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Australian Curriculum, Assessment and Reporting Authority

Curriculum Mapping Project Phase 4a

Comparing International Curricula against the Australian Curriculum

Final Report

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Document Tracking

Version	Description	Release Date
V1	Revised Report	13/7/11

EXECUTIVE SUMMARY

This paper contains the final report on the International Curriculum Mapping Project commissioned by AEEYSOC and set up by ACARA as part of the development of the Australian Curriculum. The project involves an analysis of similarities and differences between the final Australian Curriculum and international curricula in English, Mathematics and Science.

The jurisdictions selected for international comparison were:

English: Ontario and New Zealand
Mathematics: Singapore and Finland
Science: Ontario and Finland.

The criteria on which these selections were made are discussed in the body of the report. The data on the international curricula are drawn from expert mapping conducted on 21 and 22 September 2010. The data on the Australian Curriculum in Mathematics and Science are drawn from expert mapping conducted from 12-21 November 2010. The data on the Australian Curriculum in English are drawn from expert mapping conducted from 7-17 June 2011. The project was designed to provide international benchmarks against which to evaluate the Australian Curriculum. The project reports will also be useful in the further development of the Australian Curriculum.

A separate report compares the final Australian Curriculum with curricula in each state and territory.

The project involved the development of a survey instrument for each learning area based on a consistent language for describing the learning area, including:

- a language for describing the knowledge base; and
- a language for describing the 'cognitive demand' of each area, consisting of descriptions of what students can do with particular knowledge.

The survey instrument requires those completing the survey to respond on a matrix to indicate whether a curriculum framework being considered:

- includes a specific topic;
- if so, to what extent; and
- at what level of cognitive demand students are expected to operate in relation to that topic.

International mapping

The conduct of mapping of curricula from other countries had some added complexities. The project consultants were asked by ACARA to develop a paper (see Appendix 1) discussing the potential for mapping of international curricula, and advising on how it might be done. The paper recommended that mapping of English, Mathematics and Science was feasible, but that mapping of History was not realistic because of significant content differences between countries.

The second issue discussed in the paper concerned which international curricula should be mapped for comparison purposes. The paper identified a number of criteria to guide

the selection process. The criteria include Mandatory Criteria, which must have been met for the curriculum to be considered and Desirable Criteria, which would be used to discriminate between curricula that met the Mandatory Criteria. The consultants' paper proposed that an initial review be conducted of potential comparison curricula and a paper prepared recommending appropriate curricula in priority order. This further paper (see Appendix 2) recommended the following priority order for countries for comparison mapping:

English	**Mathematics**	**Science**
1. Ontario 2. New Zealand 3. England, Wales and Northern Ireland	1. Singapore 2. Finland 3. Hong Kong	1. Ontario 2. Finland 3. Singapore

The findings were accepted by ACARA, and the top two recommended countries in each learning area were included in the mapping process. International curriculum documents for the mapping process were sourced by the project consulting team. These documents are detailed in the body of the report.

The mapping of curricula from the comparison countries occurred in Sydney on 21-22 September, 2010. Curriculum experts from States and Territories and ACARA were brought together to take part in the mapping process. They were provided with a briefing including the background to the project, and a training session in completing the surveys. The project consultants worked with them to respond to questions and provide advice on the completion of the survey. Each rater was asked to map the Australian Curriculum and two international curricula in the same learning area. The same raters were subsequently asked to remap the final Australian Curriculum following changes made to the September version. This further mapping was conducted from 12-21 November, 2010. On this occasion mapping was undertaken online using the site developed by Education Services Australia.

Subsequently, a repeat mapping of the final English curriculum (but not the other subjects) was undertaken. On this occasion a mostly new and enlarged group of raters was brought together in Sydney on 7 June and provided with a training session and the opportunity to work together and moderate their results. Most raters continued the work during the following days, and the final rater data became available on 17 June.

Data arising from these mapping processes were analysed and compared, then compiled into the present report. Appendix 4 outlines the steps involved in this analysis.

The data in the report have some weaknesses. Despite training sessions and consultant availability to the curriculum experts in the completion of the survey, there were inconsistencies in some survey responses. All data for the international report were collected using the online system, which assisted in ensuring data quality, but it is important to remember that the data arise from expert judgment about curriculum and may be subject to errors of rater interpretation.

Findings

English showed a very high degree of alignment in content topic coverage between Australia and Ontario. Almost all phases of schooling were aligned at extraordinarily high levels, suggesting that the two curricula are as close as is likely to occur in an international comparison. Cognitive demand was also closely aligned between the two

curricula, although Ontario shows a materially greater representation of 'Perform procedures/Explain', and a stronger focus on 'Generate/Create/Demonstrate', while Australia had a stronger focus on 'Memorise/Recall' and 'Evaluate'. The data showed a moderate level of alignment in content topic coverage with New Zealand. The variation occurred markedly in three content topic groups that showed consistent and significant differences. In the case of cognitive demand, across the whole curriculum Australia showed a materially greater representation of 'Evaluate', while New Zealand was much stronger in 'Perform Procedures/Explain'. Australia had a greater overall focus on 'Generate/create…' and 'Analyse/Investigate', while the reverse was true of 'Memorise'.

In Mathematics, alignment in content topic coverage between the Australian Curriculum and the Singapore and Finland curricula were consistently moderate to high. In the case of Singapore, six phases of schooling showed high alignment, while three showed moderate alignment. In the case of cognitive demand, Singapore shows a materially greater focus across the years of schooling on 'Solve non-routine problems/make connections' (most notably in the later primary and early secondary years), while Australia has a materially greater focus on 'Conjecture/generalise'. While there are some areas of misalignment, overall the results suggest that the two curricula are aligned to a significant degree. The results for Finland showed two phases of schooling with high alignment in content topic coverage and one with moderate alignment. Differences are notably in content topic groups which are represented in both countries, but where the level of emphasis is different. The cognitive demand comparison with Finland is similar to that with Singapore in showing a greater focus in Australia on 'Conjecture/ generalise' both overall and at all phases of schooling.

In Science, alignment levels in content topic coverage with Ontario and Finland were mostly moderate, although a significant element in the variation arose from differences in timing rather than differences in curriculum emphasis. Virtually all Ontario phases of schooling were aligned at moderate levels in relation to content topic coverage. In the case of cognitive demand, there were no overall material variations between Australia and Ontario, suggesting a very high level of alignment. All three Finland phases of schooling were aligned in relation to content topic coverage around the boundary between moderate and low alignment. In the case of cognitive demand, Finland showed a materially greater representation of the category 'Communicate understanding of science concepts' and a greater focus on 'Perform procedures/investigate'. Australia showed a greater focus on the higher-order categories of cognitive demand, namely 'Analyse information and advance scientific argument' and 'Apply concepts/make connections'.

Introduction

This paper contains the final report on the International Curriculum Mapping Project set up by ACARA as part of the development of the Australian Curriculum. The project involves an analysis of similarities and differences between the final Australian Curriculum and international curricula in English, Mathematics and Science.

The jurisdictions selected for international comparison are:

English: Ontario and New Zealand
Mathematics: Singapore and Finland
Science: Ontario and Finland.

The criteria on which these selections were made are discussed below. The data on the international curricula are drawn from expert mapping conducted on 21 and 22 September 2010. The data on the Australian Curriculum are drawn from a further mapping process conducted from 12-21 November, 2010 (in Mathematics and Science) and from 7-17 June 2011 (in English). The project is designed to provide international benchmarks against which to evaluate the Australian Curriculum. The project reports will also be useful in the further development of the Australian Curriculum.

This report covers Phases 4 and 4a of the broader Curriculum Mapping Project initiated by ACARA. The first phase of the project involved curriculum experts nominated by each state and territory and ACARA mapping curriculum documents in English, Mathematics, Science and History. Each state or territory document was rated by the experts nominated by that jurisdiction and by those nominated by one other state or territory or ACARA, using the phases of schooling in use for that jurisdiction. Each state or territory provided documents appropriate to the task. The data arising from the expert surveys were then analysed and compiled into an interim report.

In the second phase of the project, each state and territory was invited to nominate teachers to participate in a mapping of the enacted curriculum in that jurisdiction. Six jurisdictions accepted the invitation: ACT, New South Wales, Northern Territory, Queensland, Tasmania and Western Australia. Teachers completed surveys for particular subjects at year levels (rather than phase or stage of schooling). Across Australia, 890 teachers in the six states and territories completed 1196 surveys. Following the completion of the teacher surveys, the results were analysed and combined with the data from the expert surveys to generate a single set of results for each state and territory. For South Australia and Victoria, which did not participate in the teacher mapping, the data in the report were derived from expert mapping only.

The curriculum experts involved in third phase mapping were asked to map three documents each. All participants were asked to map the September version of the Australian Curriculum in one subject. In addition, they mapped two international comparison curricula in the same subject. The jurisdictions selected for international comparison were:

English: Ontario and New Zealand
Mathematics: Singapore and Finland
Science: Ontario and Finland.

The current report is part of Phases 4 and 4a of the project, including two parts:

- This report comparing the final Australian Curriculum with each of the international curricula;
- A report comparing the final Australian Curriculum with curricula in each state and territory, using the same state and territory data as used in the final report on the draft Australian Curriculum. The data drawn from the November 2010 mapping of the Australian Curriculum in Mathematics, Science and History and the June 2011 mapping in English provide the basis for the state and territory comparisons.

The project involved the development of a consistent language for describing each subject addressed in the project, based on a 'uniform language' developed by Porter and colleagues (see Appendix 3 for further information on the source methodology). This includes:

- a language for describing in detail the knowledge base in each of English, science, history and mathematics. This consists of lists of topics arranged in broad content categories in each subject domain. In English, for example, the topic group of 'Language Study' includes topics such as 'spelling' and 'effects of race, gender or ethnicity on language and language use'. In Science, 'ecosystems' and 'adaptation and variation' appear as topics within 'Ecology'. The lists of topics are intended to be complete and universal, so that they could be used to describe any curriculum in the relevant domain, regardless of year level, context or level of complexity; and

- a language for describing the 'cognitive demand' of each area, based on a hierarchy of performance expectations. This consists of descriptions of what students can do with particular knowledge. These descriptions are different for each learning area, though they are based on a similar hierarchy of demands consisting of five levels in categories like the following:
  - memory and recall
  - performing procedures
  - communicating, demonstrating, explaining, creating
  - analysis, argument and investigation
  - evaluation and application in different contexts

A survey instrument was then developed for each subject, based on this 'uniform language'. The survey instrument was used by expert respondents to describe an official curriculum document, and by teachers to describe their teaching programs. The survey instrument requires those completing the survey to respond on a matrix to indicate whether a curriculum framework or teaching program being considered:

- includes a specific topic;
- if so, to what extent; and
- at what level of cognitive demand students are expected to operate in relation to that topic.

This phase of the project was conducted over an extended period. During the third phase of the overall mapping project, curriculum experts from States and Territories and ACARA were invited to take part in mapping curriculum documents. Those nominated were brought together in Sydney on 21-22 September, 2010. They were provided with a briefing including the background to the project, and a training session in completing the surveys. The project consultants worked with them to respond to questions and provide advice on the completion of the survey. The surveys were

completed using the online system developed on behalf of ACARA by Education Services Australia, in a project managed by the project consultants.

A further mapping of the Australian Curriculum was held in November 2010. This fourth phase involved remapping the Australian Curriculum following revisions undertaken to the September draft. Raters involved in phase 3 were asked to undertake a further mapping of the curriculum as at 12 November, 2010 to ensure that the ratings reflected recent changes to the documents. This mapping process occurred in the period 12-21 November. On this occasion, raters were not brought together, since they had been trained and supported in the phase 3 mapping. Instead, mapping was undertaken online, using the site developed by Education Services Australia.

Phase 4a involved remapping the Australian English curriculum because of concerns about the data set in English following the Phase 4 mapping. The Phase 4 mapping of English resulted in a low number of raters completing the task. This led to the decision to remap English with a larger number of raters, included dedicated primary and secondary school raters. The Phase 4a process began on 7 June 2011 with a training session in Sydney. Raters then undertook the mapping process and were able to moderate their results. Most raters continued the work over subsequent days, completing the work by 17 June 2011 at the latest.

This report compares data arising from the phase 4 and 4a mapping of the final Australian Curriculum with data from phase 3 mapping of curricula from international comparison jurisdictions.

International mapping

The conduct of mapping of curricula from other countries had some added complexities. The project consultants were asked by ACARA to develop a paper (see Appendix 1) discussing the potential for mapping of international curricula, and advising on how it might be done. The paper first discussed which subjects were appropriate for international mapping. In summary, the paper recommended that mapping of English, Mathematics and Science was feasible, but that mapping of History was not realistic.

The exclusion of History occurred on the basis that History curricula in different countries strongly reflect local history. Because the mapping methodology requires a rating of specific content as well as cognitive demand, the existence of substantial variations in content makes the methodology inapplicable. The paper also noted that History is less consistently described in curricula in some countries, appearing in different forms (although this issue also applies in Australia, and was not a barrier to completion of the surveys).

The second issue discussed in the paper concerned which international curricula should be mapped for comparison purposes. The paper identified a number of criteria to guide the selection process. The criteria were divided into two categories: Mandatory Criteria, which must be met for the curriculum to be considered; and Desirable Criteria, which would be used to discriminate between the curricula that met the Mandatory Criteria. The criteria are as follows:

<u>Mandatory criteria</u>

1. The curricula for comparison must be written in English.

2. Comparison nations must have a relatively well-established system of universal or near-universal primary and secondary education, at least up to the middle years of secondary schooling.
3. The years of schooling must be broadly comparable with those for Australia.
4. The country from which the curriculum for comparison is provided must be willing to assist in the process.

Desirable criteria

5. Partner nations should have variations in starting ages no greater than those existing in Australia.
6. The curricula for comparison should preferably be national curricula.
7. The curricula for mapping should be mainstream curricula designed to cater for a wide range of normal performance.
8. The curricula for comparison should preferably be articulated at year levels (at least in explanatory or support documents) rather than phases or stages of schooling
9. It would also be desirable for comparisons to be made with nations that have had a degree of success in international assessment programs.
10. Curricula for mapping should be checked for style to ensure comparability.

The consultants' paper proposed that an initial review be conducted of potential comparison curricula and a paper prepared recommending appropriate curricula in priority order. This further paper was prepared (see Appendix 2). The paper discussed each criterion with the exception of criterion 4, which was set aside in the paper because it requires contact with potential comparison jurisdictions, which was not necessary unless the proposal to subsequently involve personnel from the other jurisdictions in the process were pursued.

The recommended countries for comparison were as follows:

English	**Mathematics**	**Science**
1. Ontario 2. New Zealand 3. England, Wales and Northern Ireland	1. Singapore 2. Finland 3. Hong Kong	1. Ontario 2. Finland 3. Singapore

The recommendations were accepted by ACARA, and the top two recommended countries in each subject area were included in the mapping process. The latest version of the Australian curriculum was used to form the basis of the comparison. Documents for the mapping process were sourced by the project consulting team. They are outlined in the table below.

Country and subject	**Documents used**
Australia English, Mathematics, Science	The subject 'Organisation' section, 'Content statements', 'Elaborations and 'Achievement standards' for each of the four subjects in the Australian Curriculum as at 12 November, 2010.
Ontario English	*The Ontario Curriculum Grades 1-8 Language* *The Ontario Curriculum Grades 9-10 English*

New Zealand English	*The New Zealand Curriculum: Achievement Objectives by Learning Area* *The New Zealand Curriculum: Reading and Writing Standards for Years 1-8*
Singapore Mathematics	*Mathematics Syllabus Primary 2007* *Mathematics Syllabus Secondary 2006*
Finland Mathematics	*National Core Curriculum for Basic Education 2004*
Ontario Science	*The Ontario Curriculum Grades 1-8 Science and Technology*
Finland Science	*National Core Curriculum for Basic Education 2004*

The data arising from the expert surveys were then analysed and compiled into this draft report. Appendix 2 outlines the steps involved in this analysis.

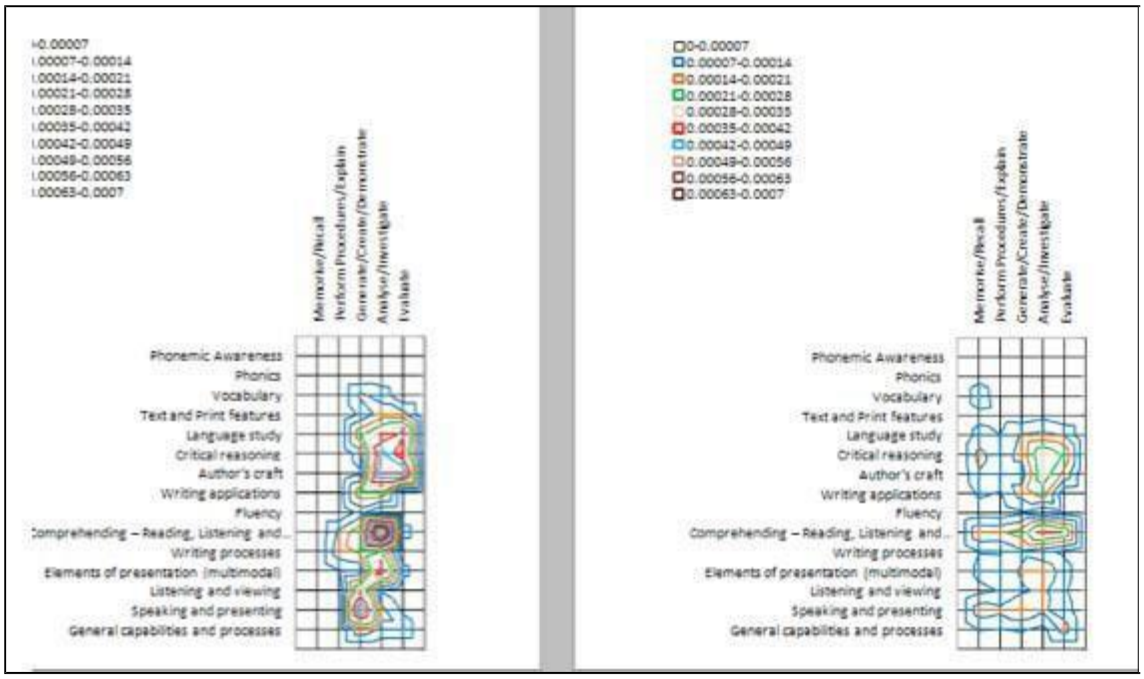
The reports

This report summarises the key findings of the project. These can be found at pages 14-21, organized by subject. They include, for each subject, a table showing topic coverage indices for each country for each phase of schooling. The table for each subject is accompanied by a commentary noting the extent of alignment between the Australian Curriculum and curriculum documents in the other two countries, and identifying those areas where the greatest differences are evident.

The detailed data supporting the findings can be found in the **attachments to this paper**, which are organised by subject. Within each subject, the report analyses data comparing the Australian Curriculum with each comparison country in turn, using the curriculum phases used in each of these countries as the organiser. For each phase for each country, the report includes:

- **Graphs** which represent the outcomes of the mapping processes for the draft Australian Curriculum and the documents mapped for each curriculum phase used in the comparison country. They show the topic and topic group coverage, and the levels of cognitive demand for each of the comparison curriculum phases. The graphs show both the extent of coverage (in simple terms, the area covered by the graph lines) and the extent of emphasis on each topic/topic group and area of cognitive demand (in simple terms, the colour and closeness of the graph lines). The following English graphs show the difference in the spread of the topics covered and the associated extent of emphasis on each topic group and the range of cognitive demands addressed for each topic group.

Australian Curriculum **Comparison curriculum**



These sample English graphs indicate that there is significant overlap between the Australian Curriculum and the comparison curriculum at this phase of schooling. The comparison curriculum has a greater focus on 'Critical reasoning' but a lesser focus on 'Language study'. The analysis suggests a high degree of alignment between the two curricula.

It should be noted that the graphs vary in some cases because one curriculum will have a broader coverage (all topic groups) and another will have a narrower coverage (a predominance of a smaller number of topic groups). This will lead to what seems to be greater intensity of coverage for some topic groups for the second curriculum, because the total coverage for each curriculum is 100%. A second reason for variation is the representation of both topic coverage and cognitive demand. If a topic is associated with high ratings for time on topic and substantial levels of cognitive demand, this will produce more apparent intensity in the graph than a case where the topic is associated with low levels of time on topic and cognitive demand.

In the written discussion (see below), there will often be a reference to the level of coverage shown by the graphs, referring, for example, to 'moderate overlap' between the comparison country graph and the Australian Curriculum graph. This is an attempt to indicate the extent to which the graphs appear to cover a similar curriculum range. This is not the same as the topic coverage index (see below) which might show a 'Low' index despite apparent overlap in the graphs. This is because there will be cases where the different curricula cover the same or similar topic groups, but do so at different levels of intensity, or where each topic group covered is somewhat different in emphasis and the aggregated difference amounts to a significant variation in the topic coverage index.

- **Topic Coverage Indices** for each curriculum phase used in the comparison jurisdiction, represented by a single number less than or equal to 1. The indices provide a measure of the extent to which the comparison curriculum for that

  stage of schooling is aligned with the Australian Curriculum. The index has been calculated by comparing the absolute difference in the proportion of the curriculum

devoted to each topic by the Australian Curriculum and the comparison curriculum. An index number of 1.00 (or 100%) represents an exact alignment. An index of 0 (or 0%) represents no alignment. These indices are summarised in tabular form at the beginning of each subject report (see 1 above) along with a legend indicating the levels of alignment represented by the different numbers.

- **A table showing the percentage of the curriculum devoted to each topic group** in the Australian Curriculum and the relevant comparison curriculum. The percentage of the curriculum devoted to each topic group is listed for the Australian Curriculum and for each jurisdiction.

  The following table relates to the English graphs above:

% of Curriculum devoted to Topic Group	Australian Curriculum	Comparison Curriculum
Phonemic Awareness	0.23%	1.54%
Phonics	0.23%	1.76%
Vocabulary	4.21%	3.56%
Text and Print features	3.97%	3.19%
Language study	10.51%	7.48%
Critical reasoning	10.28%	12.32%
Author's craft	9.46%	10.78%
Writing applications	5.61%	6.82%
Fluency	1.64%	2.20%
Comprehending – Reading, Listening and Viewing	17.17%	16.69%
Writing processes	6.43%	5.57%
Elements of presentation (multimodal)	7.48%	7.77%
Listening and viewing	5.96%	5.39%
Speaking and presenting	11.45%	10.27%
General capabilities and processes	5.37%	4.66%

  The surveys used, showing a full list of topic groups/topics is appended to this report. These tables support a more detailed analysis of differences at the topic group level between the Australian Curriculum and the comparison curriculum. It allows the reader to determine where the important differences lie. In many cases, the extent to which the topic coverage index is below 1 results from the sum of mostly small variations in coverage of the various topic groups. This table is a major component of the brief written analysis (see next point for further discussion, including a set of guidelines for determining the significance of different levels of variation between curricula).

- **A short written discussion** of the key variations between the Australian Curriculum and the comparison curriculum at the level of topic groups. The graphs and this written discussion provide some explanation as to why the topic coverage index is at the level indicated. In the written discussion, the following guidelines have been adopted:

  - a difference of more than 4% between the topic group coverage percentage indicated for the Australian Curriculum and the percentage

indicated for the relevant comparison curriculum (eg a difference between 2.1% and 6.4%) is regarded as significant and is referred to in the written commentary;

- a difference of more than 2% but less than 4% is regarded as worth noting but as falling with an acceptable range of variation, and is referred to in the written commentary;

- a case where one framework has a result above 2% and the other has a result of 0% (ie the topic is not represented in that framework at that level), is regarded as material and is referred to in the written commentary;

- differences smaller than 2% are regarded as not material, and are not referred to in the written commentary.

- **A discussion of relative cognitive demand** in the subject as represented in the Australian Curriculum and the comparison curriculum. This includes graphic representation of the relative representation of cognitive demand at each phase in the subject and in the subject overall. It also includes a table of percentages of each element of cognitive demand at each phase which are the basis for the graphic representation. In the written discussion, the following guidelines have been adopted:

  - a difference of more than 10% in cognitive demand percentage indicated for the Australian curriculum and the percentage indicated for the relevant comparison curriculum is regarded as significant and referred to in the written commentary
  - a difference of more than 5% but less than 10% is regarded as worth noting but as falling within an acceptable range of variation and is referred to in the written commentary
  - a case where one curriculum has a result above 5% and the other has 0% is regarded as material and referred to in the written commentary
  - differences smaller than 5% are not regarded as material and hence not referred to in the commentary.

  The data in the report have some weaknesses. Despite training sessions and consultant availability to the curriculum experts and teachers in the completion of the survey, there were inconsistencies in some survey responses. All data for the international report were collected using the online system, which assisted in ensuring data quality, but it is important to remember that the data arise from expert judgment about curriculum and may be subject to errors of rater interpretation.

ENGLISH

This section of the report is based on the expert mapping of the final version of the English curriculum documents for Australia and the two comparison curricula, Ontario and New Zealand. It includes an account of overall results for Australia and the two comparison curricula, and some discussion of any significant differences in coverage.

The table below shows in summary form the topic coverage indices for all phases of the two comparison curricula for English.

Year Level	Ontario	New Zealand
P	0.73	0.59
Yr 1		
Yr 2	0.84	
Yr 3	0.84	0.65
Yr 4	0.86	
Yr 5	0.87	0.68
Yr 6	0.87	
Yr 7	0.87	0.70
Yr 8	0.88	
Yr 9	0.88	0.64
Yr 10	0.89	

It is the view of the consultants that the significance of index levels is as follows (note that the colours used in the legend below are also used to indicate coverage indices in the table above):

Index	Level of alignment
Above 0.8	Very high
0.7-0.8	High
0.6-0.7	Moderate
0.5-0.6	Low
Below 0.5	Very low

In English, the alignment level with Ontario was extraordinarily high, especially for an international comparison. Apart from the first phase, all levels were aligned at a very high level, in one case as high as 0.89, which is the highest level achieved throughout the project. The average alignment across all year levels was 0.85. This suggests that the two curricula are exceptionally close in key respects.

The comparison with the New Zealand curriculum shows lower alignment. The average alignment across all levels was 0.65 (moderate alignment), with one phase showing low alignment, three showing moderate alignment and one just into the high range.

This suggests that in English, there is a very high degree of alignment between Australia and Ontario, and moderate alignment with New Zealand.

At a more detailed level, (see Appendix 5) the data show results for topic groups by comparison curriculum and by phase. From this data, the following findings emerge:

1. It was notable that the graphs of the Ontario-Australia comparisons showed very similar patterns. In most cases the high levels of alignment were reflected not only in coverage of topic groups, but also in similar levels of intensity of coverage, and in similar breadth of cognitive demand. This means that the two curricula outline very closely related programs in terms of both curriculum content and cognitive demand.

2. Remarkably, there were only three occasions in the entire Australia-Ontario comparison where a topic group fell outside an acceptable range of difference (ie a difference of more than 4% in the percentage of the curricula devoted to the topic group). All occurred in the early years of schooling and in all three cases the difference concerned a higher representation of 'Phonics' in the Australian Curriculum at the first three phases (F-1,2 and 3). Apart from these isolated examples, all topic groups at every level fell within an acceptable range of difference.

3. The analysis of cognitive demand also shows similarities between Australia and Ontario, although there were more areas of material difference. Ontario has a materially greater representation across the curriculum of 'Perform procedures…'. Australia has a greater focus on 'Memorise/Recall' and 'Evaluate' overall and at a number of levels, while Ontario has a greater focus on 'Generate/Create…' overall and at a number of levels.

4. In summary, this means that the curricula for Ontario and Australia are as close as is likely to occur in an international comparison.

5. In the case of New Zealand, the lower levels of alignment can be tracked in significant part to three topic groups that showed material variations in a consistent direction across a number of year levels. The most striking difference occurred in 'Comprehending – Reading, Listening and Viewing' and 'Elements of presentation (multimodal)', which were materially stronger in New Zealand at all five phases. 'Speaking and presenting' was almost as consistently strong in Australia across all phases. These topic groups appear to show significant and consistent differences in emphasis between the two curricula. 'Critical reasoning' was also stronger in New Zealand, though not to the same extent.

6. In the case of cognitive demand, across the whole curriculum Australia showed a materially greater representation of 'Evaluate', while New Zealand was much stronger in 'Perform Procedures/Explain'. Australia had a greater overall focus on 'Generate/create…' and 'Analyse/Investigate', while the reverse was true of 'Memorise'.

7. It is important to note that higher or lower levels of alignment are not in themselves measures of quality. They are, to a significant extent, measures of similarity in curriculum coverage and structure. The English data suggest that the Australian curriculum is notably similar to the Ontario curriculum, but has important and identifiable differences from New Zealand.

MATHEMATICS

This section of the report is based on the expert mapping of the final version of the Mathematics curriculum documents for Australia and the two comparison curricula, Singapore and Finland. It includes an account of overall results for Australia and the two comparison curricula, and some discussion of any significant differences in coverage.

The table below shows in summary form the topic coverage indices for all phases of the two comparison curricula for Mathematics.

<table>
<tr><th>Year Level</th><th>Singapore</th><th>Finland</th></tr>
<tr><td>P</td><td rowspan="2">0.75</td><td rowspan="4">0.70</td></tr>
<tr><td>Yr 1</td></tr>
<tr><td>Yr 2</td><td>0.73</td></tr>
<tr><td>Yr 3</td><td>0.74</td></tr>
<tr><td>Yr 4</td><td>0.71</td><td rowspan="3">0.72</td></tr>
<tr><td>Yr 5</td><td>0.72</td></tr>
<tr><td>Yr 6</td><td>0.68</td></tr>
<tr><td>Yr 7</td><td>0.72</td><td rowspan="4">0.63</td></tr>
<tr><td>Yr 8</td><td>0.67</td></tr>
<tr><td>Yr 9</td><td rowspan="2">0.66</td></tr>
<tr><td>Yr 10</td></tr>
</table>

It is the view of the consultants that the significance of index levels is as follows (note that the colours used in the legend below are also used to indicate coverage indices in the table above):

Index	Level of alignment
Above 0.8	Very high
0.7-0.8	High
0.6-0.7	Moderate
0.5-0.6	Low
Below 0.5	Very low

In Mathematics, levels of alignment across the two comparison curricula ranged consistently between moderate and high, with a highest alignment index of 0.75 and a lowest index of 0.66. In the case of Singapore, six phases showed high alignment while three showed moderate alignment. The average alignment across the whole curriculum was 0.71. In the case of Finland, two phases showed high alignment and one showed moderate alignment, with an average alignment of 0.68

This suggests that in Mathematics, alignment between the Australian Curriculum and the Singapore and Finland curricula is consistently moderate to high. The Australian curriculum is broadly consistent with the curricula from the other two countries at the global level.

At a more detailed level, (see Appendix 6) the data show results for topic groups by comparison curriculum and by phase. From this data, the following findings emerge:

1. In the case of Singapore, a number of topic groups showed material variations between the two curricula. The Australian curriculum has a significantly greater representation of 'Number sense…'. At K-1, Year 6 and Year 8 this difference is marked. 'Measurement' is also better represented in Australia, notably at K-1, and Years 4, 5 and 8. 'Instructional technology' appears earlier in the Australian curriculum and is better represented at every year level from Year 2 onwards.

2. Conversely, Singapore has a significantly greater representation of 'Operations' up to Year 5 and on average across the years of schooling. The story is similar with 'Geometric concepts', which constitutes a major focus in Singapore from the beginning of schooling. The group is also present throughout the Australian curriculum at a material level, but at a lower level.

3. Other differences, while less substantial, do reveal some patterns. Australia introduces 'General capabilities and processes' earlier, and has a greater continuing focus, than in Singapore. The same is true of 'Probability', which appears through the Australian curriculum, but only in secondary school in Singapore. 'Basic algebra' is similarly present in both curricula in primary school, but stronger in Singapore in secondary.

4. In about half of the topic groups, the overall difference between the two countries over the years of schooling is negligible. While the topic groups noted above do show patterns of difference, the overall position is that the Australian and Singapore mathematics curricula show acceptable levels of alignment.

5. In the case of Finland, the differences are similar in scale. It is notable that the largest differences occur in those topic groups that have a material representation in both curricula. In most cases, it is not that one country makes a dramatically different set of choices about the focus of mathematics, but that where both countries see a topic group as a priority, one spends somewhat more time on the area.

6. It is worth noting however, that for the three topic groups where Finland shows a materially greater representation than Australia, the direction of difference was the same as in the comparison with Singapore. The greatest variation occurs in 'Geometric concepts'. Here, Finland spends materially more time on the topic group, though it is the third most prevalent topic group in the Australian curriculum. 'Operations' is more evident in the Finnish curriculum, but it is also the fourth most prevalent group in the Australian curriculum. 'Basic algebra' is also stronger in Finland overall, but stronger in Australia in the early years. These three topic groups were also stronger in the Singapore curriculum than in Australia.

7. The Australian curriculum is notably stronger in 'Data displays' throughout schooling, and in 'Probability', especially in the primary years. 'Consumer applications', 'Instructional technology' and 'General capabilities and processes' are also somewhat more evident in Australia, but the differences are less material.

8. Again, as with Singapore, about half of the topic groups show negligible patterns of difference, and alignment across the two curricula is at acceptable levels throughout the years of schooling.

9. In the case of cognitive demand, Singapore shows a materially greater focus across the years of schooling on 'Solve non-routine problems/make connections' (most

notably in the later primary and early secondary years), while Australia has a materially greater focus on 'Conjecture/generalise'. The comparison with Finland shows a similarly greater focus in Australia on 'Conjecture/ generalise' both overall and at all phases.

SCIENCE

This section of the report is based on the expert mapping of the final version of the Science curriculum documents for Australia and the two comparison curricula, Ontario and Finland. It includes an account of overall results for Australia and the two comparison curricula, and some discussion of any significant differences in coverage.

The table below shows in summary form the topic coverage indices for all phases of the two comparison curricula for Science.

<table>
<tr><th>Year Level</th><th>Ontario</th><th>Finland</th></tr>
<tr><td>P</td><td rowspan="2">0.62</td><td rowspan="6">0.60</td></tr>
<tr><td>Yr 1</td></tr>
<tr><td>Yr 2</td><td>0.63</td></tr>
<tr><td>Yr 3</td><td>0.65</td></tr>
<tr><td>Yr 4</td><td>0.67</td></tr>
<tr><td>Yr 5</td><td>0.67</td></tr>
<tr><td>Yr 6</td><td>0.69</td><td rowspan="2">0.59</td></tr>
<tr><td>Yr 7</td><td>0.70</td></tr>
<tr><td>Yr 8</td><td>0.67</td><td rowspan="3">0.63</td></tr>
<tr><td>Yr 9</td><td>0.65</td></tr>
<tr><td>Yr 10</td><td>0.64</td></tr>
</table>

It is the view of the consultants that the significance of index levels is as follows (note that the colours used in the legend below are also used to indicate coverage indices in the table above):

Index	Level of alignment
Above 0.8	Very high
0.7-0.8	High
0.6-0.7	Moderate
0.5-0.6	Low
Below 0.5	Very low

In Science, alignment levels with both Finland and Ontario are lower than with comparison curricula in Mathematics. In the case of Ontario, alignment indices are relatively consistent across all year levels, ranging between 0.64 and 0.73. Five levels demonstrate high alignment and five moderate alignment. The alignment with Finland is also clustered, though at somewhat lower levels (0.59-0.66), with two levels showing moderate alignment and one just falling into the low category. Ontario alignment levels are all moderate or high.

This suggests that alignments levels in Science are largely moderate, and somewhat lower than in the other two subjects, taken as a whole.

At a more detailed level, (see Appendix 7) the data show results for topic groups by comparison curriculum and by phase. From this data, the following findings emerge:

1. The alignment of the Australian Science curriculum with that of Ontario is generally at acceptable levels, almost completely in the 'Moderate' range. A notable cause of this concerns the sequencing of elements of the science curriculum. This is particularly evident in the number of topic groups that appear at a material level in one curriculum at a level, but not in the other.

2. There are two broad possible explanations for this phenomenon. The first is that the two curricula simply focus on different aspects of science. The second is that while they focus on similar aspects of science, they time and sequence them differently. The data support the second explanation. An examination of the prevalence of different topic groups across all the years of schooling reveals that there are no topic groups showing a material difference in overall coverage. The topic group with the greatest variation is 'Nature of science' where Australia has a greater focus across the curriculum than Ontario but the difference is not material. All topic groups show a relatively consistent overall coverage across the two curricula.

3. This makes clear that the material difference between Ontario and Australia in Science is sequencing. Some examples illustrate the point. 'Evolution' receives its greatest focus in Australia at Years 7 and 10. In Ontario it is virtually absent from 7-10, but represented in the primary years, especially Grade 6. 'Animal biology' is much better represented in Ontario at Grades 1, 2 and 10, but the reverse is true at most other years of schooling. 'Human biology' receives a major focus on Ontario at Grade 5 (where is almost unmentioned in the Australian curriculum) and Grade 10, but is a focus in Australia at Years 8 and 9. 'Ecology' is a major focus in Ontario at Grades 4 and 7 but in Australia at Years 6 and 8.

4. The differences between the two curricula are virtually all to do with the timing and sequencing of topics, and hardly at all to do with significantly different overall emphases. There are, however, two topic groups which show relatively consistent differences. 'Nature of science' shows a somewhat greater representation of the topic group in Australia at every year level, the difference being especially marked at Years 5 and 6. This suggests a real difference in approach between the two countries, and a more explicit focus in this country on ideas about the practice of science. While the difference is less dramatic, 'Measurement and calculation in science' is also better represented in Australia at all levels except Years 8 and 9.

5. There are, therefore, some topic groups where there does appear to be a variation in the value attributed to them by the two countries. In general, however, Australia and Ontario have made closely related decisions about what students should learn, but somewhat different decisions about when they should learn each topic group. This suggests that taking the curriculum as a whole, the levels of agreement between Ontario and Australia about the Science curriculum are very high.

6. In the case of Finland, alignment levels are somewhat lower, but this difference is not strongly evident at the topic group level, partly because there are more groups and so fewer cases where a small number of groups dominate the coverage. The greatest variation occurs in the case of 'Earth systems' and 'Ecology' which are substantially better represented in the Australian curriculum at all levels. Finland shows somewhat stronger representation of 'Science, health and environment', 'Human biology', 'Energy', 'Chemical reactions and formulas' and 'General capabilities and processes' at all levels of schooling.

7. There are also isolated cases where there are significant differences in sequencing, but not in overall emphasis. 'Components of living systems' for example, is stronger in Finland in the early years, but this is reversed from Year 5 onwards. 'Astronomy/space' is stronger in the early and later years in Australia, but the reverse is true in the middle years. These differences appear to be variations in timing rather than emphasis.

8. Despite the somewhat lower levels of overall alignment, it is notable that 15 of the 29 topic groups show negligible levels of variation between Australia and Finland across the years of schooling. While the indices show moderate levels of alignment between the Finnish and Australian science curricula, it seems that the material variation is largely confined to a small number of topic groups.

9. In the case of cognitive demand, it is notable that there are no overall material variations between Australia and Ontario in science. Even at specific years levels, there are very few examples of material variation. This suggests a very high degree of alignment in cognitive demand. The position with Finland is, however, different. Finland has a materially greater representation of 'Communicate understanding of science concepts' and a greater focus on 'Perform procedures/investigate'. Australia has a greater focus on both 'Analyse information and advance scientific argument' and 'Apply concepts/make connections'.

APPENDIX 1: INTERNATIONAL MAPPING PROPOSAL

Introduction
The draft Australian curricula for English, mathematics, science and history, K-10, have been mapped to both the curriculum documentation in each of the states and territories and to what a significant sample of teachers around Australia actually teach. ACARA now seeks a proposal for the conduct of a mapping process to compare the Australian Curriculum with international peers. It is anticipated that the process would be conducted using the final released version of the curriculum. This proposal concerns the four subjects developed as part of Stage 1.

Issues to resolve
There are two issues to consider prior to the development of a detailed proposal. The first concerns which subjects would be able to be mapped internationally. The second concerns the identification of appropriate international peers.

Which subjects?
Of the four subjects developed to date, it is likely that mathematics would be most amenable to international comparison. This reflects the fact that mathematics is subject to considerable international commonality and is not unduly affected by cultural matters. The review of the Porter survey instrument for mathematics led to relatively limited changes to suit Australian curriculum although it was clear that the Australian reviewers (nominated by ACARA) felt that the changes were worth making. It is likely that the instrument would be useable internationally, but this would need to be resolved with potential international partners if they were to be involved in the mapping process.

Science is also likely to be generally comparable internationally, although there are some variations in subject arrangements that could make the comparison more difficult in some jurisdictions. In Hong Kong, for example, primary school science is incorporated in General Studies, which also includes Social Studies and Health Education. In Singapore, science is not taught until Year 3. These variations would make the form of international mapping in science more problematic, but ways could be found to accommodate them.

English should also be manageable for international mapping, though it may be somewhat more difficult than mathematics. English teaching is somewhat more culturally specific than mathematics, in that the theoretical framework of English teaching is somewhat culturally specific, and it is possible that some approaches and references might be unfamiliar to some international curriculum raters. The Australian survey, for example, includes elements to do with Viewing (eg 'screen conventions' under Text and print features) which were not part of the US survey and which may not be familiar to raters in other countries. The Australian version also includes more material related to a view of English as culturally located, such as 'Use of language to generate different responses' and 'Relationship of form and structure of language use to cultural context' (both under Language study) which may not be as familiar to international raters. These differences are, however, relatively minor and could be accommodated by noting them for international raters.

A further issue potentially affecting English concerns some of the likely peer nations. Singapore and Hong Kong, for example, have student cohorts for whom English is not always their first language, and it is possible that their curriculum documents in English are affected by the need to deal with multiple official languages. This could make mapping a less useful exercise. On the other hand, these are two of our natural regional peers, and would provide valuable comparisons.

In the case of history, the survey instrument was almost completely rewritten for Australian use. It was clear that the Porter survey would not be suitable to mapping history in this country because of the volume of Australia-specific material contained in the draft curriculum document. This issue will recur in any international mapping process, and is likely to make any international history mapping impossible except by using a generic survey stripped of content identifiers. This is not likely to be a useful approach. This difficulty is exacerbated by the limited extent to which history is identified as a separate subject in some primary school curricula. In Singapore it is part of Social Studies in the primary years. In Hong Kong it is part of General Studies in primary schools.

On the basis of this analysis, it is proposed that international mapping of English, mathematics and science would be feasible, but that history is not feasible.

Which international peers?

The second issue requiring resolution concerns which countries would provide appropriate and feasible comparison curriculum documents. The discussion below is intended to provide a basis for the establishment of a short list of criteria, some of which should be mandatory and some of which constitute preferences. These criteria should guide the choice of international mapping partners.

Mandatory criteria

1. The curricula for comparison must be **written in English**. It is not realistic to compare curricula across linguistic boundaries. Apart from those cases where the curriculum is written in a language other than English, there are cases where English is not the medium of instruction in schools (eg Hong Kong), or where English is the medium of instruction but most students have a different mother tongue (eg Singapore). It will be important to determine the extent to which variations of this kind would affect the validity of the comparison.

2. Comparison nations must have a relatively **well-established system of universal or near-universal primary and secondary education**, at least up to the middle years of secondary schooling. In India, for example, fewer than 40% of adolescents attend secondary school, half of India's students leave school by 14 and half of 10-year-old children cannot read at a basic level. These circumstances mean that a curriculum mapping comparison would be less meaningful and would carry little weight with users of the data.

3. The **years of schooling must be broadly comparable** with those for Australia. It is worth noting that PISA, for example, avoids this problem by sampling students by age rather than by year of schooling. Table 1 below illustrates some of the variations in equivalent year levels up to Australia's Year 10 between some natural comparison systems. It illustrates some practical difficulties in the development of international comparisons, although it also demonstrates that the difficulties largely occur in the first year or two of schooling. On the basis of the data below, it is proposed that each of these curricula would be suitable for mapping because the differences are relatively minor.

Australia	England and Wales	USA	Hong Kong
K	Reception	Kindergarten	Kindergarten
	Year 1		Primary 1
Year 1	Year 2	Grade 1	Primary 2
Year 2	Year 3	Grade 2	Primary 3
Year 3	Year 4	Grade 3	Primary 4
Year 4	Year 5	Grade 4	Primary 5
Year 5	Year 6	Grade 5	Primary 6
Year 6	Year 7	Grade 6	Form 1
Year 7	Year 8	Grade 7	Form 2
Year 8	Year 9	Grade 8	Form 3
Year 9	Year 10	Grade 9	Form 4
Year 10	Year 11	Grade 10	Form 5

Table 1: Comparative Years of Schooling

4. **The country** from which the curriculum for comparison is provided **must be willing to assist in the process**. The evidence from the state and territory expert mapping process is that even individuals with strong curriculum backgrounds and experience in subject areas find it difficult and time-consuming to understand the conceptual framework and style of specification in an unfamiliar curriculum. The expert mapping would have been significantly more difficult if it were not for the participation of experts from each of the jurisdictions in the process, assisting those unfamiliar with their curriculum documents. Even the determination of which document(s) to use was problematic. In Australia, curriculum documents have relatively similar provenance and many share common approaches (eg phase or stage specification and an outcomes basis). In cases where such difficulties are exacerbated by different national traditions and assumptions, the problems would be magnified, and the participation of personnel from the comparison states would be essential.

