4.65 | $(1.01)$ | 0.38 | 25.98 | 18466 | 0.000 |


| $6 \& 7$ | 9454 | 7950 | 5.40 | $(1.08)$ | 4.95 | $(1.10)$ | 0.45 | 27.11 | 16827 | 0.000 | 0.40 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $7 \& 8$ | 7950 | 7094 | 5.58 | $(1.15)$ | 5.25 | $(1.17)$ | 0.33 | 17.43 | 14781 | 0.000 | 0.28 |

Table C3
Comparison of Final Framework Stages on Addition/Subtraction (SDs in brackets) for Particular Sub-groups at Each Initial Framework Stage in 2004
European vs Māori

| Initial <br> stage | No. of <br> European | No. of <br> Māori | Final stage <br> European |  | Final stage <br> Māori | Diff | t value | df | Prob | Effect <br> size |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 1119 | 495 | 2.68 | $(1.74)$ | 2.16 | $(1.51)$ | 0.53 | 6.17 | 1075 | 0.000 | 0.31 |
| 1 | 2544 | 885 | 2.46 | $(0.99)$ | 2.36 | $(0.99)$ | 0.10 | 2.58 | 1532 | 0.010 | 0.10 |
| 2 | 5478 | 1794 | 3.14 | $(0.94)$ | 3.11 | $(0.95)$ | 0.03 | 1.22 | 3040 | 0.223 | 0.03 |
| 3 | 2728 | 920 | 3.91 | $(0.71)$ | 3.85 | $(0.67)$ | 0.07 | 2.59 | 1677 | 0.010 | 0.10 |
| 4 | 12397 | 4813 | 4.58 | $(0.64)$ | 4.52 | $(0.65)$ | 0.06 | 5.82 | 8586 | 0.000 | 0.09 |
| 5 | 13198 | 3815 | 5.33 | $(0.54)$ | 5.25 | $(0.60)$ | 0.08 | 7.31 | 5737 | 0.000 | 0.14 |
| Average |  |  |  |  |  |  |  |  |  |  | $\mathbf{0 . 1 3}$ |

European vs Pasifika

| Initial stage | No. of European | No. of Pasifika | Final stage European |  | Final stage Pasifika |  | Diff | $\begin{gathered} \mathrm{t} \\ \text { value } \end{gathered}$ | df | Prob | Effect size |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 1119 | 292 | 2.68 | (1.74) | 1.98 | (1.29) | 0.71 | 7.72 | 596 | 0.000 | 0.42 |
| 1 | 2544 | 478 | 2.46 | (0.99) | 2.47 | (1.02) | -0.01 | -0.22 | 656 | 0.829 | -0.01 |
| 2 | 5478 | 963 | 3.14 | (0.94) | 3.07 | (0.95) | 0.07 | 2.23 | 1314 | 0.026 | 0.07 |
| 3 | 2728 | 567 | 3.9 | (0.71) | 3.82 | (0.73) | 0.09 | 2.67 | 809 | 0.008 | 0.13 |
| 4 | 12397 | 2806 | 4.58 | (0.64) | 4.46 | (0.62) | 0.12 | 9.59 | 4251 | 0.000 | 0.19 |
| 5 | 13198 | 1682 | 5.33 | (0.54) | 5.23 | (0.54) | 0.10 | 7.10 | 2136 | 0.000 | 0.19 |
| Average |  |  |  |  |  |  |  |  |  |  | 0.17 |

Asian vs Pasifika

| Initial <br> stage | No. of <br> Asian | No. of <br> Pasifika | Final stage <br> Asian |  | Final stage <br> Pasifika | Diff | t <br> value | df | Prob | Effect <br> size |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | ---: | ---: | ---: | :---: |
| 0 | 106 | 292 | 3.29 | $(1.76)$ | 1.98 | $(1.29)$ | 1.32 | 7.06 | 148 | 0.000 | 0.86 |
| 1 | 175 | 478 | 2.69 | $(1.04)$ | 2.47 | $(1.02)$ | 0.22 | 2.39 | 303 | 0.017 | 0.21 |
| 2 | 475 | 963 | 3.37 | $(0.94)$ | 3.07 | $(0.95)$ | 0.30 | 5.66 | 953 | 0.000 | 0.31 |
| 3 | 252 | 567 | 3.96 | $(0.68)$ | 3.82 | $(0.73)$ | 0.14 | 2.67 | 510 | 0.008 | 0.20 |
| 4 | 966 | 2806 | 4.62 | $(0.66)$ | 4.46 | $(0.62)$ | 0.16 | 6.60 | 1579 | 0.000 | 0.25 |
| 5 | 1253 | 1682 | 5.41 | $(0.51)$ | 5.23 | $(0.54)$ | 0.18 | 9.10 | 2767 | 0.000 | 0.34 |
| Average |  |  |  |  |  |  |  |  |  | $\mathbf{0 . 3 6}$ |  |

