



The Australian Geography Competition: An Overview of Participation and Results 2004–2013

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Abstract

The Australian Geography Competition (AGC) was established in 1995 by the Royal Geographical Society of Queensland (RGSQ) and the Australian Geography Teachers' Association to promote the study of geography in Australian secondary schools and to reward student excellence in geographical studies. Initially focusing on students at the lower secondary level, the Competition expanded in 2005 to include students up to Year 12. In 2013, the number of students participating nationwide in the AGC was 74,498. This paper firstly gives an overview of national participation by Australian students in the Competition over the 2004–2013 period. Secondly, more detailed analysis of the 2012 and 2013 competitions is presented in terms of overall results in the three age groups, the types and levels of difficulty of questions, and gender differences in achievement. Some concluding observations are made relating to the scope and significance of the AGC in the context of the introduction of the national geography curriculum from 2014.

Keywords: Geography, competition, Australia, secondary school, gender

Introduction

The Australian Geography Competition (AGC or Competition) was established in 1995 by the Royal Geographical Society of Queensland (RGSQ) and the Australian Geography Teachers' Association to promote the study of geography in Australian secondary schools and to reward student excellence in geographical studies. Initially focusing on students at the lower secondary level, the Competition was expanded in 2005 to include students up to Year 12. In 2013, the number of students participating nationwide in the AGC was 74,498.

The AGC consists of multiple-choice questions testing geographical knowledge and skills. Teachers administer the competition within schools, the answer sheets are centrally marked by computer, and results returned to schools. Students are graded in three age divisions: junior for students under 13 years; intermediate for students aged 14 and 15 years; and senior for students aged 16 to 18 years. The Competition question booklet has 50 questions and students in the different age divisions answer different subsets of these questions. All students have 35 minutes to answer the questions.

Based on AGC results, the top one or two students from each state proceed through different types of testing in order to select teams to represent Australia at two international geography competitions: the National Geographic World Championship (drawn from intermediate students) and the International Geography Olympiad (drawn from senior students). The need to discriminate at the upper end of students' results means that the overall level of difficulty of the Competition has been kept high.

The present paper presents an overview of the AGC over the ten years 2004 to 2013 in terms of overall national trends and participation. More detailed analysis of 2012 and 2013 AGC results is presented in terms of types of questions, levels of difficulty based on student achievement, and gender differences.

The following research questions are addressed in the present paper:

- Has participation in the AGC been rising or falling in Australia and in individual states?
- How do students perform on various types of questions? What types of incorrect choices do students choose?
- What are the differences in performance between boys and girls?

Overall Trends in Competition Participation

Over the ten-year period between 2004 and 2013, participation in the AGC across the Australian states has averaged 5.0% of all students enrolled in State secondary schools with a peak of 5.6% in 2008 (Table 1).

Table 1. Participation in the AGC 2004–2013 as a percentage of State Secondary School Enrolment in that State. (Non-shaded boxes display the total number of students that entered the competition in each state for each year. Shaded boxes are state participation percentages for each year.