Desirable criteria

5. An issue related to the year level structure (see 3 above) concerns school starting ages, which is also an issue in Australia. While this issue does not directly affect comparisons of curricula, it might indirectly affect what is included in curricula, especially during the early years. Children start school at four in Ireland, but at five in England, Scotland and Wales (although in England and Wales, many children start at four). In the Netherlands, schooling is compulsory from the age of five, but many children start before this. In New Zealand, Denmark, France and Germany, schooling starts at six. In Norway, children must start school in the year they turn seven, while schooling starts at seven in Sweden and Finland. In the United States, as in Australia, starting age is determined by each state or territory, and they differ substantially, although thirty-eight states now have cut-off dates requiring children entering kindergarten to be five years old before October 16 in the year before they enter school. On this basis, it is proposed that **partner nations should have variations in starting ages no greater than those existing in Australia**.

6. The curricula for comparison should preferably be **national curricula**. While it would be possible, for example, to select one or more of the state curricula in the United States or the provincial curricula in Canada, this would probably not have the status of

comparisons involving national curricula, and could provide additional barriers to comparison (eg local specificity). These curricula are, however, easily available for mapping and would have considerable structural and other similarities to Australian curricula, making the process more manageable. It should be noted that the involvement of American states in the process could raise an issue about the adaptation of the Porter methodology and survey instruments, since some would have participated in mapping using the original methodology and surveys. It could also, however, be valuable because of the potential availability of trained raters (and possibly of existing data for a large proportion of the survey items).

7. A further complication concerns the extent to which countries have differentiated curricula, especially in the secondary school. In Singapore, the results of the Primary School Leaving Examination determine which of four secondary education tracks students enter. Each track has its own curriculum structure. This makes the identification of the appropriate curriculum for mapping more difficult. It is proposed that **curricula for mapping should be mainstream curricula designed to cater for a wide range of normal performance**.

8. The curricula for comparison should preferably be **articulated at year levels** (at least in explanatory or support documents) rather than phases or stages of schooling. In the Australian mapping, the comparison of the year level basis of the Australian Curriculum with phase- or stage-based state and territory curricula was managed through the use of an algorithm to enable the comparison. While this approach works, it adds an additional layer of complexity in the process. International comparisons will already involve additional degrees of difficulty and complexity, and it would be best to avoid unnecessary additional complications.

9. It would also be desirable for comparisons to be made with **nations that have had a degree of success in international assessment programs**. There is little point in a comparison with a nation that has been identified as performing poorly by comparison with Australia, in part because the comparison will carry less weight with users.

10. There may also be an issue in some cases about the style in which the curriculum is written, and its accessibility to international raters. This is a marginal issue, but it is proposed that **curricula for mapping should be checked for style to ensure comparability**. This extract from the Scottish Curriculum for Excellence document for Literacy and English at the second curriculum level (covering learning up to the end of Primary year 7) illustrates a style issue which may affect the mapping process:

    > As I listen or watch, I can identify and discuss the purpose, main ideas and supporting detail contained within the text, and use this information for different purposes.

As the set of issues identified above makes clear, the identification of partner nations with which to compare curricula is complex. There are almost no curricula that satisfy all of the criteria and preferences above. Singapore comes close. Its curriculum is written in English (as well as Chinese), it has broadly similar arrangements for schooling, children start school at 6-7 but have two years of Kindergarten before, it has a national curriculum, it does well in international comparisons, has a well-established universal education system and its curriculum is written in a familiar style. Its curriculum is not, however, clearly aligned with year levels, and it has differentiated curricula for different tracks.

It is proposed that a review be undertaken to determine which curricula have the highest degree of alignment with the criteria and preferences outlined above, that a selection of these

be made and that selected countries be approached to determine their interest in taking part in international mapping.

The extent to which, and the means by which, resulting data would be published or otherwise disseminated might affect the participation of other nations. It is likely that participating nations would want the capacity to check the data before finalisation, and to exercise a degree or control over the public use of data arising from the mapping of their curricula.

Process for mapping

In principle, it would be possible to adopt a range of different options for the conduct of the mapping process. These could include:

- A model based directly on the Australian expert mapping process, with international systems taking the place of states and territories. This is the preferred model discussed in more detail below.
- A model involving each participating system mapping its own curriculum in situ, along with one other curriculum, and submitting completed surveys. This would require a training session in each participating country and assistance with survey completion. It would be more difficult for participating experts to complete surveys of curricula with which they were not familiar because of the absence of expert advice from those familiar with the curriculum being mapped. This model is easier and less expensive to set up but is likely to produce less reliable data.
- A model involving completion of all surveys by Australian experts from states and territories (and ACARA if desired), followed by some checking process involving experts from the participating systems. This approach would be the easiest and cheapest to implement, and could probably draw on at least some experts already familiar with the methodology, providing them with a valuable professional development experience. The lack of involvement in the survey process of experts from the participating jurisdictions would, however, substantially weaken the process. It is difficult to see why other systems would agree to a process of this kind, since it puts responsibility for mapping their curricula (and using the results) in other hands.

Variations could be developed around each of these models. On balance, however, based on the integrity of the process, the first model is recommended. The conduct of international mapping should be based as far as possible on the existing Australian methodology, and must use the Australian surveys so the data is directly comparable. The process should include the following elements:

- Involvement of personnel from each of the participating systems in the mapping process. This is designed to ensure that the curricula to be mapped are well understood and that personnel who are familiar with each document are available to assist other raters in making judgments. In the Australian mapping process, it was clear that some raters found it difficult to grasp the conceptual organisation of curricula from other jurisdictions and that this affected their capacity to make reliable judgments. This difficulty may be greater with international raters and curricula.
- Face-to-face training to ensure that all raters understand the methodology. In the Australian experience, even with face-to-face training some raters found it difficult to understand and apply the methodology.
- Allocation of raters to their own and one other curriculum to ensure that each curriculum is rated by experts who are familiar with it, and by experts who are independent.
- Engagement of raters for at least three full days to allow them to become familiar with the methodology and to practice the rating process prior to completion of a survey. In the Australian case, although most raters were involved for at least two full days, some took

a considerable time to master the methodology and some found it impossible to complete two full surveys in the time available. Following the training and survey completion session, it was difficult to persuade raters to complete and submit unfinished surveys.

- Use of the online survey process to simplify and systematize the process.

The consultants who took responsibility for the Australian mapping, or by others nominated by ACARA could manage such a process.

In addition, it will be necessary to develop a means for involving participating countries. This process should involve the preparation of a statement about how countries were selected for invitation to participate, a detailed summary of the process to be involved, the expectations of participants and the rules governing the publication and use of the resulting data.

Recommendations

11. That if ACARA decides to proceed with an international mapping process, the procedure for the Australian expert mapping process be adopted.

12. That the international mapping process focus on English, mathematics and science at Years K-10.

13. That a review be undertaken to determine which international curricula have the highest degree of alignment with the criteria and preferences outlined above, that a selection of these be made and that selected countries be approached to determine their interest in taking part in international mapping.

14. That a protocol be prepared for participating jurisdictions outlining:
    - how countries were selected for invitation to participate;
    - the process to be involved including required elements;
    - expectations of participants; and
    - rules governing how data from the survey would be quality assured and how control of publication, dissemination and use would be managed.

APPENDIX 2: INTERNATIONAL MAPPING REPORT

Introduction

ACARA has decided to map the final version of the Australian Curriculum in English, Science and Mathematics against selected international curricula to provide benchmarks for the new curriculum. It was resolved not to map History because of substantial content differences between countries. This paper provides advice on which international curricula are most appropriate to the task.

Criteria

The consultants prepared a paper at the request of ACARA setting out, inter alia, criteria for the selection of international comparison curricula and arguments for the adoption of these criteria. The criteria were divided into two categories: Mandatory Criteria, which must be met for the curriculum to be considered; and Desirable Criteria, which would be used to discriminate between the curricula that met the Mandatory Criteria. The criteria are as follows:

Mandatory criteria

11. The curricula for comparison must be **written in English**.

12. Comparison nations must have a relatively **well-established system of universal or near-universal primary and secondary education**, at least up to the middle years of secondary schooling.

13. The **years of schooling must be broadly comparable** with those for Australia.

14. **The country** from which the curriculum for comparison is provided **must be willing to assist in the process**.

Note that criterion 4 has been ignored in this paper, because it requires contact with potential comparison jurisdictions, which is not necessary until a later stage of the process.

Desirable criteria

15. **Partner nations should have variations in starting ages no greater than those existing in Australia**.

16. The curricula for comparison should preferably be **national curricula**.

17. The **curricula for mapping should be mainstream curricula designed to cater for a wide range of normal performance**.

18. The curricula for comparison should preferably be **articulated at year levels** (at least in explanatory or support documents) rather than phases or stages of schooling

19. It would also be desirable for comparisons to be made with **nations that have had a degree of success in international assessment programs**.

20. **Curricula for mapping should be checked for style to ensure comparability**.

The consultants' paper proposed that an initial review be conducted of potential comparison curricula and a paper prepared recommending appropriate curricula in priority order. This paper is intended to satisfy that recommendation.

The original paper noted that there appeared to be no curricula that satisfied all of the criteria.

Criterion 1: The curricula for comparison must be written in English.

The first criterion, that the curriculum be written in English, if strictly applied, would rule out most of the potential comparison curricula. Other than Australia, of the countries which performed best in Programme for International Student Assessment (PISA) Science, Reading and Mathematics in 2006 (scoring at or higher than the OECD average in all subjects) for example, only five candidates have curricula written in English: Canada, New Zealand, Hong Kong, the United Kingdom and Ireland. Note that curriculum in the United Kingdom consists of the Scottish Curriculum and the National Curriculum for England, Wales and Northern Ireland.

Apart from these candidate countries, Singapore, which also has a curriculum written in English (as well as Chinese), did not participate in PISA 2006 but has performed well in other test years. The United States has curricula written in English (but has no national curriculum and has not generally performed well in PISA).

Some countries which do not have curricula written in English have translations into English. Finland, which has been the most consistent high performer in PISA, is one example. The Finnish translated curriculum is of good quality, so has been included in the next stage of the analysis because of the extremely high international reputation of Finnish education.

The eight curricula selected for further analysis are:

Canada
New Zealand
Hong Kong
England, Wales and Northern Ireland
Scotland
Singapore
Finland
United States

Criterion 2: Comparison nations must have a relatively well-established system of universal or near-universal primary and secondary education

All eight of the potential comparison curricula come from countries with effectively universal education systems.

Criterion 3: The years of schooling must be broadly comparable with those for Australia.

Australia	Canada	New Zealand	Hong Kong	England, Wales	Scotland	United States	Singapore	Finland
K	K#	Year 0*	Primary 1	R	Primary 1	K	K1	Pre-school+
		Year 1		Year 1			K2	
Year 1	Grade 1	Year 2	Primary 2	Year 2	Primary 2	Grade 1	Primary 1	
Year 2	Grade 2	Year 3	Primary 3	Year 3	Primary 3	Grade 2	Primary 2	Year 1
Year 3	Grade 3	Year 4	Primary 4	Year 4	Primary 4	Grade 3	Primary 3	Year 2
Year 4	Grade 4	Year 5	Primary 5	Year 5	Primary 5	Grade 4	Primary 4	Year 3
Year 5	Grade 5	Year 6	Primary 6	Year 6	Primary 6	Grade 5	Primary 5	Year 4
Year 6	Grade 6	Year 7	Form 1	Year 7	Primary 7	Grade 6	Primary 6	Year 5
Year 7	Grade 7	Year 8	Form 2	Year 8	S1	Grade 7	Year 1	Year 6
Year 8	Grade 8	Year 9	Form 3	Year 9	S2	Grade 8	Year 2	Year 7
Year 9	Grade 9	Year 10	Form 4	Year 10	S3	Grade 9	Year 3	Year 8
Year 10	Grade 10	Year 11	Form 5	Year 11	S4	Grade 10	Year 4	Year 9

Table 1: Comparative Years of Schooling

* Often not a separate year, but integrated into Year 1
# Ontario Kindergarten, for example, is not full time or compulsory, and is offered for four and five year old children
+ Finland has only nine years of schooling up to the equivalent of Year 10 in Australia, children usually starting school at seven

The key issues for effective comparisons arising from this set of data are:

1. Finland has only nine years of schooling and children usually start school at seven. This means that comparisons with the Australian Curriculum for the early years are problematic. While Year 10 in Australia is equivalent to Year 9 in Finland, the same is not true of the first year or two of schooling. Despite, this, the comparability of most years of schooling means that the mapping process is feasible.

2. The 'K' year in Australia will align only imperfectly with equivalent points in schooling in some countries, but from Year 1 onwards the alignment is probably sufficiently close to use for comparison purposes. In Singapore, for example, K1 and K2 are the second and third years of a non-compulsory kindergarten program provided by the private sector. Schooling proper begins with Year 1. New Zealand has a Year 0, essentially to manage the differentiated entry points of children with different birth dates, but this should not affect the comparison. The 'R' year in England is part of the Foundation Stage of the curriculum, but is delivered in school.

3. In both Canada and the United States, arrangements vary between provinces or states. The comparison project will, in any case, have to select provincial or state curricula, since there are no national curricula. In the case of Canada (see below) Ontario has been selected. Ontario has a relatively new one full day of kindergarten, but this is not compulsory or universal. In other respects, Ontario matches the Australian structure.

Criterion 4: The country from which the curriculum for comparison is provided must be willing to assist in the process.

This criterion is not in use at this stage of the analysis (see above)

Criterion 5: Partner nations should have variations in starting ages no greater than those existing in Australia.

Australia	Canada	New Zealand	Hong Kong	England, Wales	Scotland	Singapore	United States	Finland
K: 5 or 6	Year 1: 6 or 7	5	Primary 1: usually 5	Year 1: usually 5	4½ to 5½	Primary 1: usually 7	K: usually 5 or 6	7

Table 2: Comparative Starting Ages

It is assumed that in Australia, children mostly start school at five or sometimes six. There are material differences in starting ages between Australia and some of the countries under consideration. In most cases, the differences fall within the tolerance accepted in the mapping of curriculum from the Australian States and Territories, but there are exceptions.

Children in Finland usually start school at seven, and occasionally at six. This means that children starting school in Finland are in some cases more than two years older than children in some Australian schools. It was noted above that comparisons between Finland and Australia in the early years may be problematic.

Children in Singapore usually start Primary 1 at seven, or sometimes six. Although there are three pre-school years prior to Primary 1, these are not compulsory. Primary 1 is probably broadly comparable with Australia's Year 1.

The other countries fall within the tolerances accepted in the Australian mapping process.

Criterion 6: The curricula for comparison should preferably be national curricula.

Of the eight countries under consideration, all have national curricula (or its equivalent) except Canada and the United States. The curriculum in Hong Kong is regarded as a national curriculum, despite Hong Kong's political status. In the case of Canada, it would be possible to use the Ontario curriculum as a comparison, because of the high regard in which the Ontario system is held internationally, and the generally strong performance of Canada (and Ontario) in international comparisons. In the case of the United States, the absence of a national curriculum and the country's weaker performance in international comparisons suggests that it would be undesirable to select a state curriculum for comparison purposes. On this basis, the United States is eliminated from the evaluation.

Criterion 7: The curricula for mapping should be mainstream curricula designed to cater for a wide range of normal performance.

Most systems under consideration have a common mainstream curriculum.

Singapore conducts a Primary School Leaving Examination at the end of Primary 6, and on the basis of results in this assessment students are placed in different secondary education streams. While Mathematics in primary is common, there are different Mathematics curricula for the different streams in secondary. In the Normal (Technical) and Normal (Academic) streams, Science is not compulsory, but is available as an elective. Science is common in primary school, but syllabuses seem to reflect the different streams in secondary school.

The other countries involved have an essentially mainstream curriculum structure, despite opportunities in some systems (eg Hong Kong) for subject and course choices in the middle of secondary school.

Criterion 8: The curricula for comparison should preferably be articulated at year levels (at least in explanatory or support documents) rather than phases or stages of schooling

The value of a curriculum written in year levels is that it enables an easy comparison with Australia. Curricula written in phases or stages can be compared relatively easily if the phases are directly linked to year levels. Where loosely-coupled phases are provided, the phases need to be formally linked to specific year levels to enable the mapping report to be written.

Only Ontario's curriculum is fully articulated at year levels. Hong Kong's curriculum is laid out in Key Stages, but units are allocated to year levels, so it is easily comparable with Australia.

Singapore curriculum varies in its structure. Mathematics is set out in year levels. Science is presented in multi-year blocks (eg Primary 3-6).

In England, Wales and Northern Ireland, curriculum is articulated in key stages comprising specified years of schooling. In the case of Finland, the curriculum is set out in three phases up to the end of Year 9 (equivalent to Year 10 in Australia). In Scotland, the curriculum is set out in five levels that are only loosely linked with year levels. New Zealand's standards are set out over eight levels, of which about six are related to Years K-10, though the alignment is loose.

Criterion 9: It would also be desirable for comparisons to be made with nations that have had a degree of success in international assessment programs.

All curricula selected for evaluation come from countries that have performed well in international assessment programs such as PISA, Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS). All seven remaining curricula satisfy this criterion. Finland was the best performing country in PISA 2006 Mathematics, Reading and Science and has an exceptionally strong international reputation.

Of the other countries under consideration, Hong Kong, Canada and New Zealand had the best results in each of Reading, Mathematics and Science. In each case, the United Kingdom was at or above the OECD average. Singapore did not participate in PISA in 2006.

TIMSS results in 2007 showed Hong Kong and Singapore were the best performing countries, Singapore having been the best performer in 1995 and 2003.

Hong Kong and Singapore did best in PIRLS in 2006 along with Ontario. England performed better than Scotland and New Zealand, though all were above the PIRLS average.

Criterion 10: Curricula for mapping should be checked for style to ensure comparability.

Curricula from most of the countries/regions included for evaluation follow a style that is sufficiently consistent with the writing of the Australian Curriculum to enable effective comparison. This is particularly the case for Ontario, Singapore and Finland and the new curriculum in New Zealand.

The Scottish curriculum adopts a different style of writing:

> To help me develop an informed view, I am learning to recognise the difference between fact and opinion

While this is distinctive, it may be amenable to comparison, though the style would probably make the comparison task somewhat more difficult.

Other Issues

A further set of issues concerns the way in which specific subjects are articulated in the curriculum or offered in schools.

Hong Kong does not offer Science as a standard subject in primary schools, although it is taught in some schools. Science in the primary school curriculum is incorporated as part of a General Studies course. Finland divides Science into a number of parts: Environmental and Natural Sciences (or studies), appearing at Years 1-4; Biology and Geography appearing as a single subject at Years 5-6; Biology at Years 7-9; Physics and Chemistry at Year 5-6; and Physics and Chemistry separately at Years 7-9. This is complex, but does offer a rich set of data for comparison. Singapore does not include Science in its curriculum statement until Primary 3.

The position of English in Finland, Hong Kong and Singapore means that it would probably be inappropriate to use curricula in these countries as comparison documents with Australia. In Hong Kong, only a handful of schools can maintain English as the medium of instruction, so that English is very widely a second language in schools. In Singapore, although education is largely conducted in English, it is a second language for a proportion of students. In Finland, English is almost universally a second language.

In addition, there are political and educational judgments to make about those countries that would most generally be viewed as appropriate benchmarks for Australia. It is probably the case, for example, that in the general community economically successful countries will be seen as better benchmarks, while in the educational community countries which do better in international assessments may be seen as more appropriate.

DISCUSSION AND RECOMMENDATIONS

The data assembled in this paper are summarized in the table below. Where a curriculum satisfies the criteria, a 'Yes' appears. Where no comment appears, the curriculum does not satisfy the criteria. In cases where the judgment is difficult to resolve, a question mark appears.

Criteria	Canada: Ontario	New Zealand	Hong Kong	England, Wales and Northern Ireland	Scotland	Singapore	Finland
Written in English	Yes	Yes	Yes	Yes	Yes	Yes	?
Universal schooling	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Years of schooling	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Starting ages	Yes	Yes	Yes	Yes	Yes	Yes	
National curriculum		Yes	Yes	Yes	Yes	Yes	Yes
Mainstream curriculum	Yes	Yes	Yes	Yes	Yes	?	Yes
Year level curriculum	Yes		Yes			?	
International test success	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Style comparability	Yes	Yes	Yes	Yes	?	Yes	Yes

Table 3: Number of criteria satisfied by curricula

The criteria do not in themselves determine a preferred list of comparison documents. New Zealand, for example, satisfies many criteria in the table, but may be a less satisfactory benchmark for both the general and the educational communities than, say Finland, which satisfies fewer criteria than any other curriculum. Hong Kong satisfies all criteria, but is not an appropriate comparison for English.

Because of this, the list of preferred comparison curricula below may appear somewhat idiosyncratic if viewed against the criteria, but is drawn from the discussion as a whole.

English recommendations

1. Ontario
2. New Zealand
3. England, Wales and Northern Ireland

The range of realistic choices for English is limited to countries with English as a first language. Ontario and New Zealand have advantages in being generally better performed internationally and Ontario has year-level statements that are easier to compare. New Zealand's standards will have to be artificially linked to year levels (as was done with the Tasmanian curriculum in the Australian mapping) to enable the report to be written. The UK example may be preferred because the Key Stages are linked to specified year levels.

Mathematics recommendations

1. Singapore
2. Finland
3. Hong Kong

Singapore provides a strong comparison because of the country's strong reputation in Mathematics and the fact that Mathematics is presented in year levels enabling easy comparison. A selection will need to be made of the secondary streamed curricula: it is proposed that the 'O Level' mathematics syllabus be used as the syllabus that leads on to further study. Finland, despite some difficulties in year alignments with Australia, is demonstrably the best performing nation internationally in Mathematics and Science, and has a very well articulated curriculum. Hong Kong's curriculum is laid out in Key Stages, but units are allocated to year levels, so it is more easily comparable. Hong Kong also has a strong Mathematics reputation.

Science recommendations

1. Ontario
2. Finland
3. Singapore

Ontario aligns well with Australia, has a strong reputation in science and has a curriculum which is relatively easy to map. Finland, despite some difficulties in year alignments with Australia, is demonstrably the best performing nation internationally in Mathematics and Science, and has a very well articulated curriculum. Singapore's Science curriculum is clearly strong but does not start until Primary 3 and has a streamed structure in the secondary years. Singapore does, however, perform exceptionally well in international tests.

APPENDIX 3: PORTER SOURCE METHODOLOGY

The methodology selected to address this task is based on an approach developed by Porter, Polikoff and Smithson[1], who established a 'uniform language' for describing curriculum content, which was then used to analyse and compare curriculum frameworks (the intended curriculum), classroom practice (the enacted curriculum) and assessment regimes (the assessed curriculum). The language can also be used to describe the content of assessment items, text-books and teaching materials.

The uniform language developed by the researchers involves two components:

- a language for describing in detail the knowledge base in each of English, science, history and mathematics; and
- a language for describing the 'cognitive demand' of each area, based on a hierarchy of performance expectations.

The first of these consists of lists of topics arranged in broad content categories in each subject domain. In English, for example, the topic group of 'Language Study' includes topics such as 'spelling' and 'effects of race, gender or ethnicity on language and language use'. In Science, 'ecosystems' and 'adaptation and variation' appear as topics within 'Ecology'. The lists of topics are intended to be complete and universal, so that they could be used to describe any curriculum in the relevant domain, regardless of year level, context or level of complexity.

The second category, 'cognitive demand', consists of descriptions of what students can do with particular knowledge. These descriptions are different for each learning area, though they are based on a similar hierarchy of demands consisting of five levels in categories like the following:

- memory and recall
- performing procedures
- communicating, demonstrating, explaining, creating
- analysis, argument and investigation
- evaluation and application in different contexts

Porter (2004: 3) argues that 'the content language for an academic subject should be exhaustive in its inclusion of all possible types of content, and it should be common in the sense that the same language is used across studies and purposes'. He proposes that the terms used in the uniform language should have a common meaning to different people and over time.

The tool for analysis using these categories is a survey listing the knowledge base and cognitive demand applying to a subject area (eg English or mathematics). The strength of the surveys arises from the interaction of these two categories: respondents (usually curriculum developers or teachers) are asked to respond on a matrix that requires them to indicate whether, for example, a curriculum framework being considered includes:

- a specific topic;
- if so, to what extent; and
- at what level of cognitive demand students are expected to operate in relation to that topic.

A mathematics framework might, for example, include the expectation that a student will use a linear equation (the topic) to solve a novel problem (the cognitive demand). In English, a framework might require a student at one level to recall (cognitive demand) the difference

[1] Porter (2002); Porter (2004)

between fact and opinion (the topic), while at a different level the requirement could be evaluate (cognitive demand) whether a writer has used facts and opinions (the topic) appropriately in a newspaper article. The topic in this example is the same in both cases (fact and opinion), but the cognitive demand is different.

It is, therefore, in the intersections between the topic lists and the cognitive demands that the curriculum is described. Any curriculum is likely to include some but not all of the content topics for the field, and some curricula will be more comprehensive in their inclusion of topics. Any curriculum is likely to include a range of cognitive demands, and some will include a greater or lesser proportion of higher or lower cognitive demands.

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APPENDIX 4: ACARA CURRICULUM MAPPING CALCULATIONS

Porter Graph

Step 1 Quality check of survey data

Perform following checks:

1. Ensure that a *Level of Coverage* cell is rated for all topics
2. Check that no more than one *Level of Coverage* cell is rated for each topic
3. Where *Level of Coverage* – None, ensure no *Expectation of Students* cell is rated for the topic

Step 2 Average *Level of Coverage* ratings

Where more than one survey has been completed for a domain/jurisdiction/phase of schooling, average *Level of Coverage* ratings for each topic across multiple surveys

Step 3 Sum weighted *Level of Coverage* ratings

Weight *Level of Coverage* ratings (weighted 1 X Slight Coverage, 2 x Moderate Coverage and 3 X Sustained Coverage) for each survey and add together to find total.

Step 3a Aggregate ACARA surveys to equal Phase of Schooling for comparison curriculum

Find maximum of *Level of Coverage* ratings for each topic across multiple year levels of National curriculum surveys

Find average of *Cognitive Demand* ratings for each topic across multiple year levels of National curriculum surveys

Step 4: *Level of coverage* %

For each topic, weight the *Level of Coverage* (1 X Slight Coverage, 2 x Moderate Coverage and 3 X Sustained Coverage) and divide by Total from Step 3

Step 5: *Average Cognitive Demand*

Where more than one survey has been completed for a domain/jurisdiction/phase of schooling, average *Cognitive Demand* ratings for each topic across multiple surveys

Step 6: *Total Cognitive Demand*

Sum of all Cognitive Demand ratings from *Step 5*.

Step 7: Calculate *Cognitive Demand %*

Cognitive demand cell/*Total Cognitive Demand* from Step 6

Step 8: *Cognitive Demand%* X *Level of Demand%*

For each cell, Level of coverage % x Cognitive Demand %

Step 9: Generate Graph

Use steps 1-8 for the expert mapping data and the teacher mapping data. Average the % coverage and the cognitive demand for the expert mapping data and the teacher mapping data and generate the graph.

Topic Coverage Index

Step 1: *Level of coverage* % for national and comparison curricula

Take *Level of coverage* % for National curriculum and selected combined comparison curriculum.

Step 2: Find absolute differences

Find absolute difference between *Level of coverage* % for national and *Level of coverage* % for the combined comparison curricula

Step3: Calculate *Coverage Index*

For comparison of any two curricula,

$$\text{Alignment Index} = 1 - \frac{\Sigma|X - Y|}{2},$$

Where X = ACARA *Level of coverage* %

Y = Comparison Combined Curriculum *Level of coverage* %

% of Curriculum devoted to Topic Group

Step 1: Sum *Level of coverage* % for all topics in each topic group for national curriculum

Sum *Level of coverage* % for all topics in each topic group for national curriculum.

Step 2: Sum *Level of coverage* % for all topics in each topic group for comparison combined curriculum

Sum *Level of coverage* % for all topics in each topic group for the comparison combined curriculum.

Step 3: Report

Report *Level of coverage* % for each topic group for national and the comparison combined curricula, or in cases where there is no data, the comparison curriculum documents.

% of Cognitive Demand

Step 1: Sum % Cognitive Demand for all topics in each topic group for national curriculum

For each cognitive demand, sum % *Cognitive Demand* for all topics in each topic group for national curriculum.

Step 2: Sum % Cognitive Demand for all topics in each topic group for comparison curriculum

For each cognitive demand, sum *% Cognitive Demand* for all topics in each topic group for comparison curriculum.

Step 3: Weighted Average Cognitive Demand for national curriculum

For each cognitive demand, average((Phase 1 Sum %Cognitive Demand x Phase years) +(Phase 1 Sum % Cognitive Demand x Phase years) + … (Phase N Sum % Cognitive Demand x Phase years) for national curriculum.

Step 4: Weighted Average Cognitive Demand for comparison curriculum

For each cognitive demand, average((Phase 1 Sum %Cognitive Demand x Phase years) +(Phase 1 Sum % Cognitive Demand x Phase years) + … (Phase N Sum % Cognitive Demand x Phase years) for comparison curriculum.

APPENDIX 5: ACARA CURRICULUM MAPPING – English

INTERNATIONAL ENGLISH REPORTS

This section of the report is based on the expert mapping of final version of the English curriculum documents for Australia and the two comparison curricula, Ontario and New Zealand. It provides details of **the results for Ontario and New Zealand compared with results for the Australian Curriculum**, organized by the curriculum phases used in the comparison curriculum.

As indicated in the overall report, for each subject report at each phase or year level within each jurisdiction, this appendix includes the following elements:

1. **Graphs** which represent the data resulting from the mapping process for the Australian Curriculum and the comparison curriculum. The graphs represent the emphasis in the curriculum on both topic coverage and cognitive demand.

2. **Topic Coverage Indices** for each year-level grouping used in that jurisdiction, represented by a single number less than or equal to 1. The indices provide a measure of the extent to which the comparison curriculum for that stage of schooling is aligned with the Australian Curriculum. The index has been calculated by comparing the percentage of the curriculum devoted to each topic.

3. **A table showing the percentage of the curriculum devoted to each topic group** in the Australian Curriculum and the comparison curriculum. This table supports a more detailed analysis of differences at the topic group level between each jurisdiction's documents. The percentage of the curriculum devoted to each topic group is listed for the Australian curriculum and for the comparison jurisdiction.

4. **A short written discussion** of the key variations between the Australian Curriculum and the comparison curriculum.

5. **A discussion of relative cognitive demand** in the subject as represented in the Australian Curriculum and each State and Territory curriculum. This includes graphic representation of the relative representation of cognitive demand at each phase in the subject and in the subject overall. It also includes a table of percentages of each element of cognitive demand at each phase which are the basis for the graphic representation.

New Zealand

Topic Coverage Index: Australian Curriculum versus NZ 0.59

Comments

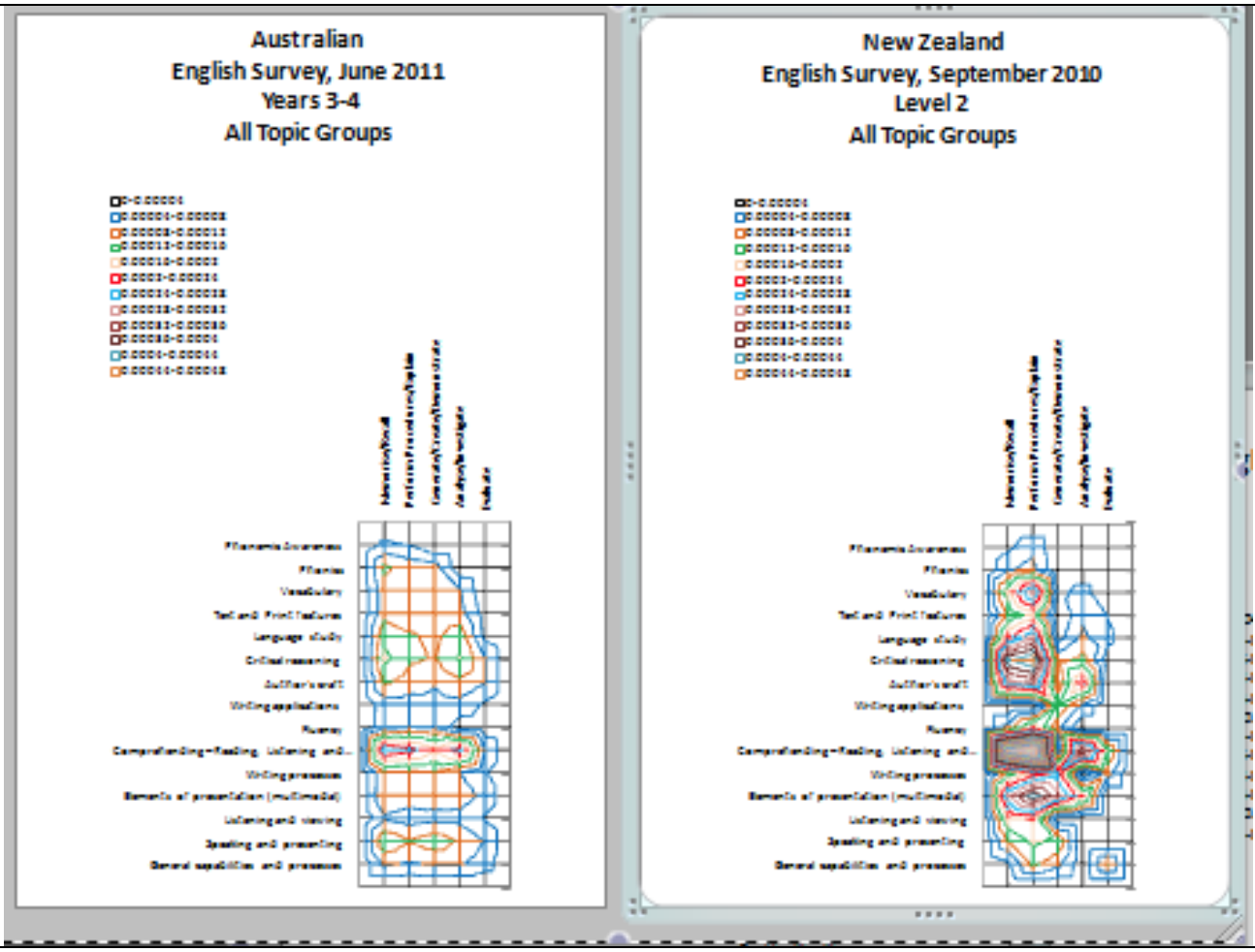
As the graphs indicate, there is moderate overlap between the NZ and Australian curriculum at the F-2 level, but a significant difference in intensity of coverage and breadth of cognitive demand.

NZ has a materially greater representation of 'Comprehending – RLV' and 'Elements of presentation…', but less of 'Speaking and presenting'.

All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Phonemic awareness', 'Writing processes' and 'Fluency'. NZ has a greater focus on 'Language study.

The analysis suggests a low degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	New Zealand
Phonemic Awareness	7.21%	4.39%
Phonics	7.52%	7.44%
Vocabulary	6.90%	5.53%
Text and Print features	6.90%	6.30%
Language study	7.21%	10.31%
Critical reasoning	8.15%	9.54%
Author's craft	5.02%	5.15%
Writing applications	3.76%	2.10%
Fluency	4.08%	1.91%
Comprehending – Reading, Listening and Viewing	12.54%	18.13%
Writing processes	6.58%	4.01%
Elements of presentation (multimodal)	5.64%	12.98%
Listening and viewing	5.02%	4.01%
Speaking and presenting	8.78%	4.77%
General capabilities and processes	4.70%	3.44%



Topic Coverage Index: Australian Curriculum versus NZ 0.65

Comments

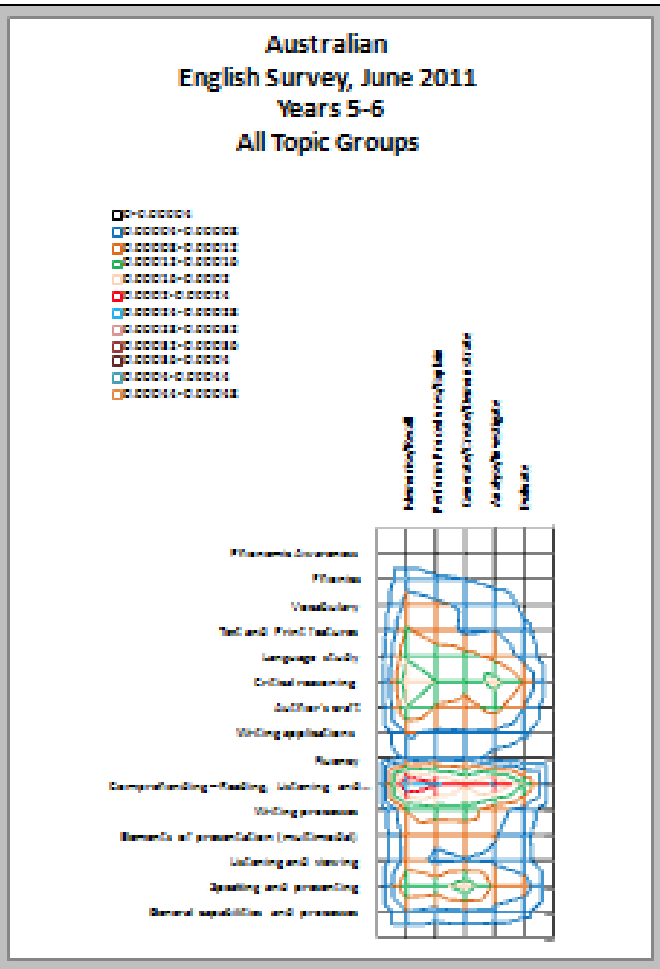
The graphs indicate moderate overlap between the NZ and Australian curriculum at the 3-4 level, but significant differences in intensity and breadth of cognitive demand

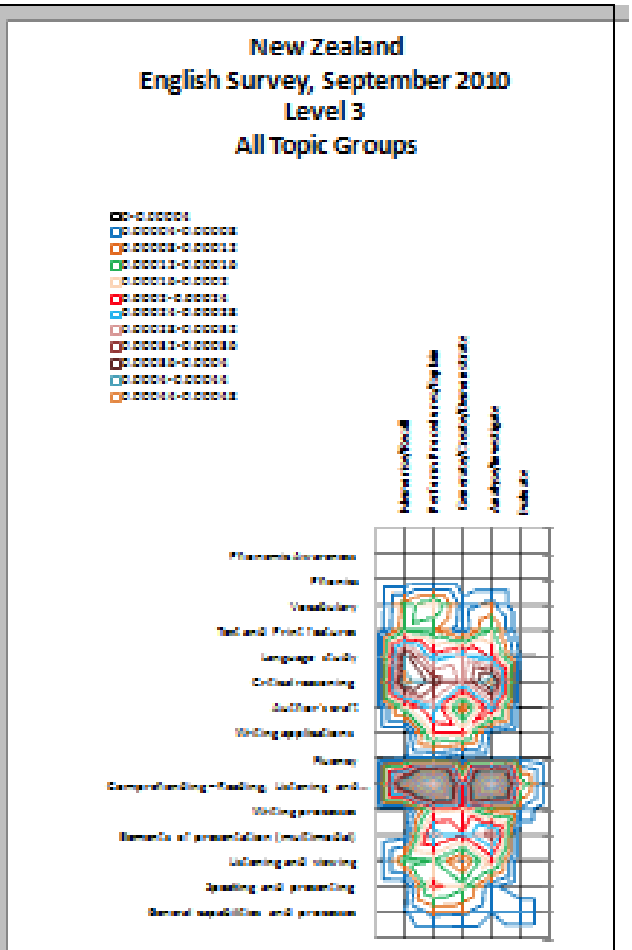
NZ has a significantly greater representation of 'Comprehending – RLV' and 'Elements of presentation…', while Australia has a greater representation of 'Speaking and presenting'.

All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Phonics' and 'General capabilities and processes', but less on 'Vocabulary', Critical reasoning' and 'Author's craft'.

The analysis suggests a moderate degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	New Zealand
Phonemic Awareness	2.34%	1.58%
Phonics	6.69%	3.00%
Vocabulary	5.69%	7.90%
Text and Print features	5.35%	4.58%
Language study	8.36%	8.06%
Critical reasoning	9.03%	11.37%
Author's craft	6.69%	9.16%
Writing applications	4.68%	2.84%
Fluency	3.68%	3.95%
Comprehending – Reading, Listening and Viewing	16.05%	20.06%
Writing processes	6.69%	5.37%
Elements of presentation (multimodal)	6.69%	10.74%
Listening and viewing	4.68%	4.42%
Speaking and presenting	8.36%	3.95%
General capabilities and processes	5.02%	3.00%





Topic Coverage Index: Australian Curriculum versus NZ 0.68

Comments

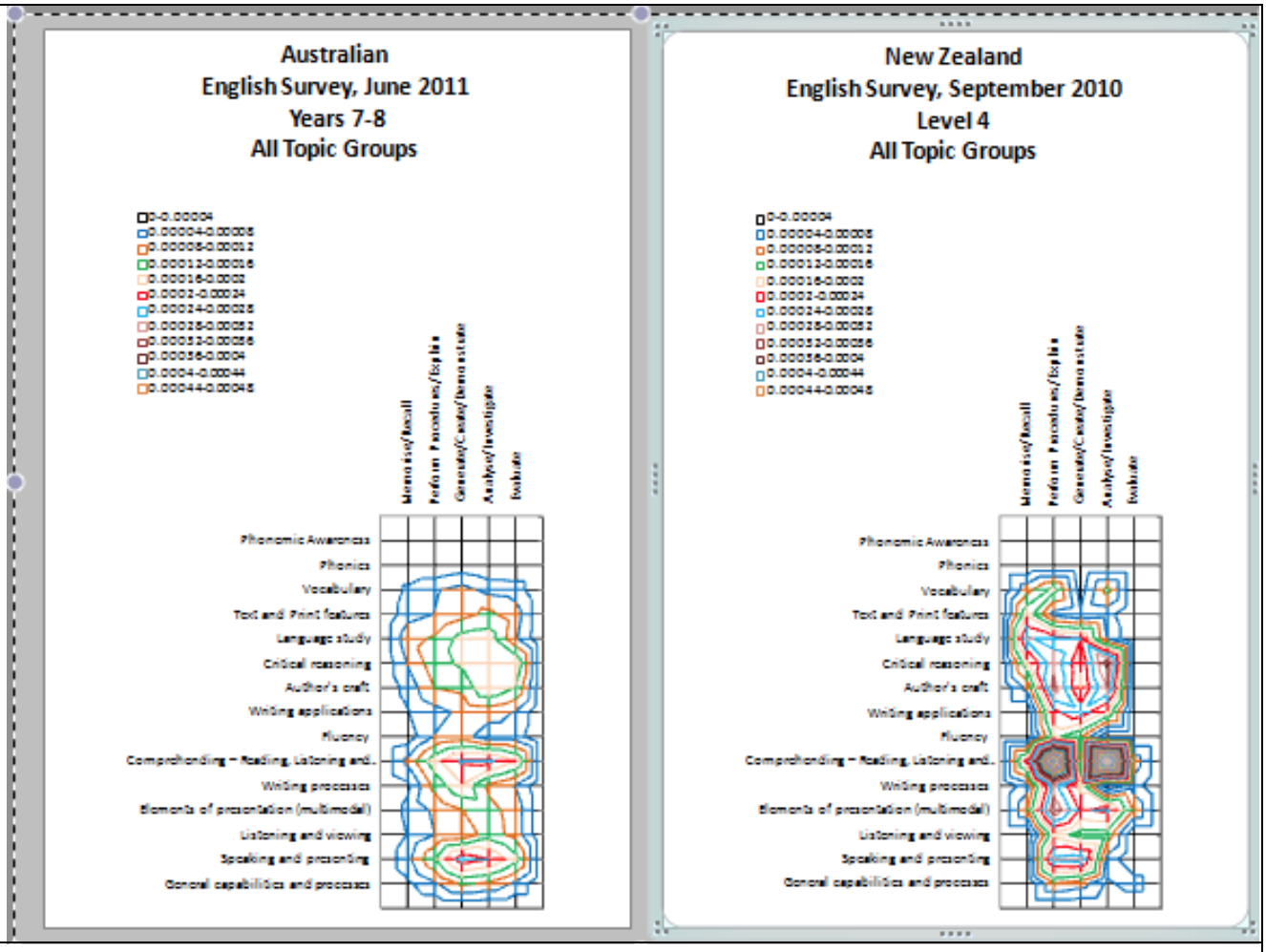
It is clear from the graphs there is moderate to considerable overlap between the NZ and Australian curriculum at the 5-6 level, but differences in intensity of coverage and breadth of cognitive demand.