High Decile vs Low Decile

| Initial <br> stage | No. of <br> high <br> decile | No. of <br> low <br> decile | Final stage high <br> decile | Final stage low <br> decile | Diff | t value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 453 | 791 | $2.03(1.27)$ | $2.77(1.81)$ | -0.74 | -8.44 | 1191 |  | -00.44 |
| 1 | 1532 | 1137 | $20.55(00.97)$ | $20.45(10.01)$ | 00.11 | 20.76 | 2387 | 0.006 | 00.11 |
| 2 | 3182 | 2249 | $30.23(00.93)$ | $30.13(00.93)$ | 00.11 | 40.24 | 4828 | 0.000 | 00.12 |
| 3 | 1574 | 1299 | $30.94(00.67)$ | $30.85(00.68)$ | 00.09 | 30.63 | 2757 | 0.000 | 00.13 |
| 4 | 6520 | 6505 | $40.61(00.61)$ | $40.49(00.65)$ | 00.11 | 100.04 | 12974 | 0.000 | 00.17 |
| 5 | 6839 | 4796 | $50.34(00.51)$ | $50.26(00.58)$ | 00.08 | 70.93 | 9395 | 0.000 | 00.15 |
| Average |  |  |  |  |  |  |  |  | $\mathbf{0 0 . 1 0}$ |

Table C4
Comparison of Final Framework Stages on Addition/Subtraction (SDs in brackets) for Particular Sub-groups at Each Initial Framework Stage in 2003

European vs Māori

| Initial <br> stage | No. of <br> European | No. of <br> Māori | Final stage <br> European | Final stage <br> Māori | Diff | t value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 2416 | 1629 | $2.03(1.56)$ | $1.81(1.33)$ | 0.22 | 4.81 | 3835 | 0.000 | 0.15 |
| 1 | 4933 | 2278 | $2.40(0.97)$ | $2.31(0.97)$ | 0.08 | 3.43 | 4431 | 0.001 | 0.08 |
| 2 | 12749 | 5618 | $3.16(0.97)$ | $3.03(0.97)$ | 0.13 | 8.14 | 10787 | 0.000 | 0.13 |
| 3 | 4474 | 1946 | $3.90(0.73)$ | $3.80(0.79)$ | 0.10 | 5.00 | 3452 | 0.000 | 0.13 |
| 4 | 24685 | 11679 | $4.59(0.63)$ | $4.51(0.72)$ | 0.08 | 10.67 | 20445 | 0.000 | 0.12 |
| 5 | 22516 | 7734 | $5.30(0.58)$ | $5.21(0.72)$ | 0.09 | 10.51 | 11481 | 0.000 | 0.14 |
| Average |  |  |  |  |  |  |  |  | $\mathbf{0 . 1 3}$ |

European vs Pasifika

| Initial <br> stage | No. of <br> European | No. of <br> Pasifika | Final stage <br> European | Final stage <br> Pasifika | Diff | t value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 2416 | 874 | $2.03(1.56)$ | $1.90(1.21)$ | 0.13 | 2.57 | 1980 | 0.010 | 0.09 |
| 1 | 4933 | 1153 | $2.40(0.97)$ | $2.29(0.95)$ | 0.10 | 3.32 | 1756 | 0.001 | 0.10 |
| 2 | 12749 | 2728 | $3.16(0.97)$ | $2.99(0.98)$ | 0.17 | 8.06 | 3955 | 0.000 | 0.17 |
| 3 | 4474 | 1030 | $3.90(0.73)$ | $3.71(0.81)$ | 0.19 | 6.97 | 1433 | 0.000 | 0.25 |
| 4 | 24685 | 4876 | $4.59(0.63)$ | $4.32(0.96)$ | 0.27 | 19.01 | 5732 | 0.000 | 0.38 |
| 5 | 22516 | 2346 | $5.30(0.58)$ | $4.97(1.20)$ | 0.33 | 13.33 | 2463 | 0.000 | 0.49 |
| Average |  |  |  |  |  |  |  |  | $\mathbf{0 . 2 5}$ |