Participation totals and participation as a percentage enrolled secondary students per state											
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average % per state
ACT	2022	2464	2721	1842	2852	2869	2330	2599	2783	2166	
	7.1	8.6	9.5	6.4	10.0	10.0	8.1	9.0	9.6	7.4	8.6
NSW	37706	38406	42534	37845	37355	36532	33384	30217	30148	29323	
	7.8	7.9	8.7	7.7	7.6	7.4	6.7	6.0	6.2	5.8	7.2
NT	237	60	214	82	385	198	336	114	197	108	
	2.0	0.5	1.7	0.7	2.5	1.3	2.1	0.7	1.2	0.7	1.3
QLD	12476	12376	14851	14932	15147	15364	17957	15216	15283	13229	
	4.9	4.8	5.6	5.5	5.5	5.5	6.4	5.4	5.4	4.6	5.4
SA	4922	4941	4576	4669	4863	4411	4771	4215	4241	3903	
	5.4	5.4	4.9	4.9	5.1	4.5	4.8	4.2	4.2	3.9	4.3
TAS	620	757	761	816	679	797	787	713	789	559	
	1.7	2.1	2.1	2.2	1.8	2.2	2.1	1.9	2.2	1.6	2.0
VIC	16085	17915	18499	16559	18649	17231	15680	14997	14812	14116	
	4.4	4.8	4.9	4.4	4.9	4.5	4.0	3.9	3.8	3.6	4.3
WA	7376	8372	8286	9170	9626	9268	9856	10572	10855	11094	
	5.7	6.4	6.2	6.8	7.1	6.7	7.7	8.2	8.3	8.3	7.1
Total participation all states	81444	85291	92442	85915	89556	86670	85101	78643	79108	74498	
Average % participation all states	4.9	5.1	5.5	4.8	5.6	5.3	4.7	4.9	5.1	4.5	5.0

Source: Modified from ABS(2012) cat.4221.0 and RGSQ competition records

The Northern Territory has consistently had the lowest total number of students entering the competition each year, reflecting its low population when compared to larger states, as well as the lowest participation rate (average 1.3% of enrolled secondary students). The Australian Capital Territory also has a relatively low number of students entering the competition, although it has the highest average participation rate (8.6%). New South Wales has consistently the largest number of students entering and the second highest average participation rate of 7.2%. In terms of participation trends, the state that shows the largest increase in participation is Western Australia (from 5.7% in 2004 to 8.3% in 2013). In contrast, participation rates in New South Wales, Victoria and South Australia have fallen from highs of 8.7% in New South Wales (2006), 4.9% in Victoria (2008) and 5.1% in South Australia (2008). Queensland and Tasmania have remained relatively stable with average participation rates of 5.4% and 2.0% respectively (see Table 1).

Total participation in the AGC has been declining from a peak of 92,442 in 2006 to 74,498 in 2013. To attempt to gain some insights into the reasons for the overall decline in participation, the Competition organisers conducted short surveys of schools which competed in 2006 but not 2007 and schools which competed in 2010 but not in 2011. Response rates, however, for such surveys have been low, with only interested teachers returning forms. Only 12% of 224 surveys were returned in 2011 and 16% of 235 surveys in 2007. This low return rate in the sample would likely be biased towards teachers who are favourably disposed towards the Competition. The reasons cited for not entering the Competition were similar across the two surveys and mainly related to school organisational problems, timetabling, and logistical difficulties such as the usual contact teacher being on leave, or not being able to organise the entry by the deadline. Only 22% of respondents across the two surveys gave as a

reason that the Competition did not relate to their school's needs, and this included aspects such as the difficulty-level of the questions or relevance to the curriculum. In some cases, geography was only taught for half the year and the timing of the Competition did not coincide with this. Only 3% of respondents said that they would not be entering their school in the following year, while 64% intended to participate and the balance were undecided.

Analysis of AGC Results: 2012–2013

We focus here on questions from 2012 and 2013 as being typical of the Competition throughout its history.

Types of Questions

The AGC attempts to test a range of geographical skills and knowledge in four categories. *Skills* questions typically include map and graph interpretation. *Factual knowledge* questions test recall of factual geographical phenomena. *Conceptual knowledge* questions test understanding of geographical processes and *Mixed* questions may require students to apply both skills and knowledge. In the 2012 and 2013 AGCs, the distribution of skills and knowledge questions was approximately 40% each with approximately 20% of mixed questions (Table 2).

Level of Difficulty

In terms of the level of difficulty of questions, AGC results reveal that it is not simply a matter of one category being easy and another difficult. The examples below from the 2012 and 2013 Competitions demonstrate this complexity in achievement on questions of varying levels of difficulty. Examples of questions which students found **easy** to answer in the four categories on the 2012 and 2013 AGC are given below. Correct answers are in **bold**.

