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The longer they stay the less talented they perceive they are: Females' talent based on approaches to learning.

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ABSTRACT

A cohort of female adolescents from 11 to 18 Years of age (n = 325) completed a questionnaire based on Gardner's theory of multiple intelligences (Gardner, 1999) to examine their perception of their talents as they progressed through secondary school. Results showed that the highest ranking talents were Physical and Sport Activity, and Language and Communication. The perceptions of total talent declined from Year 7 to Year 9 and then remaining relatively stable from Year 10 to Year 12. Analysis of the nine talents by the two year level groups (the younger group of Year 7 to Year 9, and the older group of Years 10 to 12) showed three trends but there was no significant difference for individual talents. Cluster analysis of the nine talent scores revealed two groups of students with one group significantly higher (n = 156) in all talents and a second group significantly lower (n = 169) in comparison. A MANOVA comparing nine talents between year levels (younger/older) and cluster (low/high) showed only one interaction in which the low perceived talent, older students were problematically low on Self-awareness. The findings are discussed in reference to students' developing accurate perceptions of their performance and enhancing the salience of past and future learning.

INTRODUCTION

The common expectation is that students develop skills and competencies as they progress through the secondary school Years. As the subjects become more specialized from junior to secondary school, the curriculum becomes more difficult, and the necessity to engage, learn, and demonstrate skills, competencies and knowledge retention related to each subject is the expected response from students. This progressive development and increasing challenge is imbedded in the curriculum, as reflected in the curriculum statement:

> The K–12 national curriculum will provide the settings in which students can develop increasingly deep knowledge and skills. In the selection of content for particular learning areas, the Board will take account of the rapid expansion in bodies of knowledge and of the challenges this presents to curriculum development.
>
> The national curriculum will emphasise the fundamental knowledge, skills and understandings that are the core of a learning area. It will also specify some contexts and related knowledge as essential for all students, where these are based on age, grade or stage considerations….
> (National Curriculum Board, 2009, p. 10).

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Just as perceptions of competence increase over the period of secondary school so does domain-specific and general intellectual functioning increase (Baltes, Staudinger, & Lindenberger, 1999); declarative and procedural mathematical knowledge increases (Nagy, Watt, Eccles, Trautwein, Ludtke, & Baumert, 2010), as does mathematical achievement (Ackerman, 1996), and fluid intelligence (Cattell, 1963). Correspondingly, the expected increase in talent is described in Figure 1. However, it is perplexing that this anticipated rise in ability is not consistently reflected in subject specific self-concept of students which declines over the same period of time (Nagy et al., 2010). The general question posed in this research is, do female students self-perceptions of talent, reflect developmental gains in the manner that curriculum, academic performance and intellectual functioning progresses?

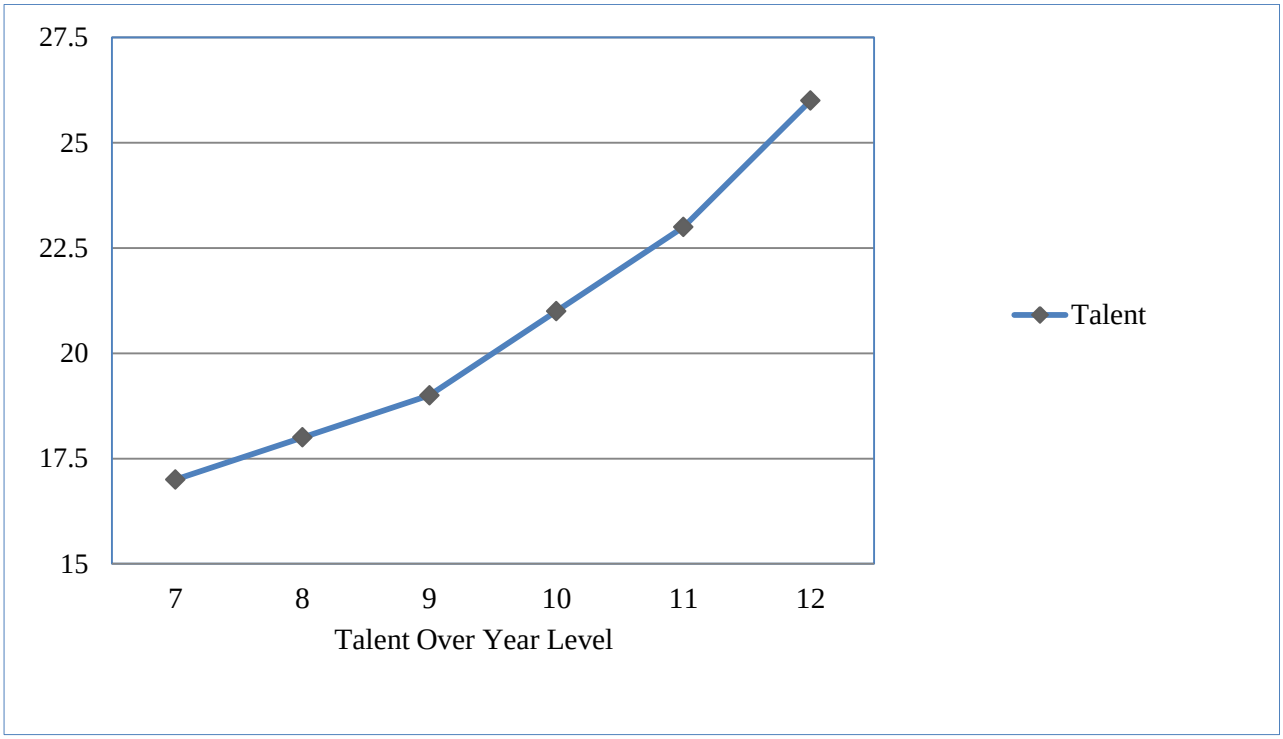


Figure 1. The anticipated trajectory of the perception of talent at secondary school.

The research problem under investigation is prompted by a number of concerns. Firstly, it is an investigation of the perceptions of the talents of female students as they progress through secondary school. To date, there is very little discussion, argument, or data indicating what might be the best trajectory of students' perception of their talents. Secondly, this research investigates the potential presence of a group of students who perceived themselves to be low in talent. The exploratory nature of this research begs the question of whether students low in perceived talent have this perception from the beginning of the secondary school or gain this view as they progress through secondary school. Given that secondary schools have six Years systematically to teach, train, coach, remediate, and prepare students to exit secondary school it is reasonable that students will be equipped with sufficient skills and competencies to perceive themselves to be talented, at least in some ways, as a result of this education. The four general questions asked were: What are the talents used by the students? Are there differences between year level groups based on perceived talent? Are there underlying groups of students based on their talents? Do the underlying groups vary across year level?