Asian vs Pasifika

| Initial <br> stage | No. of <br> Asian | No. of <br> Pasifika | Final stage <br> Asian | Final stage <br> Pasifika | Diff | t value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | :---: | ---: | ---: | ---: | ---: |
| 0 | 250 | 874 | $2.64(1.80)$ | $1.90(1.21)$ | 0.74 | 6.11 | 316 | 0.000 | 0.53 |
| 1 | 301 | 1153 | $2.55(1.05)$ | $2.29(0.95)$ | 0.25 | 3.81 | 439 | 0.000 | 0.26 |
| 2 | 928 | 2728 | $3.20(0.97)$ | $2.99(0.98)$ | 0.21 | 5.56 | 1616 | 0.000 | 0.21 |
| 3 | 391 | 1030 | $3.91(0.75)$ | $3.71(0.81)$ | 0.20 | 4.30 | 762 | 0.000 | 0.25 |
| 4 | 1743 | 4876 | $4.60(0.68)$ | $4.32(0.96)$ | 0.28 | 13.23 | 4371 | 0.000 | 0.31 |
| 5 | 1841 | 2346 | $5.29(0.71)$ | $4.97(1.20)$ | 0.32 | 10.89 | 3925 | 0.000 | 0.31 |
| Average |  |  |  |  |  |  |  |  | $\boldsymbol{0 . 3 1}$ |

## High Decile vs Low Decile

| Initial <br> stage | No. of <br> high <br> decile | No. of <br> low decile | Final stage <br> high Decile | Final stage <br> Low Decile | Diff | t value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | :---: | ---: | ---: | ---: | :---: |
| 0 | 1068 | 2466 | $2.29(1.70)$ | $1.90(1.33)$ | 0.40 | 6.79 | 1663 | 0.000 | 0.27 |
| 1 | 2182 | 3466 | $2.51(0.99)$ | $2.35(0.99)$ | 0.17 | 6.12 | 4621 | 0.000 | 0.17 |
| 2 | 5960 | 8458 | $3.21(0.97)$ | $3.03(0.97)$ | 0.18 | 11.11 | 12846 | 0.000 | 0.18 |
| 3 | 2073 | 3034 | $3.96(0.71)$ | $3.76(0.81)$ | 0.20 | 9.51 | 4801 | 0.000 | 0.26 |
| 4 | 10340 | 16830 | $4.62(0.62)$ | $4.45(0.81)$ | 0.17 | 19.16 | 25992 | 0.000 | 0.23 |
| 5 | 10032 | 10732 | $5.31(0.55)$ | $5.16(0.90)$ | 0.16 | 15.29 | 18016 | 0.000 | 0.21 |
| Average |  |  |  |  |  |  |  |  | $\boldsymbol{0 . 2 2}$ |

Table C5
Comparison of Final Framework Stages on Addition/Subtraction (SDs in brackets) for Students in Low-decile Schools Involved in the Manurewa Enhancement Initiative Versus Students at all Other Low-decile Schools at Each Initial Framework Stage (2004)
Low-decile Manurewa Enhancement Initiative vs Low-decile non-MEI

| Initial <br> stage | No. of <br> MEI | No. of <br> non-MEI | Final stage <br> MEI |  | Final stage <br> non-MEI |  | Diff | t <br> value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | ---: | :---: | ---: | ---: | ---: | ---: | ---: |
| 0 | 20 | 771 | 1.85 | $(0.93)$ | 2.79 | $(1.82)$ | -0.94 | -4.30 | 23 | 0.000 | -0.52 |
| 1 | 55 | 1082 | 3.00 | $(1.17)$ | 2.42 | $(1.00)$ | 0.58 | 3.62 | 58 | 0.001 | 0.57 |
| 2 | 123 | 2126 | 3.07 | $(0.89)$ | 3.13 | $(0.93)$ | -0.06 | -0.68 | 138 | 0.498 | -0.06 |
| 3 | 59 | 1240 | 4.00 | $(0.56)$ | 3.84 | $(0.69)$ | 0.16 | 2.08 | 67 | 0.041 | 0.24 |
| 4 | 385 | 6120 | 4.61 | $(0.63)$ | 4.49 | $(0.65)$ | 0.12 | 3.64 | 437 | 0.000 | 0.18 |
| 5 | 251 | 4545 | 5.19 | $(0.46)$ | 5.26 | $(0.59)$ | -0.08 | -2.56 | 298 | 0.011 | -0.14 |
| Average |  |  |  |  |  |  |  |  |  |  | $\mathbf{0 . 0 5}$ |

