



High Ability and Learner Characteristics

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The outstandingly able learner has been conceptualised, in terms of test and examination performance, as the learner showing superior academic performance which is markedly better than that of peers and in ways regarded as of value by wider society. In Kuwait, such superior examination performance leads to a classification regarded as being 'gifted'. This study looks at the inter-correlations between performance in various subjects in examinations and then considers how examination performance correlates with measures of working memory capacity, extent of field dependency, extent of divergency and visual-spatial abilities. A very large sample of grade 7 Kuwaiti students (aged ~13) was involved, the sample being selected in such a way that it contained a high proportion of those regarded as 'gifted' under the procedures used in Kuwait. While specific learner characteristics have been related to examination performance, this study brings four different characteristics together to gain a picture of the way these characteristics may be seen in those who perform extremely well in examinations. Principal components analysis using varimax rotation, was used to look at the examination data and one factor accounted for 87% of the variance. A consideration of the examination papers led to the conclusion that the national examinations tested only recall-recognition. It was also found that those who performed best in all six subjects tended to be those who are highly divergent and strongly visual-spatial as well as those tending to have higher working memory capacities and being more field independent. The inter-correlations between the various learner characteristics are explained in terms of the way the brain is known to process information. The implications of the findings for assessment and for the way high ability is considered are discussed.

Key Words: Giftedness, High Academic Ability, Learner Characteristics, Learning, Kuwait

INTRODUCTION

High ability or giftedness involve complex ideas on which there are diverse viewpoints (eg. Frasier and Garland, 1982; Gardner, 1993; Sternberg and Grigorenko, 1995; Sousa, 2003; Sternberg, 2004; Simonton, 2005; Smith, 2006; Dai, 2010; Davis *et al.*, 2011).

In this study, we are looking at academic or intellectual giftedness, and a review of the literature (Hindal, 2007) suggests the following context (Figure 1).

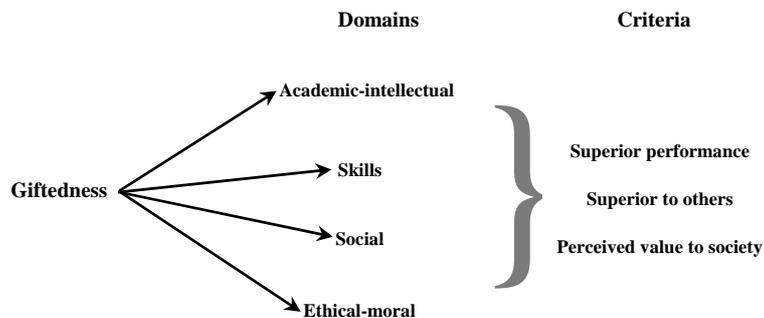


Figure 1: Domains and Criteria for Giftedness

Figure 1 above suggests that giftedness can be defined to take into account three aspects. The gifted learner demonstrates:

- Superior academic performance;
- Academic performance which is markedly better than that of peers;
- Academic performance in ways regarded as of value by the wider society.

When thinking of the academic, there are three major issues relating to the idea of giftedness or high ability:

- The problem of definition;
- The problem of measurement;
- The nature of educational provision.

Most societies in the world use formal examinations as the measure of academic performance although there may be numerous other ways to assess such performance. In simple terms, those who perform exceptionally well in examinations and tests, well above the achievements of peers, tend to be regarded as gifted.

This study seeks to relate high performance (as measured in traditional examinations) to a range of cognitive characteristics in order to offer some new insights into academic giftedness or high academic ability.

While there is considerable quantitative work which has related some learner characteristics to examination performance, there is a lack of work which has used tests that measure these characteristics. This study seeks to fill a gap by linking several learner characteristics to examination performance and to each other and to explore the number of skills being measured by such examinations. The long-term goal is to understand how such learner characteristics might relate to high ability and to explore which of these characteristics are capable of enhancement. This study takes another step in this enquiry.