Perceptions of Ability and Academic Outcomes

There is at present no comprehensive theory explaining the developmental trajectory of perception of talent across the secondary school Years. One possible theoretical framework explaining students' perceptions of talent is expectancy-value theory. It explains achievement motivation and was developed in regard to students' choices of achievement in relation to specific subjects (Wigfield & Eccles, 2000). Simply put, expectancy-value theory holds that students' beliefs about their ability and expectations of success are very strong predictors of performance. For example, in research involving mathematics, Wigfield and Eccles found that students' beliefs about their ability predicted outcomes more strongly than either previous grades or achievement values.

By contrast, research into the link between perceptions of self and academic performance have found relatively inconclusive outcomes other than the strong link relating verbal self-concept with language and mathematical self-concept and mathematics (Marsh, Byrne, and Shavelson, 1988). However subject specific self-concept is different from self-perception of talent. Self-concept is grounded within the theory of self-worth (Eccles & Wigfield, 2002) which suggests that students have a "tendency to establish and maintain a positive self-image, or sense of self-worth" (Eccles & Wigfield, 2002, p. 122) associated with certain academic subjects in reference to specific academic self-concepts. There are inherent dangers in linking achievement, self-image and self-worth and so rather than focus on academic self-concept focusing on developing accurate perceptions of performance, distinct from the self-concept, is preferable.

According to Expectancy Theory, self-perceptions are subset of attributions given by the individual to explain outcomes such as success and failure (Heider, 1958). Self-perceptions are associated with many theories of psychology that explain learning gains and achievement in reference to a range of self-views (Nagy et al., 2010). The four most frequent justifications of students' general perceptions of success or failure are ability, effort, task difficulty, and luck (Weiner, 1974, 1980, 1986, 1994, 2000). Teachers have the facility to assist students to understand each of these four factors in relation to their performance by providing accurate feedback relating the subject of interest (Hattie, 2012). Dunning, Heath and Suls (2004) maintain that providing accurate feedback to students assists them to become better judges of their own performance. In turn, this would influence the students' self-perception or self-attribution. However, this only occurs if students transfer such feedback into strategies and actions that could alter and improve academic outcomes. In the classroom setting there has been mixed findings associating self-perceptions to achievement. For example, Moore and Kim (2003) have shown that students react pessimistically when confronted with challenging tasks and that adolescent students who are less competent tend to have poorer perceptions about their performance (Hacker, Bol, Horgan, & Rakow, 2000).

Poor judgement may be the result of poor training in secondary schools in perceiving one's capabilities. For example, one British study showed that 96% of secondary students believed they were average or above when asked about their ability at school work (Gibbons & Silva 2007). In higher education 90%, of first Year students indicated that they were average or above (Thorpe, Snell, Hoskins & Bryant, 2007) with female students and those from low socio-economic backgrounds under-estimating their performance (Thorpe, Snell, Hoskins & Bryant). Other research into self-perceptions of ability and performance have shown that students who are more accurately assessing their ability spend more time studying, are more efficient, and have better academic outcomes (Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005). Adolescents with more positive views of their academic performance expected to attend university (Chevalier, Gibbons, Thorpe, Snell, Hoskins, 2007). Hence, gaining an accurate view of one's talents, both general and activity or subject specific, has utility.

One issue associated with over-estimation of self-perceptions is the accuracy of self-perception and the relevance of the 'self' in the measurement. Self-perception has been measured using self-esteem in much of the ability and outcome research (e.g. Murnane Willet, Braaz & Duhaldeborde, 2001). This results in a conflation of the 'self' and self-worth with the perceptions of learning, performance, and outcome factors. Domain-specific self-concept has been linked with various other constructs associated with achievement (Eccles,Wigfield, Harold, & Blumfeld, 1993; Marsh, 1990; Marsh & Hau, 2003; Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005; Trautwein, Lüdtke, Köller, & Baumert, 2006), and to activity choices (Eccles & Wigfield, 1995; Feather, 1988; Trautwein, & Lüdtke, Schnyder, & Niggli). General academic self-concept has been associated with, and is considered a predictor of, achievement

(Marsh, Trautwein, Lüdtke, Köller, & Baumert). Previous research has also shown that academic self-concept decreases across the secondary school years with sharp declines in mathematics self-concept and less steep declines in English self-concept (Nagy et al., 2010; Wigfield, Eccles, Mac Iver, Reuman, & Midgley, 1991). As the findings linking self-esteem to positive outcomes have not been consistent (Baumeister, Campbell, Krueger & Vohs, 2003), there may be alternatives to self-concept as an indicator of self-perception. The self-perception under investigation in this research is not self-esteem but talent (Gardner, 1993a; 2006).

Defining and Measuring Talents

Gardner (1993a; 1993b) defined Multiple Intelligence (MI) as "a biopsychological potential to process information in certain ways, in order to solve problems or fashion products that are valued in a culture or community (p. 33-34)." Later Gardner (2003) stated that intelligence is not in the heads of intelligent people but is an essential part of the context within which the intelligence is applied or manifest. Gardner (2006, p. 50) also stated that intelligences were the "raw, biological potentials, which can be seen in pure form only in individuals who are, in the technical sense, freaks". Gardner's Multiple Intelligences (MIs) may be considered behavioural representations of talent; discrete indicators or manifestations of talent (Bowles, 2004; Gardner, 1999). Gardner has consistently argued that there are at least seven intelligences: Spatial, Linguistic, Logical-mathematical, Bodily-kinesthetic, Musical, Interpersonal, and Intrapersonal, He admits that other intelligences, in particular, Naturalistic, and Existential are possible (Gardner, 1999; 2000; Tirri & Nokelainen, 2011). The rank of the nine talents from previous research was, in order, highest to lowest, Physical and Sport Activity, Musical and Rhythmic, Construction and Spatial Design, Social and Leadership, Language and Communication, Nature and Environmental, Mathematical and Logical, Self-awareness, and Spiritual and Religious (Bowles, 2008).

One recent operationalization of nine talents based on the MIs are as follows: Language and Communication, Mathematical and Logical, Construction and Spatial Design, Physical and Sport Activity, Musical and Rhythmic, Social and Leadership, Self-awareness, Nature and Environmental, and Spiritual and Religious (Bowles, 2004; Appendix 1). This operationalization is new and relevant as it combines students' nine talents in reference to ratings of students' perception of seven approaches to learning (Bowles, 2004; 2008). Gardner (1999) differentiates an intelligence from a learning or working style by describing a style as "a general approach that an individual can apply equally to an indefinite range of content" (pp. 83-84). Gardner's definition of a working style is synonymous with the definition of Approaches to Learning (Bowles, 2004).