The NZ curriculum has a materially greater representation of 'Comprehending RLV' and 'Elements of presentation…'.

All other topic groups fall within an acceptable range of difference. The Australian curriculum has a greater focus on 'Phonics', 'Text and print features', 'Writing processes' and 'Speaking and presenting' but less on 'Critical reasoning' and 'Author's craft'.

The analysis suggests a moderate degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	New Zealand
Phonemic Awareness	0.00%	0.00%
Phonics	3.75%	0.00%
Vocabulary	5.63%	4.47%
Text and Print features	6.88%	4.62%
Language study	9.38%	9.39%
Critical reasoning	10.63%	14.01%
Author's craft	8.13%	10.43%
Writing applications	5.94%	4.47%
Fluency	2.50%	1.19%
Comprehending – Reading, Listening and Viewing	15.00%	21.31%
Writing processes	7.81%	5.66%
Elements of presentation (multimodal)	5.63%	9.69%
Listening and viewing	4.69%	5.66%
Speaking and presenting	9.69%	5.81%
General capabilities and processes	4.38%	3.28%



Topic Coverage Index: Australian Curriculum versus NZ 0.70

Comments

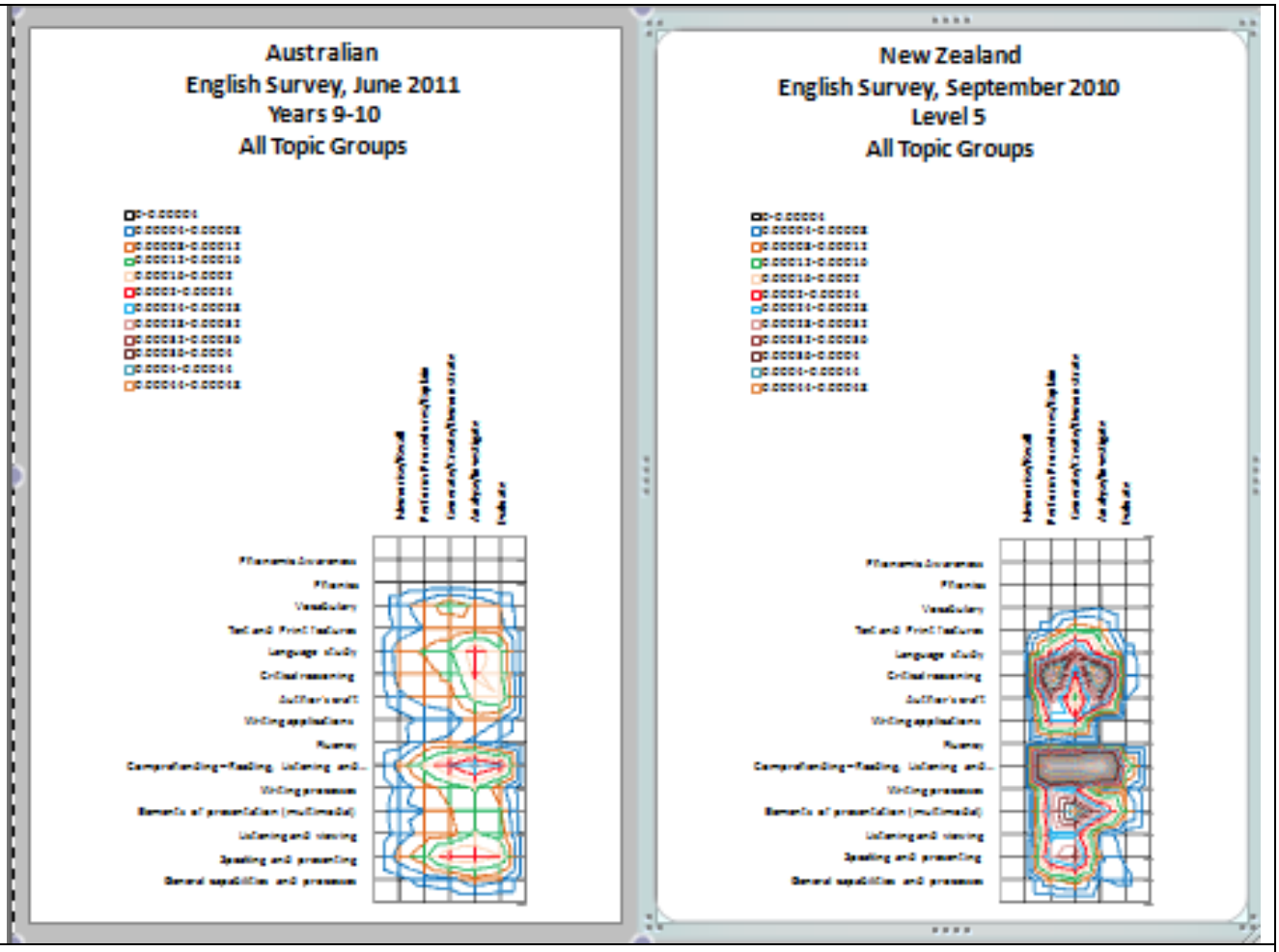
The graphs indicate considerable overlap between the NZ and Australian curriculum at the 7-8 level, but differences in intensity of coverage and breadth of cognitive demand.

The New Zealand curriculum has a materially greater representation of 'Comprehending RLV' but the reverse is true of 'Speaking and presenting'.

All other topic groups fall within an acceptable range of difference. NZ has a greater focus on 'Elements of presentation…' and less on 'Text and print features' and 'General capabilities…'.

The analysis suggests a high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	New Zealand
Phonemic Awareness	0.63%	0.00%
Phonics	0.31%	0.00%
Vocabulary	5.31%	5.10%
Text and Print features	6.56%	4.08%
Language study	8.44%	7.53%
Critical reasoning	10.31%	10.71%
Author's craft	9.38%	10.20%
Writing applications	5.31%	6.38%
Fluency	4.38%	3.70%
Comprehending – Reading, Listening and Viewing	13.13%	19.90%
Writing processes	6.88%	6.51%
Elements of presentation (multimodal)	6.25%	10.20%
Listening and viewing	5.94%	5.10%
Speaking and presenting	11.88%	7.53%
General capabilities and processes	5.31%	3.06%



Topic Coverage Index: Australian Curriculum versus NZ 0.64

Comments

As the graphs show, there is moderate overlap between the NZ and Australian curriculum at the 9-10 level, but significant differences in intensity of coverage and breadth of cognitive demand.

New Zealand has a materially greater representation of 'Critical reasoning', 'Comprehending RLV' and 'Elements of presentation…'. The reverse is true of 'Vocabulary'.

All other topic groups fall within an acceptable range of difference. Australia has greater focus on 'Text and print features', 'Fluency', 'Listening and viewing' and 'Speaking and presenting'.

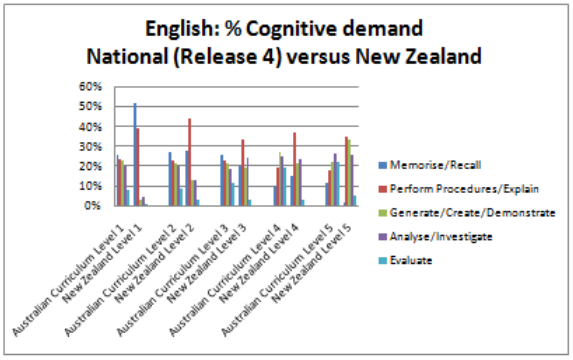
The analysis suggests a high degree of alignment between the two curricula.

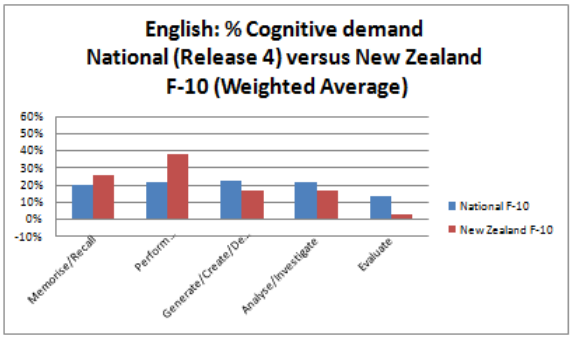
% of Curriculum devoted to Topic Group	Australia	New Zealand
Phonemic Awareness	0.00%	0.00%
Phonics	0.00%	0.00%
Vocabulary	6.99%	0.91%
Text and Print features	5.78%	3.50%
Language study	9.12%	8.51%
Critical reasoning	9.12%	13.83%
Author's craft	9.42%	10.33%
Writing applications	4.86%	4.71%
Fluency	3.95%	1.06%
Comprehending – Reading, Listening and Viewing	13.98%	21.58%
Writing processes	6.08%	5.62%
Elements of presentation (multimodal)	6.99%	12.77%
Listening and viewing	7.90%	5.32%
Speaking and presenting	11.55%	8.51%
General capabilities and processes	4.26%	3.34%

% Cognitive Demand Analysis

English: % Cognitive Demand
Australia (Release 3) versus New Zealand

	Memorise/Recall	Perform Procedures/Explain	Generate/Create/Demonstrate	Analyse/Investigate	Evaluate
Australia F-10	20.41%	21.57%	22.91%	21.91%	13.20%
New Zealand F-10	25.90%	37.85%	16.59%	16.81%	2.85%
Australia F-2	25.65%	23.72%	22.85%	20.02%	7.77%
New Zealand Level 1	52.15%	39.19%	3.08%	4.56%	1.03%
Australia 3-4	27.02%	23.16%	21.15%	20.19%	8.47%
New Zealand Level 2	27.66%	43.75%	12.70%	12.58%	3.31%
Australia 5-6	25.72%	22.62%	21.28%	18.89%	11.49%
New Zealand Level 3	19.95%	33.67%	19.28%	24.22%	2.87%
Australia 7-8	9.73%	19.39%	26.92%	24.80%	19.16%
New Zealand Level 4	15.35%	36.93%	21.45%	23.41%	2.86%
Australia 9-10	11.31%	17.88%	22.39%	26.56%	21.85%
New Zealand Level 5	1.29%	35.02%	33.23%	25.39%	5.07%





Comments

As the weighted average F-10 graph indicates, there is moderate to considerable overlap between New Zealand and the Australian Curriculum. Australia has a materially greater representation of 'Evaluate' while the reverse is true of 'Perform…'. NZ has a greater focus on 'Memorise…' while Australia has a greater focus on 'Generate…' and 'Analyse…'.

At the F-2 phase, NZ has a significantly greater representation of 'Memorise…' and 'Perform…' but the reverse is true for 'Generate…' and 'Analyse…'. Australia has a greater focus on 'Evaluate'.

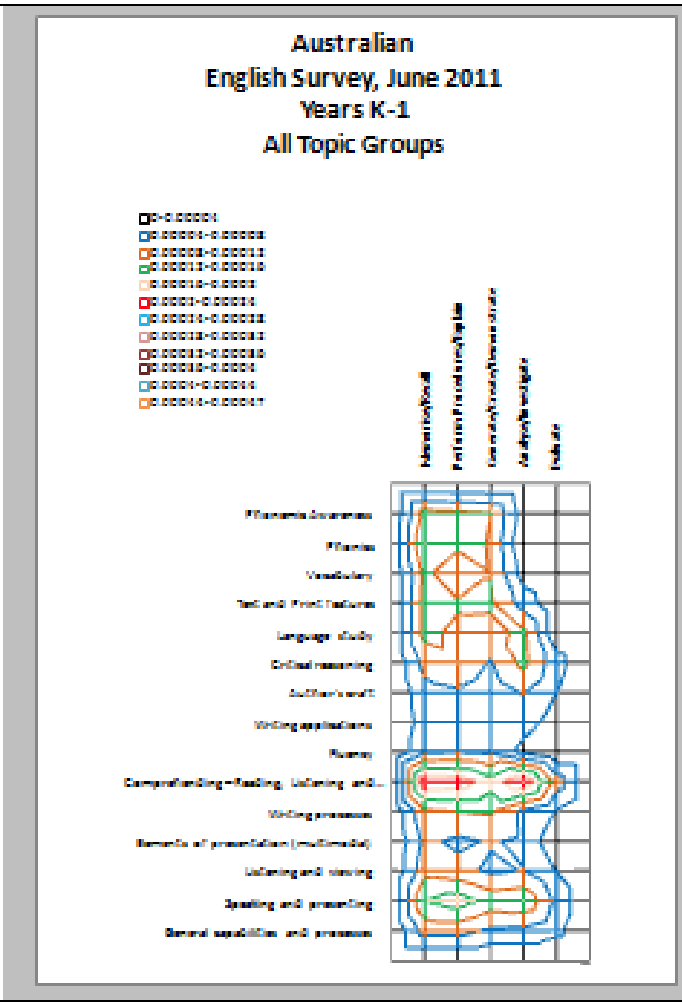
At the 3-4 phase, NZ has a significantly greater representation of 'Perform…'. Australia has a greater focus on 'Generate…', 'Analyse…' and 'Evaluate'.

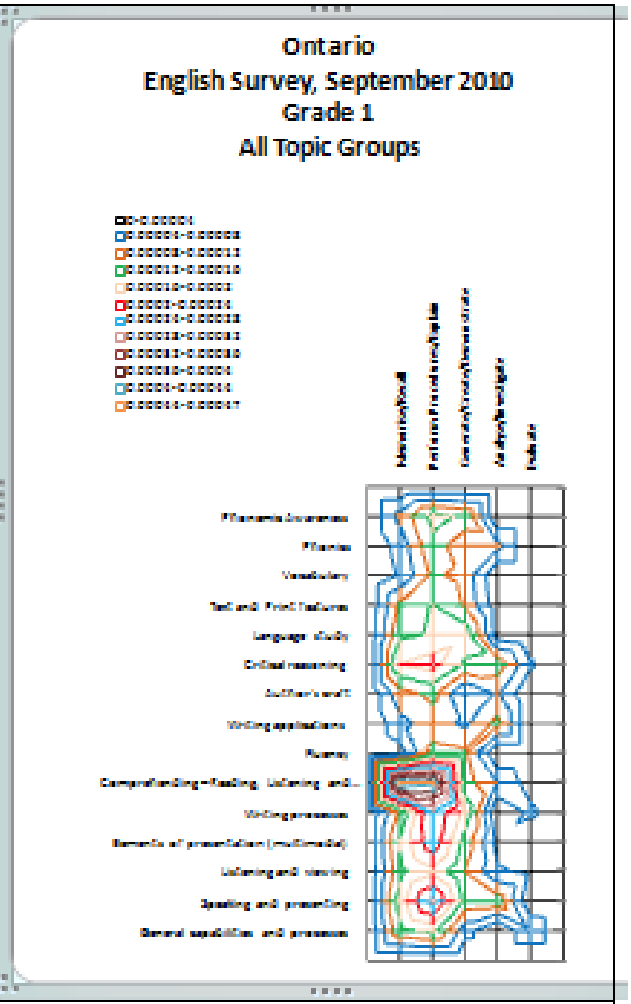
At the 5-6 phase, NZ has a materially greater representation of 'Perform…'. Australia has a greater focus on 'Memorise…' and 'Evaluate' but the reverse is true of 'Analyse…'.

At the 7-8 phase, NZ has a materially greater representation of 'Perform…' but the reverse is true of 'Evaluate'. The Australian Curriculum has a greater focus on 'Generate…' but less on 'Memorise…'.

At the 9-10 phase, Australia has a materially greater representation of 'Memorise…' and 'Evaluate…' while the reverse is true of 'Perform…' and 'Generate…'.

Ontario





Topic Coverage Index: Australian Curriculum versus Ontario 0.73

Comments

The graphs reveal a considerable degree of overlap between the Ontario and Australian curriculum at the F-1 level, with some variation in intensity of coverage and breadth of cognitive demand.

The Australian Curriculum has a materially greater representation of 'Phonics'.

All other topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Comprehending RLV' and 'Elements of presentation…' and less on 'Vocabulary'.

The analysis suggests a high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	7.39%	5.56%
Phonics	8.52%	4.34%
Vocabulary	6.53%	3.77%
Text and Print features	6.82%	5.84%
Language study	7.95%	6.50%
Critical reasoning	6.53%	7.45%
Author's craft	4.55%	4.90%
Writing applications	3.69%	4.05%
Fluency	3.69%	3.77%
Comprehending – Reading, Listening and Viewing	12.78%	16.21%
Writing processes	6.53%	7.54%
Elements of presentation (multimodal)	5.11%	8.39%
Listening and viewing	5.40%	6.50%
Speaking and presenting	9.37%	10.37%
General capabilities and processes	5.11%	4.81%

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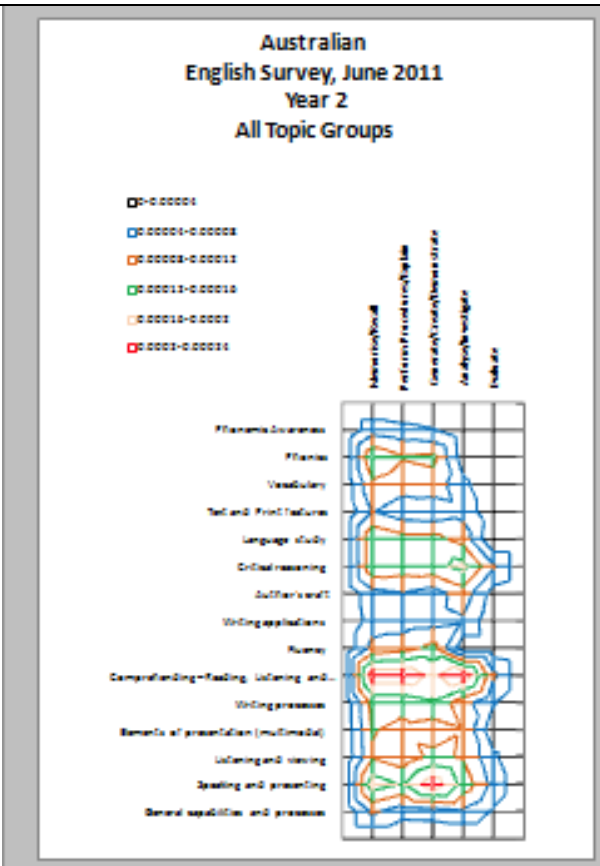
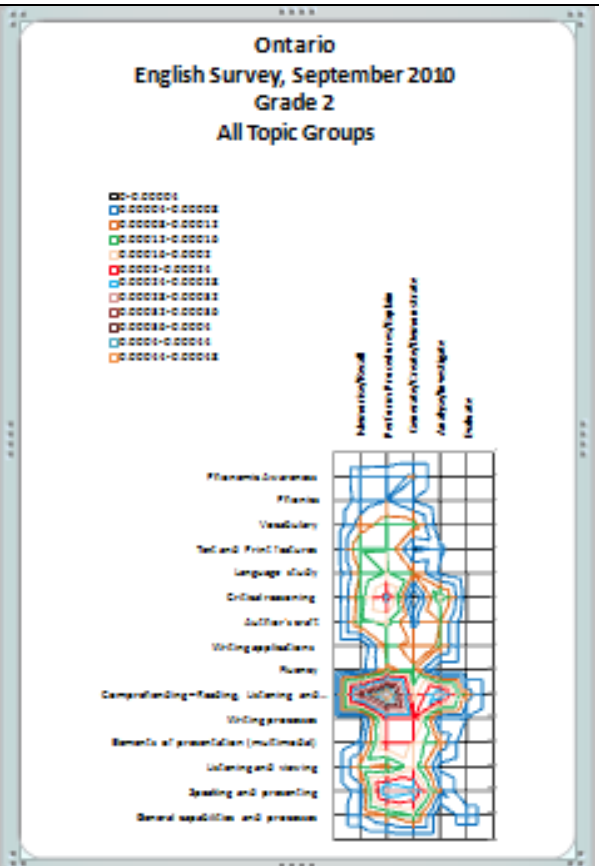




Topic Coverage Index: Australian Curriculum versus Ontario 0.84

Comments

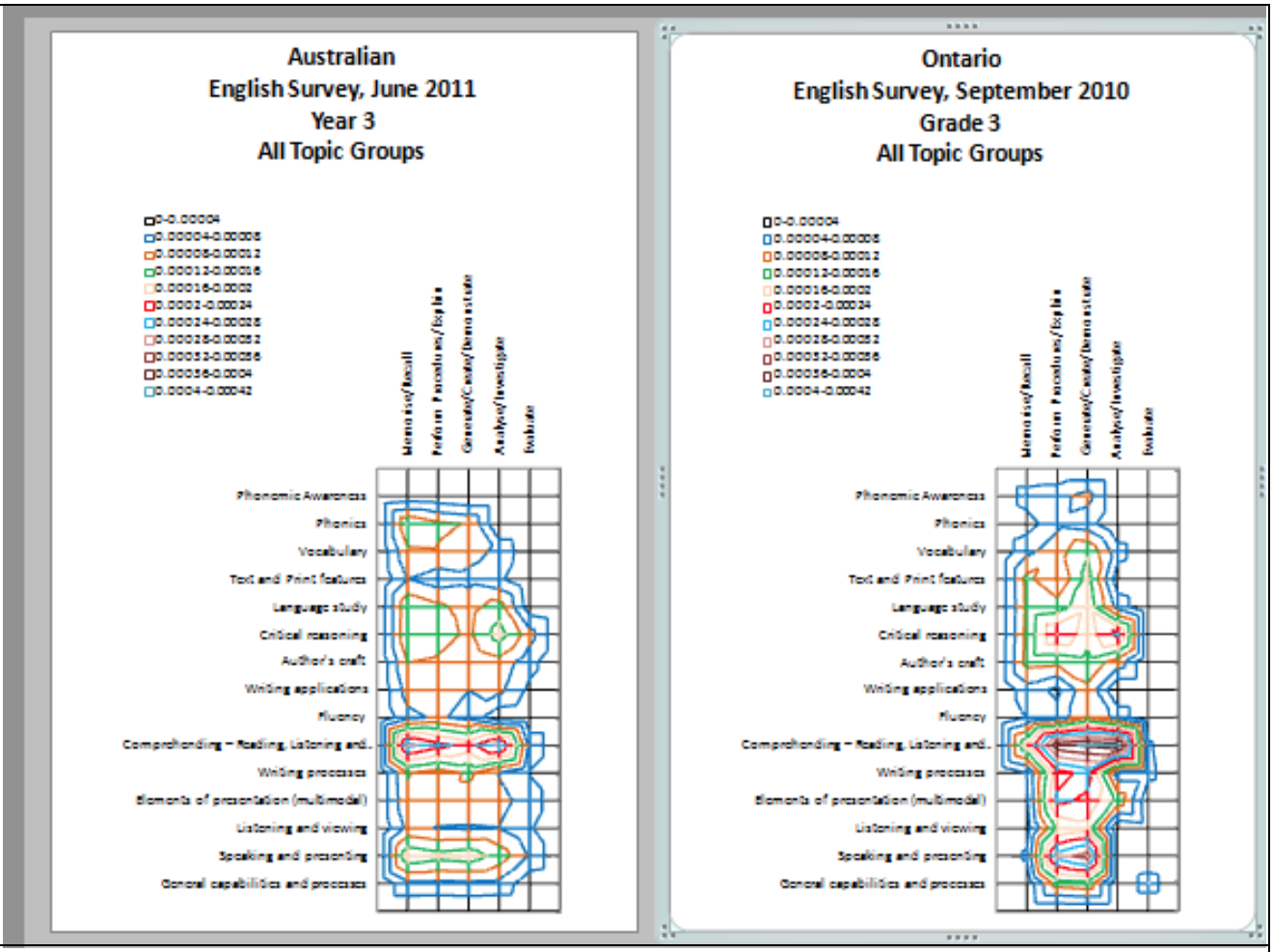
As the graphs show, there is considerable overlap between the Ontario and Australian curriculum at Year 2, with some variation in intensity of coverage and breadth of cognitive demand.

The Australian curriculum has a materially greater representation of 'Phonics'.

All other topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Comprehending RLV'.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	3.23%	3.40%
Phonics	8.35%	3.40%
Vocabulary	5.87%	5.14%
Text and Print features	4.14%	5.78%
Language study	8.19%	6.65%
Critical reasoning	9.02%	8.47%
Author's craft	4.88%	5.38%
Writing applications	4.47%	4.51%
Fluency	4.80%	3.56%
Comprehending – Reading, Listening and Viewing	13.65%	16.30%
Writing processes	6.78%	7.99%
Elements of presentation (multimodal)	6.95%	8.47%
Listening and viewing	6.04%	6.17%
Speaking and presenting	9.59%	10.13%
General capabilities and processes	4.05%	4.67%



Topic Coverage Index: Australian Curriculum versus Ontario 0.84

Comments

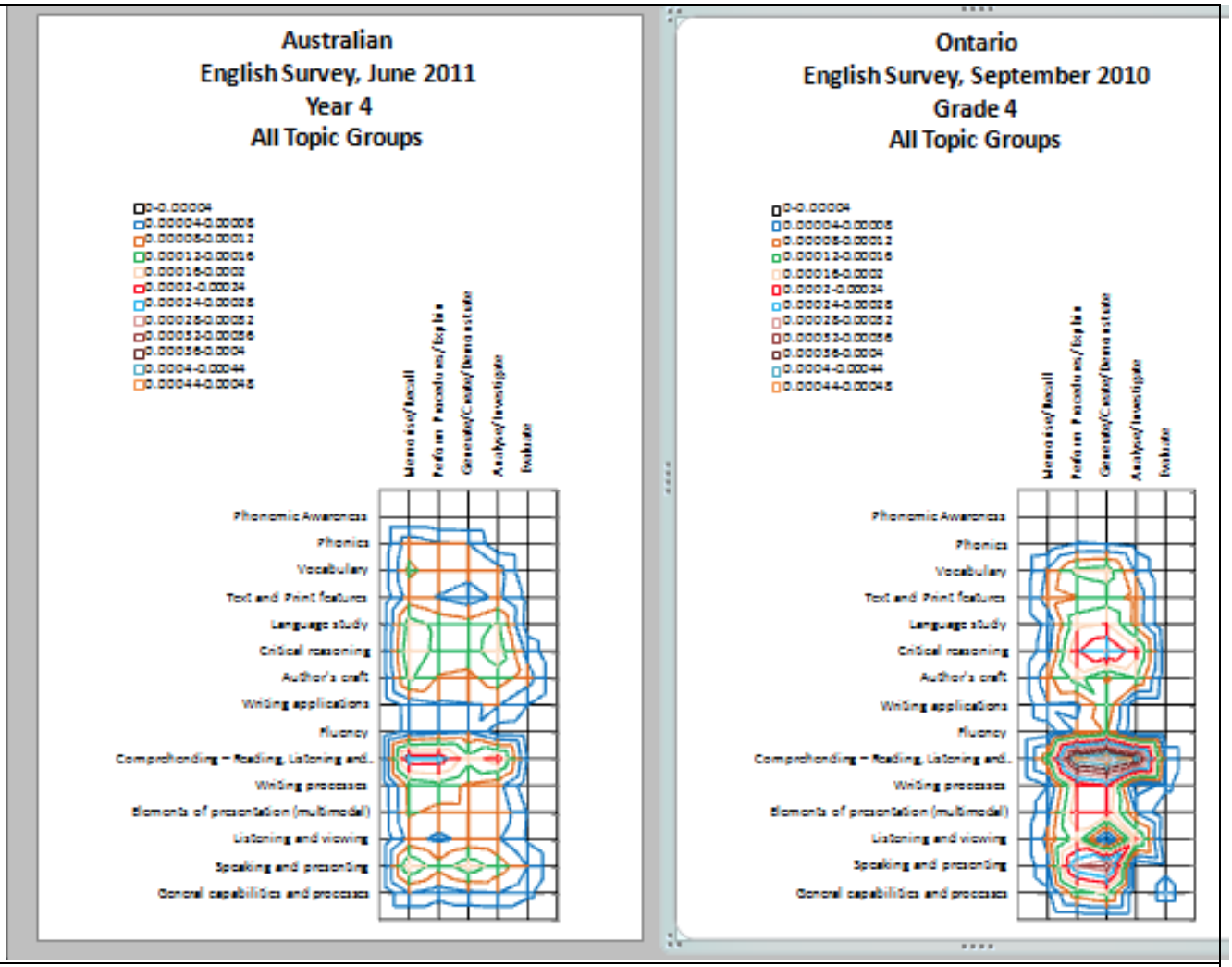
The graphs show a moderate to considerable degree of overlap between the Ontario and Australian curriculum at Year 3, with some variation in breadth of cognitive demand and minor variation in intensity of coverage.

Australia has a materially greater representation of 'Phonics'.

All other topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Phonemic awareness' and 'Text and print features'.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.59%	3.23%
Phonics	8.01%	2.38%
Vocabulary	7.00%	5.04%
Text and Print features	3.63%	6.08%
Language study	8.09%	7.32%
Critical reasoning	9.11%	9.03%
Author's craft	6.07%	5.80%
Writing applications	5.40%	4.18%
Fluency	3.96%	3.52%
Comprehending – Reading, Listening and Viewing	15.51%	16.25%
Writing processes	6.32%	7.70%
Elements of presentation (multimodal)	6.75%	8.46%
Listening and viewing	5.56%	5.99%
Speaking and presenting	9.78%	10.55%
General capabilities and processes	4.22%	4.47%



Topic Coverage Index: Australian Curriculum versus Ontario 0.86

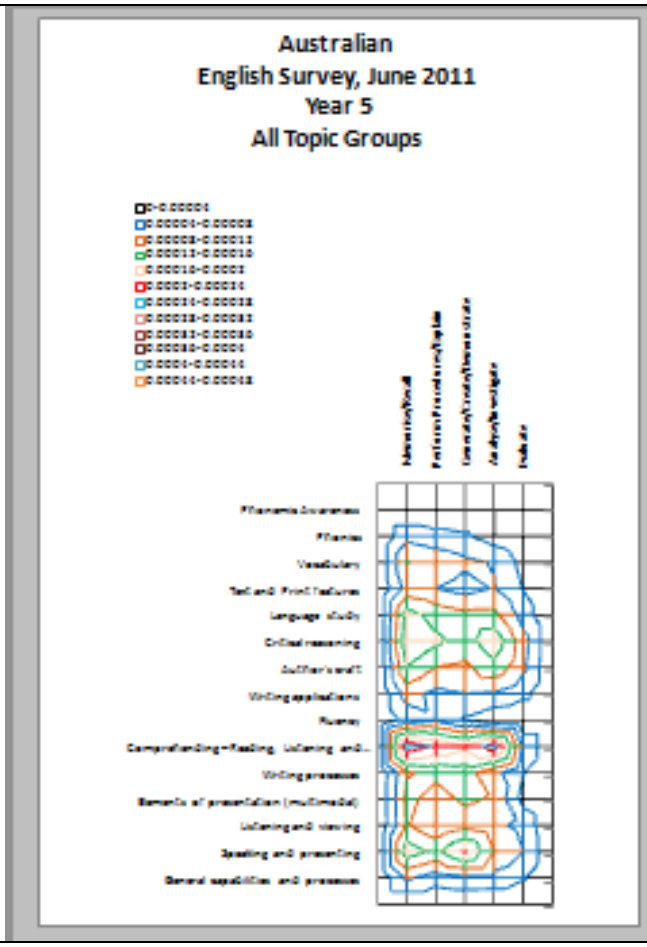
Comments

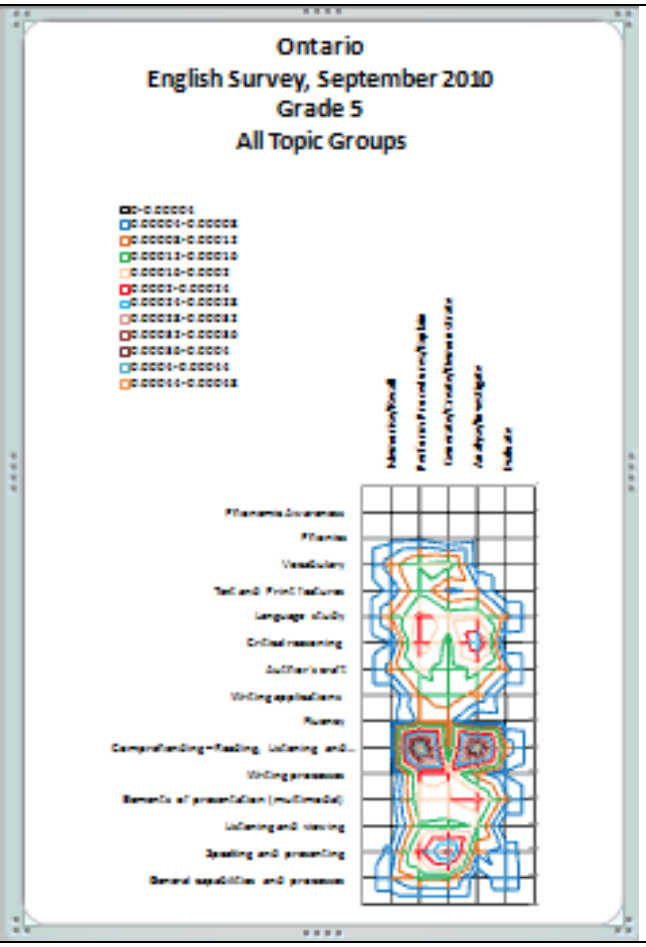
As the graphs show there is considerable overlap between the Ontario and Australian curriculum at Year 4, with some variation in intensity of coverage and breadth of cognitive demand.

All topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Phonics' and 'Language study'.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.00%	0.19%
Phonics	5.24%	1.31%
Vocabulary	6.17%	6.47%
Text and Print features	4.65%	6.10%
Language study	9.46%	7.32%
Critical reasoning	9.54%	8.82%
Author's craft	7.69%	6.66%
Writing applications	5.83%	5.44%
Fluency	2.96%	3.66%
Comprehending – Reading, Listening and Viewing	14.86%	16.04%
Writing processes	7.43%	7.32%
Elements of presentation (multimodal)	6.42%	7.97%
Listening and viewing	5.41%	6.00%
Speaking and presenting	10.14%	11.54%
General capabilities and processes	4.22%	5.16%





Topic Coverage Index: Australian Curriculum versus Ontario 0.87

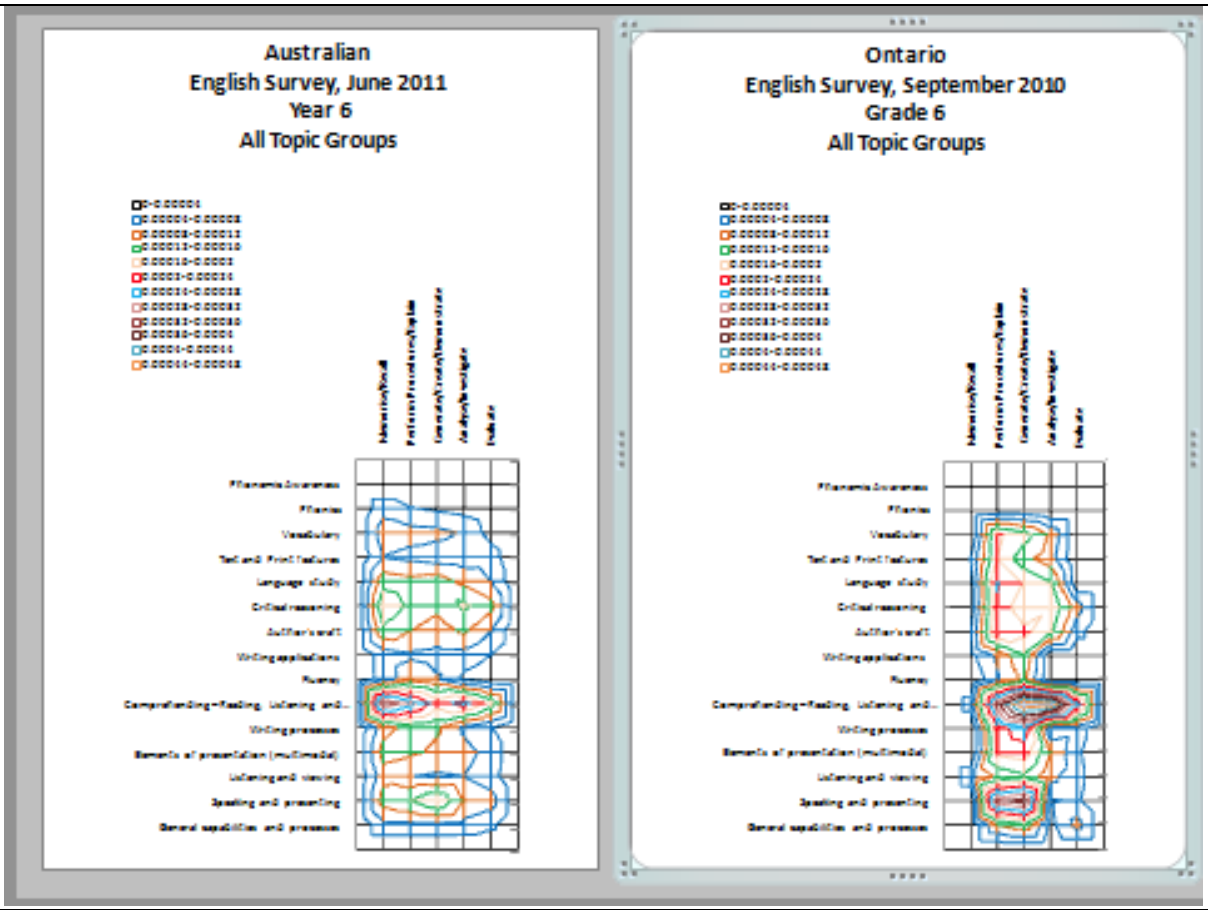
Comments

As the graphs indicate, there is considerable overlap between the Ontario and Australian curriculum at Year 5, with some variations in intensity of coverage and cognitive demand.

All topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Phonics'.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.00%	0.08%
Phonics	4.00%	1.23%
Vocabulary	6.85%	6.09%
Text and Print features	5.46%	4.93%
Language study	9.38%	9.01%
Critical reasoning	10.52%	8.94%
Author's craft	7.83%	7.86%
Writing applications	5.63%	5.62%
Fluency	2.69%	3.00%
Comprehending – Reading, Listening and Viewing	14.36%	15.87%
Writing processes	6.93%	7.55%
Elements of presentation (multimodal)	7.10%	8.17%
Listening and viewing	5.22%	5.55%
Speaking and presenting	9.87%	11.09%
General capabilities and processes	4.16%	5.01%



Topic Coverage Index: Australian Curriculum versus Ontario 0.87

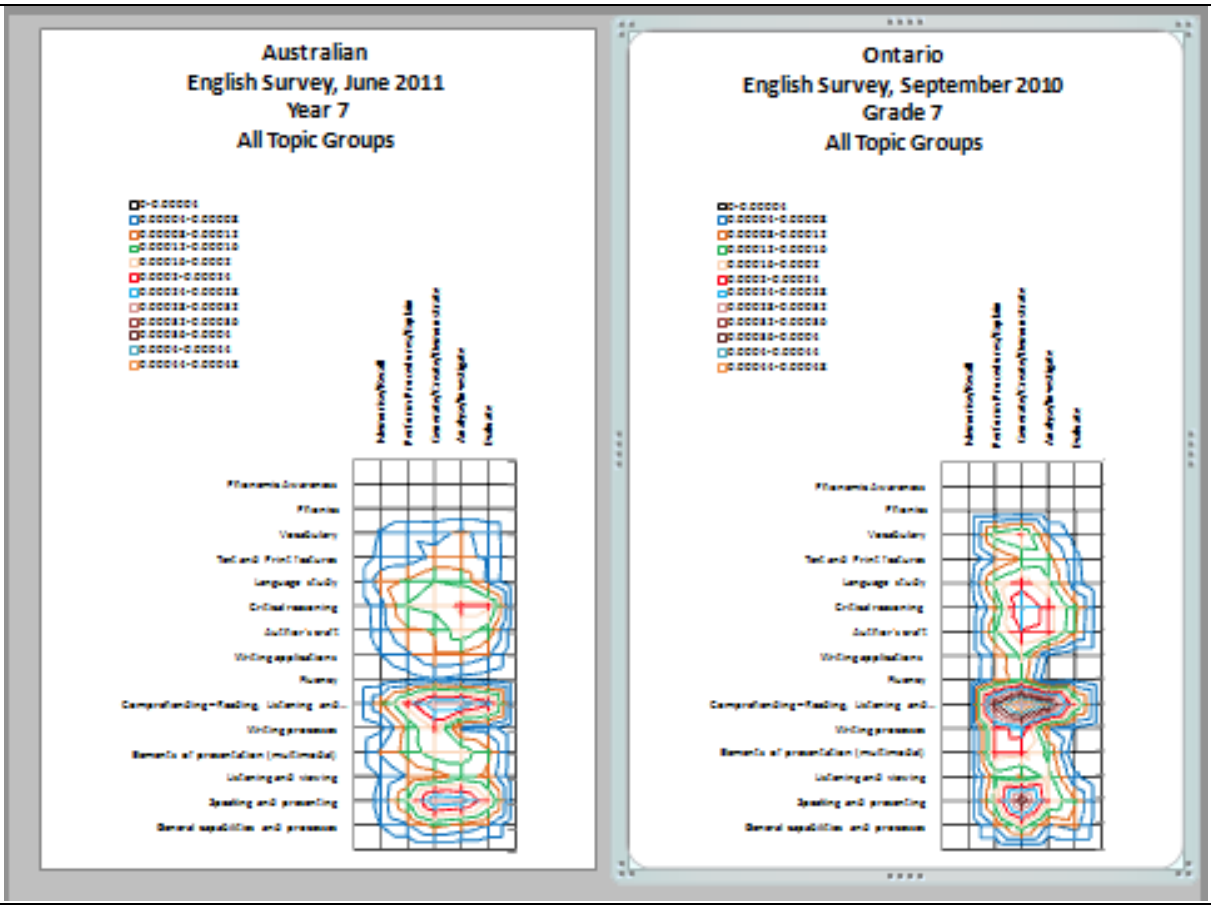
Comments

As the graphs show there is considerable overlap between the Ontario and Australian curriculum at Year 6 with some variation in cognitive demand and minor variations in intensity of coverage.

All topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Phonics' and 'Language study'.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.00%	0.10%
Phonics	3.43%	0.39%
Vocabulary	5.93%	6.21%
Text and Print features	4.57%	6.12%
Language study	9.64%	7.28%
Critical reasoning	10.21%	9.32%
Author's craft	7.79%	7.86%
Writing applications	5.43%	5.15%
Fluency	3.14%	3.69%
Comprehending – Reading, Listening and Viewing	16.29%	16.41%
Writing processes	7.00%	7.77%
Elements of presentation (multimodal)	7.07%	7.77%
Listening and viewing	5.07%	5.92%
Speaking and presenting	10.36%	11.17%
General capabilities and processes	4.07%	4.85%



Topic Coverage Index: Australian Curriculum versus Ontario 0.87

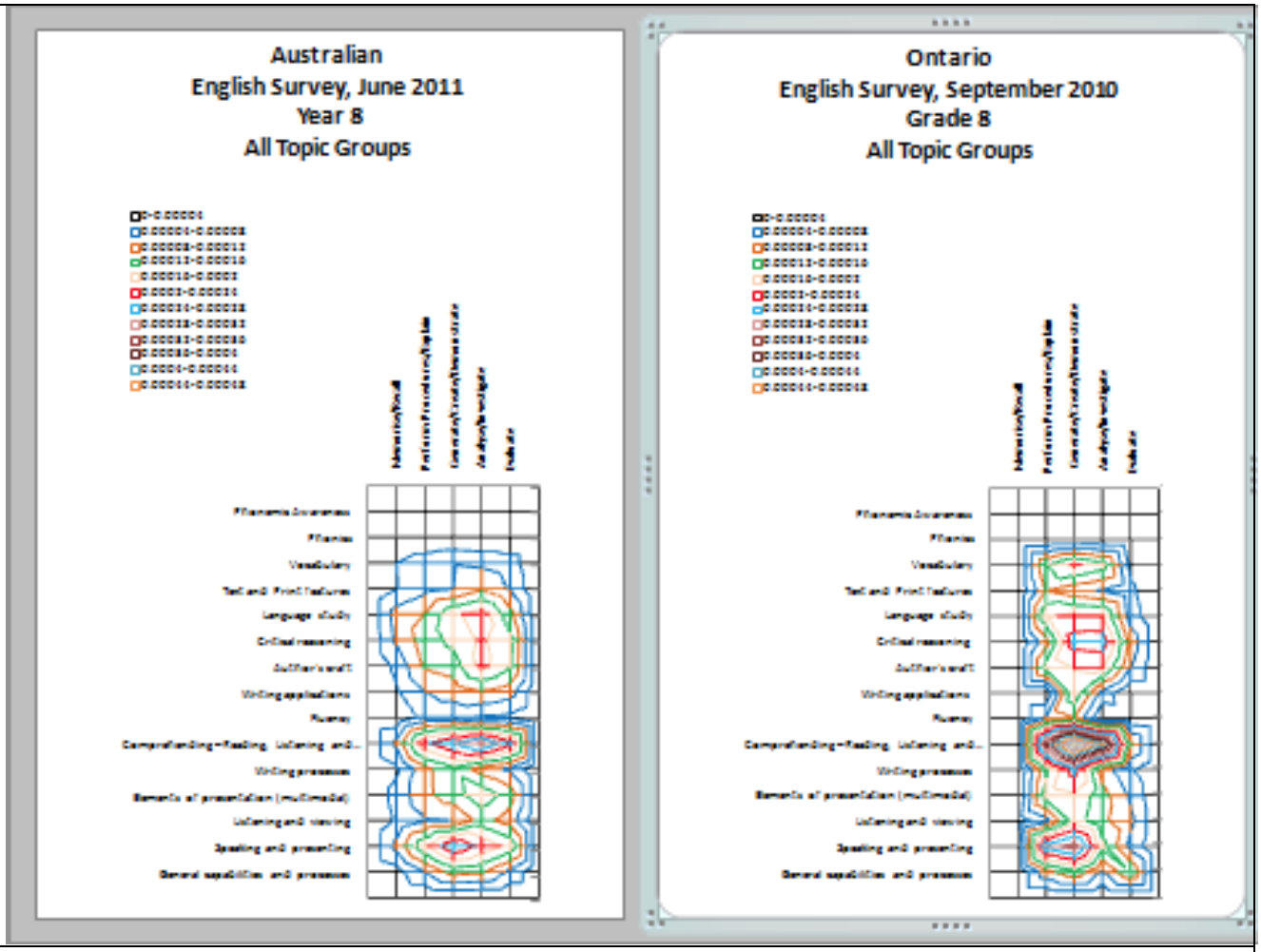
Comments

The graphs indicate considerable overlap between the Ontario and Australian curriculum at Year 7, with some variation in intensity of coverage and breadth of cognitive demand.

All topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Fluency'.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.00%	0.09%
Phonics	0.00%	0.09%
Vocabulary	4.66%	5.84%
Text and Print features	4.51%	5.18%
Language study	7.32%	7.63%
Critical reasoning	11.02%	9.42%
Author's craft	9.10%	8.19%
Writing applications	6.14%	5.27%
Fluency	1.63%	4.24%
Comprehending – Reading, Listening and Viewing	15.68%	16.01%
Writing processes	5.99%	7.72%
Elements of presentation (multimodal)	8.80%	7.63%
Listening and viewing	6.07%	5.65%
Speaking and presenting	13.39%	11.77%
General capabilities and processes	5.70%	5.27%



Topic Coverage Index: Australian Curriculum versus Ontario 0.88

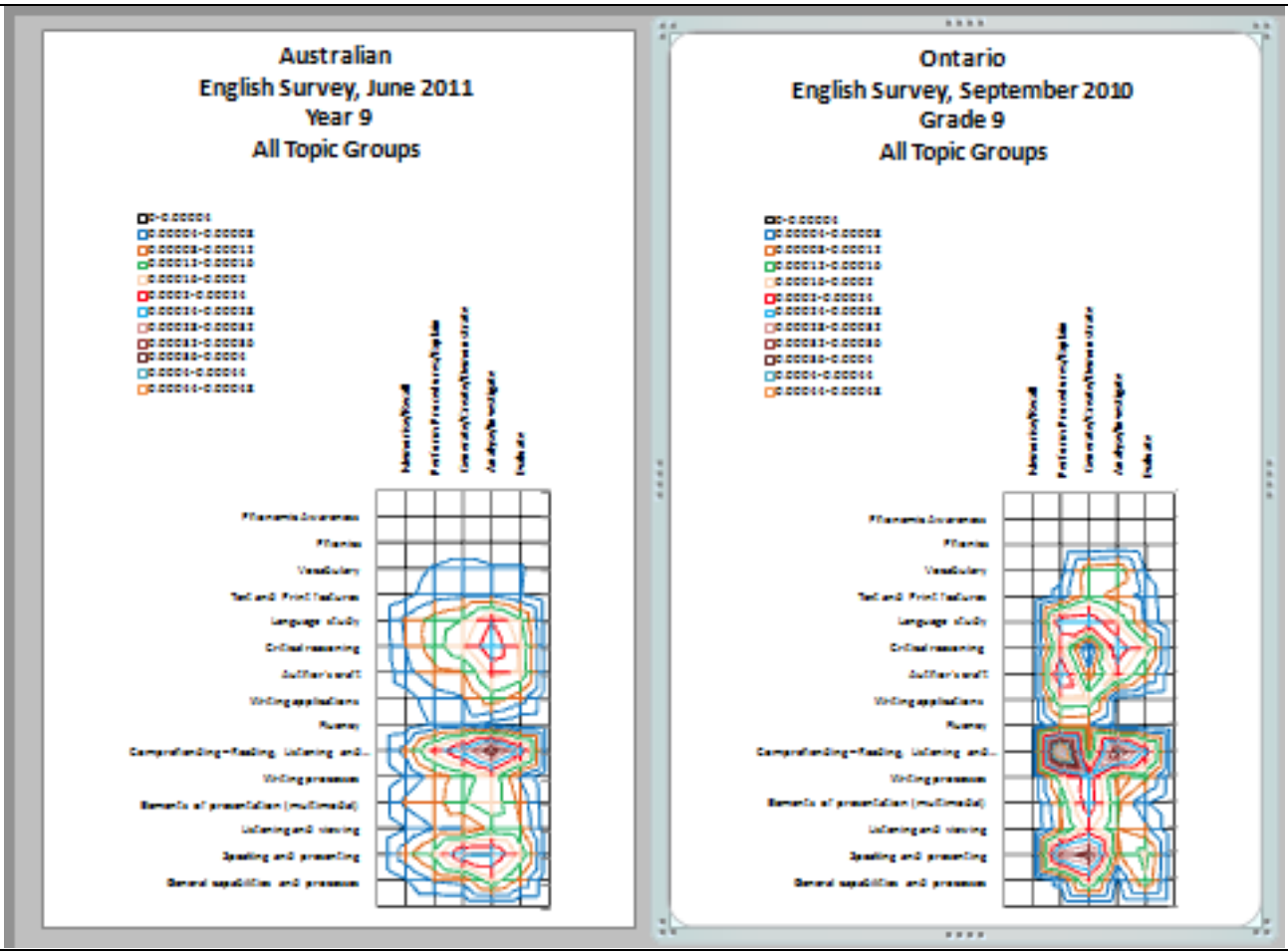
Comments

As the graphs show there is considerable overlap between the Ontario and Australian curriculum at Year 8, with minor variation in intensity of coverage and some variation in breadth of cognitive demand.

All topic groups fall within an acceptable range of difference.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.14%	0.10%
Phonics	0.07%	0.10%
Vocabulary	4.27%	6.05%
Text and Print features	4.91%	4.70%
Language study	9.60%	7.68%
Critical reasoning	10.60%	9.50%
Author's craft	9.17%	8.16%
Writing applications	6.19%	5.57%
Fluency	2.35%	3.55%
Comprehending – Reading, Listening and Viewing	15.93%	16.60%
Writing processes	6.05%	7.68%
Elements of presentation (multimodal)	7.97%	7.87%
Listening and viewing	5.55%	5.57%
Speaking and presenting	12.16%	11.71%
General capabilities and processes	5.05%	5.18%



Topic Coverage Index: Australian Curriculum versus Ontario 0.88

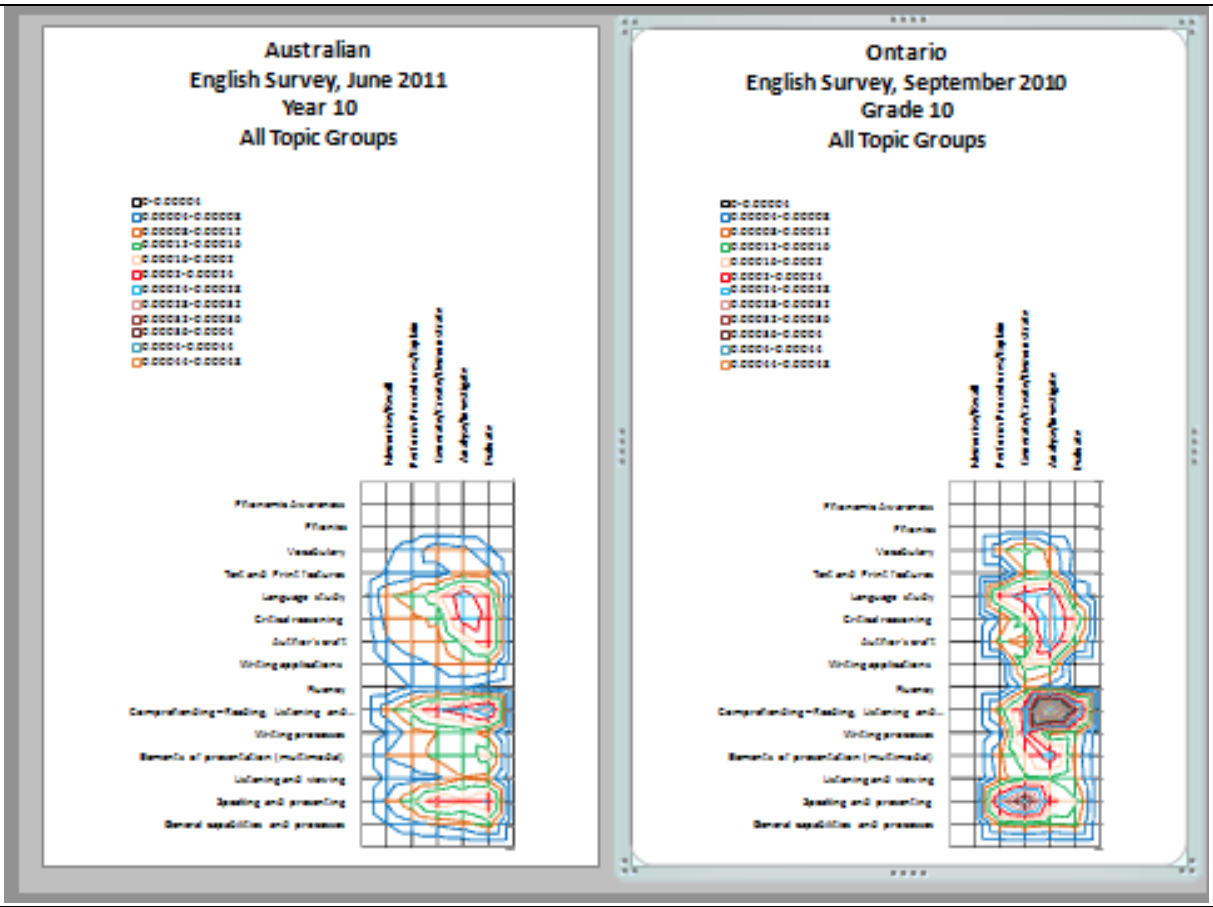
Comments

As the charts show there is considerable overlap between Ontario and Australian curriculum at Year 9, with some variation in breadth of cognitive demand and intensity of coverage.

All topic groups fall within an acceptable range of difference. The Ontario curriculum has a greater focus on 'Vocabulary' and 'Writing processes'.

The analysis suggests a very high degree of alignment between the two curricula.

% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.00%	0.09%
Phonics	0.00%	0.19%
Vocabulary	3.24%	5.42%
Text and Print features	4.17%	4.86%
Language study	9.35%	8.50%
Critical reasoning	11.65%	9.99%
Author's craft	9.86%	8.87%
Writing applications	6.12%	5.79%
Fluency	2.09%	2.43%
Comprehending – Reading, Listening and Viewing	15.68%	16.43%
Writing processes	5.83%	7.94%
Elements of presentation (multimodal)	8.20%	7.75%
Listening and viewing	5.97%	5.51%
Speaking and presenting	12.30%	11.02%
General capabilities and processes	5.54%	5.23%



Topic Coverage Index: Australian Curriculum versus Ontario 0.89

Comments

As the graphs indicate there is considerable overlap between the Ontario and Australian curriculum at Year 10, with some variation in intensity of coverage and breadth of cognitive demand.

All topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Comprehending RLV' and 'Writing processes'.

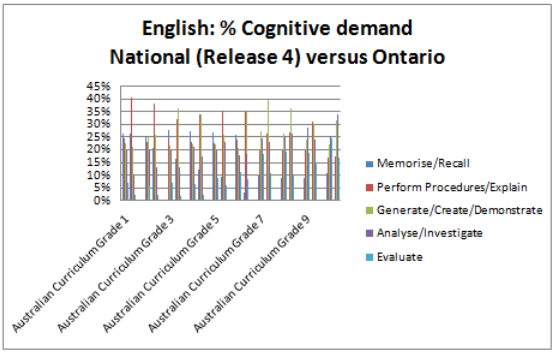
The analysis suggests a very high degree of alignment between the two curricula.

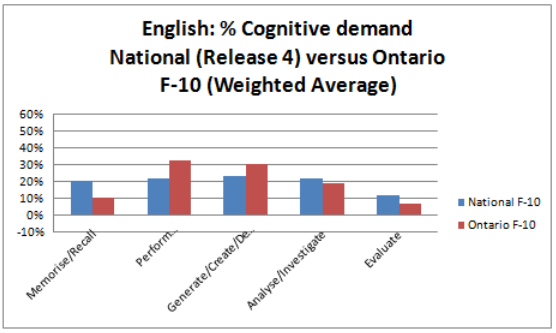
% of Curriculum devoted to Topic Group	Australia	Ontario
Phonemic Awareness	0.00%	0.00%
Phonics	0.00%	0.00%
Vocabulary	4.06%	4.46%
Text and Print features	4.74%	4.27%
Language study	10.35%	9.47%
Critical reasoning	11.10%	10.03%
Author's craft	9.54%	8.91%
Writing applications	6.22%	5.76%
Fluency	2.30%	2.32%
Comprehending – Reading, Listening and Viewing	14.41%	16.99%
Writing processes	5.62%	7.80%
Elements of presentation (multimodal)	8.19%	8.17%
Listening and viewing	5.68%	5.76%
Speaking and presenting	12.04%	11.23%
General capabilities and processes	5.75%	4.83%

% Cognitive Demand Analysis

English: % Cognitive Demand
Australia (Release 3) versus Ontario

	Memorise/Recall	Perform Procedures/Explain	Generate/Create/Demonstrate	Analyse/Investigate	Evaluate
Australia F-10	20.38%	22.07%	23.33%	21.98%	12.24%
Ontario F-10	10.44%	32.53%	30.62%	19.35%	7.06%
Australia F-1	26.29%	24.52%	22.57%	19.65%	6.97%
Ontario Grade 1	26.30%	40.47%	21.04%	10.09%	2.10%
Australia 2	25.55%	23.28%	25.11%	20.07%	6.00%
Ontario Grade 2	20.55%	38.35%	25.89%	13.17%	2.04%
Australia 3	27.67%	24.22%	21.54%	19.74%	6.84%
Ontario Grade 3	16.54%	32.01%	36.23%	13.28%	1.93%
Australia 4	27.20%	23.10%	22.13%	20.99%	6.58%
Ontario Grade 4	12.38%	33.78%	34.19%	17.27%	2.38%
Australia 5	27.03%	22.75%	21.93%	19.55%	8.74%
Ontario Grade 5	9.19%	35.59%	26.07%	22.97%	6.18%
Australia 6	25.70%	24.03%	20.87%	17.91%	11.48%
Ontario Grade 6	3.24%	35.10%	34.96%	18.52%	8.18%
Australia 7	9.79%	19.99%	27.40%	24.39%	18.43%
Ontario Grade 7	0.21%	26.43%	39.43%	23.16%	10.77%
Australia 8	8.96%	19.71%	26.28%	25.67%	19.39%
Ontario Grade 8	0.15%	26.89%	36.58%	26.42%	9.95%
Australia 9	8.66%	19.57%	24.18%	28.74%	18.85%
Ontario Grade 9	0.00%	31.09%	30.00%	23.89%	15.02%
Australia 10	11.01%	17.06%	22.08%	25.47%	24.38%
Ontario Grade 10	0.00%	17.60%	31.39%	33.95%	17.05%





Comments

As the weighted average F-10 graph indicates, there is moderate to considerable overlap between the Ontario curriculum and the Australian Curriculum. The Ontario curriculum has a materially greater representation of 'Perform…'. The Australian Curriculum has a greater focus on 'Memorise…' and 'Evaluate' while the reverse is true of 'Generate …'.

At the F-1 phase, Ontario has a significantly greater representation of 'Perform…'. Australia has a greater focus on 'Analyse…'.

At the 2 phase, Ontario has a materially greater representation of 'Perform …'. Australia has a greater focus on 'Memorise…' and 'Analyse…'.

At the 3 phase, Ontario has a materially greater representation of 'Generate …' while the reverse is true of 'Memorise…'. Australia has a greater focus on 'Analyse…' but less on 'Perform…'.

At the 4 phase, Ontario has a materially greater representation of 'Perform …' and 'Generate…' while the reverse is true for 'Memorise…'.

At the 5 phase, Ontario has a materially greater representation of 'Perform …' while the reverse is true of 'Memorise…'.

At the 6 phase, Ontario has a materially greater representation of 'Perform …' and 'Generate…' while the reverse is true of 'Memorise…'.

At the 7 phase, Ontario has a materially greater representation of 'Generate…'. Ontario has a greater focus on 'Perform, while Australia has a greater focus on 'Memorise…' and 'Evaluate'.

At the 8 phase, Ontario has a materially greater representation of 'Generate…'. Ontario has a greater focus on 'Perform…' while the reverse is true of 'Memorise…' and 'Evaluate'.

At the 9 phase, Memorise is absent from the Ontario curriculum. Ontario has a materially greater representation of 'Perform…' and a greater focus on 'Generate…'.

At the 10 phase, Memorise is absent from the Ontario curriculum. Australia has a greater focus on 'Evaluate' but the reverse is true of 'Generate

APPENDIX 6: ACARA CURRICULUM MAPPING - Mathematics

INTERNATIONAL MATHEMATICS REPORTS

This section of the report is based on the expert mapping of final version of the Mathematics curriculum documents for Australia and the two comparison curricula, Finland and Singapore. It provides details of **the results for Finland and Singapore compared with results for the Australian Curriculum**, organized by the curriculum phases used in the comparison curriculum.

As indicated in the overall report, for each subject report at each phase or year level within each jurisdiction, this appendix includes the following elements:

1. **Graphs** which represent the data resulting from the mapping process for the Australian Curriculum and the comparison curriculum. The graphs represent the emphasis in the curriculum on both topic coverage and cognitive demand.

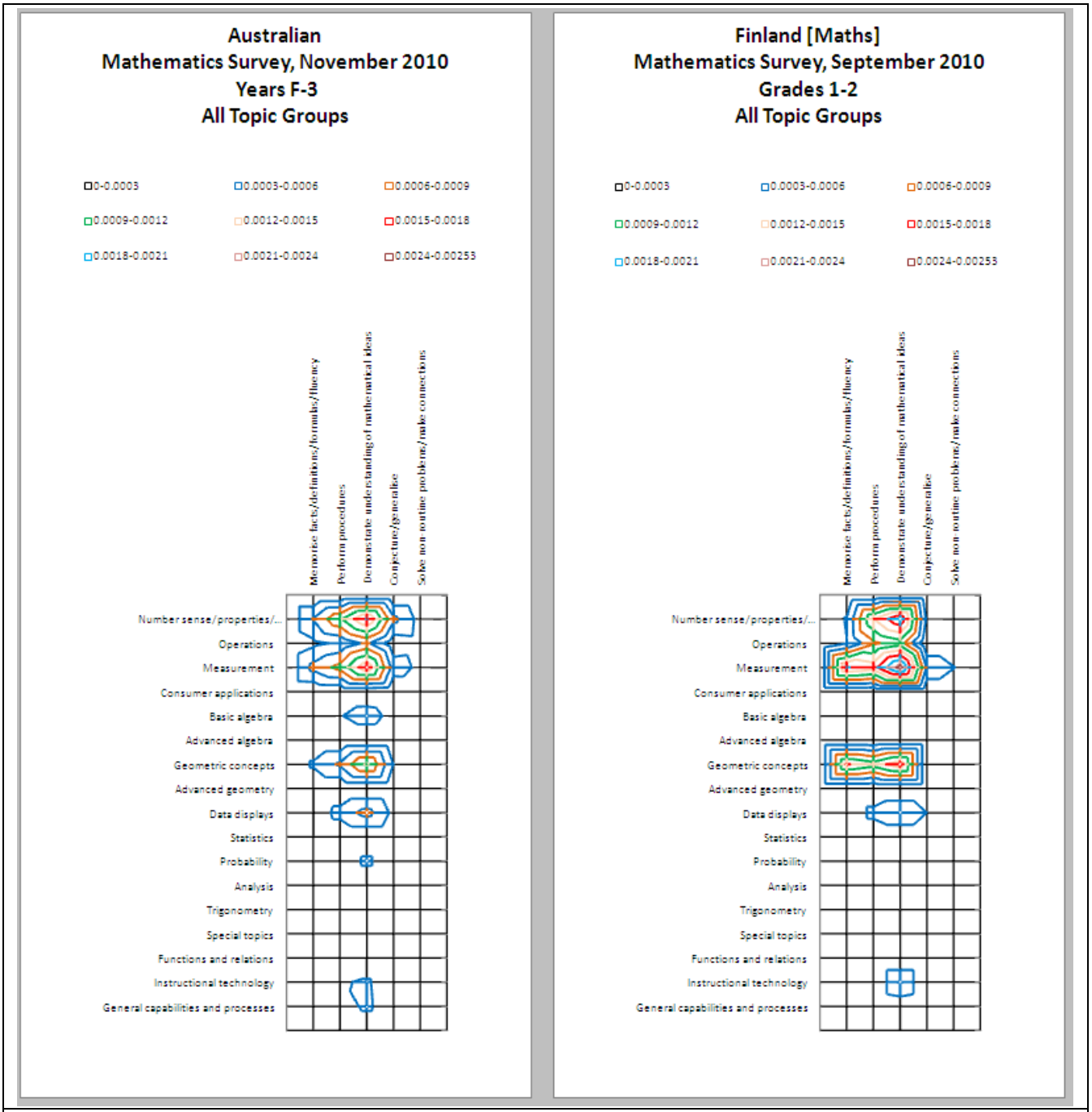
2. **Topic Coverage Indices** for each year-level grouping used in that jurisdiction, represented by a single number less than or equal to 1. The indices provide a measure of the extent to which the comparison curriculum for that stage of schooling is aligned with the Australian Curriculum. The index has been calculated by comparing the percentage of the curriculum devoted to each topic.

3. **A table showing the percentage of the curriculum devoted to each topic group** in the Australian Curriculum and the comparison curriculum. This table supports a more detailed analysis of differences at the topic group level between each jurisdiction's documents. The percentage of the curriculum devoted to each topic group is listed for the Australian curriculum and for the comparison jurisdiction.

4. **A short written discussion** of the key variations between the Australian Curriculum and the comparison curriculum.

5. **A discussion of relative cognitive demand** in the subject as represented in the Australian Curriculum and each comparison curriculum. This includes graphic representation of the relative representation of cognitive demand at each phase in the subject and in the subject overall. It also includes a table of percentages of each element of cognitive demand at each phase which are the basis for the graphic representation.

Finland



Topic Coverage Index: Australian Curriculum versus Finland 0.70

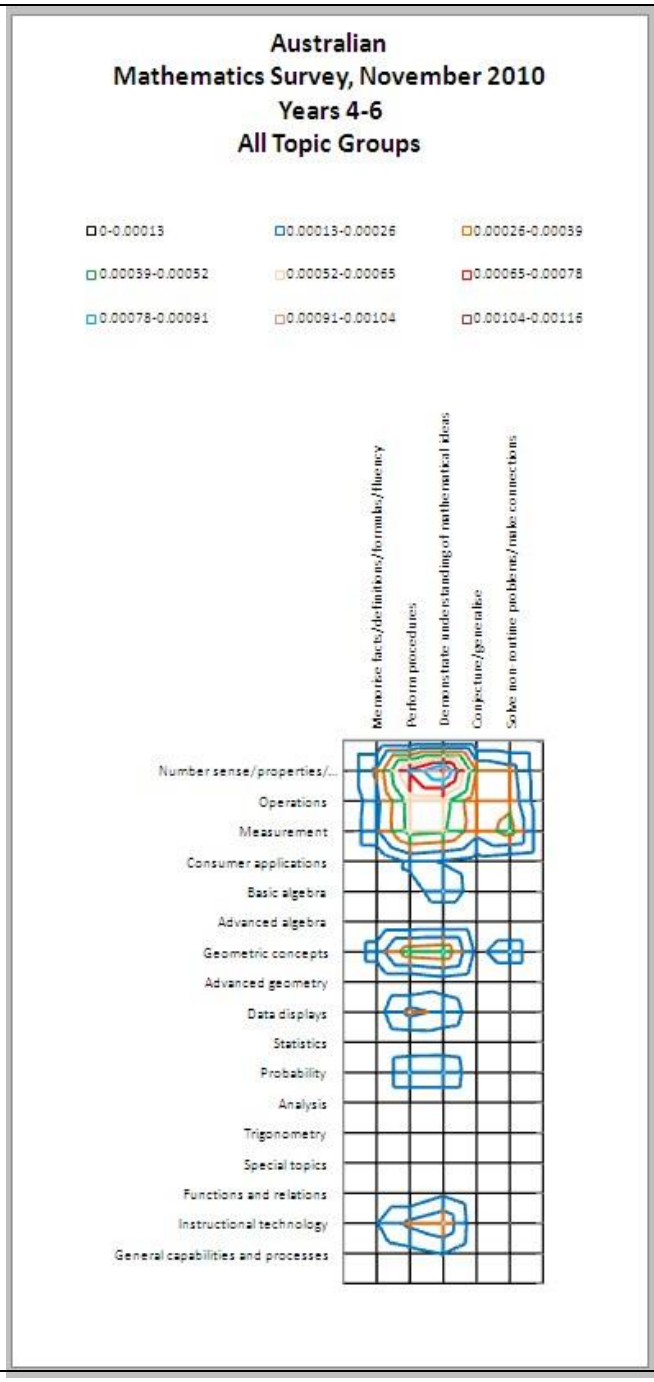
Comments

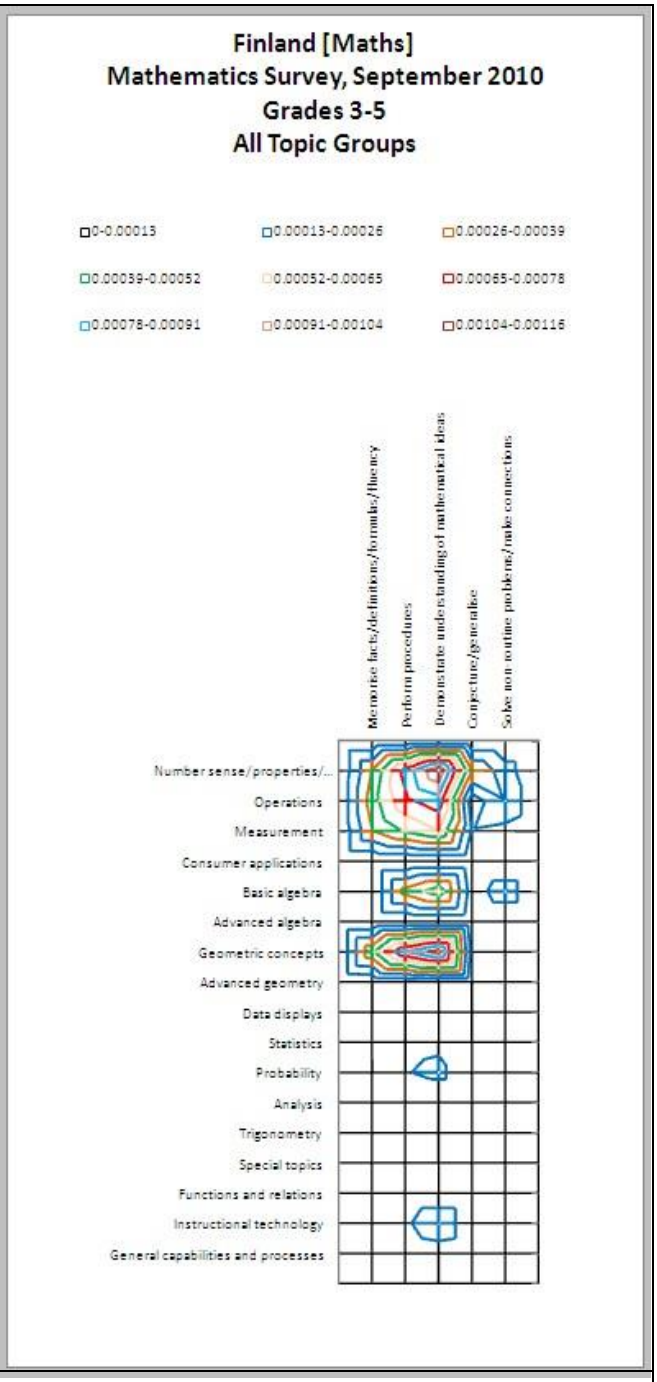
As the graphs indicate, there is moderate overlap between the Singapore and Australian curriculum at the P-3 level, but a significant difference in intensity of coverage.

Probability is materially represented in the Australian curriculum, but not in Finland. Finland has a materially greater representation of 'Operations', 'Measurement' and Geometric

% of Curriculum devoted to Topic Group	Australian	Finland
Number sense/properties/ relationships/numeration	24.71%	23.84%
Operations	8.24%	13.25%
Measurement	22.35%	27.81%
Consumer applications	1.18%	0.00%
Basic algebra	5.88%	1.32%

concepts' but less of 'Basic algebra'. All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Data displays', 'Probability' and 'General capabilities and processes'. The analysis suggests a moderate to high degree of alignment between the two curricula.	Advanced algebra	0.00%	0.00%
	Geometric concepts	16.47%	20.53%
	Advanced geometry	0.00%	0.00%
	Data displays	9.41%	7.28%
	Statistics	0.00%	0.00%
	Probability	3.53%	0.00%
	Analysis	0.00%	0.66%
	Trigonometry	0.00%	0.66%
	Special topics	0.00%	0.00%
	Functions and relations	0.00%	0.00%
	Instructional technology	4.71%	3.97%
	General capabilities and processes	3.53%	0.66%





Topic Coverage Index: Australian Curriculum versus Finland 0.72

Comments

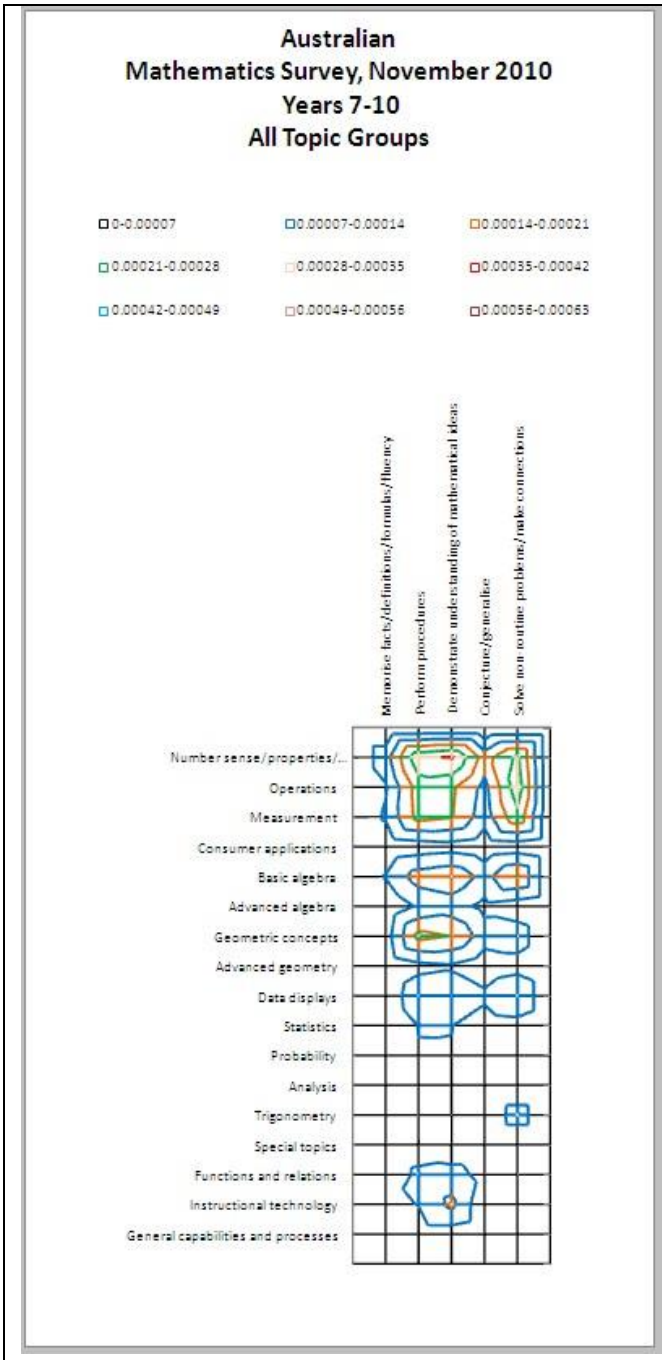
As the graphs indicate, there is considerable overlap between the Singapore and Australian curriculum at the 4-6 level, but a significant difference in intensity of coverage.

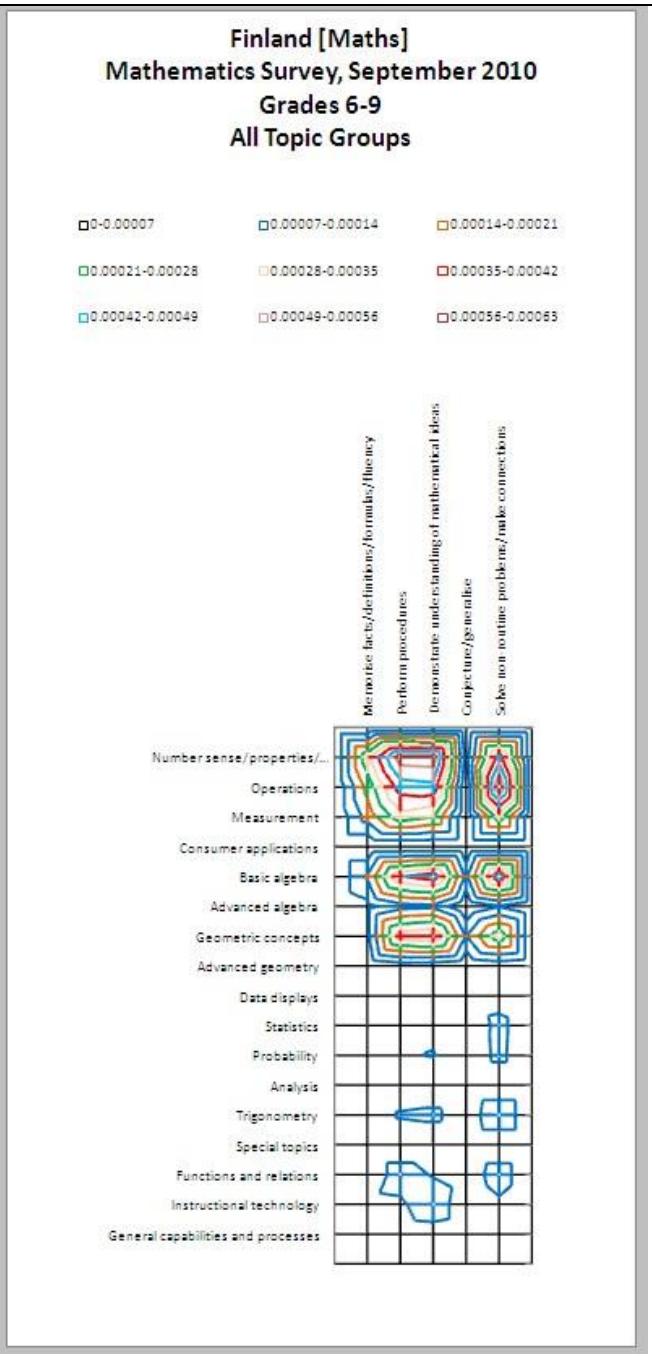
'Consumer applications' is represented in the Australian curriculum but not in Finland. Finland has a materially greater representation of 'Basic algebra' and 'Geometric concepts'.

All other topic groups fall within an acceptable range of difference. Australia has a greater focus on

% of Curriculum devoted to Topic Group	Australian	Finland
Number sense/properties/ relationships/numeration	26.38%	23.32%
Operations	15.95%	19.37%
Measurement	15.34%	13.44%
Consumer applications	3.68%	0.00%
Basic algebra	3.68%	11.46%
Advanced algebra	0.00%	0.00%
Geometric concepts	10.43%	20.55%

‘Number sense…’, ‘Data displays’, ‘Probability’, ‘Instructional technology’ and ‘General capabilities and processes’ and Finland has a greater focus on ‘Operations’. The analysis suggests a high degree of alignment between the two curricula.	Advanced geometry	0.61%	0.40%
	Data displays	6.13%	2.37%
	Statistics	0.61%	1.98%
	Probability	6.13%	2.77%
	Analysis	0.00%	0.00%
	Trigonometry	0.00%	0.40%
	Special topics	0.00%	0.00%
	Functions and relations	1.23%	0.00%
	Instructional technology	7.36%	3.56%
	General capabilities and processes	2.45%	0.40%





Topic Coverage Index: Australian Curriculum versus Finland 0.63

Comments

As the graphs indicate, there is moderate overlap between the Singapore and Australian curriculum at the 7-10 level, but a significant difference in intensity of coverage and breadth of cognitive demand.

'Consumer applications' is represented in the Australian curriculum but not in Finland. Finland has a materially greater representation of 'Basic algebra' and 'Geometric concepts' but less of 'Data displays'.

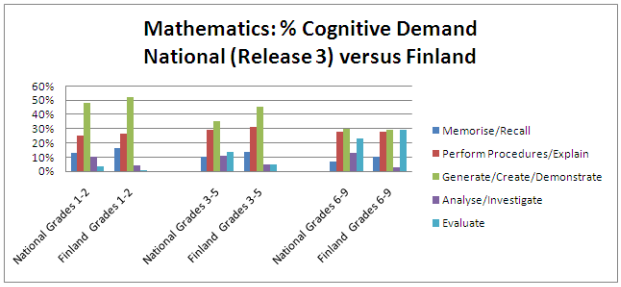
% of Curriculum devoted to Topic Group	Australian	Finland
Number sense/properties/ relationships/numeration	18.66%	20.77%
Operations	12.69%	16.02%
Measurement	11.57%	11.28%
Consumer applications	2.24%	0.00%
Basic algebra	10.45%	16.32%
Advanced algebra	5.22%	3.86%

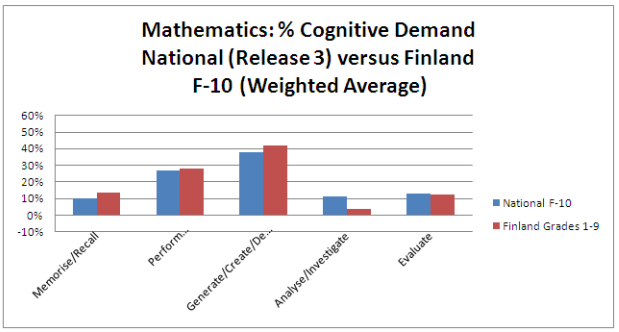
All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Advanced geometry' while Finland has a greater focus on 'Number sense…' and 'Operations'. The analysis suggests a moderate degree of alignment between the two curricula.	Geometric concepts	10.45%	14.54%
	Advanced geometry	2.99%	0.89%
	Data displays	5.97%	1.19%
	Statistics	3.73%	2.37%
	Probability	2.99%	2.37%
	Analysis	0.37%	0.00%
	Trigonometry	2.61%	3.26%
	Special topics	0.37%	0.00%
	Functions and relations	4.10%	3.86%
	Instructional technology	4.48%	2.67%
	General capabilities and processes	1.12%	0.59%

% Cognitive Demand Analysis

Mathematics: % Cognitive Demand
National (Release 3) versus Finland

	Memorise/Recall	Perform Procedures/Explain	Generate/Create/Demonstrate	Analyse/Investigate	Evaluate
National F-10	9.93%	27.15%	38.08%	11.55%	13.29%
Finland F-10	13.44%	28.23%	41.97%	3.93%	12.41%
National F-3	13.01%	25.13%	48.37%	10.33%	3.16%
Finland Grades 1-2	16.58%	26.14%	51.90%	4.31%	1.08%
National 4-6	10.12%	29.39%	35.47%	11.07%	13.95%
Finland Grades 3-5	13.50%	31.53%	45.37%	4.59%	5.00%
National 7-10	6.71%	27.50%	29.75%	13.12%	22.92%
Finland Grades 6-9	10.27%	27.86%	29.50%	3.06%	29.31%





Comments

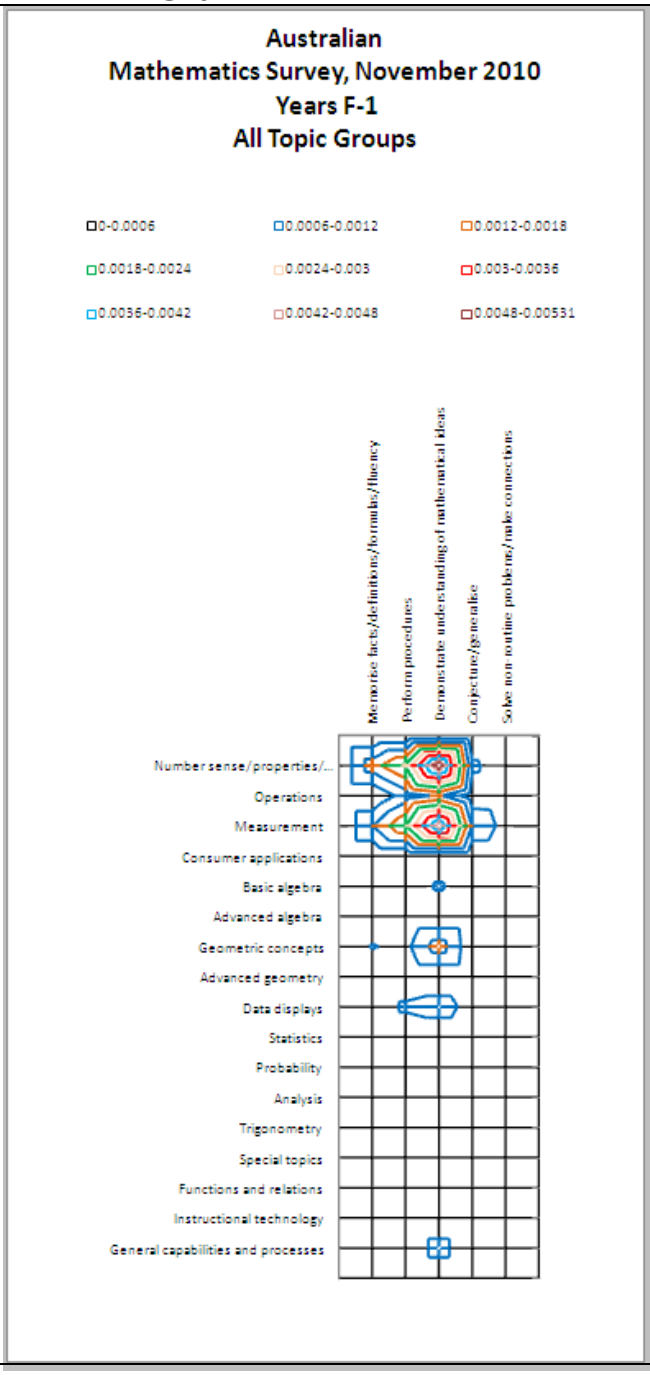
As the weighted average F-10 graph indicates, there is moderate overlap between the Finland and the Australian Curriculum. The Australian Curriculum has a greater representation of 'Conjecture/generalise'. Other categories of cognitive demand fall within an acceptable range of difference.