Cognitive Characteristics and High Academic Ability

Performance in examinations and tests is almost always linked to working memory capacity (Johnstone, 1991, 1997; Gathercole *et al*, 2006, Reid, 2008, 2009 a, b, c), the extent of field independency (Johnstone and Al-Naeme, 1991; Tinajero and Paramo, 1997) and the extent of divergency (Danili and Reid, 2006). It also seems possible that performance may be linked to visual-spatial abilities (Silverman, 2002). The aim of this study is to explore the relationships between these four cognitive characteristics and performance in examinations, good performance often being regarded as evidence of high ability. Indeed, in Kuwait, where this study was conducted, so-called 'gifted' school students are selected primarily on the basis of very high performance in school examinations (Ngoi and Vondracek, 2004). This is consistent with the widely accepted description of the gifted student as:

'One who demonstrates an exceptionally high level of performance in one or more areas of human endeavor.' (Sousa, 2003: 2)

The area of human endeavour considered here is academic performance.

METHOD

641 Kuwaiti school students were selected for the study from thirteen public middle schools in Kuwait (grade 7, age ~13). The schools represented a wide variety of social and home backgrounds and are typical of the whole middle-school population in Kuwait.

Middle schools were chosen as this is the end of the compulsory stage of education in the State of Kuwait, with students still following a common curriculum and no areas of specialism. The aim was to follow the grade 7 students through grades 8 and 9 in the same schools but this is not discussed here. Middle school students are moving from the age at which the manifestations of childhood are gradually vanishing and the characteristics of adolescence begin to emerge.

In most studies, simply selecting a random cross section of the total student population would be ideal but, in this case, with the focus on high ability, such a procedure would not have given sufficient numbers of such high ability students. The sample, therefore, contained 50% who had been classed as 'gifted' on the basis of high school grades or whose grades in many subjects (but not all) were the same as those classed as 'gifted'. The remaining 50% were sampled randomly. Girls and boys are educated separately in Kuwait and the sample contained 311 girls and 330 boys.

Four characteristics were measured:

- (a) Working memory capacity;
- (b) The extent of field dependency;
- (c) The extent of divergency-convergency;
- (d) Visual-spatial abilities.

The first three involved paper and pencil tests while the fourth involved paper and pencil responses to a computer-driven test. The marks in the six subjects studied at this stage were also gathered. Three questions were explored:

- (1) How many skills are being measured in the six subject examinations? This was explored using principal components analysis.
- (2) How do the outcomes from measures of working memory capacity and the cognitive characteristics relate to test results in the six subjects studied in Kuwait at this stage? This was explored using Pearson correlation.
- (3) What are the implications from any findings for the way tests and examinations are constructed and the way highly able students are selected in Kuwait?

Five measurements were made (table 1).

Table 1: Data gathered

<i>Measurement</i>	<i>Test Used</i>	<i>Source</i>	<i>Validity</i>	<i>Reliability</i>
Measurement of working memory capacity	Figural intersection test	Pascual-Leone (1970).	Johnstone and El-Banna (1986, 1989).	Widespread use of these tests: given the large sample, the carefully conducted test conditions, there is high confidence in reliability (Reid, 2003).
Extent of field dependency	Group embedded figures test	Witkin et al (1971).	Witkin and Goodenough (1981), Witkin et al. (1974, 1977).	
Extent of divergency	Shapes Test	Hudson (1968).	Danili and Reid (2006).	
Visual-spatial skills	A new visual-spatial skills test	This study.	Validity uncertain but checked by consulting expert opinion as well as two rounds of pre-testing, with ensuing discussions with participants.	Reasonable length, of appropriate difficulty, avoiding verbal ambiguity and applied under appropriate test conditions suggest good reliability (Reid, 2003).
Examination grades	School national examinations	6 subjects, marks standardised.	Unknown.	Unknown

In thinking of reliability, reliability in the test-retest sense is considered here (Reid, 2006). Validity can be enhanced by knowing the language, thoughts, skills and approaches of the population; talking to those who know the population and also know the subject matter being tested; and talking to the testees.

Pearson correlations were used throughout as the distributions were all found to be approximately normal.

FINDINGS

Examination Marks

The subject marks were correlated with one another (table 2).