Talent and Approaches to Learning

Research shows that learning informed by the ways students go about, or approach learning, enhances outcomes (Biggs, Lai, Tang & Lavelle, 1999; Doolan & Honigsfeld, 2000; Stellwagen, 2001; Watkins & Mboya, 1997; Zeegers, 2001) and can bring about moderate effect sizes of approximately .40 (Hattie, 2009). However, there are problems with the definition and measurement of students' approaches to learning. For example, among the variety of names synonymous with approaches to learning are learning processes (Biggs, 1987); leaning styles (Busato, Prins, Elshout, & Hamaker, 2000) Kolb, 1976, 1984; Smith & Kolb, 1986); learning strategies (Riding & Rayner, 1998); and students' conception of learning (Purdue & Hattie, 2002).

Similarly, there is a range of operationalizations and factors defining approaches to learning. For example, Biggs' original work operationalized learning styles by measuring three factors of surface, deep, and achieving, with each of the approaches divided into a motive and a strategy. The Learning Styles Inventory (Kolb, 1976, 1984; Smith & Kolb, 1986) is a common measure of adult learning styles. It measures four styles of learning. The "diverger" prefers immediate concrete experiences and reflection on observation. The "assimilator" prefers to use inductive cognitive processes to learn, to generate abstract models and to represent learning material. The "converger" prefers to conceptualize and actively experiment to solve problems, while the "accommodator" takes information from concrete experiences, makes plans, experiments, and brings about changes. Finally, Ainley (1993) defined six learning styles by

labelling clusters that emerged from an analysis of Biggs (1987) constructs. The six approaches were committed, engaged, detached, disengaged, hopeful, and keen-to-do-well.

Given the variety and inadequate definition of many of the constructs synonymous with approaches to learning, research was undertaken to define the construct more accurately (Bowles, 2004). Respondents participated in structured interviews. They were asked to identify the methods people used to gain and maintain their skills in the nine talents (see Appendix 1). Seven approaches to learning emerged from the sorting of the terms (in order of preference): effort, understanding, interest, natural ability, performance, pre-occupation, and ease (Appendix 2). A second study in which adolescents rated the nine talents using the seven approaches to learning resulted in a questionnaire that has shown good factor structure and reliability (Bowles, 2008). Ranking "most to least frequently nominated approaches" showed that, despite the nine years of primary and secondary school, respondents considered themselves more talented in non-scholastic subjects. Language and Communication ranked fifth, Mathematical and Logical ranked seventh, and Self-awareness and Spiritual and Religious were the lowest ranking talents.

The current research is designed to validate these findings by investigating the rank of the ratings of talent from adolescent females. Students' ratings of their talents will be ranked to establish the talents on which students consider themselves most talented. Secondly, a Total Talent score will be compared across the six year levels to establish whether students perceive that they are more talented as they proceed through the secondary school years.

Talents and Year Level and Sex Differences

Research into the perceptions of student ability has shown small but consistent gender effects. Gifted, adolescent female students had higher ability than males in language arts, and gifted male students were higher scoring than females in mathematics, science, and social studies (Siegle & Reis, 1998). In reference to research into talent, weak sex effects have been found showing that males rated themselves higher on Mathematical and Logical, and Construction and Spatial Design factors while females rated themselves higher on Self-awareness, and Nature and the Environment (Bowles, 2008). Females rate themselves lower in logical–mathematical dimensions than in other areas of study and higher in linguistic ability than males (Tirri & Nokelainen, 2011). For simplicity, it was decided to complete a study involving one gender only, and hence gender is not central to, nor addressed in this research.

Research into the trajectory of perceptions of talent across the secondary school Years generally shows a trend of decline (Eccles et al., 1983; Wigfield, 1997). Declines in the perceptions of competence of students through the secondary school are also shown for mathematics and language arts subjects (Midgley, Feldlaufer, & Eccles, 1989; Yates, 1999). Research into the Australian context shows linear declines in talent perception in mathematics and English, not related to other contextual changes associated with differences, across the secondary school Years (Watt, 2004). Further, relatively steep declines have been recorded on similar dimensions, such as intrinsic value of academic work, through the younger Years of secondary school (Fredericks & Eccles, 2002). Thus, the anticipated, constant incline expected across the secondary school Years may not be found in this research.

The general research question is do female students perceive that they have increasing levels of talent as they proceed through the Years of secondary school. Specific research questions are stated below.

Research Questions:

1 On what talents do adolescent females rate themselves most to least high?
2 Do adolescent females consider themselves to be more talented as they progress through secondary school?
    a. Across the six year levels?
    b. Across two year levels groups of younger and older secondary school?
3 Is there evidence of a group of students who rate themselves as having significantly lower talent regardless of year level?
4 Is there an association between students who conceive themselves as low scoring on all talents and year level group?

METHOD

Participants

A total of 325 adolescent students from one metropolitan, secondary school in Melbourne, Victoria participated in this research. The ages of the students ranged from 11 to 18 Years. Data were gathered from students at each of six Years of secondary school. The mean age of the females was 14.51 Years (S*D* = 1.79), for students at Year 7 age was 12.14 (s.d. = .76), Year 8 age was 13.34 (s.d. = .50), Year 9 age was 14.25 (s.d. = .48), Year 10 age was 15.30 (s.d. = .63), Year 11 age was 16.49 (s.d. = .73), and Year 12 age was 17.21 (s.d. = .47). There was a significant difference of age by year level effect with ($F(5, 319) = 506.503$, $p < .001$, $\eta_p^2 = .88$). The post hoc analysis showed that the age of students at each year level was significantly different to each other. As there was a natural break in the distribution of year levels and talent scores between Years 9 and 10, two groups were established comprised of Years 7 to 9 and Years 10 to 12 which was also significantly different ($F(5, 319) = 185.302$, $p < .001$, $\eta_p^2 = .88$). A second cluster (IV) was constructed from a cluster analysis of the nine talent scores rendering a low and high group (described below).

Procedure

Respondents completed the questionnaire in class groups under the supervision of the researcher and a school staff member. The questionnaire and the permission slip authorizing the research and analysis were collected by the researcher. The respondents rated each talent against seven approaches to learning and engagement generating nine individual talent score and one Total Talent score. The talents scores were profiled using a cluster procedure and two distinct and statistically significantly different groups emerged: a less talented and a highly talented group. K-means cluster analysis is a procedure for defining a number of clusters by combining respondents on their mean scores on various factors resulting in a profile of respondents. In this instance the two cluster solution provided the optimal definition of the separation the groups. K-means approximative method was applied in this research. This method uses Lloyd's algorithm to generate centroids while applying a near-neighbour method of separating and joining respondents on the basis of the factor scores approximation to the centroids (Lloyd, 1982). The cluster procedure results in a sorting and allocating of the respondent into one and only one group based on the combination of their scores in relation to the centroids.