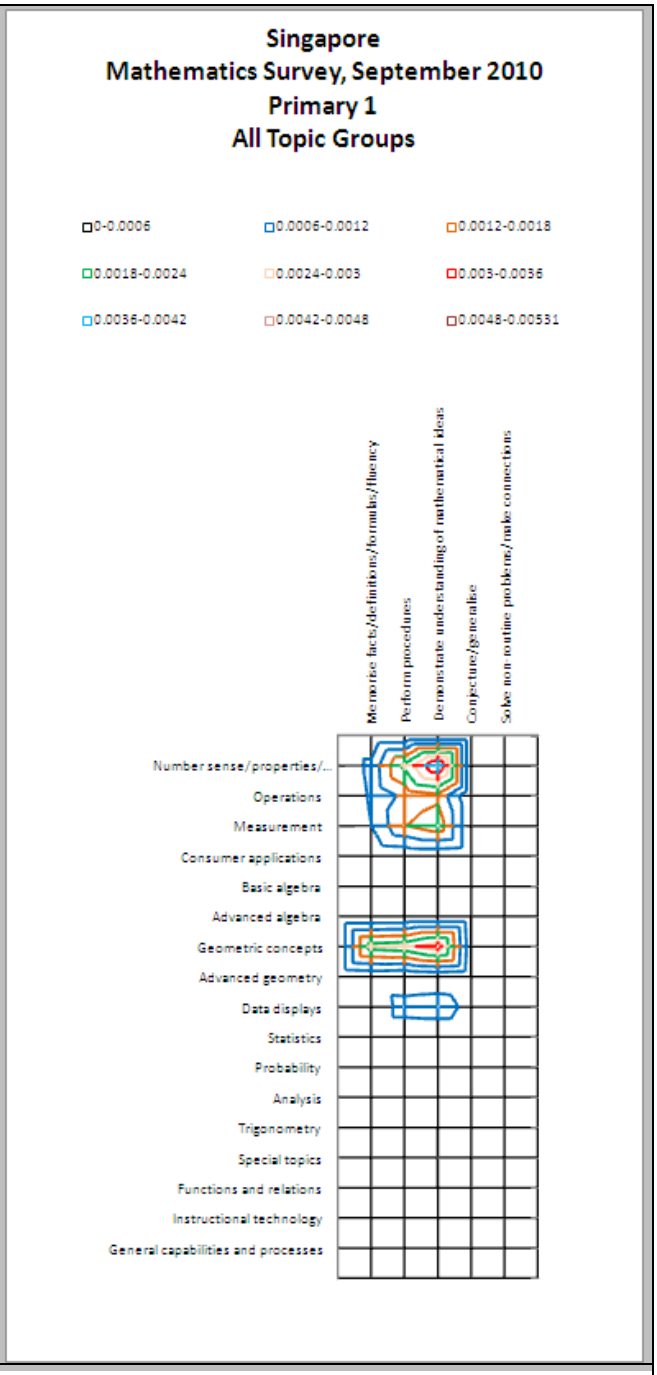
At the F-3 phase, the Australian Curriculum has a greater representation of 'Conjecture/generalise'.

At the 4-6 phase, the Australian Curriculum has a greater representation of 'Conjecture/generalise' and 'Solve non-routine problems/make connections' and less on 'Demonstrate understanding of mathematical ideas'.

At the 7-10 phase, the Australian Curriculum has a significantly greater representation of 'Conjecture/generalise'. The Finish Curriculum has a greater representation of 'Solve non-routine problems/make connections'.

Singapore





Topic Coverage Index: Australian Curriculum versus Singapore 0.75

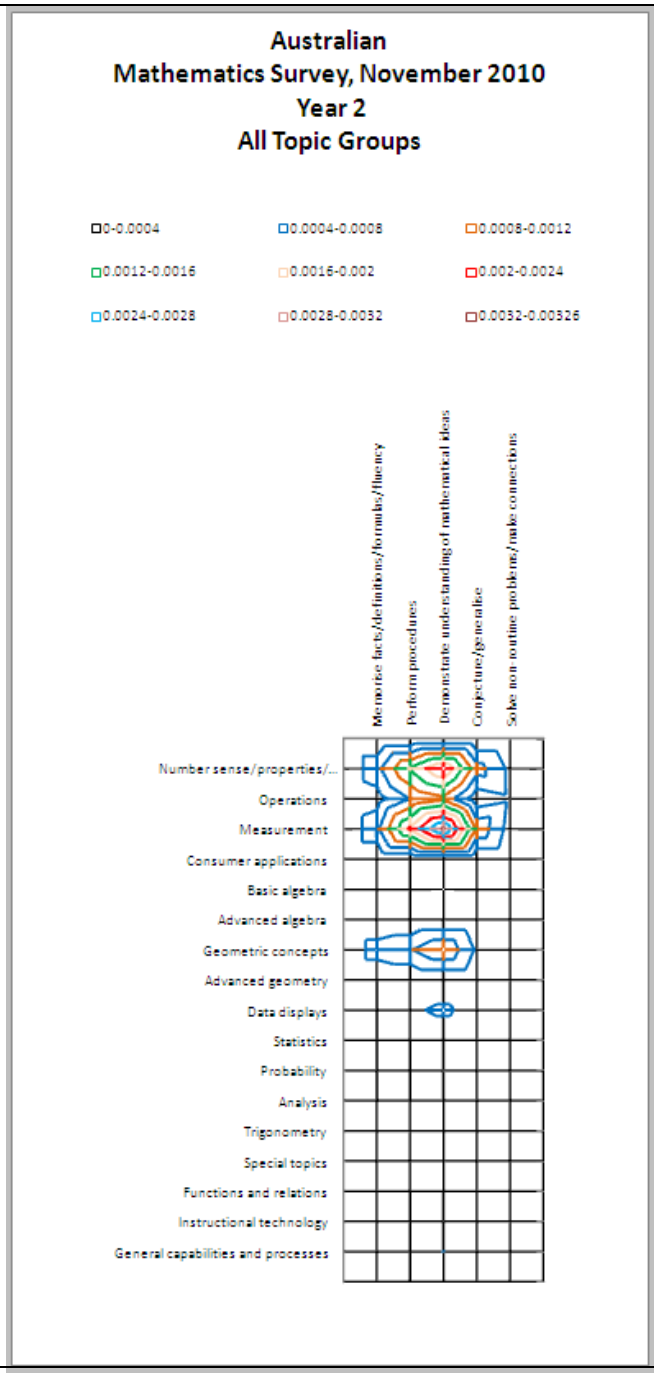
Comments

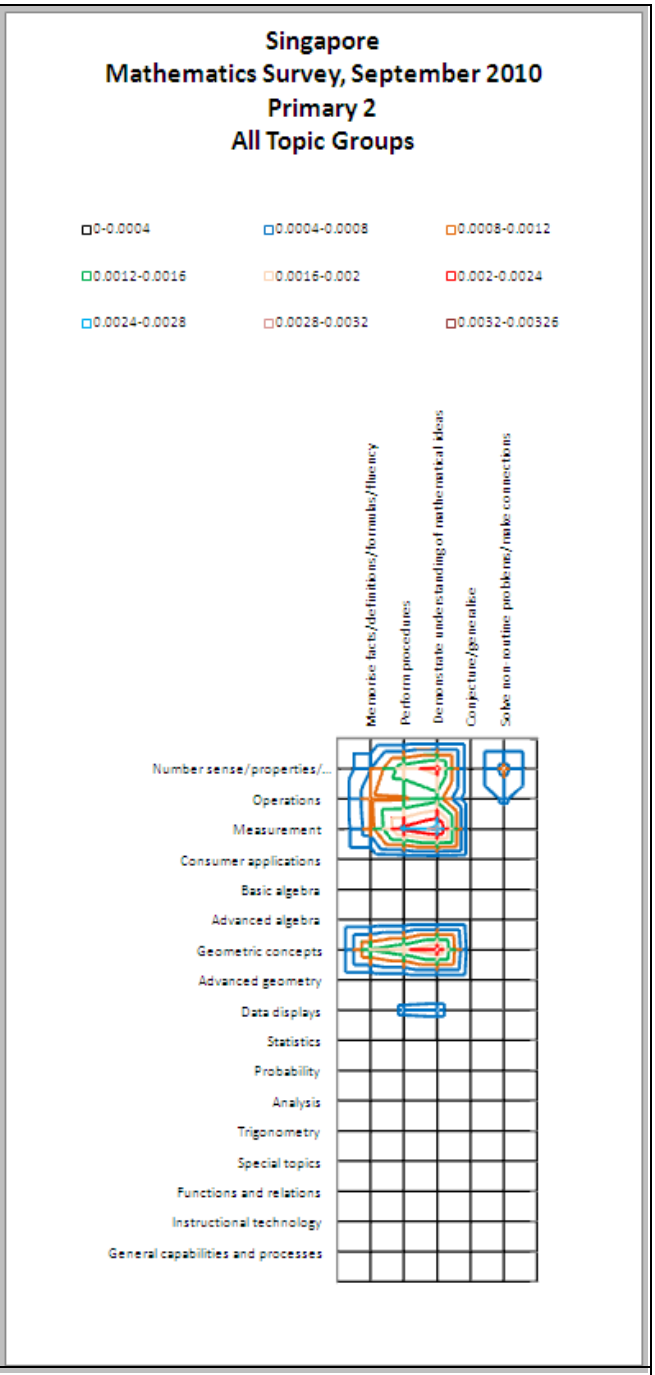
As the graphs indicate, there is moderate to considerable overlap between the Singapore and Australian curriculum at the P-1 level, but a significant difference in intensity of coverage and breadth of cognitive demand.

Australia has a focus on 'General capabilities and processes' while Singapore has none. Singapore has a materially greater representation of 'Operations' and 'Geometric concepts' but less of

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	33.96%	27.83%
Operations	7.55%	13.91%
Measurement	32.08%	17.39%
Consumer applications	0.00%	0.87%
Basic algebra	3.77%	2.61%
Advanced algebra	0.00%	0.00%

‘Number sense…’ and ‘Measurement’. All other topic groups fall within an acceptable range of difference. The analysis suggests a high degree of alignment between the two curricula.	Geometric concepts	9.43%	26.96%
	Advanced geometry	0.00%	0.87%
	Data displays	7.55%	8.70%
	Statistics	0.00%	0.00%
	Probability	1.89%	0.00%
	Analysis	0.00%	0.00%
	Trigonometry	0.00%	0.00%
	Special topics	0.00%	0.87%
	Functions and relations	0.00%	0.00%
	Instructional technology	0.00%	0.00%
	General capabilities and processes	3.77%	0.00%





Topic Coverage Index: Australian Curriculum versus Singapore 0.73

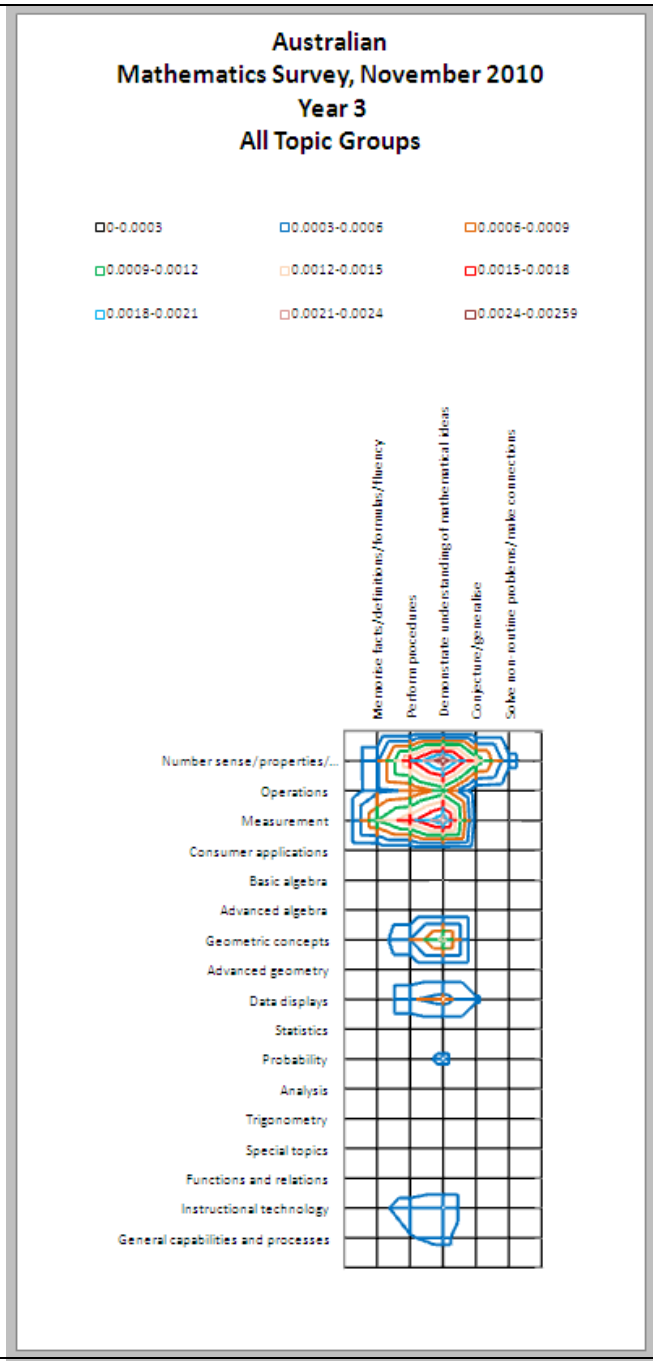
Comments

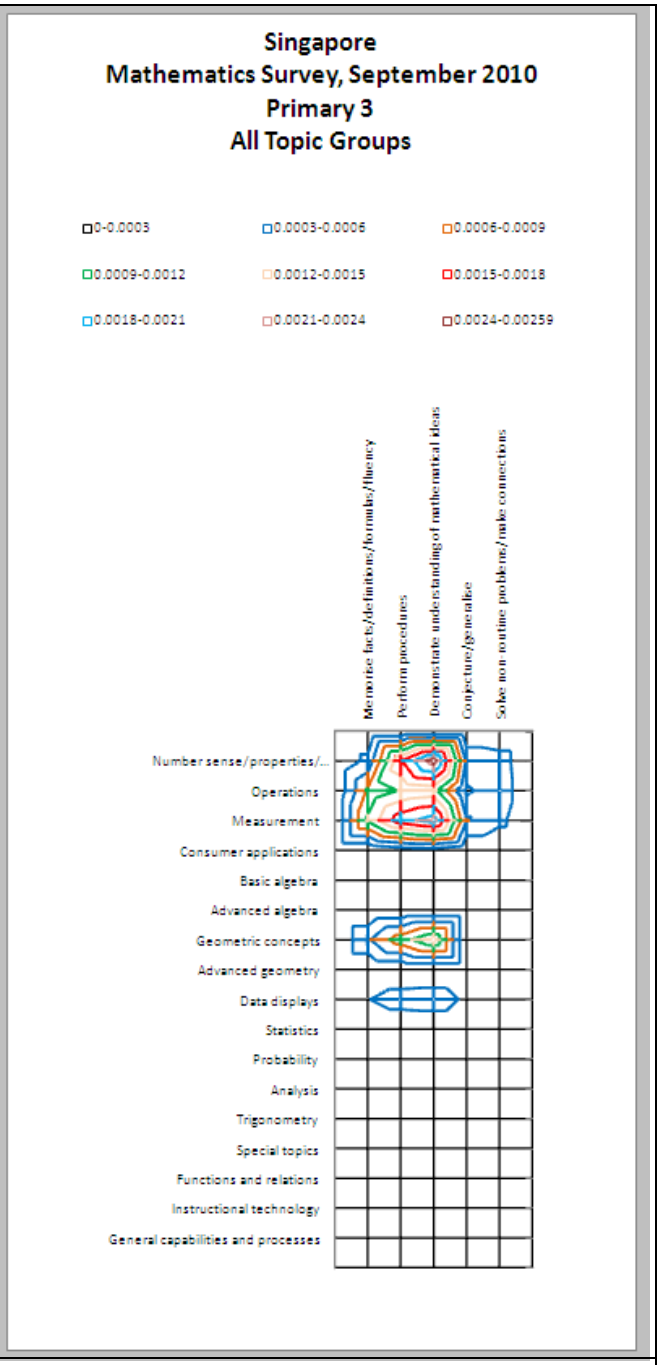
As the graphs indicate, there is considerable overlap between the Singapore and Australian curriculum at the 2 level, but some difference in intensity of coverage and breadth of cognitive demand.

Australia has a focus on 'General capabilities and processes' while Singapore has none. Singapore has a materially greater representation of 'Geometric concepts'.

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	26.90%	23.45%
Operations	11.70%	15.17%
Measurement	32.16%	29.66%
Consumer applications	0.00%	0.69%
Basic algebra	3.51%	2.07%
Advanced algebra	0.00%	0.00%
Geometric concepts	14.04%	22.76%

All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Number sense…' and 'Measurement' and less on 'Operations'. The analysis suggests a high degree of alignment between the two curricula.	Advanced geometry	0.00%	0.00%
	Data displays	5.26%	6.21%
	Statistics	0.00%	0.00%
	Probability	1.75%	0.00%
	Analysis	0.00%	0.00%
	Trigonometry	0.00%	0.00%
	Special topics	0.00%	0.00%
	Functions and relations	0.00%	0.00%
	Instructional technology	1.75%	0.00%
	General capabilities and processes	2.92%	0.00%





Topic Coverage Index: Australian Curriculum versus Singapore 0.74

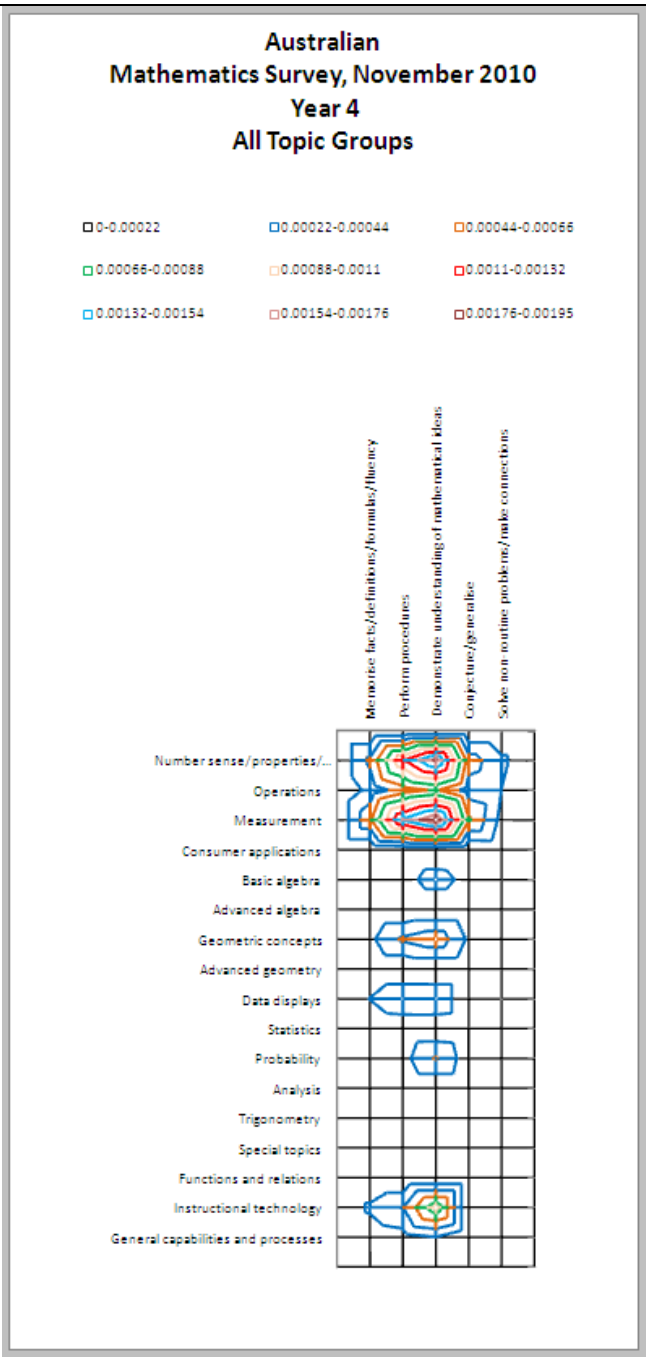
Comments

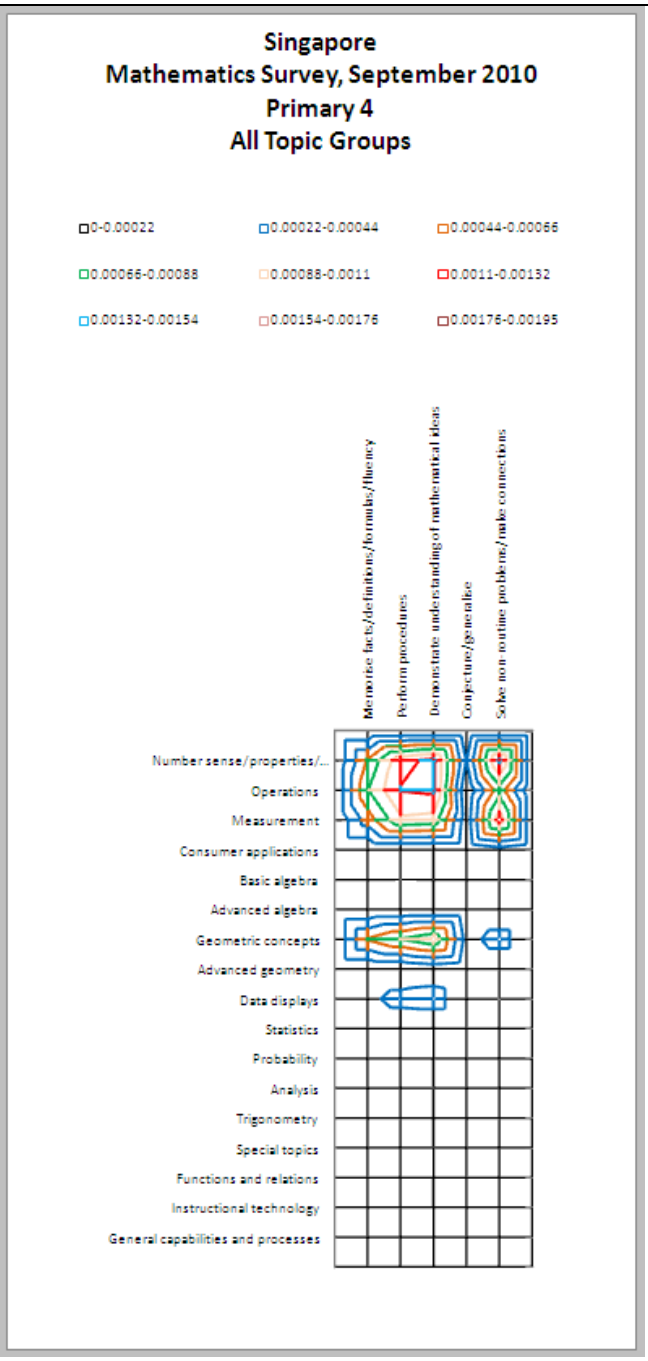
As the graphs indicate, there is moderate to considerable overlap between the Singapore and Australian curriculum at the 3 level, but a significant difference in intensity of coverage and breadth of cognitive demand.

Australia has a focus on 'Probability', 'Instructional technology' and 'General capabilities and processes' while Singapore has none. Singapore has a materially greater representation of 'Operations', 'Measurement' and 'Geometric

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	30.29%	26.59%
Operations	12.00%	18.50%
Measurement	24.57%	30.06%
Consumer applications	0.57%	1.73%
Basic algebra	2.86%	1.73%
Advanced algebra	0.00%	0.00%
Geometric concepts	9.71%	14.45%

concepts'. All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Number sense…'. The analysis suggests a high degree of alignment between the two curricula.	Advanced geometry	0.00%	0.00%
	Data displays	8.00%	6.94%
	Statistics	0.00%	0.00%
	Probability	2.86%	0.00%
	Analysis	0.00%	0.00%
	Trigonometry	0.00%	0.00%
	Special topics	0.00%	0.00%
	Functions and relations	0.00%	0.00%
	Instructional technology	5.71%	0.00%
	General capabilities and processes	3.43%	0.00%





Topic Coverage Index: Australian Curriculum versus Singapore 0.71

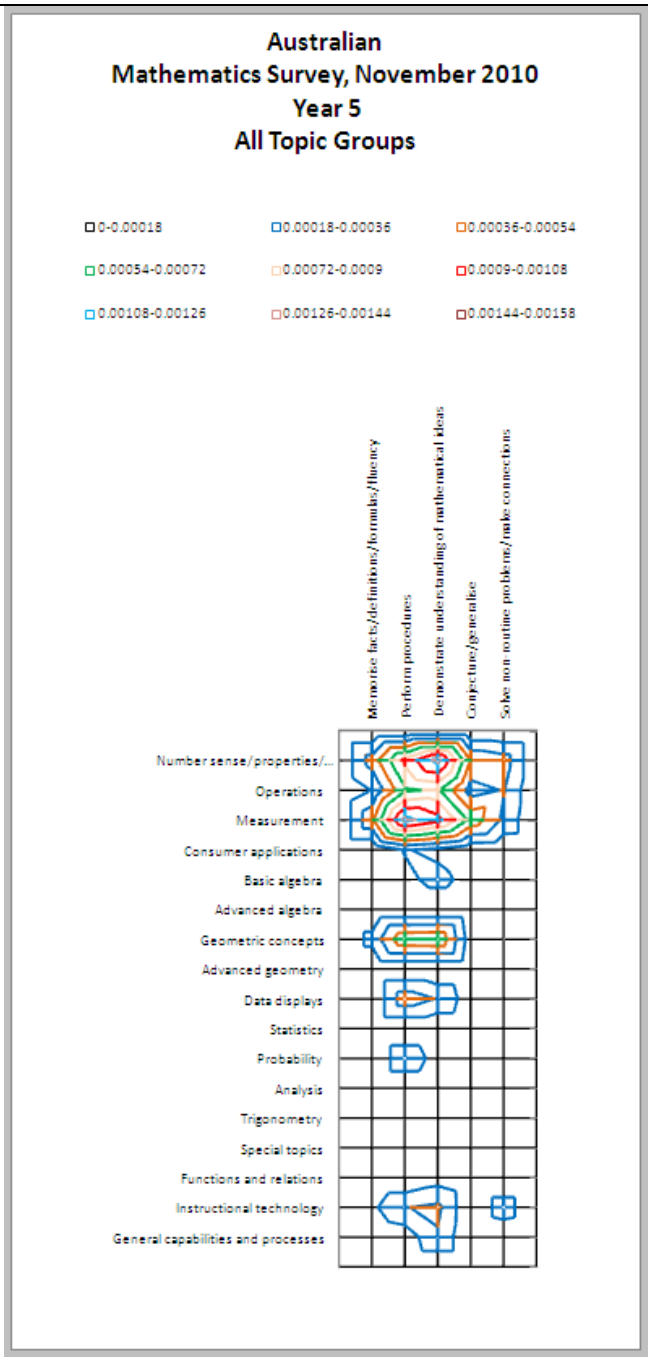
Comments

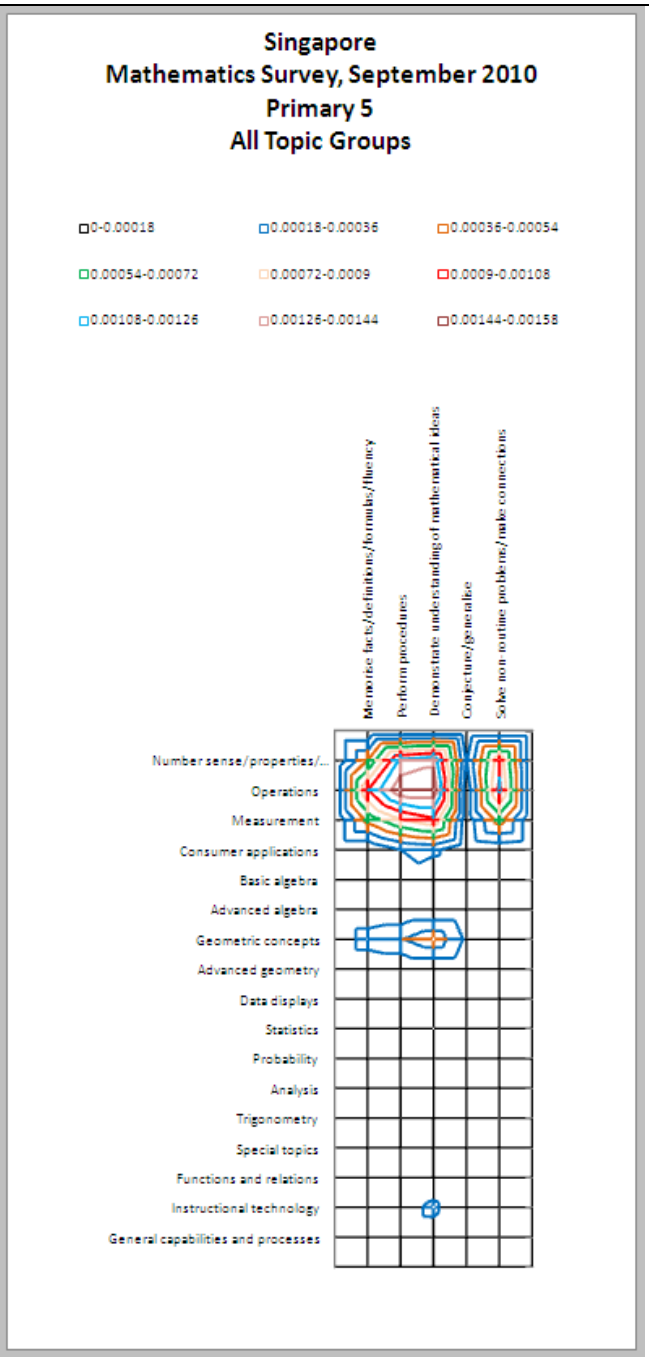
As the graphs indicate, there is moderate overlap between the Singapore and Australian curriculum at the 4 level, but a significant difference in intensity of coverage and breadth of cognitive demand.

Australia has a focus on 'Probability', 'Instructional technology' and 'General capabilities and processes' while these areas are not represented in the Singapore curriculum. Singapore has a materially greater representation of

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	25.55%	25.37%
Operations	11.45%	24.88%
Measurement	27.31%	19.51%
Consumer applications	0.44%	0.98%
Basic algebra	3.96%	3.90%
Advanced algebra	0.00%	0.00%
Geometric concepts	8.81%	17.56%

‘Operations’ and ‘Geometric concepts’ while Australia has a significantly greater representation of ‘Measurement’. All other topic groups fall within an acceptable range of difference. The analysis suggests a high degree of alignment between the two curricula.	Advanced geometry	0.00%	0.49%
	Data displays	7.05%	5.85%
	Statistics	0.44%	0.00%
	Probability	3.96%	0.00%
	Analysis	0.00%	0.49%
	Trigonometry	0.00%	0.00%
	Special topics	0.00%	0.49%
	Functions and relations	0.00%	0.49%
	Instructional technology	8.81%	0.00%
	General capabilities and processes	2.20%	0.00%





Topic Coverage Index: Australian Curriculum versus Singapore 0.72

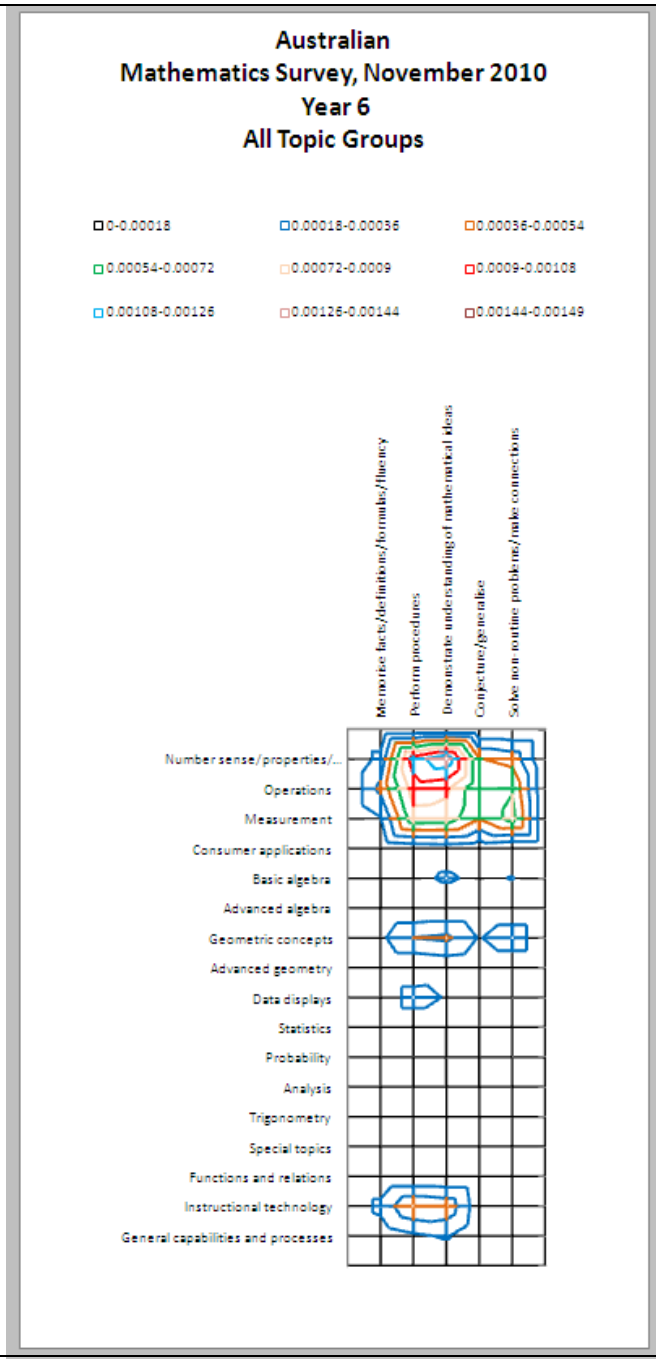
Comments

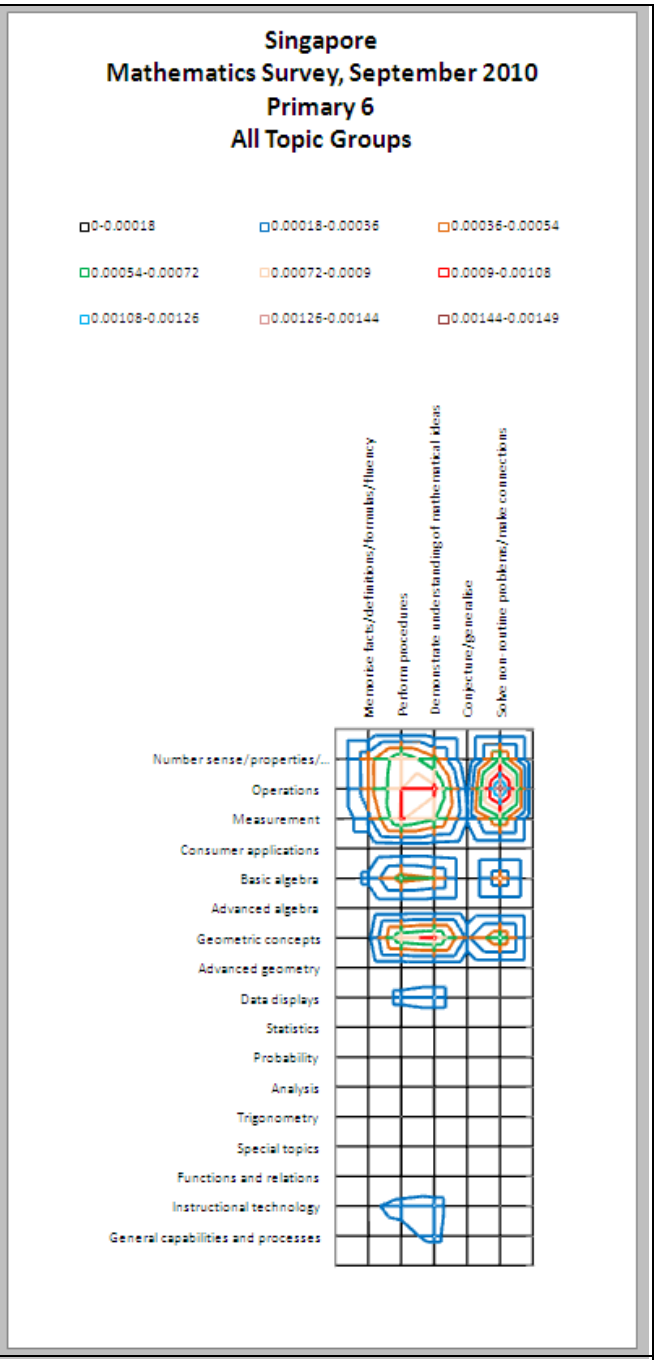
As the graphs indicate, there is some overlap between the Singapore and Australian curriculum at the 5 level, but a significant difference in topic coverage, intensity of coverage and some variation in breadth of cognitive demand.

Singapore has a materially greater representation of 'Operations' but less of 'Measurement'. Australia has a significant focus on 'Data displays' and 'Probability' while Singapore has none, but Singapore has a focus on 'Statistics' while

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	25.29%	26.18%
Operations	14.56%	32.19%
Measurement	22.61%	17.17%
Consumer applications	2.30%	3.86%
Basic algebra	3.83%	2.15%
Advanced algebra	0.00%	0.00%
Geometric concepts	11.49%	9.44%

Australia has none. All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Geometric concepts' and 'Instructional technology'. The analysis suggests a high degree of alignment between the two curricula.	Advanced geometry	0.00%	0.00%
	Data displays	6.13%	0.00%
	Statistics	0.00%	2.58%
	Probability	3.45%	0.00%
	Analysis	0.00%	0.00%
	Trigonometry	0.00%	0.86%
	Special topics	0.00%	0.43%
	Functions and relations	0.77%	0.86%
	Instructional technology	6.51%	2.58%
	General capabilities and processes	3.07%	1.72%





Topic Coverage Index: Australian Curriculum versus Singapore 0.68

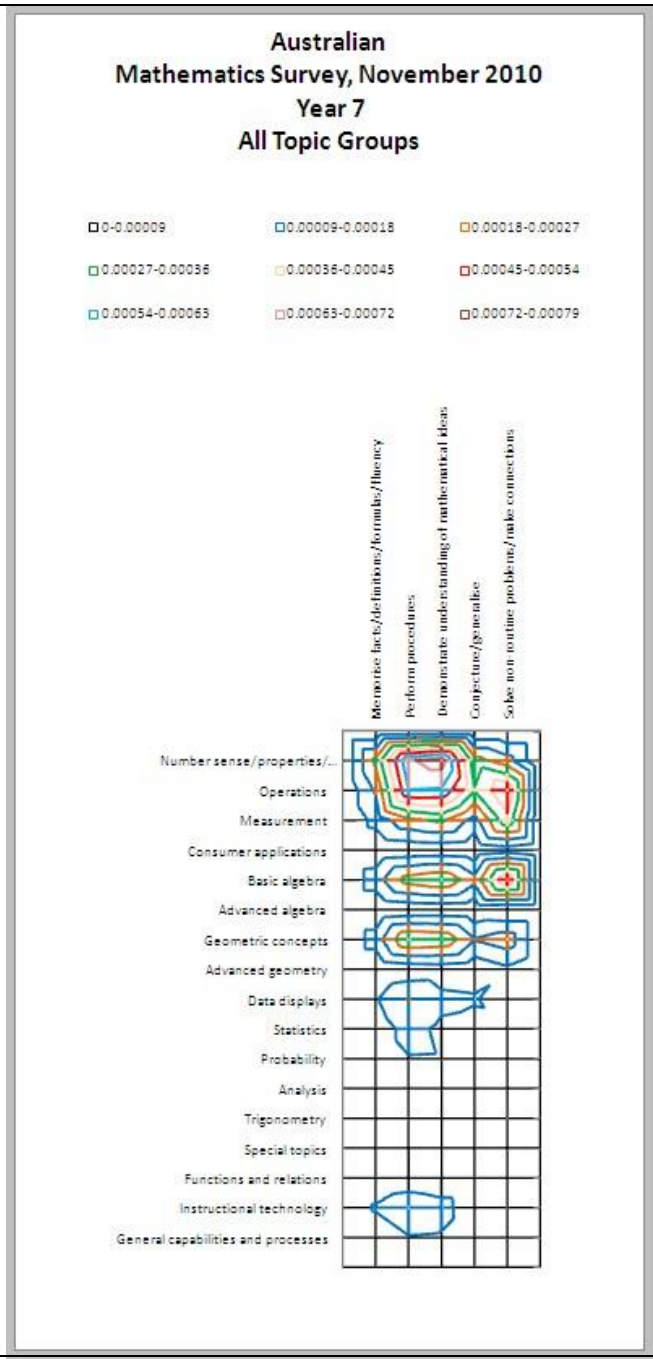
Comments

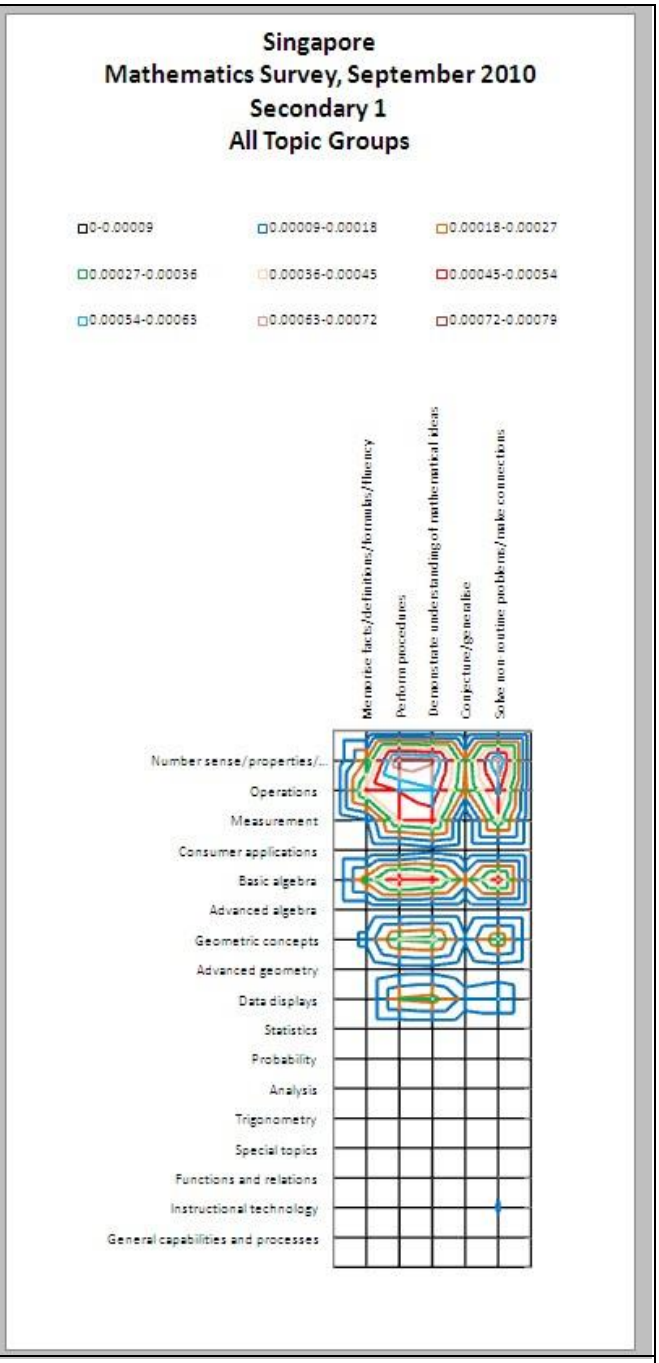
As the graphs indicate, there is moderate overlap between the Singapore and Australian curriculum at the 6 level, but some differences in topic coverage, intensity of coverage and breadth of cognitive demand.

Singapore has a materially greater representation of 'Basic algebra' and 'Geometric concepts' but less of 'Instructional technology' and 'Number sense…'.