Table 2: Correlations between school subject examination scores

N = 641	<i>Islamic Studies</i>	<i>Mathematics</i>	<i>Science</i>	<i>English</i>	<i>Arabic</i>
Social Studies	0.86	0.83	0.87	0.82	0.84
Islamic Studies		0.83	0.85	0.81	0.80
Mathematics			0.88	0.84	0.85
Science				0.86	0.88
English					0.87

The very high inter-correlations suggest that the examinations in the six subjects might be simply testing the same thing. Principal Components Analysis confirmed this, revealing one component which accounted for slightly more than 87% of the variance (remarkably high). The six subjects loaded onto this factor (table 3).

Table 3: Factor loadings

	<i>Social Studies</i>	<i>Islamic Studies</i>	<i>Mathematics</i>	<i>Science</i>	<i>English</i>	<i>Arabic</i>
Loadings	0.93	0.92	0.93	0.96	0.93	0.94

In looking at the assessments used in national examinations, 80% of the questions are multiple-choice questions. The use of these has been extensively criticised on the basis of numerous studies (Johnstone and Ambusaidi, 2000). Indeed, most of the questions tend simply to measure recall of information. It is, therefore, likely that skills that could be described as '*recall-recognition*' constitute the single factor found.

The outcomes from this analysis raise some interesting questions. If 'giftedness' in Kuwait is being assessed primarily on the basis of an overall examination mark and the marks in all the separate subjects are essentially based on aspects of recall-recognition skills, then it is clear that those perceived as 'gifted' are those who are best at recall-recognition skills. Therefore, 'giftedness' in Kuwait is being defined in terms of recall-recognition. In many Western countries, there is no emphasis on identifying gifted students but the situation in Kuwait is typical of many countries where the development of the country is perceived to be related to the development of the gifted who are seen to be important in future leadership.

Of course, recall might be the essential underpinning of many higher order cognitive skills relating to successful academic performance. However, evidence would have to be found to support this although it might be argued that, without knowledge, skills like understanding, critical thinking and evaluation cannot be undertaken. Nonetheless, the requisite knowledge might be simply accessible rather than needing to be memorised.

Working Memory

The findings related to working memory have been discussed in Hindal et al. (2009). The key result is to note that the correlation of working memory capacity with overall performance (based in standardised marks) is 0.22, with mathematics and science marks

showing slightly higher correlations and the arts subjects slightly lower, all significant at $p < 0.001$.

A Factor Analysis on the six sets of examination data and working memory total scores using Principal Components Analysis with Varimax Rotation, gave loadings as shown in table 4.

Table 4; Factor loadings: Working memory and six subjects (Hindal et al., 2009)

<i>N</i> = 641	Components	
	Recall-recognition	Capacity of working memory
Working Memory Capacity	0.11	0.99
Social Studies Performance	0.93	0.00
Islamic Studies Performance	0.92	0.00
Mathematics Performance	0.92	0.12
Science Performance	0.95	0.13
English Performance	0.92	0.00
Arabic Performance	0.93	0.10

The six subjects are loaded on to one factor, which is almost certainly recall-recognition. Working memory capacity hardly loads onto this factor at all. Recall-recognition is one of the most important processes associated with long-term memory while the capacity of working memory is not the same as recall of information.

Recall-recognition is a very different process from the holding and manipulating of information (Higbee, 1977; Baddeley, 1986, 2002). Although the working memory capacity can influence test performance (depending on the test used), working memory is part of the brain's mechanism for processing information and developing understanding (Johnstone, 1997; Reid, 2010).

With the examinations testing recall-recognition skills, it is clear that, while working memory capacity correlates highly significantly with test performance, the low correlation values (averaging 0.22) suggest that it is not a very important correlate of such skills. This is consistent with other studies which have shown that it is the *handling of information* and *thinking processes* that make working memory capacity important for academic success (Johnstone, 1997; Johnstone *et al.*, 1998; Johnstone, 2000; Reid and Yang, 2002; Danili and Reid, 2004, Al-Ahmadi and Oraif, 2009; Reid, 2009c; Ali, 2008). These studies show much higher correlation values where the tests involved required thinking and processing skills in solving problems. Correlation values up to 0.69 have been observed while the work of Johnstone and El-Banna (1986, 1989) shows that it is cause and effect: capacity of working memory *controls* success.

