International Perspectives on Giftedness
Special Issue

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International Education Journal

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Special Issue: International Perspectives on Giftedness

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CONTENTS

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International perspectives on giftedness: Experimental and cultural observations of IQ and creativity with implications for curriculum and policy design

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This special edition of the IEJ explores the cognitive, cultural, biological, social, emotional, and even spiritual notions of human abilities and the links with very advanced levels of intellectual functioning. In addition, this IEJ Edition's twenty original papers include practical research findings, guidelines for curriculum design, for curriculum change, and for policy development. This article discusses each author's contribution within the current context of gifted education and attempts to make links across common themes within the papers, and to highlight areas for future research. Although none of the articles fit neatly into clearly defined categories, for ease of analysis, they will be discussed within broad areas.

Giftedness, creativity, international, experimental, cultural, observation, IQ, advanced intelligence, curriculum, policy design, biological basis

CURRENT NOTIONS OF GIFTEDNESS AND CREATIVITY: From the biological basis of advanced intelligence to cultural perspectives

In one of the most recent and comprehensive analyses of the state of gifted education in Australia (McCann, 2005a), the field of neuroscientific study on the so-called 'gifted brain' and implications for curriculum design, was posited as one of the major future directions.

Michael O'Boyle, formerly of the University of Melbourne, Australia, and currently at Texas Technical University in the United States, has devoted much of his research to identifying aspects of the gifted brain when it is engaged in mathematical processing (O'Boyle et al., 1995). His paper explores the biological basis of such intellectual functioning and he has used behavioural and psychophysiological experiments to collect data. His study published in this edition of the IEJ provides further evidence to the already cited strength of right hemisphere functioning in gifted youth when engaged in mathematical processing. In particular the role of the *corpus callosum,* the major conduit between left and right hemispheres, has emerged in this study with "heightened interhemispheric communication as unique functional characteristics of the math gifted brain" (p.247). O'Boyle's research is in keeping with earlier observations of outstandingly gifted mathematicians who showed early and striking spatial abilities, as opposed to verbal/linguistic abilities. Comments from mathematical geniuses themselves, such as Einstein, who claimed that his mathematical thinking was "of visual and some muscular type … conventional words or other signs have to be sought for laboriously only in a second stage …" (in McCann, 2005b, p.6) are in agreement with the neuroscientific findings of researchers such as O'Boyle. This exciting field of research is highly contentious, as it is well documented that pre-natal testosterone enhances right

hemisphere development, which some researchers suggest may help to explain the documented higher numbers of males in programs for mathematically eminent students (Benbow, 1992; Geake, 2000b). Implications for curriculum design have been raised by researchers such as Geake suggesting that the neuroscientific research is sufficient to warrant a qualitatively different mathematics curriculum design for boys who are gifted in mathematics. Certainly, one clear curriculum outcome from studies into the biological basis of intelligence, such as O'Boyle's, is for teachers to avoid trite interpretations of 'right brain/left brain' classrooms and to note from this early research that the brain is *far* more connected in terms of hemisphericity, particularly for gifted individuals who, according to the findings from functional magnetic resonance imaging (fMRI), show evidence of a thicker *corpus callosum.* Gender differences have also been identified in the studies to date, with females in general having more neuronal connections and activity in the *corpus callosum.* As Geake once observed, "to divide a curriculum into left brain and right brain activities is a trite misinterpretation of the research…." (in McCann, 2000). More research is currently underway on the experimental exploration of the biological basis of intelligence and O'Boyle's contribution is a cornerstone of such work.

Interestingly, locating the site of *creative* thinking in the brain has proved to be a much more illusive quest, and other papers in this edition of the IEJ have focused on refining tests of creativity and observational instruments.

Although 'creativity' is the major theme in the article by Ugur Sak and June Maker, mathematics was also the subject area chosen to explore the divergence and convergence of what they call the "mental forces" children utilise when they are engaged in open and closed mathematical problems. Although the terms 'convergent' and 'divergent' are often used in opposition, Sak and Maker found a statistically significant correlation between divergent and convergent thinking and between convergent thinking and the components of divergent thinking such as Guilford and Torrance's original posits of fluency, flexibility, originality and elaboration. The focus of Sak and Maker's study was on open and closed mathematical problems. The notion of flexible thinking is at the core of this study with the experiments involving the ability to shift cognitive functioning from common applications to the uncommon: "The process of flexible thinking includes both divergent and convergent thinking provided that a problem solver works on multiple solutions, as well as one single solution during the course of problem solving …" (p.252).

Sak and Maker refer to Cropley's (1992, 1999) studies on creativity which revealed that early researchers tended to separate both types of thinking, convergent and divergent, and considered them as functions of giftedness in different forms, with different instruments needed to measure them.

The focus on mathematics in this paper explored the three key questions:

1. how does student performance on convergent tasks relate to performance on divergent tasks in the mathematics domain?
2. how does student performance on fluency and OFE (originality, flexibility and elaboration) relate to performance on convergent tasks in the mathematics domain?
3. what relationships, if any, exist between problem types?

The DISCOVER Assessment is outlined in Sak and Maker's article. It is interesting that the analysis showed a strong positive correlation between OFE and convergent scores; fluency scores were also correlated with convergent scores moderately, in a positive direction.

The question is also raised in this paper as to whether creativity is domain specific rather than general across diverse domains. In other words, does creativity in one domain predict creativity in another domain? The authors caution that most recent research on creativity has confirmed that it

appears to be more domain-specific than general. This research has been highlighted recently (in McCann, 2005b) with tests such as the Torrance Tests of Creative Thinking and Klaus Urban's figural creativity test, which is discussed in the following section, being criticised as attempting to measure creativity in a "knowledge poor" domain.

Klaus Urban is currently the President of the international body, the *World Council for Gifted and Talented Children* and so it is fitting that this international journal should include an update on the research on his figural test of creativity, the Test of Creative Thinking – Drawing Production (TCT-DP).

This test was designed to mirror what Urban has called a more "holistic" concept of creativity rather than what he refers to as "the mere quantitatively orientated, traditional divergent thinking tests …" (p.272). The details of the test itself are set out in Urban's paper. What is important to note in this analysis is that this test has been used extensively over the past fifteen years and has received very positive evaluations (Cropley, 2000; Colangelo and Davis, 2003; McCann, 2003, 2005b). It has been compared, in terms of its contribution to the field of testing for creativity, with the famous tests of E. Paul Torrance, the Torrance Tests of Creative Thinking (TTCT) and more recently with the Abbreviated Torrance Test for Adults (ATTA). A recent analysis found a strong correlation between the TCT-DP and scores on the ATTA (McCann, 2005b) which suggests that the figural creative abilities which the TCT-DP measure are very close to those measured by the Torrance tests. Analysis of the TCT-DP results showed that it does not discriminate against subjects in terms of sex, socio-economic status or cultural differences (McCann, 2005b). Urban's own paper cites studies that support the reliability and stability of the test's data. Given this, it needs to be noted that many studies have criticised the whole concept of testing for creativity, in what Sternberg (1999) has called a "knowledge poor" domain. Howard Gardner has been critical of creativity tests in general, claiming they attempt a futile measure of, as he termed it, "psychometric creativity", such that few practising classroom teachers can use them. Recent research has suggested that creativity should always be assessed in domain-specific fields (Han and Marvin, 2002; Kaufman and Baer, 2004). Checklists and inventories of creativity characteristics have been rated very highly in the literature (for example, Kirschenbaum, 1998; Renzulli et al., 1997) as an alternative to the standardised tests such as the TTCT and the TCT-DP. However, Cropley's extensive evaluation of testing for creativity did conclude that "creativity tests are worth using" (2000, p.78) and he identified Urban's test as one with particular promise in this relatively young field of research. Urban's study is cognisant of this research and in his paper contained in this edition, he notes that the TCT-DP should be used in conjunction with other information such as other creativity tests, or teacher/parent ratings of children's abilities.

Many studies of highly creative individuals have suggested that the very nature of high creativity predisposes the person to a risk of personal maladjustment. This is a much more difficult aspect of creativity to measure or observe.

Alexander Yeung, Alan Chow and Phoebe Chow's study in this edition of IEJ explores creativity traits in 'disaffected' gifted students. Students in this study were identified by teachers to be gifted in non-academic areas, but disaffected and even disruptive, in academic settings. These students were compared with other students in an analysis involving school motivation, academic self-concept, originality in thinking, and imagination. A range of questionnaires and observational measures are outlined in this paper. Interesting cultural issues are also outlined, particularly with the difficulty of assessing creativity, as "this could be even more difficult in Hong Kong, given the highly competitive, segregated, and outcome driven features of the Hong Kong schooling" (p.281). Interestingly, this study concluded, " … that students found to be disaffected and disruptive did not differ from other students in self-concept and their effort goal orientation … however they scored significantly higher in originality and imagination" (p.286). Implications for

identification of creative students and the design of more appropriate curriculum are outlined in this paper.

Cultural notions of giftedness and creativity are further highlighted in this edition of the IEJ, with a particular focus on the excellent research coming out of New Zealand.

Jill Bevan-Brown's study of the Maori, the indigenous people of New Zealand, explored three different types of leadership and differing leadership styles which seem to be unique to this culture and their views on giftedness. Her study of notions of creativity and the Maori revealed that while Western traits of originality or *difference* underpin most concepts of creativity, for the Maori it is quite different. Ownership of the notion of "kotahitanga" which translates as "acting in unity" is central to the Maori view of high creativity.

Findings such as these are similar to Cooper's (2005) study on the Indigenous Aboriginal populations in Western Australia, where the notion of cultural "oneness, or belonging to the mob" was central to their view of intelligent behaviour. In these indigenous cultures, being 'different' or 'original' does not necessarily comprise intelligent or creative behaviour. A further extension of the Maori view of giftedness itself was outlined by Bevan-Brown as the "service" component. As she states: "In order to be considered a gifted Maori not only must you be exceptional but you must also use your outstanding skill, ability or quality to help others in some way" (p.152).

This altruistic view of the essence of giftedness has very recently been proposed by researchers such as Sternberg in his *WICS* (Wisdom, Intelligence, Creativity, Synthesised) model (2004), and his *Balance Theory of Wisdom* (2003). Both are based on the premise that a definition of giftedness must incorporate providing "a common good … for individuals and institutions" (p.234). Bevan-Brown asserts that at the heart of successfully developing the Maori notions of giftedness and creativity in New Zealand is the need to maintain and nurture the "culturally responsive environment" which is unique to the Maori. Her early research (1996) highlighted skills such as "service to maoridom" and even "cooking ability" as unique cultural markers of giftedness for the Maori. This paper extends her excellent research in this field.

Graeme Miller's study on perceptions of giftedness within the Cook Island Maori communities is a very insightful and moving tribute to this unique, minority culture within the larger Maori context. Extending the earlier studies of Bevan-Brown (1996, 1999) of characteristics regarded by the Maori as essential to giftedness, Miller provides a detailed insight into giftedness as a construct within the Cook Island Maori on the islands of Aitutaki and Tokoroa. It is interesting to note in Miller's study, the Maori culture's most often cited characteristics such as *good memory, communication skills, good knowledge of the Bible and carefully reasoned understanding of right and wrong* were identified, while other characteristics such as *tertiary qualifications* were not rated highly at all. In a finding similar to Bevan-Brown's research, Miller found that the general qualities of *leadership* emerged as most significant to the Cook Island Maori notions of giftedness, although such qualities were often encapsulated under characteristics such as the ability to "dance … to carve … to fish … skills as an orator, and ability to bring the community together with a sense of unified purpose" (p.242).

The issue of *spirituality* and giftedness also emerges in this fascinating paper and the difference in viewpoints between the resident Cook Island Maori and those who now live in New Zealand is noted in this extract from an interview: "I think it is interesting that in a sense, Christianity is an enclave within our culture that is not from our culture. The influence of the missionaries has been so great that I, as a Cook Islander in New Zealand, gain my identity through the church. I guess it's a bit different in the Cook Islands where the main source of a person's identity is through their island" (p.244). This indigenous view is in keeping with American/Canadian Indian and Australian indigenous beliefs in *belonging* to the land (as opposed to *owning* the land) as central to concepts of culture and the development of ability and power within the culture.

Most checklists of giftedness include the characteristic of a sense of *humour*. Paul Jewell's article in this edition of the IEJ focuses on the role of humour in cognitive and social development. It is a unique contribution to the field, as few studies have actually analysed the nature of this characteristic. Jewell maintains that actual analysis of humour is possible and involves quite definite states and processes: "It requires cognitive processing, has an impact on the psychological condition (such as release of tension) and has physiological results (such as laughter)" (p.202). Jewell highlights Edward de Bono's 'lateral thinking' as comparable to the 'paradigm shift' necessary to humour, which he also indicates is derived from the philosophy of science. The article proposes that the 'joke' models important intellectual processes, and according to Jewell is "the essence of creativity". This is a thoughtful paper, written from a philosopher's view of giftedness, and there are some excellent jokes to keep the reader's interest!

SOCIAL AND EMOTIONAL DEVELOPMENT OF GIFTED STUDENTS

Since Gardner's (1983) *Frames of Mind: The Theory of Multiple Intelligences*, incorporated *inter* and *intra*personal abilities as central to the determination of human intelligence, many studies have explored the links between social and emotional abilities, general intelligence, and giftedness.

Marzieh Amini's study, presented in this edition of IEJ, used a 'Student Life Stress Inventory' and the 'Coopersmith Self-Esteem Inventory' to identify stressors in adolescent students (such as unrealistic parental and teacher expectations), and to assess student reactions to such stress.

Gifted students in her study showed significantly more cognitive reactions to stressors. Boys had higher scores on frustration levels but lower emotional reactions than those of girls. Her results showed that gifted children in general showed higher self-esteem than those subjects who were not identified as gifted.

Amini's paper highlights the still conflicting research in this field with some studies indicating giftedness is attended by a robust social and emotional profile, and others suggesting the opposite. It seems that the *degree* of giftedness is the critical issue, with profoundly gifted students possibly much more at risk, than mildly to moderately gifted, of developing stress. More research is needed in this important field of study. Implications for acceleration as an educational option have been raised from a major Australian study (Gross, 2004), which has advocated radical acceleration for profoundly gifted students. Gross's study found a much higher incidence of social and emotional maladjustment in profoundly gifted Australian students who were denied accelerated learning or had only limited acceleration. Issues such as self-concept and self-esteem do appear to be intrinsically linked with the provision of an education that is appropriate to the degree of giftedness.

The use of ability grouping *in general* has emerged as a further contentious area of study from other papers in this edition of IEJ. Toni Banfield's Australian study of ability grouping in the mathematics class, explored the links with self-concept and self-esteem in gifted adolescent boys. She found that gifted students have higher mean scores for self-concept and self-esteem and showed evidence of a higher global self-concept when compared with other students at the year 8 level. Her paper highlights the documented lack of research on mathematically gifted students in Australia, which is an issue which Diezmann and Watters (2002) have also been critical. Banfield refers in detail to the contentious Australian debates on what has been called the "big fish, little pond" effect (Gross, 1997; Marsh et al., 1995; Craven and Marsh, 2000), which has debated the effects of selective schooling and ability grouping on students' self-concept and self-esteem. While Craven and Marsh have cautioned that lowered self-concepts are likely to result from selective ability grouping, Gross has argued that any drop in self-concept is relatively short-term and more the result of gifted students finally being placed in a challenging educational

environment, more suited to their abilities. In general Banfield's study favours special grouping for gifted adolescent boys, although she cautions that more research is needed on this issue.

Appropriate educational environments can rarely be debated without reference to appropriate training of teachers, teacher characteristics, and the relationship patterns between students and teachers. John Kesner's paper in this edition of IEJ explored gifted students' relationship with their teachers. His study found that gifted students have a more positive relationship with their teachers than students who are not identified as gifted: "The hypothesis that teachers of gifted students would report a less positive relationship than teachers of non-gifted students was not supported … Teachers of gifted students reported lower levels of conflict when compared to reports by teachers of non-gifted students" (p.219).

This paper raises some interesting issues such as proposing that gifted students "are even more profoundly affected by the interactions they have with their teachers compared to other students" (p.222). With the weight of research reporting that many gifted individuals found school in general, and relationships with teachers specifically, to be a negative experience (for example, Csikszentmihalyi and Wolfe, 2001), it is clear that more research is needed. From Kesner's paper, the issue of the *degree* of giftedness needs further research. It seems his findings are in keeping with the research that gifted students in general tend to have a higher social and emotional profile within school. However, this relatively positive profile seems to change for the highly to profoundly gifted students. Kesner's article is an important contribution to this field, concluding with the reminder that meeting students' affective needs within schools is as important as meeting their academic needs.

Kong Yan and Haihui Zhu's paper also explores the links between general social environment and self-concept, and giftedness and self-concept.

Their study focused on high school and university students who had been selected out and accelerated. This is a very common option for catering for gifted students in China and indeed Kong and Zhu's definition of "gifted students" in this article is "adolescents who are admitted to colleges at a much lower age than common peers" (p.225). Their study spans a decade of research, comparing results and exploring the links between the academic self-concept of gifted students who participated in the study in 1993 with those who participated in 2003.

Their literature review identifies other studies which suggest lowered self-concept can set in when gifted students are ability-grouped and hence, possibly for the first time, not necessarily the 'top of the class'. This has already been cited as the 'big fish, little pond' effect on self-concept and self-esteem. This study is particularly interesting as it provides a 'snapshot' of adolescent adjustment in China over a ten-year period. Indeed for the non-gifted cohort, Kong and Zhu found that the self-concept of students in 1993 was less positive than that of the non-gifted students identified in 2003. Their explanation for this is the improved lifestyle of adolescents in China in 2003, who enjoy "a more colourful life … and with the development of the internet and communication technology, it is easier for them to get access to and connect with the outside world" (p.229).

Interestingly, Kong and Zhu found that a positive self-concept was not found in the gifted cohort studied in 2003. Instead, a slight, although non-significant, negative self-concept was found. To possibly explain this, they suggest that "when the gifted are placed with other exceptional adolescents, they may feel less confident in their academic achievement" (p.230). Although the authors did not cross-reference to the 'big fish, little pond' effect, this has been highlighted in the literature and is still a contentious issue of debate within gifted education practice.

Michelle Kornblum's study of perfectionism in an Australian sample of students raises many issues that warrant further research. Kornblum observes in her paper that no population has been more frequently associated with perfectionism than the gifted; yet the research in this area is still

relatively inconclusive as to whether perfectionism is a 'normal' part of being gifted or a condition to be avoided at all costs. Kornblum differentiates between the notions of 'normal' and 'neurotic' perfectionism.

The hypothesis that gifted students would have higher personal standards than non-gifted students was supported by her study. In addition, gifted students also showed increased parental expectations scores with students in the same year level, suggesting that gifted students may encounter greater parental pressures than the 'non-gifted' in order to 'live up to' their abilities. Her paper concludes that gifted students were more likely to be perfectionists. The study also found that the higher personal standards identified in the gifted cohort might give them an advantage over their non-gifted peers because of the associations between high personal standards and positive outcomes.

CURRICULUM ISSUES: LINKS WITH ACHIEVEMENT AND UNDERACHIEVEMENT

Kay Gibson and Linda Mitchell's article explores some critical curriculum components, referred to as the *C3 Model*, in programs for gifted young children. They examine three early childhood education programs, which presented to them as the most comprehensive approaches to curriculum development: the High Scope, Montessori, and Reggio Emilia models. They also propose that Clark's Integrative Model (1986), Betts and Kircher's Autonomous Learner Model (1999) and Smutney et al.'s (1997) Model seem to be the ones most appropriate to instruct pre-K curriculum needs. Gibson and Mitchell claim the following seven critical components should underpin the design of a critical curriculum: philosophy, environment, interpersonal interactions, curriculum, instruction, assessment, and research. They claim that appropriate adherence to each of these factors, as ongoing design and evaluation of appropriate curriculum, is essential and their paper provides a very practical outline of each component. Gibson and Mitchell also indicate that the *C3 Model* itself can serve as an evaluative tool to analyse existing programs and curriculum which may be appropriate for young gifted learners.

Tracy Heavner's paper explores what she calls the Integrated Music Curriculum for Gifted Students. She uses the term 'intradisciplinary' study of music to describe a study whereby the various strands such as music theory, music history, music literature and music performance are integrated rather than separate studies. This study is in keeping with findings in the field of neuroscience (for example, O'Boyle, 2000; O'Boyle, Benbow and Alexander, 1995; Geake, 2000) highlighting the role of the *corpus callosum* in the brain of gifted learners, which identify a higher facility for integrated, cross-subject learning in gifted students. The comprehensive musicianship approach outlined by Heavner is also closely related to gestalt psychology in that music is approached as a totality. As Heavener observes, the actual goal of all areas of music is to "develop a total understanding and competency of all areas of music through the unity of … performing, creating, conducting, analytical listening and discussing" (p.172). Heavener's article also suggests crossing over cultural notions of music, advocating that selections should come from at least three different categories such as Western art, Western music and Eastern African music.

The study by Astrid Heinz has a focus on mathematically gifted students in which the author analysed the presentation of non-routine word problems to children aged 6 to 10 years. A detailed analysis of videotapes of the children's problem solving processes provided insight into the strategies used. The paper is a fascinating exposé of individual case studies and detailed presentation of individual problem solving stages and procedures. Findings from this study showed that the gifted children excelled in the ability to work systematically, quickly, and to getting an insight into a problem's mathematical structure much faster than other students. Essentially Heinz's paper confirmed other research in the field, which highlights gifted children's ability to quickly and accurately recognise formal structures in mathematics. The gifted students in her study also excelled in the ability to verbalise solutions to problems.

Lesley Henderson's article presents a model for a moral reasoning strategy, called the PAVE model. The philosophical perspectives underpinning this model are: *Principles, Agreements, Virtues and End Consequences*. This paper is more than just an exploration of the role of moral reasoning strategies within a curriculum; it is also a paper wherein practical strategies are outlined to teach moral reasoning strategies, often beginning with a moral dilemma. A *Community of Inquiry* approach is advocated, based largely on the work of Jewell (2000) and underpinned by both Bloom's Taxonomy of cognitive objectives and Krathwohl's Taxonomy of Affective Thinking. Henderson makes the important distinction between the notion of advanced moral *reasoning* and advanced moral *development.* The necessity to incorporate moral behaviour, or action, as a determining factor is further advocated in her paper by Jewell who asks the question whether "a morally developed person is one who *feels* strongly about moral issues or *understands* moral issues or *acts* ethically when dealing with other people. Human beings are free agents who may or may not choose to act morally" (p.190). This paper combines major models and philosophies, such as the *Philosophy for Children* and the *Community of Inquiry* approaches, based soundly on the literature in the field which suggests that gifted students in particular need, "the skills of analysis to sort out and clarify the nature of the real world in order to navigate their course through life" (p.190). This is a paper that will be appreciated by all teachers who wish to incorporate moral reasoning and higher order thinking skills into their curriculum design.

The value of a curriculum design that is appropriate to the abilities of gifted students, particularly those who are underachieving in the regular classroom, is outlined in Heidrun Stoeger and Albert Ziegler's paper. This research explores the issues of self-regulated learning in the elementary classroom and outlines the design of special programs for mathematically gifted underachievers.

Stoeger and Ziegler examined the central causes of academic underachievement in 36 fourth grade students, highlighting the difficulty in the research of this kind whereby "the lack of a consensus regarding a precise operational diagnosis of underachievement makes it impossible to introduce a standard applicable diagnostic process" (p.262). A training program, developed by Zimmerman et al. (1996), was conducted within the framework of regular classroom instruction of mathematics. Positive training effects were statistically identified in their findings, which in general were that training was deemed suitable as an intervention to reduce underachievement. The authors of this paper indicate that the self-regulated learning training should be beneficial not only for the gifted underachieving students, but for all gifted students.

POLICY DEVELOPMENT: GOVERNMENT SUPPORT AND DIRECTION

Policy is basically the articulation of best practice and intended directions in a field. The necessity to design and implement specific policies to support gifted students has been raised in Australia (McCann, 2005a) as a critical issue, particularly because the eight States and Territories each have their own separate Departments of Education and specific directions. Internationally, and particularly within the Asia-Pacific region, the publication of policy statements provide guidelines for other regions to follow.

Angela Chessman's article on policy development and practice in the Australian State of New South Wales, is a practical exploration of three key Australian policy documents and how they can have an impact upon the formation of major policy. Probably the most influential of the documents cited is the *Australian Senate Enquiry*, which was published in 2001 and has (albeit only since 2004) been responsible for a major injection of funding into the field of gifted education in Australia. Similarly to the Senate Enquiry, a major recommendation from Chessman's paper was that policies need to include a clear definition of giftedness, which will communicate to teachers more accurately the nature of the population of students that is currently under-served in the school system. Chessman also highlights the need for more concerted training of teachers in Australia in the field of gifted education. This is a very practical article and will no

doubt be of great interest to others who are in the process of designing policy in the field of gifted education.

New Zealand and Australia have collaborated for many years, sharing teacher education programs and best practice in terms of policy development in gifted education. David Keen's comprehensive coverage of gifted education in New Zealand stems from a two-year study he conducted in 68 educational centres and schools across three quite disparate regions of New Zealand. This wide-ranging study was conducted at early childhood centres through to secondary schools and from urban to rural settings.

Keen's study, entitled *Talent in the New Millennium* documented issues such as gifted students' perceptions of school as *too easy* or *boring* and anxieties in the school setting, particularly with regard to managing peer relationships and the need for peer recognition and approval. Other issues such as perfectionism and time management are raised as concerns in this most comprehensive study.

It was interesting to note in this paper that many parents of the gifted students in the study, across the full socio-economic spectrum, "maintained that the most important task of the gifted-effective home is quasi-spiritual" (p.215). As Keen further noted, "The spiritual preconditions of giftedness are not quantifiable and, perhaps partly for this reason, in western educational contexts are under-researched" (p.215). This aspect of Keen's study links it with the research on giftedness since the beginning of the new millennium which indeed does suggest that spiritual intelligence is one of the highest expressions of giftedness. Gardner has not yet proposed it as a formal part of his Theory of Multiple Intelligences (1983; 1997). However, other researchers such as Sisk and Torrance (2001) have maintained that it is the *highest* intelligence that "integrates all others". Spiritual precocity, along with the necessity to 'give back' one's gift within the cultural milieu, is prominently advocated in more recent literature as a component of giftedness (Grant, 2002; Sternberg, 2003, 2004).

IN SUMMARY

In conclusion, the papers that follow this *link* article, all explore experimental and cultural notions of giftedness, and creativity specifically. Each one makes a significant contribution to what is still one of the youngest areas of research and practice within education.

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Identifying stressors and reactions to stressors in gifted and non-gifted students

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Using the Student Life Stress Inventory and the Coopersmith Self-Esteem Inventory, stressors and reactions to stressors were identified in gifted high school students and compared with non-gifted students. Altogether, 340 boys and girls (156 gifted and 184 non-gifted students) from four high schools in Shiraz (two high schools for gifted and two for non-gifted students) took part. Although there was no significant difference between gifted and non-gifted students in stressors, gifted students showed significantly more cognitive reactions to stressors. Boys had higher scores in frustration than girls, but their scores on emotional reactions were lower than those of the girls. There was an interaction between sex and type of student (gifted versus non-gifted). Moreover, there was a significant negative relationship between father's education and the experience of frustration in gifted students. Finally, the gifted students showed significantly higher self-esteem than the non-gifted.

Self-esteem, cognitive, emotional, stress, gifted, non-gifted

INTRODUCTION

Reviewing the literature on characteristics of gifted and talented individuals reveals contradictory findings, especially with regarding to their psychological well-being, level of adjustment and coping.

There are two points of view. The first is that gifted student's adjustment level is higher than their non-gifted peers. Because of their cognitive capacities gifted students have better understanding of self, environment and other people, and they can cope well with stress.

Terman (1925) and Terman and Oden (1935; 1947) had conducted longitudinal studies. According to their findings, gifted individuals show lower incidence of mental illness and adjustment problems. Coleman and Fults (1985) suggested that gifted students are happy, popular and healthy. When compared with non-gifted students, they are less vulnerable to mental disorders.

The second point of view is that gifted children are more vulnerable to mental illness and they can not adjust to emotional and social problems, particularly during adolescence and adulthood (Neihart, 1999). Lombroso (1891) initially described high ability persons as weak, unpopular and disturbed. Hollingworth (1942) showed that gifted students (IQ over 180) had some difficulties in educational and social adjustments. The adjustment problems for gifted students have been reported by many researches (Tannenbaum, 1983; Gross, 1993; Gallucci, 1988; Janos, Fung and Robinson, 1985; Janos and Robinson, 1985; Yewchuck and Jobagy, 1991).

Some other researchers focused on self-concept and self-esteem of gifted students. These studies also showed controversial results. There are three points of view that should be considered in this regard:

a) Gifted comparing to non-gifted students get benefit from better self-concept and therefore a higher self-esteem scores (Lehman and Erdwin, 1981; Ketchman and Snyder, 1977; Olszwski-Kubilius, Kuliekea and Krasney, 1988).

b) Some researchers reported low self-esteem scores for gifted students (Milgram and Milgram 1977).

c) Some studies showed no differences between gifted and non-gifted students' self-esteem scores (Kerves and Wherry, 1981; Leo and Jay 1987; Coleman and Fults, 1982, 1985).

With regard to stress, there are some studies which support the notion that gifted students experience different kind of stress, such as unrealistic expectation of their parents and overwhelming expectation of their teachers (Chan, 2003; Kaufman, 1992). Moreover, there are other investigations that emphasise a "special stress" which comes from labelling them gifted (Yewchuk and Jobagy, 1991; Coleman and Cross, 1988; Delisle, 1985; Galbraith, 1985).

Due to the special stress, which gifted students receive from their environments, identifying stressors and the type of reaction to stressors will help the counsellor to improve gifted psychological health (well-being).

However, the finding about gifted students' self-esteem are controversial, but it is important to study the relationship between self-esteem and level of stress in them. This will help the educators, parents, and counsellors to prepare better conditions for gifted students.

The purposes of the present study were as follows:

1. To identify stressors and reaction to stressors in gifted students and compare them to non-gifted students.
2. To compare self-esteem in gifted and non-gifted students.
3. To investigate the relationship between self-esteem and level of stress.
4. To examine gender differences with regard to stressors and reaction to stressors in gifted students.
5. To analyse the stressors and reaction to stressors in relation to some socio-demographic variables.

METHOD

Sample

The study was conducted in four high schools in Shiraz (a city in the south of Iran). Two high schools were special schools for gifted students and the other two were regular schools. The subjects were 340 males and female students (156 gifted and 184 non-gifted) who were studying in the final year of high school (education in all four schools was free of charge).

Instruments

Student-life Stress Inventory (SSI, Gadzella, 1991) was used for collecting data on stress. SSI has 51 items listed under nine categories and two sections: a) Stressors, and b) type of reaction to stressors. The items in the first section focused on five type of stressors (frustration, conflict, pressure, change and self imposed). The items in the second section focused on the types of reaction to the stressors (physiological, emotional, behavioural and cognitive). To determine the reliability and validity of the SSI in Iranian culture, Cronbach's coefficient alpha was calculated, and the obtained coefficient for total scale was 0.92. The correlations among SSI, Beck

Depression Inventory, and Taylor's Anxiety Scale were all statistically significant at 0.001 (Amini and Yousefi, 2001).

The Cooper-Smith Self-Esteem (SEI) (Cooper-Smith, 1981) was used for collecting data on self-esteem.

RESULTS

With regard to identifying the type of stressors, Table 1 shows that there were no significant differences between gifted and non-gifted students' scores. But the gifted students had significantly high scores in cognitive reaction to stressors than non-gifted students (p=0.0001), as presented in Table 1.

Table 1. Means and Standard Deviations of Gifted and Non-gifted Students' Scores on SSI

	Gifted Students (N=156)		**Non-gifted Students** (N=184)		
Categories	**M**	**SD**	**M**	**SD**	**t**
a) **Stressors**					
1- Frustration	16.07	4.02	16.39	4.03	0.73
2-Conflict	8.45	2.28	8.39	2.34	0.23
3- Pressure	11.62	3.11	10.78	3.28	2.42
4-Change	6.92	2.66	7.51	2.28	1.92
5-Self-imposed	20.73	3.48	21.30	3.73	1.45
b) **Reactions to stressors**					
1-Physiological	25.81	8.07	27.41	8.92	1.72
2-Emotional	11.58	3.45	12.40	3.72	2.07
3-Behavioral	15.14	4.10	15.75	4.19	1.34
4-Cognitive	7.18	1.66	5.92	2.03	6.18*

* $p < 0.0001$

Analysing the self-esteem scores showed that gifted student had significantly higher scores than non-gifted (p=0.0001).

The results, presented in Table 2, showed negative relationship between scores on self-esteem (SEI) inventory and the scores on Student-life Stress Inventory (SSI) ($r = –0.52$, p=0.0001).

In relation to sex differences, Table 2 showed that the gifted boys had high scores on frustration compared to gifted girls. But girls showed significantly more emotional reaction to stressors than boys (p=0.001).

Table 2. Means and Standard Deviations of Gifted Boys and Girls' Scores on SSI

	Gifted Boys (N=68)		**Gifted Girls (N=88)**		
Categories	**M**	**SD**	**M**	**SD**	**t**
a) **Stressors**					
1- Frustration	17.44	3.83	15.02	3.86	3.91*
2-Conflict	8.10	2.34	8.72	2.21	1.70
3- Pressure	11.32	3.27	11.86	2.99	1.07
4-Change	6.98	2.44	6.88	2.83	0.22
5-Self-imposed	19.95	3.39	21.34	3.44	2.50
b) **Reactions to stressors**					
1-Physiological	25.95	9.79	25.70	6.50	0.19
2-Emotional	10.57	3.64	12.37	3.10	3.33*
3-Behavioral	14.38	4.55	15.73	3.63	2.07
4-Cognitive	7.13	1.45	7.22	1.81	0.35

* $p < 0.001$

Although there were no significant relationships between stress and some socio-demographic variables, such as mother's education, father/mother's occupation, the number of siblings and birth order. But there was a significant negative relationship between father's education and the experience of frustration in gifted students.

Finally, there was an interaction effect between sex and the groups of students (gifted versus non-gifted). This interaction effect was significant at p=0.0001.

CONCLUSION

Understanding the characteristics of gifted students is highly important, not only for their fulfilment, but for their specific contributions to their societies. Despite all controversy, it seems that gifted students because of higher level of cognition, access better and more sufficient strategies for coping with stress (Zigler and Glick, 1986; Luthar, Zigler, and Goldstein, 1992). Therefore, as Freeman (1991) suggested, there is no scientific evidence showing that gifted students have emotional problems.

Finally, it should be considered that gifted students experience more stress than their non-gifted peers, but they mostly prefer to react to stressors in a cognitive way.

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Ability grouping for mathematically gifted adolescent boys

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Embedded in the contemporary issue of gifted education is the contentious notion of ability grouping. The debate surrounding appropriate educational provision for gifted students continues to argue the cognitive and affective influences of ability grouping on gifted students. While recognising the various forms of intellectual giftedness, analysis of the research about mathematically gifted students, especially during adolescence is scarce and underrepresented (Diezmann and Watters, 2002). Adolescent boys' education coupled with a priority for mathematical giftedness is paramount in a time of technological development and advancing global partnerships for future sustainability. Recent Australian Senate Inquiries into Gifted Education (Collins, 2001), Declining Rates of Achievement and Perspectives of Adolescent Boys (Trent, 2001), and Boys' Education (Australian House of Representatives, 2002) highlight the interconnected relevance of examining mathematically gifted adolescent boys' education.

Mathematics, cognitive, affective, ability grouping, gifted

INTRODUCTION

The concept of gifted education and ability grouping continues to have a forum in many aspects of educational programming. The notion of ability grouping is broad and many variations of ability grouping are internationally recognised (Kulik, 1992; Kulik and Kulik, 1982, 1991, 1992; Rogers, 1991, 1993). International support for ability grouping is perceived in varying degrees, resulting in support from some schools while other schools communicate an anti-grouping decision, advocating for mixed ability classes (Boaler, 1997; Oakes, 1985; Slavin, 1990). It is important to realise that Oakes (1985) focused on tracking, a more rigid form of ability grouping, and Slavin's (1990) best-evidence synthesis of effect sizes from twenty-nine studies pertaining to ability grouping should be analysed with caution. Data from Savin's study reveals a neglect to discuss the positive effect sizes in thirteen of the twenty-nine studies for high achieving students in ability grouping, and seven studies have a zero effect size indicating no detrimental effect on students' achievement through ability grouping. Strong advocates for ability grouping, Kulik (1992) and Rogers (1991), found strong positive effect sizes to support all forms of ability grouping for gifted students. Many myths about ability grouping prevail in educational systems despite research evidence to support grouping practices for gifted students (Fiedler and Lange, 1994; Fiedler, Lange and Winebrenner, 1993; Rogers, 1991). Gross (2001) further extrapolates that "much of the criticism is polemic, rather than evaluative and arises from socio-political, rather than educational concerns" (p.17).

Equally prevalent is the desire to understand gifted students' perceptions of self as issues of self-concept, self-esteem, and self-efficacy may be simultaneously transferred to aspects of education. Concepts of self have an underlying importance in education as "schools are beginning to assume

responsibility for teaching children that they are worthwhile, often employing standardised self-esteem tests and classroom curriculum aimed at enhancing feelings of self-worth" (Pope, McHale, and Craighead, 1988, p.1). Intellectually gifted students have many unique cognitive and affective characteristics which separate them from peers of the same chronological age such that gifted students should be placed with peers of the same mental age for at least part of their schooling day (Allan, 1991; Feldhusen, 1991; Gentry and Kettle, 1998; Gross, 1994; Hoekman, 1994; Kulik, 1992; Kulik and Kulik, 1982, 1991, 1992; Rogers, 1991, 1993; Silverman, 1993; VanTassel-Baska, 1992; Winebrenner and Devlin, 1992). Colangelo (2002) argues that "meeting the cognitive needs of gifted students often meets simultaneously their social-emotional needs" (p.5). Publications about students' achievement in gifted mathematics programs are predominantly representative of primary and secondary students who have attended a University coordinated extension course, and reveal that boys have higher mathematics results compared to girls of the same age (Benbow and Lubinski, 1991; Benbow and Minor, 1990). Research is scant on the effectiveness of gifted mathematics programs being offered in secondary schools (Diezmann and Watters, 2002). In Australia, "apathy seems a very apt word to describe the deafening silence about mathematics" (Thomas, 2000, p.4). It is clear that boys' education, specifically within the context of gifted mathematics education, have been significantly underrepresented in contemporary research agendas.

In an occasional paper of the Federation of Australia Science and Technological Society (FASTS), Thomas (2000) highlights the importance of mathematics education by stating, "within Australia, the failure to develop appropriate mathematical skills for a technological society for all young people has been given much lesser priority, both by current and previous governments" (p.3). Thomas continues to state "if Australian national sciences are to have a future than talented young mathematicians must have opportunities to develop those talents" (p.21). Diezmann and Watters (2002) elaborate on the lack of Australian contributions to research by stating that there is "a paucity of Australasian research on mathematically gifted students" (p.222). Goodrum, Hackling, and Rennie (2001) supports the necessity for Australia to raise the importance of the mathematical sciences.

Although many studies have focused on the influence of full-time ability grouping on self-concept and self-esteem for students in primary schools, there are few published studies examining the effects of ability grouping for students in secondary schools (Craven and Marsh, 2000; Janos, Fung, and Robinson, 1985; Janos and Robinson, 1985; Marsh, Chessor, Craven, and Roche, 1995). Research suggests that global self-concept and self-esteem of gifted students is high compared to students of average ability, yet there is some disagreement about ability grouping and its affect on the subcomponents of self-concept and self-esteem (Gross, 1997; Hoge and Renzulli, 1993; Janos, Fung, and Robinson, 1985; Janos and Robinson, 1985; Kulik, 1992; Marsh, et al., 1995; Marsh and Craven, 1994; Rogers, 1991). Gross (1997) found that while gifted students' self-esteem declined upon enrolment, in a selective high school, levels of self-esteem became more realistic as gifted students may have previously held elevated perceptions of their capabilities in a mixed ability environment.

Self-efficacy refers to a person's perception about their ability to achieve goals or complete challenging tasks (Bandura, 1986, 1997; Schunk, 1996). Self-efficacy is a component originating from Bandura's (1986, 1997) social cognitive theory which states that self-efficacy results from the interactions between performance, vicarious experiences, verbal persuasion and physiological state (Starko and Schack, 1989). Mathematical self-efficacy is related to students' perceptions of their ability to complete specific mathematical tasks. Gifted boys have been found to have higher mathematical self-efficacy compared to both females and average ability mathematics students (Benbow and Lubinski, 1991; Benbow and Minor, 1990; Hoge and Renzulli, 1993; Janos and

Robinson, 1985; Junge and Dretzke, 1995; Pajares, 1996a, 1996b, 2002; Pajares and Graham, 1999; Pajares and Kranzler, 1995; Ross and Parker, 1980).

Few studies have been completed about mathematical ability grouping, gifted mathematics programs being implemented in ability grouping environments, and mathematical self-efficacy in the secondary school. The research about specific regrouping of gifted adolescent mathematicians for instruction is scant, and there is minimal explanations of how and why regrouping gifted students for mathematics influences the three aspects of self-concept, self-esteem, and self-efficacy. It has been suggested that ability grouping for a specific curriculum area produces substantial academic gains in achievement, improves general attitude towards schooling and enhances self-efficacy in specific domains (Rogers, 2001a, 2001b; Kulik, 1992; Kulik and Kulik, 1991, 1992). Rogers' (2001a) meta-analyses of ability grouping and acceleration reveals that regrouping for mathematics instruction yields an effect size of 0.76, providing the curriculum is differentiated (Allan, 1991). If only the pace of instruction is altered and no differentiation occurs, the effect size reduces to 0.57.

Inherent in catering for mathematical giftedness is a curriculum creating opportunities to optimise students' potential (VanTassel-Baska, 1993). A goal in gifted education is to reach the 'optimal match' of curriculum with the needs of gifted students (Hoekman, McCormick, and Gross, 1999). It is argued that curriculum should be complex, fast-paced, rigorous and match the abilities and interests of gifted students (Gross, 1994, 1997, 2001; Rogers, 2001b; Sawyer, 1988; VanTassel-Baska, 1988, 1991, 1992, 1993, 1998). Matching curriculum to the needs of gifted students can be achieved through a range of curricular practices such as above level testing, curriculum compaction (Reis, Westberg, Kulikowich, and Purcell, 1998) and curriculum differentiation (Gross, Sleap, and Pretorius, 2001). Students should be able to compact the curriculum by completing a variety of pre-and above level tests (Starko, 1986).

The purpose of these tests is to ascertain knowledge and skills already mastered so that gifted students can complete work at greater depth and complexity or accelerate their learning. Mathematical giftedness can be defined by specific cognitive and affective characteristics. Gifted mathematicians exhibit many of the specific characteristics outlined in Table 1.

Table 1. Characteristics of Mathematical Giftedness

Formalised perception of mathematics
Solve complex problems (usually at a young age)
Logical thought about quantitative and spatial relationships
Think in mathematical symbols and flexibility of thought
Rapid and broad generalisations of relations and operations
Curtailment of mathematical reasoning
Rapid reconstruction of mental processes and reversibility of mathematical reasoning
Mathematical memory for relationships, arguments, proofs, principles of problems solving
Energy, persistence and concentration
Organise data to consider patterns or relationships
Analyses problems, considers alternatives
Learns mathematical concepts and processes faster than other students
Able to verbalise mathematical concepts, processes and solutions
May enjoy difficult problems, puzzles and logic problems
Develops unique associations, uses original methods for solutions
Sometimes solves problems intuitively, and may not be able to explain why the solution is correct

Adapted from: Feldhusen, Hoover, and Sayler, 1991; House, 1987; NCTM, 2000; Wieczerkowski and Prado, 1993

High school males have higher academic mathematical achievement results on standardised and class tests, and enhanced mathematical self-efficacy, compared to high school females (Junge and Dretzke, 1995; Lubinski, Benbow, and Sanders, 1993; Sowell, 1993; Terwilliger and Titus, 1995). Reviews of mathematics programs and characteristics of mathematically gifted students reveal

that high spatial ability, independence, motivation and flexibility of thought are indicative of very high mathematical achievement (Benbow and Lubinski, 1991; Benbow and Minor, 1990; Olszewski-Kubiliyus, Kulieke, Shaw, Wilhus, and Krasney, 1990; Stanley, 1993). Recognising that "curriculum is the medium through which learning occurs" (NCTM, 2000, p.31), gifted students should have opportunities to develop abstract thinking skills and engage in higher cognitive processing.

PROPOSED CASE STUDY

An explanatory case study is currently being conducted to investigate how regrouping gifted Year 8 students for mathematics influences aspects of self. The focus of the case study are five students from Year 8 Extension Mathematics (n=43), receiving a differentiated mathematics curriculum compared to students in the remaining six mixed ability mathematics classes (n=123), specifically analysing the affects of ability grouping on aspects of adolescent boys' self-concept, self-esteem, and mathematical self-efficacy. The students in the Extension Mathematics classes are representative of mildly, moderately and highly gifted students. Extension Mathematics is an example of regrouping for specific instruction (Rogers, 1991; Kulik, 1992).

The case study is theory-testing and will investigate the influence of ability grouping on mathematically gifted adolescents' aspects of self. It is envisaged that this research will inform practice in gifted education, mathematics education, and has relevance for aspects of psychology. The research makes the assumption that ability grouping for mathematically gifted adolescent boys will at least have a neutral effect on self-concept, self-esteem, and mathematical self-efficacy. Results from three standardised measures, Self-Esteem Inventory (Cooper-Smith, 1969/1989), Self Description Questionnaire II (Marsh, 1990), and Mathematical Self-Efficacy Scale (Betz and Hackett, 1983), will be analysed at pre- and post-test stages to understand the influence of regrouping for mathematics. Semi-structured interviews will also be used to gain further understanding about students' and teachers' perceptions of how and why ability grouping influences aspects of self. Students in the Extension Mathematics class will also complete a problem solving activity aimed at investigating aspects of mathematical self-efficacy.