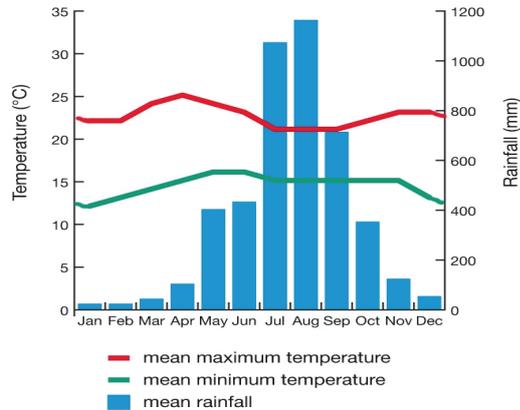
Table 2. Types of Questions in the 2012–2013 AGC

TYPES OF QUESTIONS					
	2012		2013		Overall % 2012–2013
	#Qs	2012	#Qs	2013	
SKILLS	20	40%	18	36%	38%
KNOWLEDGE	20	40%	24	48%	44%
factual	12		13		
concept	8		11		
MIXED	10	20%	8	16%	18%

Easy skills question

2013 Q.3

Figure 1. Climate Graph for Baguio, Philippines.
Source Weatherbase



From Figure 1
What is Baguio's mean rainfall in August?

- A 15mm
- B 34mm
- C 398mm
- D 515mm
- E 1160mm**

This question required students to interpret a rainfall graph of Baguio in the Philippines. Only junior and intermediate students attempted this question, with 68% of junior participants and 72% of intermediate students answering correctly.

Easy factual knowledge question

2012 Q.6

Which religion do most people in Thailand follow?

- A Buddhism**
- B Christianity
- C Hinduism
- D Islam
- E Shintoism

This question required students to have knowledge of the geography of religion in Asia. Only junior and intermediate students attempted this question, with 62% of junior participants and 67% of intermediate participants answering correctly.

Easy conceptual knowledge question

2013 Q.11

Bushfire behavior is affected by:

- A humidity
- B rainfall
- C temperature
- D wind
- E all of the above**

This question required knowledge of bushfire behavior and climate processes. Only junior and intermediate students attempted this question, with 61% of junior participants and 76% of intermediate participants answering correctly.

Easy mixed question

2012 Q.11

Figure 2 Miyako, Japan. 20 March 2011.
Source: U.S. Navy



What caused the devastation shown in Figure 2?

- A fire
- B tornado
- C tsunami**
- D typhoon
- E volcanic eruption

This question required students to identify an image of devastation in Miyako, Japan, and to identify tsunami hazard as the cause. Only junior and intermediate students attempted this question, with 87% of junior participants and 88% of intermediate participants answering correctly.

Examples of 2012 and 2013 questions in the four categories which students found difficult are given below. Correct answers are highlighted in **bold**. The most commonly chosen incorrect answers are indicated by the label *most commonly chosen incorrect answer*.