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	26.90%	15.31%
Operations	21.38%	22.45%
Measurement	19.31%	17.86%
Consumer applications	1.72%	0.51%
Basic algebra	3.79%	12.76%
Advanced algebra	0.00%	0.00%
Geometric concepts	8.97%	16.84%

All other topic groups fall within an acceptable range of difference. The analysis suggests a moderate degree of alignment between the two curricula.	Advanced geometry	0.34%	0.00%
	Data displays	4.48%	5.10%
	Statistics	0.00%	0.00%
	Probability	1.72%	0.00%
	Analysis	0.00%	1.02%
	Trigonometry	0.00%	1.02%
	Special topics	0.00%	0.00%
	Functions and relations	0.00%	1.02%
	Instructional technology	8.28%	4.08%
	General capabilities and processes	3.10%	2.04%





Topic Coverage Index: Australian Curriculum versus Singapore 0.72

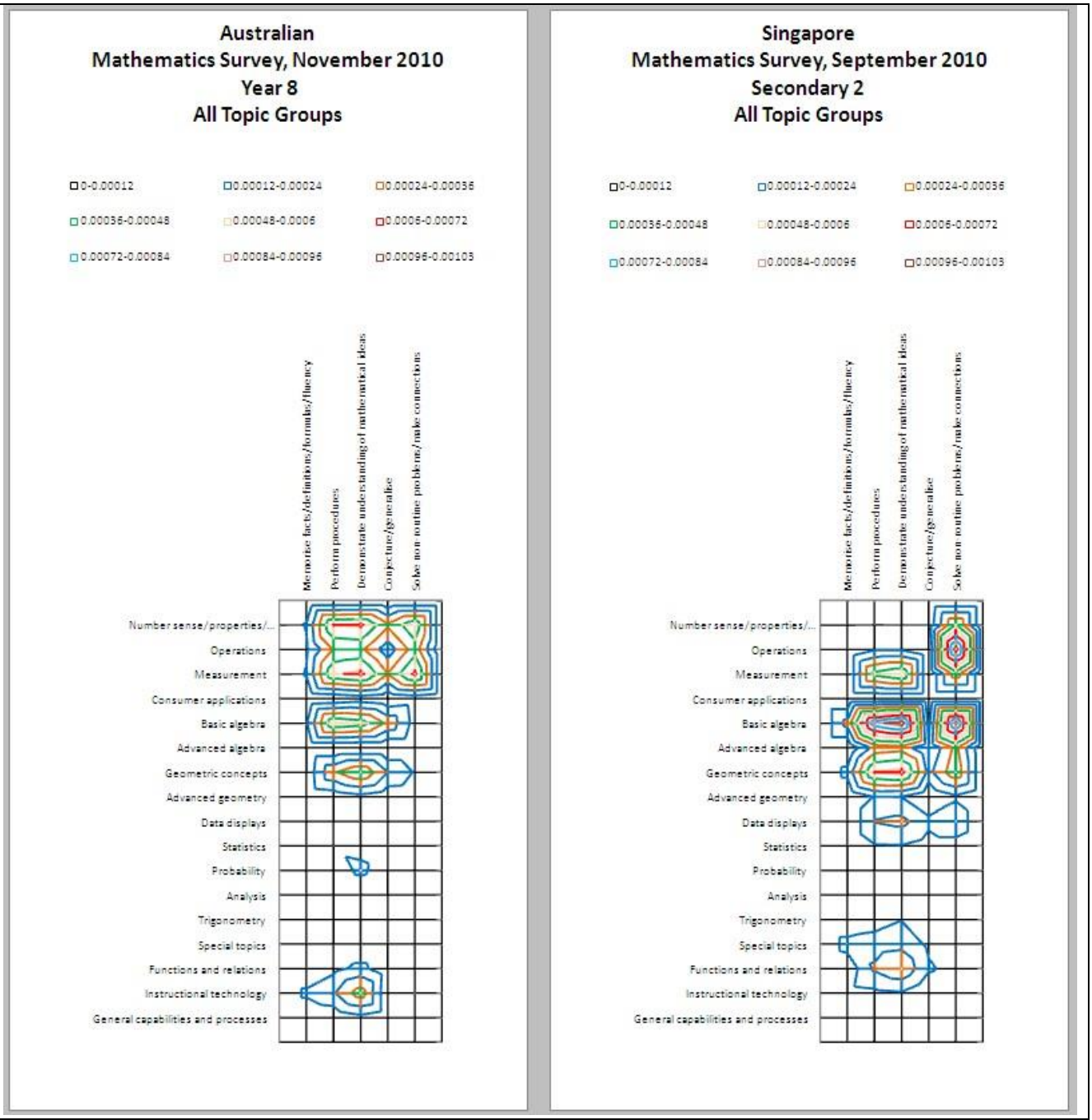
Comments

As the graphs indicate, there is moderate to considerable overlap between the Singapore and Australian curriculum at the 7 level, but some difference in intensity of coverage and cognitive demand.

''Statistics' and 'Probability' are materially represented in the Australian curriculum but not in Singapore. Singapore has a materially greater representation of 'Basic algebra' and 'Data displays' but less of 'Operations'.

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	24.03%	23.17%
Operations	21.97%	17.78%
Measurement	10.30%	13.97%
Consumer applications	1.37%	0.63%
Basic algebra	12.13%	17.14%
Advanced algebra	0.69%	0.00%
Geometric concepts	11.67%	11.11%

All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Instructional technology'. Singapore has a greater focus on 'Measurement'. The analysis suggests a high degree of alignment between the two curricula.	Advanced geometry	1.14%	1.59%
	Data displays	3.89%	9.21%
	Statistics	2.97%	0.00%
	Probability	2.75%	0.00%
	Analysis	0.00%	0.63%
	Trigonometry	0.46%	0.00%
	Special topics	0.00%	0.00%
	Functions and relations	0.46%	1.90%
	Instructional technology	4.35%	1.90%
	General capabilities and processes	1.83%	0.95%



Topic Coverage Index: Australian Curriculum versus Singapore 0.67

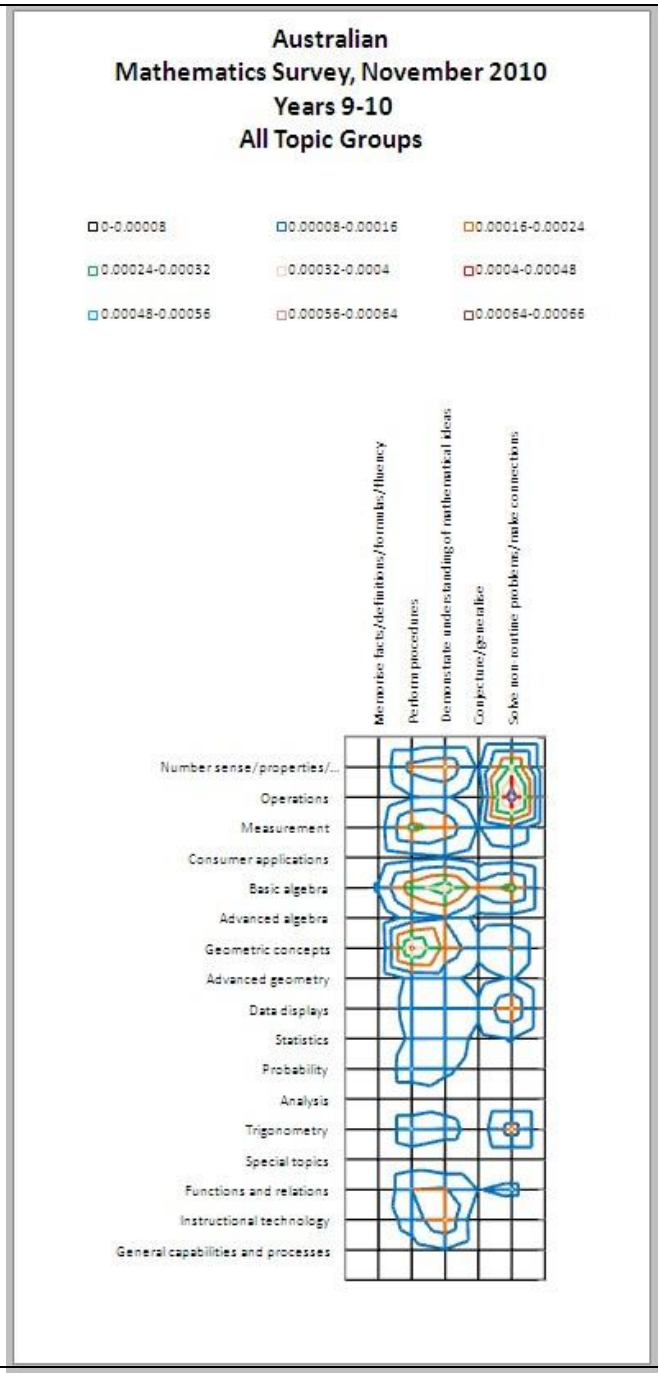
Comments

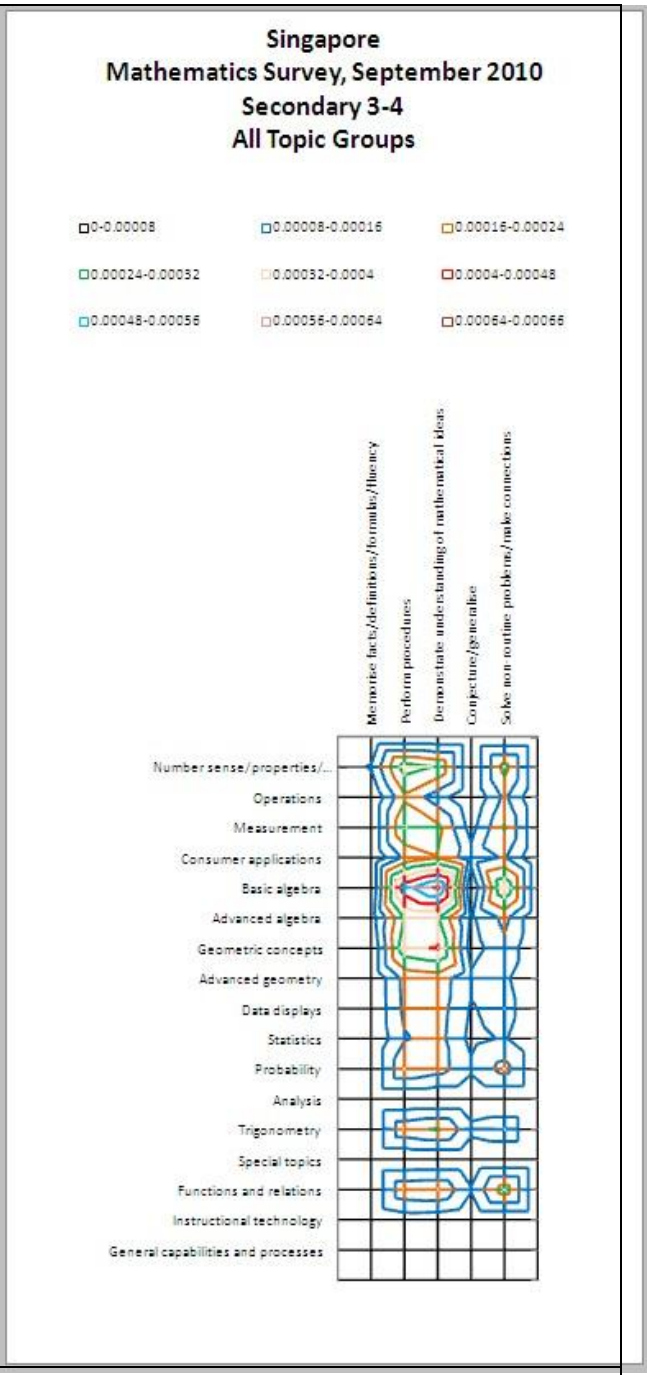
As the graphs indicate, there is moderate overlap between the Singapore and Australian curriculum at the 8 level, but a significant difference in topic coverage, intensity of coverage and breadth of cognitive demand.

'Advanced algebra' and 'Special topics' appear at a material level only in the Singapore curriculum. Singapore has a materially greater representation of 'Basic algebra', 'Data displays', and 'Functions and relations' but less of 'Number sense…',

% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	20.97%	6.91%
Operations	12.16%	10.11%
Measurement	17.63%	11.17%
Consumer applications	1.22%	0.00%
Basic algebra	15.20%	21.28%
Advanced algebra	0.00%	6.91%
Geometric concepts	11.85%	14.36%

‘Measurement’ and ‘Instructional technology’. All other topic groups fall within an acceptable range of difference. Australia has a greater focus on ‘Operations. Singapore has a greater focus on ‘Geometric concepts’. The analysis suggests a moderate degree of alignment between the two curricula.	Advanced geometry	1.82%	2.66%
	Data displays	2.13%	6.91%
	Statistics	3.04%	2.66%
	Probability	2.74%	2.13%
	Analysis	0.00%	0.00%
	Trigonometry	0.91%	1.60%
	Special topics	0.00%	4.26%
	Functions and relations	2.74%	6.91%
	Instructional technology	6.08%	1.60%
	General capabilities and processes	1.52%	0.53%





Topic Coverage Index: Australian Curriculum versus Singapore 0.66

Comments

As the graphs indicate, there is moderate to considerable overlap between the Singapore and Australian curriculum at the 9-10 level, but some difference in intensity of coverage and breadth of cognitive demand.

All topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Operations', 'Geometric concepts' and 'Instructional technology'.

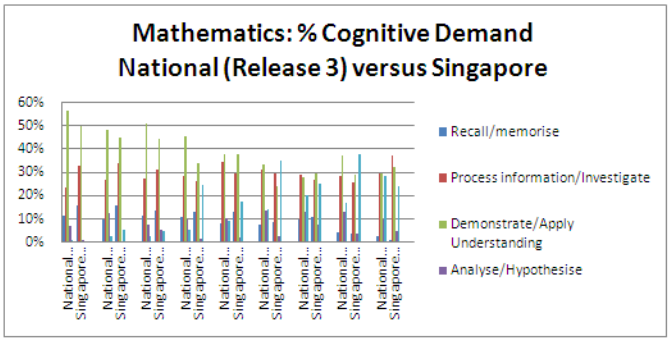
% of Curriculum devoted to Topic Group	Australian	Singapore
Number sense/properties/ relationships/numeration	9.69%	9.85%
Operations	9.18%	5.30%
Measurement	8.67%	8.33%
Consumer applications	3.06%	6.44%
Basic algebra	14.29%	13.64%
Advanced algebra	5.61%	9.47%
Geometric concepts	12.24%	9.85%

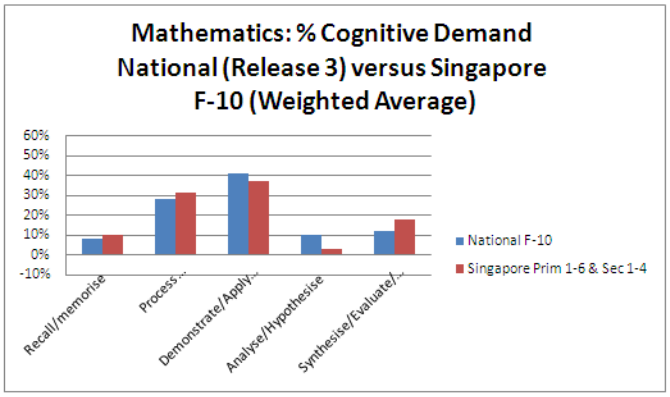
Singapore has a greater focus on 'Consumer applications', 'Advanced algebra', 'Probability' and 'Trigonometry'. The analysis suggests a moderate degree of alignment between the two curricula.	Advanced geometry	4.08%	6.06%
	Data displays	7.14%	5.30%
	Statistics	4.59%	4.92%
	Probability	4.08%	6.44%
	Analysis	0.51%	0.00%
	Trigonometry	4.59%	6.82%
	Special topics	0.51%	0.00%
	Functions and relations	5.61%	6.44%
	Instructional technology	4.59%	0.76%
	General capabilities and processes	1.53%	0.38%

% Cognitive Demand Analysis

Mathematics: % Cognitive Demand
National (Release 3) versus Singapore

	Memorise facts/definitions/formulas/fluency	Perform procedures	Demonstrate understanding of mathematical ide	Conjecture/generalise	Solve non-routine problems/make connections
National F-10	8.21%	28.46%	41.13%	10.34%	11.87%
Singapore Primary 1-10	10.32%	31.25%	37.11%	3.25%	18.06%
National F-1	11.54%	23.55%	56.71%	7.04%	1.15%
Singapore Primary 1	16.07%	33.00%	49.77%	1.17%	0.00%
National 2	10.00%	27.08%	47.97%	12.48%	2.48%
Singapore Primary 2	15.88%	33.68%	44.76%	0.45%	5.23%
National 3	11.23%	27.51%	50.80%	7.83%	2.63%
Singapore Primary 3	13.82%	31.39%	44.37%	5.62%	4.79%
National 4	10.90%	28.68%	45.42%	9.68%	5.31%
Singapore Primary 4	12.94%	26.36%	34.17%	1.73%	24.79%
National 5	8.30%	34.49%	37.52%	10.43%	9.25%
Singapore Primary 5	13.17%	29.41%	37.99%	1.91%	17.52%
National 6	7.66%	31.12%	33.49%	13.36%	14.37%
Singapore Primary 6	8.51%	29.63%	24.13%	2.82%	34.92%
National 7	9.80%	29.11%	27.78%	13.05%	20.25%
Singapore Secondary 1	11.12%	26.70%	29.36%	7.59%	25.24%
National 8	4.43%	28.53%	37.01%	13.19%	16.83%
Singapore Secondary 2	3.97%	25.60%	29.02%	3.86%	37.56%
National 9-10	2.46%	29.68%	29.48%	9.80%	28.57%
Singapore Secondary 3-4	1.01%	37.51%	32.42%	4.73%	24.32%





Comments

As the weighted average F-10 graph indicates, there is moderate overlap between the Singapore and the Australian Curriculum. Singapore has a greater representation of 'Solve non-routine problems/make connections' while the Australian Curriculum has a greater representation of 'Conjecture/generalise'. Other categories of cognitive demand fall within an acceptable range of difference.

At the F-1 phase, the Singapore curriculum has a significantly greater representation of 'Perform procedures' and the Australian Curriculum has a significantly greater representation of 'Demonstrate understanding of mathematical ideas' and 'Conjecture/generalise'.

At year 2, the Singapore curriculum has a significantly greater representation of 'Memorise facts/definitions/formulas/fluency' and 'Perform procedures' and the Australian Curriculum has a significantly greater representation of 'Conjecture/generalise'.

At year 3, the Australian Curriculum has a greater representation of 'Demonstrate understanding of mathematical ideas'.

At year 4, the Singapore curriculum has a significantly greater representation of 'Solve non-routine problems/make connections' and the Australian Curriculum has a significantly greater representation of 'Demonstrate understanding of mathematical ideas' and 'Solve non-routine problems/make connections' and a greater representation of 'Conjecture/generalise.

At year 5, the Singapore curriculum has a greater representation of 'Solve non-routine problems/make

connections' and the Australian Curriculum has a greater representation of 'Perform procedures' and

‘Conjecture/generalise’.

At year 6, the Singapore curriculum has a significantly greater representation of ‘Solve non-routine problems/make connections’ and the Australian Curriculum has a significantly greater representation of ‘Conjecture/generalise’ and a greater representation of ‘Demonstrate understanding of mathematical ideas’.

At year 7, the Australian Curriculum has a greater representation of ‘Conjecture/generalise’.

At year 8, the Singapore curriculum has a significantly greater representation of ‘Solve non-routine problems/make connections’ and the Australian Curriculum has a greater representation of ‘Demonstrate understanding of mathematical ideas ‘ and ‘Conjecture/generalise’.

At years 9 and 10, the Singapore curriculum has a greater representation of ‘Perform procedures’ and the Australian Curriculum has a greater representation of ‘Conjecture/generalise’.

APPENDIX 7: ACARA CURRICULUM MAPPING – Science

INTERNATIONAL SCIENCE REPORTS

This section of the report is based on the expert mapping of the final version of the Science curriculum documents for Australia and the two comparison curricula, Ontario and Finland. It provides details of **the results for Ontario and Finland compared with results for the Australian Curriculum**, organized by the curriculum phases used in the comparison curriculum.

As indicated in the overall report, for each subject report at each phase or year level within each jurisdiction, this appendix includes the following elements:

1. **Graphs** which represent the data resulting from the mapping process for the Australian Curriculum and the comparison curriculum. The graphs represent the emphasis in the curriculum on both topic coverage and cognitive demand.

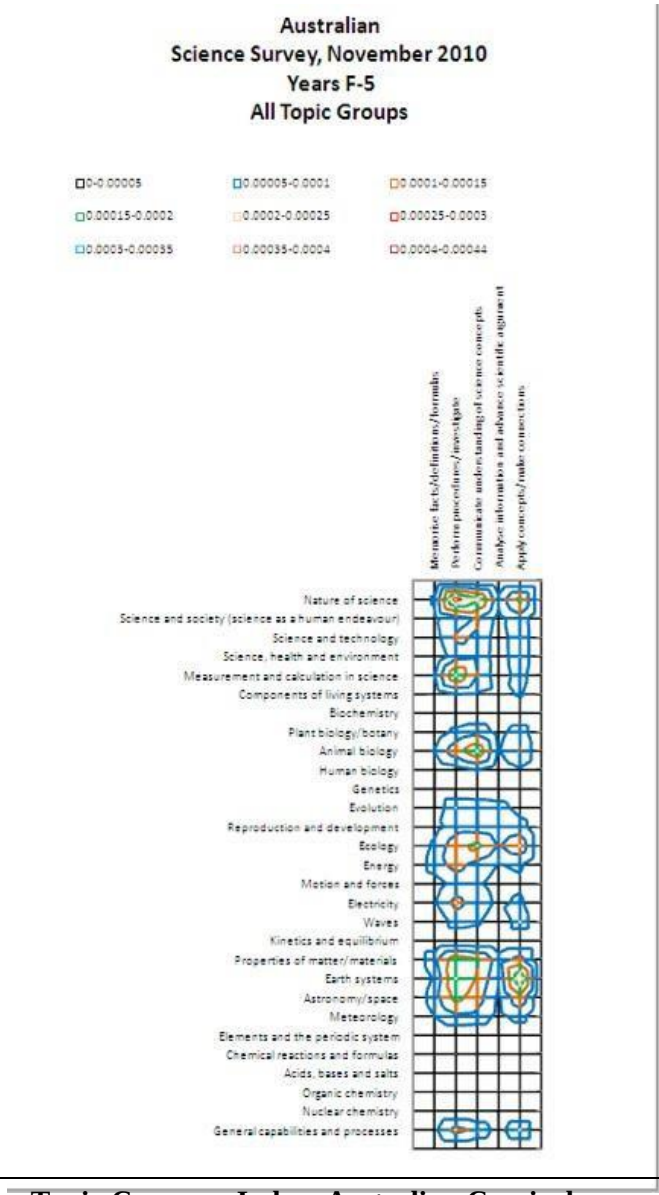
2. **Topic Coverage Indices** for each year-level grouping used in that jurisdiction, represented by a single number less than or equal to 1. The indices provide a measure of the extent to which the comparison curriculum for that stage of schooling is aligned with the Australian Curriculum. The index has been calculated by comparing the percentage of the curriculum devoted to each topic.

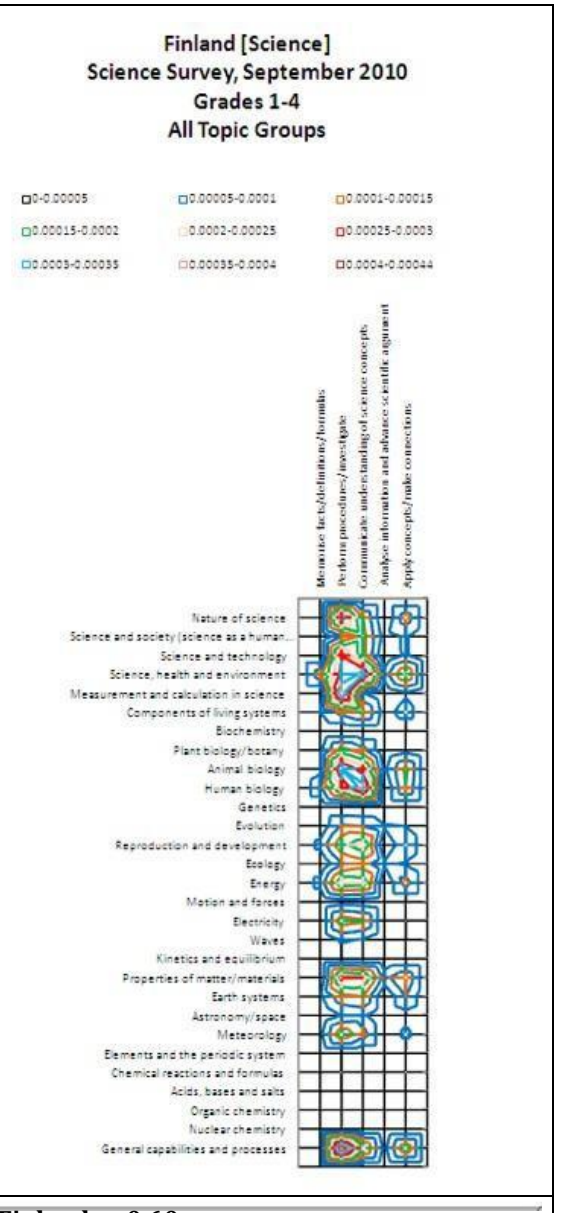
3. **A table showing the percentage of the curriculum devoted to each topic group** in the Australian Curriculum and the comparison curriculum. This table supports a more detailed analysis of differences at the topic group level between each jurisdiction's documents. The percentage of the curriculum devoted to each topic group is listed for the Australian curriculum and for the comparison jurisdiction.

4. **A short written discussion** of the key variations between the Australian Curriculum and the comparison curriculum.

5. A discussion of relative cognitive demand in the subject as represented in the Australian Curriculum and each comparison curriculum. This includes graphic representation of the relative representation of cognitive demand at each phase in the subject and in the subject overall. It also includes a table of percentages of each element of cognitive demand at each phase which are the basis for the graphic representation.

6. Finland





Topic Coverage Index: Australian Curriculum versus Finland 0.60

Comments

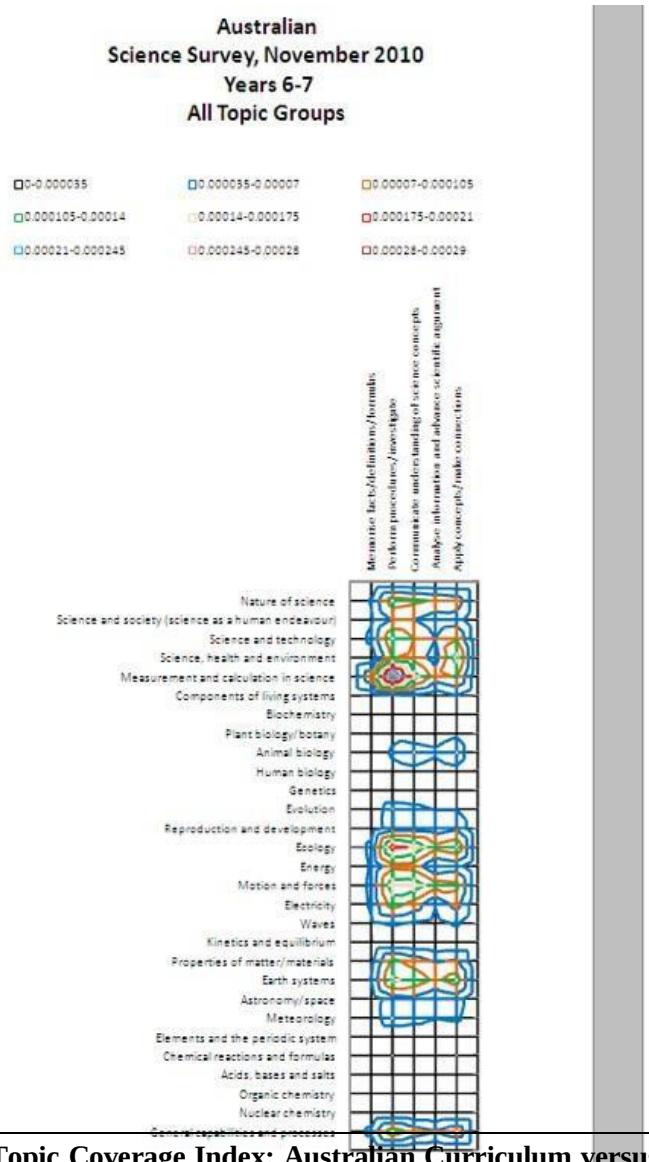
As the graphs indicate, there is moderate overlap between the Finland and Australian curriculum at the F-5 level, with some variation in intensity of coverage and breadth of cognitive demand.

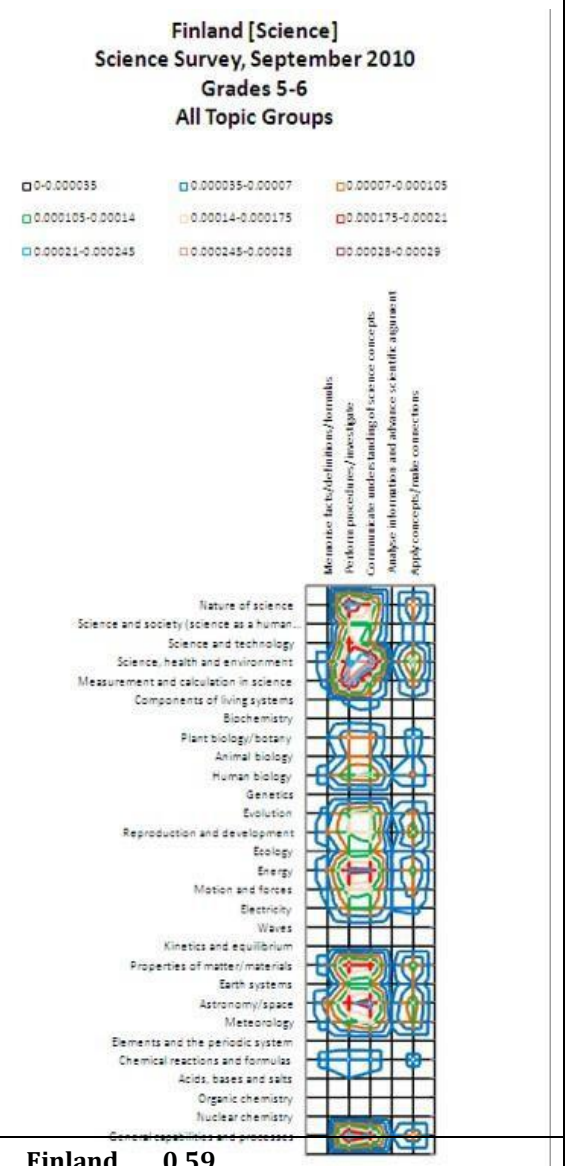
Finland has a materially greater representation of 'Science, health and environment', 'Human biology' and 'General capabilities', while 'Ecology' and 'Astronomy/Space' have a substantially greater representation in the Australian curriculum.

All other topic groups fall within an acceptable

% of Curriculum devoted to Topic Group	Australia	Finland
Nature of science	7.06%	5.20%
Science and society (science as a human endeavour)	3.53%	3.47%
Science and technology	4.12%	4.70%
Science, health and environment	4.12%	8.91%
Measurement and calculation in science	5.88%	5.20%
Components of living systems	2.35%	4.46%
Biochemistry	0.00%	0.00%
Plant biology/botany	2.94%	3.22%

range of difference. Finland has a greater focus on 'Components of living systems', but less on 'Motion and forces'. The analysis suggests a low to moderate degree of alignment between the two curricula.	Animal biology	6.47%	7.67%
	Human biology	1.76%	7.43%
	Genetics	0.00%	0.00%
	Evolution	3.53%	3.22%
	Reproduction and development	3.53%	5.20%
	Ecology	7.65%	2.97%
	Energy	4.71%	6.68%
	Motion and forces	2.94%	0.50%
	Electricity	4.71%	3.96%
	Waves	2.94%	1.49%
	Kinetics and equilibrium	0.00%	0.00%
	Properties of matter/materials	7.65%	7.18%
	Earth systems	9.41%	4.21%
	Astronomy/space	6.47%	1.73%
	Meteorology	4.12%	3.47%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.59%	1.24%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.00%
	General capabilities and processes	3.53%	7.92%





Topic Coverage Index: Australian Curriculum versus Finland 0.59

Comments

As the graphs indicate, there is low to moderate overlap between the Finland and Australian curriculum at the 6-7 level, with some variation in intensity of coverage and breadth of cognitive demand.

Finland has a materially greater representation of 'Astronomy/space' while 'Ecology' and 'Earth systems' have a substantially greater representation in the Australian curriculum.

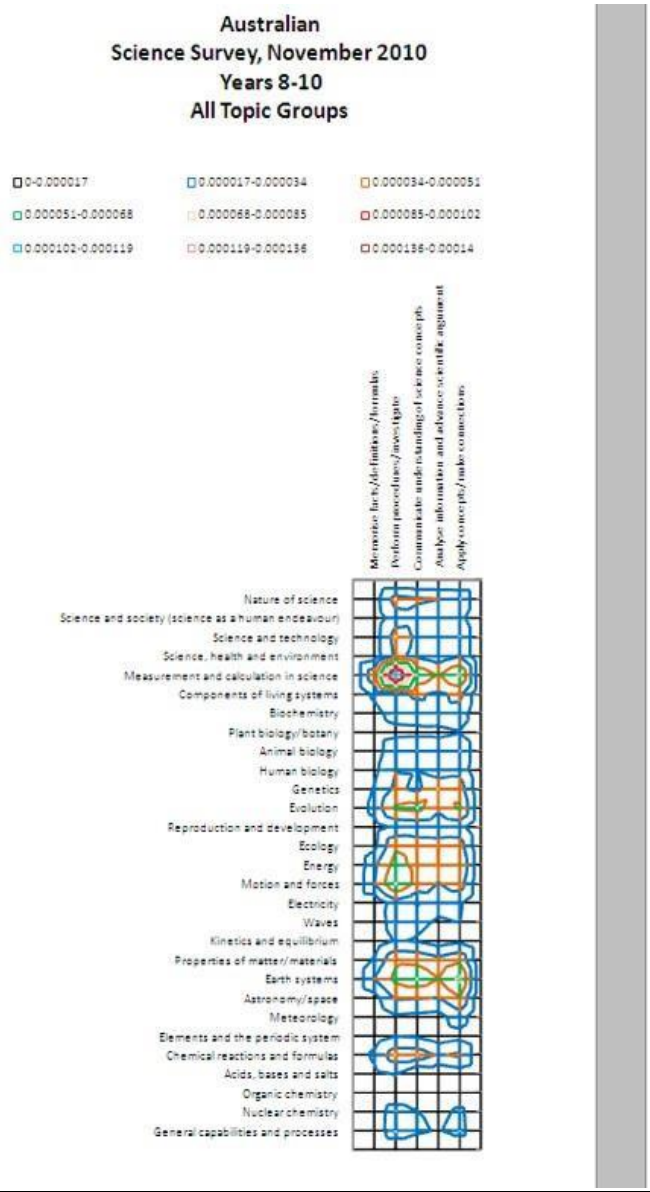
All other topic groups fall within an acceptable range of difference. Finland has a greater focus on 'Human biology', 'Evolution' and 'Energy', but less on 'Measurement …' and 'Motion and forces'.

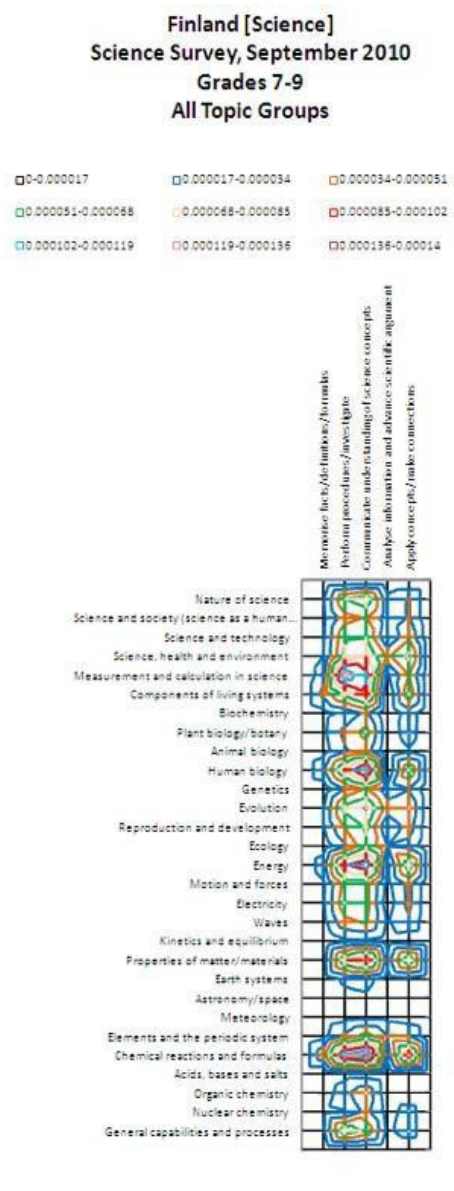
% of Curriculum devoted to Topic Group	Australia	Finland
Nature of science	5.81%	5.56%
Science and society (science as a human endeavour)	3.49%	2.98%
Science and technology	5.43%	3.77%
Science, health and environment	5.43%	7.34%
Measurement and calculation in science	9.30%	5.95%
Components of living systems	1.94%	1.59%
Biochemistry	0.00%	0.60%
Plant biology/botany	1.55%	3.37%
Animal biology	2.71%	2.58%
Human biology	1.94%	4.56%
Genetics	0.00%	0.00%
Evolution	2.71%	4.96%

The analysis suggests a low degree of alignment

between the two curricula.

Reproduction and development	3.88%	5.16%
Ecology	9.30%	3.77%
Energy	4.65%	7.34%
Motion and forces	8.91%	5.56%
Electricity	5.04%	3.57%
Waves	1.94%	0.40%
Kinetics and equilibrium	0.00%	0.00%
Properties of matter/materials	5.43%	6.75%
Earth systems	8.53%	3.97%
Astronomy/space	3.10%	7.34%
Meteorology	3.10%	4.56%
Elements and the periodic system	0.00%	0.00%
Chemical reactions and formulas	1.16%	2.38%
Acids, bases and salts	0.00%	0.79%
Organic chemistry	0.00%	0.00%
Nuclear chemistry	0.00%	0.00%
General capabilities and processes	4.65%	5.16%





Topic Coverage Index: Australian Curriculum versus Finland 0.63

Comments

As the graphs indicate, there is moderate overlap between the Finland and Australian curriculum at the 8-10 level, with some variation in intensity of coverage and breadth of cognitive demand.

The Australian Curriculum has a materially greater representation of 'Earth systems'.

All other topic groups fall within an acceptable range of difference. Finland has a greater focus on 'Chemical reactions and formulas', but less on 'Ecology' and 'Astronomy/Space'.

The analysis suggests a moderate degree of alignment between the two curricula.

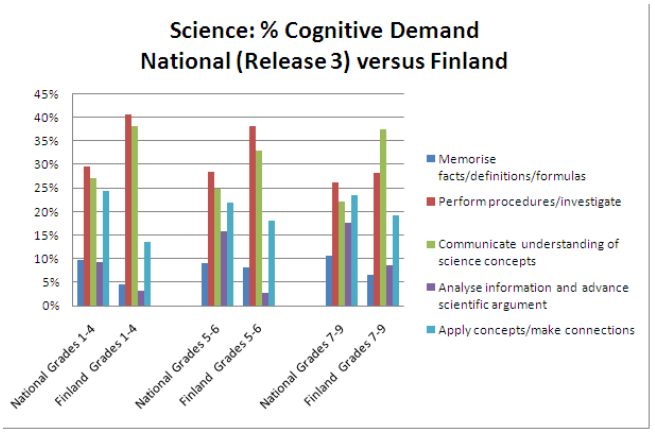
% of Curriculum devoted to Topic Group	Australia	Finland
Nature of science	3.83%	4.56%
Science and society (science as a human endeavour)	2.63%	2.86%
Science and technology	3.59%	3.60%
Science, health and environment	3.11%	5.08%
Measurement and calculation in science	6.70%	6.67%
Components of living systems	3.59%	5.40%
Biochemistry	3.11%	1.69%
Plant biology/botany	1.67%	2.65%
Animal biology	3.59%	2.01%
Human biology	3.59%	5.51%
Genetics	3.83%	2.65%

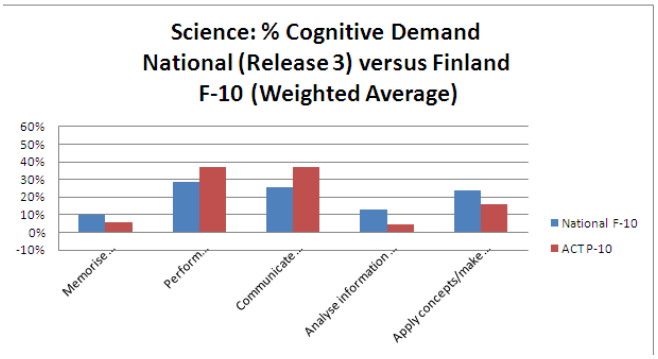
		Evolution	5.26%	4.66%
		Reproduction and development	2.63%	3.60%
		Ecology	5.02%	2.97%
		Energy	5.50%	6.67%
		Motion and forces	5.74%	3.81%
		Electricity	2.39%	3.92%
		Waves	2.39%	3.50%
		Kinetics and equilibrium	1.67%	0.74%
		Properties of matter/materials	5.26%	5.40%
		Earth systems	6.70%	1.38%
		Astronomy/space	4.78%	0.95%
		Meteorology	1.91%	0.85%
		Elements and the periodic system	1.44%	2.86%
		Chemical reactions and formulas	4.55%	8.26%
		Acids, bases and salts	1.20%	0.53%
		Organic chemistry	0.00%	1.69%
		Nuclear chemistry	2.15%	2.01%
		General capabilities and processes	2.15%	3.50%

% Cognitive Demand Analysis

Science: % Cognitive Demand
National (Release 3) versus Finland

	Memorise facts/definitions/formulas	Perform procedures/investigate	Communicate understanding of science concepts	Analyse information and advance scientific argument	Apply concepts/make connections
National F-10	9.86%	28.45%	25.33%	12.73%	23.64%
Finland F-10	5.74%	36.78%	37.02%	4.53%	15.93%
National F-5	9.71%	29.58%	27.07%	9.31%	24.34%
Finland Grades 1-4	4.50%	40.61%	38.12%	3.11%	13.66%
National 6-7	9.02%	28.45%	24.91%	15.78%	21.84%
Finland Grades 5-6	8.10%	38.10%	32.96%	2.83%	18.01%
National 8-10	10.70%	26.18%	22.12%	17.55%	23.45%
Finland Grades 7-9	6.64%	28.24%	37.52%	8.52%	19.09%





Comments

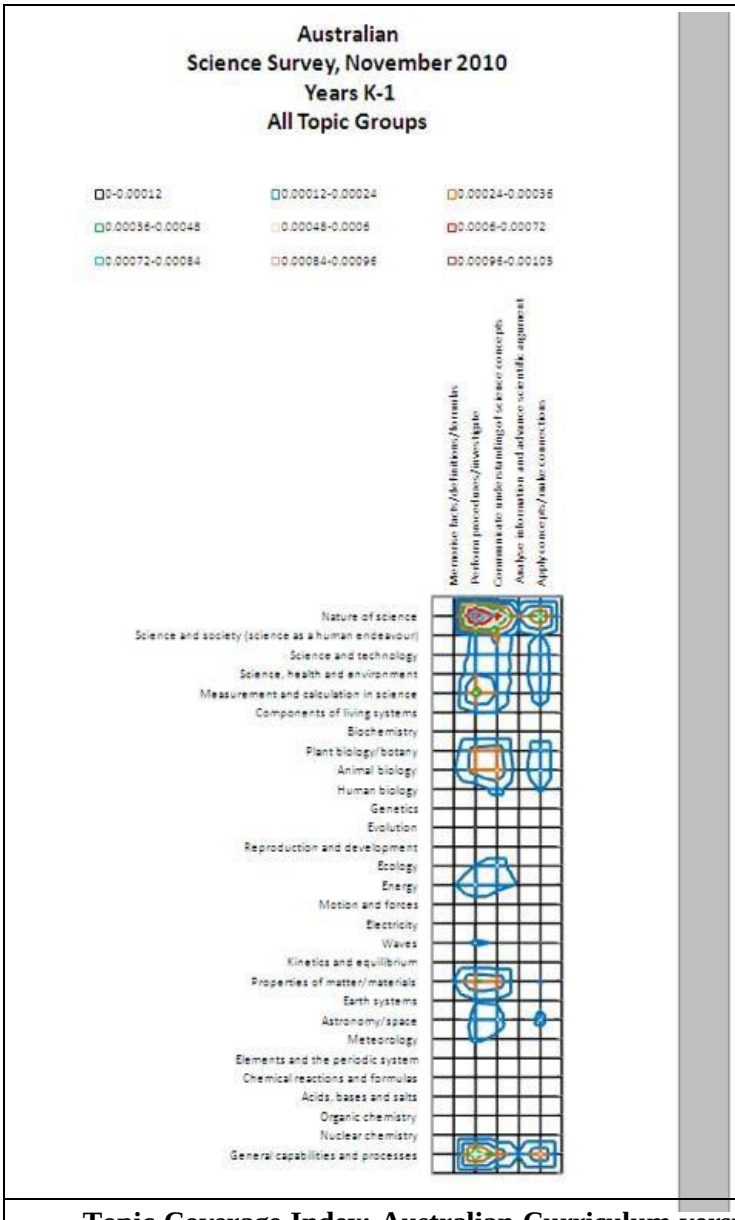
As the weighted average F-10 graph indicates, there is moderate to considerable overlap between the Australian and Finnish curricula. The curriculum in Finland has a much greater focus on 'Communicate …' All other categories fall within an acceptable range of difference. Finland has more of an emphasis on 'Perform …' while the Australian Curriculum has a stronger focus on 'Analyse …' and 'Apply …'

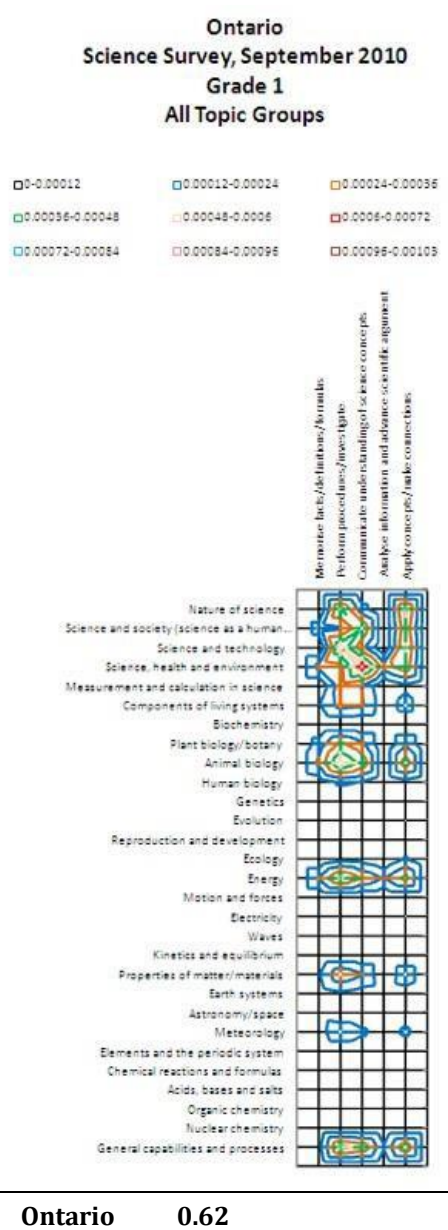
At F-5 the Australian Curriculum has a much greater focus on 'Apply …' and the Finland curriculum puts substantially greater emphasis on ''Perform …' and 'Communicate …' The Australian Curriculum has a bigger focus on 'Memorise …' and 'Analyse …'

At 6-7 the Australian Curriculum puts significantly more emphasis on 'Analyse …' The Finnish curriculum has more of a focus on 'Perform …' and 'communicate …'

At 8-10 the Finnish curriculum puts much greater emphasis on 'Communicate …' The Australian Curriculum has a larger focus on 'Analyse …'

Ontario





Topic Coverage Index: Australian Curriculum versus Ontario 0.62

Comments

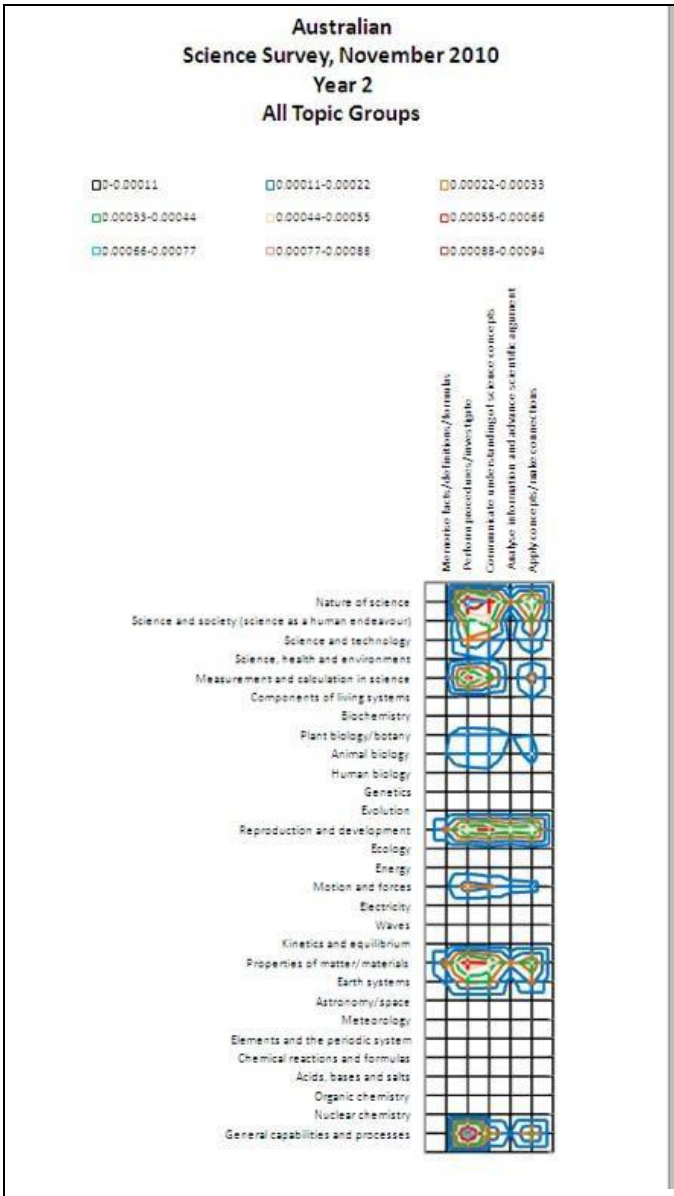
As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the F-1 level, with some variation in intensity of coverage and breadth of cognitive demand.