The Extension Mathematics program is a gifted program that has implemented many recommendations from the research literature for gifted curricula. The guiding principles for the Extension Mathematics Program include: (i) rapid progression, (ii) acceleration, (iii) ability for abstraction and complexity, and (iv) solving challenging problems. Characteristics of gifted learners and gifted mathematicians which the program specifically addresses includes an ability to learn at a fast pace, dealing with complex and ambiguous concepts, intuitive perception to solve problems and use mathematical conventions, rapid and broad generalisations of relations and operations, mathematical memory for relationships, arguments, proofs, principles of problems solving, persistence and concentration, an ability to develop unique associations and use original methods for solutions (Feldhusen, Hoover, and Sayler, 1991; House, 1987; NCTM, 2000; Wieczerkowski and Prado, 1993).

Multiple selection criteria enable data to be collated about individual students. In 2003, the program structure maintains the schools' traditional structure of eight, Year 8 classes. As the mathematics classes are timetabled in two blocks, two Extension Mathematics classes were created. Other students remain in mixed ability environments. Figure 1 presents an illustration of the 2003 program structure.

RESULTS

Preliminary results for the two standardised measures for self-concept and self-esteem reveal consistencies with existing research as outlined previously. It is important to understand that the

measures were administered prior to selection for the Extension Mathematics program. Subcomponents of self-concept reveal gifted students have higher means compared to other Year 8 students in six of the eleven subcomponents, and have higher global self-concept means. Means were higher in mathematics, general self, honesty-trustworthiness, verbal, emotional stability, general school, and same-sex relations. Similar results were found in parent relations, with gifted students having a mean greater by 0.22. Slightly lower means for gifted students were found in physical appearance, physical ability, and opposite-sex relations.

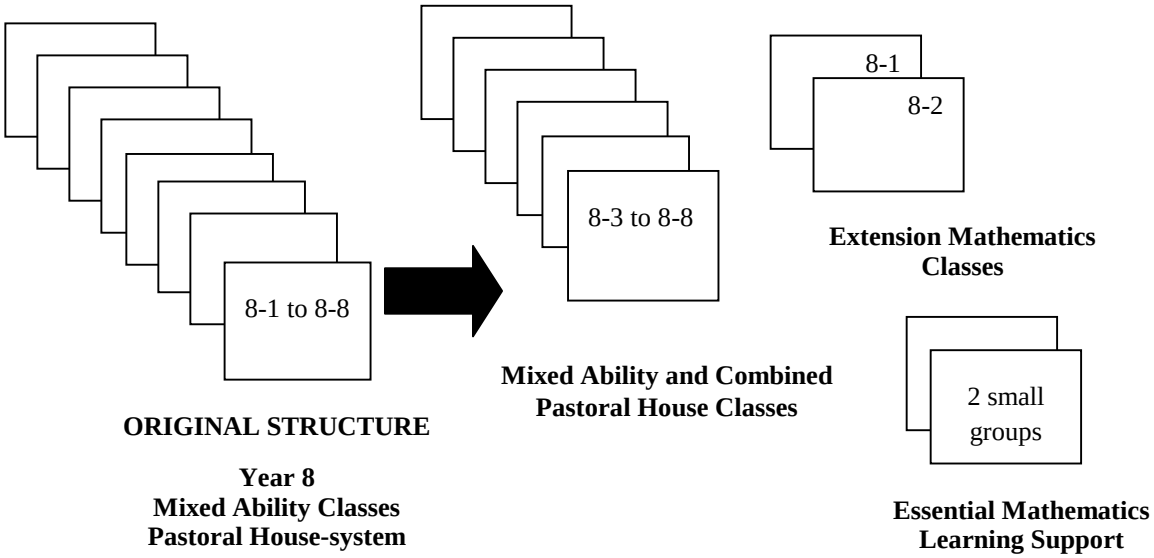

Figure 1. Structure for the Year 8 Mathematics classes

Analysis of self-esteem also reveals higher global and school/academic self-esteem, and home/parent relations. A higher mean difference of 0.26 was found for general self-esteem. Social self-esteem was lower compared to other Year 8 students with a mean difference of 0.23. Table 2 outlines means for the two measures. Comparison with the norms for self-concept and self-esteem reveals that both groups of students have higher means for all subcomponents of self.

FUTURE DIRECTIONS

Research about ability grouping and its influence on aspects of self is divided. Although some researchers strongly urge for ability grouping, other results indicate that ability grouping causes a decline in global self-concept and self-esteem. It seems that one of the agreements is that gifted students' global self-esteem remains higher compared to students of average ability. Research has revealed implications of ability grouping and usually in the context of full-time ability grouping and usually publishes results in the global scale and does not always indicate results from subcomponents of self-concept and self-esteem.

Generalising these results across all forms of ability grouping and in the secondary school should be cautioned. Research about students completing a differentiated program in the secondary school setting and its influence on aspects of self is scant. The current study is relevant as it addresses the gap in knowledge to ascertain how regrouping mathematics instruction influences aspects of self for gifted adolescent boys. Analysis of the data yet to be collected from the semi-structured interviews, problem solving self-efficacy activity, and post-test standardised measures will reveal how and why regrouping influences aspects of mathematically gifted adolescent boys' self-concept, self-esteem, and self-efficacy. In a time of rival propositions concerning boys' education and gifted education, the influence of regrouping gifted adolescent boys for mathematics instruction is paramount. A new millennium of research should continue to inform

professionals of effective pedagogy and productive partnerships that place students and the learning process as the central force which progressively drives contemporary and further educational systems. It is timely that rival theories be considered and that if necessary new theories be postulated about the education of mathematically gifted adolescent boys.

Table 2. Comparison of norms for self-concept and self-esteem

Subcomponent	Gifted Students	Other Year 8 Students	Normed Means (Year 9)
Self-Concept			
Mathematics	51.12	42.78	37.5
Physical Appearance	35.74	36.51	34.2
General Self	52.28	49.81	49.1
Honesty-Trustworthiness	49.53	46.98	41.8
Physical Abilities	38.88	39.63	38.0
Verbal	47.23	43.10	39.2
Emotional Stability	45.14	44.59	41.5
Parent Relations	42.65	42.43	39.1
General School	52.02	46.70	43.3
Same-Sex Relations	53.37	51.66	46.0
Opposite-Sex Relations	37.12	38.72	35.2
Global Self-Concept	501.84	482.53	444.8
Self-Esteem			
General	41.81	41.15	33.2
Social	13.3	13.07	10.9
Home/Family	13.4	12.96	9.1
School/Academic	12.7	11.87	7.9
Global Self-Esteem	81.21	79.06	61.2

Source: Coopersmith (1989); Marsh (1990)

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Providing a culturally responsive environment for gifted Maori learners

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Despite the multi-categorical concept of giftedness having widespread acceptance throughout the world, cultural giftedness does not appear to be widely recognised or provided for. This paper examines what cultural giftedness means for Maori (the indigenous people of New Zealand) and describes how a culturally responsive learning environment can contribute to identifying and providing for gifted Maori students. While the paper focuses on gifted Maori learners, the underlying principles are relevant to gifted students from any ethnic minority group. Readers will be challenged to reflect on and share how they recognise and provide for cultural giftedness in their particular area of involvement.

Maori, culture, identification, diversity, gifted

INTRODUCTION

This paper is written as a series of reflections and responses. The initial title for this paper, which I subsequently changed, used the term "culturally gifted". I do not know what it is like in other countries, but from my experience in New Zealand I have learnt that when you talk about cultural giftedness people equate this with exceptional ability in various cultural arts, crafts, music, traditions and ethnic languages. Examples are the Samoan pupil who makes brilliant tapa cloth, the Aboriginal student who is an expert on the didgeridoo or the Maori child who delivers inspirational *whaikorero* (traditional speeches). While these are all important manifestations of cultural giftedness, culture does, in fact, have a much broader influence on the concept of giftedness. It is this wide-ranging influence that is the focus of this paper.

The examples given relate to giftedness from a Maori perspective. However, I must make an important point from the outset. Like any other people, Maori are a diverse group. They differ in lifestyle, beliefs, values, socio-economic circumstances, religious and tribal affiliation, geographic location, degree of acculturation and knowledge and practice of their Maori culture. I am not claiming to present the Maori viewpoint on giftedness but rather a Maori perspective that arose from research studies involving people who identify with and adhere to their Maori culture (Bevan-Brown, 1993, 2002).

CULTURE AND GIFTEDNESS

For Maori, culture influences giftedness in a variety of ways. First, there is the 'cultural giftedness', mentioned above, that is, being exceptional in Maori arts, crafts, music, historic and cultural knowledge and traditions, *whakapapa* (genealogy) and *te reo* (the Maori language). Examples are people like Peter Sharples who is a gifted exponent of Maori *haka* and other performing arts; Cliff Whiting who carves brilliantly in both traditional and contemporary styles, Erenora Hetet whose weaving is exceptional, Tuini Ngawai who composed some of the most famous Maori *waiata*, (songs), Tom Te Maru who has an extensive knowledge of Ngati Porou

whakapapa, Patricia Grace who is a wonderful story teller, and Whaea McClutchie whose speeches on the *marae* have people spellbound.

Reflection

In our schools are we providing opportunities for students who are gifted in cultural areas to be recognised and extended? Does developing excellence in these areas receive the same priority, status, funding and time commitment as developing excellence in academic subjects? If cultural expertise is not treated equitably, what message does this give students from minority cultures?

Second, cultural giftedness for Maori not only includes exceptionality in cultural skills, abilities and knowledge but it also includes exceptionality in culturally valued qualities. Some qualities that have been identified include *awhinatanga* and *whakaritenga mahi* (helping and serving others), *mäia* (courage, bravery) *manaakitanga* (hospitality), *wairuatanga* spirituality), *whanaungatanga* (famliness), *aroha-ki-te-tangata* and *tütohutanga* (love for, caring and sensitivity to others) *pukumahi* and *pükeke* (industriousness and determination) (Bevan- Brown, 1993; Jenkins, 2002). These qualities are probably considered important to most, if not all people. Certainly, emotional intelligence, intrapersonal intelligence and spiritual intelligence have received increased recognition internationally with the work of Goleman (1995), Gardner (1993) and Sisk and Torrance (2001). However, it is doubtful whether they are accepted as widely in gifted education as other more academically focused intelligences. For Maori, providing for students who are gifted in culturally valued qualities is just as important as providing for students who have exceptional skills and abilities.

Think of gifted learners from ethnic minority groups that you work with. Do they have any culturally valued qualities that are important components of their concept of giftedness? Are students who are outstanding in these qualities being recognised and provided with opportunities to display and extend these qualities?

Third, culture has an important influence on the way that widely accepted abilities are interpreted, recognised and demonstrated. The abilities referred to here are those listed in many of the popular multi-categorical definitions of giftedness: abilities such as intellectual, academic and physical, leadership, creativity, the visual and performing arts and so forth. These abilities can vary from one culture to the next in the way they are understood, in their characteristics and in how they are manifest. A Maori example will illustrate this point.

Three different styles of leadership have been identified for Maori (Bevan-Brown, 1993) There is ‘up-front’ leadership and leadership by example – both similar to leadership styles familiar worldwide. However, a third style involves a ‘behind-the-scenes’ genre where the leader provides emotional support, guidance and inspiration in a quiet, unassuming way. When teachers seek to identify and provide for their Maori students who are gifted leaders, they must take all three types of leadership into consideration, not just the two styles that are similar to Western concepts of leadership.

A further example relates to creativity. There is general agreement about many of the characteristics of creatively gifted children, for example, exceptional ability to produce a variety of ideas and to develop and extend them, to take different approaches, view a situation from many perspectives, identify problems, think critically, separate the relevant from the irrelevant, see relationships and make intuitive leaps. (Davis and Rimm, 1989). However, these characteristics can be exhibited in different ways by learners from different cultures. For example, the ability to ‘read between the lines’ depends on your particular ‘life script’ – what constitutes an ‘intuitive leap’ in one culture may have no meaning at all in another. Similarly, what is considered ‘relevant and irrelevant’ in creative problem solving will very much depend on your culture, socio-economic status and life circumstances.

Reflection

In identifying and providing for areas of giftedness in our schools, are differing cultural understandings and characteristics of various abilities taken into consideration? Do we interpret the behaviours and answers students provide through a lens that is appropriate to their culture? Or do we identify, interpret and provide for giftedness only from a majority cultural viewpoint?

Finally, culture not only influences the areas in which giftedness is recognised and the ways giftedness is demonstrated, but it also influences the fundamental nature of giftedness itself. There are three aspects of the Maori concept of giftedness that illustrate this point. Firstly, my research has shown that for Maori, both individual and group giftedness exist. The latter is exceptional ability that arises from group effort rather than individual talent. This is most easily understood in a musical context. While a band may have many talented members, it is playing together that produces an outstanding performance. Individually the members are not 'gifted', together they are! In Maori there is a word, *kotahitanga* that describes this process of acting in unity. Giftedness arises from this unity and therefore it must be nurtured and developed in this context.

Secondly, Maori can have group 'ownership' of giftedness. There are two types of group ownership, the first being the *whanau* (extended family) ownership of a particular talent or gift that is passed down from one generation to the next. These gifts are cultural skills, abilities or qualities such as *karanga* (the art of calling on and welcoming people to a formal gathering). The second type of group ownership of giftedness is not restricted to cultural skills, abilities or qualities and can be best described in relation to Sir Apirana Ngata. Apirana was an outstanding Maori leader and politician. Not only was he a *tohunga* (expert) in Maori knowledge but when he was in parliament he was also the most highly qualified member by western academic standards. Apirana was especially chosen to be the repository of important Maori knowledge and was supported by his family to go to College and University. While he was the gifted individual, his giftedness was considered to be shared by his family because he was enabled to develop it through their hard work and support. A third aspect of giftedness that is possibly unique to Maori is the 'service' component. In order to be considered 'a gifted Maori', not only must you be exceptional but you must also use your outstanding skill, ability or quality to help others in some way.

Reflection

Group giftedness, group ownership of giftedness and the service component are all aspects of a Maori concept of giftedness, which must be taken into consideration in identifying and providing for gifted Maori students. They illustrate the point that cultural influence on giftedness is multifaceted. Again think of gifted learners from ethnic minority groups that you work with. Do you really know what giftedness means to them? Are you aware of any components of giftedness that are unique to their culture and if so, are you taking these into consideration in identification and provision?

PROVIDING A CULTURALLY RESPONSIVE ENVIRONMENT FOR GIFTED MAORI LEARNERS

At the heart of successful education for all Maori students is the provision of a culturally responsive environment. By this I mean an environment where the learner's culture is valued, affirmed and developed. In such an environment students' self-esteem is enhanced because they are given "positive feelings about their worth as individuals and as productive members in their classroom" (Montgomery, 2001, p.6). Likewise, students' learning is facilitated because their educational and home environments are culturally compatible. They are able to utilise familiar learning strategies and to relate new information to prior knowledge. In a culturally responsive environment students are more motivated to learn, they feel psychologically secure and thus are

able to concentrate fully on required academic tasks (Gay, 1994). Apart from these general advantages of a culturally responsive environment, there are specific benefits for gifted Maori students. Research has indicated that Maori children who have a knowledge of and pride in their Maori culture are more likely to develop their gifted potential and to resist negative peer pressure against achieving (Bevan-Brown, 1993).

For Maori students a culturally responsive environment has a number of essential ingredients.

Four of these are:

1. Teachers who value and support cultural diversity in general and Maori culture in particular. In my experience I have found Maori students especially sensitive to people's attitudes towards Maori. Many appear to have a finely honed perceptive ability to detect people who are biased, insincere or culturally patronising. Once detected these people may be avoided, challenged, discounted, ignored or treated in some other disrespectful manner. On the other hand, I have also found Maori students respond very positively to people they perceive as valuing them and their culture. Having a teacher they relate well to and respect is particularly important for gifted Maori learners. Research shows that this is often a crucial factor in determining whether gifted potential is realised or not (Bevan-Brown, 1994).

Detailed knowledge of Maori culture is not a pre-requisite to valuing it. Students respect teachers who admit their shortcomings and actively strive to increase their cultural understanding. However, providing a culturally responsive environment is obviously a lot easier for a teacher who has a sound knowledge of Maori culture. In addition, in order to provide effectively for gifted Maori students, teachers also need an understanding of how culture impacts on giftedness, of Maori concepts of giftedness and of the consequent implications for identification and provision.

2. Programs that incorporate cultural content including cultural knowledge, skills, practices, experiences, customs and traditions. In a culturally responsive classroom the inclusion of cultural content is part and parcel of the general classroom program. For example, Maori content may include waiata and haka in music; stories about Maori characters and novels by Maori authors in reading and language; Maori history in social studies; the study of native plants in science; carving and weaving in art.

Apart from the previously mentioned cognitive and affective benefits of including such content, it also provides opportunities for Maori students who are gifted in these areas to surface and be identified. However, identification is just the first step. Once identified these gifted students must be provided with opportunities to extend their abilities. An excellent example of this was provided by a teacher of a student gifted in the Maori performing arts: What we did with Mere was we put her in charge of a production. *Heta* (a teacher) kept an eye on her but essentially she created the whole show – wrote the script and waiata, made up the actions, taught them to other kids, organised the practices. The show was performed for the *whanau* and they were blown away (Bevan-Brown, 2000, p.1).

3. Programs that incorporate cultural values, beliefs, attitudes, behaviours and dispositions. Gorman (1999) and Wilson (1997) maintain that adding cultural content to programs is not enough. Cultural values, behaviours and dispositions should also be incorporated. Gorman (1999, p.166) urges educators to develop strategies that build on, rather than change, the cultural dispositions of students and that emphasise being rather than doing; address the past and present rather than only the future; and promote harmony with nature, rather than subjugation of nature.

Although Gorman was referring to Native Canadian students, his quote is equally relevant to Maori students in general and gifted Maori students in particular. The ‘being’ Gorman speaks of

equates to many of the 'qualities' identified in the Maori concept of giftedness described previously.

For Maori students a culturally responsive environment is a place where spirituality is valued and acknowledged, where perseverance is rewarded, where caring for others is expected and encouraged and where there are opportunities to work cooperatively in groups and to be of service. Just as the inclusion of cultural content allows cultural abilities to surface and be identified, the incorporation of Maori values allows Maori learners to demonstrate culturally valued qualities. As Milne (1993) asks, how can a student who is gifted in *manaakitanga* be recognised if hospitality is not a valued, integral part of the classroom program? Similarly, how can group giftedness be identified if students are not provided with many opportunities to work together?

An example of the 'service' component of Maori giftedness was provided by a teacher who worked with a group of students who had advanced ability in the Maori language. These students were required to analyse published stories for young children to determine the components of a successful children's story. They researched topics of interest to young children by spending a morning in a *kohanga reo* (Maori immersion early childhood centre) and then wrote and illustrated their own children's book. Finally, the completed stories were read to the *kohanga reo* children and a copy of each book was donated to the *kohanga reo's* library.

4. Teaching and assessment that utilises culturally preferred ways of learning. Matching teaching and learning styles eliminates "disjunctures in how different students learn in their cultural communities and how they are expected to learn at school" (Gay, 1994, p.6). The literature reveals many teaching and assessment strategies that are deemed to be culturally appropriate and preferred by Maori students (see for example, Glynn and Bishop, 1995; Hemara, 2000; Metge, 1984; and Walters, Phillips, Oliver and Gilliland, 1993). While being mindful of the danger of stereotyping Maori children and of the fact that gifted students are often claimed to be qualitatively different thinkers (Hallahan and Kauffman, 1991), a number of culturally preferred ways of learning appear to be especially appropriate to gifted Maori students. The use of mentors is one teaching approach that has particular relevance as it was successfully used in traditional times to educate gifted learners (Best, 1974; Buck, 1950; Metge, 1983) and continues to be a popular, effective teaching strategy. A teacher from a *kura kaupapa* Maori (total immersion Maori primary school) explains:

Once a particular talent is identified we look for someone within the *whanau* (extended family) who can take the child under their wing and nurture that talent. Their job is to encourage and teach. The *whanau* member can come into the *kura* (school) and work with the child and maybe others or perhaps the child will go out of the *kura* to work with that person. This can be in school time, after school or at the weekend. It doesn't really matter. It depends on what is most appropriate and what opportunities arise (Bevan-Brown, 2000, p.1).

CONCLUSION

There are two main aims in this paper. The first is to raise awareness of the significant and multifaceted influence culture has on giftedness. Hopefully my examples of what giftedness means to Maori illustrate this and have broaden your understanding of 'cultural giftedness'. My second aim is to emphasise how important it is to provide a culturally responsive environment. For gifted Maori students it is an effective means of recognising and developing their outstanding skills, abilities and qualities. I feel confident that a culturally responsive environment will also be beneficial to the gifted students from ethnic minority groups that you are involved with. I challenge you to find out if I am correct!

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Policy development and practice: The New South Wales experience

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Three key documents are being used for the revision of the NSW Policy for the Education of Gifted and Talented Students and its associated implementation strategies (originally published in 1991). These documents post-date the 1988 report by the Senate Select Committee on the Education of Gifted and Talented Children. The three documents which are the focus of this paper are the Australian Association for the Education of the Gifted and Talented national position paper (1996); the NSW Ministerial paper on the Quality of Teaching (1999); and the 2001 Australian Senate Enquiry report.

Policy, gifted, identification, provision, accountability

INTRODUCTION

This paper provides a brief overview of each of the three key documents that comprise it. The findings of the papers, their terms of reference and their specific policy issues are then evaluated in terms of how they instruct the revision of policy in New South Wales.

Document 1. ***Australian Future: A National Position Paper on the Education of Gifted and Talented Students***

This paper was written to 'provide a broad theoretical and functional framework to complement and support the policies developed in States and Territories' (AAEGT, 1996). It argued that a significant number of gifted students are not readily identified or catered for by school systems, including:

- disadvantaged populations;
- students with divergent aptitudes; and
- students of profound ability who do not demonstrate conventional behaviours associated with school-based achievement.

Document 2. ***Professional Development for Teachers: Identifying and Catering for the Needs of Gifted and Talented Students***

This report advised on the professional development of teachers to identify and cater for gifted students (NSW, 1999). Through a literature review it observed that:

- a practicum component of initial teacher education can be beneficial (Feldhusen and Huffman, 1988; Leroux, 1987);
- professional development is needed (Pears, 1993);
- university post-graduate courses and teacher employers' professional development programs are effective (Hansen and Feldhusen, 1994; Sexton, 1995);

- staff development involving parents, teachers and students broadens views about giftedness and understanding of the educational needs of gifted students (Copenhaver and McIntyre, 1992; Roberts, 1993);
- networking is key to the success of gifted programs (Larsson, 1986; Shaw, 1990);
- staff training is important for differentiation of curriculum in the regular classroom (Reis and Westberg, 1994);
- teacher training is important to meet the needs of high ability students in mainstream classrooms (Coleman, 1995; Goree, 1996);
- training of teachers and multiple measures are needed to identify gifted students from minority groups (Baldwin, 1987; Parks, 1994; Van Tassel-Baska et al., 1991); and
- particular interventions are required for gifted learners in special populations (Van Tassel-Baska, 1994).

The main findings were that:

- identification of gifted students requires a variety of strategies;
- identification of students from different cultural backgrounds requires teachers who understand the values and attitudes of the various groups;
- teachers are unlikely to acknowledge giftedness in those of low socioeconomic status (SES) or in indigenous or ESL students;
- teachers in the regular classroom need to be able to identify gifted and talented students and to have the appropriate skills to cater for them;
- acceleration as a strategy for gifted students has become popular, and in combination with curriculum differentiation, extension work, enrichment activities and mentoring may meet the educational needs of individual students;
- teachers in specialist classes or schools may need additional professional development to cater for the needs of their gifted and talented students;
- the compulsory core of teacher education courses lacks a component in gifted and talented education; and
- professional development and networking opportunities are needed in gifted and talented education.

Document 3. ***The Education of Gifted Children***

In 2000, the Australian Senate referred an inquiry into the education of gifted and talented children to its Employment, Workplace Relations, Small Business and Education References Committee. The purpose of the inquiry was to review developments since the 1988 Senate Select Committee report. The committee considered the means to identify gifted and talented children, the adequacy and equity of gifted and talented programs, the relationship between achievement and socioeconomic status, and the appropriate role of the Commonwealth.

The committee's report noted some positive developments since 1988 but concluded that much remained to be achieved (Senate, 2001). All interest groups represented at the inquiry recognised problems in education of gifted students, such as underachievement, boredom, frustration and psychological distress, due to special needs not being met. The report commented particularly on negative attitudes towards giftedness. It noted a lack of awareness that giftedness occurs regardless of socio-economic status, rural isolation, physical disability or ethnicity. A further key

finding was that teacher training, essential to identify and cater for gifted and talented students, was not being provided. The committee also concluded that differentiation of the curriculum to cater for gifted students was inadequate, under-resourced, uneven across jurisdictions and often misunderstood. Confusion existed over what constitutes enrichment, extension and acceleration.

GENERAL FINDINGS

The following issues were emphasised in each of the key documents.

Definitional variations

States and Territories use a range of definitions of the terms 'gifted' and 'talented'. Some differentiate these terms whereas others use them interchangeably. Some refer to 'high intellectual potential' or 'exceptional abilities'. The MACQT report noted that the definitions expressed in the Differentiated Model of Giftedness and Talent (DMGT: Gagné, 1995) are well supported by research and have been adopted by the Board of Studies in NSW.

Identification: Problems related to practice and inclusion

States and Territories are philosophically committed to multiple criteria for identification of gifted and talented students. For the most part, however, identification relies on teacher nomination and test performance. Consequently, students selected for programs are generally those who achieve in class. Students who are from minority or rural backgrounds, of low SES, indigenous, learning or physically disabled or underachieving may be overlooked.

Lack of expertise of teachers

Policies and support documents from all States and Territories provide ideas about curriculum differentiation for gifted students. Acceleration is increasingly popular in NSW, in combination with curriculum differentiation, extension work, enrichment and mentoring. However, this requires teacher expertise and time.

Teacher training

The level and quality of pre-service and ongoing training in gifted education vary among Australian universities. The MACQT report observed that in initial teacher education in NSW there is:

- no requirement from teacher employers that the compulsory core include gifted education, and
- negligible or no attention to gifted education in the compulsory core of teacher education courses.

OVERVIEW OF AUSTRALIAN POLICIES ON GIFTED EDUCATION

Eight Australian departments or ministries of education have developed policies that provide, to varying levels of detail, the:

- rationale for gifted education,
- general definition of giftedness or talent,
- approaches to identification,
- provisions,
- programs available at State level,
- lists of resources, and
- contact persons.

The education of gifted and talented students is often not recognised as an equity issue by educators or politicians in Australia. A major challenge is to provide for individual excellence while not invoking criticisms of elitism and privilege. Braggett and Moltzen (2000, p.780) complained of 'little realisation that giftedness is culturally based, that talent is developmental…, and that both are intricately related to motivation, self-confidence, interest and sustained effort'. An increased level of teacher awareness about gifted educational issues relies on well publicised government policy.

Provision for gifted students within mainstream classes is increasingly emphasised. This has produced positive outcomes but there is a danger that the most advanced students may be ignored. It is important that provisions for gifted students of varying ability levels are adequate and appropriate (Braggett and Moltzen, 2000).

The NSW *Policy for the Education of Children with Special Talents*, published in 1983, was followed by the *NSW Policy for the Education of Gifted and Talented Students* and associated implementation strategie*s* in 1991. This policy recognised that gifted students exist in all communities, irrespective of ethnicity or socio–economic background, and that schools have a responsibility to identify them and educate them to their full potential. Seven policy statements were outlined, as listed below.

1. School communities have a responsibility to identify their gifted and talented students.
2. School communities have a responsibility to provide a range of opportunities for their gifted and talented students.
3. Teachers have a responsibility to identify the gifted and talented students in their classes.
4. Teachers have a responsibility to select a variety of teaching strategies for inclusion in the programs for the range of gifted talented students in their classes.
5. Regions and schools have a responsibility to coordinate school provisions for gifted and talented students when it is feasible for more than one school to share this responsibility.
6. Regions and schools have a responsibility to provide staff development opportunities for principals, teachers and other appropriate school personnel in the education of gifted and talented students.
7. The Director-General and the Central Executive have a responsibility to account for the implementation of government policy and to report on the outcomes of schooling for gifted and talented students in NSW government schools.

Relevant documents can be accessed at http://www.curriculumsupport.nsw.edu.au/. A companion document, titled *Guidelines for Accelerated Progression – Revised 2000,* is available at http://www.boardofstudies.nsw.edu.au/.

Terms of reference

The terms of reference for the current revision are to:

- examine the current Department of Education and Training (DET) Gifted and Talented Policy (1991);
- determine whether it is suitable and sufficient to guide provision in relation to the definition of gifted and talented students the means of identifying gifted and talented students equitable access to support for all gifted and talented students the range of provision for gifted and talented students;

- report on current provision for the professional development needs of teachers to identify and cater for gifted and talented students; and
- not extend to consideration of structural changes to specialist classes or specialist school groupings. (NSW presently has 70 schools with 111 opportunity classes for academically gifted students in Years 5 and 6 of primary school. There are 28 selective high schools comprising 17 fully selective high schools, 4 selective agricultural high schools and 7 high schools with selective classes.) A reference group of representatives from key organisations was established to oversee the policy revision and provide submissions. In the second phase experts in gifted education provided advice about policy improvements. The third phase of the project involves school surveys. Twelve representative schools have been selected at random for surveying. Principals, teachers, school counsellors, parents and students are included in the survey process.

Policy Issues and NSW Policy Improvements: Definition of giftedness and talent

The reference group has agreed that the definition should be research-based, accessible to teachers and have a direct and logical connection to identification programs and programming strategies. Gagné's (2000) model is highly regarded nationally because it recognises the dynamic factors involved in the processes of learning, including skill development and self-efficacy.

Identification

The use of nomination, screening and monitoring is well supported by research. The same applies to off-level testing, which has been considered by the reference group for possible inclusion in the revised Policy as a way to pinpoint a student's level of ability (Gross, personal communication 2003). The current NSW policy does not include a formal definition of under-achievers. In particular the terms 'invisible underachiever' and 'deliberate under-achiever' are not precisely defined (Chaffey 2003, personal communication). Teachers need to recognise under-achievers in order to intervene.

The factors contributing to underachievement must similarly be addressed. This condition is often concordant with underlying social and emotional issues as well as immature cognitive and meta-cognitive processes. These issues need to be addressed initially, to allow students to reach their potential eventually. Lack of self-efficacy or a fundamental lack of self-belief, as opposed to self-esteem or self-concept, is evident in these students. Self-esteem will generate from improved self-efficacy. These issues can be addressed in an identification program by employing a dynamic testing model (Chaffey 2003, personal communication).

Historically, parents have had to take the initiative to draw attention to the needs of their gifted child. A closer, more systematic approach to generate information flow between parents and schools may need to be incorporated into the new Policy.

Provision

The reference group has been considering whether schools should implement policy developed through community consultation and should have a school-based gifted and talented coordinator. Such a coordinator would have expertise in Board of Studies and Department of Education and Training policies, and have an ongoing responsibility for informing staff and parents about gifted educational opportunities.

Of the recommended practices for gifted students, acceleration and grouping strategies are most strongly supported in the literature (Van Tassel-Baska, 2000). The only intervention mentioned in

detail in the current NSW policy is acceleration. The reference group has considered the option of communicating an expanded concept of acceleration. For example, curriculum compacting, telescoping the curriculum and online learning can also expedite student access to the syllabus.

Forms of ability grouping could also be more detailed. Flexible grouping of students by ability within particular domains, including cluster grouping to provide social interaction and cross-grade learning opportunities for younger students, has support from research literature (Rogers, 2000; Van Tassel-Baska, 2000).

Appropriate models of provision and differentiation need to be described to assist teachers to address diversity. The new policy could provide, for the school community, an amplification of the rationale for differentiation. It could also give greater attention to appropriate adjustment of the level, pace and degree of abstraction of curriculum. Scope exists to expand the use of technology for learning centres, mentor programs and student and teacher networks for students of metropolitan, regional and rural backgrounds.

Accountability

The translation of policy into practice in the NSW government school system from 1977 to 1990 was investigated by Forster (1993). The analysis of how policy became practice was achieved by using a 'policy making framework'. The first stage of the framework was *normative* relative to the purpose of the educational system. The second was *strategic* relative to the way that the purpose could be achieved, and the third was *operational* relative to how the first two stages can be implemented. The fourth stage was *administrative* relative to what is done to achieve the purpose (Forster, 1993).

Forster (1993) aligned the four types of decisions within the structure of the then NSW Department of School Education. She concluded that with the advent of the 1991 policy, the matching of commitment, needs and educational initiatives had a better chance of making opportunities for gifted students a reality. With a new policy being developed, this matching needs further consideration.

A model whereby districts are supported by an overarching State infrastructure warrants further consideration. For example, a strengthening of the relationship between the Department of Education and Training (DET) and the Board of Studies (BOS), with greater opportunities for collaboration to support district personnel, would be desirable. District personnel can work strategically to assist with the identification of and provision for gifted students. The modelling and sharing of best practice at the school level is necessary for policy to become an effective reality. Currently, principals have the prime responsibility, in consultation with their staff, for deciding how gifted students are catered for in their schools. An expansion of the annual school reporting process to include outcomes in gifted education is an option for the communication about provision for these students. Consideration could also be given to monitoring of policy implementation by the institutionalisation of an on-going reference group.

Professional development

Few universities in NSW offer specialised training in gifted education. All pre-service teachers need to take a mandatory course in gifted education, as research indicates that qualified (post-graduate study) teachers should be equipped to implement necessary educational strategies for gifted students (Rowley, 2002). Training is needed at all levels of the school community to link identification to effective intervention. For example, training courses for gifted and talented coordinators coupled with annual briefings supported by DET and BOS personnel would be advantageous. Schools currently have the responsibility to provide regular staff development

opportunities in gifted education for administrators and teachers. However, it would be beneficial if different levels of training/qualifications were specified and accredited.

CONCLUDING REMARKS

Just as the 1991 NSW policy was advanced in being solidly underpinned by research findings, the current process of policy revision has brought into focus recent research findings on the diversity and characteristics of the gifted population. Policies need to include definitions of giftedness and talent that communicate to teachers more clearly the population of students that is currently under-served (Senate Report, 2001). A shared understanding of the nature and variety of the gifted population is necessary for their identification.

Educators need training in identification procedures and tools to diagnose students' profiles of abilities. Training for educators and parents is also essential to implement the range of practices and strategies that are recommended for gifted students. A more school-focused approach with stronger home-school partnerships could optimise student development. The instigation of specific and systematic initiatives could further enable the effective translation of policy into practice. Action research and models of provision and best practice – so called 'real world stuff' - need to be shared. As Forster (1993) observed, coherence between the various phases of the 'policy making framework' is critical to the comprehensive implementation of policy to avoid inadequate or ad hoc provision for gifted students in NSW specifically and Australia in general.

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Critical curriculum components in programs for young gifted learners

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There continues to be a need for providing teachers of young gifted learners with best-practice approaches for the development of curriculum in gifted education programs. Too often, early childhood gifted programs have focused on academic acceleration, and neglect to consider developmentally appropriate approaches to designing curriculum and implementing instruction. This paper presents the Critical Curriculum Components Model as a guide for early childhood educators to consider. It also proposes that that this model can serve as an evaluative tool to analyse existing programs.

Curriculum, programs, young gifted learners, United States

INTRODUCTION

The Pre-K to Grade 12 Gifted Program Standards developed by the National Association for Gifted Children in the United States (1998) state that "gifted education programming must evolve from a comprehensive and sound base" (p.3) and that "differentiated curriculum for the gifted learner must span grades pre-K-12" (p.1). Gifted education approaches to developing curriculum and instruction can be found throughout the literature in the form of a variety of models. However, many of these curriculum models have not explicitly considered and incorporated the elements of a developmentally appropriate curriculum for young gifted learners. Although some differences exist between the approaches, there are many similar components that appear to be essential to the development of an effective and appropriate curriculum that acknowledges the gifted student's individual educational and social-emotional needs and abilities. Therefore, identifying the critical components of each curriculum model can offer significant insights and strategies to developers of early childhood gifted programs.

There are many well-established and influential approaches to curriculum development from the fields of gifted education and early childhood education. For example, curriculum models and approaches for gifted education include The Autonomous Learner Model (Betts and Kercher, 1999) The Integrative Education Model (Clark, 1986), and an inclusion approach advocated by Smutny, Walker, and Meckstroth (1997). Early childhood approaches include Montessori (1967/1995), Reggio Emilia (Edwards, Gandini, and Forman, 1998), and the High Scope program (Schweinhart and Weikart, 1993). Combining both can provide information that holds considerable promise for the development of comprehensive curriculum models for the effective teaching, development, and optimal learning of young gifted children. In order to adequately combine gifted and early childhood models, there is a need to examine the available approaches

and models in order to provide a framework of critical curriculum components for teachers to help them prepare challenging, developmentally appropriate programs to meet the needs of young gifted learners.

The purpose of this study was to identify the essential components of several curriculum development models in order to create an effective, holistic curriculum program for use with Pre-K gifted learners. One outcome of the study was the development of the *Critical Curriculum Components Model* (*C3 Model)* that not only addresses gifted Pre-K curriculum but, also, can be applied to gifted curriculum for all ages of learners. This paper briefly explains the development of the *C3 Model* and provides details of each component. Finally, suggestions are made for uses of the model in current programs and in the development of new programs.

EXAMINING THE LITERATURE

A number of early childhood curriculum approaches and gifted curriculum approaches were examined in the meta-analysis of the literature. Only six of the approaches were found to comprehensively address most if not all of the critical curriculum components are presented here. Those approaches include three that focus on young gifted learners and three that were developed for general early childhood education programs.

Of the gifted models that were considered, Smutny's, et al. (1997) regular classroom approach spoke specifically to the Pre-K curriculum and needs of gifted children four to eight years old; while Clark's Integrative Education Model (1986) and Betts' and Kircher's Autonomous Learner Model (1999) offers a well-rounded approach to the development of curriculum from Pre-K to high school that addressed the cognitive, academic, and social-emotional needs of the gifted learner. Three early childhood education program models that presented the most comprehensive approaches to curriculum development were High Scope (Schweinhart and Weikart, 1993) that offers scientifically-based information, Montessori (1995) which offers both individual and group information, and Reggio Emilia (Edwards, et al. 1998) which offers a constructivist approach.

The six approaches were analysed to determine in what way they were effective in the development of curriculum programs for young gifted learners. The analysis revealed that there were seven common components across the highly effective curriculum development models and approaches. These components include (a) a stated philosophy, (b) an explicitly planned environment, (c) a focus on interpersonal interactions that facilitate optimal learning, (d) a developmentally appropriate curriculum plan, (e) instructional strategies that successfully challenge the individual learning needs of the student, (f) systematic student assessment using a variety of methods, and (g) research that provides accountability for the approach and justification for its use.

THE CRITICAL CURRICULUM COMPONENTS MODEL

Consideration and inclusion of seven components in some form are critical to the development of comprehensive curriculum that is effective *and* developmentally appropriate for young gifted learners. Using all of the components identified by the *Critical Curriculum Components Model (C3 Model)* can be compared to an artist using varying degrees of all the various hues of paint on the palette (Figure 1). The early childhood educator uses the palette of critical curriculum components, mixing and blending them together and choosing variations of each, to create an effective educational program for all children, including the young gifted learner.

The seven critical components can assist early childhood educators in two major ways. They can be used to develop new programs and curriculum by facilitating the educators ability to judge various approaches and models to determine which aspects would be effective in the early childhood educator's particular teaching and learning setting. Secondly, the components provide a

means by which existing programs and curriculum can be examined, analysed, evaluated, and adjusted.

Figure 1. The educators' palette of critical curriculum components for creating effective and appropriate learning for young gifted students

As we worked to come to a common understanding of the components and developed a definition of each component in terms of early childhood education, it became apparent that the seven common components could be easily used in program and curriculum development at all levels of education. However, for this particular paper, the components of the model are viewed in the context of curriculum development for young gifted learners. The definition for each component is shown in Table 1.

Table 1. Definitions of the Critical Curriculum Components

COMPONENT	DEFINITION
Philosophy	A statement of foundational educational values and beliefs.
Environment	The purposeful arrangement of equipment/materials/people, space, lighting, and use of time in all indoor and outdoor environments.
Interpersonal inter-actions	Professional-to-child, child-to-child, professionals-to-parent, and professional-to-professional interactions; includes individual and collaborative models for professionals, and individual and grouping models for children.
Curriculum	A written plan for learning experiences, including objectives/ standards, selection and organisation of content, appropriate learning experiences, and determination of the most appropriate sequence for learning activities.
Instruction	The method in which the curriculum is delivered such as direct, individual and group instruction.
Assessment	The use of a variety of strategies in order to (a) determine a child's development, strengths, needs, (b) document progress, and (c) make decisions for child and program improvement..
Research	Verification that program choices and decisions are validated through on-going research efforts.

Teachers seldom use exclusively one program approach or curriculum development model. Experienced teachers tend to describe their approach to teaching as eclectic in nature, selecting various components from a number of different models, approaches, and writers as they develop curriculum, making the *C3 Model* one that fits current practices.

A matrix to facilitate this selection process is presented in Table 2. Early childhood educators can use the seven critical curriculum components in the matrix as criteria to analyse single or multiple approaches. Aspects of each approach that address a critical curriculum component can be written in that component row under the approach name. In this way a 'picture' can be 'painted' of each approach allowing the early childhood educator to easily see and compare the components of the approaches and determine the appropriateness and viability of their inclusion in a specific program.

Table 2. Analysis Matrix for Evaluating Curriculum Development Models and Approaches Using the Critical Curriculum Components Model

	Model or Approach		
Component	Insert Model Name Here	Insert Model Name Here	Insert Model Name Here
Philosophy			
Environment			
Interpersonal Interactions			
Curriculum			
Instruction			
Assessment			
Research			

The matrix shown in Table 2 was used in the final analysis of what was considered to be the most promising curriculum development models and approaches identified during the literature review. To complete the matrix, brief descriptive phrases were used to characterise each component.

Rather than showing the analysis for all six approaches in the matrix, the analysis of one gifted model and one early childhood approach are shown in Table 3. Hopefully, this assists the reader in developing a more in-depth understanding of the model, of each curriculum component, and of the usage of the analysis matrix.

Table 3. Analysis of the Integrative Education Model and the High Scope Model Using the Critical Curriculum Components Analysis Matrix

Component	**Model or Approach**	
	Clark's Integrative Education Model	High Scope Model
Philosophy	1. Belief that there is a need for an integrative use of brain functions in the learning process. Each function is intricately interdependent on each other function. Brain/mid complex best developed when opportunities are made available for that interdependence p.6 2. Early experiences are critical in the development of intelligence p.8 3. New organisations for curriculum presentation needed to personalise learning approach and restructured opportunities for the limitless possibilities of the brain/mind system. p.9	1. Based on constructivist approach 2. Developed from the Perry Preschool Project (initiated in 1962) – outcome was to prevent school failure 3. Children are active learners
Environment	1. Key 1 of model is The Responsive learning environment – used to establish the social-emotional and physical climate of the educational setting p.48 2. Movement is necessary part of learning environment. (Manipulative materials, rhythms, role playing, creation of simulations of real events Clark, p.34 3. Should be filled with a variety of objects and activities, with an observant, responsive caregiver present who interacts with the child p.49 4. Social environment must be diversified to provide a variety of stimulating experiences for optimal human potential development	1. Materials rich environment 2. All materials, areas, learning items are labelled to help children learn organisational skills and for literacy purposes 3. Materials are easily accessible at child's level 4. Areas within the classroom are set up to build social relationships

Table 3. Continued

Component	Model or Approach	
	Clark's Integrative Education Model	High Scope Model
Interpersonal Interactions	1.Encourages students to be active participants in learning process Clark, p.33 2. Includes students in the planning of learning 3. Teacher is a facilitator (guide on the side) 4. Open, respectful and cooperative relationship among teachers, students and parents 5. Teacher, student and parents form a team in the learning process p.48	1. Adults include teachers and parents 2. Children are allowed to solve their every day intellectual, social and physical problems, encouraged to express their own thinking, and to interact socially with other children 3. Substantial outreach to parents; includes social services connections for parents
Curriculum	1. Encourages experimentation and exploration of interests 2. Utilises compacting to ensure that students are challenged and motivated 3. Curriculum based on students' interests, learning styles, needs and abilities 4. Provides for affective learning and emotional growth Clark p.31 5. Flexible to meet learner needs 6. Uses enrichment and acceleration 7. Complexity of content allows for deep learning 8. Develops and uses higher order thinking skills 9. Encourages creativity and leadership 10. Curricula includes guided imagery, dreams, mind/body integrative 11. Is differentiated on an individual basis 12. Learning experiences for development of all four brain functions (cognition, sensing, feeling, and intuition) 13. Curriculum is integrative and builds a framework of understanding	1. Designed around key experiences including: creative representation, classification, language and literacy, seriation, initiative and social relation, numbers, movement, space, music and time 2. Children clean up their own play areas; labels on all materials help with this process
Instruction	1. Allows students to control their learning. Provides for student choices. 2. Focuses discussions towards open-endedness. Empowering language and behaviour 3. Whole group learning is minimal p.33	1. Teacher encourages active learning, encouragement to initiate and carry out their own learning experiences (Plan-Do-Review: children plan what they will do, do it, then review what they did with the teacher) 2. Teacher role is to listen, ask open-ended questions, 3. Includes individual time with teacher, small group experiences and large group experiences 4. Children are encouraged to share their thinking with others
Assessment	1. Learning process documented through many mediums (Photographs, videotapes, audio recordings, models notes, other product/project results) 2. Assessment used to inform immediate and future curriculum decisions 3. Uses a variety of authentic assessment techniques	1. Teachers observe and record child activities every day. 2. Uses the Child Observation Record to document and assess child development and skills (for example, initiative, social relations, creative representation, music and movement, language and literacy, logic and mathematics)
Research	1. Well-grounded with many references to research made throughout the book to justify the need for individualisation, the importance of the learning environment, student-centred learning, grading reliability and practices, the critical role of intuition and the prefrontal cortex of the brain in high level intellectual and emotional operations, etc. 2. New Age School (NAS) has been held, six weeks in summer since 1979. From this experience, the model and its components have evolved.	1. Longitudinal research from beginning; significant findings that include significantly higher numbers graduating from high school, going on to college; and decreased teen pregnancies than control group

CONCLUSION AND IMPLICATIONS

The *Critical Curriculum Components Model*, though in the early development stages, promises to be an important curriculum development tool for early childhood educators. It alerts the reflective practitioner to the essential critical components that should be considered when creating curriculum that is developmentally appropriate as well as effective for the development of young gifted learners' cognitive potential. The *C3 Model* also can serve as an evaluative tool with which to analyse existing programs and curriculum.