Field Dependency

This construct was developed in the work of Witkin (Witkin et al., 1974; Witkin et al., 1977; Witkin and Goodenough, 1981). Many studies have shown that the field independent population always perform better than the field dependent population in examinations and tests (Tinajero and Paramo, 1997). Overall, the field dependent/independent test is considered by many researchers a very powerful instrument to predict academic performance of individuals (Terrell, 2002).

Witkin *et al* (1971) developed a Group Embedded Figures Test to measure the extent of field dependency. This test was used with very minor adjustments by El-Banna (1987) and found to work well. Later, the same test was used in many studies (Johnstone and El-Banna, 1986; Johnstone, and Al-Naeme, 1991; Bahar and Hansell, 2000; Danili and Reid, 2004; Tsapalis, 2005). The test is a timed written test, making its use straightforward. The student has to find a simple shape which is embedded in a complex matrix of shapes. The simple shape is given to the student and they are asked to trace the shape hidden in the matrix, the shape being of the same size, the same proportions, facing in the same direction, with only one shape within each pattern.

The Group Embedded Figures Test was translated into Arabic to use with Kuwaiti students. The test has been used reliably in many cultural settings, being largely dependent on diagrams and shapes (Danili and Reid, 2004). However, the test was designed for adults and the school students here found it somewhat difficult (mean 2.0 and standard deviation 1.6). The results must, therefore be treated with some caution in that the discrimination of the test may be low, given the low spread of scores.

It was expected that the extent of field dependency (strictly, this is the extent of field independency) would correlate with examination scores, at least in some subjects, in that it has frequently been found that those who are more field independent perform better in academic assessments (Danili and Reid, 2004). The results, using Pearson correlation, are shown in table 5.

Table 5: Correlations of extent of field dependency with subject performance

Correlations of Extent of Field Dependency with Subject Performance							
N = 641	Social Studies	Islamic Studies	Mathematics	Science	English	Arabic	Total Mark
Extent of Field Independency	0.12	0.08	0.21	0.19	0.18	0.20	0.18
	p < 0.05	p < 0.05	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001

Table 5 shows that those who are field independent tend to do better in all subjects. The effect is least for Social Studies and Islamic Studies, reflecting the nature of these subjects. Being field independent means that a student can focus on what is important in a question, leaving aside the less important. The differences between subjects may simply reflect the types of questions being asked.

As with working memory, if higher marks determine whether a student is seen as 'gifted' in Kuwait, then being field independent will also be more associated with giftedness.

Extent of Divergency

The test used was almost identical to the test used by previous researchers (Alamolhodaie, 1996; Bahar, 1999, Danili and Reid, 2006). There were six timed sub-tests, with a total time limit of 20 minutes. All the sub-tests explored aspects of the student ability to generate ideas in a given situation. Some were symbolic, some visual, some geometric. The only minor changes were a slight increase in the use of the visual and the adjustment of some words to suit the Arabic sample. In order to measure students' performance, one mark was given for every single correct response (Hudson, 1968). A Cronbach's Alpha gave a value of 0.76 suggesting a good measure of internal consistency across the six tests. The school students handled this well-established test well, with a mean of 33.6 and a standard deviation of 11.4.

Table 6: Correlations of convergency-divergency test with subject performance

<i>Correlations of Extent of Divergency with Subject Performance</i>							
N = 641	Social Studies	Islamic Studies	Mathematics	Science	English	Arabic	Total Mark
Extent of divergency	0.45	0.46	0.51	0.54	0.57	0.57	0.56
	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001

Those who are scoring the highest marks in the convergency-divergency test tend to be those who do best in all subjects, all the correlation results being highly significant (at p 0.001). However, the values are less in Social Studies and Islamic Studies (table 6). This might reflect the nature of these subjects or it might reflect the actual questions asked in these specific examinations.