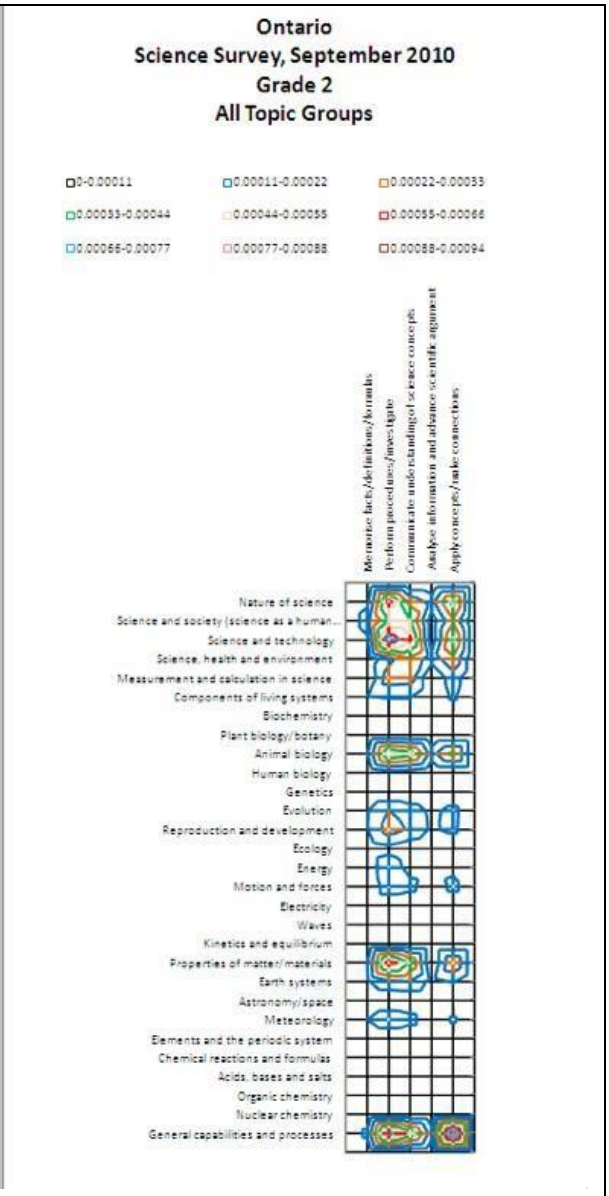
Ontario has a materially greater representation of 'Energy', while 'Nature of science' has a substantially greater representation in the Australian curriculum. 'Waves has a material representation in the Australian curriculum but is not represented in Ontario.

All other topic groups fall within an acceptable

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	14.85%	9.29%
Science and society (science as a human endeavour)	4.95%	5.75%
Science and technology	4.95%	8.85%
Science, health and environment	5.94%	7.96%
Measurement and calculation in science	6.93%	3.98%
Components of living systems	2.97%	6.19%
Biochemistry	0.00%	0.00%
Plant biology/botany	6.93%	7.96%
Animal biology	7.92%	10.62%
Human biology	2.97%	3.54%

range of difference. Ontario has a greater focus on 'Science and technology', 'Science, health and environment', 'Components of living systems' and 'Animal biology', but less on 'Measurement …', 'Ecology' and 'Astronomy/Space'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	0.00%	0.00%
	Evolution	1.98%	0.44%
	Reproduction and development	0.00%	0.00%
	Ecology	3.96%	1.77%
	Energy	4.95%	9.29%
	Motion and forces	0.99%	0.00%
	Electricity	0.00%	1.33%
	Waves	2.97%	0.00%
	Kinetics and equilibrium	0.00%	0.00%
	Properties of matter/materials	7.92%	7.52%
	Earth systems	2.97%	1.77%
	Astronomy/space	3.96%	0.88%
	Meteorology	2.97%	4.42%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.00%	0.00%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.00%
	General capabilities and processes	8.91%	8.41%





Topic Coverage Index: Australian Curriculum versus Ontario 0.63

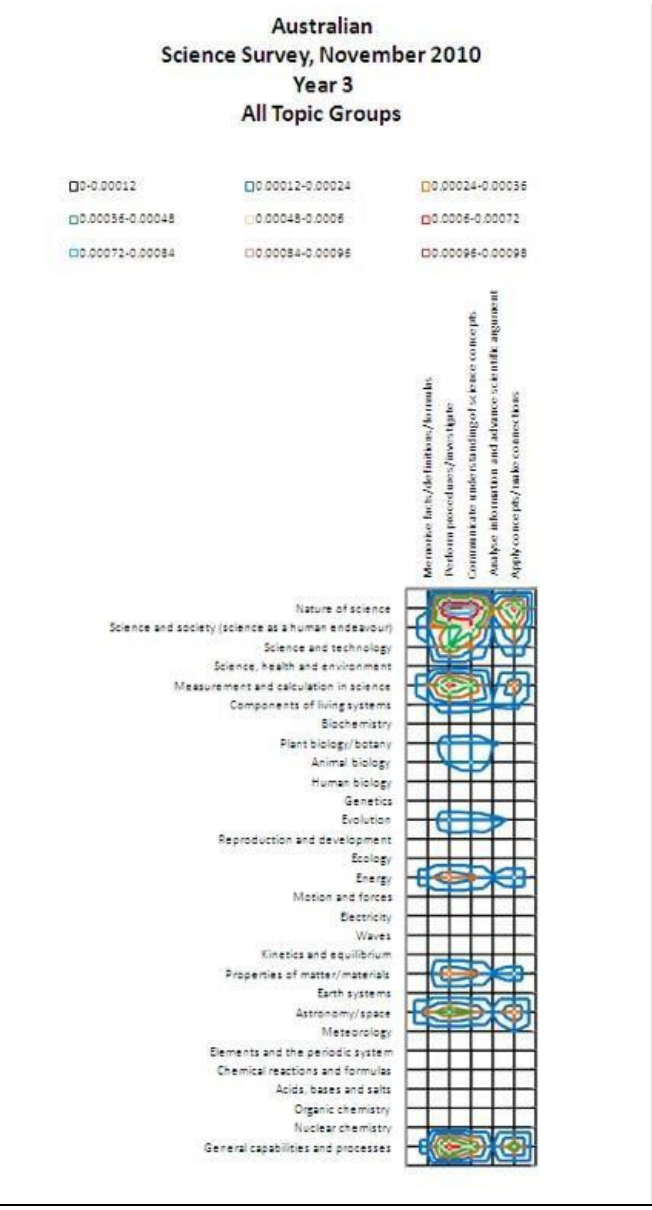
Comments

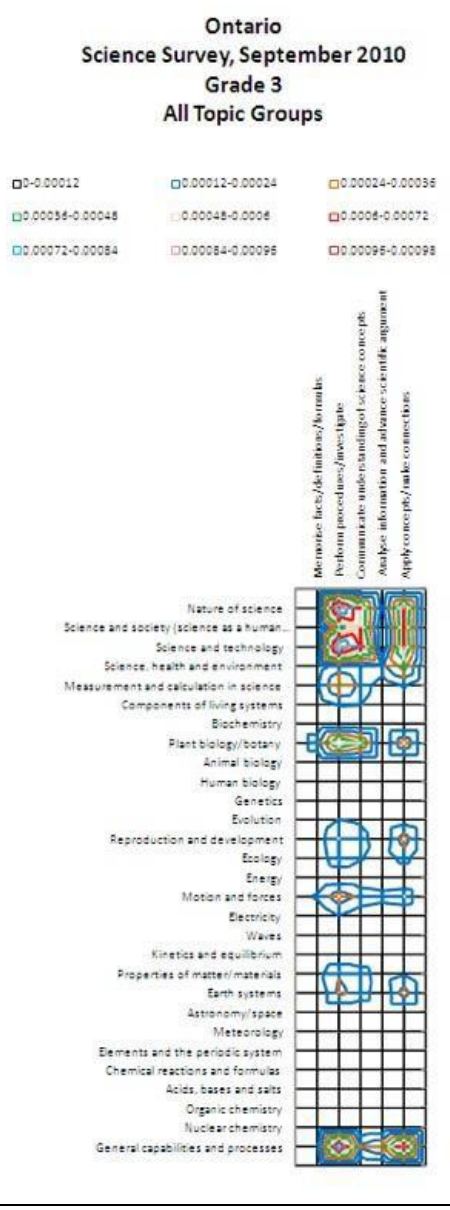
As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the 2 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Evolution' is materially present in the Ontario curriculum, but does not appear in the Australian Curriculum, while 'Plant biology…' does not appear in Ontario. 'Science and technology', 'Science, health and environment' and 'Animal biology' have a substantially higher representation in Ontario. 'Measurement …' and 'Reproduction and development' have a substantially higher representation in the Australian Curriculum.

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	13.71%	10.46%
Science and society (science as a human endeavour)	8.06%	7.53%
Science and technology	5.65%	10.88%
Science, health and environment	2.02%	6.69%
Measurement and calculation in science	9.27%	4.18%
Components of living systems	1.61%	2.09%
Biochemistry	0.00%	0.00%
Plant biology/botany	3.63%	0.00%
Animal biology	4.03%	10.46%
Human biology	2.02%	0.84%

All other topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Energy' and 'Meteorology' but less on 'Nature of science', 'Motion and forces', 'Properties of matter …' and 'Earth systems'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	0.00%	0.00%
	Evolution	0.00%	4.60%
	Reproduction and development	11.69%	5.44%
	Ecology	0.81%	1.26%
	Energy	0.40%	2.93%
	Motion and forces	5.65%	2.93%
	Electricity	0.00%	0.00%
	Waves	0.00%	0.00%
	Kinetics and equilibrium	0.00%	0.00%
	Properties of matter/materials	13.31%	10.88%
	Earth systems	7.66%	4.18%
	Astronomy/space	0.00%	0.00%
	Meteorology	0.40%	4.18%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.40%	0.00%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.00%
	General capabilities and processes	9.68%	10.46%





Topic Coverage Index: Australian Curriculum versus Ontario 0.65

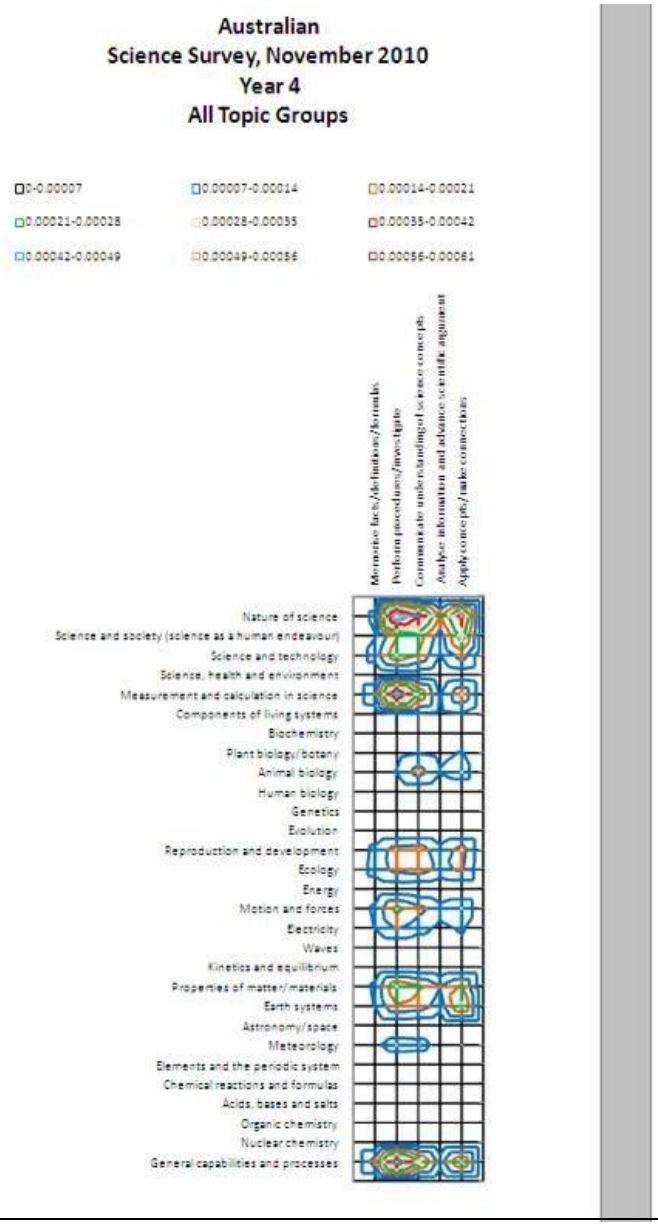
Comments

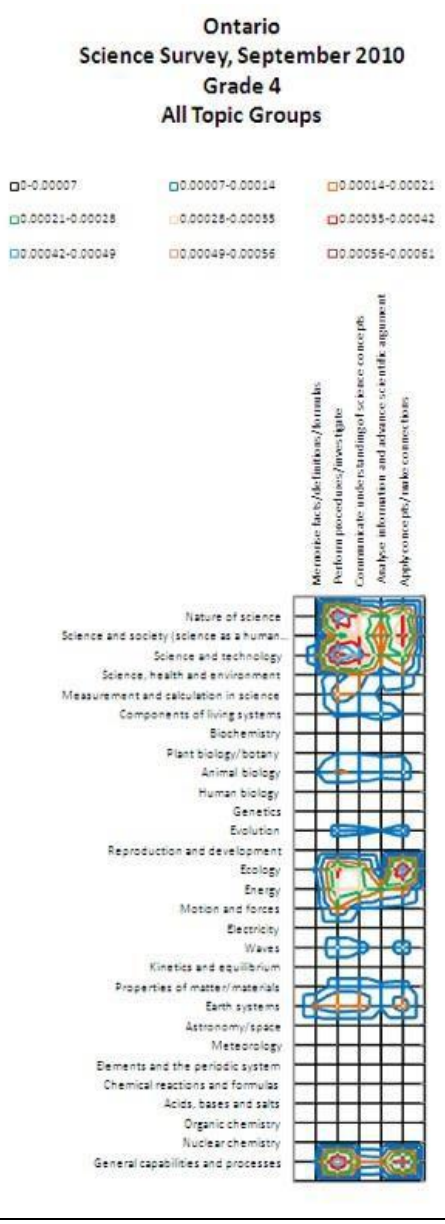
As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the 3 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Animal biology' and 'Astronomy/space' which are materially and significantly present respectively in the Australian Curriculum do not appear in the Ontario curriculum, while 'Ecology' and 'Earth systems' do not appear in Australia. 'Science and technology', 'Science, health and environment', 'Plant biology…' and 'Motion and forces' have a substantially higher representation in Ontario. 'Measurement…' and 'Energy' have a substantially

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	16.83%	13.56%
Science and society (science as a human endeavour)	8.91%	8.90%
Science and technology	6.93%	13.14%
Science, health and environment	0.33%	5.51%
Measurement and calculation in science	11.55%	5.08%
Components of living systems	5.28%	2.54%
Biochemistry	0.00%	0.00%
Plant biology/botany	3.96%	11.44%
Animal biology	3.96%	0.00%
Human biology	0.33%	0.00%

higher representation in the Australian Curriculum. All other topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Reproduction and development', but less on 'Nature of science' and 'Components of living systems'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	0.00%	0.00%
	Evolution	4.29%	2.54%
	Reproduction and development	1.98%	4.24%
	Ecology	0.00%	4.24%
	Energy	7.59%	0.42%
	Motion and forces	0.33%	6.78%
	Electricity	0.00%	1.27%
	Waves	0.00%	0.00%
	Kinetics and equilibrium	0.00%	0.00%
	Properties of matter/materials	6.60%	4.66%
	Earth systems	0.00%	4.24%
	Astronomy/space	8.91%	0.00%
	Meteorology	0.99%	0.42%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.33%	0.00%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.00%
	General capabilities and processes	10.89%	11.02%





Topic Coverage Index: Australian Curriculum versus Ontario 0.67

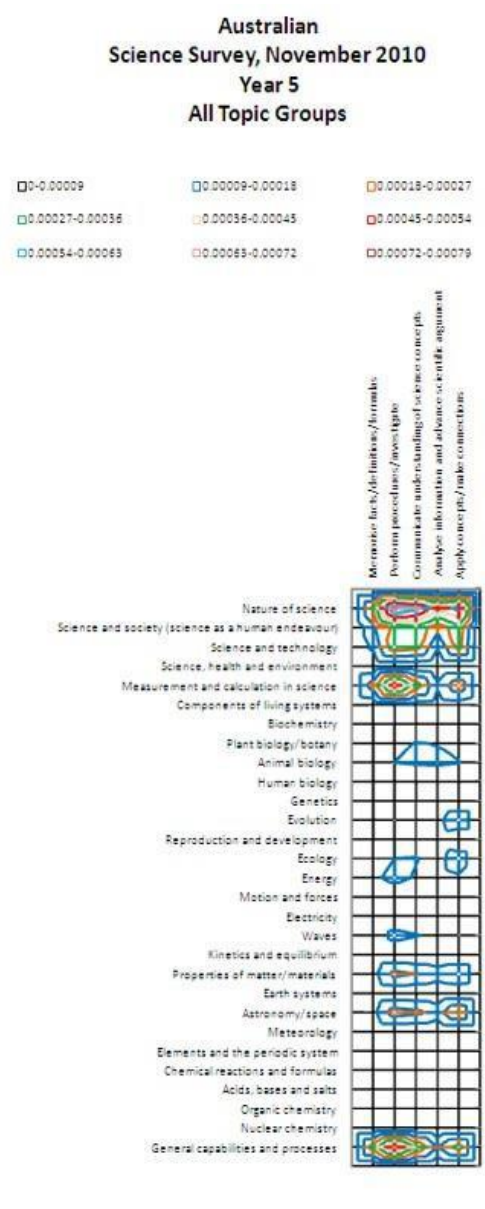
Comments

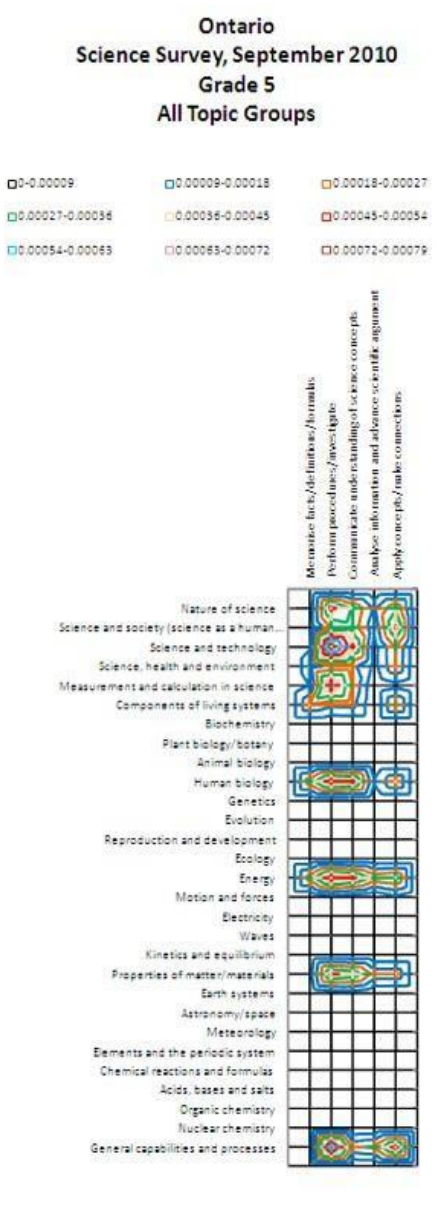
As the graphs indicate, there is considerable overlap between the Ontario and Australian curriculum at the 4 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Evolution', which is materially present in the Ontario curriculum does not appear in the Australian curriculum. 'Science and technology', 'Science, health and environment' and 'Energy' have a substantially higher representation in Ontario. 'Measurement…', 'Reproduction and development, 'Electricity' and 'Properties of matter …' have a substantially higher representation in the Australian Curriculum.

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	13.71%	10.80%
Science and society (science as a human endeavour)	6.72%	8.02%
Science and technology	6.72%	12.65%
Science, health and environment	0.54%	4.63%
Measurement and calculation in science	10.48%	3.70%
Components of living systems	2.42%	2.47%
Biochemistry	0.00%	0.00%
Plant biology/botany	2.15%	2.78%
Animal biology	3.49%	4.94%
Human biology	0.27%	0.00%

All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Nature of science', 'Motion and forces' and 'Meteorology', while Ontario has a stronger focus on 'Ecology' and 'Waves'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	0.00%	0.00%
	Evolution	0.00%	2.47%
	Reproduction and development	6.18%	0.00%
	Ecology	5.91%	9.57%
	Energy	0.27%	9.88%
	Motion and forces	6.99%	4.01%
	Electricity	4.03%	0.00%
	Waves	0.54%	3.70%
	Kinetics and equilibrium	0.00%	0.00%
	Properties of matter/materials	8.60%	3.70%
	Earth systems	7.80%	6.79%
	Astronomy/space	0.00%	0.00%
	Meteorology	3.49%	0.93%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.00%	0.00%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.00%
	General capabilities and processes	9.68%	8.95%





Topic Coverage Index: Australian Curriculum versus Ontario 0.67

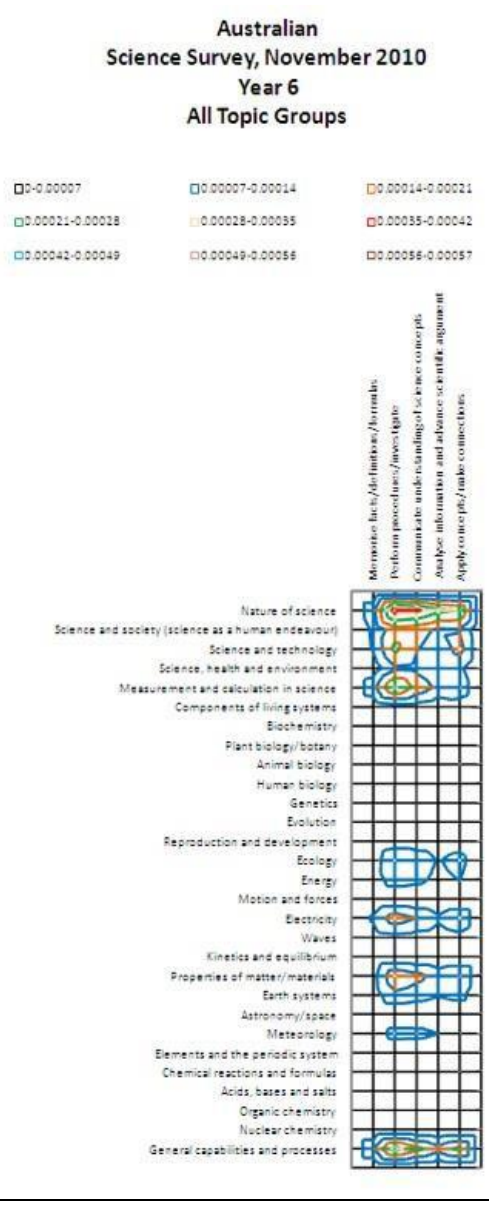
Comments

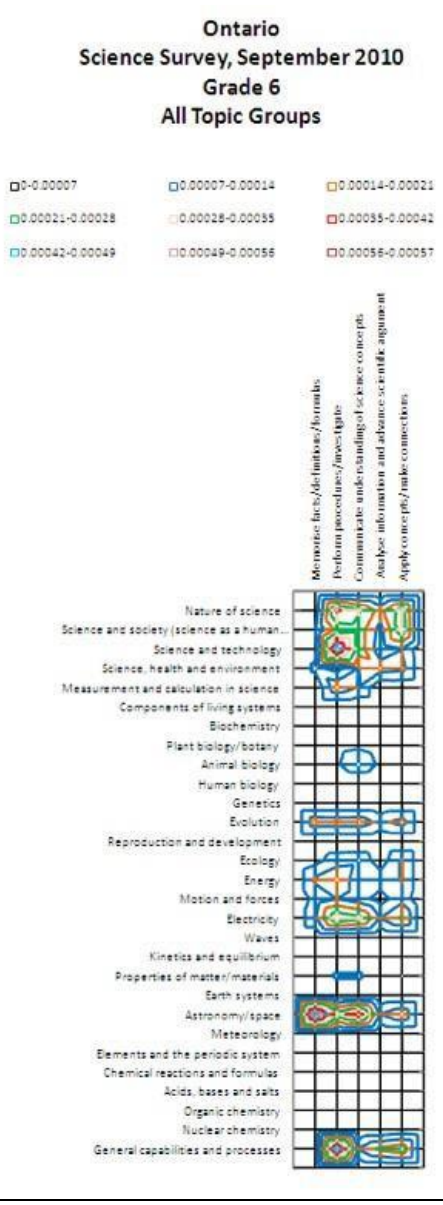
As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the 5 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Plant biology…', 'Animal biology', 'Evolution', 'Ecology' and 'Astronomy/Space' are all either substantially or materially present in the Australian Curriculum, do not appear in the Ontario curriculum. 'Nature of science' has a substantially higher representation in the Australian Curriculum, while 'Science, health and environment', 'Components of living systems', 'Human biology', 'Energy' and 'Properties of matter…' are

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	19.35%	10.45%
Science and society (science as a human endeavour)	9.18%	7.63%
Science and technology	8.68%	11.02%
Science, health and environment	0.50%	5.08%
Measurement and calculation in science	10.67%	7.91%
Components of living systems	1.49%	5.65%
Biochemistry	0.00%	0.00%
Plant biology/botany	2.98%	0.00%
Animal biology	3.72%	0.00%
Human biology	0.50%	13.56%

substantially better represented in Ontario. All other topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Science and technology', less on 'Measurement …' and 'Waves'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	0.00%	0.00%
	Evolution	4.22%	0.00%
	Reproduction and development	0.99%	0.00%
	Ecology	3.72%	0.00%
	Energy	2.98%	13.84%
	Motion and forces	0.25%	0.85%
	Electricity	0.00%	0.00%
	Waves	3.97%	1.13%
	Kinetics and equilibrium	0.00%	0.00%
	Properties of matter/materials	7.44%	11.86%
	Earth systems	0.50%	0.85%
	Astronomy/space	7.94%	0.00%
	Meteorology	0.00%	0.56%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.00%	0.00%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.00%
	General capabilities and processes	10.92%	9.60%





Topic Coverage Index: Australian Curriculum versus Ontario 0.69

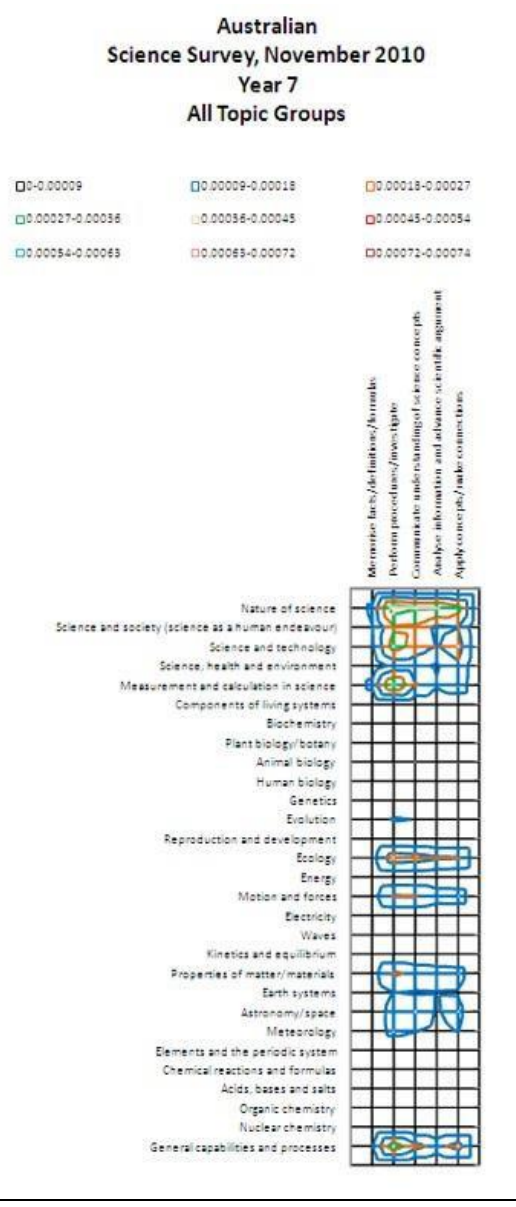
Comments

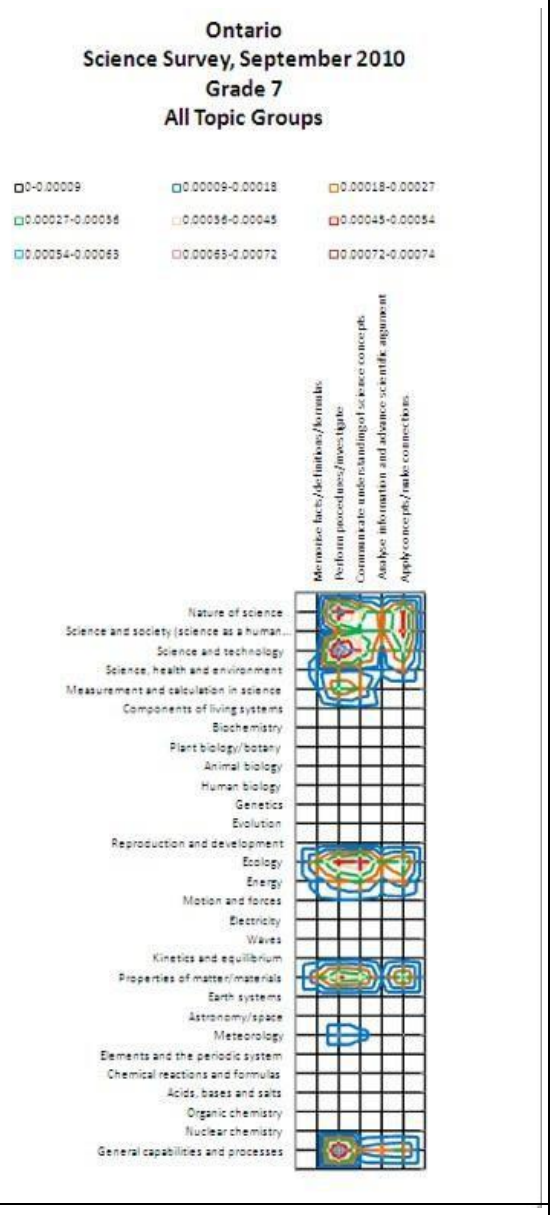
As the graphs indicate, there is considerable overlap between the Ontario and Australian curriculum at the 6 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Motion and forces' and 'Astronomy/space' are significantly represented in the Ontario curriculum, but do not appear in the Australian curriculum. 'Earth systems' does not appear in Ontario. 'Evolution' and 'Electricity' are substantially better represented in the Ontario curriculum, while 'Nature of science', 'Measurement…' and 'Properties of matter …' are better represented in Australia.

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	14.90%	10.13%
Science and society (science as a human endeavour)	7.45%	8.10%
Science and technology	7.06%	9.37%
Science, health and environment	5.10%	5.32%
Measurement and calculation in science	8.82%	3.29%
Components of living systems	1.96%	0.00%
Biochemistry	0.00%	0.00%
Plant biology/botany	1.57%	1.77%
Animal biology	2.35%	3.04%
Human biology	0.98%	0.00%

All other topic groups fall within an acceptable range of difference. Australia has a greater focus on 'Meteorology', while Ontario has a stronger focus on 'Science and technology' and 'energy'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	0.00%	0.00%
	Evolution	0.98%	7.09%
	Reproduction and development	1.96%	0.00%
	Ecology	5.69%	4.81%
	Energy	4.51%	6.84%
	Motion and forces	0.00%	4.56%
	Electricity	6.47%	11.65%
	Waves	1.96%	0.00%
	Kinetics and equilibrium	0.00%	0.00%
	Properties of matter/materials	8.24%	2.78%
	Earth systems	5.69%	0.00%
	Astronomy/space	0.00%	12.15%
	Meteorology	4.51%	0.76%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.59%	0.00%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.25%
	General capabilities and processes	9.22%	8.10%





Topic Coverage Index: Australian Curriculum versus Ontario 0.70

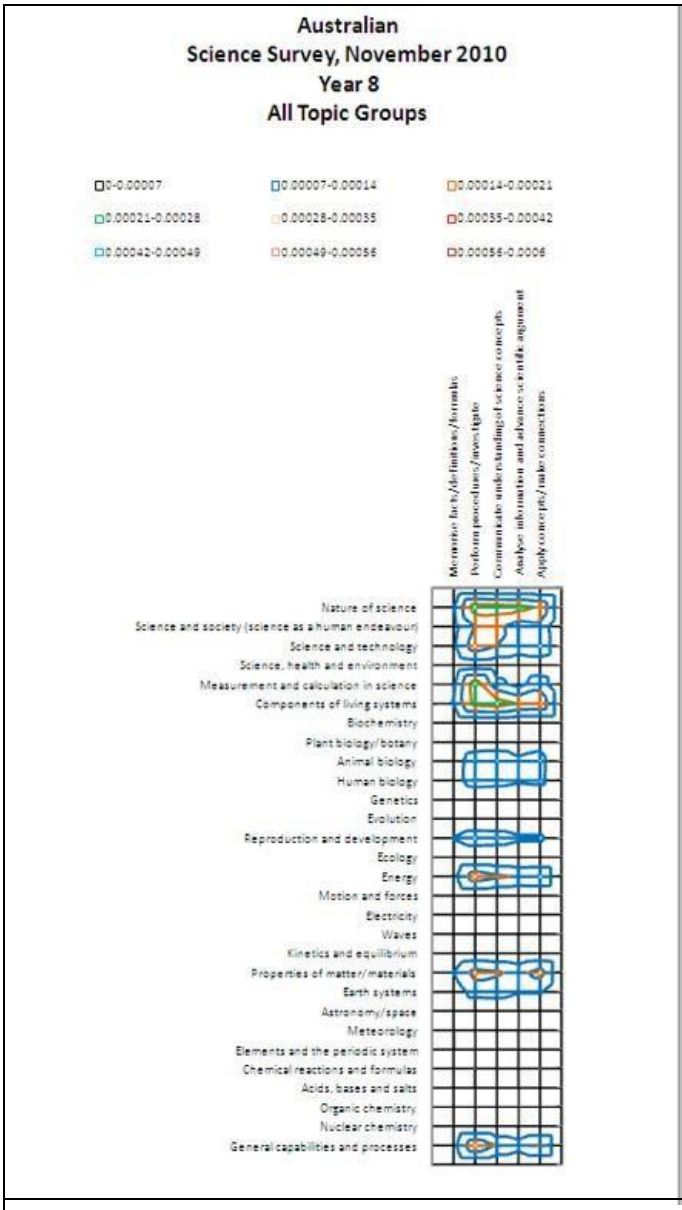
Comments

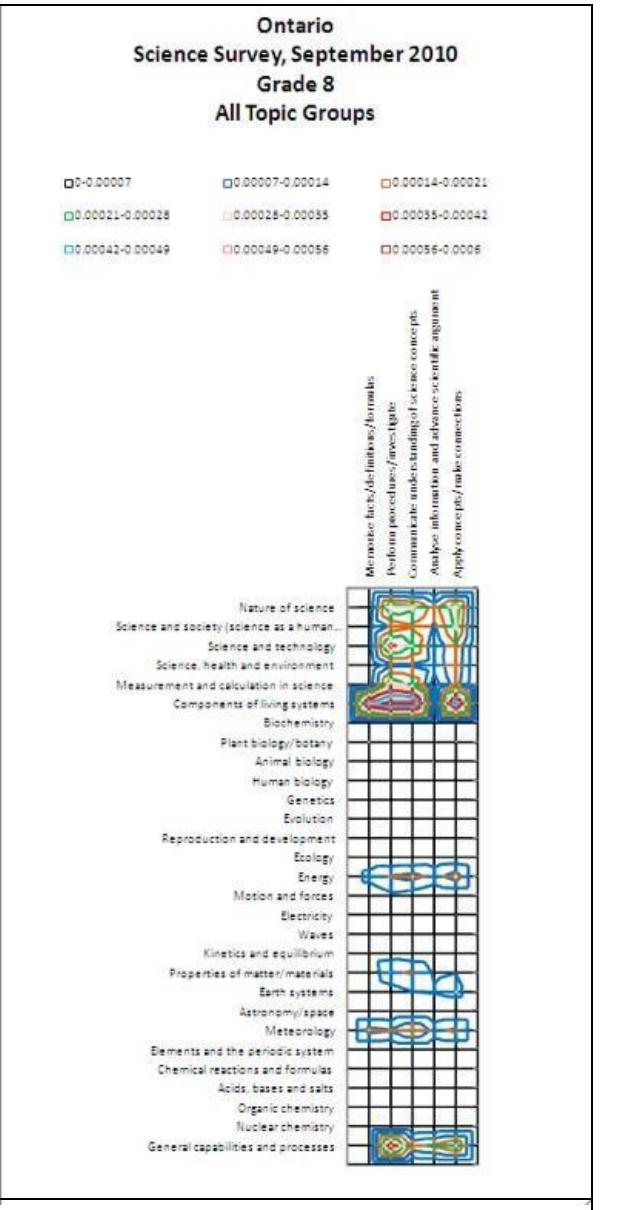
As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the 7 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Evolution', 'Earth systems' and 'Astronomy/Space' are significantly represented in the Australian Curriculum, but do not appear in the Ontario curriculum. 'Ecology', 'Energy' and 'Properties of matter…' have a substantially higher representation in Ontario. 'Motion and forces' has a substantially greater representation in the Australian Curriculum.