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The applied music lesson: Teaching gifted and talented students utilising principles of comprehensive musicianship

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Comprehensive musicianship is a term used to describe the intradisciplinary study of music. The comprehensive musicianship approach is closely related to Gestalt psychology in that music is approached as a totality, with a concern for constituent parts and how they relate to the whole (Willoughby, 1971). The concept of integration is central to the philosophy of comprehensive musicianship. By relating and integrating the various areas of music, integration allows for a logical and meaningful learning experience. The comprehensive musicianship approach brings balance and focus to the disparate areas of music, allowing students to pursue and explore all aspects of music and their interrelationships (Willoughby, 1971). The intent of the comprehensive musicianship approach is to integrate and synthesise all areas of music including music history, music literature, music theory, performance and pedagogy into a unified whole (Spearman, 1979; MENC, 1965).

Music, comprehensive musicianship, integration, performance, gifted

INTRODUCTION

In a traditional music curriculum, various courses such as music theory, music history, music literature and performance are usually studied as separate and distinct areas of music. Because these various courses are taught separately and often by different instructors, the integration of knowledge from one course to another is rare. This is especially true in the area of applied instruction in which the relationship of the music literature studied is seldom related to the theoretical systems, historical and stylistic periods from which the literature was composed. Often, students perform literature without an understanding of the historical and theoretical aspects that served as guidelines in the compositional process. Therefore, students have a fragmented knowledge of music that prevents them from developing a comprehensive musical understanding (Mark, 1986).

Incorporating Comprehensive Musicianship into the Applied Lesson

Most students do not have the time, financial means, opportunity or desire to study the various areas of music separately. Many times the applied lesson is the student's only opportunity to gain musical knowledge. The applied music instructor should not only strive to teach the student performance skills, but should also educate the student in all aspects of music. The musical composition being studied by the student becomes the nucleus for all the disparate areas of music to be integrated in to the applied lesson. At the same time students are learning the skills necessary to perform the musical composition, they are also gaining knowledge in a variety of other musical areas such as music theory, history, literature and style.

The comprehensive musicianship approach should ideally be used to teach all applied music students but it is especially beneficial to gifted and talented students who have the ability to master various musical skills and concepts at a fast pace. By integrating the various areas of music into the applied lesson, gifted and talented students will not only gain performance skills but also acquire knowledge that allows them to become well-rounded accomplished musicians.

The researcher developed a theoretical comprehensive musicianship curriculum model that outlines the musical knowledge and skills to be integrated into the applied music lesson. The model was constructed based upon findings from (a) studies that resulted in a comprehensive musicianship curriculum for various grade levels and (b) other literature pertaining to comprehensive musicianship. In addition to a thorough review of related literature in the development of the theoretical comprehensive musicianship model, the model was also examined by music educators experienced in the comprehensive musicianship approach. The theoretical comprehensive musicianship curriculum model, along with a cover letter describing the study, was sent to music educators who are experts in the field of comprehensive musicianship. These music educators examined the model for deficiencies, suggested revisions and the model was revised accordingly. The model consists of five categories: concepts, content, activities, instructional literature and evaluation. These categories address the development of musical skills and knowledge advocated by the comprehensive musicianship approach. An explanation of each follows.

Concepts

The theoretical comprehensive musicianship curriculum model includes the development of musical skills and knowledge through the study of seven common elements of music: timbre, rhythm, harmony, form, melody, tonality and texture (Colwell, 1992; Ernst, 1974; Lawler, 1976). When teaching an applied lesson, the music instructor should strive to incorporate these concepts into the lesson using a spiral approach. The spiral approach advocates that a concept be introduced first on a simple level, and then revisited on a more complex level each time the student studies a new piece of music. Individual concepts may receive more or less attention due to the nature of the particular piece being performed but over a period of time, the student will gain a mastery over these concepts as each is introduced and revisited on a more sophisticated level.

Content

The comprehensive musicianship approach stresses the development of musical skills and knowledge in the following nine content areas: music theory, music history, music literature/style, ear training, compositional techniques, improvisational techniques performance practices, conducting practices, and music aesthetics. A primary area in the comprehensive musicianship approach is music theory. A comprehensive musicianship curriculum advocates the development of knowledge concerning the structural elements of music, musical form and compositional techniques used in the creation of music (Ernst, 1974; Garofalo, 1983; Lawler, 1976; MENC, 1965; Warner, 1990).

Other areas in the theoretical comprehensive musicianship curriculum model are music history, music literature and style. The comprehensive musicianship approach develops students' interpretive and stylistic skills in musical performance through knowledge of music history and music literature. Comprehensive musicianship stresses the integration of music history to enhance performance and listening skills in addition to merely gaining historical facts and information (Colwell, 1992; Ernst, 1974; Lawler, 1976; MENC, 1965; Warner, 1990).

A comprehensive musicianship curriculum also develops students' ear-training skills. The ability to identify the various structural elements of music, music forms, intervals, chord progressions,

recognition of various instruments and the development of internal hearing are goals of a comprehensive musicianship curriculum (Lawler, 1976; MENC, 1965; Warner, 1990).

Other areas of a comprehensive musicianship curriculum are compositional techniques, improvisational techniques, performance and conducting practices. The teaching of these content areas is important in the comprehensive musicianship approach (Ernst, 1974; Heisinger, 1973; Lawler, 1976; MENC, 1965; Warner, 1990).

The last musical area included in the content category of the theoretical comprehensive musicianship curriculum model is music aesthetics. Aesthetic education is the development of human sensitivity to the expressive qualities of the arts. The comprehensive musicianship approach contains the necessary components to develop students' aesthetic sensitivity to music. The goal of comprehensive musicianship is for all students to have a knowledge and understanding of the music that will enable them to:

(1) judge music with discriminating taste,

(2) have knowledge of and tolerance towards various musical styles,

(3) develop an appreciation for quality music and

(4) develop an appreciation of compositional and performing skills
(Ernst, 1974; Lawler, 1976; Willoughby, 1971).

The theoretical comprehensive musicianship curriculum model advocates the teaching of the nine previously listed musical areas in an integrated manner. The comprehensive musicianship approach requires the integration and synthesis of music study. Compartmentalisation of the various musical areas is to be avoided. This integration allows the student to perceive music in its totality and for synthesis of conceptual knowledge and skills from the various areas of music to take place (Heisinger, 1973; Lawler, 1976; MENC, 1965).

Activities

The goal of comprehensive musicianship is to develop a total understanding and competency of all areas of music through the integration of the following activities: performing, creating, conducting, analytical listening and discussing. Comprehensive musicianship stresses student involvement in all areas (Colwell, 1992; Ernst, 1974; Heisinger, 1973; Lawler, 1976; MENC, 1965; Willoughby, 1971).

As students gain proficiency on a musical instrument or voice, they are given an opportunity to experience the art of music through performance. As students assume the role of composer and conductor, they become more independent, making choices, taking risks and using intuition and imagination. Through analytical listening and discussion, students gain insight into the structure of the music through the comprehension of interrelationships and organisation of the piece. Students develop discriminatory listening habits and the ability to communicate what is heard through the use of a musical vocabulary. Through these five activities, performing, creating, conducting, analytical listening and discussing, the comprehensive musicianship approach allows the student to relate musical concepts and skills in one area to that of another through interaction and continuity of experiences (Heisinger, 1973; Lawler, 1976; Willoughby, 1971).

Instructional Literature

Another category addressed by the theoretical comprehensive musicianship curriculum model is the inclusion of a variety of western and non-western music incorporating various periods and styles. The comprehensive musicianship approach encourages the study and utilisation of a wide variety of music literature; both western and non-western, form various periods and styles,

including music from the twentieth century (Ernst, 1974; Heisinger, 1973; Lawler, 1976; Warner, 1990; Willoughby, 1971).

Evaluation

The last category addressed by the theoretical comprehensive musicianship curriculum model is evaluation. The comprehensive musicianship approach includes assessment in the areas of descriptive competence, performance competence, creative competence and attitude (MENC, 1968).

THEORETICAL COMPREHENSIVE MUSICIANSHIP CURRICULUM MODEL

The intent of the comprehensive musicianship approach is to integrate and synthesise all areas of music into a unified whole. The theoretical comprehensive musicianship curriculum model presented in Table 1 organises and outlines the various areas of music allowing them to be integrated into the applied music lesson.

Table 1. The theoretical comprehensive musicianship curriculum model

CONCEPTS	CONTENT	ACTIVITIES	INSTRUCTIONAL LITERATURE			EVALUATION
			Western Art	Western	Eastern/African	
Timbre	Music Theory	Performing	20th Century	Folk	Folk	Descriptive
Rhythm	Music History	Creating	Romantic	Traditional	Traditional	Performing
Harmony	Music Lit and Style	Conducting	Classic	Sacred/Spiritual	Sacred/Spiritual	Creative
Form	Ear Training	Analytical Listening	Baroque	Pop		Attitude
Melody	Compositional Techniques	Discussing	Renaissance	Rock		
Tonality	Improvisational Techniques		Medieval	Jazz		
Texture	Performance Practices					
	Conducting Practices					
	Music Aesthetics					

Developing a Lesson Plan

In order to incorporate principles of comprehensive musicianship into the applied lesson, the music instructor will need to create a pre-lesson plan that contains all the information to be presented to the student. This pre-lesson plan should contain (1) historical notes about the composition, composer, musical period in which the piece was written as well as available recordings and (2) an analysis of the piece examining the following seven elements of music: timbre, rhythm, harmony, form, melody, tonality and texture.

The applied music instructor should then develop a lesson plan writing instructional objectives for teaching as many of the seven musical elements listed above as possible. Content areas used for teaching these elements should include as many of the following nine content areas as possible: music theory, music history, music literature and style, ear training, compositional techniques, improvisational techniques, performance practices, conducting practices and music aesthetics.

Activities used by the music instructor to teach these objectives should include performing, creating, conducting, analytical listening and discussing. When choosing literature for performance, selections should come from at least three different categories of Western Art, Western and Eastern or African music.

Evaluation techniques utilised by the music instructor should include descriptive (written), performance (playing), and creative (composition or arranging) tests. A survey of attitude should also be done to find out the student's interests and feelings about the lesson.

SUMMARY

For many students, the applied lesson is the only music class they will take. By incorporating principles of comprehensive musicianship into the applied lesson, music students will not only learn performance skills but will also music theory, music history, music literature and style along with the other various areas of music. Students will develop a comprehensive musical knowledge that will allow them to be better performers and increase their appreciation and enjoyment of all music as they become well-educated patrons of the arts.

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Differences in problem solving strategies of mathematically gifted and non-gifted elementary students

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This study presents problem solving strategies and processes of thinking of mathematically gifted elementary children with respect to non-routine word problems. The data stem from a university-based course, especially designed to foster gifted children, ages 6-10 years, through the enrichment of the elementary mathematics curriculum. Videotapes of the children's problem solving processes were transcribed in great detail and provided the basis for the analysis. The presented examples show that mathematically gifted elementary students stand out in the ability to work systematically and quickly, getting an insight into the problem's mathematical structure. Additionally these children stand out in their high ability to verbalise and to explain their solutions. In comparison to non-gifted children these qualities in problem solving show significance. The significance was calculated by non-parametric tests.

Mathematics, elementary, enrichment, problem solving, gifted

INTRODUCTION

Since April 2001 I have worked within a university-based course with mathematically gifted and interested elementary students. The aim of my doctorate study is to gain knowledge of special qualities in mathematically gifted children. The focus is on their problem solving strategies and processes of thought while working on mathematically challenging problems. Dealing with demanding tasks should, moreover, promote the children's interest and talents in mathematics.

SELECTION OF CHILDREN

The children are 6-10 years old and are in the second to fourth grade of elementary school. The selection of the children happened in two steps: The children visiting the course are selected by being nominated by their teachers and parents. Some children had high scores in intelligence tests. After observing the children for weeks or months during the course, the children are selected for the research project. The criteria of mathematical giftedness are tested by these children solving the indicative tasks developed by Käpnick (1998). An intelligence test (WISC III) serves additional information provided that such a test has not yet being taken.

SELECTION OF PROBLEMS

I chose a selection of mathematical problems that were adequate for revealing mathematical giftedness in children, especially in comparison with "normally" talented children. Following Käpnick (1998) and according to what Krutetskii (1976) says about capable primary school children, mathematical giftedness by primary school children can manifest itself in the following criteria:

- recognising patterns and formal structures,
- ability to transfer recognised mathematical structures,
- reversibility of operations and processes, flexibility of mental processes,
- changing the representation of the problem,
- mathematical sensitivity, creativity, and
- mathematical memory.

I studied the children's problem solving strategies while they were working on combinatorial problems (Examples 1 and 2) unsolvable puzzles (Example 3), and sum tasks on series of natural numbers (Example 4). A representative selection of children's solutions to the problems are also presented and explained.

Example 1. Different coloured houses (Hoffmann, 2003, p.94)

Different Coloured Houses

Houses in one city consisting of a basement, a ground and a roof should be painted in different colours. For the basement you have four colours red (r), green (g), yellow (y) und blue (b), but for the ground and roof only the two colours red (r) and green (g).

Find all possibilities to paint the houses in different colours.

This combinatorial problem requires a complex and demanding strategy in order not to forget a possibility. Children solve this problem by putting all possible houses onto a magnetic blackboard. Altogether there are 16 combinations possible, although there is room for 18 combinations on the blackboard. As soon as the children signal that they have found all possible houses they are asked to explain their results.

Lea (10 years old, Fourth Grade) chose the roof and the ground to remain constant. Therefore she combines four houses with green roofs and red ground and then four with a green roof and green ground on the blackboard. For the combinations with red roofs she works analogously. She emphasises this order by leaving one house grey between the houses with green and red roofs as can be seen in Figure 1.

Lea	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
roof	g	g	g	g	g	g	g	g		r	r	r	r	r	r	r	r	
ground	r	r	r	r	g	g	g	g		r	r	r	r	g	g	g	g	
basement	b	g	r	y	b	g	r	y		g	y	r	b	g	r	y	b	

Figure 1. Lea's solution of the "Different coloured houses"

Lea applies the so-called odometer strategy[1] (English, 1997, p.261) by exhausting the constants of roof and ground. She comments on her strategy: "Because here is green and then red and then you can only choose the four colours below; and then once more green and green and all four colours below and that are eight colours and this as well as red roofs and green roofs."[2] The strategy is reflected in Lea's explanation of how she formed the combinations.

In contrast to Lea, Michel (9 years old, Fourth Grade) chose the basement as a first constant. On ground and roof level he forms counterparts, as seen in Figure 2.

[1] English describes the odometer strategy for two- and three-dimensional combinatorial problems. This strategy could be transferred to four-dimensional combinatorial problems as shown in example 2.

[2] Lea's original explanation: „Weil hier ist grün und dann rot und dann kann man ja nur noch nur alle vier unteren Farben nehmen und dann noch grün und grün und dann noch alle vier unteren Farben und das sind dann ja acht Farben und das halt bei roten Dächern und bei grünen Dächern"

Michel	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
roof	g	r	r	g	r	g	r	g	g	r	g	r	g	r	g	r		
ground	g	r	g	r	r	g	g	r	g	r	r	g	r	r	g	g		
basement	y	y	y	y	b	b	b	b	g	g	g	g	r	r	r	r		

Figure 2. Michel's solution of the "Different coloured houses"

Michel explains in detail: “Because of finding all possibilities with red and green for the yellow, for the blue, for the green and for the red basement. And I do not have another colour for the basement. There are four possibilities for each because there are only two colours for ground and roof, so I thought for one basement colour the whole house to be red, the whole house to be green, then once a house with green ground and red roof and once a house with red ground and green roof and this for each basement”.[3] Michel gets additional support for his solution by analysing the problem arithmetically and by justifying why two houses have to be left blank on the blackboard: “It should have been 16 houses but there are 18 and 18 is not a fourth number”.[4] Fourth number means that this number is divisible by four. Michel not only realises the systematic strategy but also the mathematical structure of the problem and explains this in a clear verbal manner.

In her study on problem solving abilities of primary and secondary students, Hoffmann classifies the odometer strategy as an expert strategy into the field of the macro strategies. Macro strategies are higher strategies for creating all possible combinations. In contrast to macro there are micro strategies that merely form part of all possibilities. Among the odometer strategy, Hoffmann distinguishes two further macro strategies as expert strategies. In her study only 12.5 per cent of all primary students (randomly chosen) use one of the macro strategies to solve the “Different coloured houses” problem (Hoffmann 2003, Appendix). In comparison to Hoffmann’s students, the mathematically gifted primary students in my study more frequently use a macro strategy. This difference is statistically significant[5]; it seems that mathematically gifted children recognise higher structures faster and can therefore work more structurally and more systematically on tasks or problems. Not only remarkable however is the systematic and structural procedure but moreover the children’s explanations of why they considered all combinations. Mathematically gifted primary students can explain and verify their systematic procedure significantly[6] more often by comparison with the children in the study of Hoffmann.

The use of the odometer strategy could be observed by a whole string of further combinatorial problems. Some children only use the odometer strategy for obtaining insight into the mathematical structure of the problem for deducing and respectively calculating the total number of combinations. Example 2 demonstrates such a solution.

Example 2. “Combination lock”

Combination Lock

How many different possibilities exist to combine the four figures 0, 1, 2, 3 at the combination lock?

[3] Michel’s original explanation: “Weil ich bei den gelben Kellern alle Möglichkeiten mit rot und grün herausgefunden habe, bei den blauen, bei den grünen, bei den roten und ich hab’ ja keine andere Kellerfarbe. Es gibt bei jedem vier Möglichkeiten, weil es ja nur zwei Farben für Wand und Dach gibt und da hab ich gedacht, bei einer Kellerfarbe das ganze Haus rot, das ganze Haus grün und dann einmal ein Haus mit grüner Wand und rotem Dach und einmal ein Haus mit roter Wand und grünem Dach und das bei jedem Keller so.”

[4] Michel’s original explanation: “Es hätten genau 16 Häuser sein müssen, aber es sind 18 und 18 ist keine 4-stellige, 18 ist keine 4er Zahl”.

[5] Using the Fisher-Tests (Siegel 2000, p.94) with a 0.05 level of significance.

[6] Using a test by Raatz for grouped ordinal data (Lienert 1973, p.235) with a 0.05 level of significance.

As presented in Figure 3, Ingo (7 years old, Second Grade) starts with figure 0 and fixes the second position only when he has formed all possible combinations. He misses one combination for figure 3 in the second position. After finding these first five combinations he deduces immediately that there must be five combinations analogously for the other three figures in the first position (logical thought).

Ingo explains these insights by drawing four lines. One line under the combinations with 0 and three lines held for the further combinations with another figure in the first position. He continues his work with figure 1 in the first position. It is again a complete application of the odometer pattern. This strategy allows Ingo to find all six combinations for figure 1.

Consequently he returns to the combinations with 0 and completes the missing possibility. Ingo transfers the insight that he gained from figure 1 without any difficulties to figure 0. Evidently he knows that for each figure in the first position there must be an equal number of combinations. For figure 2 in the first position Ingo notes analogously six combinations. It is interesting that Ingo does not note these combinations for figure 2 as systematically as for figure 1.

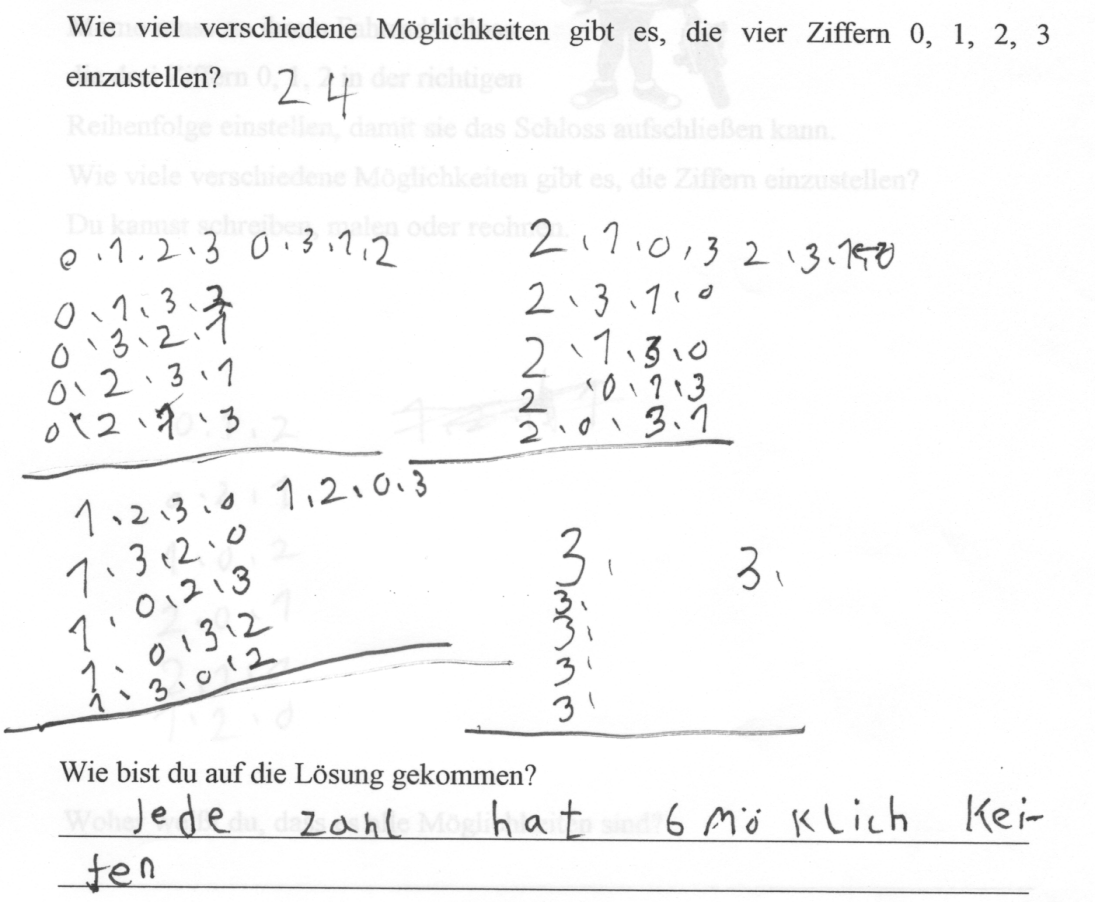


Figure 3. Ingo's solution using the odometer strategy

Perhaps it is not necessary for him because of his knowledge of the existence of six combinations for each figure. For figure 3 Ingo writes only six figures 3 and calculates the total number of combinations by C_4^6. He notes the result, 24, and explains his solution: "Each number has 6 possibilities."[7]. During the problem solving process, Ingo develops a procedure to solve the problem completely using the odometer pattern as a higher strategy. His insight into the mathematical structure of the problem is reflected in his explanation.

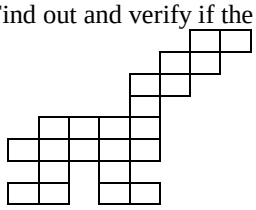
[7] Ingo's original explanation: "Jede Zahl hat 6 Möglichkeiten."

The mathematically gifted primary students' special ability to verbalise appears in another kind of problem similar to the unsolvable puzzle by Burchartz and Stein (2003). As well as Hoffmann, Burchartz and Stein present in their study these problems to primary and secondary students. Therefore a comparison between mathematically gifted primary students and randomly chosen primary students could take place.

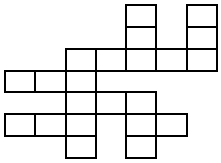
Example 3. "Unsolvable Puzzle"[8]

Puzzle

Find out and verify if the puzzles are solvable or not.

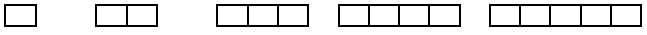


Puzzle A



Puzzle B

Each puzzle should be covered exactly with the following tiles (each is given once)



1-unit-tile 2-unit-tile 3-unit-tile 4-unit-tile 5-unit-tile

2-unit-angle 3-unit-angle

The unsolvability of puzzle A and B is based on a logical analysis of the possibilities to cover the puzzle. For the 5-unit-tile there is only one possible position in puzzle A and two possible positions in puzzle B, thus logically concluding that there is only one space left for the 4-unit-tile. If the 4-unit-tile and 5-unit-tile are placed in their unique positions, there are no possibilities to place the 3-unit-tile and the 3-unit-angle in puzzle A or the 3-unit-angle in puzzle B. Children have to realise the fixed positions of the big tiles and have to deduce logically the impossibility to cover the whole puzzle with the remaining tiles.

Till and Michel (both 10 years old, Fourth Grade) together solve puzzle A and explain the impossibility of the task as follows: Till: "Firstly there is only one position where the 5-unit-tile fits [he places the 5-unit-tile in its unique position], therefore there is only one where the 4-unit-tile fits [he places the 4-unit-tile in its unique position], and now the remaining tiles could not be used" - Till: "yes you could only place these tiles [he touches the 3-unit-tile and 3-unit-angle] but these two could not be placed anywhere".[9]

Martin (8 years old, Third Grade) comments on the impossibility of puzzle B: "Look at those here [he points at the 4-unit-tile and 5-unit-tile] they always have to be there [he points to the possible positions] or could be placed in this way [he demonstrates the other possible positions for the 4-unit-tile and 5-unit-tile], this is always the same, because they always cover these spaces. And where should this one fit? [He points to the 3-unit-angle]. This one doesn't fit anywhere!"[10]

---

[8] Source: Burchartz and Stein (2003, p.3).

[9] Original explanation of Till and Michel: Till: "Erst mal weil's nur eine Stelle gibt, wo die 5 reinpasst *(legt 5er)* dann gibt es auch nur noch eine wo die 4 reinpasst *(legt 4er)* - Michel: "und den Rest kann man dann nicht mehr verbauen"- Till: "ja und dann kann man nur noch die Teile *(3er und 3er Winkel)* verbauen aber die beiden gehen nicht"

[10] Martin's original explanation: "Guck mal dieses hier *(4er, 5er)* das muss ja hier immer hin oder so *(zeigt die andere mögliche Position)*, das ist ja eigentlich genau das gleiche, weil immer die diese Felder auch bedeckt sind, wo soll der *(3er Winkel)* dann noch hinpassen? Der passt hier nirgendswo dann mehr hin."

The children Till, Michel and Martin discuss the impossibility of the tasks in a logical analysis. First they explain the fixed positions of the two big tiles (5-unit-tile and 4-unit-tile). In puzzle A, there is only one possible position for the 5-unit-tile, explains Till. Martin demonstrates the two possible positions for 5- and 4-unit-tile in puzzle B. These fixed positions in mind they deduce the insolvability of each puzzle by pointing out those tiles that could not be placed. The children's answers consequently form a complete proof for the impossibility of each puzzle. Therefore these explanations belong to the highest category in the classification of Burchartz and Stein (Burchartz and Stein 2003, p.10). A comparison shows the mathematically gifted children to give qualitatively better answers than the normal primary students, displaying a significant difference[11].

Beyond this, mathematically gifted primary school children need fewer attempts in order to recognise the puzzle to be unsolvable. Because of this significantly[12] less time was required to deal with the problem.

The qualitatively better answers and explanations given by mathematically gifted children by solving combinatorial problems and dealing with unsolvable puzzles may be the result of these problems not being typical numeral tasks and of the children being allowed to use material. Example 4 shows a more typical arithmetical problem. Here again the mathematically gifted children's special ability to verbalise and to work more structurally is demonstrated.

Example 4. "**Series of natural numbers of size up to 25**"[13]

Series of Natural Numbers of Size Up to 25
"Find all possible sums consisting of an adjacent sequence of natural numbers. The result may not be larger than 25"

"Normal" primary students, as shown by Schwätzer and Selter, solve this problem by writing different sums rather unstructured. On their way to find a solution they use a large number of different strategies. To explain the reason for completion most of them sort their sums using a superior sort strategy. In comparison to the students in the study of Schwätzer and Selter the mathematically gifted primary students in my study use a macro strategy to find systematically all sums right from the beginning. The difference to the results of Schwätzer and Selter is statistically significant[14]. The following two superior "production strategies" (Schwätzer and Selter, 1997, p.132) were shown by the mathematically gifted children and are presented in Figures 4 and 5.

Firstly the solutions are sorted according to the first addend's size. An "ascending" or "descending" amount of addends can be distinguished. Martin's (9 years old, Fourth Grade) solution, shown in Figure 4, is an example for the strategy "First addend descending".

Another strategy is to sort according to the amount of addends,. Firstly the children write down all sums with two addends, then with three addends, and so on. Second condition in this case is the size of the first addend. Again an "ascending" and "descending" size of the used addends can be distinguished. Sarah's (9 years old, Fourth Grade) solution, presented in Figure 5, is an example for the strategy "Amount of addends ascending".

[11] Using a test by Raatz for grouped ordinal data (Lienert 1973, p.235) with a 0.05 level of significance.

[12] Using the U-test by Mann-Whitney (Siegel 2001, p.112) with a 0.05 level of significance.

[13] Source: Schwätzer and Selter (1998, p.125).

[14] Using the Fisher-Tests (Siegel 2001, p.94) with a 0.05 level of significance.

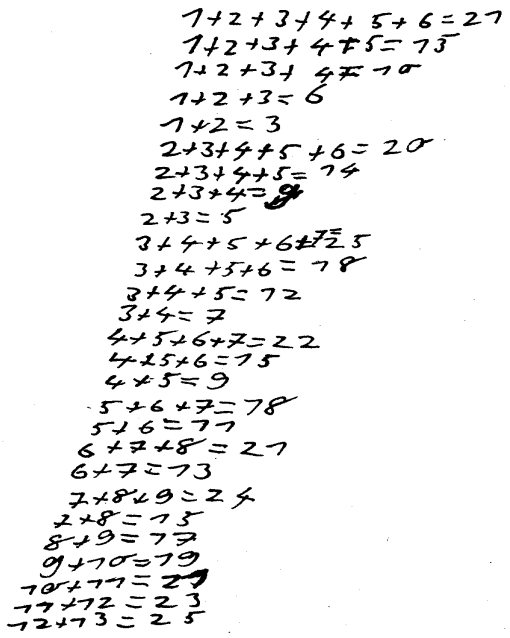


Figure 4. Martin's solution using the "First addend descending" strategy

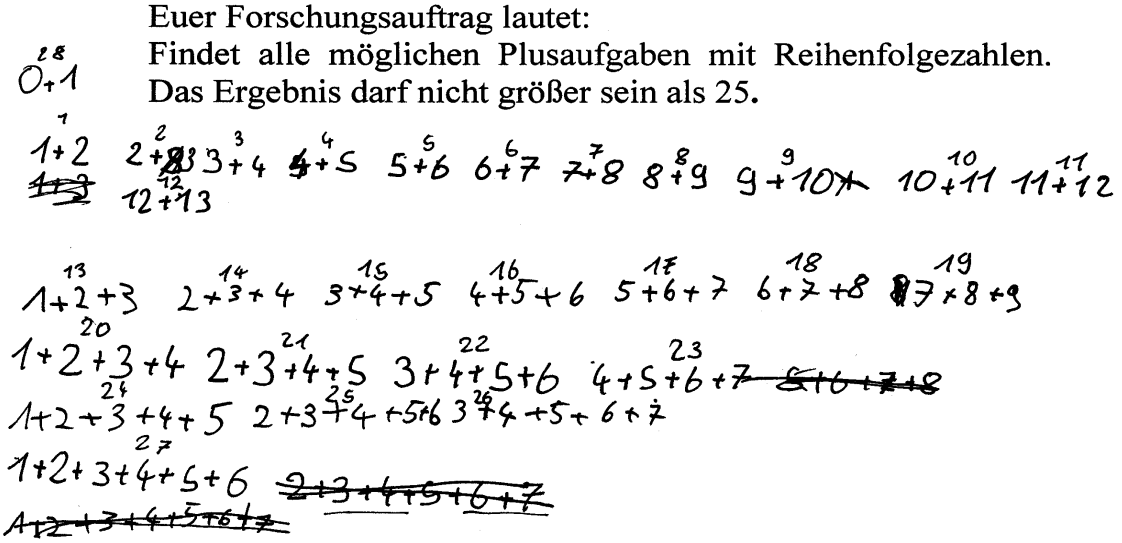


Figure 5. Sarah's solution using the "Amount of addends ascending" strategy

Using a superior production strategy mathematically gifted primary students are able to solve the sum problem faster. They need significantly[15] less time than the children by Schwätzer and Selter (1998). The gifted children do not need to sort their sums subsequent to explain the completeness of the produced sums. Instead of this they explicitly or implicitly explain the completeness with the help of their production strategy.

On one hand, Martin describes his strategy; on the other hand, he also explains the completeness of his solution (see Figure 4) by indicating explicitly when 25 is exceeded. He demonstrates this for the first addend 1 exemplarily: Martin: "At first the 1 then 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 [he taps the numbers with his pencil]. I add the numbers as long as the next one does not fit anymore. And always when I get this number, for example now 6 here [he taps 1+,..,+6], if I

[15] Using the U-test by Mann-Whitney (Siegel 2001, p.112) with a 0.05 level of significance.

would add the 7, then I would get 28. So I leave it and I always remove the last number, there again one less and there again one less [he taps 1+2+3+4 and 1+2+3] and there again one less until it does not go on anymore."[16]

CONCLUSION

In comparison to "normal" primary students, the mathematically gifted ones need significantly less time to deal with the unsolvable puzzle and the sums. Their procedure is based on a logical analysis (puzzle) and they solve the combinatorial problems and the sum task significantly more systematically by using macro strategies. Some children satisfy the insight in the mathematical structure to solve the combinatorial problems arithmetically. This suggests that there is a special ability of mathematically gifted children to use their insight in mathematical structures to be able to calculate the result.

All examples additionally explain another ability, which has not been considered in criteria lists of mathematically gifted children yet: the high ability to verbalise and to explain/reason. The mathematically gifted children's explanations reflect their understanding of the mathematical structure of the problem and their strategic use. A comparison to "normal" primary students shows that gifted children more often give answers of "better quality". The difference is significant.

On the one hand, my study confirms the typical criteria of mathematical gifted children as formed by Krutetskii and Käpnick, especially the ability to recognise formal structures. On the other hand, it seems necessary to add some further characteristics of mathematically gifted primary students to the list mentioned above. Firstly a criteria which is, as Krutetskii says, typical for mathematically gifted secondary students, is "the ability for logical thought and logical analysis" (Krutetskii, 1976, p.350).

Secondly, two additional criteria have emerged:

- the high ability to verbalise and to explain their solutions, and
- the ability to use the insight in the mathematical structure of a problem in order to solve it by deducing or calculating the solution.

Further solutions and observations in the study confirm these results. However, individual abilities of mathematically gifted children should also be taken into consideration. The different criteria of mathematical giftedness do not have to take effect completely. Rather, they appear individually pronounced and require individual support. But one form of mathematically giftedness can turn out to be an ability to give a precise analysis of problems and reasons for solutions.

The presented problems not only serve to foster mathematically gifted children, but rather supply important knowledge about children's ability to recognise mathematical structures and relationships. They are consequently qualified as part of the identification of mathematically gifted children.

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[16] Martin's original explanation: "Ich hab immer erst 1 dann 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 und 12 *(tippt mit dem Stift auf die jeweiligen Zahlen)*. So lange da die Zahlen drangehängt, bis es nicht mehr geht, bis dann die nächste nicht mehr dranpasst. Und dann immer wenn ich die Zahl hat z.B. jetzt 6 hier *(tippt auf 1+...+6)* wenn ich da die 7 dranhäng' würde, dann wären es ja schon 28. Dann hab ich die gelassen und dann hab ich immer den letzten weggenommen und da wieder den ein weniger und da wieder ein weniger *(tippt auf 1+...+4 und 1+...+3)* und da wieder ein weniger bis tiefer geht nicht."

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Combining moral philosophy and moral reasoning: The PAVE moral reasoning strategy

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The ability to reason well is central to the concept of intelligence, but intelligence alone will not guarantee morality. To recognise the 'right' choice and to judge our own and others' actions, is to make an act of reason. To choose to value morality and to make the 'right' choice is an act of character. The link between intelligence and choice "makes the whole idea of morality possible in the first place...that's ultimately why we hold people responsible for what they do – because their intelligence gives them the power to choose how they'll behave" (White, 1988, p.72). This paper provides a moral reasoning strategy which may be useful to teachers. It is based on an understanding of Principles, Agreements, Virtues and End Consequences (PAVE).

Gifted, morality, philosophy, reasoning, strategy

INTRODUCTION

High levels of cognitive intelligence and affective intelligence lead to the development of character and ultimately the potential for moral vision. The thinking, feeling person, in whom intelligence and character combine, can achieve the highest level of human development – self-actualisation. It is a confluence between cognitive intelligence, affective intelligence and the disposition towards morality that can determine an individual's moral reasoning ability. The more confluence between the three, the greater the individual's capacity to reason and behave morally. Without the disposition towards morality, the individual lacks the motivation for moral action.

Context is also an important consideration. The environmental, social, personal and situational contexts will influence an individual's choice to reason or behave morally. Individuals may choose moral behaviour in some situations, but disregard it in others, depending on the importance of the situational context to their personal viewpoint.

What is the PAVE moral reasoning strategy?

The moral reasoning strategy outlined in this paper borrows heavily from other problem-solving strategies, particularly Maker's (1995) discussion of moral dilemmas based on Kohlberg's (1964) theory of moral development, and Ruggiero's (1997) analysis of ethical issues, and has evolved from an earlier strategy devised by Barker and Henderson (2001). By including a consideration of the major philosophical schools of thought, this strategy gives the moral reasoner additional knowledge and skills with which to deliberate at greater depth and understanding. These philosophical perspectives are referred to as ***P****rinciples,* ***A****greements,* ***V****irtues* and ***E****nd Consequences.* These four schools of thought are outlined in Table 1. However, further knowledge and understanding of moral philosophy is highly recommended. By taking the initial letters, the acronym of PAVE has been used to name this moral reasoning strategy.

Table 1. Four moral perspectives

Principles What makes an action right is whether it upholds a certain principle. Principles are like duties or rules that apply to *any* set of circumstances. So when someone argues that it is *never* right to murder, they are thinking about principles. Principles are very useful for dealing with large groups of people. Many laws are based on principles. Some common principles are: Do no harm. Always tell the truth. Keep your promises. Be fair.	**(End) Consequences** What makes an action right is whether it has good consequences, that is, whether it increases the welfare of the people affected by it. By 'good' we might mean happiness, well-being, pleasure, interest or satisfaction. . If large numbers of people are affected, you could consider the greatest good for the greatest number.
Agreements What makes an action right is whether it is consistent with what people involved expect to happen. People willingly enter into contracts with each other, either formally or informally, written or spoken, about the way they agree to treat each other.	**Virtues** What makes an action right is whether it is what a virtuous person would do. Virtues are character traits, like courage, compassion and integrity. A virtuous person will always do the right thing out of habit because it is in their character to do so.

Jewell, P. (2003)

In the process of paving a path, stones are laid which make a sure-footed foundation upon which to tread. The analogy of this process to the reasoning strategy also makes the acronym of PAVE an appropriate name because the strategy is a step-by-step process leading from an initial moral dilemma to a possible outcome. The steps of the strategy are presented in Figure 1. Along the way, it is to be hoped that a parallel development of moral reasoning ability will be founded.

In discussing moral dilemmas, one assumption that is made is that people in general seek to do the right thing. The central questions asked are:

- What *could* I do that is morally right?
- What *should* I do in this situation?
- What *will* I do? and importantly
- *Why* will I choose that course of action?

Rather than allowing students to act and react without thinking, the PAVE moral reasoning strategy encourages them to reflect on these very important questions. It empowers them to make reasoned moral choices, to understand the basis of others' moral choices and to develop the skills with which to negotiate positive outcomes.

THE PAVE MORAL REASONING STRATEGY: EXPLANATION AND TEACHING STRATEGIES

What follows is an explanation of the task to be done at each step of the PAVE moral reasoning strategy and some suggestions as to the way(s) in which the teacher can facilitate the process.

Presenting the Moral Dilemma

The aim in presenting the moral dilemma to the students is to arouse their interest, curiosity and sense of personal involvement, such that a meaningful and controversial discussion may develop. Thus the way in which the dilemma is presented is very important. One way is to begin by asking the class some probing questions which link the issues in the dilemma about to be presented to the students' own personal experiences. The dilemma may be presented in many forms such as by

viewing a short segment from a video of a film or news program, giving students some role plays to enact, or reading a short story to the class.

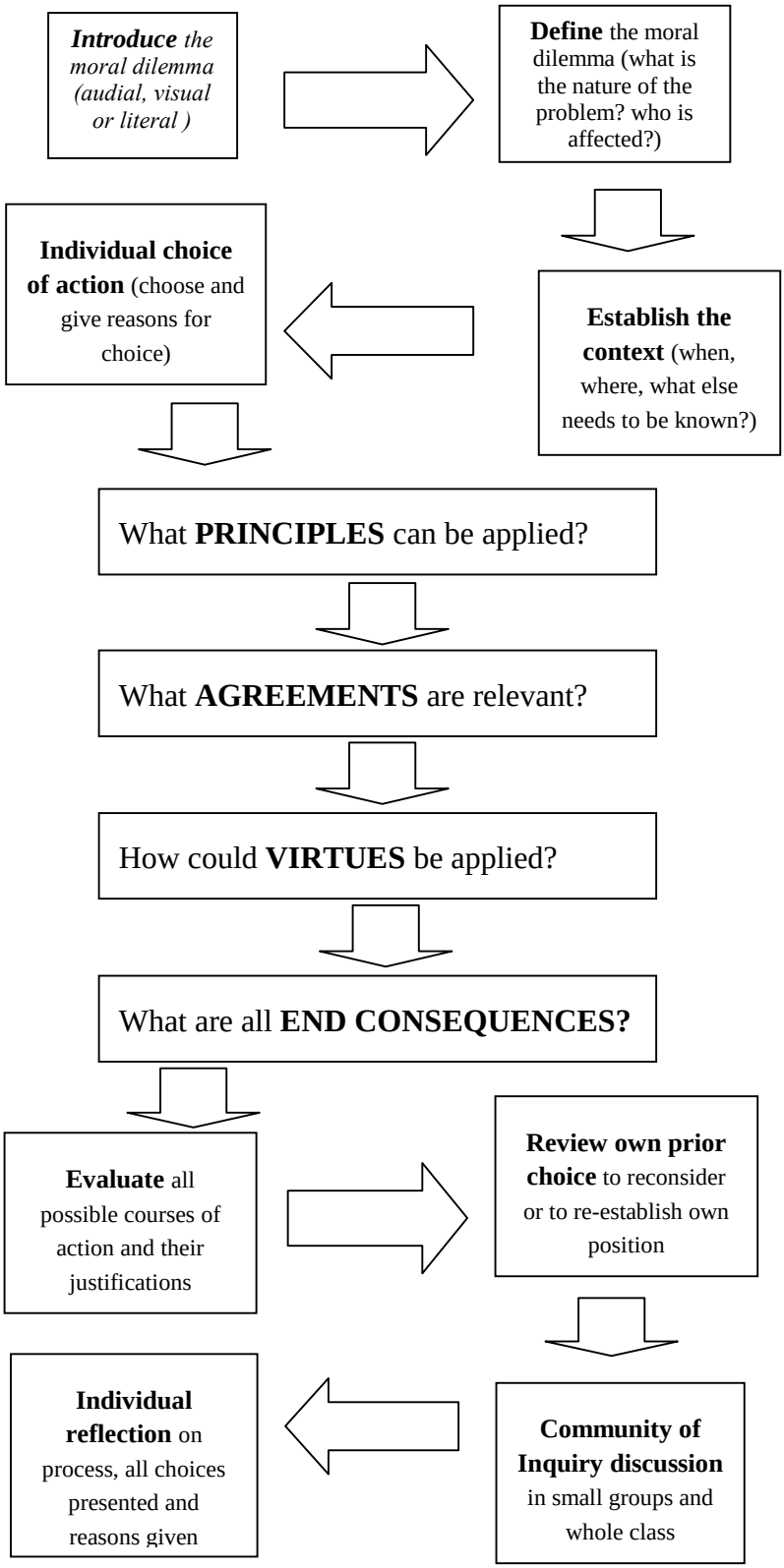

Figure 1. The PAVE moral reasoning strategy

Step One: Define the moral dilemma and identify who is affected

Having perceived that a moral dilemma exists, the first step in the process is to restate the dilemma – what exactly is the moral question involved? Integral to identifying the dilemma will be the identification of all the people involved - the main people as well as others affected by the outcome.

Students who are morally sensitive will quickly identify a moral issue, but in order to discuss the dilemma, all students need to understand exactly what and who are involved. In the classroom, this step can be taken as a whole group together, to ensure that all students are clear about the nature of the problem.

Step Two: Establish the context

Students also need to be clear about all the relevant facts of the situation. Where and when the situation occurs is important to establish, as context is critical in deciding upon what is the right action to take. Perhaps not all of the details necessary for making a decision are obvious, and questions may need to be asked to clarify the context of the dilemma. If not all the necessary information is available, then some speculations and assumptions may need to be made in order to advance. Younger children should be given as much information as they need, perhaps through them identifying the questions needing answers and the teacher providing the information, or perhaps giving all the information from the outset. Older children should be encouraged to ask 'what if' questions and to entertain a complexity of possibilities.