Table C6
Comparison of Final Framework Stages on Each Operational Domain (SDs in brackets) for Each Initial Framework Stage as a Function of Gender in 2004
Addition/Subtraction

| Initial <br> stage | No. of <br> boys | No. of <br> girls | Final stage boys |  | Final stage <br> girls |  | Diff | t <br> value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | ---: | :---: | ---: | ---: | ---: | ---: | :---: |
| 0 | 1153 | 959 | 2.43 | $(1.66)$ | 2.57 | $(1.65)$ | -0.14 | -2.00 | 2046 | 0.046 | -0.08 |
| 1 | 2191 | 2056 | 2.44 | $(1.02)$ | 2.45 | $(0.98)$ | 0.00 | 0.06 | 4243 | 0.949 | 0.00 |
| 2 | 4613 | 4501 | 3.15 | $(0.97)$ | 3.13 | $(0.92)$ | 0.02 | 1.07 | 9108 | 0.285 | 0.02 |
| 3 | 2440 | 2226 | 3.93 | $(0.73)$ | 3.86 | $(0.67)$ | 0.07 | 3.28 | 4664 | 0.001 | 0.10 |
| 4 | 10143 | 11760 | 4.57 | $(0.66)$ | 4.53 | $(0.62)$ | 0.04 | 4.52 | 20887 | 0.000 | 0.06 |
| 5 | 10747 | 10066 | 5.33 | $(0.55)$ | 5.28 | $(0.55)$ | 0.05 | 6.35 | 20754 | 0.000 | 0.09 |
| Average |  |  |  |  |  |  |  |  |  | $\boldsymbol{0 . 0 5}$ |  |

Multiplication/Division

$\left.$| Initial <br> stage | No. of <br> boys | No. of <br> girls | Final stage boys |  | Final stage <br> girls |  | Diff | t <br> value | df | Prob |
| :---: | :---: | :---: | :---: | :---: | ---: | ---: | ---: | ---: | :---: | :---: | | Effect |
| :---: |
| size | \right\rvert\,

Proportion/Ratio

| Initial <br> stage | No. of <br> boys | No. of <br> girls | Final stage boys |  | Final stage <br> girls |  | Diff | t <br> value | df | Prob | Effect <br> size |
| :---: | :---: | :---: | :---: | :---: | ---: | ---: | ---: | ---: | ---: | :---: | :---: |
| 1 | 3293 | 2846 | 4.22 | $(0.75)$ | 4.17 | $(0.70)$ | 0.04 | 2.33 | 6111 | 0.020 | 0.06 |
| $2-4$ | 10639 | 11506 | 4.71 | $(0.81)$ | 4.65 | $(0.77)$ | 0.06 | 5.62 | 21799 | 0.000 | 0.08 |
| 5 | 5584 | 5426 | 5.64 | $(0.78)$ | 5.55 | $(0.75)$ | 0.09 | 6.10 | 11005 | 0.000 | 0.12 |
| 6 | 2964 | 2621 | 6.49 | $(0.69)$ | 6.42 | $(0.66)$ | 0.07 | 4.03 | 5546 | 0.000 | 0.10 |
| 7 | 1398 | 901 | 7.24 | $(0.51)$ | 7.21 | $(0.51)$ | 0.03 | 1.15 | 1916 | 0.249 | 0.06 |
| Average |  |  |  |  |  |  |  |  |  | $\boldsymbol{0 . 0 8}$ |  |

## Appendix D: Stages of the Number Framework

## Stage Zero: Emergent

Students at this stage are unable to consistently count a given number of objects because they lack knowledge of counting sequences and/or the ability to match things in one-to-one correspondence.

## Stage One: One-to-one Counting

This stage is characterised by students who can count and form a set of objects up to ten but cannot solve simple problems that involve joining and separating sets, such as $4+3$.

## Stage Two: Counting from One on Materials

Given a joining or separating of sets problem, students at this stage rely on counting physical materials, such as their fingers. They count all the objects in both sets to find an answer, as in "Five lollies and three more lollies. How many lollies is that altogether?"