Difficult skills question

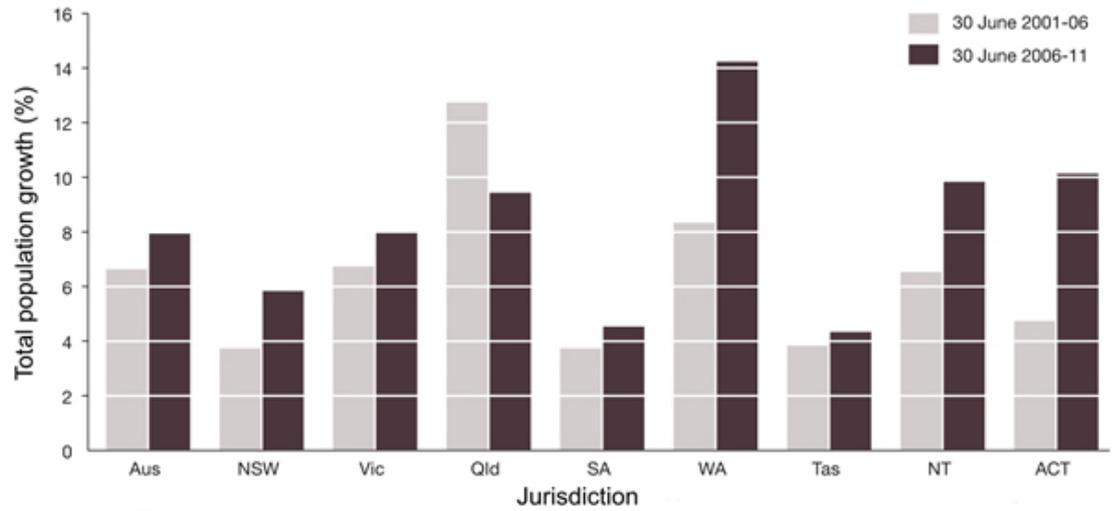
2013 Q.30

See Figure 3. *Total population growth, intercensal periods 2001 to 2011. Next page.*

From Figure 3, Which statement is true of the intercensal period 2006–2011?

- A the ACT's population grew at a higher rate than the national average**
- B the population of all states grew at a higher rate than in the previous 5 years
- C the population of Western Australia passed that of Queensland
- D Queensland's population decreased
- E all of the above (*most commonly chosen incorrect answer*)

Figure 3. Total population growth, intercensal periods 2001 to 2011. Source ABS.



Answer choice	% choice selected		
	Junior	Intermediate	Senior
Correct A	16.3	23.3	29.3
Incorrect E	26.6	29.5	31.6

Answer choice	% choice selected		
	Junior	Intermediate	Senior
Correct B	14.8	23.1	-
Incorrect E	28.4	28.8	-

This question required students to interpret a graph displaying data on population growth rates for the Australian states over two intercensal periods. It appears from the results that many students in all three age levels had difficulty interpreting the graph and probably did not understand the difference between *total population growth* and *rate of growth*. Choice E *all of the above* was the most commonly selected incorrect choice in all three age divisions. Choice E included choices C and D both of which referred to *total populations* of Western Australia and Queensland, rather than *rates*. Choice A is the only choice which correctly compares the *rate of growth* of ACT with the national average. The incorrect choice may also be the *best guess* choice if students did not know the correct answer. It was notable that males performed much better than females on this question.

Difficult factual knowledge question

2012 Q.2

Thailand has been sheltering approximately 100,000 refugees from which neighbouring country?

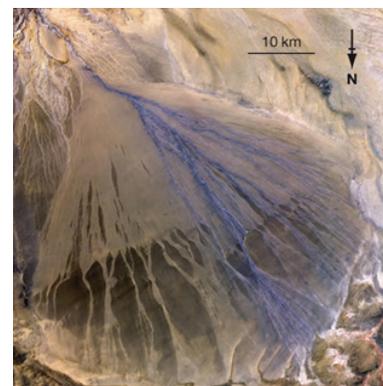
- A Afghanistan
- B Burma**
- C China
- D Indonesia
- E Vietnam (*most commonly chosen incorrect answer*)

This question required simple knowledge of geographical location of countries within Asia. Only junior and intermediate age-level students answered this question. The results reflect a lack of knowledge in this area, in particular the fact that Burma and Thailand are neighbouring countries. The most commonly selected incorrect choice by both junior and intermediate age levels was E *Vietnam*. Juniors also commonly selected A *Afghanistan*, and intermediate students selected D *Indonesia* – i.e. answers were widely off the mark.