Again, the reasoning strategy depends upon these two initial steps being taken as a group to ensure that all students have the knowledge they need to make a reasonable choice.

Step Three: Individual choice of action

At this point in the process, each student should be able to write down, with their reasons, their own position as to the right course of action in the dilemma being discussed. At this stage they may not be completely decided but they need to take at least a tentative position.

Step Four: Consider multiple moral perspectives

The next step is a detailed process of holding the facts up to the scrutiny of each of the four Moral Philosophy perspectives in turn. Each of these four most commonly used philosophical perspectives offers criteria to help solve the moral dilemma of 'what ought to be done' by imposing a sense of order and moral imperatives. But each moral perspective on its own has limitations. Looking at the dilemma from all four perspectives is like examining a botanical specimen through four different procedures – each procedure will reveal the specimen in a different light and help to ascertain its nature, but a more complete understanding of its nature is possible by referring to all four forms of analysis.

During this process, students should be given guidance to help them to understand the criteria and limitations of each perspective, and how each perspective would determine right action in this particular situation. The justification of each perspective is as important for the student to understand as the action it advocates.

Initially the teacher should guide the students through this step. Scope is there to broaden the students' knowledge and understanding of Moral Philosophy with some extension work exploring this field and some of its greatest philosophers. What would Plato decide to do in this situation? What contributions has Kant made to our understanding of morality? How would Hobbes advise us to act?

It is to be hoped that the students will develop both knowledge of morality and Moral Philosophy as well as the skills of applying this knowledge. Once they have been guided through the four perspectives, they can be tasked to apply the criteria independently. Wall charts may be displayed to act as prompts in remembering the main focus of each school of thought.

Question prompts for each of the moral perspectives are included at the end of this paper. The class could be divided into four groups, with each group assigned one perspective to explore and then report their answers back to the whole class.

Step Five: Exploration of alternatives

The students at this point should be able to explain what each person or interest group relevant to the dilemma would want to happen from their point of view and why. This is important because the students may identify with only one of the people involved, but a well-reasoned choice will also consider others' points of view. The students need to empathise with others to understand that different people may have different needs and priorities from each other and from themselves. Role plays can be useful here in challenging students to 'try on' different people's points of view and attitudes.

Step Six: Review of individual choice of action

The students can now look back at their original choice (Step 3). Has their original position altered? Having all possible courses of action and justifications at hand, the students now have to decide what they think is the overriding priority, and which criteria for judgment best 'solves' the dilemma. There will be some dilemmas where a couple of perspectives seem to carry equal importance and yet come to different conclusions. Students may be overwhelmed by the difficulty of singling out and justifying one course of action. The teacher may need to give them guidance towards finding some way to resolve such an impasse.

Attaining this step may be the desired end point of a lesson, perhaps even the completion of step six being set as a homework task. This then allows a full lesson when resuming the strategy to discuss at length the moral choices involved.

Step Seven: Community of inquiry discussion

When we decide on a course of action, we need to be able to communicate our decision to others, giving our reasons to support our decision, in the context of the Community of Inquiry. This next step requires students to share their ideas, in pairs, in small groups and finally as a whole class. The pairs and small groups could be comprised of students who agree as to the course of action and at this point they can share with each other the reasons for their decision. This should help the students to clarify and consolidate their own positions, as well as listening to and considering others' points of view.

Each student needs to be able to present her/his choice of action and defend it with clear justifications. This gives them the opportunity to apply their reasoning ability to the moral issues in question. Students will vary as to their levels of reasoning ability. An active Community of Inquiry discussion will allow students to observe higher levels of ability and reflect on their own reasoning ability. This exposure to higher levels of development provides cognitive conflict and may act as a catalyst to the development of their own moral reasoning ability.

The role of the teacher is critical in facilitating the discussion. A list of possible question starters based on Bloom's and Krathwohl's Taxonomies is provided in the Appendix.

Time is always a critical factor in this step. The aim of the discussion may be to voice and compare different choices, and time may run short when the discussion is still in full swing. If the

aim of the discussion is to reach a consensus as to the best right choice of action (for example, what rules should the class adopt in order to resolve a problem) the lesson may end before the group has collectively arrived at a satisfactory decision. If this is the case, some students may feel frustrated because they still have no 'answer'. Philosophers love endless discussions; some students are more impatient! One caution here is to beware implying that all investigations concerning the right thing to do necessarily must reach a single correct answer. That would negate the whole purpose of conducting a Community of Inquiry discussion. Students are encouraged to present conflicting points of view, provide reasons for that view, listen to other views and underlying reasons and make a choice, with justification, as to what they believe is the right course of action.

The *process* of the discussion is important in itself. However, it *is* important to give each discussion some closure. Take some time before the lesson ends to perhaps summarise the discussion so far, to note the progress the group has made, to identify the different positions being taken, perhaps ask people to summarise an alternative viewpoint to their own, possibly even to ask the students by a show of hands which position they agree with, or to ask students to stand on a number line to indicate how satisfied they felt at the end of the discussion from zero (not at all) to ten (very satisfied).

Step Eight: Individual reflection

The last step is one of individual reflection. It may be that the student's original position as to the right thing to do in this situation has been reinforced as a consequence of the Community of Inquiry discussion. It may be that the student's choice remains unaltered, but the reasons for holding this view have changed. Perhaps the group discussion has caused the student to rethink his or her original choice. Ultimately students need to make their own decisions autonomously, and should be able to communicate the reasons behind their choices. Whatever the outcome, thinking about thinking, or metacognition, is a conscious, self-evaluative process which serves to consolidate the reasoning process and reconcile any concerns.

This step may be completed as a homework task, or it may be possible to allow some lesson time for the students to reflect whilst their focus is maintained.

Some students may need some guidance to channel their reflections in a more constructed form. Proforma sheets may be devised by the teacher that ask the students to answer specific questions about their choices, the most helpful comment that was made, the most difficult aspect of the dilemma and so forth.

WHY USE MORAL DILEMMAS TO ENCOURAGE MORAL DEVELOPMENT?

Most theories of moral development describe the transition to higher stages of development occurring through the arousal of inner conflict (Piaget, 1930; Kohlberg, 1966; Dabrowski, 1972; Gilligan, 1982; Rest, Navarez, Thoma and Bebeau, 2000). It would seem that, just like the grain of sand causing the oyster to produce the pearl, so too the individual needs to experience a level of inner friction or 'disequilibrium' (Piaget, 1965) in order to advance to higher levels of development. The verbal conflict aroused through consideration and discussion of a moral dilemma can create the desired stimulation under the careful guidance of a perceptive and thoughtful teacher.

A **moral dilemma** is generally agreed to exist when an issue calls into question what right course of action should ensue. To decide whether or not an issue presents as a moral dilemma, the question being asked needs to concern the nature of what is right, and one choice of action must be selected from several possible alternative actions, each of which can be justified in some way. The discussion of moral dilemmas actively involves the students in the process of decision-

making and demands of them a personal commitment to the choice. Rather than expecting them to passively and almost vicariously absorb morality by being given good moral exemplars to follow, this active, student-centred approach is far more likely to be meaningful and effective.

HOW CAN MORAL REASONING BE APPLIED ACROSS THE CURRICULUM?

As a vehicle for encouraging the development of moral reasoning, the study of moral dilemmas through literature, film, subject application, current affairs, personal experience or relationships, and the teaching of moral reasoning strategies in this context, has valuable applications. Subjects studied not simply for their technical worth, but in a way that gives students an understanding of the social condition and context will 'feed their moral interest and develop moral insight' (Dewey, in Rice, 1996).

Reasoning strategies are best learnt in the context of content that is relevant to the subject and students being taught. Moral dilemmas can be found in all curriculum subjects. Moral dilemmas revolve around key moral issues such as civil liberties, social norms, authority, personal conscience, truth, punishment, life, sex, property and contract (Kohlberg, 1973). Whenever an issue raised prompts the questions 'what should I do?' and there are several justifiable alternatives, each with different outcomes, then a moral dilemma is presented.

Not only *can* moral reasoning be applied across the curriculum, but it also *should* be applied in all areas in order to maximise the students' efficacy. Teachers cannot assume that reasoning strategies are automatically transferred to contexts outside that in which they are explicitly taught.

WILL GOOD MORAL REASONING ENSURE GOOD MORAL BEHAVIOUR?

Moral reasoning attempts to synthesise different views that are, in a sense, rival views. Although the aim is to achieve an outcome, a decision that is good or right, the process is as significant as the end product. The reasoning process as a whole is an interplay between the parts, the parts are connected by their conflict into a dynamic tension of logic and debate, and metacognition, or reflection, is the key to achieving a personal commitment to an outcome.

Jewell (2000) asks the question whether 'a morally developed person [is] one who *feels* strongly about moral issues or *understands* moral issues or *acts* ethically when dealing with other people'. Human beings are free agents who may or may not choose to act morally. Rational, independent thinkers make decisions after considering the information at hand, reflecting upon their knowledge base and making connections between their knowledge and understanding, supporting their decisions with sound reasoning. In order to act morally, one must place importance on moral behaviour and see oneself as a moral agent. Whether or not a person chooses to act morally in all situations is dependent not necessarily on their capacity for moral reasoning but on other personality factors that provide the motivation for moral behaviour.

The distinction must be drawn between advanced moral reasoning and advanced moral development. The former implies the abstract intellectual ability to recognise a moral issue and decide upon the 'right' outcome. The latter implies the practical application of the moral imperative. This requires other personality factors such as courage, autonomy and altruism. The best moral choices will be made by people who are able to reason well and who also desire to do the right thing.

CONCLUSION

Students need to learn how to understand the complex issues they will face in the real world beyond school. More importantly, they need the skills of analysis to sort out and clarify the nature of the real world in order to navigate their course through life. Perhaps most importantly, they

need to develop positive dispositions or habits of mind that will sustain their sense of hope and purpose throughout their lives. The goal of Renzulli's work in Operation Houndstooth (in Colangelo and Davis, 2003, p.84):

> is to infuse into the process of schooling, experiences related to the [personal characteristics that are the components of positive development] that will contribute to the development of wisdom and a satisfying lifestyle.

Renzulli's conception of giftedness is far broader than an IQ score, and his challenging reminder (2003, p.83) to teachers of gifted students:

> as persons who are the stewards and nurturers of today's potentially able young people [is that we] can have a profound affect on shaping the values and directions towards which future contributors of remarkable accomplishments devote their energies.

Whether or not gifted children should be burdened with the responsibility of being our future leaders and society's hope for a better future is disputable. However, society will be stronger and richer if its members are able to make sound moral judgments, develop positive moral outlooks and take sound moral action. Working with students to encourage their development of these skills and dispositions will be in the best interests, not only of the students themselves, but also society in general.

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APPENDIX: PAVE MORAL REASONING STRATEGY

Thoughtful Question Starters Using Bloom's Taxonomy of Cognitive Objectives

LEVELS OF TAXONOMY:	To Encourage Good Critical Thinking: Question Starters
REMEMBER	
This is the information level which asks for the facts, definitions, and clarifies the purpose of the discussion. It seeks to determine the evidence underlying what we think and ascertain what we know.	What are the facts? Who is involved? What is the problem? What happened? Where and when did it happen? What proof is there…? Please remind me of the facts about…?
UNDERSTAND	
This is the interpretation level of questioning that seeks explanations and illustrations of the facts and helps to clarify understanding. (* Be careful not to let the discussion be waylaid by endless examples and personal stories. The teacher may need to step in and ask questions that will refocus the discussion onto the main purpose at hand.)	What do you find puzzling? What do you mean by…? Why is this a problem…? For whom is it a problem? Why do you say that…? How does that relate to what …said? Can you say that in another way? I'm no expert, perhaps you could explain that to me? Can you repeat what …just said in your own words? Have you made any assumptions when you say…? Can you give an example of…?* Can you explain why…acted that way/said that? Can we clarify that point? What could have happened if…? Can you expand upon what you just said?
APPLY	
Once students understand the facts and issues, they can apply this knowledge in meaningful ways. If responses indicate flaws in their understanding or interpretation of the facts, you may need to summarise and display what the class knows on the whiteboard, or task the class to write down their own summaries of all relevant facts.	Do you know of a similar problem? How was that solved? Could that resolution apply here? Can you think of a situation where (*this suggestion/idea etc)*would not work? What questions would you ask a particular person involved if you could? Can you list of all the pros and cons of that idea? Could you report the main ideas in a news flash?
ANALYSE	
Being able to break down the 'big picture' into its component parts can help students to distinguish the faults and strengths in arguments. Also it helps identify what is or isn't relevant, what assumptions or generalisations are being made that undermine moral reasoning.	Is that a good enough reason? If that is true, what else is true? If that is true, what then must be false? What consequences will follow? Who is most positively/negatively affected by this? What motivation was there to do this? At what point did things change? What problems did that cause? What positive outcomes happened as a result? Is that an assumption?
EVALUATE	
Holding ideas up to check and judge their worth or appropriateness to the task is an important executive thinking skill. It is most important that the students can give their reasons for why they judge something to be so.	Are our sources reliable? Is this point relevant? How do we know…? Do you agree with…? What is one solution? How can you justify that? What would you say if you were the judge/ prosecutor…? What reasons did you find most convincing for…? Is there a better solution? Are these 2 ideas compatible/different/the same? Does that person simply act/react, or does s/he consider…?
CREATE	
Creative questions can be asked at any time, and in the spirit of the Community of Inquiry, all contributions are accepted, and lateral and creative thinking is valued. These questions ask students to look at creative solutions or to look beyond the situation. Through the process of reasoning, stimulated by good questioning, the students will gain a knowledge and understanding of the issue, be able to analyse and evaluate all the relevant facts and opinions and can then construct or hypothesise solutions or new ways to view the problem.	How else could that be interpreted/viewed? What would you change if you could? What questions could we ask to move forward? How could you best do that? What decisions have we made? What implications can be drawn? Where do we go from here? What could you propose? What if…?

Thoughtful Question Starters Using Krathwohl's Taxonomy of Cognitive Objectives

LEVELS OF TAXONOMY:	To Encourage Good Critical Thinking: Question Starters
RECEIVE	
This is the level of thinking where the student displays awareness – listens, notices and observes. Information is received through all senses.	What do you notice about this? What did you hear … say? How did that make you feel? How would you feel if … ?
RESPOND	
Students are encouraged to discuss or explain their thoughts and ideas. In sharing them with others, students are often able to crystallise and clarify their own thoughts and receive valuable feedback from others.	Can you suggest why that might be? Can you offer a way to proceed from here? What was your initial reaction? How do you feel about it now? What should we think about first?
VALUE	
The student chooses a concept or position or behaviour that he/she believes is worthy. It is not a matter of being told what is important, but is what the student values.	How could you defend…? What would you like to see happen here? What appeals to you most about…? Whose idea do you identify most closely with? What do you disagree with?
ORGANISE	
The student reviews, questions and arranges values and ideas into an ordered system or plan.	Which of your values can be applied here to give some structure? How can you figure out…? What is the best choice, based on what you care about?
CHARACTERISE	
When asking students to connect with a problem in an emotional way, they need to have some positive outcome or resolution as an outlet for their feelings. Characterising asks students to live their beliefs. The student voices his/her beliefs and affirms his/her values.	What can you say to affirm each position? Which person involved is someone in whom you would confide? Imagine if you believed someone's actions to be wrong, what would you do? Do you respect someone who changes their mind? How would you have behaved?

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The relationship between creative thinking ability and creative personality of preschoolers

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This study investigates the relationship between creative thinking ability and creative personality of preschoolers. Prior research showed that the correlation coefficient between creative thinking ability and creative personality of teenagers was very low (Hah, 1999), so this research was undertaken to validate the test and to examine how preschoolers would be influenced by sex and age variables. It was conjectured that these prior results would change if subjects were sampled from a much younger age pool, and so, a test instrument (the Integrated Creativity Test) to measure creative thinking ability and creative personality was developed and validated.

About 1,000 preschoolers aged 4 to 5 years old were sampled nationwide to verify the relationship between creative thinking ability and creative personality. Then the ICT was administered. The relations between creative thinking ability and creative personality were analysed according to total scores and factors. Creative thinking ability and creative personality were analysed according to sex and age.

Creative thinking, creative personality, preschoolers, measurement, validation

INTRODUCTION

People engage in unique thinking because of an intrinsic desire to find new and better things. This is called creative thinking. The power of a nation depends greatly on the quality of new knowledge and unique information. Our societies require creative thinking more and more than in the past. Because of social changes, the Republic of Korea is paying more attention to the development of creativity. Until now, there has not been enough educational support to educate children who have high creativity and special talents in regular schools, and they have been neglected. They must not be overlooked, but their latent ability and creativity should be developed and supported at the national level. In order to do so, first, there should be research conducted in the area of creative thinking and the development of educational programs for children.

Since Guilford addressed the definition of creativity in the 1950s, various other definitions have been presented (Guilford, 1950). Psychologists have considered creativity as a trait of character, creative process, creative environment, and inventive product. Researchers go on to say that when the traits of character, process, environment, and product interact with each other, creativity is mobilised (Isaksen, Murdock, Firestein and Treffinger, 1993). '101 creativity definitions' (Aleinikov, Kackmeister and Koenig, 2000), published recently, explained that methods to measure creativity are as various as the kinds of creativity.

In order to raise creative thinking and develop educational programs for children, we need to know what creativity is, how to measure it, and how it changes according to sex and age.

What is creativity? Creativity is an individual's ability to produce appropriate and novel things (Hennessey and Amabile, 1988; Ochse, 1990). What does 'appropriate' and 'novel' things mean?

Regarding this problem, Simonton (1988) proposed the 4P standard. 4P stands for product, person, thinking process, press or environment.

How can creativity be measured? There is no guarantee that children think creatively even if they have creative ability. Creative behaviour may not be generated if children fear new thinking or don't want to be creative. If so, which factors are identified to measure creativity construct? The abilities required in the creative thinking process include sensitivity, fluency, flexibility, originality, elaboration, and imagination. Characteristics related to creative behaviour are curiosity, run-a-risk, independence, task commitment, humour, and motivation, which are related to the cognitive process for accomplishment. Renzulli's three-ring model (Davis and Rim, 1994) considers above-average intelligence, creativity, and task commitment as important factors that explain giftedness. In this model, both creativity and commitment are much more important factors than intelligence. Terman (1925) said that creativity, achievement motivation, and emotion control ability play a more important role than intelligence.

If creativity is defined as the 'ability to make new and useful things', the socio-cultural context needs to be considered as a factor. Therefore, a study of creativity in the Korean cultural context was needed. From this viewpoint, the Volcano Model for Creativity Measurement, presented in Figure 1, was developed. This model attempts to mirror the creativity of children and inter-relates the elements of individual environment, creative thinking ability, creative personality, socio-cultural environment, and subject domain. Individual environment involves inheritance and home environment. Creative thinking ability involves fluency, flexibility, originality, and elaboration. Creative personality involves curiosity, independence, run-a-risk, and task commitment. Subject domain includes literature, art, mathematics, science, information, and communication. These are the components of the model that are required for creative products to erupt. The socio-cultural environment in this model is considered an important factor for new and appropriate products to be accepted into society.

An Integrated Creativity Test I: for Preschoolers, which measured preschoolers' creative thinking ability and creative personality, was developed on the basis of this Volcano Model. In order to identify the developmental trend of children's creativity, this test was administered to 4 to 5 year-old preschoolers. Two research questions were formulated as follows:

1. What will be the relation between creative thinking ability (language, drawing) and creative personality? What is the relation between the sub-factors of creative thinking ability (language drawing) and the sub-factors of creative personality?
2. How will creative thinking ability and creative personality change according to sex and age?

METHOD

Subjects

This study focused on 4 to 5 year-old preschoolers to investigate the relations between creative thinking ability and creative personality, and developmental tendency of ability and personality. In total, 716 subjects were sampled from:

- big cities (341 children), which included Seoul, Pusan, Kwangju, Suwon city,
- medium-sized cities (240 children), which included Wonjoo, Cheonan, Changwon, Anyang, Ansan city, and
- small cities (235 children), which included Seosan, Yeosoo, Icheon, Asan, Namyangju city.

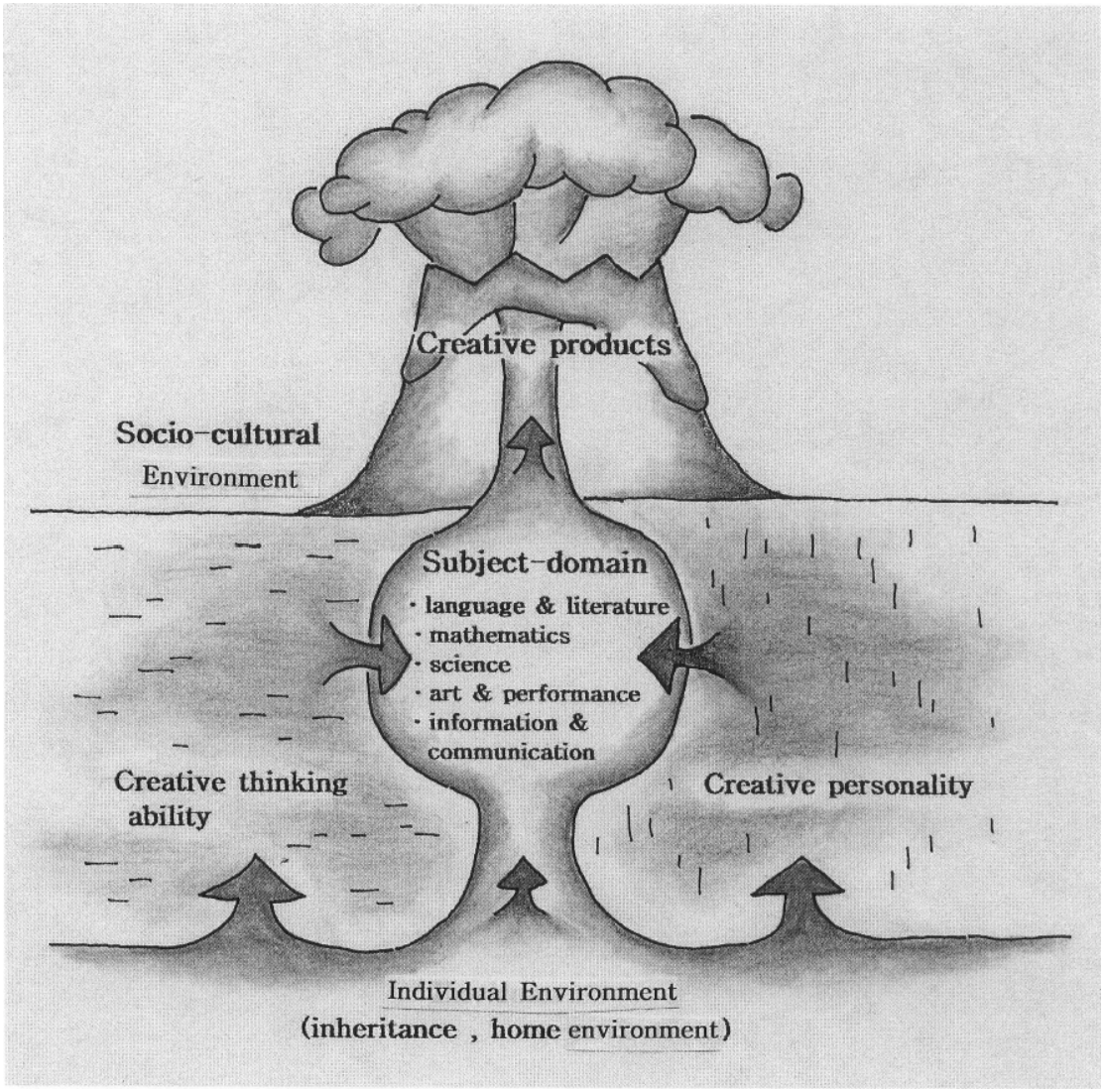

Figure 1. Volcano Model for Creativity Measurement

Instruments

Integrated Creativity Test/ for Preschoolers developed by Lee and Lee (2002) was used to measure creative thinking ability and creative personality. This test was developed on the basis of the Volcano Model for Creativity Measurement influenced by theoretical background of Guilford (1950) and Torrance (1970, 1972). This test for 4 to 5 year-old preschoolers is sub-divided into language, drawing, and personality domains.

The language domain consists of imagination, fluency, and originality factors. The drawing domain consists of continuation, connection and completion, new elements addition, theme, and unconventionality factors. The creative personality domain consists of curiosity, independence, run-a-risk, and task commitment factors. Language and drawing tests were scored 0 or 1 point per test item. Creative personality test items were scored on a scale of 1 to 5 points, as in the Likert scale.

PROCEDURE AND ANALYSIS

As stated previously, the Integrated Creativity Test 1: for Preschoolers was administered by trained teachers to 716 preschoolers over a three-month period. Only the creative personality test was sent home and answered directly by parents. The tests were scored by trained kindergarten

teachers and graduate students. The relations between creative thinking ability and creative personality were analysed according to total scores and factor scores. The scores were analysed using SPSSWIN 10.0 statistical package. Pearson's correlation coefficient was computed and an ANOVA performed.

RESULTS

This study investigated the relationship between creative thinking ability and creative personality. Pearson's correlation coefficient of 0.019, significant at the 1 per cent level, was found between creative thinking ability and creative personality.

What is the relation between the sub-factors (language domain: imagination, fluency, originality/drawing domain: completion, continuation and connection, new element addition, theme, unconventionality) of creative thinking ability and the sub-factors (curiosity, independence, run-a risk, task commitment) of creative personality?

Pearson's correlation coefficients were computed and presented in Table 1.

As presented in Table 1, imagination of the language domain correlated significantly to curiosity, independence, run-a-risk, and task commitment of creative personality, and fluency correlated significantly to three factors except run-a-risk. However, originality correlated significantly to only curiosity.

Table 1. The correlation coefficients between the sub-factors

	IM	F1	OR	CC	CO	NE	TH	UC	CU	IN	RR
IM											
FL	0.394**										
OR	0.204**	0.244**									
CC	0.111**	0.102**	0.106**								
CO	0.121**	0.161**	0.083*	0.316**							
NE	0.063	0.133**	0.021	0.048	0.322**						
TH	0.127**	0.139**	0.131**	0.276**	0.474**	0.329**					
UC	-0.034	0.138**	0.023	0.176**	0.394**	0.421**	0.433**				
CU	0.113**	0.144**	0.087*	0.116**	0.057	0.046	0.063	0.117**			
IN	0.112**	0.174**	0.069	0.118**	0.064	0.015	0.089*	0.089*	0.573**		
RR	0.087*	0.061	0.044	0.114**	0.042	0.007	0.051	0.073	0.623**	0.539**	
TC	0.138**	0.121**	0.065	0.119**	0.066	0.048	0.126**	0.103**	0.463**	0.571**	0.429**

IM=imagination, FL=fluency, OR=originality, CC=connection and continuation, CO=completion, NE=new elements, TH=theme, UC=unconventionality, CU=curiosity, IN=independence, RR=run-a-risk, TC=task commitment
*p<0.05,**p<0.01

In the drawing domain, continuation and connection highly correlated to all four creative personality factors. In particular, theme factor correlated to independence and task commitment, and unconventionality correlated significantly to curiosity, independence, and task commitment. However, completion and new elements addition did not correlate significantly to creative thinking ability.

How will creative thinking ability and creative personality factors vary according to sex and age? In order to investigate the differences in sex and age between 4 and 5 year-old preschoolers in creative thinking ability and personality, a t-test was administered and the results are shown in Table 2. There were significant differences in language, drawing, and total score of creative thinking ability according to sex, but no significant difference in creative personality. Girls displayed higher creative ability in both language and drawing than boys. The differences were statistically significant.

As presented in Table 3, there were significant differences in both creative ability and creative personality according to age. That is, 5 year-old preschoolers scored higher in the language and

drawing domains of creative thinking ability and creative personality than 4 year-old preschoolers. According to this result, the fact that creative ability and personality change is confirmed. Therefore, teachers need to develop individualised creativity programs according to age level and gender characteristics.

Table 2. The difference between creative thinking ability and personality by sex

			N	M	SD	df	t
Creative thinking ability	Language	Boys	348	6.12	6.01	714	-2.411 *
		Girls	348	7.54	9.33		
	Drawing	Boys	348	4.41	2.98	714	-2.876**
		Girls	348	5.05	2.95		
	Total	Boys	348	10.53	7.14	714	-3.078**
		Girls	348	12.59	10.38		
Creative personality		Boys	348	111.02	15.72	714	0.279
		Girls	348	110.68	16.12		

*p <0.05, ** p<0.01

Table 3. The difference between creative thinking ability and personality by age

			N	M	SD	df	t
Creative thinking ability	Language	4 year	342	6.10	6.42	680	-2.824*
		5 year	340	7.82	9.30		
	Drawing	4 year	342	4.36	3.00	680	-3.664**
		5 year	340	5.20	2.95		
	Total	4 year	342	10.46	7.48	680	-3.700**
		5 year	340	13.03	10.37		
Creative personality		4 year	342	108.60	15.76	680	-4.379**
		5 year	340	113.79	15.21		

*p<0.05, ** p<0.01

DISCUSSION

For the students sampled, this study confirmed the relations between 4 to 5 year-old preschoolers' creative thinking ability and creative personality, and their development. This research has implications for identifying gifted children and developing educational programs for gifted and talented children.

Firstly, the imagination factor and fluency factor in the language domain of creative thinking ability were related significantly to four factors of creative personality – curiosity, independence, run-a-risk, and task commitment. These results imply that we can substitute creative thinking ability test for creative personality test because of the complicated scoring method that obscures the validity.

Secondly, analysed by sex, there were significant differences in language, drawing, and total score of creative thinking ability but no difference in creative personality. This suggests that there is a difference in creative ability between boys and girls. Girls are more creative than boys in the preschool years.

Thirdly, analysed by age, there were significant differences in language, drawing, and total score of creative thinking ability and creative personality. This implies that there is a developmental trend in creative thinking ability and creative personality.

It was found that creative thinking ability was partly related to creative personality and that there was a difference between creative thinking ability and creative personality. This researcher believes that teaching 4 to 5 year-old preschoolers in educational programs designed with consideration of these study results will be much more effective than in the past.

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Humour in cognitive and social development: Creative artists and class clowns

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There are a number of characteristics of gifted children reported by teachers and researchers. Such characteristics may include curiosity, advanced mathematical skills, large vocabulary, acute sense of humour. This paper examines the demands that humour, as a creative activity, makes on cognitive and social development. It is derived from research that includes interviews with renowned professional humorists and examination of their work. The production of humour requires a sophisticated cognitive ability in order to relate multilevel disparate concepts. Furthermore, to amuse an audience, a humorist needs a high level of empathy, the ability to see the world from another's point of view, and a sensitivity to people's feelings and beliefs. On the other hand, much humour is cruel, and class clowns are seriously disruptive. An understanding of humour in the context of social and cognitive development reconciles these contrasts and suggests appropriate responses.

Humour, gifted, cognitive, creativity, empathy

There are a number of characteristics of gifted children reported by teachers. Such characteristics may include curiosity, advanced mathematical ability, large vocabulary, acute sense of humour.

It is the last of these that I wish to examine in this paper, in the hope of finding some explanation for the phenomenon. I hypothesise that humour involves cognitive processes, which are appreciated by children (and adults) who have advanced cognitive abilities, and I will explore some forms of humour in an attempt to identify cognitive strategies used in their construction.

A comedian has a rapport with the audience. The telling of a joke, for example, requires a scene to be established, a story to be told, a set of expectations to be developed in the minds of the audience. Then, at precisely the right moment, the expectations are overturned. This ability require a high level of cognitive development (Shultz, 1974, 1976).

> The joke-telling of school-age children demands several skills not usually apparent in younger children: the ability to listen carefully; to know what someone else will think is funny; and, hardest of all, to remember the right way to tell a joke.
>
> Berger (1983, p.301)

As we all know, some adults never manage to develop the art of comic delivery, whilst others develop their skills to a professional level, which provoke admiration and delight amongst the rest of us.

The comedian has a fine sense of empathy, can see the world from another's point of view, and is sensitive to people's feelings and beliefs. A poorly told joke has misplaced timing, or leaves out important information, or fails to engage the interests of the listener. In contrast, a well told joke is the result of highly developed social sensitivity.

The comedian, then, possesses sophisticated cognitive ability and exhibits virtues that are a basis for ethical behaviour.

Nonetheless, I will not attempt to substantiate the belief that an acute sense of humour can be validly considered a marker for giftedness. One might imagine developing an instrument that measured a sense of humour and seeking a correlation with IQ but the practical and theoretical difficulties are a deterrent. Measuring creativity is difficult enough, and the difficulties multiply with a measurement of humour. One would need to disentangle the factors of humour as a personality trait, a cognitive ability, the cultural context, the particular content, personal taste and the essentially ephemeral nature of humour. Typically a joke that is funny the first time one hears it is not funny on subsequent exposures, so how could its affect be measured? This is assuming that an agreement could even be reached that the joke was intrinsically funny. I say ‘intrinsically’ rather than ‘objectively’ because I suspect ‘objectively funny’ may be an oxymoron.

So, rather than examine gifted children and their purported sense of humour, I will explore humour itself to see if its constructions makes use of cognitive strategies in any way similar to mathematics, science, reasoning or the arts.

For the purposes of this paper I will begin with one manifestation of comedy, the common joke, and examine its form for evidence of cognitive strategies in its construction.

I do not choose the common joke because I think it the variety of humour most likely to exhibit cognitive strategies. Quite the reverse. *Prima facie,* a sketch constructed and performed by a professional comedian would provide a better example. The author of a common joke is unknown, its modifications over time uncontrolled and its performer an amateur who doubtless has never reflected upon comic techniques or strategies. Looking for cognitive strategies in a common joke is analogous to seeking musical forms in a child’s nursery rhyme rather than an exquisitely constructed concerto. Still, one can find musical strategies in nursery rhymes which also occur in concertos and so finding strategies in common jokes which also occur in sophisticated performances would be encouraging.

In the medium I am using here, the written word, it is impractical to reproduce a performed comedy sketch, which is another reason for referring to common jokes which can or have been written down. Mind you, I contend that they should <u>not</u> be written down. Much of the humour in a joke is in the telling, the characterisation and, most importantly, the timing.

Typically we think of jokes as being about something. There are dirty jokes, lawyer jokes, racial jokes, toilet jokes and so on. Indeed, joke books classify jokes by their content and typically concentrate on only one form, such as the riddle, the one liner or the short conversation between two blokes in a bar (or the Englishman, the Irishman and the Scotsman) (Fechtner, 1986; Adams and Newell, 1997). Is it possible to examine the construction of a piece of comedy as distinct from its content?

Here is a joke whose content might be considered relevant to gifted education.

> A bloke in the bar turns to the guy next to him and says, 'Can I buy you a beer?', and the other bloke replies, 'Look, I'll be perfectly frank with you so we won't waste any of our precious time. See, I'm a genius. And if you buy me a beer you'll want to talk, and what could you say that would interest me, a dead-set genius with an IQ of 196?' And the bloke says, 'An IQ of 196! This is incredible. I'm a genius too, with an IQ of 195 - we can talk! Bartender, two beers.' And so they settle down to discussing quantum physics and the great theories of the cosmos.
>
> Down the bar a bit, a bloke nudges his neighbour and says, 'How about these two? I'm not stupid, in fact, I have an above average IQ of 127 but I wouldn't have a clue what

> these geniuses are talking about. Quantum what? Theories of where? It's way over my head.' And his neighbour says, 'You have an IQ of 127! I'm above average, too. My IQ is 126 - we can talk! Bartender, two beers.' And so they settle clown to discussing feminism's impact on the Australian film industry and the safety features of Volvos.
>
> Further down the bar, a bloke nudges his neighbour and says, 'Check this out, would you? Whatever those geniuses are talking about, it's complete gobbledegook to me, and I'm not ashamed to admit that all this stuff is way over my head. I've got an IQ of 80. You wanna make something of it?' And his neighbour says, 'This is great! I'm really dull, too. My IQ is 78 – we can talk! Bartender, two beers. So, the elections went pretty well. I hear you got returned to parliament with an increased majority.'
>
> Adapted from Adams (1997, p.387)

This joke does not have a particularly interesting construction and its success depends entirely on how delighted its audience is by the insult delivered in the punch line, or rather, which particular group of people are insulted. So you can leave the form of the joke as it stands and change the content of the last line to indicate football supporters, fans of Brad Pitt, devotees of alternative medicine or any group you wish to denigrate. You can also change the genius conversation to subject matter you wish to glorify. Thus, while there is an interplay between the construction of a joke and its content, an analysis that concentrates on its construction rather than its content is possible.

Although I maintain that such an analysis is possible, it is rarely undertaken. Humour clearly involves a number of states and processes. It requires cognitive processing, has an impact on the psychological condition (such as a release in tension) and has physiological results (such as laughter) while much research has been undertaken on the psychological and physiological processes there has been very little analysis of comic constructions besides that of Beattie in 1776 and Koestler in 1964. (Dillon, 1985; Berk, 1989; Labott et al, 1990; Newman, 1996; Beattie, 1776; Koestler, 1964)

Indeed, analysis is explicitly discouraged. Adams and Newell maintain, “It's painfully obvious that scholars should be kept at arm's length from any manifestation of humour…. Because as soon as you start thinking about the construction and purpose of a joke the humour evaporates” (Adams and Newell, 1997, p.3).

It is easy to demonstrate the error in these thinkers’ expectations by considering commentary of other art forms such as literature or music (Sagar, 1978; Kennedy, 1994). A critique of poetry does not scan, an analysis of music does not harmonise and a pathologist’s report is not toxic. Adams and Newell simultaneously state the obvious and miss the point. The point of analysing humour is analysis rather than amusement.

I have now presented three propositions:

1. that there may be cognitive strategies evident in the construction of jokes,
2. that the construction of a joke may be distinguishable from its content,
3. that comedy is an art form and comparable to other art forms.

Allow me some further illustration of the last two points before I return to the primary proposition:

Consider the following joke as an example of the art of comedy.

> The young prince was in excellent spirits. The kingdom was prosperous. His father, the king, was a popular and competent ruler, but was nearing the end of his reign and

> the prince would soon assume the throne. As the prince rode on parade through the town, the peasants lined the streets cheering and waving. The prince noticed amongst them a young man who looked remarkably like himself "Father, you old philanderer!" thought the prince as he approached the young man in the crowd, "Tell me fellow, did your mother ever work at the palace?"
>
> "No", replied the peasant, "but my father did," (trad)

This joke has a beginning, a middle and a climatic end. It has characters we can identify with, a commentary on the human condition and a critique of social mores. It is tightly constructed and works well as a performance piece.

Let us return to the proposition that it is worth examining jokes for cognitive processes. The simplest verbal joke is the pun (Aristotle in Janko 2002).

> "How do you make a slow racehorse fast? Don't feed him anything."
>
> Fetcher (1979, p.137)

The pun produces the collision of two incongruous cognitive frames of reference. The punch line of a joke provides a cognitive jolt, a demand that the listeners suddenly shift their frame of reference to a contrasting one. The comic cannot simply provide two frames of reference. The rules of the game, or, to put it another way, the aesthetic form, requires the comic to set up one frame of reference and then to provide a link to another which is unexpected but connected via the link. In a pun, of course, the connection is the pronunciation. As Beattie (somewhat pompously put it "sameness is the sound and diversity in the signification" (1975, p.599). The concept of quickly can be pronounced fast and the concept of abstinence from food can be pronounced fast.

Koestler (1964) calls this process 'bisociation'. He maintains that bisociation is fundamental not only to humour, but to creativity itself. Understanding how comedy is constructed, he asserts, leads to an understanding the nature of wisdom and the nature of Art.

This is a bold claim, so let us pursue the notion of two frames of reference a little further. If we consider the relationship between form and content, we find that the pun is more amusing if the frames of reference are interesting or meaningful.

> A wealthy and unusually idealistic merchant banker was pottering around the backyard of his mansion one day when an itinerant handyman came round and asked him for a bit of casual work. Feeling sorry for the fellow, the banker produced 0.S litres of enamel paint and a brush and told the handyman he would like him to go and paint the front porch.
>
> An hour later the handyman was around the back again to collect his earnings. The banker commended him on the speed of his work and handed him ten dollars. As he was leaving the handyman remarked, 'By the way, it's not a Porsche, it's a Mercedes.'
>
> Adams and Newell (1997, p.290)

The humour here is not derived from the similar sound of porch and Porsche. It is the result of the sudden devaluation of the rich man's Mercedes. Beattie would call this the incongruity between dignity and meanness. It is similar to the prince's sudden realisation that he is illegitimate.

The prince had a stable concept of parentage and royal succession, but experienced a shift in the relationships of its elements. The concept remains stable despite the father's infidelity but is radically upset by the mother's.

It is this use of radical upset, which provides the humorist with opportunities for subversion. Political satire abounds. Newspaper cartoons, stage impressionists and television satirist's

constantly ridicule powerful persons (for example, Clarke, 1998; Berner, 2002; Gillies, 2002; Leaky, 2002; Quantock, 2002). The flawed politician has been a stock character in comedy for centuries (Beattie, 1975). Indeed, the use of stock characters has been a satiric strategy for millennia. Compare the political comedies of Ancient Greece, the *Commedia del Arte*, Shakespeare's comedies, the Goon Show and the popular Australian comedy "Seachange". Consider, too, the classic duo arrangement (such as Laurel and Hardy, Moriarty and Gryppepipe-Thynne, Pete and Dud), which is categorised by Idle (1999) as the white faced (pompous) clown and the red faced (foolish) clown. The more powerful tries to crush the other, though both are continuously crushed by circumstances.

The task of the class clown is to adopt the role of the subversive red faced clown and to cast the teacher as the white faced clown, to play Dudley More to the teacher's Peter Cooke (Idle, 1999). A wise teacher will politely decline the role and divert the class clown's talents.

Understanding how comedy can be subversive prompts the replacement of the terms 'bisociative' and 'frames of reference' with 'paradigm shift'. Interestingly, this term is derived from the philosophy of science.

In *The Structure of Scientific Revolutions*, Kuhn (1996) analyses the history of science to demonstrate that rather than an accumulation of incremental steps in a linear fashion, scientific progress consists of radical changes in the way phenomena are viewed, related and explained. Thus, astronomy once held the view that the heavens spun around a stationary Earth. Replacing that view with the concept of a spinning and orbiting Earth was a paradigm shift.

Kuhn himself maintained that the notion of paradigm applied only to the history of scientific practice but other thinkers have brushed aside this caution, funding applications in other fields. Rather than 'paradigm' being merely a phenomenon in the sociology of scientific practice, the concept has been adapted by some to represent an essential part of any cognitive process (Jewell, 1991).

De Bono (1985) promotes lateral thinking as the key to creative intellectual endeavour. His concept is comparable to that of paradigm shifting. There is a striking similarity between joke punch lines and paradigm shifts. Consider the change in astronomy from a fixed Earth to an orbiting one. Compare this to the story of the prince. His stable relationships with his parents and the peasantry have been suddenly replaced by a new and disturbing set of relationships. The prince, or rather, the recipient of the joke, has been led by its author to accept a stable, predictable scenario that has suddenly and shockingly lurched into unexpected conclusion.

The creation of a joke requires the construction of a scenario or set of expectations or paradigm before the delivery of a punch line which demands an unsettling shift to a related by unexpected result. Indeed, if the result is predictable (say from prior exposure), the joke does not work.

The joke, then, models other important intellectual processes. It requires the manipulation of its elements into an authentic form, as do other arts. It requires the perception of disparate frames of reference and possible connections between them. This, according to Torrance (1988) and Koestler (1964), is the essence of creativity. It requires an understanding of how one might shift from one set of assumptions to another. This is what De Bono calls lateral thinking and what Kuhn calls scientific progress.

There is much more to humour than jokes and punch lines. Analysis could be made of its genre, its performance techniques and its history. It merits critiques as an ethical force, a social phenomenon and a psychological effect.

This initial exploration has been enlightening. We are not surprised when gifted young people develop an especial interest in one of the sciences or the arts. We encourage them to be creative

and to undertake intellectual activities. We should not be surprised then, at an appreciation of humour. The construction and appreciation of comedy is an intellectual, creative and ethical endeavour. As such, it should be lauded and nurtured.

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Talent in the New Millennium: A two-year research study of gifted education

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"Talent in the New Millennium" was a research study into gifted education, conducted over a two-year period in 68 centres and schools in three disparate regions of New Zealand. Using questionnaires, oral interviews and sample case studies, the study drew input from educators of the gifted, from children and students identified as gifted, and from the parents and caregivers of children thus identified.

Through this input, the study sought information on how giftedness popularly is defined; the demographic profile of those identified as gifted; the range of strategies used to address the needs of those identified as gifted. From the identified gifted and their parents/caregivers, the study sought evaluative comment about these strategies.

The study's findings highlight areas of strength, potential and deficit in gifted education in New Zealand.

Early childhood education, ethnicity, gifted, definition, identification

THE STUDY

Talent in the New Millennium, a two-year research study of gifted education, commenced at the beginning of the year 2001. Coordinated through the Dunedin College of Education, the study involved 68 education providers, with an aggregate roll of 10,236 children and students, as presented in Table 1. These providers were sited in three regions of New Zealand, namely Otago and Southland, in New Zealand's South Island and, in the North Island, the Bay of Plenty. Although every region of New Zealand is culturally diverse, Otago and Southland each claim a strong Scottish and, to some extent, Irish heritage. The Bay of Plenty has strong Maori cultural links. All early childhood education centres and all primary, intermediate and secondary schools in Otago and Southland were invited to take part in the study, and about a fifth elected to do so. In the Bay of Plenty, three primary schools, one intermediate school and one secondary school joined *Talent in the New Millennium*, by invitation. The purpose of this invitation was to afford, within the study, a measure of inter-regional comparison.