Questionnaire

The Talent Questionnaire is comprised of a questionnaire booklet requesting respondents to rate themselves on each of the nine talents in reference to each of the seven approaches to learning. Each page of the seven page questionnaire is headed by a Likert-type scale rating one of the seven approaches to learning derived from a qualitative study (Bowles, 2004). Respondents in the qualitative study (Bowles, 2004) were asked to describe the ways in which individuals who they considered proficient or outstanding acquired and maintained their talent. In the qualitative study the terms derived from respondents were agglomerated, thematically into the seven approaches to learning used in this research. The seven approaches to learning were: Interest, Ease, Effort, Understanding, Performance, Pre-occupation, and Natural Ability. Each of the approaches to learning are defined in Appendix 2 (Bowles, 2004). Each new page of the Talent Questionnaire, used in the current study, begins with a new Likert-type scale inviting respondents to rate each talent in reference to one of the seven approaches to learning, in an iterative manner. The association between the approaches to learning and talents, and the psychometric properties of adolescent respondents has been previously explained in detail (Bowles, 2008). The Likert-type scale ranged from 1 = Not…(Interested) to 5 = Extremely…(Interested) or extremely high if syntax demanded, in comparison with each talent. For example, the instructions were:

Respond to each statement using the SCALE from one to five on each page. Put the number indicating your response in the appropriate square on the answer sheet.

There is a different SCALE on each page. Each page is a new column on the answer sheet. IN WHICH OF THE SETS OF ACTIVITIES ARE YOU INTERESTED?

RESULTS

Screening of the data was completed in accordance with standard procedures recommended to evaluate the integrity of the data prior to the analyses (Hair et al., 2006; Tabachnick & Fidell, 2007). The univariate and multivariate preliminary analyses of the cell sizes were satisfactory and the standard deviations did not deviate from the normal distribution in all except a small number of cases.

The correlations, means and standard deviations are presented in Table 1. The factors are weakly to moderately correlated (Field, 2009), ranging from .11 to .40 with 20 of 36 correlations of factors being significant. All nine factors were related to the Total Talent factors to a moderate level or better, ranging from .31 to .59. Logically consistent, high correlations associated Language and Communication with Social and Leadership, Spiritual and Religious with Nature and Environment, Self-awareness with Nature and Environment, and Construction and Spatial Design with Nature and Environment. The alpha reliability of each of the factor was relatively high (Boyle, 1991).

Table 1: Correlation, Mean and Standard Deviations for MI Factors.

	1[a]	2	3	4	5	6	7	8	9	10
(1) Language & Communication		.04	-.01	.16**	.23**	.44**	.30**	.08	.18**	.50**
(2) Mathematical & Logical			.13*	-.07	.04	.01	.10	.09	.06	.31**
(3) Construction & Spatial Design				.17**	.11*	.01	-.03	.38**	.26**	.48**
(4) Physical & Sport Activity					.22**	.28**	-.03	.21**	.03	.47**
(5) Musical & Rhythmic						.15**	.14*	.19**	.18**	.51**
(6) Social & Leadership							.22**	.06	.19**	.51**
(7) Self-awareness								.17**	.39**	.48**
(8) Nature & Environmental									.40**	.59**
(9) Spiritual & Religious										.59**
(10) Total Talent (mean)										
Scale Mean	23.65	19.28	21.69	24.34	23.59	22.16	22.16	20.06	16.69	21.55
Scale *SD*	5.29	6.33	7.09	7.29	6.79	6.10	6.31	6.68	6.04	3.19
Cronbach's Alpha	.86	.91	.92	.92	.91	.90	.89	.92	.92	.91

Note. [a] Decimal points have been removed and numbers have been rounded to hundredths for the correlations. * Significance of less than or equal to .05 (2-tailed); ** significance of less than or equal to .01 (2-tailed).

Table 2: Rank, Mean, Standard Deviation, and T-scores of Pairwise Mean Comparisons of MIs.

	Mean	*SD*	T-test Comparison							
			2	3	4	5	6	7	8	9
(1) Physical & Sport Activity	24.24	7.29	*1.28*[1]	*1.33*	3.57	3.82	4.95	8.55	8.95	14.60
(2) Language & Communication	23.65	5.29		*0.88*	3.03	3.88	3.98	7.90	9.76	17.28
(3) Musical & Rhythmic	23.59	6.79			2.04	2.99	3.70	7.42	8.55	15.11
(4) Social & Leadership	22.64	6.10				*1.09*	*1.83*	5.28	6.89	13.90
(5) Self-awareness	22.16	6.31					*0.89*	4.52	6.15	14.47
(6) Construction & Spatial Design	21.69	7.09						3.80	4.90	11.23
(7) Nature & Environmental	20.06	6.68							*1.61*	8.68
(8) Mathematical & Logical	19.28	6.33								5.52
(9) Spiritual & Religious	16.69	6.04								

Note. [1] All italicized mean comparisons are not significant at the .01 level; all other comparisons are equal to or less than .01 (df = 324)

To address the question of the rank of talent of adolescent females, the mean of each talent was compared using pairwise t-tests to establish which factors were significantly different from each other. The majority of non-adjacent factors were significantly different (Table 2). The rank revealed that Physical and Sport Activity, Language and Communication, and Musical and Rhythmic talents were the most highly rated. The lowest rating MIs were Nature and Environment, Mathematical and Logical, and Spiritual and Religious.

To address the question of the perception of talent of adolescent females as they progress through secondary school, the scores were graphed with a trendline indicating a general decline in the perception of Talent across the secondary school Years (Figure 2). A univariate ANOVA with Bonferroni's post hoc adjustment was conducted to establish the association between Total Talent and difference between year levels. The results indicate that the peak at Year 7 is significantly different from each other year level and that the Year 8 score is different from Year 10 but that the scores of the remaining year level comparisons are not significantly different from each other (Table 3; $F(5, 319) = 11.01$, $p < .001$, $\eta_p^2 = .15$).