## Stage Three: Counting from One by Imaging

This stage is also characterised by students counting all of the objects in simple joining and separating problems. Students at this stage are able to image visual patterns of the objects in their mind and count them.

## Stage Four: Advanced Counting (Counting On)

Students at this stage understand that the end number in a counting sequence measures the whole set and can relate the addition or subtraction of objects to the forward and backward number sequences by ones, tens, and so on. For example, instead of counting all objects to solve $6+5$, the student recognises that " 6 " represents all six objects and counts on from there: " $7,8,9,10,11$."
Students at this stage also have the ability to co-ordinate equivalent counts, such as " $10,20,30$, $40,50, "$ to get $\$ 50$ in $\$ 10$ notes. This is the beginning of grouping to solve multiplication and division problems.

## Stage Five: Early Additive Part-Whole

At this stage, students have begun to recognise that numbers are abstract units that can be treated simultaneously as wholes or can be partitioned and combined. This is called part-whole thinking. A characteristic of this stage is the derivation of results from related known facts, such as finding addition answers by using doubles or teen numbers.

## Stage Six: Advanced Additive Part-Whole

Students at the advanced additive stage are learning to choose appropriately from a repertoire of part-whole strategies to estimate answers and solve addition and subtraction problems. They see numbers as whole units in themselves but also understand that "nested" within these units is a range of possibilities for subdivision and recombining. Simultaneously, the efficiency of these students in addition and subtraction is reflected in their ability to derive multiplication answers from known facts. These students can also solve fraction problems using a combination of multiplication and addition-based reasoning. For example, $6 \times 6$ as $(5 \times 6)+6$.

## Stage Seven: Advanced Multiplicative Part-Whole

Students at the advanced multiplicative stage are learning to choose appropriately from a range of part-whole strategies to estimate answers and solve problems involving multiplication and division. Some writers describe this stage as "operating on the operator". This means than one or more of the numbers involved in a multiplication or division is partitioned and then recombined.

For example, to solve $27 \times 6,27$ might be split into $20+7$ and these parts multiplied then recombined, as in $20 \times 6=120,7 \times 6=42,120+42=162$. This strategy uses the distributive property.

A critical development at this stage is the use of reversibility, in particular, solving division problems using multiplication. Advanced multiplicative part-whole students are also able to estimate answers and solve problems with fractions using multiplication and division.

## Stage Eight: Advanced Proportional Part-Whole

Students at the advanced proportional stage are learning to select from a repertoire of partwhole strategies to estimate answers and solve problems involving fractions, proportions, and ratios. This includes strategies for the multiplication of decimals and the calculation of percentages.

These students are able to find the multiplicative relationship between quantities of two different measures. This can be thought of as a mapping. For example, consider this problem: "You can make 21 glasses of lemonade from 28 lemons. How many glasses can you make using 8 lemons?"
To solve the problem, students need to find a relationship between the number of lemons and the number of glasses. This involves the creation of a new measure, glasses per lemon. The relationship is that the number of glasses is three-quarters the number of lemons. This could be recorded as: $21: 28, \square: 8,21$ is $3 / 4$ of 28 , or $3 / 4$ of 8 is 6 .

# Appendix E (Te Poutama Tau: A Case Study of Two Schools) 

TE PUNA WANANGA
FACULTY OF EDUCATION


THE UNIVERSITY OF AUCKLAND
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## Te Rārangi Patapatai mō te Hunga Tumuaki

## Te Tumuaki

1. E hia tau e mahi ana koe hei kaiako?
2. E hia tau e mahi ana koe hei tumuaki?
3. He aha ngā tohu whakaako kei a koe?
4. Kua uru atu koe i tētahi/ētahi wānanga pāngarau? Whakamāramatia mai.
5. Kei te kaingākaunui koe ki te pāngarau?

## Ngā āhuatatega -ā-iwi, ā-whānau

6. He pēhea āhua o te whanaungatanga i waenganui i te kura me te iwi kāinga, ngā iwi/hapū?
7. He aha ngā kapapori pāpori, kapapori ohaoha (socio-economic background) o ngā tamariki?
He teitei te katoa/te nuinga/ètahi/ruarua noa iho/ kare kau
Kei waenganui te katoa/te nuinga/ètahi/ruarua noa iho/ kare kau
He hakahaka
te katoa/te nuinga/ètahi/ruarua noa iho/ kare kau
8. Te āhua o te whānau. He pēhea te āhua o ngā whānau?