Table 1. **Institutions taking part in *Talent in the New Millennium***

Type of institution	Number participating
Early childhood education centre	21
Primary school	28
Intermediate school	3
Secondary school	16
Urban setting	46
Provincial setting	7
Rural setting	15
Total number of institutions involved	68

The participants constituted a sample representative of the early childhood, primary and secondary educational sectors, in rural and urban settings, and sited in diverse socio-economic catchment

areas. All the participating institutions however, except for the five schools located in the Bay of Plenty, were self-selected volunteers. Inevitably, granted the range and fluidity of their circumstances, not all of the participating institutions were able to fulfil all aspects of *Talent in the New Millennium*'s two-year schedule. It must be accepted, therefore, that the study's findings afford useful, but necessarily incomplete, insight into perception and practice, in relation to gifted education, among an interested, twenty-per-cent minority of schools. *Talent in the New Millennium*'s implementation proceeded through six stages, as outlined in Table 2.

Table 2. Implementation of *Talent in the New Millennium*

Year 2001	**Investigation of:**
Stage 1 March	• Participants' definitions of giftedness
Stage 2 June-July	• Demographic profile of the identified gifted, and approaches to servicing the needs of the identified gifted
Stage 3 September-October	• Students' and parents'/caregivers' perceptions and evaluation of these approaches
Year 2002	**Reflection, triangulation and interpretation:**
Stage 4 April-May	• Evaluation of the Year 2001 program
Stage 5 May-September	• Implementation of interpretive case studies
Stage 6	• Establishment of guidelines for future research and practice

The study explored, firstly, definitions and perceptions of giftedness both among schools and their wider communities. Secondly, it pieced together the demographic profile of the children and students whom the participating centres and schools identified as gifted. Thirdly, it assessed the impact of programs of gifted education from the several perspectives of the participating students and their parents or caregivers. The fourth stage of the study centred on a series of four regional workshops. These took place, respectively, in Dunedin, Alexandra (Central Otago), Invercargill (Southland) and Tauranga (Western Bay of Plenty). The workshops afforded opportunities for an evaluative sharing of concept and practice among representatives from participating schools. The fifth stage tested *Talent in the New Millennium*'s interim findings against evidence provided by specific case studies of giftedness, carried out over a five-month period in 11 of the 68 enrolled centres. The final, interpretive stage of the study set out guidelines for future research and practice in relation to giftedness. From these guidelines has evolved a derivative, longitudinal research study, *Tracking Talent*, scheduled to run through 2004 and 2005.

METHODS OF RESEARCH

As regards its methodology, *Talent in the New Millennium* used both quantitative and qualitative approaches. A quantitative dimension was provided by two sets of questionnaires administered, respectively, in March 2001 and in June-July 2001, to teachers in each of the 68 participating centres and schools. Further sets of questionnaires were given, in September-October 2001, to identified-gifted children and students enrolled at the participating centres and schools, and to their parents and caregivers. In total, 258 identified-gifted children and students and 254 parents/caregivers of these children and students, representing 38 centre and school communities, completed the September-October 2001 questionnaires. A qualitative dimension to the study emerged through the series of regional workshops, held during April and May 2002. These workshops, following a semi-structured format, were attended by between one and seven representatives, severally, from each of 27 centres and schools. A further qualitative dimension emerged from the 11 case-study profiles, which were developed during Stage 5 of *Talent in the New Millennium,* in the period May-September 2002. The profiles synthesised the results of observation, interviews, the monitoring of work records and student diaries, staff networking and parental contact. Compiling the profiles entailed a significant commitment of time by schools with a particularly strong interest in gifted education.

RESULTS

Giftedness, of its very essence, is multifaceted. The results of *Talent in the New Millennium* highlighted the variety and fluidity of giftedness among young people, a variety evident both in the personality traits and interests of the gifted young and in the range of their preferred contexts for, and styles of, learning. Asked to rate, on a 1 to 4 Likert scale, each item in a list of some 20 learning contexts and styles, the 258 children and students responding to Stage 3 of *Talent in the New Millennium*, during September-October 2001, offered the full gamut of replies. On the 4-step scale, to which the children and students were working, a Level 1 rating indicated strong support or agreement, a Level 2 rating moderate support or agreement, a Level 3 rating moderate disapproval, dislike or disagreement, and Level 4 strong disapproval, dislike or disagreement. None of the 20 listed learning contexts and styles drew an unequivocal rating from the responding students. Table 3, groups and classifies the students' patterns of response. Socio-learning contexts involving ownership and choice emerged clearly as the most preferred option among the responders, with problem-solving and reading featuring as the runners-up. Experiential learning was favoured over passive listening, which emerged as the least preferred option of the responding students. Second-least popular, especially among secondary school responders, were contexts requiring affective engagement or expression of feeling – a function, perhaps, of the insecurities and shyness of adolescence. Even these contexts, however, attracted more positive rather than negative ratings among responding children and students at every level of schooling. Gifted and talented students, it seems, can squeeze some benefit out of almost any socio-educational context.

Table 3. Gifted students' rating of learning styles and contexts

Learning style or context	Percentage of gifted students
Contexts affording choice to the student	93
Problem-solving contexts	87
Learning through reading	84
Contexts allowing or promoting the use of computer technology	78
Learning through watching	78
Learning through interaction with age peers	78
Practical contexts, for example, model-making	75
Contexts involving physical activity, for example, sport	74
Contexts involving argument and debate	69
Contexts calling for use of the imagination	69
Learning through interaction with adults or older people	69
Contexts calling for the engagement or expression of feeling	67
Learning through listening	65

*according positive responses (that is, Levels 1 or 2 responses on a 4-step Likert scale)

Affording a measure of triangulation to *Talent in the New Millennium*, the 11 gifted children and students profiled at Stage 5 of the study, during May-September 2002, mirrored the diversity of the wider body of student participants. The profiled students displayed a striking range of attribute and need, and gave evidence of change over time: socialites and loners; conservatives and rebels; perfectionists and dilettantes; broad spectrum high achievers and specialists; extroverts and introverts, and the autistic. Each of these qualities and conditions was represented among the eleven profiled students and, in some cases, contrasting pairs of qualities were manifest, according to circumstance and time, within the experience of single individuals.

Precisely because of its essential dynamism, giftedness creates difficulties of definition, identification and address for practitioners in the field. Giftedness is not a state but a process. Inevitably, therefore, tension arises between the identification of, and provision for, gifted students. Identification resembles the taking of a snapshot. Identification is a freeze-frame within a movie. Provision, however, has to set the movie rolling once more and adapt to its changing

scenario. The dichotomy between the identification of, and provision for, giftedness is shown diagrammatically in Figure 1.

For staff at some schools participating in *Talent in the New Millennium*, issues of definition and address in a context as elusive as giftedness proved divisive. It became evident, during the Stage 4 workshop phase of *Talent in the New Millennium*, April-May 2002, that participating schools with effective gifted programs invested a great amount of effort in whole-staff consultation and in community networking. It was evident, also, that primary schools found consultation and networking relatively easier to achieve than did secondary schools. Primary schools, as a rule, are smaller, have shorter lines of communication and are less diffuse in structure than are their secondary counterparts. It is easier in a primary school than it is in a secondary school to give the whole school community a common focus, whether that focus relates to giftedness or to any aspect of educational activity (Flude, Glaister and Keen, 2002, p.14). Regardless of school type, however, *Talent in the New Millennium* showed schools with informed and supportive principals and boards of trustees, and with dedicated committees of staff members, as being well-placed to cope with the challenges of gifted education – challenges which, generally, are too demanding to load on to a single staff coordinator. Recent research undertaken by Massey University, Palmerston North, on behalf of the New Zealand Ministry of Education, corroborates this finding (Ministry of Education, NZ, 2004, *Case Studies*, p.47).

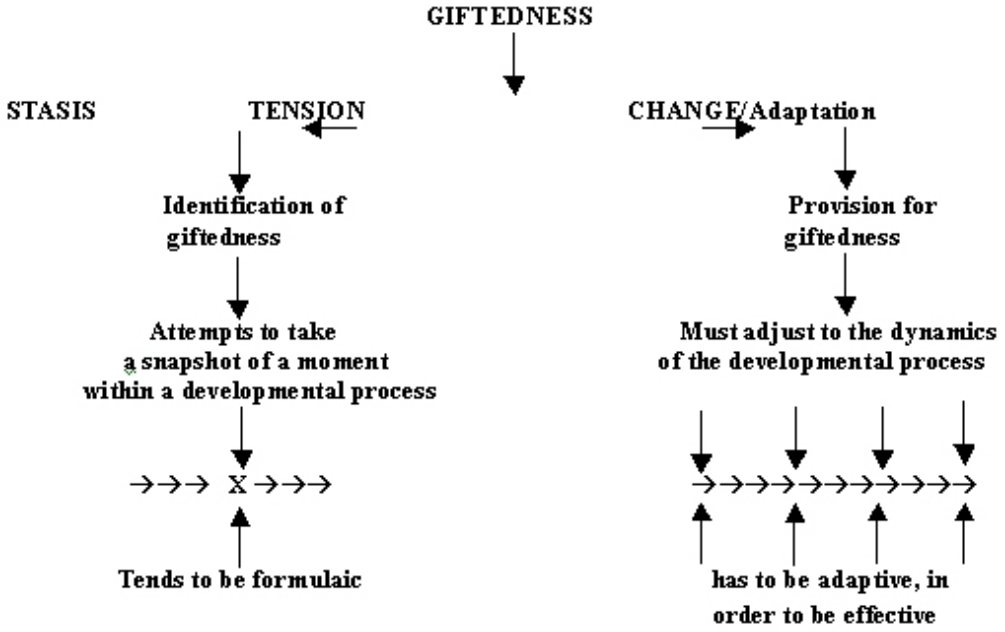

Figure 1. The dichotomy between the identification of, and provision for, giftedness

From the earliest stages of *Talent in the New Millennium*, the difficulty of achieving synthesis amid diverse perspectives became apparent. Among the study's participants, approximately a sixth of the early childhood education centres and schools, and a larger proportion of parents, felt unable to define giftedness. Secondary teachers, especially, expressed difficulty in this regard. A minority of early childhood providers rejected definition *per se*, not on the grounds that it was impossible but rather that it was inappropriate. These commentators based their argument on the holistic nature of early childhood programs and rejected labels, including the label 'gifted', as intrinsically compartmentalising and, therefore, incompatible with a sound curricular philosophy (for example, Ministry of Education, NZ, 1996, p.14). Labels, it was held, inherently circumscribe and, thus, actually impede the attainment of the very goals which gifted education, theoretically, espouses. Some early childhood centres, on the other hand, and especially those run on Montessori lines, embraced the concept of gifted education.

It would be valuable for the early childhood education sector in New Zealand to run its own internal debate regarding its philosophy in relation to giftedness, and the outcomes of this debate would be of wider interest. A degree of sympathy with early childhood centre reservations regarding gifted education now has become apparent among some primary and secondary schools taking part in *Tracking Talent*, the research project, noted above, which has derived from *Talent in the New Millennium*, and which, currently, is running in Otago and Southland. Teachers associated with *Tracking Talent*, generally, have welcomed the enhanced profile accorded to giftedness this year, 2004, in the New Zealand Ministry of Education's revised *National Administrative Guidelines*. However, some teachers fear that this enhanced profile will be reconfigured to suit an administratively-driven imperative of *accountability* and, thence, will become linked to inappropriate demands for *measurable outcomes*, killing the spirit of gifted education.

Even where early childhood centre or school communities associated with *Talent in the New Millennium* seemed to agree, the veneer of agreement often masked fundamental differences of understanding regarding the definition and identification of giftedness and talent. Over 80 per cent of school responders to *Talent in the New Millennium*, and over 70 per cent of participating parents, defined giftedness normatively, in relation to the anticipated performance levels of cohorts of age peers. This approach, however, provided no guarantee of unanimity of identification. Teachers and parents disagreed profoundly, among themselves, as to where, on a quantitative continuum, the cut-off point for giftedness might lie. On average, centres and schools taking part in *Talent in the New Millennium* identified 9.4 per cent of their children and students as gifted. However, very few actually identified and selected at the mathematically average rate; statistics may well conceal rather than elucidate reality! Most centres and schools taking part in *Talent in the New Millennium* either identified 5 per cent or less of their children and students as gifted, or else identified between 12 and 15 per cent. Survey responses showed this pattern to be spread evenly across the socio-economic spectrum of participating centres and schools. Those identifying at the lower rates insisted on demonstrated performance rather than indicative potential as evidence of giftedness, and excluded the gifted underachiever from their tally.

Responders, also, looked for evidence of giftedness in different areas. For secondary teachers, the focus tended to fall on the student's conceptual range or facility of access to the realm of abstract thought. For teachers of primary-age children, it fell on facility in numeracy, language or recall and, at the pre-school level, on the child's perception of spatial relations and fine motor skills. Parents, when asked what first led them to recognise giftedness in their own children, highlighted, in at least two-thirds of cases, qualitative intangibles of attitude, emphasising the child's passionate interests, powers of self-motivation and concentration, insatiable curiosity and, also, sense of humour. Markedly more than parents, schools, on the other hand, emphasised originality and creativity as hallmarks of giftedness.

Program participants, also, diverged in their understanding of the term *talent*. Some regarded giftedness and talent as synonymous. Some, particularly education professionals, accepted a Gagnéan differentiation between giftedness as genetically endowed potential and talent as environmentally nurtured performance (Gagné, 1985, 2003). Others, parents rather than schools, distinguished giftedness and talent in terms of performance range. For these responders, giftedness represented broad-spectrum excellence, while talent represented attainment in a specific domain. About a fifth of schools and about half of all parent responders to *Talent in the New Millennium* differentiated giftedness and talent in this way. A smaller number of parent responders differentiated giftedness and talent in terms of outlay of effort. For this group, giftedness denoted seemingly effortless performance. Talent was the painstaking output of the "average to bright" (Keen, 2001, p.4).

Diversity of perception regarding the fluid processes of giftedness and talent was mirrored in the range of identification procedures favoured by the several educational sectors. Seemingly, identification strategy is a function of school size, pupil-staff ratio and relative degrees of complexity within school organisational structures. Among *Talent in the New Millennium*'s participants, observational approaches to gifted identification predominated in early childhood centres and primary schools. Behavioural profiles were favoured particularly by teachers in early childhood centres, reflecting the personalised bond which these centres, typically enjoying small rolls and favourable adult-child ratios, were able to cultivate with their children. Cumulative work and attainment profiles were favoured among primary school teachers, both for convenience and perceived reliability. Secondary schools, generally larger and more complex in structure than their primary counterparts, gave prominence to formal, academic testing, whether by agency of one of a range of standardised instruments, or in the context of the schools' own internal assessment programs, or through the public examination system. Secondary teachers did not necessarily rate formal academic tests as more reliable than other procedures for identifying giftedness, but they found them to be more manageable.

Among other identification instruments available to schools but seldom used, secondary teachers gave the psychological services, generally, a positive rating for reliability, but did not use the services because they were too expensive. Stretched budgets constrain schools to choose between support for mainstreamed *special needs* students or for the psychological diagnosis of the gifted underachiever. Seemingly, the gifted underachiever misses out, while the harassed coordinator of gifted programs laments his or her own lack of training in therapeutic counselling. *Pari passu*, the secondary schools' own guidance counsellors generally lack training in gifted education. Moreover, professional commitment to client confidentiality can make it difficult for the secondary school guidance counsellor to contribute within a gifted education committee or team. Primary and intermediate schools, enrolled in *Talent in the New Millennium*, stated that they would integrate teacher-counsellors into the shaping and delivery of their gifted programs, were they allowed to employ such people.

Talent in the New Millennium's participating schools, in fact, saw resourcing in all its aspects as fundamental to their servicing of gifted students' needs. The schools sought money to buy resources for enrichment and extension, and to purchase the physical space in which to store these resources and conduct appropriate programs. They looked for money to buy teacher time to levels adequate for the processes of identification, networking and program preparation and delivery. They sought funding for teacher in-service training, prioritising training for the schools' leaders, the principals and boards of trustees.

Parents responding to *Talent in the New Millennium* concurred in the need for teacher training. In open-ended comment appended to written questionnaires, some 20 per cent of responding parents alluded to the crucial role of the teacher, for better or worse, in their children's school performance, their comments corroborating current research findings identifying teacher effectiveness as a key determinant of educational outcomes (Hattie, 2002, pp.5-6). About half of the parental comment regarding teacher influence was strongly supportive. Parents saw the effective teacher of gifted children as possessing, not necessarily exceptional academic qualifications, but exceptional attitudes. They saw their children flourishing in the care of teachers who valued, and empathised with, their children's interests, and who had the willingness and humility to be fellow travellers in inquiry. Negative parental comment, on the other hand, complained to a small degree of teacher apathy regarding giftedness, to a larger degree of the perceived effects of the 'tall poppy' syndrome in New Zealand education and, above all, to alleged deficiencies in teacher training which left the classroom practitioner with a conceptual void in a crucial area. Parents who were themselves trained teachers complained that too little has been

done in New Zealand's colleges and university schools of education to address the teaching of gifted and talented pupils.

Consistently, parents associated with *Talent in the New Millennium* expressed a desire for earlier and closer relations with the schools, whether in respect of the identification of giftedness or in ongoing networks of mutual support; parents in New Zealand today seem to have moved from the markedly egalitarian ethos that prevailed in the 1960s, an ethos which made parents during that era somewhat diffident regarding their children's abilities (Knudson, 2003, p.287). Less than half of the 254 parents and caregivers responding to Stage 3 of *Talent in the New Millennium*, during September-October 2001, felt well informed about the provision for giftedness at the early childhood education centres or schools that their children attended. At least a fifth of the parents wished that their children's giftedness had been identified, and the identification acted upon, at an earlier stage of schooling. On the other hand, for schools associated with *Talent in the New Millennium,* contact with parents, on occasion, has proved to be problematic. Some teachers, both in written comment and oral comment, expressed concern regarding parental bias or parental politicking. Some feared that parental expectations and attitudes might compound anxiety problems for the gifted child. However, most teachers, whether responding to *Talent in the New Millennium* or to its current derivative, *Tracking Talent*, accepted, or do accept, that parents are rich and uniquely valuable sources of information and support regarding gifted identification and provision, and that school-home networks should be fostered, in spite of the mutual sensitivities involved.

Precisely because perceptions of giftedness are both rich and controversial in their diversity, it is desirable that gifted identification and provision should involve networking, within and between schools, between schools and agencies of support within the community, and between schools and parents. Patterns of response from *Talent in the New Millennium* participants suggest that interschool networking and community networking in New Zealand both currently are underdeveloped, especially in relation to the potential input of the early childhood sector. Some early childhood practitioners, attending workshops in association with *Talent in the New Millennium*, asserted strongly that their intimate, observational knowledge of children gave them insight into gifted potential long before it was picked up in the wider school system. In the perception of these early childhood teachers, primary new entrant programs focus on the homogeneous at the expense of the idiosyncratic, and on whole-group socialisation at the expense of individualised gifted enrichment. Peters (2002, p.96) has noted that primary new entrant teachers experience "internal tensions from the competing demands of their role, as they [try] to balance espoused child-centred approaches to learning with the practicalities of helping thirty just-turned-five-year-olds adapt to the rules and routines of the school environment". Teaching is the vision of the ideal, re-sketched as the art of the possible. Squeezed between competing priorities, information forwarded from early childhood centres to primary new entrant classes sometimes is ignored. Conscious of the constructive contribution which they could make to gifted education, early childhood centres associated with *Talent in the New Millennium* voiced frustration at the extent to which they saw themselves as marginalised, both at local level and as regards central policy on giftedness.

Better lateral networking between home and school, and better vertical networking between the several levels of education, might help to correct some of the imbalances in the demographic profile of students currently identified as gifted. Theories of giftedness maintain that giftedness and talent are gender-neutral, and are manifest in every ethnic, cultural and socio-economic setting (Cathcart, 1994, p.197; Ministry of Education, NZ, 2004, *Conclusions*, p.1). Gender ratios among the students noted as gifted in *Talent in the New Millennium* did, indeed, match the expectations of theory; among a tally of approximately 10,000 children and students associated with the study, 9.6 per cent of boys were identified as gifted and 9.2 per cent of girls were so identified. The same

could not be said in relation to socio-economic profile. Over a third of *Talent in the New Millennium*'s identified gifted came from professional homes and, of this third, almost 50 per cent, that is, almost a sixth of all the identified gifted, came from homes associated professionally with education. These figures far exceed the proportion of professionals and, particularly, educational professionals in the New Zealand population as a whole, as shown in census-based statistical reports (Statistics New Zealand 1999 and 2000). Conversely, children from semi-skilled or unskilled labouring backgrounds, and the children of the unemployed, proportionally were underrepresented in *Talent in the New Millennium*. Interesting detail, available from the 11 case studies deriving from Stage 5 of *Talent in the New Millennium,* May-September 2002, suggested that mothers with professional qualifications, rather than fathers, might exercise an especially strong influence in relation to gifted development. Anecdotal comment deriving from studies conducted in Otago during the 1960s supports this finding (Knudson, 2003, p.287), as does preliminary information from the *Tracking Talent* study, 2004. It is not clear whether the finding, if proved to be valid, is socially generic, or whether it relates to specific circumstances within current New Zealand society.

A further cause for concern in the profile of giftedness deriving from *Talent in the New Millennium* relates to student ethnicity, as presented in Table 4.

Table 4. Ethnicity of children and students identified as gifted and talented in schools and centres taking part in Stage 2 of *Talent in the New Millennium*, June-July 2001

Ethnic group	Number enrolled	Percentage identified as gifted/talented
New Zealand European	7534	10.0
Maori	923	5.6
Other Polynesian	63	4.8
Asian	301	9.3
Other ethnic groups	223	7.6

Among pupils taking part in the study, those of New Zealand European stock headed Table 4 of the identified gifted, while those of other ethnicity fared less well. Maori and other Polynesian children and students comprised some 11 per cent of the aggregate enrolment in centres and schools involved in the study. Seemingly these children and students, relative to roll numbers, were identified as gifted and talented at about half the rate for New Europeans and Asians, and at lower rates, also, relative to other ethnic groups. Gifted performance is culturally conditioned (Bevan-Brown, 1996, p.91; 2003). In Maori cultural terms, giftedness may be regarded as an attribute of the group rather than of the individual. Certainly, to be meaningful in Maori terms, giftedness should be exercised in community service. Also, to a greater degree than is expected in contemporary western culture, Maori giftedness should embody a spiritual dimension. New Zealand's educational system, multicultural in its ideals, faces challenges, as yet unaddressed, in recognising and fostering giftedness in diverse socio-economic and ethnic settings.

Nevertheless, notwithstanding difficulties and inequities of identification and provision, schooling has proved to be an enjoyable or, at least, acceptable experience for a four-fifths majority of the identified gifted children and students taking part in *Talent in the New Millennium*. Responders valued their schooling for its range of curricular and co-curricular opportunities. As regards preferred content areas within the school program, students responding to *Talent in the New Millennium*'s Stage 3 questionnaires, September-October 2001, both in structured answers and in open-ended supplementary comment, often expressed affinity with language, mathematics, science or computing. More than half the students played a range of sports, and almost half were involved in music or dance, both in school and as leisure activities. Art and drama tended not to emerge as interests until the later years of secondary schooling. There was some tendency for girls to favour language as an area of interest, and for boys to favour mathematics, sport and outdoor education. Gifted boys, markedly more than girls, cited computing as an active interest. These

gender-related tendencies emerged even more clearly in information supplied by parents, regarding their children's interests, than they did in information supplied by the children themselves; it is not clear, from the research, if or to what degree the parents shaped, rather than merely observed and described, their children's choices and preferences. However, the high status of music among the interests of gifted young people associated with *Talent in the New Millennium*, equally reported by gifted boys, girls and their parents, suggests that this subject should be promoted more vigorously in schools. Current trends towards downgrading music as a mainstream element in New Zealand curriculum delivery are of concern. Also, the paucity of reference to social studies in the curricular perceptions of gifted students should be of concern to teachers of the social sciences in New Zealand.

Compared with the 80 per cent majority, a 20 per cent minority of gifted children and students responding to *Talent in the New Millennium* expressed an overt dislike of school. Qualitative feedback from the children and students concerned suggested two reasons for their antipathy. Firstly, two-thirds of the young gifted who disliked school reported their schoolwork as being *easy* or *very easy*. In marked contrast, of the gifted students who expressed positive enjoyment of school, 45 per cent, that is, rather less than half, found their schoolwork to be easy. Typically, it seems, the gifted pupil who is unhappy at school is under-challenged and therefore bored, a symptom that emerged more commonly among primary rather than secondary students responding to *Talent in the New Millennium*. Challenge, it seems, was a feature intrinsic too much examination-focused work in the senior classes of New Zealand secondary schools; it remains to be seen whether this will hold true for work associated with the National Certificate of Educational Attainment which, currently, is being introduced into the New Zealand secondary school system in place of the former examination regime. A second issue for *Talent in the New Millennium*'s dissatisfied gifted related to groupwork, much used in New Zealand schools as a vehicle of socialisation. Groupwork was enjoyed by the gifted when it involved interaction with like-minded peers. It was resented when it placed the gifted in partnership with the apathetic. Numerous gifted students in group situations had experienced peer pressure, in various guises, to *dumb down* their performance. There was some, perhaps derivative, tendency for *Talent in the New Millennium*'s dissatisfied gifted to prefer working alone. Mentorships, with a partner wider in experience but not too dissimilar in age, might be useful in such cases.

School, evidently, can be an anxious place for the gifted. Most of the 11 students involved in *Talent in the New Millennium*'s Stage 5, May-September 2002 case studies, to varying degrees, expressed anxieties, several with regard to peer relations. One student felt herself to be tactless in her handling of, in her perception, less intelligent associates. Another, an accelerated student, moved tentatively between tiers of friendship, her attainment peers at school and her age peers in her leisure hours. Public recognition of their achievements overtly was important to most of the students, and all sought out, and drove themselves in, academic and sporting competition, risking peer jealousy in the process. Side effects of the drive for success, in some respects, were negative. A younger student voiced concern lest she fail to match the standards of an older sibling. For another, perfectionism encouraged risk aversion and a preference for a limited range of *safe* challenges. Implicit in some student comment was a fear of failure to match parental expectations. Some students, on the other hand, accepted challenges to a level where time management became a significant issue. The experience and perceptions of these students are not unique. Already, in the early stages of *Tracking Talent*, the current, ongoing research study derived from *Talent in the New Millennium*, perfectionism, time management and the need for peer recognition and approval are emerging as issues for some of the participating gifted students.

Talent in the New Millennium's research could not, and did not, attempt to evaluate the extent to which, and the circumstances under which, anxiety might serve as a positive spur to gifted performance, or as a negative inhibitor. Self-awareness of giftedness, it seems, is socially

constructed and this self-awareness, for better or worse, comes freighted with a measure of anxiety. Each of the 11 students featuring as subjects in *Talent in the New Millennium*'s Stage five case studies became aware of his or her own giftedness while at primary school, usually during the later years of primary schooling. For about half of the students, the catalysts were external, with teacher comment, test results and parental comment being cited prominently by the children concerned. The remainder of the student responders developed an intuitive awareness that their interest range and work output, qualitatively, were different from those of their age peers. Comments from students involved in the early stages of *Tracking Talent*, April 2004, indicate a similar, intuitive awareness, deriving from age-peer interaction. Interestingly, however, those students who, in *Tracking Talent*, have extensive, first-hand experience of working with their attainment, rather than age, peers, do not see themselves as gifted; in a community of like minds and interests, they perceive themselves as average. A parallel instance is provided by a cohort of identified-gifted children who, for a year of their primary schooling in Dunedin during the 1960s, were taught in a dedicated class. In keeping with the egalitarian ethos of the time, neither their teachers nor their parents told the children the basis on which the class had been selected. Interviewed some thirty years later, as adults in middle age, the former scholars of the Dunedin class remained unaware that the class had been created on the basis of giftedness (Knudson, 2003, pp.298-299).

Giftedness, thus, together with its concomitant concepts of success and failure, are socially mediated terms. A major task, alike, for teachers and parents of the gifted is to help the gifted child or student reconceptualise perceived *failure* as a positive and useful, even necessary, stepping stone on the pathway of success. In this connection, advice provided by parents of identified-gifted children and students taking part in *Talent in the New Millennium* is apposite both for the home and the school. *Talent in the New Millennium*'s parents saw the gifted-effective home as a place of open communication, which mutually shared and celebrated the interests and passions of all its members. It acknowledged, valued and drew constructively on the resources of the extended family, including siblings, uncles, aunts and grandparents. Rather than money, it invested quality time in its children; cash-strapped solo parents of gifted children, however, qualified this seemingly easy assertion with expressions of regret at their financial inability to access the range of learning experiences available to their better-heeled neighbours. Nevertheless, *Talent in the New Millennium*'s parents of the gifted, across the socio-economic spectrum, maintained that the most important task of the gifted-effective home is quasi-spiritual, this being to develop, for all the home's members, an environment secure in unconditional acceptance and love. The spiritual preconditions of giftedness are not quantifiable and, perhaps partly for this reason, in western educational contexts are under-researched.

Unconditional acceptance presupposes and anticipates a measure of aberrant behaviour – the behaviour, perhaps, of Jesus Christ, at the age of 12, leaving the family caravan and subverting the Temple School in Jerusalem. The manner in which, and the degree to which, the behaviour and goals of the profiled students in Stage 5 of *Talent in the New Millennium*, May-September 2002, were governed by external stimuli, therefore, must give cause for thought. Theories of giftedness tell us that the gifted are characterised by an internal locus of control (Clark, 1997, pp.58,143). However, they tell us, also, that the gifted are culturally conditioned, translating gift into talent, Gagné-wise, in terms meaningful for the social milieu wherein they move. Perhaps *Talent in the New Millennium*'s case study profiles simply showed this mechanism at work. Asked about their short and long-term goals and their most valued achievements, most of the responding students specified academic or sporting targets which they had attained or hoped to attain, targets which were fully predictable in relation to the norms and values of contemporary New Zealand society. Two participants in the final case studies overtly stated that their long-term goal was to be rich, and both itemised precisely the steps they intended to take in the quest. Nevertheless, I remain

uneasy about the extent to which our gifted young, seemingly, set their goals according to the evaluative norms of the society wherein they operate. Certainly, socialisation must feature as an important goal of education. However, are our education procedures so wedded to convention that the gifted, in our care, simply learn to do the socially obvious, but on a larger scale, to a higher level or more efficiently? Easily the most moving response from any student engaged in *Talent in the New Millennium* came from a primary school girl whose evaluative compass steered her to be true to herself. She rated her most significant achievement of the past twelve months as being "my treasure poem". Her reason? "I used my best language. It came from the heart."

CONCLUSION

The findings of *Talent in the New Millennium* have suggested both that much is being achieved for gifted children and students in New Zealand early childhood education centres and schools, and that much remains to be done. Traditionally neglected in a land with a long tradition of egalitarianism, giftedness now is on the New Zealand schools' agenda. Ministry of Education initiatives, commencing in the Year 2000, have given giftedness a sustained profile, which it has never before enjoyed in the story of education in New Zealand.

Research, at this stage of the development of gifted education in New Zealand, inevitably raises questions rather than providing answers. It shows that issues of definition and identification, with regard to giftedness, need further resolution. Socio-economic and ethnic differences, which at present levels of awareness, cloud rather than elucidate the identification of giftedness, remain to be bridged. Schools, increasingly aware of their obligations to the gifted, are stretched for resources. Pre-service teacher education, however, has yet to integrate the dimension of giftedness, effectively, into its programs. Established teachers, meanwhile, call for in-service support. They work in situations where the vertical and lateral, and educational and community, networks crucial to effective functioning in the servicing of giftedness, as yet, are in embryonic stages of development. The role of the early childhood sector in gifted education, particularly, requires address. Above all, perhaps, practitioners in the area of giftedness today face an evaluative and ethical challenge. New Zealand's young gifted grow up in an environment wherein *accountability* and administratively-driven demands for *quantified outcomes* externalise the locus of control, fostering neatly packaged conformity at the expense of the intangibles of reflection and spirituality, and the seditious untidiness of original thought. In this environment, the young gifted need encouragement, whether in school or home, to grow up true to themselves, in the freedom to translate giftedness into talent, in terms that "[come] from the heart".

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Gifted children's relationships with teachers

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Educators exert a tremendous influence on gifted children's academic and social-emotional development, thus their perceptions of these students is critical. Many factors are associated with a successful classroom experience for the gifted child, and the classroom teacher plays a vital role in that success. The teacher influences not only the academic side of classroom life, but the personal one as well. There is a growing research interest in the interpersonal relationship between teacher and child and how it affects the child's experience in the classroom (Pianta, 1992, Kesner, 2000), but this research has not been systematically applied to the study of gifted children.

Psychology, relationships, adjustment, counselling, gifted

INTRODUCTION

There has been much debate regarding the psychological adjustment of gifted children. Seemingly contradictory views have found support in the literature. One view suggests that, because of their gifts, gifted children are more likely to be better adjusted psychologically than their non-gifted counterparts (Baker, 1995). Likewise, an opposing view, that gifted children are actually at risk because of their intellectual abilities, has also received support (Neihart, 1999). It is possible that both arguments have validity. Gifted children may be savvier than their non-gifted counterparts when it comes to their behaviour and responses in research studies and thus appear better adjusted, yet in reality have the kinds of social and emotional difficulties described by the professionals who work with them everyday.

In support of this idea, McCallister and Nash (1996), state that when examining the empirical literature, gifted children appear to be as well or better adjusted than their non-gifted counterparts. However, they point out that outside of the empirical study, the picture is somewhat different. Educators and counsellors in the field of gifted education describe the gifted children they work with as having more social/emotional difficulties than their non-gifted counterparts. These difficulties include problems in social relationships, isolation from peers, anxiety and depression, difficulty in accepting criticism, nonconformity, and resistance to authority, boredom in school, excessive competitiveness and poor study habits (Delisle, 1992). In addition, VanTassel-Baska (2000) reported that as many as 63 per cent of gifted children are underachievers and show a record of truancy.

Stemming from research on child-parent relationships, the focus on interpersonal child-teacher relationships has utilised an attachment theory framework (Bowlby, 1973, 1980, 1982). Traditional attachment theory focuses on the development of a close emotional bond between a child and the primary caregiver (usually the mother) and the impact the quality of this relationship has on the child's development. Attachment theory posits that in addition to their parents, children form close attachments to other significant adults in their lives, and that these relationships may also influence their development. Perhaps there is no other non-familial adult who is more

significant in a child's life than his or her teacher. It has even been suggested that secure relationships with secondary caregivers (that is, teachers) may compensate for insecure attachment relationships with parents (Van IJzendoorn and Tavecchio, 1987).

There are many similarities between the child-parent relationship and the child-teacher relationship (Howes and Hamilton, 1992; Pianta, 1992). School can be very stressful for children and they may look to the teacher for the same sort of emotional security that they rely on in a secure attachment relationship with their parents. In addition, there is evidence that suggests a correlation between the quality of the child-teacher relationship and children's social and academic behaviour in the classroom. As found in child-parent attachment research, children who have secure relationships with their teachers have been found to be more socially competent and do better in school than those who have an insecure relationship (Howes, Matheson and Hamilton, 1994). A secure child-teacher relationship is characterised by generally positive affect and low levels of conflict with the child feeling safe and secure and able to use his/her teacher as a secure base (Bowlby, 1988) for exploration and learning. Pianta and Steinberg (1992) suggest that the child-teacher relationship can even serve as a protective factor for children at risk for academic failure. They report that children predicted to be retained at the beginning of kindergarten, but were not retained, had more secure relationships with their teacher compared to those who were retained.

Gifted Children and Their Teachers

The interpersonal relationship between a gifted child and his/her teacher is unique. Although intellectually advanced, gifted children's socio-emotional development may be more age appropriate. This asynchronous development may present problems for the gifted child in their interactions with adults as their maturity level is often expected to match their cognitive level (Neihart, 1999). Additionally, gifted children tend to suffer from the often disabling effects of perfectionism which may contribute to chronic underachievement. Perfectionism is perhaps the most common and also most overlooked trait associated with giftedness (Silverman, 1999). Perfectionism may negatively affect as many as 89 per cent of gifted students (Orange, 1997). Perfectionistic tendencies in gifted children may manifest themselves in the classroom as procrastination in starting assignments, delay or unwillingness to turn in completed assignments, and reluctance to participate unless certain of the correct response (Nugent, 2000). Often gifted children feel the need to live up to unrealistic expectations, sometimes self imposed or imposed by others. Failure to live up to these expectations can result in a variety of problems for gifted students. These problems range from underachievement to depression and other more serious personality disorders (Hewitt and Dyck, 1996; Rasmussen and Eisen, 1992). Thus, the social/emotional problems that may affect gifted children, present unique challenges to the classroom teacher and suggests that developing a secure relationship with gifted children is critical and at the same time more difficult than doing so with their non-gifted counterparts.

With evidence that a positive child-teacher relationship enhances children's academic and social competence in non-gifted children, applying this theoretical framework to the gifted child's relationship with his/her teacher is a worthwhile exercise. Thus, the purpose of this study was to examine and compare teachers' perspectives of their interpersonal relationship with gifted and non-gifted children utilising an attachment theory framework. Given that educational personnel generally report that gifted children suffer more social and emotional difficulties in the classroom compared to their non-gifted counterparts, it was hypothesised that teachers of gifted students would report less positive relationships as compared to reports by teachers of non-gifted children.

METHODS

Sample

This study was conducted in a large metropolitan area of the south-eastern United States.

Subjects for the study included 1st through 5th grade gifted and non-gifted students from schools in the catchment area. Given the lack of a clear definition of giftedness in the literature and the concomitant difficulties in identifying gifted children, the term non-gifted refers to the group of children not currently identified as gifted. It is possible that within this group there may have been some unidentified gifted children; however, random selection by their teacher for inclusion in the study controls for this possibility. The non-gifted children came from schools in the same catchment area. Gifted students were recruited through their participation in a Saturday morning educational enrichment program. Enrolment in this program meant that the students met state criteria for giftedness.

Teachers of gifted students (n=95) were primarily white (83%), females (82%), with an average age of 41 years and had taught for an average of 17 years. Teachers of non-gifted children (n= 162) were exclusively white (100%) and primarily female (96%) with an average age of 37 years. This group of teachers had been teaching for an average of 11 years.

Approximately two-thirds of the gifted children in this study were White (65%). A little over one-half were male (57%), with an average age of 9.5 years. The demographics of non-gifted children were very similar to the gifted children (48% male and 74% White); however, the average age of non-gifted children was 8 years. Statistical analyses were conducted to determine if any of the groups differed significantly on any of the demographic variables. Results of these analyses are discussed in the Results section.

Instrument

The Student Teacher Relationship Scale (STRS) (Pianta, 1991) is a 28-item self-report measure designed to assess a teacher's perceptions about his/her relationship with a particular student, the student's interactive behaviour, and how the teacher thinks the student feels about him/her. Principle components analysis yielded three significant subscales: (1) Conflict, (2) Closeness, and (3) Dependency.

The Conflict subscale examines teachers' perceptions regarding the conflicting nature of their relationship with students that may evoke anger in the teacher. Pianta (1991) reported that this factor accounted for 30 per cent of the total variance. Items such as "This child and I are always struggling with each other", "Dealing with this child drains my energy", and, "When this child arrives in a bad mood, I know we are in for a long day" loaded heavily on this factor. This subscale was calculated by summing 12 items so that a higher score indicates that the teacher perceives more conflict in the relationship with the child.

The Closeness subscale assesses overall security in the relationship by focusing on the teacher's positive feelings about the child and vice versa (for example, emotional and physical affection). Pianta (1991) reported that this factor accounted for 13 per cent of the total variance. Items such as "This child shares personal information with me.", and "It's easy to know what this child is feeling." loaded heavily on this factor. The Closeness subscale score was calculated by summing 11 items from the STRS with a higher score indicating more closeness in the relationship as perceived by the teacher.

The third subscale, Dependency, focuses on teachers' perceptions regarding the dependent nature of the child-teacher relationship. Pianta (1991) reported that this factor accounted for six per cent of the total variance. Items such as "This child is overly dependent on me", and "This child

expresses hurt and jealousy when I spend time with other children" loaded most heavily on this factor. The Dependency subscale was calculated by summing five items from the STRS with higher scores indicating greater perceived dependency in the relationship.

Pianta (1991) reports good internal reliability on all subscales. Coefficient alphas for Conflict, Closeness, and Dependency, were reported as 0.92, 0.86, and 0.64 respectively. In the present study, coefficient alphas were 0.92, 0.88, and 0.61 respectively.

Procedure

Teachers of the gifted children in this study were contacted by the researcher through the child's parents. They were asked to complete the STRS and return it in a postage-paid envelope provided by the researcher. Teachers of non-gifted children were contacted by mail and asked for their participation in a study of child-teacher relationships. Teachers of non-gifted children were instructed to select a child at random from their classroom and complete the STRS on that child. The return rate for teachers of gifted students was 32 per cent and 45 per cent for teachers of non-gifted students. The final sample consisted of 95 reports of gifted child-teacher relationships and 162 reports of non-gifted child-teacher relationships.

RESULTS

First, t-tests were performed to determine if the groups (gifted and non-gifted) differed on any demographic variables (age, gender or race). Gender and race were dummy-coded to enable their use in a t-test. Results indicated that there were significantly more white children in the gifted group ($t_{(255)}$=1.96, $p < 0.05$). The gifted group also contained significantly older children ($t_{(255)}$=5.72, $p < 0.001$). The two groups did not differ significantly on child gender. Similar tests were carried out on teacher demographics to assess any significant differences between teachers of gifted and non-gifted. Results indicated that significant differences between the two groups of teachers on race and number of years teaching. There were significantly fewer White teachers in the gifted group ($t_{(255)}$=5.05, $p < 0.001$) and this group had significantly more teaching experience compared to teachers of non-gifted students ($t_{(249)}$=7.56, $p < 0.001$).

Next, multivariate analysis of covariance (MANCOVA) was utilised to determine whether there was an effect of the independent grouping variable (gifted) on the dependent variables (Closeness, Conflict, and Dependency). Because of the demographic differences between the two groups, child age, child race, teacher race and number of years teaching were covaried. When significant MANCOVAs were found, they were followed up with analysis of covariance (ANCOVA) to determine more specifically the relationship between the independent and the dependent variables.

The MANCOVA indicated a significant main effect for the grouping variable (gifted) ($F_{(3, 229)}$ =123.9, $p < 0.001$). Because the MANCOVA was significant, ANCOVAs were computed for each of the three STRS subscales. Child age, child race, teacher race and number of years teaching were again covaried in the ANCOVAs. Results of the ANCOVAs revealed a significant main effect of the grouping variable (gifted) on teachers' reports of Conflict ($F_{(1, 231)}$=11.03, $p < 0.01$) and Dependency ($F_{(1, 231)}$=223.1, $p<0.001$). Examination of the means indicated that teachers reported significantly less conflict in their relationships with gifted students as compared to reports from teachers of non-gifted students. Teachers of gifted students also reported that they perceived more dependency in their relationships with students as compared to teachers of non-gifted students. Differences between gifted and non-gifted groups amounted to a 4.8 point difference on the Conflict subscale and a 5.3 point difference on the Dependency subscale. Given the range of the Conflict and Dependency subscale, these differences represent a 10 per cent and a 22 per cent difference between gifted and non-gifted students respectively.

DISCUSSION

The findings in this study ran contrary to what was expected. The hypothesis that teachers of gifted students would report a less positive relationship than teachers of non-gifted students was not supported. Teachers of gifted students reported lower levels of conflict when compared to reports by teachers of non-gifted students. Both groups of teachers reported similar levels of closeness in their relationships with students. Thus, the same level of closeness and lower levels of conflict suggest a more positive relationship between teachers and gifted students as compared to teachers of non-gifted students.

The higher degree of dependency in the teacher-gifted child relationship is somewhat ambiguous, and thus more difficult to interpret. Teachers of gifted students perceived a higher degree of dependency in their relationships than did teachers of non-gifted students. However, it is difficult to assess whether the reported level of dependency had any type of negative impact on the student-teacher relationship. Over-dependency in any relationship cannot be considered a positive attribute, yet a certain amount of dependency is natural in the teacher-child relationship. Children are dependent upon their teacher for many things in the classroom, least of which is provision of the appropriate academic challenges. Gifted students, by virtue of their advanced intellectual capabilities may be even more dependent upon the teacher to provide for their specific academic needs. In addition, the level of dependency reported by all teachers (gifted and non-gifted) was generally low given the range of possible scores. However, the 22 per cent difference in scores and the level of significance ($p < 0.001$) suggests that there were real differences in the level of dependency between two groups.

The National Association for Gifted Children (NAGC) list several characteristics of highly successful gifted teachers that underscore the role of the interpersonal teacher-child relationship. NAGC has long recognised that meeting gifted students' affective needs is as important as meeting their academic needs. As listed in Croft (2003), NAGC suggests that a highly successful teacher of the gifted is able to inspire and motivate students, reduce tension and anxiety for gifted students and appreciate their high levels of sensitivity. A teacher must have a positive interpersonal relationship with his/her gifted students in order to accomplish these things. The results from this study indicate that this type of relationship is possible. These positive relationships with gifted students suggest that teachers were able to meet the affective needs of the gifted students in their classrooms.

Future research should utilise direct observation of teacher-child classroom interactions in order to discern the differences in the interactions between teachers and their gifted and non-gifted students. In addition, future research should assess any academic impact of a more positive teacher-child relationship. Questions related to academic achievement and teacher-child attachment relationships should be addressed in relation to gifted students. For example, are gifted students with more positive relationships with their teachers less likely to be underachievers or perfectionistic as compared to those with less positive relationships?

The National Commission on Teaching and America's Future (1996, p.iii) suggests that "good teachers literally save lives". Gifted students are even more profoundly affected by the interactions they have with their teachers compared to other students (Croft, 2003). Relationships with significant adults can either aid or hinder virtually all of children's activities. After their parents, teachers are perhaps the most significant adults in a young child's life. Teachers are in a unique position to either nurture or stifle positive relationships with children, and thereby exert a tremendous influence on their development. An effective teacher must recognise the gifted child's unique abilities and needs and provide the appropriate curricula challenges along with the appropriate affective environment.