Talent by Two Year Level groups

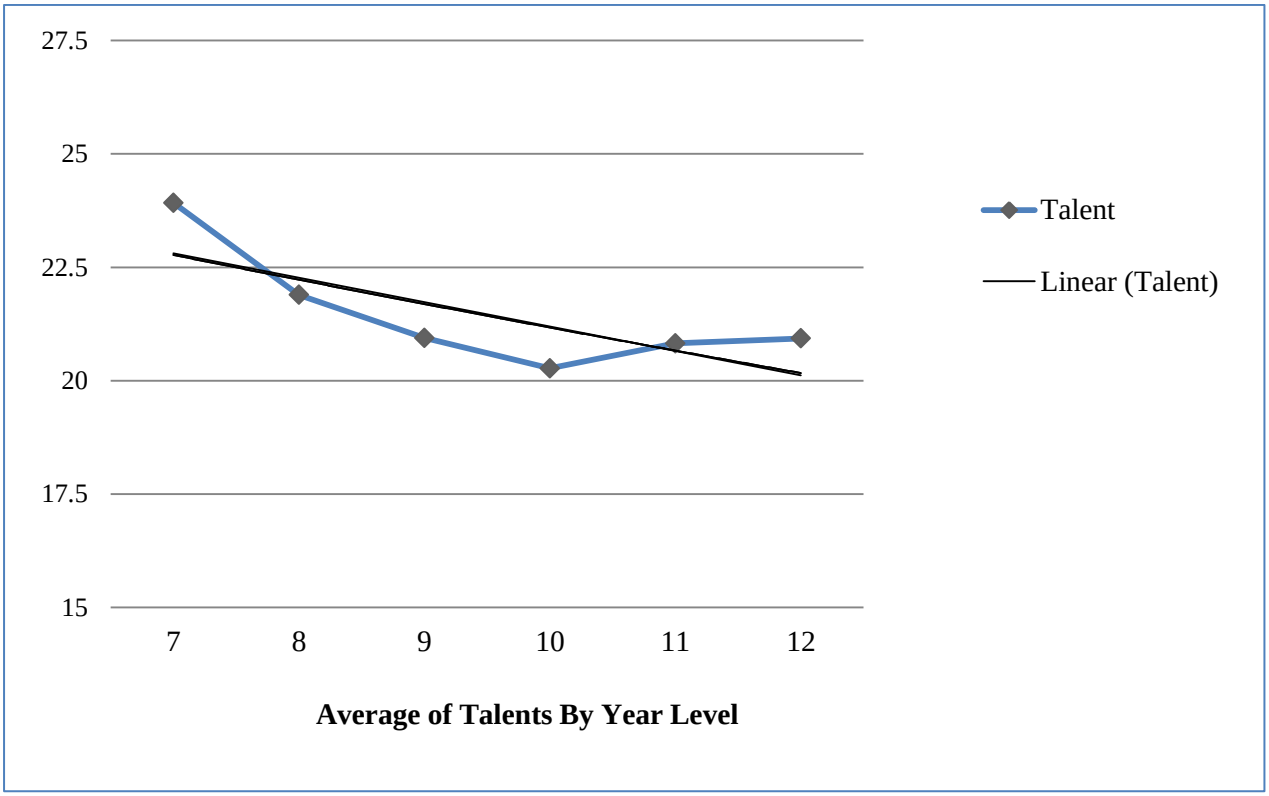
To address the question of the relationship between year level groups and talent, the six year levels were collapsed into two groups of year levels by combining the year levels of 7, 8, and 9 / 10, 11, and 12 as this was a naturally occurring breakpoint for further comparison. The mean age of the younger age group was 13.22 Years (s.d. = 1.01 Years) and the older group was aged 16.21 Years (s.d. = 1.09). An ANOVA was applied to test whether significant differences were present between the year level (IV; 2 levels) and nine individual talents and Total Talent (DV; 10 measures of talent). The analysis showed that there was a consistent effect of the group with the Years 7-9 group scoring higher than the 10-12 Years group and significantly for six talents. Self-awareness was rated significantly higher by the older group. The remaining two talents were not statistically different (Table 4).

Is there evidence of a group of students who rate themselves as having significantly lower talent regardless of year level? To test whether there was a subgroup of students who consistently considered their talents to be poor compared with other students, profile anlysis using cluster analysis was completed to establish the existence of underlying groups, based on talent scores, within the body of participating students (Shavelson, 1979). Profile or cluster analysis of the means of the nine talents showed that two groups naturally emerged from the data. An ANOVA of the mean scores of the nine talents by two cluster groups (low/high) showed that the low cluster group (n = 169) was significantly lower rating than the high cluster (n = 156). Although the magnitude of the differences ranged from small to mainly moderate, all comparisons were significant (Table 4).

Table 3: Univariate, Between Year Level Group Post Hoc Comparisons of Total Talents.

	Mean	*SD*	Z-score Mean	Z-score *SD*	*n*	Significant Difference Between Years					
Year Level						1	2	3	4	5	6
(1) 7[1]	23.92	3.31	.74	1.04	58		.002	.001	.001	.001	.001
(2) 8	21.89	2.64	.11	0.83	74			-	.034	-	-
(3) 9	20.94	2.73	-.19	0.85	53				-	-	-
(4) 10	20.27	3.10	-.40	0.97	56					-	-
(5) 11	20.82	3.31	-.23	1.04	45						-
(6) 12	20.93	2.71	-.19	.85	39						

Note. [1] Bonferroni's comparisons are indicated by the exact significance level (*df* = 5,319).



Note.* indicates significant at the .05 level; ** indicates significant at the .01 level.

Figure 2: Profile of Talent Across Year Level

Table 4: Between Group Analyses of MIs by the Year Levels of Respondent.

Main Effects Talent Group	Elements of the Variation in Talent				Univariate Significance[1]		
	Years 7-9[2]		Years 10-12				
	Mean	*SD*	Mean	*SD*	*F*	*p*	η_p^2
Language & Communication[1]	23.46	5.36	23.90	5.19	0.55	.485	.002
Mathematical & Logical	20.90	6.00	18.27	6.61	6.35	.012	.019
Construction & Spatial Design	23.45	6.26	19.35	7.46	28.97	.001	.082
Physical & Sport Activity	26.00	6.62	21.91	7.49	27.24	.001	.078
Musical & Rhythmic	24.59	6.23	22.26	7.28	9.60	.002	.029
Social & Leadership	22.36	6.04	23.00	6.19	0.89	.348	.003
Self-awareness	21.07	5.52	23.60	6.99	13.22	.001	.039
Nature & Environment	21.86	6.37	17.68	6.33	34.44	.001	.096
Spiritual & Religious	17.44	5.59	15.69	6.46	6.81	.009	.021
Total Talent (mean)	22.25	3.11	20.63	3.06	22.02	.001	.064

Note. [1] ANOVA comparisons are indicated by the exact significance level (*df* = 1, 323). [2] Year 7 - 9 group n = 185; Year 10 - 12 group n = 140.