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	14.70%	11.88%
Science and society (science as a human endeavour)	8.55%	7.73%
Science and technology	9.23%	12.98%
Science, health and environment	5.13%	6.08%
Measurement and calculation in science	8.55%	5.80%
Components of living systems	0.51%	1.66%
Biochemistry	0.00%	0.00%
Plant biology/botany	0.85%	0.00%
Animal biology	1.54%	0.00%
Human biology	0.17%	0.00%

All other topic groups fall within an acceptable range of difference. Ontario has a greater focus on 'Science and technology', but less on 'Nature of science' and 'Measurement …' The analysis suggests a moderate to high degree of alignment between the two curricula.	Genetics	0.00%	0.00%
	Evolution	4.10%	0.00%
	Reproduction and development	0.00%	0.00%
	Ecology	8.72%	15.19%
	Energy	0.85%	8.29%
	Motion and forces	7.52%	2.76%
	Electricity	0.51%	0.55%
	Waves	0.00%	0.00%
	Kinetics and equilibrium	0.00%	1.10%
	Properties of matter/materials	7.18%	12.71%
	Earth systems	4.10%	0.00%
	Astronomy/space	4.79%	0.00%
	Meteorology	4.27%	2.76%
	Elements and the periodic system	0.00%	0.00%
	Chemical reactions and formulas	0.00%	0.28%
	Acids, bases and salts	0.00%	0.00%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.28%
	General capabilities and processes	8.72%	9.94%





Topic Coverage Index: Australian Curriculum versus Ontario 0.67

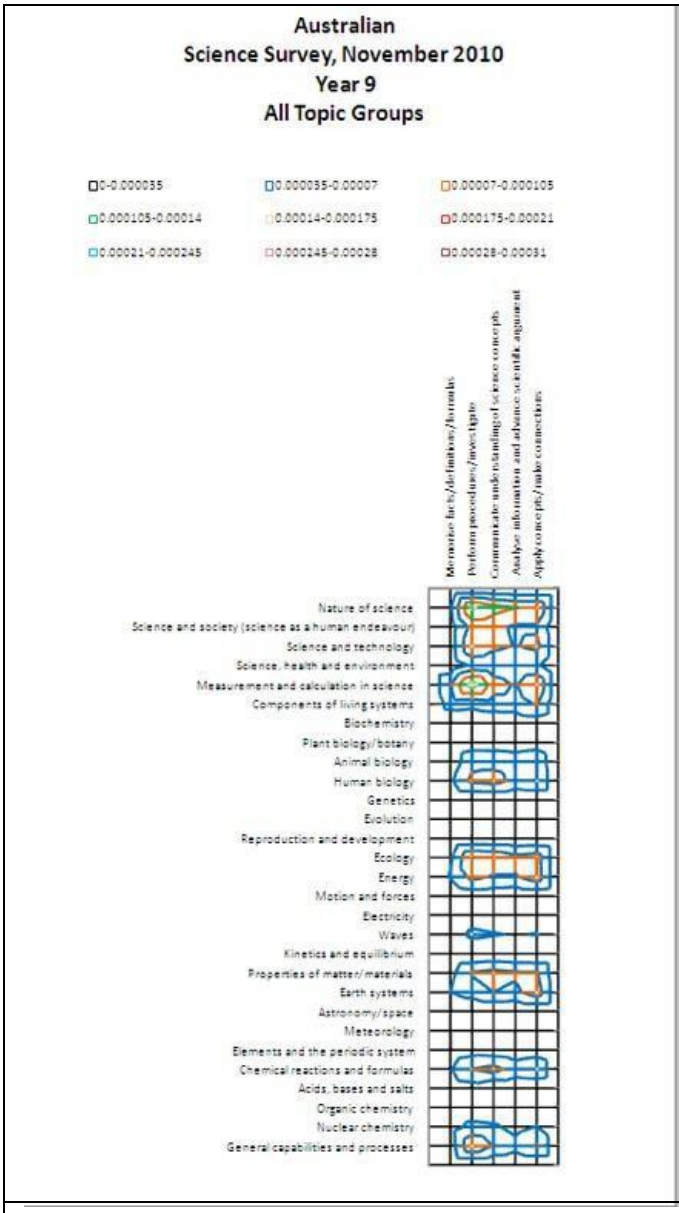
Comments

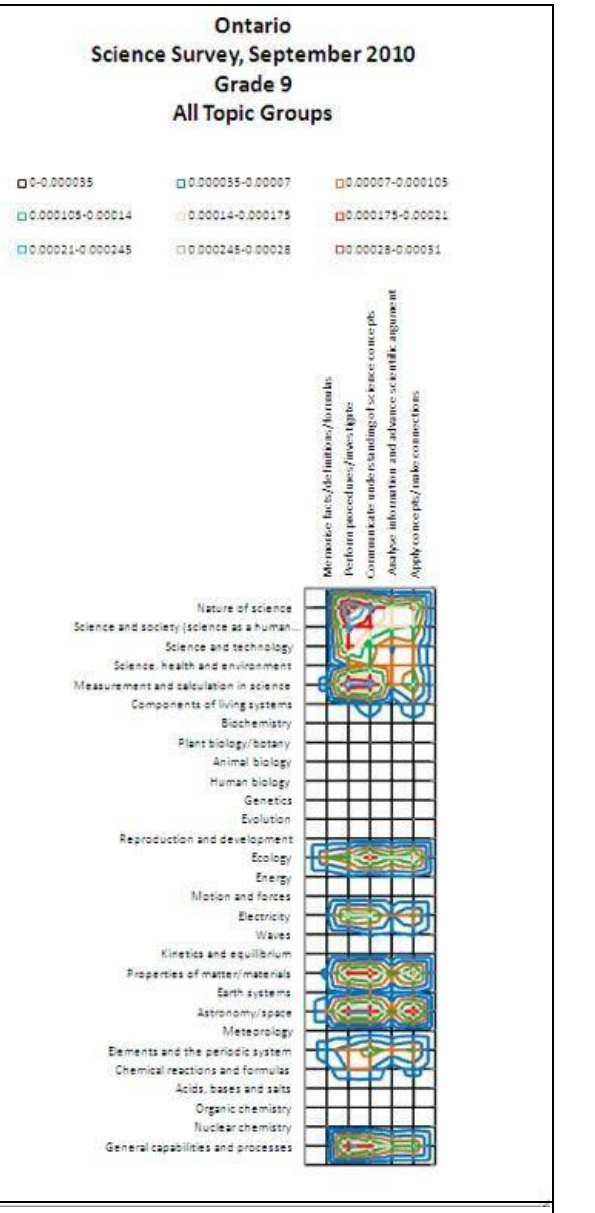
As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the 8 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Meteorology' is substantially present in the Ontario curriculum, but not represented in the Australian Curriculum, while 'Reproduction and development', Human biology' and 'Chemical reactions and formulas' are not represented in Ontario. 'Science, health and environment' and 'Components of living systems' have a substantially higher representation in Ontario. 'Animal biology' has a substantially higher representation in the Australian Curriculum.

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	12.09%	11.27%
Science and society (science as a human endeavour)	6.76%	7.51%
Science and technology	7.48%	9.86%
Science, health and environment	1.29%	6.34%
Measurement and calculation in science	6.19%	8.92%
Components of living systems	12.37%	17.61%
Biochemistry	0.14%	0.00%
Plant biology/botany	2.59%	1.64%
Animal biology	5.47%	1.17%
Human biology	5.32%	0.00%
Genetics	0.14%	0.00%

All other topic groups fall within an acceptable range of difference. The Australian Curriculum has a greater focus on 'Properties of matter …' and 'Earth systems'. Ontario has a greater focus on 'Science and technology' and 'Measurement …'. The analysis suggests a moderate degree of alignment between the two curricula.	Evolution	0.00%	0.00%
	Reproduction and development	5.61%	0.00%
	Ecology	0.00%	0.94%
	Energy	9.06%	8.22%
	Motion and forces	0.00%	1.41%
	Electricity	0.00%	0.94%
	Waves	0.00%	0.23%
	Kinetics and equilibrium	0.58%	1.17%
	Properties of matter/materials	8.92%	5.40%
	Earth systems	5.18%	2.82%
	Astronomy/space	0.00%	0.00%
	Meteorology	0.00%	5.63%
	Elements and the periodic system	1.15%	0.00%
	Chemical reactions and formulas	2.30%	0.00%
	Acids, bases and salts	0.00%	0.23%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.00%	0.00%
	General capabilities and processes	7.34%	8.69%





Topic Coverage Index: Australian Curriculum versus Ontario 0.65

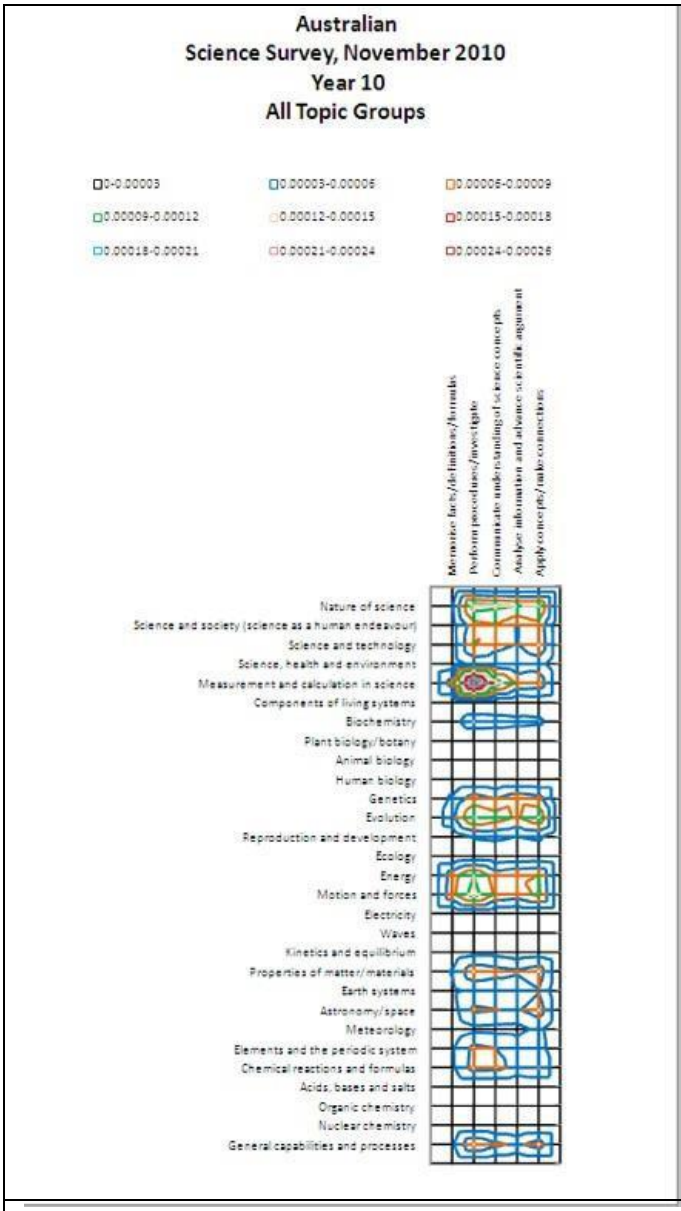
Comments

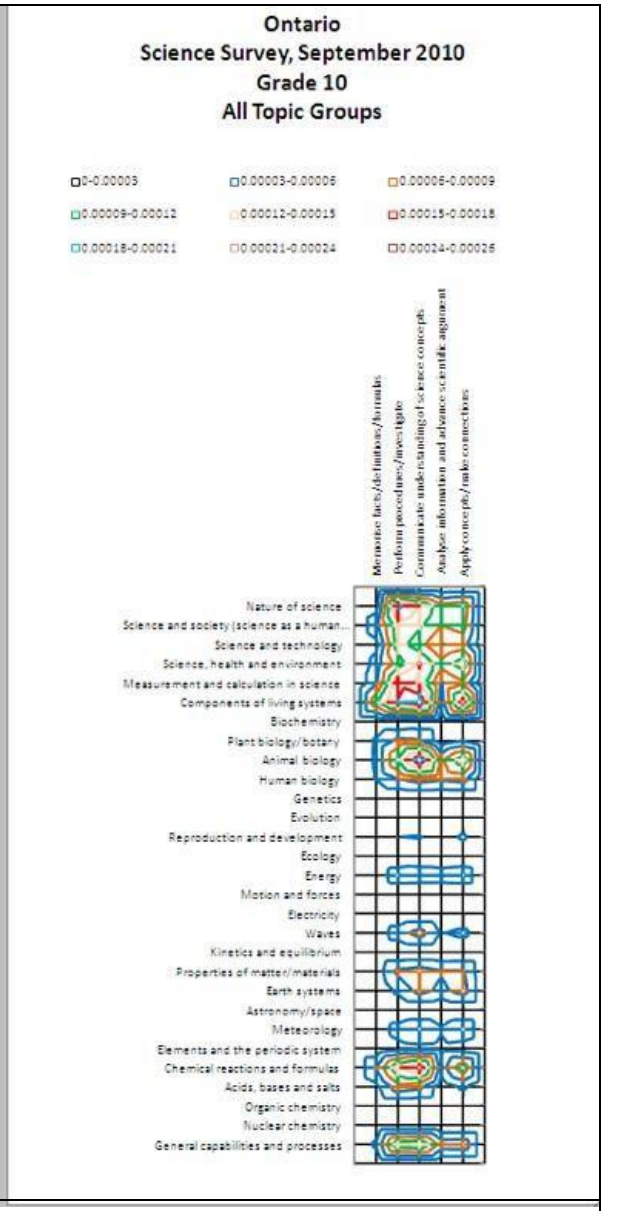
As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the 9 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Human biology' is substantially represented in the Australian Curriculum, but absent from the Ontario curriculum, while 'Astronomy/Space' is not represented in Australia. 'Animal biology', 'Human biology' and 'Energy' have a substantially higher representation in Australia. Ontario has a significantly greater representation of 'Electricity' and 'Properties of matter …'

% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	9.62%	9.39%
Science and society (science as a human endeavour)	5.77%	7.01%
Science and technology	6.33%	6.37%
Science, health and environment	2.49%	5.10%
Measurement and calculation in science	7.13%	9.71%
Components of living systems	4.52%	2.07%
Biochemistry	1.13%	1.27%
Plant biology/botany	1.58%	1.11%
Animal biology	4.75%	0.32%
Human biology	6.45%	0.00%

All other topic groups fall within an acceptable range of difference. The Ontario curriculum has a greater focus on 'Science, health…', 'Measurement …' and 'Elements and the periodic system'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	0.00%	0.16%
	Evolution	0.11%	0.80%
	Reproduction and development	0.34%	0.00%
	Ecology	8.03%	7.80%
	Energy	7.01%	1.43%
	Motion and forces	0.90%	0.00%
	Electricity	1.24%	7.96%
	Waves	3.39%	1.43%
	Kinetics and equilibrium	0.11%	0.00%
	Properties of matter/materials	6.56%	10.83%
	Earth systems	5.54%	2.39%
	Astronomy/space	0.00%	8.76%
	Meteorology	0.00%	0.32%
	Elements and the periodic system	1.36%	4.62%
	Chemical reactions and formulas	6.11%	3.18%
	Acids, bases and salts	0.90%	0.16%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	3.05%	0.48%
	General capabilities and processes	5.54%	7.32%





Topic Coverage Index: Australian Curriculum versus Ontario 0.64

Comments

As the graphs indicate, there is moderate to considerable overlap between the Ontario and Australian curriculum at the 10 level, with some variation in intensity of coverage and breadth of cognitive demand.

'Plant biology…', 'Animal biology', 'Human biology' and 'Acids, bases…' are either significantly or materially present in the Ontario curriculum, but not represented in the Australian Curriculum. 'Genetics', 'Evolution', 'Motion and forces' and 'Astronomy/space' are not represented in Ontario. 'Science, health and environment and 'Components of living systems' are substantially better represented in Ontario.

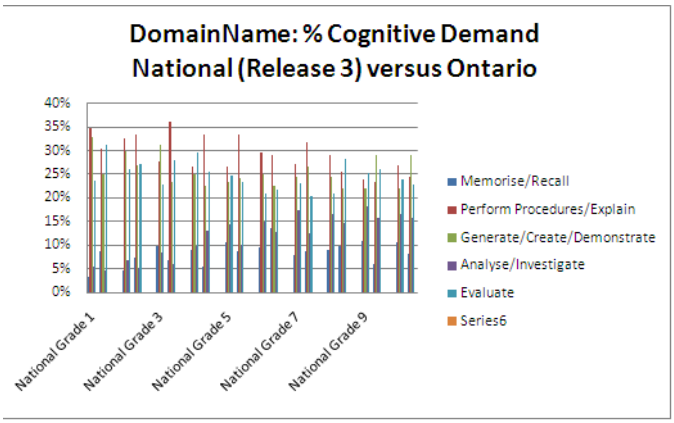
% of Curriculum devoted to Topic Group	Australia	Ontario
Nature of science	9.11%	7.27%
Science and society (science as a human endeavour)	5.53%	6.06%
Science and technology	5.83%	5.65%
Science, health and environment	2.97%	8.08%
Measurement and calculation in science	9.42%	6.33%
Components of living systems	0.20%	10.50%
Biochemistry	3.07%	0.40%
Plant biology/botany	0.00%	3.63%
Animal biology	0.00%	7.00%
Human biology	0.00%	4.17%

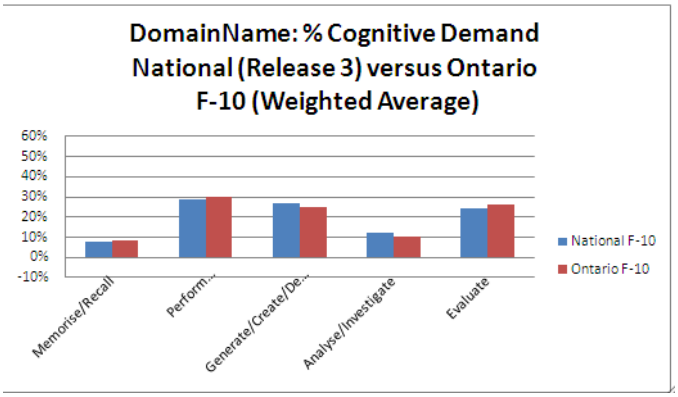
All other topic groups fall within an acceptable range of difference. The Ontario curriculum has a greater focus on 'Waves' and 'Chemical reactions…' but less on 'Measurement…', 'Biochemistry', 'Energy' and 'Elements and the periodic system'. The analysis suggests a moderate degree of alignment between the two curricula.	Genetics	5.02%	0.00%
	Evolution	7.57%	0.00%
	Reproduction and development	2.66%	1.88%
	Ecology	0.51%	0.27%
	Energy	7.06%	3.50%
	Motion and forces	7.78%	0.00%
	Electricity	0.00%	0.00%
	Waves	0.72%	3.50%
	Kinetics and equilibrium	1.33%	0.00%
	Properties of matter/materials	5.73%	4.98%
	Earth systems	3.68%	3.63%
	Astronomy/space	5.22%	0.00%
	Meteorology	2.05%	3.63%
	Elements and the periodic system	4.30%	1.35%
	Chemical reactions and formulas	5.02%	8.21%
	Acids, bases and salts	0.00%	3.50%
	Organic chemistry	0.00%	0.00%
	Nuclear chemistry	0.10%	0.00%
	General capabilities and processes	5.12%	6.46%

% Cognitive Demand Analysis

Science: % Cognitive Demand
National (Release 3) versus Ontario

	Memorise facts/definitions/formulas	Perform procedures/investigate	Communicate understanding of science concepts	Analyse information and advance scientific argum	Apply concepts/make connections
National F-10	8.07%	29.05%	26.61%	12.23%	24.03%
Ontario F-10	8.37%	30.12%	25.09%	10.47%	25.96%
National F-1	3.41%	34.72%	32.73%	5.46%	23.68%
Ontario Grade 1	8.80%	30.47%	24.95%	4.69%	31.10%
National 2	4.57%	32.63%	29.87%	6.87%	26.06%
Ontario Grade 2	7.32%	33.34%	26.95%	5.26%	27.13%
National 3	9.78%	27.64%	31.33%	8.55%	22.69%
Ontario Grade 3	6.76%	36.06%	23.24%	5.96%	27.98%
National 4	9.01%	26.61%	24.89%	9.82%	29.66%
Ontario Grade 4	5.47%	33.50%	22.58%	12.95%	25.50%
National 5	10.74%	26.61%	23.40%	14.47%	24.78%
Ontario Grade 5	8.73%	33.46%	24.28%	10.10%	23.44%
National 6	9.61%	29.52%	25.01%	15.03%	20.83%
Ontario Grade 6	13.56%	29.15%	22.55%	12.88%	21.86%
National 7	7.91%	27.16%	24.36%	17.46%	23.11%
Ontario Grade 7	8.66%	31.78%	26.53%	12.59%	20.43%
National 8	8.88%	29.16%	24.55%	16.58%	20.81%
Ontario Grade 8	9.74%	25.52%	21.88%	14.57%	28.29%
National 9	10.75%	23.93%	21.91%	18.16%	25.25%
Ontario Grade 9	6.05%	23.23%	28.99%	15.76%	25.97%





Comments

As the weighted average F-10 graph indicates, there is considerable overlap between the two curricula. All of the categories of Cognitive Demand fall within an acceptable range of difference.

At Grades 2, 6 and 7 all categories fall within an acceptable range of difference.

At Grade 1, the Australian Curriculum has a stronger emphasis on 'Communicate … ', whereas the Ontario curriculum has more of a focus on 'Memorise …' and 'Analyse …'.

At Grade 3 the Ontario curriculum places more emphasis on 'Perform …' and 'Analyse …'

At both Grades 4 and 5 the Ontario curriculum continues its extra emphasis on 'Perform …'

At Grade 8 the Ontario curriculum has more of an emphasis on 'Analyse …'

At Grades 9 and 10 the Ontario curriculum has a stronger focus on 'Communicate …'

APPENDIX 7: ACARA CURRICULUM MAPPING – Surveys

ACARA Curriculum Mapping Survey• English

Time on Topic				Topic Groups and Topics	Expectations for Students				
None	Slight coverage	Moderate coverage	Sustained coverage		Memorise/Recall	Perform Procedures/Explain	Generate/Create/Demonstrate	Analyse/Investigate	Evaluate
More Info						More Info			
	Phonemic awareness								
				Phoneme isolation (eg, distinct sounds /c/, /a/, and /t/)					
				Phoneme blending (eg, c/a/t=cat)					
				Phoneme segmentation					
				Onset-rime					
				Sound patterns					
				Rhyme recognition					
				Phoneme deletion, substitution and addition					
				Identification of syllables					
	Phonics								
				Alphabetic principle (includes alphabet recognition and order)					
				Consonants					
				Consonant blends					
				Consonant digraphs (eg, ch, sh, th, etc.)					
				Diphthongs (eg, oi, ou, ow, oy [as in 'boy'], etc.)					
				R-controlled vowels (eg, farm, torn, turn, etc.)					
				Patterns within words					
				Vowel letters (a, e, i, o, u)					
				Vowel phonemes (15 sounds)					
				Sound and symbol relationships					
				Blending sounds					
	Vocabulary								
				Compound words and contractions					
				Inflectional forms (eg, -s, -ed, and –ing)					
				Suffixes, prefixes and root words					
				Word definitions (including new vocabulary)					

				Word origins					
				Synonyms, antonyms and homonyms					

				Word or phrase meaning from context					
				Denotation and connotation					
				Analogies					
				Sight words					
				Use of references					
				Text and print features					
				Book handling					
				Screen conventions					
				Directionality, sequence of text					
				Parts of a book (eg, cover, title, front, back)					
				Letter, word and sentence distinctions					
				Structural elements (eg, index, glossary, table of contents, subtitles. headings)					
				Graphical elements (eg, graphs, charts, images, illustrations)					
				Technical elements (eg, bullets, instructions, forms, sidebars)					
				Electronic elements (eg, hypertext links, animations)					
				Environmental print (ie, prints or symbols found in students' everyday environment)					
				Interrelationship of elements to achieve purpose (eg, use of illustrations to add meaning to stories)					
				Language study					
				Syllabification					
				Spelling					
				Capitalisation and punctuation					
				Signs and symbols (eg, semiotics)					
				Syntax and sentence structure					
				Grammatical analysis					
				Standard and non-standard language use					
				Linguistic knowledge (including dialects and diverse forms)					
				History and evolution of language					
				Relationships of language forms, contexts and purposes (eg, rhetoric, semantics)					
				Use of language to generate different responses					
				Effects of race, gender or ethnicity on language and language use					
				Relationship of form and structure of language use to cultural context					
				Critical reasoning					
				Relationships among purpose, organisation, format and meaning in text					

				Distinguishing between objective and subjective uses of language					
				Comparison of topic, theme, treatment, scope or organisation across texts					
				Inductive/deductive approaches (eg, making inferences and drawing conclusions from texts)					
				Logical reasoning in text (eg, implications, author's rationale, development of argument)					
				Textual evidence and/or use of references to support position					
				Drawing meaning from allegory and myth					
				Distinguishing real from fantastical events in literature					
				Connection between own experiences and the world of literary texts					
				Criteria for determining the value of a text read, heard or viewed					
				Identifying meaning from texts read, heard or viewed					
				Identifying feelings about texts read, heard or viewed					
	Author's craft								
				Theme/thesis					
				Purpose (eg, to inform, perform, critique, or appreciate)					
				Characteristics of genres and forms					
				Point of view (eg, first or third person, multiple perspectives)					
				Literary devices (eg, analogy, simile, metaphor, hyperbole, flashbacks, structure, archetypes) used in multimodal texts					
				Literary analysis (eg, symbolism, voice, style, tone, mood)					
				Influence of time and place on authors and texts (eg, historical era or culture)					
				Aesthetic aspects of text (eg, dramatic or poetic elements)					
				Identifying the characteristics of different author's literary styles					
	Writing applications								
				Narrative (eg, stories, fiction, plays)					
				Poetry					
				Expository (eg, report, theme, essay)					
				Critical/evaluative (eg, review)					
				Expressive (eg, journals or reflections)					
				Persuasive (eg, editorial, advertisement or argumentative)					
	Fluency								

				Prosody (eg, phrasing, intonation, inflection)					
				Automaticity of words and phrases (eg, sight and decidable words)					
				Speed and pace					
				Accuracy					
				Independent reading (eg, repeated/silent reading for fluency)					
	Comprehending – Reading, Listening and Viewing								
				Word meaning from context					
				Phrase					
				Sentence					
				Paragraph					
				Main idea(s), key concepts and sequences of events					
				Descriptive elements (eg, detail, colour, condition)					
				Narrative elements (eg, events, characters, setting, plot)					
				Persuasive elements (eg, propaganda, advertisement, emotional appeal)					
				Expository or informational elements (eg, explanation, lists and organisational patterns such as description, cause-effect, compare-contrast)					
				Different types, purposes and formats of texts					
				Strategies (eg, activating prior knowledge, questioning, making connections, predictions, inference, visualising, summarising, retelling/ sequencing events.)					
				Self-correction strategies (eg, monitoring, cueing systems, fix-up)					
				Metacognitive processes (reflecting about one's thinking)					
				Fact and opinion					
				Appealing to authority, reason or emotion					
				Validity and significance of assertion or argument					
				Literal and connotative meanings					
				Visual Grammar					
				Interpret maps, graphs and charts					
				Test-taking strategies					
	Writing processes								
				Printing, cursive writing and pen craft					
				Pre-writing (eg, essential questions, topic selection, brainstorming)					
				Drafting and revising					
				Editing for conventions (eg, usage, spelling, structure) and meaning					

				Manuscript conventions (eg, indenting, margins, citations, references)					
				Final draft and publishing					
				Use of technology (eg, word processing, multimedia)					
				Procedural (eg, instructions, brochure, lab report)					
				Real world applications of writing (eg, resumes, letters to editor, note taking)					
	Elements of presentation (multimodal)								
				Purpose, audience and context					
				Main ideas					
				Organisation					
				Word choice					
				Support and elaboration					
				Style, voice, technique and use of figurative language					
				Writing conventions (eg, capitalisation, punctuation)					
				Transitional devices					
				Selection and use of media for purpose					
	Listening and viewing								
				Listening					
				Viewing					
				Nonverbal communication					
				Consideration of others' ideas					
				Conventions for successful interactions					
				Similarities/differences among print, graphic and non-print communications					
	Speaking and presenting								
				Public speaking and oral presentation					
				Diction, tone, syntax, convention or rhetorical structure in speech					
				Demonstrating confidence					
				Effective non-verbal skills (eg, gesture, eye contact)					
				Knowledge of situational and cultural norms for expression					
				Conversation and discussion (eg, Socratic seminars, literature circles, peer discussion)					
				Debate and structure of argument					
				Questioning for information and understanding					
				Dramatics, creative interpretation					
				Media-supported communication					
				Selecting presentation format					
				Interviewing					
				Role in group presentations in a variety of forms					
				Shared reading, viewing and storytelling					

				Combining written, oral, viewing and/or technical skills to convey information and ideas through multimodal texts					
	General capabilities and processes								
				ICT applications for learning and communication					
				Intercultural understanding					
				Self management (eg, planning and working independently, taking responsibility for own behaviour and performance, learning from successes and failures)					
				Strategies and processes for effectively working with others towards a common purpose					
				Ethical principles and reasoned moral judgments					
				Strategies and processes that contribute to self-awareness, empathy, respectful relationships and participation in a range of social and civic activities.					

Time on Topic				Topic Groups and Topics	Expectations for Students				
None	Slight coverage	Moderate coverage	Sustained coverage		Memorise facts/definitions/formulas/fluency	Perform procedures	Demonstrate understanding of mathematical ideas	Conjecture/generalise/prove	Solve non•routine problems/make connections
				Number sense/properties/relationships/numeration					
				Place value					
				Whole numbers and integers					
				Operations					
				Fractions					
				Decimals					
				Percents					
				Powers					
				Ratios and proportions					
				Patterns					
				Real and/or rational numbers					
				Exponents					
				Scientific notation					
				Factors, multiples, and divisibility					
				Odd/even/prime/composite/square numbers					
				Estimation					
				Number comparisons (eg, order, magnitude, relative size, inverse, opposites, equivalent forms, scale, number line)					
				Order of operations					
				Computational algorithms					
				Relationships between operations					
				Number theory (eg, base-ten and non-base-ten systems)					
				Mathematical properties (eg, distr. property)					

				Equivalence and partitioning					
				Subitising					
				Operations					
				Add/subtract whole numbers and integers					
				Multiply whole numbers and integers					
				Divide whole numbers and integers					
				Combinations of operations on whole number or integers					
				Equivalent and non-equivalent fractions					
				Add/subtract fractions					
				Multiply fractions					
				Divide fractions					
				Combinations of operations on fractions					
				Ratio and proportion					
				Representations of fractions					
				Equivalence of decimals, fractions, and percents					
				Add/subtract decimals					
				Multiply decimals					
				Divide decimals					
				Combinations of operations on decimals					
				Computing with percents					
				Computing with exponents and radicals					
				Measurement					
				Use of measuring instruments					
				Theory (eg, arbitrary, standard units, unit size)					
				Conversions					
				Metric (SI) system					
				Length and perimeter					
				Area					
				Volume					
				Surface area					
				Direction, location, and navigation					
				Angles					
				Circles (eg, *pi*, radius, area)					
				Mass (weight)					
				Time and temperature					
				Money					
				Derived measures (eg, rate, speed)					
				Calendars					
				Accuracy and precision					
				Consumer applications					
				Simple interest					

				Compound interest					
				Rates (eg, discount, commission)					
				Spreadsheets					
				Earning and spending					
				Basic algebra					
				Absolute value					
				Use of variables					
				Evaluation of formulas, expressions, and equations					
				One-step equations					
				Coordinates					
				Patterns					
				Multi-step equations					
				Inequalities					
				Linear and non-linear relations					
				Rate of change/slope/line					
				Operations on polynomials					
				Factoring					
				Square roots and radicals					
				Operations on radicals					
				Rational expressions					
				Multiple representations					
				Advanced algebra					
				Quadratic equations					
				Systems of equations					
				Systems of inequalities					
				Compound inequalities					
				Matrices and determinants					
				Conic sections					
				Rational, negative exponents, or radicals					
				Rules for exponents					
				Complex numbers					
				Binomial theorem					
				Factor/remainder theorem					
				Field properties of real number system					
				Multiple representations					
				Parametric equations					
				Polynomials					
				Geometric concepts					
				Basic terminology					
				Points, lines, rays, segments, and vectors					
				Patterns					
				Congruence					

				Similarity					
				Parallels and perpendiculars					
				Triangles					
				Quadrilaterals					
				Circles					
				Angles					
				Polygons					
				Polyhedra					
				Models					
				3-D Relationships					
				Symmetry					
				Transformations (eg, flips or turns)					
				Pythagorean Theorem					
				Advanced geometry					
				Logic, reasoning and proofs					
				Loci					
				Spheres, cones, and cylinders					
				Coordinate Geometry					
				Vectors					
				Analytic Geometry					
				Non-Euclidean Geometry					
				Topology					
				Data displays					
				Summarise data in a table or graph					
				Bar graphs					
				Histograms					
				Pie charts and circle graphs					
				Pictographs					
				Line graphs					
				Dot plots					
				Stem and leaf plots					
				Scatter plots					
				Box plots					
				Line plots					
				Classification and Venn diagrams					
				Tree diagrams					
				Statistics					
				Mean, median, and mode					
				Variability, standard deviation and range					
				Line of best fit					
				Quartiles and percentiles					
				Bivariate distribution					

				Confidence intervals					
				Correlation					
				Hypothesistesting					
				Chi-square					
				Datatransformation					
				Central Limit Theorem					
				Sampling					
				Probability					
				Simpleprobability					
				Compound probability					
				Conditional probability					
				Empirical probability					
				Samplespaces					
				Independentvs. dependentevents					
				Expectedvalue					
				Binomial distribution					
				Normalcurve					
				Poisson distribution					
				Theoretical probability					
				Counting techniques					
				Analysis					
				Sequencesandseries					
				Limits					
				Continuity					
				Rates of change					
				Maxima, minima and range					
				Differentiation					
				Integration					
				Trigonometry					
				Basicratios					
				Radianmeasure					
				Right-triangle trigonometry					
				Law of Sines and Cosines					
				Identities					
				Trigonometricequations					
				Polarcoordinates					
				Periodicity					
				Amplitude					
				Specialtopics					
				Sets					
				Logic					
				Mathematical induction					

				Linear programming					
				Networks / graph theory					
				Iteration and recursion					
				Permutation combinations					
				Simulations					
				Fractals					
				Functions and relations					
				Notation					
				Relations					
				Linear					
				Quadratic					
				Cubic					
				Polynomial					
				Rational					
				Logarithmic					
				Exponential					
				Trigonometric and circular					
				Inverse					
				Composition					
				Step functions					
				Instructional technology					
				Use of calculators					
				Use of graphing calculators					
				Use of computers and the internet					
				Computer programming					
				Use of spreadsheets					
				Dynamic geometry programs					
				Random number generators					
				General capabilities and processes					
				ICT applications for learning and communication					
				Intercultural understanding					
				Self management (eg, planning and working independently, taking responsibility for own behaviour and performance, learning from successes and failures)					
				Strategies and processes for effectively working with others towards a common purpose					
				Ethical principles and reasoned moral judgments					
				Strategies and processes that contribute to self-awareness, empathy, respectful relationships and participation in a range of social and civic activities.					

Time on Topic				Topic Groups and Topics	Expectations for Students				
None	Slight coverage	Moderate coverage	Sustained coverage		Memorise facts/definitions/ formulas	Perform procedures/investigate	Communicate understanding of science concepts	Analyse information and advance scientific argument	Apply concepts/make connections
More Info						More Info			
	Nature of science								
				Nature and structure of science					
				Nature of scientific inquiry/method (working scientifically/science investigation skills)					
				Scientific habits of mind, logic and reasoning					
				Role of evidence in scientific ideas and arguments					
				Science and reliable prediction					
				Ethical issues and critiques of science					
				Issues of diversity, culture and gender in science					
				History of scientific innovations					
	Science and society (science as a human endeavour)								
				Science-related careers					
				Real-world practice/work of scientists (including Australian scientists)					
				Impacts/influences of and on science (including social priorities for science research/application)					
				Contemporary science applications, research and real-world issues (eg, climate change, stem cell research, water and its management, nanotechnology, gene technology)					
				Everyday science (personal significance and relevance of science)					
	Science and technology								

				Relationships between science, technology and engineering					
				The role of scientific inquiry in technological design and engineering					
				The role of technologies in scientific inquiry					
				Science tools/equipment and lab safety					
				Technological benefits, trade-offs and consequences					
				Design or implement a solution or product					
	Science, health and environment								
				Personal health, behavior, disease and nutrition					
				Environmental health, pollution and waste disposal					
				Acid rain					
				Ozone depletion					
				Resources and conservation					
				Toxic and nuclear waste					
				Greenhouse effect					
				Natural and human-caused hazards					
				Sustainability					
				Climate change					
				Role of micro-organisms in health and the environment					
	Measurement and calculation in science								
				The International System					
				Mass and weight					
				Length					
				Volume					
				Time					
				Temperature					
				Electricity (volts, amps, ohms)					
				Energy (joules)					
				Accuracy and precision/estimation					
				Significant digits					
				Formal and informal units					
				Derived units (eg, rate, speed)					
				Uncertainty and error					
				Statistics					
				Conversion factors					
				Density					
				Data displays (eg, tables, charts, maps, graphs)					
	Components of living systems								
				Living vs. non-living					
				Needs of living things					
				Cell structure and function					

				Cell theory					
				Transport of material within living systems (including cellular transport)					
				Cell metabolism					
				Cell response					
				Cellular respiration					
				Cell specialization					
				Tissues					
				Organs					
				Body systems/organ systems					
				Microbiology					
	Biochemistry								
				Living elements (C, H, O, N, P)					
				Atomic structure and bonding					
				Synthesis reactions (proteins)					
				Hydrolysis					
				Organic compounds (eg, carbon, proteins, nucleic/amino acids, enzymes)					
				DNA					
	Plant biology/botany								
				Structure (characteristics and features) of plants					
				Nutrition and photosynthesis					
				Circulation					
				Respiration					
				Growth, development and behavior					
				Health and disease					
				Structure and function					
	Animal biology								
				Structure (characteristics and features) of animals					
				Nutrition					
				Circulation					
				Excretion					
				Respiration					
				Growth/development/behavior					
				Health and disease					
				Structure and function					
				Skeletal and muscular systems					
				Nervous and endocrine systems					
				Habitat					
				Micro-organisms (and uses and role in food, health and environment)					
	Human biology								
				Nutrition and digestive system					

				Circulatory system and blood					
				Excretory system					
				Respiration and respiratory system					
				Growth, development and behavior					
				Health and disease, immune system					
				Skeletal and muscular systems					
				Nervous and endocrine systems					
	Genetics								
				DNA, genes and chromosomes					
				Mendelian genetics					
				Modern genetics					
				Inherited diseases					
				Biotechnology					
				Human genetics					
				Transcription and translation					
				Mutation					
	Evolution								
				Adaptations					
				Evidence for evolution					
				Lamarckian theories					
				Modern evolutionary theory					
				Diversity					
				Life origin theories					
				Human evolution					
				Classification					
				Causes					
				Natural selection					
	Reproduction and development								
				Life cycles					
				Mitotic and meiotic cell division					
				Asexual reproduction					
				Inherited traits					
				Reproduction, growth and development in plants					
				Reproduction, growth and development in animals					
				Reproduction, growth and development in humans					
	Ecology								
				Food webs/chains					
				Competition and cooperation					
				Energy flow relationships					
				Biotic and abiotic factors					
				Ecological succession					
				Ecosystems					

				Population dynamics					
				Environmental chemistry					
				Adaptation and variation					
				Niche populations					
	Energy								
				Transfer and transformation of energy					
				Heat energy					
				Light energy					
				Sound energy					
				Potential energy					
				Kinetic energy					
				Energy storage					
				Conservation of mass/energy					
				Laws of thermodynamics and entropy					
				Work and energy					
				Mechanical energy and machines					
				Nuclear energy					
				Renewable and non-renewable energy sources					
	Motion and forces								
				Pushes, pulls, position and motion					
				Vector and scalar quantities					
				Displacement as a vector quantity					
				Velocity as a vector quantity					
				Relative position and velocity					
				Acceleration					
				Newton's First Law					
				Newton's Second Law					
				Newton's Third Law					
				Momentum, impulse and conservation					
				Equilibrium					
				Friction					
				Gravity					
	Electricity								
				Generation of electricity (renewable and non-renewable sources)					
				Static electricity (production, transfer, distribution)					
				Coulomb's law					
				Electric fields					
				Current electricity					
				Current, voltage and resistance					
				Series and parallel circuits					
				Magnetism					

				Effects of interacting fields					
				Conductors and insulators					
	Waves								
				Characteristics and behavior					
				Visible light (eg, direction, speed, transformation)					
				Non-visible light/electromagnetic spectrum (eg,					
				ultraviolet, infrared)					
				Sound (eg, direction, speed, transformation)					
				Earthquakes, tsunamis, ocean waves					
	Kinetics and equilibrium								
				Molecular motion					
				Pressure					
				Kinetics and temperature					
				Equilibrium					
				Reaction rates					
	Properties of matter/materials								
				Characteristics and composition of matter/materials					
				Elements, molecules, and compounds					
				States of matter (S-L-G-P)					
				Solutions and mixtures					
				Physical and chemical changes					
				Physical and chemical properties					
				Isotopes, atomic number and atomic mass					
				Photons and spectra					
				Atomic theory					
				Sub-atomic structure					
				Quantum theory and electron clouds					
				Synthesis of materials					
				Uses of materials					
	Earth systems								
				Earth's shape, dimension and composition					
				The Earth's spheres and their interactions					
				Earth's resources					
				Earth's origins and history					
				Maps, locations and scales					
				Measuring using relative and absolute time					
				Mineral and rock formations and types					
				Erosion and weathering					
				Fossils and their formation					
				Plate tectonics					
				Causes/formation of volcanoes, volcanic eruptions, earthquakes and mountains					

				Topography					
				Dynamics and energy transfer					
				Oceanography					
				Carbon, nitrogen and water cycles					
	Astronomy/space								
				Stars					
				Galaxies					
				Origins of the universe (including Big Bang Theory)					
				Asteroids and comets					
				The solar system					
				The moon					
				The Earth's motion: rotation and revolution					
				Relationship of Earth, moon, and sun					
				Location, navigation and time					
				Space exploration					
	Meteorology								
				Earth's atmosphere					
				Air pressure and winds					
				Evaporation, condensation and precipitation					
				Weather					
				Climate					
	Elements and the periodic system								
				Early classification system(s)					
				Modern periodic table					
				Electronic structure					
				Interaction of elements					
				Element characteristics (families and periods)					
	Chemical reactions and formulas								
				Names, symbols and formulas					
				Molecular and empirical formulas					
				Representing chemical change					
				Balancing chemical equations					
				Stoichiometric relationships					
				Oxidation/reduction reactions					
				Reactions of acids and bases					
				Chemical bonds					
				Electrochemistry					
				The Mole					
				Types of reactions					
				Rates of reactions and factors that affect them (eg, temperature, surface area, catalysts/enzymes)					
				Biological reactions (eg, photosynthesis, respiration)					

				Industrial reactions (eg, combustion)					
	Acids, bases and salts								
				Arrhenius/Bronsted-Lowry/Lewis Theories					
				Naming acids					
				Acid/base behavior and strengths					
				Salts					
				pH					
				Hydrolysis					
				Buffers					
				Indicators					
				Titration					
	Organic chemistry								
				Hydrocarbons, alkenes, alkanes and alkyne					
				Aromatic hydrocarbons					
				Isomers and polymers					
				Aldehydes, ether, ketones, esters, alcohols, organic acids					
				Organic reactions					
				Carbohydrates, proteins and lipids					
	Nuclear chemistry								
				Nuclear structure					
				Nuclear equations					
				Fission					
				Radioactivity					
				Half-life					
				Fusion					
	General capabilities and processes								
				ICT applications for learning and communication					
				Intercultural understanding					
				Self management (eg, planning and working independently, taking responsibility for own behaviour and performance, learning from successes and failures)					
				Strategies and processes for effectively working with others towards a common purpose					
				Ethical principles and reasoned moral judgments					
				Strategies and processes that contribute to self-awareness, empathy, respectful relationships and participation in a range of social and civic activities.					

Time on Topic				Topic Groups and Topics	Expectations for Students				
None	Slight coverage	Moderate coverage	Sustained coverage		Recall/Memorise	Process information/Investigate	Demonstrate/Apply Understanding	Analyse/Hypothesise	Synthesise/Evaluate/Make Connections
More Info						More Info			
				Personal/local/state/territory history					
				Generations					
				Indigenous peoples					
				Early settlement and statehood					
				Immigration and settlement					
				Structure of state government					
				Contemporary times (cultural diversity and traditions)					
				Geographic, economic, and political influences					
				Key historical figures					
				Australian history (people, events and documents)					
				Aboriginal and Torres Strait Islander/indigenous culture					
				Relations between Europeans and Aboriginal and Torres Strait Islanders (eg, Myall Creek Massacre, Stolen generations, 1967 Referendum, land rights, reconciliation, the Apology)					
				European settlement and colonisation (eg, First Fleet, Eureka Stockade, Rum rebellion, gold rushes)					
				Federation					
				Australian Constitution					
				Great Depression					
				World War I					
				World War II					
				Post-war reconstruction					
				Cold War period (eg, Korean war, Petrov Affair, Vietnam war)					

				Historical figures					
				Political crises (eg, 1975 Whitlam dismissal)					
				Australian history (growth and development)					
				Exploration (eg, opening up of the interior of Australia, mining, agriculture)					
				Immigration					
				Emergence of modern Australia					
				Industrialisation and urbanisation					
				Nationalism and national identity					
				Australian history (other themes)					
				Cultural, religious, social and political movements (eg, civil rights/voting rights, women's liberation, environment, republicanism)					
				Social and economic changes (eg, family life, music, sport, fashion, entertainment, work)					
				Social/political policies (White Australia Policy, multiculturalism)					
				Role of popular culture, art, literature and music					
				Foreign policy, alliances, relations with other nations (eg, Britain, USA, Asia, UN)					
				World history (pre-history)					
				Beginnings of human society and early civilisations					
				Emergence of civilizations (eg, Ice Age, hunting and gathering societies, and development of agriculture)					
				Development of early civilizations (eg, Mesopotamia, Egypt, Greece, Rome, India, China)					
				World history (early empires and religions)					
				Rise of world religions and the great empires					
				Early societies and empires (eg, Persian, Greek, Roman, Asian empires)					
				Philosophers and thinkers					
				Religions					
				Global encounters, exchanges and conflicts					
				Expansion of Europe (eg, Byzantine and Medieval Periods)					
				Interactions between Christendom and the Muslim World					
				Interactions through regional and overseas exploration and trade (eg, Mongol Empire, African kingdoms, Marco Polo, exploration of the Americas)					
				Patterns of crises (eg, weather, plague)					
				World history (emergence of the global age)					
				Expansion of overseas exploration and trade					
				Convergence of cultures (ecological revolution)					
				Renaissance, Reformation and political revolutions in Europe					

				An age of empires and revolutions					
				Political, agricultural, industrial and scientific revolutions					
				Nationalism, imperialism and expansion of trade-based empires					
				Western dominance and global empires					
				Global wars (World War I, World War II, the Holocaust, United Nations)					
				Global politics (eg, Cold War, Communist China, decolonisation, independence movements in Africa and India, nation building)					
				Civil Society (eg, immigration, civil rights, ethnic and religious conflicts, advances in science and medicine)					
				Rise of globalisation					
				Key historical figures					
				General capabilities and processes					
				ICT applications for learning and communication					
				Intercultural understanding					
				Self management (eg, planning and working independently, taking responsibility for own behaviour and performance, learning from successes and failures)					
				Strategies and processes for effectively working with others towards a common purpose					
				Ethical principles and reasoned moral judgments					
				Strategies and processes that contribute to self-awareness, empathy, respectful relationships and participation in a range of social and civic activities.					