At first sight, it might seem strange that such very high correlations were obtained, showing that being divergent is a very considerable advantage in examination success. However, high values were also obtained by Danili and Reid (2006). They were able to show that one factor was the actual style of test question. Nonetheless, if the examinations here are simply testing recall skills, then it appears strange that being divergent has such a large advantage. The work of Al-Qasmi (2006) throws some light on this. In the light of her results (where she was looking at problem solving in university biology), she deduced that being divergent offers many 'pathways' between what she called 'nodes of knowledge' as held in long term memory (Reid and Yang, 2002; Johnstone and Otis, 2006). The person with more pathways had a better chance of finding an answer when compared to the person whose number of pathways was more limited. If divergency means the opportunity (for some reason) to be able to use more pathways linking ideas, then it is likely that such a person is more likely to be able to recall information in an examination situation.

It is very clear that being divergent is strongly related to academic performance and this means that those selected as gifted in Kuwait will strongly tend to be those who are divergent.

Visual Spatial Skills

Although visual-spatial ability is often discussed, no specific test has been found to measure it (Silverman, 1989, 2003). It was necessary to develop a test for the purpose. Looking at the literature (e.g. Johnson, 1996; Silverman, 1989, 2003; Golon, 2004), the following skills were identified as part of the visual-spatial characteristic (table 7):

Table 7: Skills related to visual-spatial ability

<i>Skill to be Measured</i>
Discriminating between different forms and shapes
Focussing on the counting of shapes, in different sizes and positions
Distinguishing between figures and their backgrounds and inverse images
Estimating distances and velocities
Perceiving shapes and number of shapes accurately
Speed tracking information visually

The test was designed to reflect ability in these skills. The test was computer-driven, allowing for movement, colour and simple forms of animation, and projected onto a screen so that the whole class saw exactly the same visuals. The test had a specification which reflected the skills found in the literature which were thought to be associated with visual-spatial ability (table 8).

Table 8: Visual-spatial ability test specifications

<i>Q</i>	<i>Items</i>	<i>Description</i>	<i>Skill Measured</i>
1	5	Find the different shape	Discriminating between different forms and shapes
2	5	Counting of the objects	Focussing on the counting of shapes, in different sizes and positions
3	4	Shape of, and orientation of, objects	Distinguishing between figures and their orientation
	2	Points to fix a hidden form between objects	
4	4	Distances between the shapes	Estimating distances and velocities
5	4	Assembling of shapes is geometrical	Perceiving shapes and number of shapes accurately
6	5	True picture from a piece of folded paper	Speed tracking information visually
	4	Product from move of object	

The test went through many stages of testing and subsequent refinement. Early versions (with 57 items) were tried out with experienced teachers and researchers and numerous modifications were incorporated until the final test, comprising 33 items with the maximum score of 46, was developed.

The students were shown a series of visual representations, often for a very short fixed length of time and then asked a question which they recorded on paper. This procedure allows the use of pictures and animation; it allows the use of colour; it gives a tight control of timing as every class would meet exactly the same test at exactly the same speed. In every class, the computer controlled the exact speed of projection.

It is important with any new test to establish its validity. This was approached from several standpoints. The extensive trialling with other adults and repeated refinements introduced as a result of comments helped. However, the whole test was pre-tested carefully in Kuwait. 90 students (in three separate classes) were involved, without class teacher involvement. The students were asked to write their comments about the test and there were many informal discussions with them. While many commented on the level of difficulty and the speed of the test, it appeared that the test was acceptable. Later refinements reduced the number of items and allowed a little more time.

After all the modifications were completed, the test was then used with the sample of 560 (from the 641), giving a good normal distribution of scores, with an observed mean of 17.3 and a standard deviation of 5.2. The measured visual-spatial scores were correlated with academic performance in all six subjects and the total mark, using Pearson correlation (table 9).