Difficult conceptual knowledge question

2013 Q.35

Figure 4. Satellite image, Taklimakan Shamo, China (blue indicates active stream flow) Source: NASA Earth Observatory



The feature in Figure 4 formed primarily due to:

- A an abrupt change in slope**
- B changes in rainfall patterns
- C climate change

- D a significant landslide
 E tectonic activity (*most commonly chosen incorrect answer*)

Answer choice	% choice selected		
	Junior	Intermediate	Senior
Correct B	14.8	23.1	-
Incorrect E	28.4	28.8	-

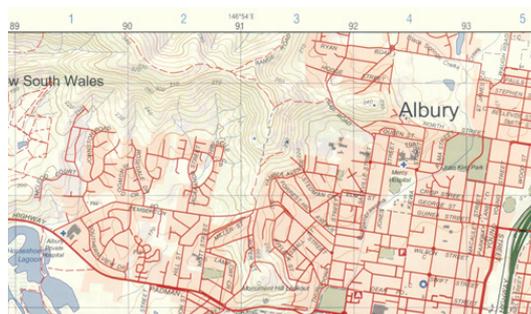
This question required an understanding of geomorphic and landform processes and identification of an alluvial fan. Only intermediate and senior students answered this question. The most commonly selected incorrect choice by both age levels was E *tectonic activity*, with smaller percentages of students selecting either B *changes in rainfall patterns* or D *a significant landslide*. The latter choice is more understandable given the image.

Difficult mixed question

2013 Q.16

Figure 5. Topographic map. Source: Department of Sustainability and Environment 2011.

(Note this is a portion of the original figure.)



Range Road (A3, Fig. 5) follows:

- A an escarpment
 B a peak
 C a ridge (*most commonly chosen answer by intermediate & senior students*)

- D a spur
 E a valley (*most commonly chosen by juniors*)

Answer choice	% choice selected		
	Junior	Intermediate	Senior
Correct D	9.3	11.8	14.6
Incorrect C	25.7 C	30.6 C	33.1 C
Incorrect E	32.0 E	26.2 E	23.2 E

This question required both topographic map interpretation and knowledge of physical geography terminology. The most commonly selected incorrect choice by junior students was E *valley*, which indicates a misreading of contours. Presumably, students mistakenly read contours to indicate descending elevation (a valley) rather than ascending elevation (a spur). In contrast, many intermediate and senior students correctly read the contours as representing an ascending landform, but chose the incorrect term C *ridge*, rather than the correct term E *spur*.

In summary, there was a significant difference in the percentage of students scoring correctly between the easy and difficult questions for all four types of questions. This emphasises the discriminatory power of the difficult questions where scores were overall low in all categories and in all age-levels.

Differences in performance between boys and girls

Over the period 2004–2013 without exception, the overall mean scores for males in the Competition have been higher than for females. This has been the case in all three sections of the competition, Junior, Intermediate and Senior (Table 3).

While there are very few exceptions on individual questions where females have scored higher than males, there is a consistent result of higher male

Table 3. AGC mean overall scores, male and female participants 2004–2013

DATE	JUNIOR/30		INTERMEDIATE/40		SENIOR/35	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
2004	14.2	13.6	19.6	18.6	–	–
2005	13.4	12.3	18.5	17.0	15.8	14.8
2006	12.5	11.5	17.5	16.0	15.7	14.3
2007	10.8	10.2	15.9	14.5	14.0	12.2
2008	11.6	10.5	16.8	15.3	14.3	13.0
2009	12.4	11.7	17.4	16.1	15.3	14.1
2010	11.9	10.8	16.7	15.1	14.8	13.2
2011	14.8	13.4	20.4	18.7	17.1	15.7
2012	13.8	12.5	19.1	17.3	16.8	15.0
2013	12.8	12.1	18.3	16.9	15.5	14.1

Table 4. AGC 2012 and 2013 percentage of answers correct by male and female participants by type of question

AGC 2012 and 2013 % correct Females & Males by Type of Question								
	Skills		Knowledge factual		Knowledge conceptual		Mixed	
JUNIOR	M	F	M	F	M	F	M	F
2012	47.3	43.1	49.5	44.4	55.4	51.6	42	38.5
2013	47.2	44.1	36.6	34.9	54.1	50.0	33.5	32.9
INTERMEDIATE								
2012	52.7	48.1	44.6	39.6	44.6	42.2	46.3	41.6
2013	53.7	49.4	40.6	37.3	49.3	45.2	37.0	34.8
SENIOR								
2012	55.3	49.9	33.8	30.7	41.5	37.7	42.8	37.2
2013	47.0	36.5	46.8	42.1	43.0	41.5	36.9	32.8

achievement. This remains the case across all question types. The results from 2012 and 2013 shown in Table 4 are typical.