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A decade comparison: Self-concept of gifted and non-gifted adolescents

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The study explores the link between general social environment and self-concept, and giftedness and self-concept. A total of 135 high school and 64 university students with an average age of 16 years from China took part in the research, consisting of four groups: gifted and non-gifted adolescents of Year 1993, and gifted and non-gifted adolescents of Year 2003. Comparison between the groups has been made. Findings indicate that social environment has a significant impact on the non-gifted adolescents while its influence on the gifted is comparatively slight. The Year 1993 sample shows that the gifted adolescents have a more positive academic self-concept than the non-gifted group while Year 2003 sample reflects inconsistency with the former result.

Self-concept, adolescence, social environment, academic

INTRODUCTION

Self-concept has been of interest to philosophers and psychologists for many decades. It is widely believed that self-concept has a great impact on the academic and social performance of the person. And some research reports that gifted children usually have a more positive self-concept than non-gifted children. Research also suggests that an individual's self-concept is strongly influenced by environmental factors. We address two general issues in this article. First, do the self-concepts of gifted and average late adolescents differ, and, if so, in what aspects? Second, in what respects does social environment influence self-concept of gifted and non-gifted students respectively?

Self-Concept in adolescence

Self-concept generally refers to "the totality of a complex, organised, and dynamic system of learned beliefs, attitudes and opinions that each person holds to be true about his or her personal existence" (Purkey, 1988). More specifically, it refers to "our attitudes, feelings and knowledge about our abilities, skills, appearance, and social acceptability" (Byrne, 1984, p.429). As the definition implies, self-concept is a multidimensional concept.

A number of theorists posit hierarchical or multidimensional self-concept models. Shavelson, Hubner, and Stanton construct a hierarchical structure consisting of many lower-level cognitive representations about oneself in different areas of behaviour. Under the general self-concept, there are two broad classes of subordinated self-concept, named academic and non-academic self-concept. Academic self-concept is subdivided according to different school subjects, whereas non-academic self-concept is subdivided into social, emotional, and physical self-concepts. Based on this model, with important adaptation, Marsh and his colleagues (1982, 1984, 1985, 1987) designed a series of Self Description Questionnaires (SDQ) to measure the self-concept of

elementary aged children, younger and late adolescents and adults. In this research, SDQII is adopted as measurement.

Harter (1983, 1990) gives an overview of the dimensions along which structural changes in the self-concept occur developmentally. Researchers generally believe that adolescence is a period when an individual strives toward a consistent, stable, independent self-identity and therefore, should be regarded of great importance.

Giftedness

Current research applies a broad definition of giftedness, including intelligence as well as social components as determining factors. Giftedness can be better understood when high intellectual capacities, creativity and motivation, as well as the environmental factors are considered (Mönks and van Boxel, 1985; Monks and Mason, 1993). In our research, however, we focus only on the intelligence factor of giftedness. "Gifted students" in this research refer to adolescents who are admitted to colleges at a much lower age than common peers.

Giftedness and self-concept

There remains great interest in the relationship between giftedness and self-concept. People expect to find in gifted adolescents a more positive self-concept than those of average ability because it is believed experiences of success and being labelled as 'gifted' or 'talented' will enhance one's self-esteem. Other hypotheses argue a negative self-concept of gifted adolescents due to several reasons including high expectations that may be difficult to measure up to.

Conflicting research results render it difficult to understand the relationship between giftedness and self-concept. Some authors find no difference in self-concept between gifted and non-gifted children while other evidence shows that there are differences between the self-concept of gifted and average adolescents. Brounstein et al. (1991) used the SDQII and found that there was no difference between gifted and non-gifted adolescents on their general self-concept, gifted students score higher on academic self-concept, but lower on social and physical self-concept.

In this research, we use multidimensional self-concept measurements to compare the self-concepts of gifted and non-gifted adolescents and we expect that the gifted will show a more positive academic self-concept than non-gifted and no significant difference in non-academic self-concept.

Social environment and self-concept

Rogers (1947), who introduced an entire system of helping built around the importance of the self, believed that self-concept is a "social product", developing out of interpersonal relationships. Theorists focusing on the self-concept agree that self-concept develops with the individual experiences in the social environment. There is also empirical evidence that the self-concept of adolescents in different cultural contexts shows significant differences in some dimensions.

China, with the further implementation of opening policy, has undergone many social changes in the previous decade (from 1993 to 2003). Great economic and technological development has not only improved the general welfare of the public, but has also brought new ideas and ideologies to Chinese people. Many significant events have taken place during the decade.

In this research, we apply multidimensional self-concept measurements and investigate the impact that social environment has on the self-concept of gifted and non-gifted adolescents respectively by comparing the self-concept of students of year 1993 and 2003. We expect to find a significant difference in dimensions such as Social and Non-academic self-concepts.

METHOD

Participants

Thirty-four Grade 1 students (6 females and 28 males) from the Special Class for the Gifted Young (hereafter referred to SCGY) of University of Science and Technology of China (hereafter referred to USTC), and 65 Grade 1 students (32 females and 33 males) from USTC high school took part in the 1993 research.

Thirty Grade 1 students (7 females and 23 males), with the average age of 16.3 years from SCGY of USTC and 70 Grade 1 students (34 females and 36 males), with the average age of 16 years from USTC high school took part in the 2003 research.

Measure

The Chinese version of Self-Description Questionnaire-II (Marsh, 1989) was used. The Questionnaire consists of 102 items. Each item has a 6-point response scale: (1) Strongly Agree, (2) Agree, (3) Generally Agree, (4) Generally Disagree, (5) Disagree, and (6) Strongly Disagree.

The questionnaire is organised in 11 subscales (8 or 10 items for each) assessing three areas of Academic Self-Concept: a) Verbal; b) Math ; and c) General School (G. School).

Eight areas of Non-Academic Self-Concept are assessed:

a) Physical Appearance (P. App)
b) Physical Abilities (P. Abil)
c) Same-sex Relations (SSexRel)
d) Opposite-sex Relations (Opp.sex)
e) Parent Relations (Parent)
f) Emotional Stability (E.Stabil)
g) Honesty-Trustworthiness (HonTr); and
h) General Self-concept (G. self-con).

High scores indicate a more positive self-concept. The coefficient alpha estimate of reliability for each SDQII subscale is reported from 0.83 to 0.91. The validity is also proved to be high.

Procedure

In a classroom setting, all participants were given the Chinese version of Self-Description Questionnaire-II requiring them to circle the response that fit their own situation.

RESULTS

By adding scores from related subscales of SDQII, we define the following combined self-concept: Academic Self-concept is a combination of math and verbal self-concept; Social Relations includes the self-concept subscales Parent Relation, Same-Sex Relation and Opposite-Sex Relation; and Non-academic Self-Concept combines physical appearance, physical ability, honesty, emotional stability, parent relation, same-sex relation and opposite-sex relations.

Differences in Self-Concept Caused by Social Environment

Self-Concept common to high school students in Year 1993 and 2003

The difference between the 11 subscales self-concepts of non-gifted students of Year 1993 and Year 2003 are presented in Table 1. In Table 2, the difference between the combined self-concept and SDQ total are presented.

Table 1. Mean scores (and standard deviations) on self-concepts of 11 subscales of non-gifted students of Year 1993 and 200

Subscale	Math	P.App	G.Self	HonTr	P.Abil	Verbal	E.Stabil	Parent	G. School	SSexRel	Opp. sex
Year93	42.498	32.54**	45.86**	41.57*	30.49	37.68***	40.58	34.66	41.14***	47.54**	32.86
(N=65)	(8.42)	(5.66)	(4.89)	(6.62)	(6.82)	(8.3)	(5.25)	(5.41)	(5.95)	(6.59)	(4.89)
Year03	39.89	35.90	49.03	44.10	32.20	43.47	40.63	36.39	45.54	51.04	34.29
(N=70)	(10.42)	(7.27)	(6.74)	(7.00)	(9.84)	(9.95)	(9.53)	(7.75)	(7.47)	(7.54)	(8.47)

*p < 0.05, **p < 0.01, ***p<0.001

Table 2. Mean scores (and standard deviations) on self-concept scales and SDQ-II total of non-gifted students of Year 1993 and 2003

Scale/Group	SDQ Total	General Self	Academic	Social Relations	Non-Academic
Year93	427.42**	45.86**	121.31**	115.06*	260.25**
(N=65)	(38.16)	(4.89)	(13.09)	(12.34)	(25.85)
Year03	452.47	49.03	128.9	121.71	274.54
(N=70)	(53.64)	(6.74)	(18.29)	(17.94)	(34.76)

*p < 0.05, **p < 0.01

Significant main effects of social environment on non-gifted students were found on subscales Physical Appearance (p<0.01), Honesty-Trustworthiness (p<0.05), Verbal (P<0.001), General School (P<0.001), and Same-sex Relations (p<0.01). And significant differences were also found in combined scales of Academic (p<0.01), Non-academic (p<0.01), Social Relations (p<0.05), General Self (p<0.01) and SDQ total.

Notably, non-gifted students of Year 2003 score higher than their counterparts in Year 1993 in every subscale except Math. They show more positive self-concepts than their 1993 counterparts in every general aspect including Academic, Non-Academic, Social and General self-concepts.

Self-Concept of gifted students in Year 1993 and Year 2003

In Table 3, the difference between the 11 subscales self-concepts of gifted students of Year 1993 and Year 2003 are presented. In Table 4, the difference between the combined self-concept and SDQ total are presented.

Table 3. Mean scores (and standard deviations) on self-concepts of 11 subscales of gifted students of Year 1993 and 2003

Subscale	Math	P.App.	G.Self	HonTr	P.Abil	Verbal	E.Stabil	Parent	G.School	SSexRel	Opp.sex
Year93	44.56	30.09*	45.38	41.56	30.74	37.71	41.03	38.53	44.32	45.91	30.15
(N=65)	(5.92)	(4.37)	(4.96)	(3.72)	(5.88)	(6.38)	(5.77)	(4.55)	(5.09)	(4.64)	(5.02)
Year03	42.10	33.07	47.27	42.27	31.53	36.77	42.53	37.57	43.17	48.13	32.57
(N=70)	(8.59)	(5.97)	(7.14)	(6.78)	(7.75)	(11.05)	(4.90)	(5.55)	(7.57)	(5.86)	(5.68)

*p < 0.05

Table 4. Mean scores (and standard deviations) on self-concept scales and SDQ-II total of non-gifted students of Year 1993 and 2003

Scale/Group	SDQ Total	General Self	Academic	Social Relations	Non-Academic
Year93	429.97	45.38	126.59	114.59	258.00
(N=34)	(31.51)	(4.96)	(11.46)	(10.51)	(20.33)
Year03	436.97	47.27	122.03	118.27	267.67
(N=30)	(44.67)	(7.14)	(22.22)	(12.55)	(26.10)

Contrary to the significant differences shown in Table 1 and Table 2, significant main effects of social environment were only found in the subscale Physical Appearance (P.App), and no significant difference was found in the general five aspects and the SDQ total. This finding suggests that change of social environment has little impact on the self-concept of gifted adolescents.

Differences in Self-Concept Caused by Intelligence

Difference in self-concept between gifted and non-gifted students in 1993

In Table 5, the differences between the 11 subscales self-concepts of gifted students and non-gifted adolescent in Year 1993 are presented. In Table 6, the differences between the combined self-concept and SDQ total are presented.

Table 5. Mean scores (and standard deviations) on self-concepts of 11 subscales of non-gifted students and gifted students of Year 1993

Subscale	Math	P.App	G.Self	HonTr	P.Abil	Verbal	E.Stabil	Parent	G.School	SsSexRel	Opp.sex
Non-gifted	42.49	32.54**	45.86	41.57	30.49	37.68	40.58	34.66***	41.14**	47.54	32.86*
(N=65)	(8.42)	(5.66)	(4.89)	(6.62)	(6.82)	(8.30)	(5.25)	(5.41)	(5.95)	(6.59)	(4.89)
Gifted	44.56	30.09	45.38	41.56	30.74	37.71	41.03	38.53	44.32	45.91	30.15
(N=34)	(5.92)	(4.37)	(4.96)	(3.72)	(5.88)	(6.38)	(5.77)	(4.55)	(5.09)	(4.64)	(5.02)

*p < 0.05, **p < 0.01, ***p<0. 001

Table 6. Mean scores (and standard deviations) on self-concept scales and SDQ-II total of gifted and non-gifted students of Year 1993

Scale/Group	SDQ Total	General Self	Academic	Social Relations	Non-Academic
Non-gifted	427.42	45.86	121.31*	115.06	260.25
(N=65)	(38.16)	(4.89)	(13.09)	(12.34)	(25.85)
Gifted	429.97	45.38	126.59	114.59	258.00
(N=34)	(31.51)	(4.96)	(11.46)	(10.51)	(20.33)

*p<0.05

Significant main effects of intelligence were found in the subscale Physical Appearance (p<0.01), Parent Relations (p<0.001), general school (p<0.01) and Opposite-sex relations (p<0.05). A significant difference was only found in the combined Academic self-concept, which shows gifted adolescents of Year 1993 have a more positive academic self-concept than the non-gifted.

Difference in self-concept between gifted and non-gifted students in 2003

In Table 7, the differences between the 11 subscales self-concepts of gifted students and non-gifted adolescent in Year 2003 are presented. In Table 8, the differences between the combined self-concept and SDQ total are presented.

Table 7. Mean scores (and standard deviations) on self-concepts of 11 subscales of non-gifted students and gifted students of Year 2003

Subscale	Math	P.App	G.Self	HonTr	P.Abill	Verbal	E.Stability	Parent	G.School	SSexRel	Opp.sex
Non-gifted	39.89	35.90*	49.03	44.10	32.20	43.47**	40.63	36.39	45.54	51.04	34.29
(N=70)	(10.42)	(7.27)	(6.74)	(7.00)	(9.84)	(9.95)	(9.53)	(7.75)	(7.47)	(7.54)	(8.47)
Gifted	42.10	33.07	47.27	42.27	31.53	36.77	42.53	37.57	43.17	48.13	32.57
(N=30)	(8.59)	(5.97)	(7.14)	(6.78)	(7.75)	(11.05)	(4.90)	(5.55)	(7.57)	(5.86)	(5.86)

*p < 0.05, **p < 0.01

Table 8. Mean scores (and standard deviations) on self-concept scales and SDQ-II total of gifted and non-gifted students of Year 2003

Scale/Group	SDQ Total	General Self	Academic	Social Relations	Non-Academic
Non-gifted	452.47	49.03	128.9	121.71	274.54
(N=70)	(53.64)	(6.74)	(18.29)	(17.94)	(34.76)
Gifted	436.97	47.27	122.03	118.27	267.67
(N=30)	(44.67)	(7.14)	(22.22)	(12.55)	(26.10)

Significant main effects of intelligence were only found in the self-concept subscale Physical Appearance (p<0.05) and Verbal (p<0.01). No significant differences were found in combined General Self, Academic, Social, Non-Academic self-concepts and SDQ total. From Table 8, we find slightly more positive self-concept in every scale of non-gifted adolescents than the gifted.

DISCUSSION

Social Environment and Self-concept

Social Environment and self-concept of non-gifted adolescents

Our results suggest that the improved social environment has a positive effect on the general self-concept of non-gifted adolescents. This result is consistent with our expectation. Compared with the social situation and living standards of 1993 in China, adolescents now enjoy a more comfortable and colourful life and with the development of the internet and communication technology, it is easier for them to get access to and connect with the outside world. And in the present China, individualism is stressed and advocated more than ever before and students tend to care more about themselves, their physical appearance, their abilities when the comparative abundance of the society provides more possibilities for the adolescents to better themselves. In general, adolescents are more satisfied and confident with their life and feel better about their quality than their counterparts ten years before. All these are represented in their more positive Academic, Social, Non-Academic and General Self-concept.

In Table 1, we find a decline, though not significant, in the self-concept subscale of math and a very significant increase in the verbal. Our explanation for this phenomenon is the reform on Chinese education and the changed social environment. In the past, math is given so much emphasis that the performance on math was almost regarded as an essential criterion for the academic performance of a student. Currently, the predominant role of math has declined and educationalists emphasise a balanced development in the arts and sciences subjects. Furthermore, the media, debate contests, and experiences in present job market make people believe that verbal abilities play a significant role in the success of one's career and personal development; therefore, an increasing emphasis is placed on verbal abilities. All these changes result in an increasing confidence in verbal and decrease in math.

Social Environment and self-concept of gifted adolescents

Surprisingly, apart from the self-concept subscale Physical Appearance, the result suggests no significant social impact on the self-concept of gifted adolescents.

It is comparatively easy to explain the significant increase in the confidence of physical appearance of gifted adolescents. Compared with the adolescents ten years ago, today we have more nutritious food to eat and more beautiful clothes to wear. The reality is that people today do look nicer than their counterparts ten years ago. Gifted and non-gifted adolescents show the same tendency in this subscale.

Although increases were found in the General Self, Social-Relations, Non-Academic self-concept and a decrease was shown in the academic aspects, the effect of changed social environment, unlike the effects on non-gifted adolescents, is far from significant. One possibility is that the sample of gifted adolescents is relatively small and cannot reflect the real trend of the changes in the self-concept of the group. But we would rather attribute the consistency to the possible special characteristic of the gifted. Because gifted adolescents are labelled as 'genius' at a fairly early age, they are used to praise and special attention. We predict that compared with their regular peers, the gifted group has less concern about the surrounding environment and how others behave toward them; therefore, this group maintains a relatively stable and consistent self-concept and is influenced less by the social environment.

Giftedness and Self-concept

The comparison of non-gifted and gifted adolescents of year 1993 is consistent with our prediction and many findings in literature in which a more positive academic self-concept is found among the gifted group. The more academically intelligent adolescents have more positive self-concept in academic fields because they experience more success in academic fields, but they may not necessarily perceive themselves positively in other aspects.

Strangely, a more positive academic self-concept is not found in the gifted group in the year 2003; instead, a more negative self-concept, though not significant, is found in the Academic, Social, Non-Academic, General self-concept dimensions. The possible explanation for this apparent inconsistency is that the research is done in the second semester of year 2003, when the gifted adolescents have studied at university for a whole semester. Some theorists, taking into consideration of the social comparison process, predict a more negative self-concept in the gifted group. When the gifted adolescents are removed from the regular classroom, and placed into homogeneous groups of other exceptional peers, this change in the comparison group might under some circumstances lead to a decline in self-esteem. Many psychologists have discussed the social comparison process in this type of situation.

CONCLUSION

Most research studies tend to explore the link between social environment and self-concept and the link between giftedness and self-concept. Our results suggest the social environment does have a great impact on the non-gifted adolescents' perception of themselves while this element has much less influence on the gifted group. The gifted adolescents seem to have a more stable and consistent self-concept probably due to their special status and social recognition.

The comparison between the self-concept of gifted and non-gifted group in 1993 is consistent with most studies, which is that the gifted have a more positive academic self-concept than their common peers, although the research in 2003 does not support this finding. We attribute the inconsistency to the comparison process which may occur when the gifted are placed with other exceptional adolescents and consequently they may feel less confident in their academic achievements.

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Perfectionism and the gifted: A study of an Australian school sample

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The quest for perfection has been anecdotally associated with great achievement and despair; with adjustment and maladjustment. No population has more frequently been associated with perfectionism than the gifted. This study was designed to (i) identify the types of perfectionism observed in a sample of Australian school students, and (ii) to examine where gifted students fitted in the profiles of perfectionism.

Perfectionism, adjustment, psychosocial development, healthy, gifted

INTRODUCTION

In an often-quoted formulation of perfectionism, Hamachek (1978) identified both normal and neurotic perfectionism. Normal perfectionists are able to set realistic performance goals and gain satisfaction from successes. In contrast, neurotic perfectionists set exceedingly high standards, and always feel that the task could have been done better. What distinguishes negative from positive perfectionism is the excessively self-critical or self-doubting stance of negative perfectionism. Organisation and neatness attitudes also feature. Individuals may be "fussy or exacting" (Hollender, 1965, p.96) or by contrast, display poor organisation as they procrastinate over tasks because of fears about adequacy of performance. Perceptions of high expectations or criticisms held by parents or significant others are also important characteristics of the perfectionist profile (Burns, 1980; Hamachek, 1978; Hollender, 1965).

Research into perfectionism has frequently used scales such as the 'Multidimensional Perfectionism Scale' (Frost, Marten, Lahart and Rosenblate, 1990). This scale divides perfectionism into six core features: Personal Standards (PS), Concern over Mistakes (CM), Doubt about actions (D), Parental Expectations (PE), Parental Criticisms (PC) and Organisation (O). Although there is some disagreement over the scale structure there is general agreement that certain groupings of items are differentially associated with positive or negative outcomes. Where a person's self standards are highly critical, or where people perceive their parents to be highly critical, an association with maladjustment seems to emerge. High concern over mistakes (CM) and doubt over actions (D) have been associated with difficulties such as obsessive-compulsiveness (Antony, Purdon, Huta and Swinson, 1998), social phobia (Saboonchi, Lundh and Öst, 1999), and depression (Enns and Cox, 1999). High parental criticism (PC) has been associated with difficulties such as social phobia (Juster et al., 1996) and panic disorder (Saboonchi et al., 1999). In contrast, high personal standards (PS) and organisation (O) have tended to be associated with adaptive traits, such as goal commitment at school and work (Flett et al., 1995), or have shown a negative association with pathology (Lynd-Stevenson and Hearne, 1999).

The distinction between positive and negative perfectionism has been confirmed by research into perfectionism subtypes. Parker (1997) identified three perfectionism subtypes from scores on the six FMPS subscales. Healthy Perfectionists were characterised by moderately high PS, moderate PE, the highest O scores and low CM.

It was suggested by Flett, Sawatzky and Hewitt (1995) that this label be used to avoid confusing this scale with another of the same name (Hewitt and Flett, 1991), which they refer to as the MPS. The Dysfunctional Perfectionism subtype was characterised by the highest scores on five of the six scales (PS, CM, D, PE and PC). They scored below Healthy Perfectionists on O. The Non-Perfectionist subtype showed low scores overall. Scores on other measures validated these subtypes. For example, Healthy Perfectionists scored the lowest on Neuroticism, while Dysfunctional Perfectionists scored the highest. Non-Perfectionists recorded the lowest scores on Conscientiousness (Parker, 1997). The present study used a similar methodology to test for the three-way typology in a sample of mixed gender, age and ability Australian school students.

Much of our existing information about perfectionism in able and talented individuals is anecdotal, such as the self-reports of gifted children (Buescher, 1985) and those who work with them (Silverman, 1995). Empirical data have been sparse and inconsistent. Using measures other than the FMPS, evidence has been reported of higher personal standards in gifted than non-gifted students (LoCicero and Ashby, 2000), or in gifted students in special programs over gifted and non-gifted students not in special programs (Roberts and Lovett, 1994). Using the FMPS, Parker and Mills (1996) found no significant differences in personal standards between gifted and nongifted students. Research into giftedness and perfectionism subtypes has also been equivocal. Parker, Portesova and Stumpf (1999, cited in Parker, 2000) reported gifted students were more likely than non-gifted students to be Non-Perfectionists, and less likely to be Unhealthy Perfectionists. In addition, the literature on giftedness and adjustment suggests that giftedness does not predispose a child to psychopathology (Freeman, 1991) and indeed could be linked with significantly lower symptomatology (Olszewski-Kubilius, Kulieke and Krasney, 1988).

Following these findings the present investigation predicted that gifted students would have higher personal standards (PS) than non-gifted students and would be more likely than non-gifted students to become perfectionists and to be healthy perfectionists. Patterns associated with age and gender were also considered but are not be reported in detail here.

METHOD

Participants

A total of 623 students from Years 6, 8 and 11 participated in the study providing 612 full data sets, as presented in Table 1. Participants were recruited from schools in the inner eastern and south-eastern suburbs of Melbourne: a coeducational private school, two single sex, private schools, and two coeducational government schools. A large number of boys were available for the study due to the passive parental consent procedure preferred by the boys' school. This gender imbalance was addressed, where necessary, during data analysis.

Table 1. Participant Numbers: Gender, Age and Year Level

Gender	Year Level			Total
	6	8	11	
Boys	110	148	180	438
Girls	61	57	55	173
Total	171	205	235	612*
Mean Age	11.5	13.4	16.1	13.9

* One student did not indicate gender

There are numerous methods of identifying gifted students. "Each method … distinguishes a somewhat different group of children, with possibly different consequences for their self-concept and education" (Friedman and Rogers, 1998, p.4). In the present study affirmative answers to questions about participation in acceleration or extension programs for highly able students identified 367 students as 'gifted' (256 boys, 110 girls). These programs typically used methods of identification that included teacher, parent, peer and self-nomination, and standardised methods of assessment. Students who did not report being selected into such programs were classified as 'non-gifted' (245 - 182 boys, 63 girls).

Procedure

Participants completed the Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990), a questionnaire about participation in special programs, as well as other questionnaires, part of a broader study that is not be presented here.

The perfectionism questionnaire was labelled "Student Attitudes Scale" to minimise priming for perfectionism. The FMPS was administered prior to questions regarding special program participation, in case thinking about programs in which they have participated might prompt students to limit their responses to that particular context.

RESULTS

Means and standard deviations on the six original FMPS subscales were calculated for the current sample and found to be comparable to two other samples (Hawkins, Watt and Sinclair, 2000; Parker and Stumpf, 1995). Principal component analysis confirmed that a four-factor solution was superior to either six or five factor solutions of the data. The solution accounted for 51.33 per cent of the total variance. Consistent with other studies (Hawkins et al. 2000; Stöber, 1998), three items showed cross loadings (18, 16 and 10) and were deleted leaving 32 items. This four-factor solution closely replicated the solutions of other samples representing different cultures, ages, abilities and genders (Hawkins et al., 2000; Stöber, 1998; Stumpf and Parker, 2000). The four factors were Personal Standards (PS), Concern over Mistakes (CMD), Parental Expectations and Criticism (PEC) and Organisation (O). Subscale scores for these dimensions were calculated by summing subscale items. Means, standard deviations and Cronbach alpha coefficients are presented in Table 2.

Table 2. Descriptives and Alpha Coefficients for four new FMPS dimensions

	Subscales			
	CMD	**PEC**	**PS**	**O**
Mean	22.51	21.47	18.10	20.71
Standard Deviation	7.35	7.42	4.89	5.26
No. of items in subscale	11	9	6	6
Cronbach's α	0.82	0.86	0.79	0.88

Students' scores were converted to z-scores and a MANOVA was performed. The FMPS subscale z-scores (PEC, CMD, O and PS) were the dependent variables, while giftedness, year level and gender were the grouping variables. Pillai's Trace criterion was used to determine significance to ensure robustness of the technique where there were unequal group sizes (Tabachnick and Fidell, 1996). Significant multivariate main effects of giftedness, year level and gender were found. These were investigated further using univariate tests for each subscale separately. The results are presented in Table 3.

For giftedness there was a significant main effect on PS. Gifted students scored higher (mean z-score=0.20) than non-gifted students (mean z-score= -0.29). There were also two significant interaction effects on CMD and PEC separating gifted and non-gifted students. These are displayed in Figure 1. CMD and PEC both increased with year level for the gifted group from

below the general mean in Year 6 to above the general mean in Year 11. For the non-gifted group scores were lowest at Year 8.

Table 3. Univariate Results: Giftedness, Year Level and Gender effects

	FMPS Subscale	F	df	p- value
Main Effects				
Giftedness	PS	28.172	1,599	< 0.0001
Year Level	PEC	3.054	2,599	<0.05
Gender	O	5.868	1,599	<0.05
2-way Interactions				
Gifted x Year Level	PEC	5.683	2,599	<0.01
	CMD	3.997	2,599	<0.05
Gender x Year Level	PS	3.953	2,599	<0.05

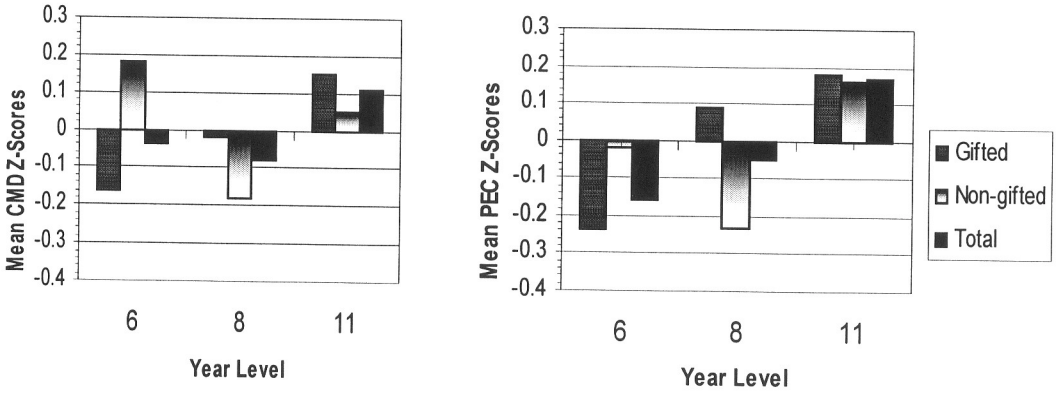

Figure 1. Year Level Differences in CMD (left) and PEC (right) for Gifted and Non-gifted Students

Perfectionist Profiles

K-Means cluster analysis was used to investigate whether the three-cluster solution reported by Parker (1997) would be identified in these data. Subscale z-scores were employed to ensure that subscales with more items did not carry a greater weight in the cluster analysis. The profile of scores for the three clusters is shown in Figure 2.

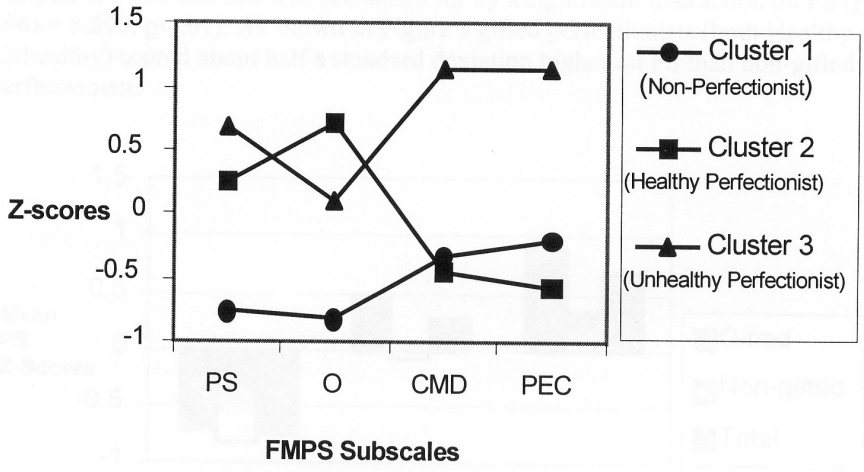

Figure 2. FMPS Subscale Z-scores for Non-Perfectionists, Healthy perfectionists and Unhealthy Perfectionists

Cluster 1 members (N=223) showed the lowest levels of PS and O identifying them as Non-perfectionists. Cluster 2 members (N=235) had the highest scores on O, above average scores on PS and low scores on CMD and PEC indicating a Healthy Perfectionists profile. Cluster 3

members (N=154) matched an Unhealthy Perfectionist profile having the highest scores on CMD and PEC. A MANOVA and follow-up univariate F-tests confirmed that the three subtypes were significantly different across the four FMPS subscales ($F_{(8, 1214)}$=194.015, p<0.001). Multiple planned comparisons (Bonferroni) showed significant differences between the three clusters on all four variables, except for clusters one and two on CMD. These results confirm the three perfectionism types reported by Parker (1997) and subsequent researchers (Hawkins et al., 2000; Parker and Mills, 1996; Rice and Mirzadeh, 2000).

Giftedness and perfectionism profiles

In order to explore the relationship of giftedness and perfectionism profiles, these data, including year level and gender variables, were subjected to a loglinear (model selection) procedure. Pooled chi-square tests revealed significant one way (Pearson $\chi^2_{(6)}$=173.331, p<0.0001) and two-way ($\chi^2_{(13)}$=27.008, p<0.05) effects. Only the effects related to exploring the association between giftedness and perfectionism profiles are described here.

The test for the overall association between giftedness and perfectionism profile was on the borderline of the 0.05 criterion of significance ($\chi^2_{(2)}$= 5.973, p=0.05). This was therefore explored further using Pearson chi-square tests and indicated that gifted students were less likely to be Non-Perfectionists than non-gifted students ($\chi^2_{(2)}$= 6.735, p<0.05). However, gifted students were no more likely than non-gifted students to be either Healthy or Unhealthy Perfectionists.

Multivariate analyses revealed a significant perfectionism profile by giftedness interaction across the four FMPS subscales ($F_{(8,1188)}$=2.235, p<0.05). Further analysis showed that this was accounted for by a significant interaction on PS ($F_{(2,596)}$=5.890, p<0.01). As shown in Figure 3 gifted perfectionists (both Healthy and Unhealthy) scored about half a standard deviation higher on PS than non-gifted perfectionists.

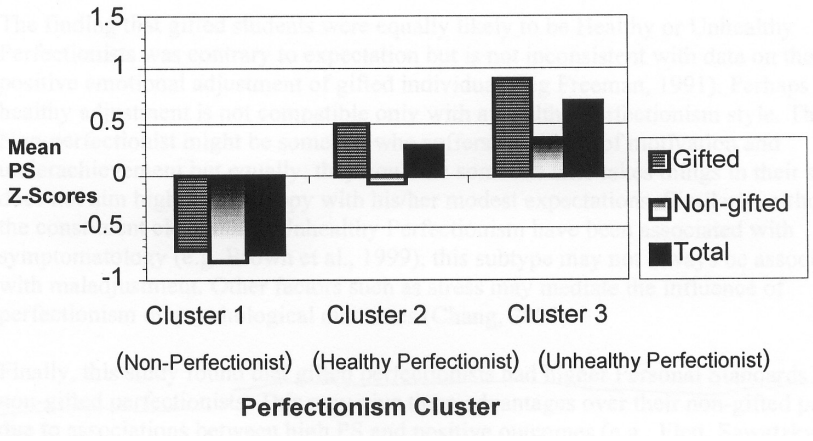

Figure 3. Giftedness and perfectionism profiles

DISCUSSION

The present study was designed to (i) identify the types of perfectionism observed in a sample of Australian school students, and (ii) to examine where gifted students fitted in the profiles of perfectionism. The hypothesis that gifted students would have higher PS than non-gifted students was supported, consistent with studies by LoCicero and Ashby (2000) and Roberts and Lovett (1994). Parker and Mills (1996) using a younger sample reported no significant differences. Participant age is unlikely to explain this inconsistency as PS scores did not increase with year level. Cultural factors might be important in these findings and need further exploration.

Gifted students also showed increased PEC scores with year level suggesting that gifted students may encounter greater parental pressure than non-gifted students to 'live up to' their abilities, pressures that are likely to increase with age. This may contribute to growing concerns about the implications of mistake making (Freeman, 1998), consistent with our finding that CMD increased with year level for gifted students. In non-gifted students, where PEC and CMD scores were lower at year eight than year six or eleven, results may reflect the curvilinear relationships between schooling level and psychosocial development found by other studies (Marsh, 1989). The finding suggests a need for future exploration of the relationship between ability and psychosocial development.

The study was able to replicate the perfectionism types reported in the literature (Hawkins et al., 2000; Parker and Mills, 1996; Rice and Mirzadeh, 2000). This is consistent with hypothesis that gifted students were more likely to be perfectionists than non-perfectionists. Parker and Mills (1996) found an even distribution of perfectionism types across ability groupings, a discrepancy which may be related to sample differences. They confined giftedness to those who performed highly on standardised tests. Our sample included those with talents that may have required high Personal Standards and Organisation for their discovery and development, for example, sport and music.

The finding that gifted students were equally likely to be Healthy or Unhealthy Perfectionists was contrary to expectation but is not inconsistent with data on the positive emotional adjustment of gifted individuals (Freeman, 1991). Perhaps healthy adjustment is not compatible only with a Healthy Perfectionism style. The Non-perfectionist might be someone who suffers from lack of motivation and underachievement but, equally, they could be someone who takes things in their stride, does not aim high, but is happy with his/her modest expectations. Similarly, although the constituent elements of Unhealthy Perfectionism have been associated with symptomatology (for example, Brown et al., 1999), this subtype may not always be associated with maladjustment. Other factors such as stress may mediate the influence of perfectionism on psychological outcomes (Chang, 2000).

Finally, this study found that gifted perfectionists had higher Personal Standards than non-gifted perfectionists. This may give them advantages over their non-gifted peers, due to associations between high PS and positive outcomes (for example, Flett, Sawatzky and Hewitt, 1995; Brown et al., 1999). For gifted Unhealthy Perfectionists, high PS might have different implications. In association with high CMD and PEC, high Personal Standards may contribute to greater distress, as it widens the gap between what the student aspires to achieve and what he/she perceives themselves as actually having achieved.

The current findings could be extended through further research. The finding of higher PS and greater membership of perfectionist types in gifted than non-gifted students requires replication, as insufficient studies have examined perfectionism and ability using a well-validated framework. Perfectionism's interaction with mediator variables such as stress, which may assist in the prediction of psychopathology or well-being, is also an area for fruitful research.

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Exploring perceptions of giftedness in the Cook Islands Maori community

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From my study in the field of gifted education it became apparent that published works related to perceptions of what constitutes giftedness began with a narrow view focused on achievement in intelligence tests and in the latter part of the twentieth century developed to a much broader view. In the New Zealand context the work of Bevan-Brown (1996, 1999) with New Zealand Maori provided a new and different perspective on special abilities or giftedness. This pioneering work was the inspiration for my study. As principal of David Henry School in Tokoroa, New Zealand for nine and a half years I worked in a community with both high New Zealand Maori and Cook Islands Maori populations. I began to wonder whether Cook Islands Maori had similar perceptions of giftedness to New Zealand Maori and whether their perceptions were different in New Zealand by comparison with the Cook Islands. I also wondered how the Cook Islands Maori children who were plainly gifted in the context of their own culture could be better nurtured by the school in order to foster and develop their gifts. Thus my study was born.

Perceptions, giftedness, Cook Islands Maori community

INTRODUCTION

I sat in the audience at the Tokoroa Schools Polynesian Festival and watched with pride as the Cook Islands Maori cultural group from my school, David Henry School took the stage. One hundred and ten smiling children from several ethnic groups stood arrayed in their gorgeous Cook Islands Maori costumes awaiting the cue for them to begin their performance. Cook Islands Maori children took lead roles in singing and dancing, producing a stunning performance, which won wide acclamation. These children were plainly gifted in the context of their own culture. I began to think about why I had never previously thought about most of them as gifted individuals and how the school might change to nurture the gifts they had and to develop other gifts which may be latent.

METHODOLOGY

In the initial stages of the project I met with a prominent Cook Islands Maori man who had been immersed in his own culture as well as achieving in the European world. I discussed whether it was appropriate for a *papa'a* (European) to undertake a thesis involving study of Cook Islands Maori. He indicated that it was appropriate and he considered my proposed study to be an exciting development for his people.

I then discussed whether it was appropriate to gather data by means of a questionnaire. He indicated that he could not foresee any problems with using this instrument. He then developed a list of what he believed were characteristics or behaviours that Cook Islands Maori may see as

indicators of giftedness. The questionnaire was developed from this list. The questionnaire was then discussed with a prominent and gifted Cook Islands Maori woman who gave it her approval.

There are three components to the qualitative research data gathering process I used:

1. use of a questionnaire,
2. interviews both in a group and individual setting,
3. "micro" studies.

All participants in the questionnaires, discussions and interviews were of Cook Islands Maori origin.

Twenty-eight adults completed the questionnaire in Aitutaki, in the Cook Islands and 39 adults completed the questionnaire in Tokoroa, in New Zealand. Five individuals participated in a group discussion in Aitutaki and five participated in a group discussion in Tokoroa. They had all completed the questionnaire prior to participating in the discussion. Two *kaumatua* (elders) were interviewed in Aitutaki and two *kaumatua* were interviewed in Tokoroa. A gifted individual was interviewed in Rarotonga, in the Cook Islands and two were interviewed in Tokoroa to become subjects for case studies. A fourth gifted individual was interviewed in Tokoroa on her perception of what constitutes giftedness to provide a better gender balance for the in depth interviews

RESEARCH FINDINGS

Results from the questionnaire responses in Aitutaki and Tokoroa are presented in Table 1. The percentage of responses for each characteristic in each column are indicated.

Table 1. Results from the questionnaire responses in Aitutaki and Tokoroa

Characteristics	Very Sig.		Significant		Insignificant	
	A	T	A	T	A	T
1. Good memory	67	69	30	31	4	0
2. Excellent vocabulary	62	59	27	38	12	3
3. Good communication skills	65	56	31	34	4	9
4. Early development of skill in the performing arts	48	56	37	25	15	19
5. Skill as a dancer	44	66	37	19	19	16
6. Able to lead in singing or chanting	39	59	36	26	25	15
7. Ability to harmonise when singing	37	63	37	31	26	6
8. Achieving success at school	36	40	46	47	18	13
9. Being articulate in more than one language	36	36	50	57	14	7
10. Ability to know and explain Cook Islands culture to others.	50	60	35	37	15	3
11. Ability to move freely in two worlds, fitting in with mainstream society but being in touch with cultural roots.	27	45	62	45	12	9
12. Ability to interpret each of the two worlds we live in to the other.	21	45	67	48	13	6
13. Ability to speak Cook Islands' dialects other than one's own.	44	38	40	50	16	13
14. Good knowledge of the Bible	48	52	28	39	24	9
15. Skill as an orator (public speaker)	44	52	36	39	20	10
16. Ability to bring the community together with a sense of unified purpose	32	59	40	38	28	3
17. Involvement in the community for the benefit of others	35	58	54	39	12	3
18. Has carefully reasoned understanding of right and wrong.	35	54	62	38	4	8
19. Strong sense of social justice.	32	40	60	52	8	8
20. Ability to think quickly on one's feet	46	48	35	33	19	19
21. Able to speak spontaneously in a coherent and convincing way.	40	38	44	47	16	16
22. Tertiary qualifications	32	19	52	65	16	15
23. Expertise in traditional fields	52	48	36	44	12	8
24. Expertise in fields in the modern world for example, ICT	40	29	44	50	16	21
25. Innovative – has original and interesting ideas	38	33	50	57	12	10
26. Creative – makes original responses or products	54	33	42	54	4	13
27. Powerful intellect – able to reason convincingly	56	40	40	45	4	15

A: Aitutaki T: Tokoroa (All numbers represent percentage of that sample's response)

The original questionnaire also provided another column for respondents to identify the three most significant indicators of giftedness in order. This was deleted from the above table of results but did provide some interesting data. Only eight of the sample of 28 individuals who completed the questionnaire in Aitutaki completed the ranking column in the way that was intended. This sample is too small to draw any real conclusions. However, the characteristics which were identified twice as being in the top three indicators of giftedness were:

1. good memory,
2. good communication skills,
3. good knowledge of the Bible, and
4. has carefully reasoned understanding of right and wrong.

Five teachers at Araura College who had previously completed questionnaires participated in a group discussion about what constitutes giftedness. Two kaumatua were also interviewed. From the discussion and interviews a comprehensive view of giftedness emerged. *Ability in sports*, which did not feature in the questionnaire emerged as an important indicator of giftedness. *Skill as an orator, expertise in traditional fields* for example, fishing, planting, medicine, and *skills related to the performing arts* assumed a greater significance than had been evident from questionnaire responses. *Good memory* was also seen as very significant. One individual indicated that the gifted individual stands out for the *quality of his/her thinking*. One participant in the discussion indicated that for an individual to be considered as gifted he/she would need to stand out in multiple domains and not just in one.

Twenty-three of those who completed the ranking column in Tokoroa did this in the intended way. From their responses the indicators of giftedness most frequently identified as the three most significant were:

1. ability to know and explain Cook Islands culture to others – eight times,
2. good knowledge of the Bible – eight times,
3. ability to harmonise when singing – six times,
4. good memory – five times,
5. early development of skills in the performing arts – four times,
6. able to lead in singing or chanting – four times, and
7. skill as a dancer – three times.

Five individuals in Tokoroa who had previously completed questionnaires participated in a group discussion where they detailed their perceptions of giftedness. Two kaumatua were also interviewed.

Leadership emerged as a significant characteristic of giftedness although it had not been listed in the questionnaire. *Expertise in traditional fields* for example, carving, planting, fishing; *skill as an orator, good communication skills* and *ability to bring the community together with a sense of unified purpose* emerged as the most significant characteristics of giftedness. One spoke of giftedness as an inherited gift and this being evidenced as a *leadership* quality. Part of this gift was viewed as knowing the family's genealogy and knowing things about the family. One of the kaumatua spoke of an individual's *creative* ability as a composer and of *skill in sports* as indicative of giftedness.

The three individuals who were the subjects of "micro" studies because of the recognition their peers give them as gifted individuals were interviewed about their perceptions of what constitutes giftedness. These individuals were Teupoko (Poko) Morgan, Tepoave Raitia and Taria Kingstone. Taria's mother, Fanaura was also interviewed with him.

All four spoke of *skills in the performing arts* as evidence of giftedness. Fanaura and Taria spoke of *confidence* as being the first essential ingredient of giftedness. Fanaura further commented on

the individual who is able to *pull people together to work for a common purpose* as having multiple gifts and possessing some of the most important gifts. Poko identified *listening skills* as perhaps the most important indicator of giftedness. She stated that linked to the ability to listen was the ability to observe and to reflect. Poko indicated that *listening, observation* and *reflection* all contribute to the development of the skills which demonstrate giftedness. She said that the gifted individual will also be *passionate* about the areas in which his/her gifts are evident. Poko emphasised that the gifts an individual possesses need to be nurtured and there is the expectation that the gifts will be shared for the benefit of the family and others.

DISCUSSION OF THE FINDINGS

The data gathered in Aitutaki and Tokoroa have certain strong similarities but also some significant differences. There are numerous trends from the data that I consider may be significant, but only four of these can be explored briefly within the scope of this paper.