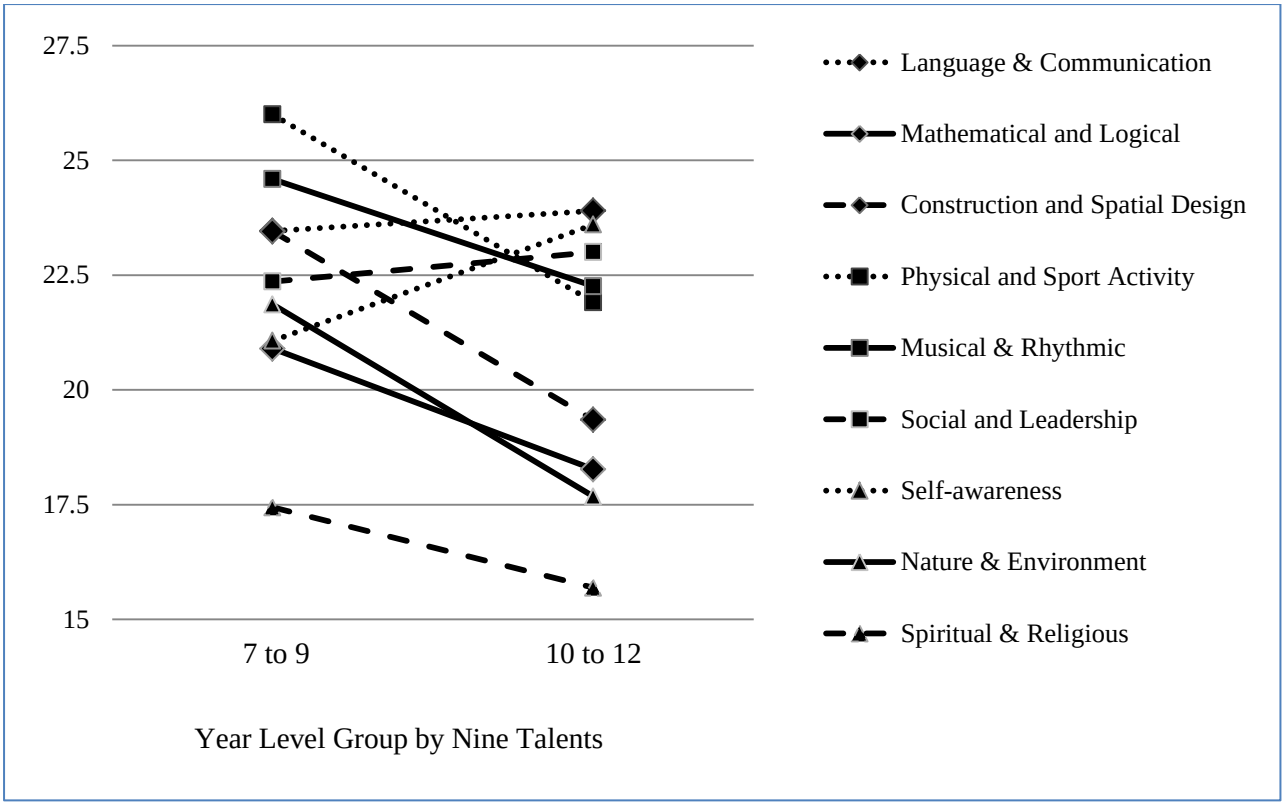


Figure 3: Talent by Two Clusters and Two Year Levels

Table 5: Between Group Analyses of MIs by the Cluster of Respondent.

Main Effects Talent Group	Elements of the Variation in Talent				Univariate Significance[1]		
	Low[2]		High				
	Mean	*SD*	Mean	*SD*	*F*	*p*	η_p^2
Language & Communication[1]	21.73	5.12	25.72	4.65	53.70	.001	.14
Mathematical & Logical	18.62	6.19	19.99	6.41	3.85	.050	.01
Construction & Spatial Design	18.65	6.19	24.98	5.99	80.60	.001	.20
Physical & Sport Activity	20.83	6.65	27.92	6.07	100.14	.001	.24
Musical & Rhythmic	20.58	6.60	27.92	6.07	87.60	.001	.21
Social & Leadership	20.43	5.80	25.02	5.51	53.20	.001	.14
Self-awareness	20.39	6.39	24.07	5.65	30.04	.001	.09
Nature & Environment	17.15	5.70	23.22	6.22	84.06	.001	.21
Spiritual & Religious	13.65	4.42	19.98	5.84	122.53	.001	.28
Total Talent (mean)	19.11	1.84	24.19	2.01	563.52	.001	.64

Note. [1] ANOVA comparisons are indicated by the exact significance level (df = 1, 323). [2] Low group n = 169; High group n = 156.

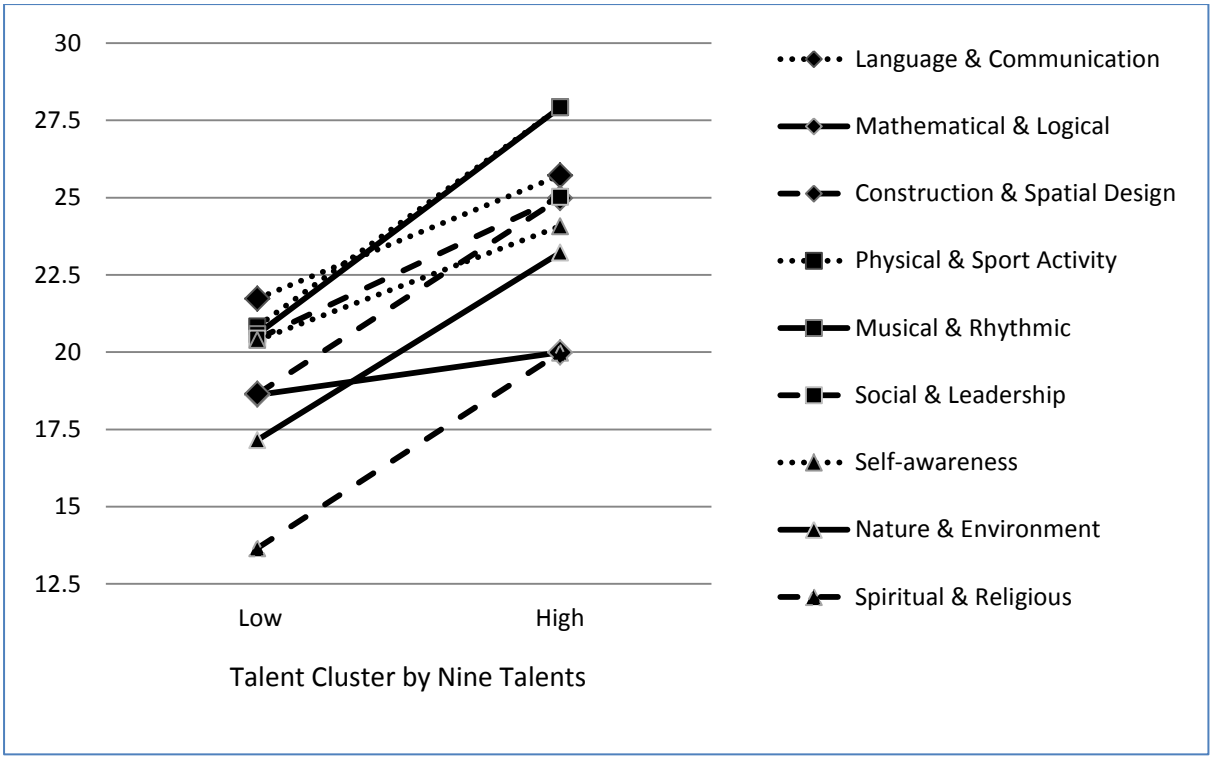


Figure 4: Talent by Two Clusters and Two Year Levels

A MANOVA was used to test differences between the year level (IV; 2 levels: Years 7-9 and 10-12 and cluster group (IV; 2 levels) of the respondents on the nine Talent factors. The results of evaluations of the assumptions of normality, linearity and multi-collinearity of the talent variables were satisfactory. At the multivariate level, Wilks' criterion from the multivariate analysis indicated that the combined dependent variables were significantly but weakly related to the interaction of year level group (younger and older) and Cluster Group (low/high; $F(9, 313) = 2.28$, $p < .017$, $\eta_p^2 = .06$). The combined dependent variable also varied as a function of the main effect of year level ($F(9, 313) = 10.15$, $p < .001$, $\eta_p^2 = .23$) and Cluster Group ($F(9, 313) = 68.94$, $p < .001$, $\eta_p^2 = .67$).