Males also score more highly in the national geography competitions of other countries. This is borne out by the male/female ratios of school students selected to represent their countries in international geography competitions. The biennial National Geographic World Championship is for students in the Australian competition's intermediate age division (14–15 years). In the last two World Championships, only 14 of a total of 105 students (13%) have been female, with a similar percentage in other years. Australia has been entering since 1995 and in that time has had no females in its three-member teams.

The International Geography Olympiad is for students in Australia's senior age division (16–18 years). The Olympiad was biennial until 2012 and has been annual since then. In the five Olympiads since 2006, males still dominate, but less so than in the World Championships – 127 females out of 543 students (23%). Australia's four-member teams since 2006 have been composed of 10 females and 10 males. This balanced gender difference in Australia's teams arises from the selection methods. All students first sit the AGC, which comprises entirely multiple-choice questions that seem to favour males (see discussion below). The intermediate students are selected for the National Geographic World Championship and its questions are mainly multiple-choice or require one-word answers. Therefore, the AGC is already a good guide to how students may perform in the World Championships. The highest-scoring intermediate students, who are predominantly male, go through a selection method that tests a harder

level of factual knowledge. This has resulted in all-male teams.

By contrast, the International Geography Olympiad tests a much wider range of geographical understanding and skills, including fieldwork and analysis. Because AGC organisers are aware of the likely male bias in their multiple-choice format, they positively discriminate to include female students in the selection process for the Olympiad team. Based on the results of the Australian competition, the highest-scoring male and female student in each state and the territories is invited to participate in the selection event, called *Geography's Big Week Out*. This comprises five days of challenging geographical activities focusing on such fieldwork as beach profiles, water quality testing, community amenity surveys, and using spatial technologies to analyse and present the collected data. At the end of the week, students sit a test that includes data manipulation, analysis and decision-making. Cumulatively over the five teams, exactly equal numbers of male and female students have been selected for the Australian team.

The topic of gender differences in cognitive abilities is controversial, due mainly to a variety of sometimes contradictory theories that attempt to explain the differences (e.g. Montello, Lovelace, Golledge, & Self, 1999; Wridt & Boehm, 2000; Hardwick, Bean, Alexander, & Shelley, 2000; Lloyd & Bunch, 2005; Keith, Reynolds, Roberts, Winter, & Austin, 2011). Despite this, some consistent findings and seemingly robust patterns have been found. This is important because understanding sex-related difference in the performance of various tasks could have implications for ameliorating occupational inequities in fields that frequently involve numeracy and spatial abilities.

There are two likely areas identified in the literature which may help to explain the gender differences in the results of the AGC. These are spatial cognitive abilities and the multiple-choice testing format.

Spatial Cognitive Abilities

Gender differences in geographical learning and achievement have been the focus of many educational studies that reveal complex patterns in the ways in which males and females approach different spatial tasks. For example, early research by Montello et al. (1999) concluded that there were many spatial tasks in which the two sexes did not differ and some in which females outperformed males. They found that males and females differed on average in their spatial abilities and styles on particular tasks. Spatial tasks in which males were found to outscore females included estimating distances and rotation tasks. The results of the AGC bear out such findings. For instance, the question *One centimetre on the map represents how much on the ground?* (Figure 5) required use of the scale bar. The result on this question was that 73.2% of males and 65% of females scored correctly. On the other hand, females have been found to outperform males in spatial tasks such as recalling landmarks. It is unclear, however, how and if these differences affect performance of males and females conducting complex spatial tasks.