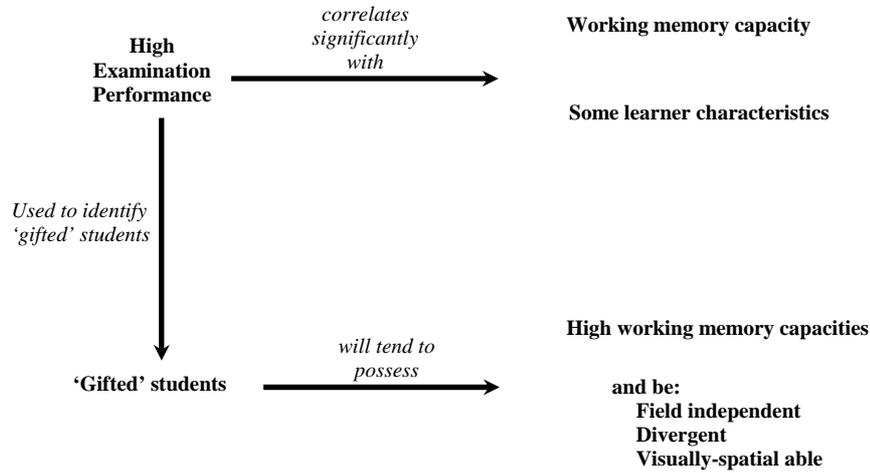
Table 9: Correlations of visual-spatial ability with subject marks

<i>N</i> = 560	<i>Social Studies</i>	<i>Islamic Studies</i>	<i>Mathematics</i>	<i>Science</i>	<i>English</i>	<i>Arabic</i>	<i>Total Mark</i>
Visual-Spatial Test	0.28	0.23	0.31	0.33	0.33	0.34	0.33
	<i>p</i> < 0.001	<i>p</i> < 0.001	<i>p</i> < 0.001	<i>p</i> < 0.001	<i>p</i> < 0.001	<i>p</i> < 0.001	<i>p</i> < 0.001

It is clear that the results of the visual-spatial test correlate very significantly with performance in all subjects. Silverman (2002) found that many highly gifted visual-spatial learners were successful at many tasks given in many ways, although there were some visual-spatial learners who seemed to depend almost entirely on their visual-spatial abilities. The first group could *choose* to learn visually spatially as a preferred learning style; the latter group *needed* to use this learning style.

Again, as 'giftedness' is determined largely by performance in school subjects, it means that those who are seen as 'gifted' in Kuwait will tend to be those who are more visually-spatially equipped.

Some of the issues can be illustrated in figure 2.



Is the presence of these characteristics '*controlling*' high ability?
 Are these the key characteristics critical or desirable in the highly able?

Figure 2: Learner characteristics and giftedness

Inter-Correlations

The results from the four cognitive characteristics tests can be correlated with each other (table 10).

Table 10: Inter-correlations

<i>N</i> = 641	<i>Working Memory Capacity</i>	<i>Extent of Field Dependency</i>	<i>Extent of Divergency</i>
Extent of Field Dependency	0.30		
Extent of Divergency	0.22	0.27	
Visual-Spatial Ability (<i>N</i> = 560)	0.21	0.30	0.39

It is possible to interpret these correlations in terms of information processing (Johnstone 1997, Reid, 2008, 2010).

Field dependency relates to the ability to select the information needed for a task efficiently. It is well established that field dependency correlates with working memory capacity measures, the field independent characteristic being seen as one aspect of the efficiency by which the working memory operates: thus, a field independent person tends to use their entire working memory capacity as none is employed to hold irrelevant information (Johnstone and Al-Naeme, 1991). This is achieved by the

perception filter working efficiently and this is controlled by the way the long term memory operates (Johnstone, 1997).

Being divergent means being able to use (or generate) links between ideas. It has been established that divergency correlates with performance (Danili and Reid, 2006) and, particularly, problem solving ability (Al-Qasmi, 2006). In the latter study, it was suggested that this was dependent on the presence of usable, accessible links between ideas in long term memory. Possessing a high working memory capacity permits more links to be formed.

Being visual-spatially able means a strong tendency to see things in terms of pictures, diagrams or spatial relationships, and these must be stored in long term memory. The person who holds information in terms of pictures, diagrams or spatial relationships implicitly holds more links between ideas. This might explain the relationship with divergency. Possessing a high working memory capacity permits more links to be formed. Overall, all three characteristics relate to long term memory and the way it works, in relation to working memory.

DISCUSSION AND CONCLUSIONS

Using a very large sample of grade 7 Kuwaiti students (aged about 13), performance in six subjects has been considered in relation to measures of working memory capacity, the extent of field independency, the extent of divergency, and a new test of the visual-spatial. The sample was selected in such a way that it contained a high proportion of those regarded as 'gifted' under the procedures used in Kuwait. The validity of the measures of working memory, field dependency and convergency-divergency are well established, while the validity of the new test for visual-spatial abilities was checked carefully.