At the univariate level one factor of Self-awareness was shown to be explained by a significant interaction (Figure 5). All other talents were best explained by the two non-interacting main effects of Cluster Group (Table 5; Figure 4) and year level (Table 4; Figure 3). The self-awareness interaction (Fig. 5) $F(1, 321) = 4.47$, $p < .035$, $\eta_p^2 = .014$) showed that the highly talented group become more self-aware from younger to older year levels and that the low talent group had a less steep incline than those who consider themselves more talented. Noteworthy is the comparison between the low talent older year level group score which is lower than the lower age, highly talented group self-awareness score. In summary, the best explanation of the link between talent and year level in this analysis is mainly through examination of the separate main effects of year level and cluster group and not the interaction of these two variables.

DISCUSSION

The results showed that for year level comparison there were three patterns that emerged from the data. The general pattern is the reverse of the expected increase in perceptions of talent - as students progress through secondary school. The first specific pattern was found for the talents of Language and Communication and Social and Leadership in which no significant differences were found. Secondly, the talent of Self-awareness showed an increase, as anticipated, but the remaining six talents showed significant declines from younger to older Years. For the cluster groups the dominant and consistent trend was for a low and high group to emerge for each talent. There was only

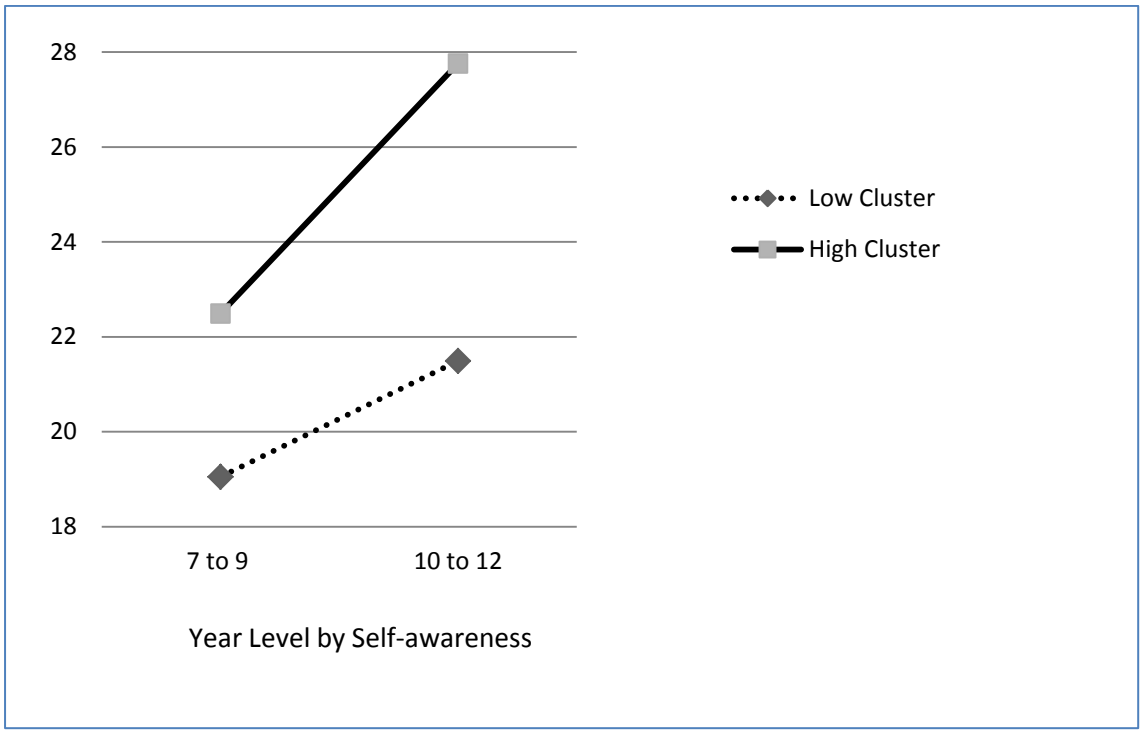


Figure 5: Interaction of Self-awareness and Two Year Levels

one interaction between the year levels and cluster groups on the talent of Self-awareness. A desirable interaction would have shown that as students progressed through secondary school the low talent group increase was steeper than the high talent group whereas the interaction shows the reverse.

The findings are not consistent with the expectations of national curriculum (National Curriculum Board, 2009, p. 10), or previous patterns of research across year level into general intellectual functioning (Baltes, Staudinger, & Lindenberger, 1999), research into mathematical knowledge (Nagi et al., 2010), mathematical achievement (Ackerman, 1996), or fluid intelligence (Cattell, 1963). The findings do conform to the previous findings showing that subject specific self-concept diminishes over the Years of secondary school (Marsh & Parker, 1984; Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005).

There are a number of explanations for these findings. The first general conclusion that can be drawn is that talents conform to the general pattern of students' performance on academic subjects (Watt, 2004) and investigations involving academic self-concept (Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005; Nagy, et al., 2010). The role of self-perception in influencing academic outcomes has been disputed. Its influence may not be direct, for example, when students are being self-protective when they are under threat (Stringer & Heath, 2008). In these circumstances there is a mismatch between self-perceived and demonstrated academic competence resulting in emotional distress or dissonance at possible failure. In such situations Stringer and Heath recommend that raising self-concept to improve academic performance is not appropriate. Secondly, attempting to improve academic performance by enhancing self-perception may be fruitless and even harmful (Glen, Heath, Karagiannakis & Hoida, 2004). Thirdly, a combined focus on accuracy of self-perceptions and improving effective instructional activities and feedback (Hattie, 2012) would be helpful in attempts to improve the match between self-perception and academic performance. The outcome of this better fit would be students who are more likely to self-monitor and self-regulate and less likely to attribute academic outcomes to external factors beyond their control (Weiner, 1974, 1980, 1986, 1994, 2000).