Wridt and Boehm (2000) proposed three possible general explanations for gender differences in geography, including some interesting biological differences. They considered *brain lateralization*, which theorises that because males use the right side of their brain (which analyses problems in a spatial, holistic manner) more than their left side, they are biologically at an advantage when it comes to geography. By contrast, females use their left-side brain which analyses problems more analytically or verbally.

Lloyd and Bunch (2005) investigated differences in gender spatial awareness using map reading that focused on perceptual and memory processes. They found that differences were likely to be caused by a combination of, and interaction between testing biases, biological brain and hormone differences, and social and environmental factors, drawing on some evolutionary biology. This study suggested a possible disadvantage to females in answering test questions because of their general slower reaction time (slower processing) – females are more affected by time limits! The critical result of this study was that people with a combination of a brain structure that supports spatial processing and additional environmental experiences with

spatial activities perform better on challenging map reading tasks.

Multiple-Choice Format

Many studies conducted into gender bias and multiple-choice questions have concluded that the multiple-choice format is biased against females. Hardwick et al. (2000) concluded that the multiple-choice test format, in which only one answer is correct, tends to privilege the type of thinking involving searching for a single correct answer. The problem-solving approaches used by males tend to be associated with finding a single correct solution, whereas verbal approaches used by females are more likely to seek complexity and less likely to differentiate between a single correct solution and alternative wrong solutions. Monk (2011) reported that males scored more highly on multiple-choice questions than did females, although girls outperformed boys on items that required an extended essay response.

In the AGC, the results of the highest-scoring senior students in the multiple-choice testing format can be compared with the results of those same students using a mixed assessment format. The latter is used to select Australia's Olympiad team and consists mainly of extended written response tasks and tasks that require spatial abilities such as producing an annotated map or plan. There is a strong contrast between the results of the highest-scoring male and highest-scoring female students in the multiple-choice format where males performing significantly better than females. However, this gender difference disappears in the mixed assessment format, with equal numbers of males and females getting the best marks and thus being selected for Australia's Olympiad team.

From the review of the above literature, the following points have been identified regarding gender differences in performance:

1. males have greater visual-spatial abilities;
2. males have higher test scores on multiple-choice tests; and
3. females receive higher scores on measures of extended answers and verbal ability.

The different results in male and female achievement in the AGC support findings in the academic literature both from Australia and internationally. This is both intriguing and somewhat worrying, given the large and increasing numbers of female students now in secondary and tertiary geography classes.

Conclusion

The bottom line for the AGC is that, even if the multiple-choice format is biased against females, the Competition really has no option but to continue using this format as there is no other viable way to mark the large number of 70,000 plus student scripts. The difficult knowledge and skills questions are also essential in order to discriminate to establish state and territory winners who go forward to further selection stages for the teams to represent Australia at the international competitions.

Australian Curriculum: Geography (ACARA, 2013), Australia's first national curriculum is being progressively introduced from 2014. In future, questions in the AGC will change to reflect the knowledge and skills included in the new curriculum.¹ The AGC, however, is age-based and the curriculum is naturally written for school years so, at least initially, the age divisions of the competition will not align with the years in the curriculum. The introduction of the new curriculum may have a positive effect on the numbers of students entering the AGC.

The national curriculum extended a stand-alone geography curriculum into the primary school years in Australia for the first time in decades. The AGC organisers are currently developing a primary-level competition which will align more closely with the national curriculum. Although the primary geography curriculum is currently being reviewed, and it may be reduced to an identified geography strand within a Humanities and Social Sciences subject, the AGC organisers believe it is worth proceeding in the development of a primary competition to support geography in this age group.

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- Further information on the Competition, including copies of past question booklets, is available at www.geographycompetition.org.au

Endnote

1. For more information on the curriculum, see <http://www.australiancurriculum.edu.au/humanities-and-social-sciences/geography>