The national examinations have been shown to test only one factor: probably recall-recognition. As 'giftedness' in Kuwait depends largely on examination results, it means that those selected as 'gifted' in Kuwait are those who have shown very high abilities in the processes of recall. Tests and examinations tend to backwash back on teaching and learning. Thus, if the rewards in education come through memorization and recall, teachers will tend to emphasis this and students will make this the focus of learning. This inevitably will mean that other, potentially much more important, skills will be neglected: understanding, critical thinking, creative thinking, evaluating, for example.

All the four cognitive measurements also correlate with examination performance in all subjects. The correlations obtained with the overall mark (obtained from standardised subject marks) are shown (table 11).

Table 11: Summary of correlations with total marks

<i>Test</i>	<i>Correlation</i>
Working Memory Capacity	0.22
Field Dependency	0.18
Convergency-Divergency	0.56

Visual-spatial	0.33
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The correlations show very clearly that those selected as 'gifted' will tend to be those who are highly divergent and strongly visual-spatial as well as those tending to have higher working memory capacities and being more field independent. Simply by selecting the 'gifted' on the basis of examination results will inevitably mean that the 'gifted' population will tend to be those who are more divergent, strongly visual-spatial, more field independent, and who have higher working memory capacities.

This will mean that those selected as having very high ability will tend to excel in these learner characteristics. This could simply be a function of the way test questions are constructed and this has been shown to be the case with working memory (Reid, 2002), with field dependency (Al-Enezi, 2008) and with extent of divergency (Danili and Reid, 2006). This raises all kinds of ethical issues for it is possible that examinations are rewarding learners on the basis of their learner characteristics rather than their true abilities.

Implications

Perhaps the most important implications relate to the dangers of relying on tests and examinations to select those deemed as of exceptional ability. It is notoriously difficult to develop tests which are not heavily dependent on recall-recognition skills. This is not a sensible way forward when societies need the leadership of highly able people who are capable of thinking new thoughts and generating new ideas with commitment and vision. There is no evidence that those who have memorized most will be able to offer the skills of leadership, critical thinking or creative thinking, all of which it might be argued are key skills for the future. Indeed, in the age of instant access to knowledge electronically, the ability to evaluate the knowledge obtained may be the skill of the future.

There are also all kinds of ethical questions. Although working memory capacity is known to be genetic, it is not known of the other three cognitive characteristics are innate or whether can they be developed by means of some kind of formal instruction. For extent of field dependency, Witkin et al. (1967) showed many decades ago that the skill grows with age. However, the work was not followed up until it was confirmed by Onwumere (2009). However, it is not certain whether the dominant reason is cognitive development, experience or formal instruction (Onwumere, 2009).

The characteristics of divergency are very obvious with young children but seem to be much less with older learners. Is it possible that this skill is suppressed as learners proceed through formal education (Robinson, 2011). The pressure for gaining the one 'right' answer removes the need for divergent thinking. The fascinating educational significance of divergent thought was introduced in Hudson's early but remarkable discussions (Hudson, 1962, 1967, 1968). The arguments of Robinson (2011) suggest that the skill can be suppressed. That seems to imply that the skills is capable of enhancement. If it can be enhanced, then enhancement would generate higher

examination marks, raising issues about what examinations are testing and whether they reflect true ability

Visual-spatial skills are nearly always under-valued in education, while there is considerable evidence that those with outstanding ability may well be those who have very enhanced visual-spatial skills. It is likely that our education systems with their dominant emphasis on the use of symbolics (language and number) are seriously hindering large numbers of very able learners, a question raised by Silverman (1989, 2002, 2003).

If countries select 'gifted' students on the basis of very high examination performance, this means that those selected will strongly tend to show certain learner characteristics. This raises the question about whether these characteristics are stable with time and this is part of the broader issue on the issue about high ability being fixed. It is assumed that ability can be enhanced. Indeed, education seems pointless unless this is assumed. Selecting out at one moment of time may simply pick out those who are more developed at that moment of time and this may change with further teaching. It may change if the learner characteristics develop.

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