Kotahi anake te matua te katoa/te nuinga/ètahi/ruarua noa iho/ kare kau
Tokorua ngā mātua te katoa/te nuinga/ētahi/ruarua noa iho/ kare kau
He whānau whānui te katoa/te nuinga/ētahi/ruarua noa iho/ kare kau
9. Kōrero ai te whānau i te reo Māori i te kāinga?

I ngā wā katoa te katoa o ngā whānau/ ètahi/ruarua noa iho/ kare kau
I te nuinga o te wā te katoa o ngā whānau/ ètahi/ruarua noa iho/ kare kau
I ètahi wā te katoa o ngā whānau/ ētahi/ruarua noa iho/ kare kau
10. Te takiwā o te kura. He aha te āhua o te takiwā o te kura?

He Rural Minor urban (small town) Major urban (big town/city)

## Te tataunga o te kura

11. What is the school decile?

He teitei (8-10) Kei waenganui (4-7) He hakahaka (1-3)
12. E hia ngā tamariki kei roto i te kura?
13. Ngā Whakaritenga o te pāngarau?
13. I pēhea koe i whakarite a te kura mō te marau pāngarau? Whakamāramatia mai.

## Te Poutama Tau

14. I pēhea koe i tautoko ai ngā pouako hei mahi i Te Poutama Tau?
15. Ki ōu whakaaro, pēhea te neketanga whakamua o tō kura kei roto i Te Poutama Tau?

He tino neke He āhua neke He iti noa Kāore i neke
16. Ki ōu whakaaro e tautoko ana Te Poutama Tau i te piki whakarunga o ngā tamariki kei roto i te pāngarau?

He tino tautoko He āhua tautoko He iti noa Kāore i tautoko
17. Ki ōu whakaaro he aha ngā āhuatanga me ngā whakaritenga o te kura i tino tautoko mai i te piki whakarunga o tōu kura i roto i Te Poutama Tau?
Hei tauira: te tautoko mai o ngā pouako?
te tautoko mai o te whānau?
te matatau o ngā pouako ki te pāngarau?
Te kaingakaunui o ngā tamariki ki te pāngarau?
18. He korero anō āu mo Te Poutama Tau, mo te whakaako rānei i te pāngarau?

## Te Rārangi Patapatai mō te Hunga Tumuaki (Principals' Questionnaire)

(These are indicative questions only)

## Principal

1. How many years have you been teaching?
2. How many years have you been principal?
3. What academic qualifications do you have?
4. Have you done any courses or professional development?
5. What are your own interests in pāngarau?

## Demographic characteristics

6. Iwi identification. Is the school closely connected to iwi/hapū?

One iwi/hapū mixture of iwi/hapū
7. What is the socio-economic background of the tamariki?

| High | All/Most/Some/Few/None |
| :--- | :--- |
| Middle | All/Most/Some/Few/None |
| Low | All/Most/Some/Few/None |

8. Family Type. What are the characteristics of the whānau?

Single Parent All/Most/Some/Few/None
Nuclear family All/Most/Some/Few/None
Extended family All/Most/Some/Few/None
9. Do the whānau speak te reo Māori?

All the time All/Most/Some/Few/None
Most of the time All/Most/Some/Few/None
Sometimes All/Most/Some/Few/None
10. School locality

What are the characteristics of the local area?

$$
\text { Rural } \quad \text { Minor urban (small town) } \quad \text { Major urban (big town/city) }
$$

## School Characteristics

11. What is the school decile?
High (8-10) Medium (4-7) Low (1-3)
12. What is the school roll?
13. How do you organize the school for pāngarau?

## Te Poutama Tau

14. What kinds of support do you provide to teachers for the implementation of Te Poutama Tau?
15. How well do you rate your school's progress in Te Poutama Tau?
16. Do you think Te Poutama Tau has raised general pāngarau achievement?
17. What do you think are the factors that have lead to your school's success in Te Poutama Tau?
For example, teacher support/attitudes, whānau involvement/support, peer (teachers' and students') support, resource quality, facilitator support, and so on.
18. Do you have anything else to add about Te Poutama Tau or mathematics?

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## Te Rārangi Patapatai mō te Hunga Pouako

## Ngā mahi whakaako

1. E hia tau koe e mahi ana hei kaiako?
2. E hia tō roa i tēnei kura?
3. He aha te/nga tohu whakaako kei a koe?
4. Kua uru atu koe ki tētahi atu wānanga pāngarau i kō atu i Te Poutama Tau?
5. He aha te/nga marautanga e tino kaingākautia ana e koe?