1. ***The strong oral tradition of Cook Islands Maori has a major influence on perceptions of giftedness both in the Cook Islands and New Zealand.***

In the data developed from the questionnaires completed in Aitutaki and Tokoroa *good memory, good communication skills* and *excellent vocabulary* are identified amongst the most significant indicators of giftedness. Surprisingly, *skill as an orator* does not rate as highly in the questionnaire responses. However, in interviewing kaumatua both in Aitutaki and Tokoroa and interviewing identified gifted individuals, *skill as an orator* featured as an important indicator of giftedness. Coupled with this, kaumatua and gifted individuals also identified *good memory* and *good communication skills* as characteristics of giftedness. In group discussions both in Aitutaki and Tokoroa *skill as an orator* featured prominently as an indicator of giftedness as did *good communication skills*.

Until the nineteenth century Cook Islands Maori had no written language. Therefore all communication was in oral form. Kaumatua therefore placed great importance on handing down the family's genealogy and the stories of the tribe in oral form. *Good memory* and skills in oral *communication* have therefore been highly valued throughout human history in the Cook Islands. Because the development of written language occurred in the comparatively recent past, *good memory, good communication skills* and *oratory* are still highly valued and viewed as significant indicators of giftedness. Individuals who were cited as gifted were said to be able to recite a genealogy of one hundred names without difficulty and one was said to be able to recall the genealogy of other families as well as that of her own. The strong oral tradition has clearly influenced perceptions of what constitutes giftedness through to the present day.

2. ***Amongst Cook Islands Maori there is a strong emphasis on the importance of skill in the traditional performing arts and skills in these areas are therefore rated highly as indicators of giftedness.***

Both in Aitutaki and Tokoroa, aspects of the *performing arts* were identified by most people as very significant or significant indicators of giftedness. Which aspects were given priority varied in the two settings. However, it was significant that the Tokoroa sample generally gave greater importance to skills in the *performing arts* than those who completed the questionnaire in Aitutaki. For example, when considering characteristics which were very significant indicators of giftedness, in the Tokoroa sample 63 per cent considered *ability to harmonise when singing,* 66 per cent *skill as a dancer,* 59 per cent *ability to lead in singing or chanting,* and 56 per cent *early development of skills in the performing arts* belonged in this category. In Aitutaki, all these characteristics had less than 50 per cent of respondents rating them very significant.

The question arises as to why the questionnaires suggest that skills in the *performing arts* may be viewed as more significant indicators of giftedness in Tokoroa than in Aitutaki. This can only be a matter of conjecture. One possible reason could be that with Cook Islands Maori being a minority culture in New Zealand the performance aspects of their culture may have become more highly valued. In Aitutaki, where Cook Islands Maori is the dominant culture, traditional aspects of performance, while still highly valued, may nevertheless not assume quite the same significance as in New Zealand.

In spite of the questionnaire data however two of the participants in the group discussion in Aitutaki identified skill in aspects of the *performing arts* as indicative of giftedness. Also, one of the kaumatua interviewed in Aitutaki placed great emphasis on performance.

All three of the individuals who were interviewed for 'micro' studies because of their giftedness identified skill in the performing arts as indicative of giftedness.

Tepoave Raitia commented:

> *What they produce is extraordinary, magic, pleasing to the eye. Some orators have style and heart in what they produce. This is evident in dancers. They shine in their field above all others.*

The way that performance is valued from an early age is illustrated in the following statement from Poko Morgan:

> *But you know with giftedness it comes from observation as a young baby, as a young toddler, as a two year old, as a three year old. You have an awful lot of teachers. All the aunties, all the uncles, and then there is your Sunday School teacher. You make a perfect presentation and he picks you up and holds you up for everybody to see. I guess it is really a sharing.*

Both Tepoave's and Poko's comments about performance presentation fit with the high value given to the performing arts by Cook Islands Maori in general.

3. The Christian faith has had a strong influence on Cook Islands Maori culture and affects perceptions of giftedness.

The only characteristic listed in the questionnaire specific to the Christian faith is *good knowledge of the Bible.* The percentages who rated this characteristic as very significant in Aitutaki (48%) and Tokoroa (52%) are mid range by comparison with the percentages for other characteristics. However, the fact that both in Aitutaki and Tokoroa this was one of the characteristics most frequently identified as being amongst the top three indicators of giftedness means that for a significant number of people *good knowledge of the Bible* is considered to be a very important indicator of giftedness.

Taria Kingstone remarked:

> *Christianity has been the most important influence in the modern history of the Cook Islands. I think it is interesting that in a sense, Christianity is an enclave within our culture that is not from our culture. The influence of the missionaries has been so great that I, as a Cook Islander in New Zealand, gain my identity through the church. I guess it's a bit different in the Cook Islands where the main source of a person's identity is through their island.*

Although *good knowledge of the Bible* is the only characteristic specific to the Christian faith, within the New Zealand context the church is often the primary vehicle for the expression of the *performing arts* of singing, chanting, drama and dancing as well as for *oratory.* Songs, dances, dramas and speeches therefore often have a Christian theme.

4. Cook Islands Maori living in Tokoroa attach greater significance to ability to move freely in two worlds, fitting in with mainstream society but being in touch with cultural roots and ability to interpret the two worlds we live in to each other than those living in Aitutaki.

The questionnaire responses indicate that 12 per cent of people in Aitutaki and 9 per cent in Tokoroa do not consider the *ability to move freely in two worlds, fitting in with mainstream society but being in touch with cultural roots* to be significant or very significant indicators of giftedness. In Aitutaki 13 per cent, and in Tokoroa 6 per cent do not consider *ability to interpret each of the two worlds we live in to the other* to be significant or very significant indicators of giftedness. However, the data are interesting when considering the percentage of these characteristics marked as very significant. In Aitutaki only 27 per cent for the former and 21 per cent for the latter rated these characteristics as very significant. By contrast, in Tokoroa they were both considered very significant indicators of giftedness by 45 per cent of the sample. This suggests that participants in Tokoroa are more aware of the two worlds of traditional Cook Islands Maori culture with its strong community values and the *papa'a* world with its greater emphasis on individualism. It also suggests that they attach comparatively greater significance to the two characteristics. When considering why this may be the case, the two worlds are clearly more evident in Tokoroa. While there are clearly influences from *papa'a* culture with, for example, the motor scooters and utility vehicles seen on the roads of Aitutaki, the influence is nowhere near as pervasive as in Tokoroa.

Comparison with Research Findings on New Zealand Maori

Some of Bevan-Brown's (1996, 1999) findings regarding New Zealand Maori perceptions of special abilities are replicated in the findings of the research with Cook Islands Maori. Possibly the most significant similarities were as follows.

1. Both have a broad and wide ranging concept of what constitutes special abilities or giftedness.
2. The concept of special abilities or giftedness includes both skills and personal qualities.
3. Traditional knowledge and skills such as oratory and the performing arts are important indicators of giftedness.
4. The concept of giftedness generally originates from Maori *kaupapa* (principles, ideas).

Two differences which may be important were as follows.

1. New Zealand Maori placed greater emphasis on outstanding personal qualities, high moral values and service to others.
2. Cook Islands Maori appeared to be more influenced by the Christian faith with specific reference to *good knowledge of the Bible* as an indicator of giftedness in contrast to the New Zealand Maori broader notion of spirituality.

Considerations for Identifying and Providing for Gifted Cook Islands Maori Students

When developing procedures for identifying and providing for gifted Cook Islands Maori students, educators need to be mindful of the following, particularly in the New Zealand context.

1. Identification processes and program provision must be developed in consultation with Cook Islands Maori.

2. Cook Islands Maori have a broad, wide ranging view of giftedness. Observations must therefore explore the wide range of qualities and abilities that are perceived to constitute giftedness.
3. Testing procedures and instruments need to be screened for monocultural bias and racism.
4. Testing and observation needs to include measures of the skills and knowledge traditionally valued by the indigenous people of the Cook Islands.
5. School programs need to provide the opportunity for Cook Islands Maori to connect with their cultural roots and to engage in learning experiences appropriate to their culture.
6. If using traditional IQ and achievement-type tests, use dynamic rather than static testing procedures.
7. Explore the use of open ended tests of creativity.
8. Avoid stereotyping of Cook Islands Maori students through over emphasis on teaching using a "learning styles" approach.
9. Provide training for teachers in catering for the needs of children from minority ethnic groups in general and particularly for those exhibiting gifted and talented behaviours in any domain, whether within or outside the school context.
10. Encourage all students, including those of Cook Islands Maori origin, to develop their own cultural identity.
11. Raise expectations for Cook Islands Maori students as well as those from other minority groups.

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Some current findings on brain characteristics of the mathematically gifted adolescent

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A number of studies investigating the brain characteristics of mathematically gifted youth indicate that they possess a unique functional organisation as compared to those of average math ability (O'Boyle, et al., 1995). Specifically, data from a variety of behavioural and psychophysiological experiments tend to suggest enhanced processing reliance on the right cerebral hemisphere and heightened interhemispheric communication, as unique functional characteristics of the math gifted brain, with the later providing supplemental processing resources and enhanced cooperation between the cerebral hemispheres. Notably, these brain differences may have important implications for the nature and timing of mathematics instruction.

Brain characteristics, mathematically gifted adolescent

INTRODUCTION

A selective review of published findings (for example, Butterworth, 1999; Dehaene, 1997) may be interpreted as supporting two potential neurobiological mechanisms underlying exceptional mathematical ability. One mechanism postulates an enhanced role for the right cerebral hemisphere (RH), while the other entails greater bilateral involvement of the cerebral hemispheres, with the later being related to heightened interhemispheric connectivity (O'Boyle and Hellige, 1989; O'Boyle, et al., 1995). Evidence from brain-damaged patients indicates that deficits in mathematics can follow injury to either cerebral hemisphere, but that the nature of the impairment will differ depending upon the locus of the cerebral insult. For example, left hemisphere (LH) damage may result in difficulties with reading or writing numbers and the performance of basic arithmetic operations (for example, acalculia or dyscalculia) while damage to the RH disrupts spatial representation (for example, misreading signs, omitting numbers, difficulties in preserving decimal places), and often impairs higher-order mathematical reasoning capacity (Benbow, 1988; Dehaene and Cohen, 1997). In this way both hemispheres of the brain and their successful interaction play a crucial role in the complex process of mathematics (Dehaene, et al., 1998).

Data derived from several psychophysiological studies support an important relationship between the specialised capacities of the RH and mathematical ability. For example, using positron emission tomography (PET), Haier and Benbow (1995) showed increased glucose metabolism in the right temporal lobe during a mathematical reasoning test of high (but not gifted) ability students. And recently, Presenti, et al. (2001) also using PET measures, found calculation in an adult mathematical prodigy to be uniquely mediated by right prefrontal and right medial temporal cortex. In still other studies, the interactive contributions of both hemispheres to the various components of mathematical reasoning have been demonstrated using the Electroencephalogram (EEG) and Event Related Potential (ERP) techniques, with the relative importance of each hemisphere being task and strategy dependent (for example, Burbaud et al., 1999; Kazui, et al., 2000). Interestingly, a recent post-mortem examination of the brain of Albert Einstein (Witelson,

et al., 1999) found enhanced development of the parietal lobes, particularly on the right side, which is the very area implicated in our ongoing studies of math gifted adolescents.

Over the last decade, O'Boyle and colleagues have conducted a considerable amount of research focusing on the morphological and functional characteristics of the mathematically gifted brain, and how it differs both qualitatively and quantitatively, from those of average math ability (O'Boyle and Benbow, 1990; O'Boyle and Gill, 1998; O'Boyle, 2000; O'Boyle, et al., 1991, 1994, 1995). In these studies a variety of experimental methods have demonstrated that enhanced development of the RH and an unusual reliance upon it when processing information are unique characteristics of the math gifted brain. Note that math gifted individuals are operationally defined as 10-15 year olds who have scored at the 99th percentile when taking the SAT-Math exam (Scholastic Aptitude Test, USA) or the SCAT-Numerical Reasoning test (School College Abilities Test, Melbourne, Australia), which places them over two standard deviations beyond the mean.

Using a dichotic listening paradigm O'Boyle and Benbow (1990) have demonstrated that adolescents of average math ability show the prototypic right ear/LH advantage when recognising linguistic stimuli like syllables (Kimura, 1967), while contrastingly, the mathematically gifted are equally able at recognising these verbal stimuli with either ear. The later finding suggests the enhanced involvement of the RH during information processing, even for the analysis of materials that are usually LH mediated. Likewise, O'Boyle et al. (1994) had mathematically gifted and average ability youths perform a concurrent finger-tapping task, one that involves tapping a key with the index finger of each hand (one hand at a time) while simultaneously reading a paragraph out loud. Average ability participants showed a significant reduction in tapping rate for the right hand/LH, with their left-hand rate tapping virtually unaffected. This pattern is thought to reflect a division of LH (but not RH) resources between the linguistic processes necessary for reading and those required for motor control of the right finger. For the math gifted, however, significant reductions in the tapping rate of both hands were observed. The pattern found in the math gifted dovetails with the aforementioned dichotic listening results, and supports the idea of enhanced development of the RH and reliance upon a special form of bilateralism when processing information, even when engaged in the analysis of linguistic (predominantly LH) inputs.

There is also evidence of a highly coordinated and orchestrated ability to switch activation (and presumably information) between the hemispheres in the brain of the math gifted (O'Boyle, et. al., 1995; O'Boyle, 2000; O'Boyle and Gill, 1998; Singh and O'Boyle, 2004). This is thought to reflect enhanced interhemispheric connectivity, perhaps via the corpus callosum (CC) which is the major anatomical conduit between the left and right hemispheres. For example, Singh and O'Boyle (2004) found average math ability children to be faster and more accurate at making same/different judgments of letter pairs when they were presented unilaterally (that is, both letters of the pair presented to the same hemisphere) as compared to bilaterally (that is, when one letter of the pair is presented to each hemisphere simultaneously, thus requiring interhemispheric exchange of information to perform the task). In contrast, the mathematically gifted were faster and equally accurate on bilateral trials as compared to unilateral trials, suggestive of a brain organisation that is uniquely predisposed towards a high degree of interhemispheric interaction, and as such is characterised by rapid and accurate information exchange between the cerebral hemispheres.

Thus, the available empirical evidence pinpoints enhanced RH mediation and heightened bilateral involvement of the cerebral hemispheres as two possible neurobiological mechanisms that underlie exceptional mathematical ability. The functional organisation of the math gifted brain, however, has only recently begun to be investigated, and new research using advanced brain

imaging techniques is required for a better understanding of the neurobiological substrate of children who display gifted mathematical ability.

METHODS AND RESULTS

To further investigate possible differences in the functional brain organisation of mathematically gifted adolescents compared to those of average math ability, we recently used functional magnetic imaging (fMRI) to monitor brain activation during performance of a mental rotation task. Success at mental rotation, although visuospatial in nature, is often reported to correlate with mathematical ability (that is, the better mental rotation, the higher the math ability, see Benbow, 1988). In the present study we had eight mathematically gifted boys (mean age =14 years) perform mental rotation problems while inside the fMRI scanning environment. On each trial participants were required to press one of four fibre optic buttons to indicate which of the four test objects was identical to the target object when rotated in space, as presented in the example trial in Figure 1.

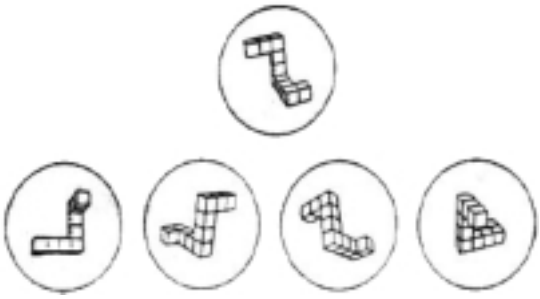

Figure 1. Mental rotation example

As can be seen in the accompanying head plot, shown in Figure 2, significant brain activation ($p_{corr}<0.05$) was obtained bilaterally in the parietal, superior occipital, and pre-motor areas, and in the right lateral frontal cortex (Brodmann 44), with somewhat less activation in right lateral frontal, right anterior cingulate and right caudate regions. A trend towards activation of the left anterior cingulate, and bilaterally in the anterior insula was also noted, but lacked statistical power given the small number of participants. In the parietal and the occipital areas the volume of activation was somewhat greater in the RH as compared to the LH. These results, although preliminary in nature, suggest that math gifted male adolescents recruit areas in both cerebral hemispheres when performing mental rotation (particularly, the right parietal), and engage other regions not typically found in previous rotation studies of young adults, namely bilateral activation of prefrontal cortex and the anterior cingulate. The later regions are known to mediate enhanced spatial attention and working memory, as well as the fine-tuning of executive functions (for a review see Kane and Engle, 2002). And, they are also thought to play an important role in the development of deductive reasoning and cognitive expertise (Knauff, et al., 2002).

DISCUSSION

There is now, and has always been, intense fascination with individuals who exhibit exceptional mathematical ability, particularly adolescents who acquire prodigious math skills in the absence of any formal training or instruction. Everyone seems to know someone who has an innate proclivity for mathematics and each of us shares an intrinsic curiosity about how the brain of a ‘budding Einstein’ might work relative to the rest of us. Of particular importance is the capacity to identify children who are gifted in mathematics, and how to foster and develop their inherent ability to its full potential. While the present findings are provocative, our current understanding of the biological bases of mathematical ability is still in its infancy. And as such, there is a pressing need for neuroscience to continue to investigate the underlying brain structures and circuitry that may serve as the physiological foundation of exceptional math ability. Such findings will undoubtedly

assist parents and teachers in ensuring the optimal development of math skills in all children irrespective of their ability level.

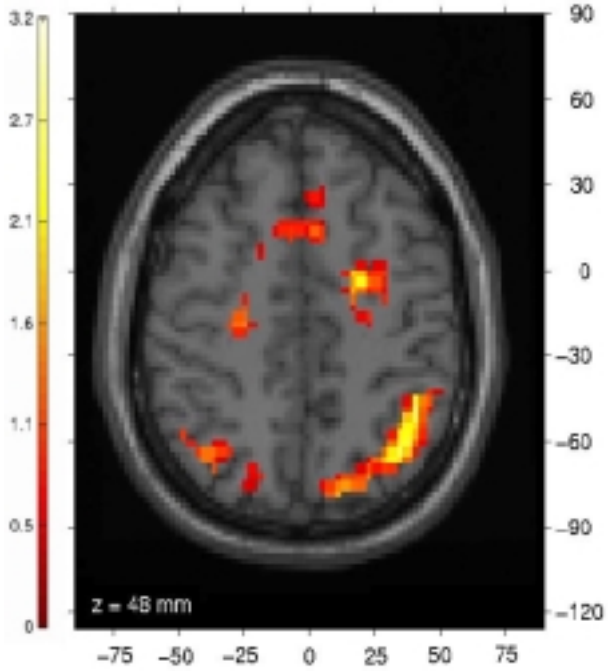

Figure 2. Active regions in mental rotation (T scores)

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Divergence and convergence of mental forces of children in open and closed mathematical problems

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In this study we investigated relationships between convergent and divergent thinking with an emphasis on fluency, originality, flexibility and elaboration in the mathematical domain. A related purpose was to examine relationships between problem types in mathematical tasks. The math section of a performance-based assessment was used to assess 857 Grade 1 to 6 students' performance in the mathematical domain. Statistically significant correlations were found between divergent and convergent thinking, and between convergent thinking and the components of divergent thinking. Also, this study provided evidence for the construct validity of the Problem Continuum Matrix (Schiever and Maker, 1991, 1997). Correlations between problem types varied according to the proximity of the types to each other.

Mathematics, convergence, divergence, creativity, gifted

INTRODUCTION

One mode of effective problem solving is to give up the old habit of thinking and try an unconventional mode of thinking. This method of problem solving involves the ability to think in a flexible fashion. Flexible thinking involves the ability to shift cognitive functioning from common applications to the uncommon; namely, breaking through cognitive blocks and restructuring thinking so that a problem is analysed from multiple perspectives. The process of flexible thinking includes both divergent and convergent thinking provided that a problem solver works on multiple solutions, as well as one single solution during the course of problem solving.

Traditionally, divergent thinking is defined as the generation and application of many different ideas to solve a given problem and is considered a good predictor of creative performance (Runco, 1990). The main focus in divergent thinking is on the quantity and quality of ideas or responses generated by the problem solver in response to prompts (Guilford, 1967). The quality and quantity of responses are evaluated based on fluency (How many ideas?); flexibility (How diverse are the classifications of ideas?); originality (How unique are the ideas?); and elaboration (How detailed are the ideas?). Divergent thinking assessments have open-ended questions or tasks to stimulate a variety of ideas.

Convergent thinking is the mental process of deriving the best or correct solution from available information. The task of the problem solver is to go back to her/his stored information (Puccio, 1998) and to make that information meaningful or useful through appropriate mental information processing. A problem sometimes requires only the application of algorithms for solutions. Some intelligence tests and academic achievement tests are good examples of ways to measure convergent thinking; they contain well-defined problems that usually have one correct answer.

Although both divergent and convergent thinking produce ideas, qualitative and quantitative differences can be found between the end products of each type of thinking. Divergent thinking often results in variability in production while convergent thinking results in singularity in production (Cropley, 1999).

Cropley (1992, 1999) further elaborated the distinction and relationship between divergent and convergent thinking. According to Cropley, early researchers in creativity tended to separate both types of thinking and considered them as functions of giftedness in different forms. He also discussed that gifted students produce both singular (convergent thinking) and varied (divergent thinking) information. However, a combination of thinking processes is necessary for novel production. Two approaches, "threshold models" and a "style approach" have been devised to explain the interaction of convergent and divergent production.

The *threshold model* was developed to explain the function of level of ability on divergent and convergent thinking. As the level of ability increases to produce singular information, the possibility of variability in production increases accordingly. Therefore, any movements in ability toward or away from the threshold directly affect the quality and quantity of information produced through divergent thinking mechanisms. In this approach, a certain level of ability is necessary for novel production. On the other hand, the *style approach* elucidates the interaction between the two forms of thinking through cognitive strategies. According to this approach, neither type of thinking influences the other. What produces singularity and variability are the cognitive strategies and mechanisms. In short, both approaches have as a central concept the interaction between two thinking forms either in levels of cognitive abilities or types of functions of the mind.

Problem Types for Measuring Divergent and Convergent Thinking

The use of divergent or convergent thinking in problem solving depends mainly on the types of problems chosen or presented, that is having open or closed problem situations. Problems can be classified into different categories. Most problems are classified into the categories of well-defined (open) and ill-defined problems (closed) (Jausovec, 1994). Howard (1983) identified two distinctive characteristics of well-defined problems that distinguish them from ill-defined problems. First, the goal is clearly specified in well-defined problems while the goal is unclear in ill-defined problems. Second, the problem statement in well-defined problems contains specified, clear and enough information necessary for solutions. In the case of ill-defined problems, information in the problem statement is not clear, or the relevance of information to the problem solution is not specified. Howard proposed that these distinctive characteristics represent a continuum, according to which problems can be classified into more categories.

Another classification was proposed by Getzels and Csikszentmihalyi (1976). Their classification is based on the triangle of problem statement, method and solution. The type of problem varies according to the specificity of the problem statement, method and solution to both problem presenters (for example, teachers) and problem solvers (for example, students). They identified three problem types: the first two are well-structured (closed), and the third is ill-structured (open); that is, the problem is not defined and the solution is unknown. In the third, the task of the problem solver is first to find or define the problem and then to develop method(s) to solve the problem.

Problems can be classified into more varied categories according to problem spaces, and cognitive processes and types of knowledge used during problem solutions. However, the distinction between ill-defined problems and well-defined problems is not clear enough to be useful in experimental research and in education for instructional purposes. Building on Getzels and Csikszentmihalyi's work, Schiever and Maker (1991, 1997) identified two additional problem types that extended the original classification. The new classification is called "Problem

Continuum Matrix." Table 1 shows the essential characteristics of the matrix. There are five problem types in this classification, and they are more specific. Inspection indicates that the number of problems is not limited to five; rather it is a continuum. That is that more specific problem types can be generated based on the matrix.

Table1. Problem Types

Problem Type	**Problem**		**Method**		**Solution**	
	Presenter	Solver	Presenter	Solver	Presenter	Solver
I	K	K	K	K	K	U
II	K	K	K	U	K	U
III	**K**	**K**	**R**	**U**	**R**	**U**
IV	**K**	**K**	**U**	**U**	**U**	**U**
V	U	U	U	U	U	U

K=Known, U=Unknown, R=Range (A variety of methods and solutions are available for a problem and only the problem presenter is aware of them).
Highlighted (bold) problem types were identified by Schiever and Maker (1991, 1997).

Creativity usually is assessed using Problem Type IV, but sometimes is assessed with the more structured Type III, and sometimes with the unstructured Type V Problem situation, often called "problem-finding." Type I and II problems also are used to assess insight problems. An assessment tool that enables us to measure performance on all these varied types of problems can give us insights into the problem solving abilities of individuals. Information gained from this assessment then can be used to nurture students' problem solving abilities and their creativity.

The DISCOVER Assessment Model

The Discovering Intellectual Strengths and Capabilities while Observing Varied Ethnic Responses (DISCOVER) Assessment Model was designed to assess the problem solving abilities of children and youth in domains of intelligence. The assessment battery contains all five types of problems to provide introspective profiles of students' convergent and divergent performances.

The math section of the assessment contains problem Types I, II, III, and IV. Individual scores in the mathematical tasks of the DISCOVER Assessment are given in two categories: accuracy and the use of mathematical concepts in answers. The total accuracy score is the number of correct responses to all problem types. While the accuracy scores for problem Types I and II (structured, one right method and one right solution) are indicative of convergent performance, the accuracy of responses in problem Types III and IV (many correct methods and many possible solutions) reflects fluency.

Concept scores are based on evidence of understanding and meaningfully using mathematical concepts. This includes a variety of operations and strategies the individual applies in solving math problems, such as commutative (for example, 10+8+10=28; 8+10+10=28) and associative properties (for example, [5+5]+8=18; 5+[5+8]=18) as well as making unique problems (for example, story problems, symbolic representations, use of algebraic notations, fractions, decimals, and/or Roman Numerals), and the recognition and creation of shapes and patterns. Concept scores are derived from responses to problem Types III and IV. They measure the flexibility, originality, and elaboration components of divergent thinking. For example, the variety of operations that a person uses to get the same correct answer contributes to that person's flexibility scores. Given the answer 13, we can get it in many different ways such as 4+9, 23-10, $13 \div 1$, $(13x1) \div 1$, and so forth.

RESEARCH RATIONALE

Research on divergent and convergent thinking has focused on fluency, originality and flexibility mostly in linguistic, artistic and spatial domains (Borland, 1986; Guilford, 1984; Runco, 1986,

1991; Runco and Albert, 1989; Wyver and Markham, 1999; Torrance and Saburo, 1979). The relationship of convergent to divergent thinking in mathematical domain still remains unclear. Divergent and convergent thinking play a major role in mathematical discoveries in that a problem solver often has to try many mathematical demonstrations if one does not work. Sometimes, only one method can lead to a correct solution as happens in mathematical deductions. Therefore, divergent and convergent thinking and their relationship in math problem solving situations merit further research.

The purpose of our study was to explore how performance on convergent tasks relates to performance on divergent tasks in mathematics. Further, the relationships between problem types in the math section of the DISCOVER Assessment were investigated. The following research questions guided the study:

1. How does student performance on convergent tasks relate to performance on divergent tasks in the mathematical domain?
2. How does student performance on fluency and OFE (Originality, Flexibility and Elaboration) relate to performance on convergent tasks in the mathematical domain?
3. What relationships, if any, exist between Problem Types?

METHOD

Participants

Data for the study were collected as part of a larger study of the DISCOVER Assessment and Curriculum models. Participants were Grade 1 to 6 students assessed in the schools participating in the DISCOVER Project. All participating schools were located in the southwest region of the United States. The total number of students was 857 from four schools, as presented in Table 2. The ethnic background of the population varied from school to school. School A was composed of 99 per cent Navajo, school B was 98 per cent Hispanic, school C was 50 per cent Caucasian and 50 per cent African American, and school D was mixed, including Hispanic, Caucasian, African American, and Yaqui Indian.

Table 2. Number of participants in each school and grade level

	Grade						
School	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
A	46	34	52	58	54	-	244
B	47	40	37	45	38	-	207
C	32	-	29	33	40	28	162
D	45	60	46	39	54	-	244
Total	170	134	164	175	186	28	857

Instrument

The DISCOVER Assessment was used to asses students' divergent and convergent thinking. The assessment tool has been used with diverse populations in the United Sates, as well as abroad. The reliability ranges from 0.92 to 1.00 when expert observers do the assessment. Novice observers' agreement with an expert ranges from 0.47 to 0.92 (Maker, 2001). Studying the concurrent validity, Almegta (1997) found that DISCOVER math total scores and accuracy scores were correlated significantly with math achievement ($r=0.335$, $p<0.05$ and $r=0.325$, $p<0.05$) but concept scores were not ($r=0.306$, ns). Sarouphim (2000) found significant correlations between the Raven Progressive Matrices and math ($r=0.35$, $p<0.01$) sections of the DISCOVER Assessment. Furthermore, Sak and Maker (2003) investigated the predictive validity of the assessment through examining kindergarten students' performance in the logical mathematical domain as measured by the DISCOVER Assessment and their academic achievement in 3rd, 5th

and 6th Grades as measured by Stanford 9 Achievement Test and Arizona's Instrument to Measure Standards (AIMS). In their study, logical mathematical intelligence accounted for 29 per cent of the overall variance in Stanford 9 Math ($p=0.033$) and 39 per cent in AIMS Math ($p=0.003$) in 3rd Grade. In 5th and 6th Grades, students gifted in logical mathematical intelligence scored significantly higher in Stanford 9 Math ($F= 6.14$, $p<0.01$) and AIMS Math ($F= 4.15$, $p<0.01$), and had significantly higher grades in 6th Grade math ($F= 4.50$, $p<0.01$) when compared to their counterparts. Also, students gifted in logical mathematical intelligence had higher grades in 6th Grade science ($F= 5.95$, $p<0.01$).

Procedure

The DISCOVER Assessment has different forms for grades K-2, 3-5, 6-8, and 9-12. Either the classroom teacher or a trained DISCOVER observer can administer the math portion of the DISCOVER Assessment. For this study, the classroom teachers administered the assessment. First, they gave each student one worksheet and one blank sheet of paper. They read standard instructions and clearly wrote examples for each section on the board so that students could understand the task. The use of explicit instructions has been found to significantly enhance divergent production (Runco and Okuda, 1988).

In the first part of the assessment (Problem Type I), students solved math problems that were clearly defined. Students knew what operations or methods to use, and were asked to compute one correct answer for each problem.

In the second part (Problem Type II), teachers instructed students in how to solve *"magic square"* problems, and then worked a sample problem with them. Students then solved the problems. Grade 3 through 6 students created their own *"magic squares"*, placing numbers and applying math operations.

In the third part (Problem Type III), students made correct addition, subtraction, multiplication, and division problems using only the three numbers given in each problem. Only addition and subtraction problems were given to 1st and 2nd Grade students. The 6th Grade sheets had fractions and decimals as well.

In the fourth part (Problem Type IV), students wrote problems that had a certain number as the answer (the answer for each grade was given). Students were prompted to write as many problems as possible that would equal the given number. Examples using a different final number were provided to make certain students understood the task.

After the administration, a DISCOVER team member scored students' solutions using standard criteria. Scoring was based on several criteria such as correctness, variety, and originality of responses. One point was given for each correct answer in all problem types. Two points were given for the use of two operations, understanding of commutative and associative properties, related facts, inverse operations, and creative use of numbers anywhere within the problems. Four points were given for the use of three operations, and six points were given for using all four types of operations. Five points were given for both clear use of strategy and unique problems. For scoring magic squares, one point was given for correct squares except the final answer. Two points were given for an entire magic square that was correct. Also, three points were given for the student-created correct magic square.

Data Analysis

The researchers analysed convergent, accuracy, and concept scores of 857 students in the math section of the DISCOVER Assessment. The Pearson Product Moment Correlation was calculated through SPSS to determine relationships between divergent and convergent scores, and fluency

and OFE scores. Coefficients of determination were calculated to find overlaps between variables. Then, "r" values were converted into "z" values to test the significance of differences between correlation coefficients.

RESULTS

Divergent and Convergent Thinking

The relationship between divergent and convergent thinking in the mathematical domain was investigated using the Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure that no violation of the assumptions of normality, linearity and homoscedasticity occurred. As shown in Table 3, a moderate, positive correlation was found between convergent and divergent thinking ($r=0.49$; $n=788$; $p<0.01$). Further, the analysis showed a strong, positive correlation between OFE (originality, flexibility, and elaboration) scores and convergent scores ($r=0.51$; $n=810$; $p<0.01$). Also, fluency scores were correlated with convergent scores moderately in a positive direction ($r=0.44$; $n=796$; $p<0.01$). Additionally, no statistically significant difference in the strength of the correlations was found between convergent scores, fluency scores, and OFE scores ($z=1.60$; $p>0.05$). However, OFE explained more of the variance in convergent performance than did fluency. The coefficient of determination indicated that OFE and convergent performance had a 26.98 per cent shared variance while fluency and convergent performance had a 20.16 per cent shared variance. Also, divergent performance and convergent performance had a 24.70 per cent shared variance.

Table 3. Intercorrelations between convergent, divergent, fluency, and OFE in mathematical tasks

n=788	Divergent	Convergent	OFE*	Fluency
Divergent	--	.49**	.86**	.97**
Convergent		--	.51**	.44**
OFE			--	.72**
Fluency				--

* OFE consists of originality, flexibility and elaboration scores.
** Correlation is significant at the 0.01 level (2-tailed).
Divergent performance is the sum of OFE and fluency scores for Problem Types III and IV *Problem Types*

Correlations between all problem types were statistically significant, positive, and moderate, as presented in Table 4. All correlations were significant at the 0.01 level. A moderate, positive correlation existed between Problem Types I and II ($r=0.49$; $p<0.01$). Similarly, the correlation between Problem Types III and IV was moderate in a positive direction ($r=0.46$; $p<0.01$). The correlations between Problem Type III and I and II ($r=0.41$; $p<0.01$; $r=0.39$; $p<0.01$) were stronger than those between Type IV and I and II. ($r=0.39$; $p=0.01$; $r=0.36$; $p<0.01$). The coefficients of determination indicated 24.80 per cent shared variance or overlap between Problem Types I and II, and 21.34 per cent between Types III and IV.

Table 4. Correlations between problem types

Problem Types	I	II	III	IV
I	--	.49*	.41*	.39*
II		--	.39*	.36*
III			--	.46*
IV				--

* Correlation is significant at the 0.01 level (2-tailed).

In addition to correlations and comparisons between all problem types, the relationships between Types III and IV fluency and OFE performances were investigated using correlational procedures. Correlations varied from moderate to strong between fluency and OFE performances in these problem types, shown in Table 5. The correlation between Problem Type III Fluency scores and

OFE scores was strong (r=0.85; p < 0.01). Similarly, the correlation between Type IV fluency and OFE scores was strong (r=0.65; p<0.01). Type III fluency scores were correlated with Type IV fluency and OFE scores moderately in a positive direction (r=0.40; <0.01 and r=0.47; p<0.01). Also, Type III OFE scores were correlated with Type IV fluency and OFE scores moderately in a positive direction (r=0.39; p<0.01; r=0.48; p<0.01).

Table 5. Intercorrelations between performance in problem types in mathematical tasks

Problem Types	I	II	III Fluency	III OFE*	IV Fluency	IV OFE
I	--	.49**	.37**	.41**	.36**	.39**
II		--	.37**	.38**	.32**	.37**
III Fluency			--	.85**	.40**	.47**
III OFE				--	.39**	.48**
IV Fluency					--	.65**
IV OFE						--

*OFE consists of Originality, Flexibility and Elaboration scores.

** Correlation is significant at the 0.01 level (2-tailed).Discussion and Conclusion

In this study, we investigated relationships between divergent and convergent thinking, and also between fluency, originality, flexibility and elaboration and convergent thinking in the mathematical domain. Relationships between Problem Types in mathematical tasks also were studied. A moderate relationship exists between divergent and convergent thinking. Likewise, a moderate relationship exists between convergent thinking and the components of divergent thinking: fluency, originality, flexibility and elaboration (OFE), in tasks that require basic mathematical knowledge and creative thinking in this domain. Overlap between these thinking types ranged from approximately 20 to 27 percent. Interestingly, OFE explains more of the variance (26.98%) in convergent thinking performance than does fluency (20.16%). However, this difference was not found to be statistically significant. More research is needed to explain this complex relationship, not only in the mathematical domain but also in other areas.

Although divergent and convergent thinking in children is correlated, we still do not know the causal relationship. A completely different variable not included in our study might cause or explain the overlap between divergent and convergent thinking. At the beginning of the paper, two approaches, ‘a threshold model’ and ‘a style approach’ were presented as possible ways to explain the complex relationship between divergent and convergent thinking. If we take into account the ‘threshold model’, the overlap between the two variables might be explained by general intellectual ability. On the other hand, the existence of a significant but not very strong correlation between the two variables indicates a distinction between them.

The findings can be interpreted to mean that divergent thinking and its mechanisms, fluency and OFE, have impact both on children’s mastery of content areas and on academic achievement in the mathematical domain. Nevertheless, we do not recommend that this interpretation be applied in other domains of ability and knowledge. Recent studies (Baer, 1998; Bamberger, 1990; Han and Marvin, 2002; Lubart, 2003; Plucker, 1998) have demonstrated that creativity is domain specific rather than general across diverse domains, and researchers have further suggested that creativity in one domain does not predict creativity in another domain. In light of these results, creativity and particularly its components in school-age children should be assessed in specific domains. Such assessment provides estimates of the potential for current and future academic achievement of students, as well as their likely creative contributions to fields that require mathematical skills.

Another significant finding of this study was the relationships that exist between Problem Types. The researchers looked at associations between four of the Problem Types and explored the moderate and positive correlation. Moreover, support for the construct validity of these Problem Types was found – although all types are correlated with each other, the strength of correlations

between types, as shown in Table 6, is based on the proximity of Problem Types to each other. For instance, Type I has a stronger correlation with Type II (r= 0.49) than it does with Types III and IV (r= 0.41; 0.39). In the same way, the relationship between Types II and III (r= 0.39) is stronger than that between Types II and IV (r= 0.36). The more distant two problem types are from each other, the lower the correlation between them, a fact that provides validation for the problem continuum. Based on this finding, one can say that various problem types challenge the mind in differing ways. Therefore, integration of all problem types into the curriculum and assessment systems can improve the education of school-age children.

Table 6. Mean scores of participants on divergent, convergent, OFE, fluency, and each problem type

	N	Mean	SD
Divergent	797	21.32	18.88
Convergent	843	8.91	3.96
Fluency	806	13.50	13.78
OFE	822	7.51	6.28
PT I	853	5.40	2.08
PT II	847	3.47	2.51
PT III fluency	839	3.47	3.32
PT III originality	852	2.91	3.25
PT IV fluency	821	9.84	12.03
PT IV originality	825	4.53	4.00

SD- Standard Deviation; PT- Problem Type

The relationship of Problem Type V to the others in the Problem Continuum remains unanswered even though we know that it is less structured than Type IV. Moreover, other researchers (Bransford and Stein, 1984; Getzels and Csikszentmihalyi 1976; Runco and Okuda 1988) discussed "discovered problem situations" and distinguished between "problem identification" and "problem definition" by saying that the former is closer to "problem discovery." An interesting new study would be to examine the double facets (identification and definition of problems) of Type V problems in the mathematical domain, as well as in other domains of human intellect. Therefore, a possible future study of the Problem Types might include the investigation of relational proximity of Problem Type V to the other types by "problem identification" and "problem definition."

Ideally, the present research will serve as an illuminating study for the systematic and theory-based development of problems in designing curriculum, instruction and assessment in mathematics. Accordingly, this can make valuable contributions to the education of the mathematically creative, as well as all types of students. Future research can focus on impacts of different ethnic, cultural, and environmental contexts on divergent thinking and its components (for example, fluency, originality, flexibility, and elaboration) in the mathematical domain. Likewise, any developmental trends in creative thinking in the mathematical domain (specifically fluency and originality of behaviours) of children by both age and grade level, and even culture, should be examined.

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Evaluation of an elementary classroom self-regulated learning program for gifted mathematics underachievers

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The evaluation of an elementary classroom self-regulated learning program aimed at the central causes of academic underachievement is recounted. The participants of the study were 36 Fourth Grade gifted underachievers in mathematics, who were identified in a sample of 1200 students. The training program developed by Zimmerman, Bonner and Kovach (1996) was conducted within the framework of regular classroom instruction of the subject of mathematics over a period of six weeks. A number of positive training effects could be statistically confirmed. In general, the training was deemed to be suitable for interventions to reduce underachievement.

Mathematics, elementary, self-regulated learning, underachievement, gifted

INTRODUCTION

A substantial proportion of highly gifted students do not attain the levels of scholastic achievement they are capable of reaching. Terman and Oden (1947), in a follow-up to their well-known longitudinal study with gifted individuals, were able to confirm large inter-individual differences in academic and occupational achievement. This early finding has meanwhile been validated in further investigative studies (Kathena, 1992; Tannenbaum, 1984). At the same time, it is generally accepted that underachievement is one of the greatest challenges facing the practice of giftedness promotion (Peters, Grager-Loidl, and Supplee, 2000). Richert (1991) estimates that "at least 50 per cent of students identified through IQ have been designated as underachievers" (p.140). With full justification, Rimm (2003) titled one of her recent publications "Underachievement: A national epidemic", whereby the only thing one can criticise about this title is that this unfortunate situation is not just limited to North America, but is rather a world wide dilemma.

Most definitions of underachievement are based on a discrepancy between IQ and achievement measurements (Peters et al., 2000; Ziegler and Stoeger, 2003). Durr (1964), for example, defined underachievement, from the perspective of learning psychology, as a significant discrepancy between IQ and performance in the form of scholastic achievement or the results of scholastic achievement tests. However, Ralph, Goldberg and Passow (1966) had previously brought attention to the immense difficulties involved in accurately measuring the achievement potential of an individual. A consequence of this measuring problem was the tendency to draw upon operational definitions, the core of which is basically composed of well-founded appraisals of achievement potential, performance and obligatory discrepancy. For example Shaw (1964) suggested labelling a child an underachiever when his/her intellectual abilities (IQ) are measured to be among the top 25 per cent of his or her class, and his or her scholastic achievements are

below the class average. Hanses and Rost (1998) defined highly gifted underachievers as school children with an intelligence percentile of at least 96, and an achievement percentile not higher than 50. In our own studies (for example, Ziegler and Stoeger, 2003), we chose as criteria an IQ of 130 and above, and a scholastic achievement level of at least one standard deviation below this score (for a discussion of these criteria see Ziegler, Dresel and Schober, 2000). These *cut-off* points are, however, completely random. Lamentably, the lack of a consensus regarding a precise operational diagnosis of underachievement makes it impossible to introduce a standard applicable diagnostic process.

Opportunities for intervention in the school

A prevention of underachievement among gifted persons calls, first and foremost, for information about the origin of the underachievement. The causes one can attribute this phenomenon to are quite varied (Peters et al., 2000; Rimm, 2003; Ziegler and Stoeger, 2003). It can be the result of specific learning disabilities such as dysgraphia, dyscalculia, or ADHD (Grimm, 1998; Leroux and Levitt-Perlman, 2000; Rimm, 2001), which are next to impossible to sufficiently resolve in the course of normal instruction and usually necessitate the execution of specific interventions. Also, grounds which can be traced to the family environment (Baker, Bridger and Evans, 1998; Rimm and Lowe, 1988), factors of psychological development as well as factors related to chance (Feger, 1987), are difficult to influence with the typical means available in a classroom. On the other hand, a very promising starting point for intervention in the scholastic setting has already been identified by Terman and Oden (1947). Supported by data collected with retrospective questionnaires filled out by participants in their longitudinal study on giftedness, they postulated that the primary reasons for scholastic underachievement could be attributed to motivational factors. The opinion that motivation plays a central role here is also shared by other researchers (for example, Butler-Por, 1993, Rimm, 1986; Ziegler and Stoeger, in press), though a number of other risk factors are also clearly significant. Counted among these are, without a doubt, deficient learning and work habits (Keller, 1993; Reis and McCoach, 2000), low control conviction levels (Tacke, 1995), and a poor ability self-concept (Rost and Hanses, 1994). A glance at the large number of possible causes here makes clear that the development of a homogeneous interventionist approach which aims to modify several central causes in the scholastic environment at the same time appear to be extremely difficult. Admittedly, the additive application of several interventionist programs, each focusing on a specific cause, would require excessive expenditures. For this reason we can justify trying out a form of intervention which is appropriate for the improvement of the central causes of underachievement which can be influenced in the classroom in the first place, and is obligated to providing underachieving students with strategies which deliberately act to eliminate the causes of their underachievement in the second place.

Extremely promising in our eyes is an improvement in the skills in self-regulated learning, whereby self-regulated learning is understood as "[...] an active, constructive process whereby learners set goals for their learning and then do monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and contextual features in the environment" (Pintrich, 2000, p.453). Similar definitions have been offered by scholars such as Butler and Winne (1995) and Zimmerman (2000). Educational psychologists subscribing to the theory of self-regulated learning believe that an improvement in this central ability also induces a series of other positive effects. For example, an improvement in learning strategies and control convictions may occur, since the results of learning are made more feasible through students' own efforts. In addition, this could have positive effects on motivation and self-concept.