Expectancy-value theory (Wigfield & Eccles, 2000) may be useful in explaining the general decline in perception of talent across the secondary school Years. If self-perception is important in

linking ability to performance, then the students in this research are not adequately making the link that they are talented, as reflected in the demand from the curriculum and the accumulated knowledge and skill through attendance from earlier to later secondary Years. The students in this research perceived themselves to be less talented than they were. Teachers should explain the link between perception of ability and actual ability while engaging students in activities explicitly to enhance approaches to learning (Dunning, Heath & Suls; 2004; Hattie, 2012). Such explanations should ensure accurate information, encourage students to practise making judgments of their ability against performance tasks, and help students to determine their own remediation strategies (Gibbons & Silva 2007; Hacker et al., 2000; Hattie). Doing so should give students a higher locus of control and ways of dealing with information about the self and performance.

Alternative explanations also deserve consideration. It may be that the results mirror the bio-psychosocial consequences of females undergoing the pubertal apex and its effect (Blyth, Simmons, & Carlton-Ford, 1983). Alternatively, it may be that the transition to secondary school takes two Years of adjustment. Different classroom strategies, structures, methods and practices leave students less focused on themselves and their capabilities and more focused on subject content (Eccles & Midgley, 1990). Finally, it has been proposed that the decline is part of a generalized decline in interest in curricular and extracurricular activities of adolescents that may be culturally relevant rather than only associated with education (Nagy, et al., 2010). Each of these explanations deserve further research.

There may be curricular and structural reasons for the decline. Prior to approximately Year 9, students engage in a relatively consistent set of curriculum subjects which become progressively more complex and more demanding each Year. A student at each subsequent year level advances in their talent however they also need to trade-off competing interests. Students make various choices based on career aspirations, maximizing the possibility of success in academic subjects, following career interest and subjects in which they may have natural aptitude. Students engage in a process of conservation of resources to protect against the threat to self (failure) and seek to preserve resources while striving to protect and engage in activities they value (Hobfoll, 1989). If this is the case students have a complex set of factors to negotiate: the threat of failure in a competitive environment versus the desire to demonstrate their natural talents and competencies on the other.

Another associated explanation may be found in social comparisons about performance and competence that students make in reference to their peers and their imagined or ideal other students (Suls, Martins, & Wheeler, 2002). These social comparisons may be real or imaged but they do become part of the school environment and student's imagination. It is through engaging with others in the school environment that students develop their perception of the self and the relevance of their academic performance (Marsh & Shavelson, 1985). In the transition to secondary school, with its curricular and classroom management changes, social comparison becomes more salient and combines with a greater focus on performance and a lesser focus on mastery (Dijkstra, Kuyper, van der Werf, Buunk, & van der Zee, 2008).

Improvements could be made to curriculum and teaching practices. By assisting students to be more accurate at self-perception of their ability, students may be able to engage in more self-directed and self-correcting learning. This ability is predicated on the student becoming practised at applying approaches to learning and understanding the link between approaches to learning and various educational and learning activities and products. Teachers should show students how to apply strategies to reach outcomes in much the same way an elite athlete applies skills and training activities to achieve outcomes. Teachers should revise previously learned knowledge, values and skills and ensure that students are regularly made aware of the advancement in knowledge, values and skills that have occurred at each year level (Watt, 2004). It would be advantageous to emphasize a culture of respect for knowledge and commensurate values and skills and the utility of engaging with the curriculum.

Importantly, in this operationalization, talents are defined in terms of approaches to learning and this may influence how students refer to their talents. Qualitative research (Bowles, 2004) was used to identify the approaches to learning used by people who are very talented. The responses describing the behavior of talented people to acquire and maintain their talent was used to develop the questionnaire used to measure the talents of respondents in this research. The respondents in this research (who were not selected on the basis of talent) may not be attempting to excel and may not

use the same strategies. As a result, the approaches to learning developed for those who are, or who are aspiring to be, outstanding in their field may not generalize to the behaviour of all students.

There are a number caveats and limitations on this research and there are possibilities for further research. First, only females were involved in this research. Future research should include males and females. The data were gathered from self-report measures of students from one school. Multi-source data would help to validate these findings. Future research involving students from co-educational schools would be advantageous. Model testing of the development of talent over time could be carried out for both curricular and extra-curricular activities. Identifying the approaches to learning of elite students compared with other students would provide a means of validating or revising the seven approaches used in conjunction with the nine talents used in this research. Identifying the role of family, significant others, and ideal others in fostering a stimulus to exceed previous performance and expression of talent would expand understanding of students' talent performance. Finally, this research was cross-sectional rather than longitudinal in design. Following the same cohort across year levels would provide a more rigorous test of the research question examining changes in talent over time.

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Appendix 1: Definition of Nine Talent Areas.

Talent	Gardner's MI Nomenclature	Stem Operationalizing the Talent…
1) Language and Communication	Linguistic	Communicating ideas, discussing, creative & other writing, reading, acting, telling jokes, playing with language or word games.
2) Mathematical and Logical	Logical and Mathematical	Recognising patterns and relationships, 'cracking' codes, solving problems and number patterns or calculating complex problems.
3) Construction and Spatial Design	Visual and Spatial	Making models, drawing, imagining how to build things, reading maps, working with wood, other material or construction sets.
4) Physical and Sport Activity	Bodily-kinaesthetic	A Sport/s, exercise, aerobics, physical training, creative movement, dance, acting, miming or other physical activities.
5) Musical and Rhythmic	Musical and Rhythmic	Music, listening for relaxation or pleasure, rhythm patterns, music playing, performing, reproducing rhythm or pitch by singing or playing.
6) Social and Leadership	Interpersonal Intelligence	Group activities, clubs, cooperative tasks, being with others, community service activities, being responsible or being a leader.
7) Self-awareness	Intrapersonal Intelligence	Finding out about your own feelings and thoughts, focusing on your own behaviour and the behaviour of others, spending time by yourself, thinking about thinking.
8) Nature and Environmental	Naturalistic Intelligence	Looking after nature, being in nature, visiting places where animals live, finding out about the connections between environments and animals.
9) Spiritual and Religious	Existential Intelligence	Being aware of a spiritual self and world, involvement in different religious activities and tasks, being involved in spiritual celebrations and rites.

Appendix 2: Definition of Nine Talent Areas (Bowles, 2004).

Approaches to Learning	Definition of the Construct
Effort (1)	Practice, Do it, Effort, Study, Motivation, Persistence, Committed, Determination
Understanding (2)	Understanding, Experience, Learning, Reflection, Thinking, Knowledge, Awareness, Imagination
Interest (3)	Being interested, Involvement, Like it, Enjoy it, Listening, Curiosity, Open minded, Participate
Natural Ability (4)	Natural ability, Born with it, Talent, Creative, Natural disposition, Ability, Aptitude, Inherit skills
Performance (5)	Training, Performance, Skill development, Achievement, Competitive, Challenge, Competence, Exercise it
Pre-occupation (6)	Pre-occupied, Passion, Need, Drive, Love it, Have to have it, Really focused, Compulsion
Ease (7)	Comes easily, Opportunity, Content, Relaxed, Comfortable, Suits them, As they are, Calm