## Te āhua o tō akomanga

6. He aha te āhua o tō kura/akomanga i te tau 2003:

- He kura kaupapa Māori?
- He kura rumaki?
- He kura-ā-iwi?
- He akomanga rumaki i te kura auraki?
- He akomanga reo rua?
- He momo kura kē atu?

7. Tokohia nga tamariki i tō akomanga?

5-10 $\quad 11-15 \quad 15-20 \quad 20-30 \quad 30+$
8. He aha te/nga tau kura o nga tamariki i tōu akomanga?

Tau 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
9. E hia tau koe i whakaako i tēnei reanga/karaehe?
10. He pēhea te matatau o tōu karaehe ki te reo Māori?

- He tino matatau te katoa
- He matatau te nuinga
- He āhua matatau te nuinga
- Kāore i te matatau te nuinga

11. He pēhea tō rātau ngakaunui ki te pāngarau i mua mai i Te Poutama Tau?
a. He tino ngakaunui te katoa
b. He ngakaunui te nuinga
c. He āhua ngakaunui te nuinga
d. He iti nei ō rātau ngakaunui
12. He pēhea te whakaaro o nga tamariki ki te pāngarau i naianei?

He ōrite tonu He āhua rerekē He tino rerekē

## Te Whakaako Poutama Tau

13. E hia tau koe e whai atu ana i Te Poutama Tau?
14. I whakahaeretia Te Poutama Tau i te whānuitanga o te kura?

Ae Kao
15. Mehemea ko koe te kaiwhakahaere o Te Poutama Tau ki tō kura, he aha ētahi o nga wharitenga matua mō tēnei kaupapa?
16. He pēhea tō whakaako i te pāngarau i naianei? He rite tonu, he rerekē? Whakamāramatia mai.
17. He aha nga rautaki whakaako o Te Poutama Tau e tino pai ki a koe? Whakamāramatia mai.
18. He aha nga wāhanga tino pai o Te Poutama Tau ki a koe? Whakamāramatia mai.
19. He aha nga wāhanga tino pai o Te Poutama Tau ki ō tamariki?
20. I pēhea koe i whakamahi ai nga rauemi o Te Poutama Tau? Whakamāramatia mai.
21. He aha nga rauemi matua ki a koe? Whakamāramatia mai.

## Te Tautoko o te Kura

22. He pēhea nei te tautoko mai o tōu kura i a koe e whai atu ana i Te Poutama Tau;

- ka tino tautoko
- ka āhua tautoko mai
- kāore e tino tautoko mai i ētahi wā
- kāore i te tino tautoko.

23. He korero anō āu mo Te Poutama Tau, mo te whakaako rānei i te pāngarau?

# Te Rārangi Patapatai mō te Hunga Pouako 

(Teacher's Questionnaire)
(These are indicative questions only)

## Teaching Experience

1. How many years have you been teaching?
2. How many years have you been teaching in this school?
3. What academic qualifications do you have?
4. Have you done any courses or professional development in pāngarau outside of Te Poutama Tau?
5. What are your main curriculum areas?

## Characteristics of class

6. Is/was your class:

- kura kaupapa Māori?
- total immersion school?
- total immersion class in an English-medium school?
- bilingual class?
- another type of class?

7. How many children did you have in your class?
5-10 11-15 15-20 20-30 $30+$
8. What year group were they?

Y1, 2, 3, 4, 5, 6, 7, 8, 9, 10
9. How many years have you been teaching this age group?
10. How would you rate te reo Māori fluency of your class?
11. What is/was the attitude of the children to pāngarau?
12. Has their attitude to pāngarau changed?

## Teaching Te Poutama Tau

13. How many years have you been involved in the Te Poutama Tau project?
14. Do you have school-wide responsibilities for Te Poutama Tau?
15. If you are the lead teacher, what are some of the main factors to consider?
16. Has your own teaching style been affected by Te Poutama Tau?
17. What are some of the effective strategies of Te Poutama Tau?
18. What do you find most effective about Te Poutama Tau? Explain.
19. What aspects of Te Poutama Tau do your children enjoy most?
20. How have you used the equipment?
21. What has been the key equipment?

## School support

22. How has the school supported you in the Te Poutama Tau project?
23. Do you have anything else to add about Te Poutama Tau or mathematics?