Zimmerman et al. (1996) suggest a cyclical model of self-regulated learning, which consists of four phases. In the first phase a self-evaluation is conducted in which the students make an

assessment of their present performance behaviours against the background of their earlier achievements. In the second phase they analyse the learning tasks at hand, set specific learning goals and decide which strategies they want to engage in order to make the learning goals attainable. In the third phase they apply these strategies and monitor their learning progress. In some cases adjustments may need to be made in the strategy. In the last phase a connection must be drawn between the resulting learning success and the applied strategy in order to make an assessment of the effectiveness of the strategy. In conclusion the students return to the first phase of the cycle and re-evaluate their performance levels. In accord with this theoretical model, the authors have – on the basis of Zimmerman et al. (1996) – developed a training program (for a detailed description, see below). This appears to be capable of improving not just one of the causes of underachievement mentioned above – inadequate learning and work behaviour (Keller, 1993; Reis and McCoach, 2000). The training also aims to enable realistic appraisals of one's own strengths and weaknesses, an improvement in self-concept as well as improvements in motivation and control. Furthermore, it permits an individualised training approach, whereby the students act as managers of their own learning, in that they actively attempt to improve their own weaknesses.

EMPIRICAL STUDY

The aim of our study was to evaluate the self-regulated learning training program for gifted students who are underachieving in math (Zimmerman et al., 1996). There are indicators that support the expectation that this highly convincing training program will prove to be effective (Zimmerman, 2000; Zimmerman et al., 1996), but they are mainly based on the experiences of teachers and systematic empirical studies are not available.

The training program was conducted in scholastic instruction in the subject of mathematics with fourth grade students. This subject was selected for two reasons. Following the fourth grade a decision is made as to the type of school in which a student will continue his education.[1] On the basis of their talent, gifted students should be sent to a Gymnasium in which the approximately 25 per cent strongest students, with respect to prior performance, are educated. The decision for acceptance to the Gymnasium is mainly made on the basis of grades attained in the subjects of mathematics and German, so underachievement in one of these two subjects has significant consequences. A further rationale for the decision to choose mathematics was that the indicators assessed in the evaluation are highly domain specific (for example, motivation, self-efficacy) and, in contrast to the subject of German, suitable and reliable measuring instruments had been already developed.

Design and participants

The 36 underachievers who took part in the investigation were identified with a discrepancy between their score on an IQ test and their performance in the subject of mathematics. They are a sub-population of a random sample that consisted of about 1200 students. The investigation only considered gifted underachievers whose score on the Raven's Standard Progressive Matrices (SPM) (Heller, Kratzmeier, and Lengfelder, 1998), came to 130 or above. The gifted students were then classified as underachievers if their z-standardised report card grade in the subject of mathematics was at least one standard deviation below their z-standardised IQ score on the SPM. Out of the total of 36 underachievers identified with this criterion, 15 (8 girls, mean age (M) =10.50 years, SD=0.53; 7 boys, M=10.42 years, SD=0.53) were in the classes that received the training. Twenty-one subjects (9 girls, M=10.13 years, SD=0.35; 12 boys, M=10.67 years,

[1] In the German public school system, after attending primary school, students are assigned to attend one of three school formats, according to scholastic achievement. The Hauptschule (lower achievement level), the Realschule (middle achievement level) or the Gymnasium (higher achievement level).

SD=0.65) were in the classes, which did not receive the training. Random selections were made as to which of the classes were to receive the training. Participation in the study was voluntary and required parental permission.

The training was conducted at the beginning of the second half of the fourth grade. This phase is extremely significant from the perspective of the students, since they are preparing for a test, which will play a critical role in the decision of whether or not they can attend the Gymnasium. The evaluation used a pre-test, post-test design, whereby the first assessment took place about one week before the training and the second assessment ca. one week after the training.

Description of the training program

The training was administered by 12 teachers, within the framework of normal classroom instruction. This of course means that other students attending these classes also received this training; however, the focus of our analyses will remain on the gifted underachievers. The 12 teachers were randomly chosen from a pool of 25 teachers who had volunteered to participate in the study. The classes of the remaining teachers served as the control group. The teachers attended a three-day seminar that was conducted by the authors of this report. On the first day the theoretical groundwork of self-regulated learning was presented. The second day was dedicated to the topics of time management and behaviour patterns relevant to home study, and exercises related to self-regulated learning were also conducted. In addition, all learning materials relating to the training were distributed and discussed. On the third day the teachers worked together to conceptualise 30 sets of exercises, six mathematics quizzes (see below) and a comprehensive final exam, which was to be completed by all students in all classes. The intention of this exam was to provide an indicator of the success of the training.

The content of the training addressed the abilities associated with time management and the preparation of classroom materials at home (for more details and the materials see Zimmerman et al., 1996). The training itself was conducted over a six-week period: In the first week the students were to recount their own learning behaviors on standardised forms. For example, entries were made as to when and for how long the student studies, what kinds of breaks are made, what types of distractions are present, if the student studies alone or with partners and where this study takes place. Additionally, these forms had room for the students to both predict how well they expected to do on the homework exercises and the “Math Quiz” and then to later record the actual results.

From the first day of the training the students received exercises to be completed at home on which they could score up to 10 points, which were based on the topics currently being covered in the classroom. A grade in the traditional sense was not made. These daily homework exercises were composed by the teachers taking part in the study, whereby consideration was taken to insure that these exercises were standardised to the same level of difficulty, in order to maintain that effective learning/or less effective learning could be directly reflected by the performance on these exercises. The students were able to inspect the exercises at the end of the periods in which the material was covered, and were to estimate how many points they thought they would be able to attain. Additionally, at the end of each week a math quiz, which covered the subject matter discussed that week, was given during the classroom period. Once again the students had the opportunity to attain 10 points per quiz and the difficulty level remained appropriate for the achievement one would expect of a student who did not undergo this training.

After the first training week the students were in possession of an outline of their homework behaviour skills for the prior week, their daily achievement levels on the exercise sets and their score on the weekly math quiz. At the start of the second training week the teachers addressed the entries made in the first week during the class period. They drew a relationship between the quality of the homework behaviour skills and the performances on the exercise sets and quizzes

and gave hints on how the homework skills could be improved. The students were then to set achievement goals (for example 6 out of 10 points on the next exercise sets or 5 out of 10 points on the next math quiz), which were then recorded in the materials prepared for them. They were also to record which strategic methods they intended to engage in order to attain these achievement goals. In addition to the clues given by the teachers, leaflets on effective homework skills, which had been distributed among the students contained tips on how to organise a workplace, regulate study time and breaks, and deal with distractions.

In the records for the second week, for which the students once again received standardised forms, the students were to describe, among other things (1) the goals they had set for themselves and the (2) strategies they chose to engage in order to attain these goals. As they had already done in the first week, the students were to continue to record (3) their daily scores on the exercise sets (both the predictions they made in school after viewing the exercise sets for the first time and the actual scores attained after working through the exercises at home) as well as those for the (4) math quiz. Since (5) analogue to the documentation made for the first week, the learning behaviours with respect to home study were also recorded, (6) notice was also taken as to how well the implementation of the chosen learning strategy supported the attainment of the goals set. Thereby the students were able to establish a relationship between the effectiveness of their strategies and their learning performances.

At the start of every subsequent training week, discussions were held with the students on examples of effective as well as ineffective learning strategies. Each student continued making specific goals for the coming week and making concrete decisions for, in his/her opinion, suitable learning strategies needed to meet these goals. The completion of the homework exercises, the math quiz and the filling out of the materials was formulated analogue to the procedure followed for the second training week.

MEASUREMENT INSTRUMENTS

Since interests, attitudes and self-related cognitions about a particular topic assume a high degree of domain specification, measuring instruments specifically designed for the domain of mathematics were put to use. The study participants evaluated statements on various subjects along a six-point Likert scale. The assessments were conducted as paper and pencil tests during regular mathematics instruction, under the supervision of the class teacher and required approximately 40 minutes to complete, including instructions. The test to assess mathematics achievement was conducted separately and also took about 40 minutes to complete. The ability levels of the students were assessed with the assistance of the Raven Test (Standard Progressive Matrices, SPM; Heller, Kratzmeier, and Lengfelder, 1998).

Time management and self-reflection of own learning

In order to assess the constructs time management and a self-reflective approach to one’s own learning process, use was made of two subscales derived from the questionnaire “How do you learn?” developed by Gold and Souvignier (2000). This measuring instrument unifies items found in the questionnaire LIST (Lernstrategien im Studium [Learning strategies for university studies]) developed by Wild and Schiefele (1994) with questions out of the KSI from Baumert (1993) and WLI from Metzger, Weinstein and Palmer (1994). Both scales were adapted for the present investigation so that they could be answered along a six-point Likert scale, whereby the endpoints were marked with the statements (1) very seldom and (6) very often.

The scale used to measure skills in time management consisted of eight items. Sample items are: *Prior to every learning unit I establish a specific period of time for it. I always determine how far I want to proceed in the learning material before I start to study. I follow a specific time plan*.

Cronbach´s α for the two measuring points came to 0.68 and 0.71. The scale used to assess self-reflection of one's own learning consisted of four items. Sample items: *When I am studying math and don't understand everything, I try to determine where my difficulties are coming from. When I am studying math and a specific point seems to be confusing and unclear, I change my methods in order to get a better grip on the larger difficulties*. Cronbach´s α for the two measuring points came to 0.73 and 0.75.

Self-efficacy. In order to assess the expectations the students had of how successfully they will come to terms with future challenges in the subject of mathematics, five new items were constructed, since scales previously applied (Ziegler and Stoeger, 2002) proved, in a pilot study, to be inappropriate for children attending the fourth grade. Three of these deal with the expectation to be able to maintain good evaluations of their performances (sample item: *In the future, I will certainly not perform as well as most of the others in math*), the remaining two items intended to subjectively determine to what degree the students believed that they could attain learning gains (sample item: *In the future, I will certainly learn a lot of new things in math*). The items were assessed along a six-point Likert scale with the poles (1) 'absolutely disagree' and (6) 'agree completely'. The analyses of the internal consistencies of the scale (first measuring point: α=0.76, second measuring point: α=0.83) yielded satisfactory results.

Willingness to exert effort: The willingness of the students to exert effort was measured with a comprehensive, self-developed eight-item scale, which had already been verified in other studies. The scale offers insight into the amount of effort students apply to their learning (sample items: *I spend a lot of time at home doing math exercises* and *I only do my math exercises when I feel like it*). Cronbach´s α for the two measuring points came to 0.80 and 0.83.

Helplessness: The degree of helplessness was assessed with four items taken from the Helplessness Scale (HiS) advanced by Breitkopf (1985). The items were to be assessed along a six-point Likert scale with the poles (1) 'disagree completely' and (6) 'agree completely'. This scale appraises anxiety *(I cannot think clearly in school)* as well as the self-perceived non-contingency of ones own actions and the consequences of these actions *(for example, Even when I study a lot, I still won't be good in school).* Cronbach´s α of the scale came to a satisfactory 0.93 (first measuring point) and 0.96 (second measuring point).

Aspiration level for the subject of Mathematics: Aspiration levels for the subject of mathematics was measured with the question, with which grade on the next examination in mathematics would you be satisfied.

Scholastic achievement: The test designed to measure scholastic achievement was developed by all teachers who either led a class participating in the training or one of the classes, which was a member of the control group. The content of the test was based on the material covered in the classes during the six-week training period, and validity and comparability among the various classes was closely monitored. For example, no question formats were included which had not yet been introduced in all classes participating in the study. The internal consistency of the 14 items comprising the examination gave α=0.76.

Ability Level: The ability levels of the students were measured with the assistance of the Raven Test (Standard Progressive Matrices, SPM; Heller et al., 1998). The test was chosen for three reasons: First, the Raven has very good psychometric properties. Second, because it is a group test it is very economical. Third and most important, the Raven test shows high correlations to other intelligence tests (cf. Heller et al., 1998), which is why the results can be considered as representative. Students are referred to as underachievers when their z-standardised intelligence quotient was calculated to be at least one standard deviation higher than the z-standardised grade in mathematics in their most recent report card.

RESULTS

In order to examine the effectiveness of the training, an analysis of variance (ANOVA) with repeated measurements was calculated with group membership (training vs. control group) as the independent variable. Due to the small sample sizes, non-parametric statistics were also calculated. Since these led to the same results, further detailed descriptions are not provided. Although gender was able to generate main effect significance, this was not repeated within an interaction, and therefore it is not subjected to further considerations.

The actual aim of the training was to promote the skills involved with time management and the overriding goal was to bring about an improvement in self-efficacy and self-reflective learning behaviors. Marginally significant training effects could be reported for all three of these areas (time management: $F_{(1,30)}=2.82$, $p=0.05$; self-efficacy: $F_{(1,30)}=1.97$, $p=0.08$; self-reflective learning behavior: $F_{(1,30)}=1.82$, $p=0.09$). Time management abilities and self-reflective learning behaviors increased slightly between the two measuring points in the training group, while a decrease was observed in the control group. The training also led to an increase in self-efficacy for the training group. No change in self-efficacy could be confirmed for the control group between the two measuring points. The mean values and standard deviations calculated for both measuring points as well as the effect sizes are specified in Table 1. With regard to willingness to exert effort – contrary to our expectations – no training effect could be identified ($F_{(1,30)}=0.66$, $p=0.21$). The training proved to have an astonishing effect on the perceived level of helplessness among the underachievers examined ($F_{(1,29)}=4.06$, $p=0.03$). While the perceptions of helplessness among the students in the control group stayed just about the same from measuring point one to measuring point two, those for the training group sank sharply (see Table 1). No significant training effects could be isolated for aspirations regarding the next mathematics exam or on the grades attained on the mathematics examination taken following the training (aspiration: $F_{(1,27)}=1.68$, $p=0.10$; mathematics examination score: $F_{(1,30)}=0.81$, $p=0.19$). The correlation between aspiration and mathematics exam results for the training group were with $r=0.66$ significantly positive ($p<0.05$), while in the control group with $r=0.36$ statistical significance was not attained ($p>0.10$).

Table 1. Means, standard deviations and Δ's by cluster membership and treatment

		t_1	t_2	Δ
Time management	Treatment	2.38 (0.85)	2.58 (1.04)	0.20
	Control	2.54 (1.17)	2.14 (1.17)	–0.40
Persistence	Treatment	4.02 (0.68)	4.06 (0.78)	0.06
	Control	3.93 (0.74)	3.78 (0.93)	–0.22
Self-reflection of own learning	Treatment	3.52 (0.95)	3.67 (1.02)	0.15
	Control	3.88 (1.14)	3.50 (1.21)	–0.37
Helplessness	Treatment	2.13 (1.05)	1.69 (0.82)	–0.44
	Control	1.82 (0.87)	1.75 (0.76)	–0.07
Self-efficacy	Treatment	4.45 (0.72)	4.67 (0.65)	0.31
	Control	4.95 (0.66)	4.91 (0.55)	–0.06
Aspirations*	Treatment	3.00 (0.67)	2.92 (0.67)	–0.13
	Control	2.79 (0.66)	2.90 (0.63)	0.17
			Factor: F(1,27)=0.02, p=0.45	
			Interaction: F(1,27)=1.68, p=0.10	
Achievement*	Treatment	2.90 (0.76)	2.87 (1.13)	–0.04
	Control	2.28 (0.66)	2.53 (0.77)	0.32

All scales are based on Min=1 and Max=6.
* Achievement and Aspirations scaled inversely.

DISCUSSION

The causes of underachievement are diverse and therefore they cannot all be addressed successfully and to the same degree in a classroom setting. The training we chose to apply, developed by Zimmerman et al. (1996) did, however, exercise the appropriate objective of having

a positive influence on causes seen as being central to the issue and easily alterable within the scholastic environment.

Unfortunately, the assessment of training results was made difficult by the rather small number of underachievers in mathematics who could be identified in a sample of about 1200 students. This means that the risk of a β error is very high, that is, that actual differences may not be recognised as being statistically significant. In fact, we suspect that this was indeed the case in the present study. Even though every single indicator of the training showed improvements within the training group in comparison to the control group, only four of seven differences were statistically significant. A look at the figures for Δ_{Change} reveals, however, that several of the non-significant differences did reach considerably large proportions.

The direct content of the training dealt with time management and strategic learning. Significant improvements could be identified after the training in both of these areas. A preliminary conclusion is, therefore, that the training was able to reach the immediate goals envisioned for the underachievers. In this regard, one of the most important causes of scholastic underachievement (Keller, 1993) was successfully intervened.

Two further, rather indirect goals of the training could also be realised. According to Zimmerman et al. (1996), self-efficacy should also be raised through the training program. Aspects of the training, which sustained this goal, were the numerous measurements of achievement which (1) were coupled with opportunity to exercise realistic self-assessments and to which (2) a feedback was tendered. In this way, it was possible for the students to draw a connection between their own learning processes and the resulting performance. This should then be effective in reducing causes of underachievement such as unrealistic self-assessments, low control convictions and helplessness (Heller and Ziegler, 1996; Rost and Hanses, 1994; Tacke, 1995; Ziegler and Stoeger, in press). In fact, positive training results could be registered for the two scales used to measure values in this area, that is for self-efficacy and helplessness. Therefore the training program can be judged as being positive in this field as well.

The motivation of the students, a risk factor which several researchers consider to be central for academic underachievement (for example, Butler-Por, 1993; Ziegler and Stoeger, 2003), is also a goal of this training. The two scales we applied here referred to the establishment of challenging objectives and the persistence to pursue these objectives arduously. There were points in the training where the students were expected to develop challenging objectives, such as establishing how many exercises they wanted to correctly solve in the tests and the improvement of their learning behaviours. Since the students not only learned to set challenging objectives, but also learned that they can actually be attained, one can presume that they will now be more persistent in the pursuit of these goals. A plausible promotion of persistence is also indicated by other aspects of the training. For example, an individual reference norm was applied over the entire course of the training, which usually produces positive effects (for example, Mischo and Rheinberg, 1995; Rheinberg, Luehrmann, and Wagner, 1977). Furthermore, the entire training program is built on the basic conviction that ability is neither a fixed entity nor is it the source of learning achievement, but rather the result of learning achievement. This type of attitude should provide a positive foundation for continued persistence particularly after experiences of failure (for example, Dweck, 1999). Although the results of the study demonstrate no statistical increase in persistence among the underachievers, the training appears to provide an effective defence against a decrease. While the persistence among the underachievers in the control group decreased ($\Delta_{Change}= -0.22$), this variable remained just about constant among the underachieving students in the training group ($\Delta_{Change}= 0.06$). One reason for the lack of increase in persistence among the underachieving students could very well be due to the fact that the students received notification, shortly before our second measuring point, as to whether they had been admitted to the

Gymnasium or not. Based on poor scholastic performance, *none* of the underachievers in our investigation had received a positive notification. After taking this unique situation into consideration, one gains a bit more insight as to the lack of increase in persistence among the underachievers. Statistically verifiable training effects could not be confirmed regarding the selection of challenging goals and the associated aspiration level either. Positive tendencies were, however, identifiable here ($\Delta_{\text{Change control group}} = -0.16$, $\Delta_{\text{Change treatment group}} = 0.17$). In contrast, a clear-cut success of the training is that the aspirations among the students in the training group became much more realistic, a fact which is verified by the close correlations found between their aspirations and their actual scholastic performances.

The ultimate goal of the training should, however, be an improvement in scholastic performance since its relative relationship to IQ is the principle on which underachievement is defined. Unfortunately here one can only refer to the $\Delta_{\text{Change}} = 0.32$ for which, although it represents a mid-sized effect, a confirmation within a MANOVA could not be attained.

All in all, and despite the fact that some of the training effects could not be statistically confirmed, we arrive at an optimistic resumé of the evaluation. In the first place, the chances that a β error actually occurred are extremely high. Although the sample encompassed about 1200 students, only 36 underachievers could be identified in the subject of mathematics. In the second place and without exception, all changes recorded are in the direction expected. However, there is yet another argument which speaks for a positive evaluation of the training. The duration of the intervention encompassed merely a few weeks, whereby the improvement in self-regulated learning occurred only by means of time management skills training. Zimmerman et al. (1996) have, however, developed additional training modules, which are mediated with the same training procedure. The contents are composed of further skills (for example, test taking skills), and the acquisition of these skills should lead to a better internalisation of the general array of self-regulated learning skills. It is also plausible here to assume that improvements, more substantial than the effects attained in our study, are possible. This well-founded expectation should be placed under closer examination in further studies with larger samples. In view of the still outstanding studies only being preliminary – our resumé of the evaluation study is as follows: the improvement of self-regulated learning is very likely a promising foundation for interventions which would enable gifted underachievers to convert the potential they have within into more effective performances. There is nothing that speaks against, and much to support, the belief that special training programs such as that developed by Zimmerman et al. (1996) can be of great assistance here. Indeed a rather strong emphasis on self-regulated learning in regular classroom instruction would be desirable, since this type of learning would be beneficial not only for gifted underachievers, but rather for gifted students in general (for example, Neber and Schommer-Aikins, 2002).

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Assessing creativity: The Test for Creative Thinking - Drawing Production (TCT-DP)

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The Test for Creative Thinking - Drawing Production (TCT-DP), its design, concept and evaluation scheme as well as experiences and results of application are described. The test was designed to mirror a more holistic concept of creativity than the mere quantitatively oriented, traditional divergent thinking tests. The specific design using figural fragments is explained. The drawing production is evaluated by means of a set of criteria, which at the same time represent the underlying test construct. The test has been normed with various age and ability groups; there were no significant differences between male and female subjects. Various studies with data concerning the reliability and validity of the TCT-DP are provided.

Creative thinking, drawing production, holistic, development, gifted

INTRODUCTION

Most traditional creativity tests give mere quantitative information about a very restricted aspect of creativity only. This was especially true for the two creativity tests which were published and available in Germany in the eighties, when first deliberations on the construction of a new instrument started. Both instruments, the *Test zum divergenten Denken* [Test for Divergent Thinking] (TDK4-6; Mainberger, 1977) and the *Verbaler Kreativitätstest* [Verbal Creativity Test] (VKT; Schoppe, 1975), were very much restricted as to their range of applicability. The TDK was standardised only for three Grades (4-6), the VKT may be used only with adolescents and adults from age 15 on with good school education, since the test only uses verbal material on a fairly high level. Both instruments are relatively extensive in application and evaluation (time). The TDK lacks a theoretical basis; it consists of a not-founded or not-commented collection of various creativity tasks from the American tradition (Guilford; Torrance; Wallach and Kogan). The VKT-result is very much dependent on general verbal and intellectual abilities. Furthermore both tests are speed-tests, thus are close to intelligence tests as far as application is concerned. And both instruments refer solely to divergent thinking respectively, more restricted only to the aspect of productivity, that is the quantity of mainly verbally determined ideas.

These limitations in concept and scope of applicability were one reason for Urban and Jellen (1985; 1986; Jellen and Urban, 1986) to develop their new instrument, the *Test zum schöpferischen Denken - Zeichnerisch* (TSD-Z) (Urban and Jellen, 1995)[1], or, in English, *Test for Creative Thinking - Drawing Production* (TCT-DP) (Urban and Jellen, 1996)[2]. This assessment device may be seen as an attempt to apply a more holistic and gestalt-oriented approach to diagnostics of creativity. The German term '*schöpferisch'* was chosen consciously in order to

[1] The TSD-Z is available via http://www.testzentrale.de or directly from SWETS Test Services, Frankfurt.

[2] The TCT-DP is available from: http://www.tvtc.com under Children's tests : Thames Valley Test Company, Unit 22, Thurston Granary, Station Hill, Thurston, Suffolk, IP31 2QU, England, Tel. +44 (0)1359-232941, Fax -230581 or info@tvtc.com

stress the shaping, the production, and the final 'gestalt' as the creative end product. We wanted to consider not only divergent, or, still more limited, quantitative aspects, but aspects of quality, like content, gestalt, composition, and elaboration, too, and other components stressed in the literature, like (mental) risk taking and breaking of boundaries, unconventionality, affection, and humour.

DESIGN AND CONSTRUCTION

In designing and constructing the new assessment instrument, some premises should become realised:

- The test should be applicable to persons of a broad age range.
- It should work as a useful screening instrument in order to help to identify high creative potentials as well as low creative, neglected, and poorly developed ones.
- The instrument should be simple and economic in application, in conducting, scoring, and interpretation, economic in time and material.
- The test should be culture-fair.

Because of a broad applicability, even to young children, and of an optimal culture-fairness we decided to operationalise our concept by means of a *drawing* production. According to the definition and consistent with the practical applicability of the test, the objectivity of the administration procedure, and for reasons of the availability of materials, of a common perceptional or informational basis, of comparability of the material presuppositions and conditions for different test takers, certain basic stimuli had to be designed and incorporated into the test. One first stimulation for the design came from the additional subtest of the *Heidelberger Intelligenztest* (HIT) (Kratzmeier, 1977). The stimuli mentioned, in the form of figural elements or fragments, were intentionally designed in an incomplete and irregular fashion in order to achieve maximum flexibility as an imperative for creativity. Instead of concepts, symbols, or holistic figures, we decided to use figural fragments that possessed only vague conventional meanings. The completed drawing based more or less (creatively) on these fragments is evaluated by means of a set of categories that represent our theoretical construct of the assessment device.

This important conceptual proposition, the simple, basic, unique design gives rise to a multitude of differing creative responses as seen already in our first investigation of gifted and talented student populations as well as in the many thousands of drawings from persons of various age and ability levels from various countries. At the same time, the given figural fragments must have enough suggestibility to trigger more stereotypical responses from students with lower degrees of creativity. These different possibilities for interpretation (that is, conventional vs. unconventional) lead to a higher selectivity and validity of the TCT-DP instrument.

The test asks the testee to complete a drawing on the basis of some given figural fragments. These six figural fragments of the instrument were designed with the following points in mind. They are (1) different in design, (2) geometric and non-geometric, (3) round and straight, (4) singular and compositional, (5) broken and unbroken, (6) within and outside a (seemingly) given frame, (7) placed irregularly on the space provided, and (8) incomplete.

An additional and extremely important element of the instrument is the 'big square frame'. Together with the 'small open square' outside the large frame this boundary serves the purpose of providing information on the creative component of risk-taking, which we operationalised as 'Boundary Breaking' in a twofold manner.

The conceptual deliberations led to the following set of 14 key criteria that constitute as a whole the TCT-DP construct, and also serve as evaluation criteria (Jellen and Urban 1986; Urban and Jellen 1985, 1986):

1. *Continuations* (Cn): Any use, continuation or extension of the six given figural fragments.
2. *Completion* (Cm): Any additions, completions, complements, supplements made to the used, continued or extended figural fragments.
3. *New elements* (Ne): Any new figure, symbol or element.
4. *Connections made with a line* (Cl) between one figural fragment or figure or another.
5. *Connections made to produce a theme* (Cth): Any figure contributing to a compositional theme or "gestalt".
6. *Boundary breaking that is fragment dependent* (Bfd): Any use, continuation or extension of the "small open square" located outside the square frame.
7. *Boundary breaking that is fragment independent* (Bfi).
8. *Perspective* (Pe): Any breaking away from two-dimensionality.
9. *Humour and affectivity* (Hu): Any drawing which elicits a humorous response, shows affection, emotion, or strong expressive power.
10. *Unconventionality, a* (Uc, a): Any manipulation of the material.
11. *Unconventionality, b* (Uc, b): Any surrealistic, fictional and/or abstract elements or drawings.
12. *Unconventionality, c* (Uc, c): Any usage of symbols or signs.
13. *Unconventionality, d* (Uc, d): Unconventional use of given fragments.
14. *Speed* (Sp): A breakdown of points, *beyond a certain score-limit,* according to the time spent on the drawing production.

If creativity transcends chaos through imposition of aesthetic order, then creative process as well as creative product must reflect the character of a "Gestalt" composition or the coherence of an organisation. Since "Gestalt" is more than the sum of its parts, the 14 key criteria cannot stand as single entities. Only as interacting factors do they together reflect a holistic concept of creative thought. In statistical terms, a certain score on a single criterion says nothing about creativity; only the total score for all criteria indicates the value of the creative product.

The subjects are asked to complete the uncompleted drawing, somebody else had begun and finished without knowing what would come out of it, in whatever way they wish; everything is allowed and correct, they are free to draw how and whatever they wish. The test sheets are collected after completion, latest after 15 minutes for each drawing. Figure 1 shows two out of 31 drawing examples as published in the manual for illustration.

An extensive description of the evaluation procedure is prepared in the manual; it assists in the assessment of the drawings by means of the above mentioned evaluation criteria and guarantees an objective scoring as far as possible.

Norms for German students from age 4 to 16 respectively, kindergarten and grade one to Grade 10 have been established by means of a large norm sample (N=2500), differentiated as to age, grade, type of school. The findings show that the TCT-DP up to the age of 11 to 12 years, namely Grade 5 to 6, is a developmental test; after that age a kind of plateau begins.

In the meantime norms for pupils from Grade 4 to 10 are available for Poland; first norms are established in Korea in the Korean version; Australian norms are in progress, more than 2000 students from Grade 1 to 10 have already been tested there with both test forms.

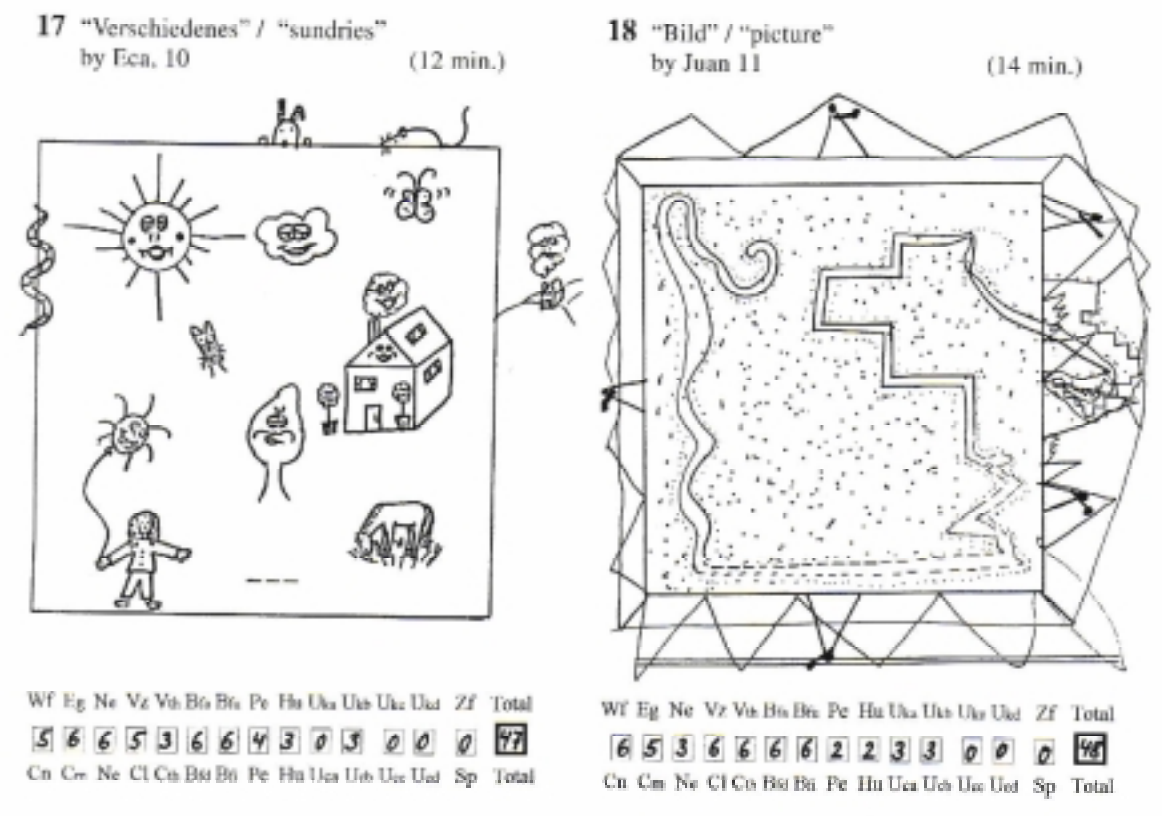

Figure 1. Two drawing productions, both on the basis of test sheet A

EMPIRICAL STUDIES WITH THE TCT-DP

After several smaller pre-studies, the first investigation with the TCT-DP was done with four groups of seventh graders from different academic achievement levels (Urban and Jellen, 1986). As expected the results show a low positive relationship between the average level of academic achievements (that is, form of school) and the test scores. Nevertheless, high creative as well as low creative thinkers were represented in each of the four groups; thus low academic achievers do not necessarily have low creative potential, and high academic achievers do not necessarily display high levels of creativity.

Some high scores were strongly surprising especially for the teachers of the low level students. For the students with the highest TCT-DP scores in each group, additional data including teacher interviews, were collected. These case studies supported very impressively the hypothesis that the TCT-DP really contributes to the reliable identification of high creative potential and unconventional thinking. The most interesting result was that in each of these cases strikingly non-conforming behaviour could be found. In two instances the TCT-DP also contributed to the identification of two subjects, who were not only misjudged by many of their teachers but had also been misplaced by ignoring previously obtained testing results.

Since each of the four cases displayed some sort of socio-emotional maladjustment, additional studies with the TCT-DP might substantiate the notion that high creativity may be accompanied by behavioural eccentricities contradictory to social norms and modes. We believe that this so-called ‘maladjustment’ is mainly caused by the unwillingness and inability of the social environment to react favourably and supportively toward seemingly ‘deviant’ but highly creative people.

By means of these high TCT-scores and the case studies, the teachers saw their students with other eyes and did no longer consider their deviant behaviour as totally negative. This function and effect marks an important field for an educationally oriented application of the TCT-DP.

A comparison of TCT-DP scores with IQ scores within the highest achievement group revealed a correlation of zero. This result, which has to be interpreted cautiously because of a number of special conditions (such as relative homogeneity of IQ scores and special mathematical talent), adds to the validity of the test in the sense that the TCT-DP measures something different from academic achievement and conventionally understood intelligence. This can provide important clues to the identification of creative and unconventional thinkers among gifted student populations as well as among non-gifted or even underachieving students. The TCT-DP might, indeed, contribute to the culture fair identification of potential knowledge producers, since knowledge production is not only an intelligent act, but also an act of risk taking, unconventionality, and imagination (Jellen and Verduin, 1986). Every one of these three important concepts is embedded in the TCT-DP construct.

The investigations for establishing norms for German population were done between 1988 and 1993. The manual gives an extensive description and some results will be reported shortly. The total distribution of gender in the norming sample (N>2000) is relatively balanced; 51.05 per cent were male, 48.95 per cent female subjects. There is no significant difference between the means of male and female subjects in the total population. A minimal trend in favour of boys is relatively consistent throughout the various sub-samples, but statistically negligible. Therefore no separate norms were calculated for boys and girls.

High effects could be observed as far as the variable age is concerned. Cautiously the TCT-DP may be labelled a developmental instrument, though the improvements are not linear, but show a step-like course. Interestingly enough, from the age of 11 years on, no significant changes could be found in the normal school population.

Though single students even from special schools for learning disabled achieve very high scores, in general students from school branches of higher scholastic achievement levels score higher in the TCT-DP. Therefore different norm tables were calculated. A large sample of adults (N>300) was considered as from one population, though the age difference between the students in education and educators/teachers was strong and significant, but their mean scores, which lay slightly higher than that of the Gymnasium students of grade 7, did not differ significantly.

Within the framework of various smaller and larger studies the reliability of the instrument has been examined, too. In various studies the *reliability of scoring,* the inter-rater reliability, mostly was found above r=0.87. The *parallel test reliability* of r=0.62 - 0.70 is less satisfying, but still acceptable for a test of this kind. The TCT-DP shows a very high *differential reliability* for the differentiation between the 25 per cent highest and lowest achievers in both test forms (Chi-square=33.54, $C_{(corr)}$=0.92) as shown with a large Hungarian sample (N=1100).

Bröcher (1989) used the TCT-DP as a pre- and posttest in his study on creativity training with intellectually gifted students. For the control group with no training he found a very high *re-test reliability* with the correlation of r=0.81 after 8 to 12 weeks with a mean difference of only 1.5 points. Even for the training group, whose mean average increased by nearly 7 points, a coefficient of r=0.71 was calculated.

It is difficult to answer the question of validity for our TCT-DP, since there are no other instruments which are directly comparable to it. Therefore information from various sources and other instruments must be considered. In the sense of discriminant validity zero or negative correlations may support the test's validity. Thus, for example, relationships with intelligence (traditional IQ-scores) should be very low or only slightly positive for a strongly inhomogeneous

(as far as intelligence is concerned) sample. Correlations with pure quantitative creativity measures or with verbally oriented divergent thinking tests should lie a bit higher, but only low positive.

In fact, the examination of the relationship between intelligence test scores (IST 70) and TCT-scores of the group of mathematically highly talented students from the first study, mentioned above, resulted in a zero correlation. That sample was relatively IQ homogeneous (M/IQ=140; variation 119-159).

Wolanska and Neçka (1990) in their Polish study calculated the following correlation coefficients with the well-known Raven's matrices, a non-verbal intelligence test, presented in Table 1. These results fit into usual expectations, especially as far as the lacking, non-significant relationship in the gifted (intelligence homogeneous) group is concerned.

In the meantime studies by other authors have been done using the TCT-DP. They yielded interesting results which shed positive lights on questions of validity and reliability.

Table 1. Correlations between intelligence (Raven) and the TCT-DP in one Polish study (Wolanska and Neçka, 1990)

Sample	N	Correlation coefficient
Total sample	600	0.44 ***
7 - 10 years old	190	0.29 ***
11 - 18 years old	410	0.21 ***
intellectually gifted	108	0.14 n.s.

By means of the TCT-DP Scheliga (1988) compared the (test) creativity of one group, consisting of 28 non- or semi-professional musicians (aged 18 to 35) who are composers, with that of another group of 42 persons (aged 20 to 40) working in a scientific-technical institute, who do not make, but love to listen to music. Scheliga found highly significant differences of 14 points (TCT-total) in favour of the musicians' group (32.7 versus 18.8), thus supporting good evidence for the TCT's validity.

Herrmann (1987) studied the effects of different training styles with two student soccer teams in regard to various personality traits (from achievement motivation to creativity). Over several years the one team had been trained by its coach in an authoritarian, autocratic way (ATM); the other team by its coach in a more open and democratic style (DTM). According to the expectation that a more democratic education allows for more creative development and behaviour, the average score in the TCT-Total of this last group (DTM) is with 28.5 points higher and significantly better than that of the ATM with 19.5 points. Here especially the category "New Elements" as well as two others, namely "Humour" and "Connections made by a theme" are responsible for this result.

A study by Jellen and Bugingo (1989) tried to assess the creative potential of engineering students participating in an annual pentathlon competition of a large middle-western university (United States). Thirty-four from out about 100 students were tested with the TCT-DP on a voluntarily basis; the 10 main winners of the pentathlon did the test again after the competition. All of them achieved far above average scores; the first winner got the highest TCT-DP score with 61 points. Including qualitative evaluations of the drawing products, both authors state on the basis of their results that the TCT-DP seems appropriate to identify even among students of engineering sciences those with very high creatively productive potentials.

Bröcher (1989) applied the TCT-DP together with the VKT (Schoppe, 1977), a verbal creativity test, and the "Wiener-Matrizen-Test" (WMT), a non-verbal IQ-Test, to a group of intellectually gifted adolescents (average IQ 130), who got a mostly verbally oriented creativity training during their participation in a summer course for gifted students. While the VKT correlated significantly with the intelligence test, the TCT-DP did not; it showed a low correlation with the VKT.

In a more recent study, factorial validity and relations to consensual assessments supported convergent and discriminant validity of the TCT-DP (Dollinger, Urban and James, 2004). In investigating the psychometric profile of the TCT-DP in the Hong Kong Chinese context, the results of a factor analysis within the frame of a large study with 2368 students by Rudowicz and Chau (2000, p.4) "offer support to structural (construct) validity of the TCT-DP".

In using the TCT-DP, Urban (1991) found interesting developmental curves for children from 4 to 8 years of age with a typical 'breakdown' for the 6 year old children in school. He formulated the following 6 stages of creative growth that are close to general cognitive development, presented in Table 2.

Several other studies using the TCT-DP in various countries can only be briefly mentioned. Ben-Michael (1991) from The Netherlands used the TCT-DP among other instruments for identifying gifted (under)achievers among Turkish and Moroccan elementary school students. Goves-Jacka (1990) investigated creativity of Aboriginal students in Australia; Posakrisna (1989) of young children in Thailand. Mkhize (1987) studied environmental restraints and the effects of 'prior activity' on creativity with Zulu children in South Africa; Nwazuoke (1989) correlates of creativity in high achieving Nigerian children. An early cross-cultural study with children from 11 countries was published by Jellen and Urban (1988).

Table 2. Developmental stages of creative abilities in the sense of the TCT-DP-concept

1. Autonomous scribbling/drawing: The child is scribbling/drawing something independent from the fragments. He/she is not interested/able (yet) to recognise or perceive the provided information or adapt to the information according to the given problem.
2. Imitation: The child copies the fragments. Beginning accommodation; the child is using the fragments, but without completing or forming or changing.
3. Concluding/Completing: The fragments are completed and become more or less closed, completed, simple figures: circle, square etc. First assimilating but still not very creative drawings.
4. Isolated animation/objectivation: Using own, individual, more complex schemes and assimilation/incorporation of the given fragments by means of creating/interpreting figures as single/isolated objects and/or creatures.
5. Producing thematical relations: Figures, objects are drawn/seen/interpreted as having an inner relation or thematic dependency structure; an intention of shaping/forming/composition becomes recognisable.
6. Formed holistic composition: High stage of creative achievement; all completed/equipped and new elements/parts of the drawing contribute to a holistic composition, to a common meaning/theme, which is expressed, too, by the holistic way of formal figural quality of the drawing (that does not necessarily mean high technical artificial drawing skills).

Böttcher (1993) used the TCT-DP and the recently developed literal-verbal version, the TCT-LV, in a study of environmental conditions of linguistically talented children. Paszkowska-Rogacz (1992) compared creative abilities of deaf students with those of normal hearing pupils; Wolanska and Neçka (1990) from Poland, investigated the factorial structure and other psychometric features of the test leading to the proposal to norm and to use the TCT-DP as an official screening instrument in Poland for identifying gifted and creative students. Recently, Albrecht (2002) found the TSD-Z (TCT-DP) to be a helpful instrument for profession and career counselling purposes.

Seen as a whole, for studies that have used the TCT-DP, the feedback is very positive in general and data supporting reliability and validity are mostly sufficient and encouraging.

Davis (1995, p.91) summarises in his review that

> the TCT-DP is a new, carefully developed, and possibly useful creativity test. Some researchers are impressed with its potential for identifying creatively gifted children. It is difficult to assess whether it will do more than existing American creativity tests. Efficiency of administration and scoring is a definite plus.

And Cropley's (1996, p.227) summary of his review reads like this:

The TCT-DP is a major addition to the battery of creativity tests. It offers an approach to creativity tests that goes beyond the divergent-convergent thinking distinction. It also goes some way towards incorporating non-cognitive aspects into measurement of creativity. The procedure itself is interesting for the people being tested as well as for those scoring the test. The manual reviewed here is highly readable, and is also thorough, providing not only practical instructions but also convincing theoretical and technical material justifying use of the test by both researchers and practitioners.

The test author totally agrees with Davis' (1995, p.91) final statement:

> As with limitations that plague all creativity tests, the TCT-DP should be used in conjunction with other information (for example, another creativity test, or teachers' or parents' ratings) in order to minimise false negatives - missing creative children whose variety of creativity is different than that measured by a single test.

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Creativity of the disaffected gifted

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Disruptive students are often perceived to be unmotivated, low in self-concept, and lacking in creative characteristics such as originality in thinking and imagination. A total of 99 students from 6th Grade classes of a primary school in Hong Kong completed a survey asking about their effort goal orientation in school motivation, academic self-concept, originality in thinking, and imagination. Those students identified by teachers to be gifted in non-academic areas but disaffected and occasionally disruptive (n=20) were compared with the other students (n=79) in the four measures. Analysis of variance showed that students found to be disaffected and disruptive did not differ from the other students in self-concept and their effort goal orientation. However, they scored significantly higher in their self-perceptions of originality and imagination. The results cast doubt not only on the assumption of the weaknesses of disaffected students, but also challenge the appropriateness of the school curriculum to suit the needs of some gifted children. Curriculum designers and teachers should consider learning activities that may fully nurture the disaffected students' creativity components to help them become useful citizens.

Creativity, self-concept, gifted, curriculum, disaffected

INTRODUCTION

Gardner (1993) has proposed that every individual has multiple intelligences that enable the individual to display his or her talents and potentials. Thus if the school can provide a nurturing environment for the development of various intelligences, adolescents should be able to strengthen their specific talents and develop into successful individuals (Ainscow, Hopkins, Southworth, and West, 1994; Gardner, 2000; Renzulli and Reis, 1997). Nevertheless, in Hong Kong where the school system places an immense focus on intelligences related to academic work, those talents in non-academic areas may become low achievers in terms of academic performance. According to Erikson's (1963, 1968) theory of development, students aged 12 to 14 years are experiencing a critical stage in their development of a sense of competence and self-concepts. Unfortunately, for some students of this age group who do not find success in their academic achievement, their talents and potentials may be geared to some form of undesirable behaviour that may have the unwelcome function of attention seeking or establishing a self-identity in an undesirable way (Wallace, 1983; Whitmore, 1980). More unfortunately, given their originality and creativity, talented students could generate all kinds of unpredictable ways to upset the harmonious climate of the classroom. The present study examines the motivation, self-concept, and creativity of disaffected 6th grade students who have displayed some form of talents in a primary school in Hong Kong.

THE DISAFFECTED TALENTS

Educators and researchers have generally found that students can learn better if they are emotionally stable, motivated, and are able to think divergently and creatively (Freeman, 1991; Gardner, 2000). Unfortunately, not all children with the wits to think divergently and creatively manage to establish their self-identity through achieving academic excellence. Some of those who fail to achieve the desirable academic targets may become disaffected, misbehave, and are often disruptive. As suggested by some researchers, this kind of talented students is not rare in the Hong Kong classrooms (Chan and Chan, 1999; Clark and Chan, 1999; also see de Souza-Fleith, 2000). For those who have talents in some non-academic areas such as art, music and sports, their outstanding abilities are seldom recognised whereas their low achievements are often criticised. The continual denial of their special capabilities in non-academic areas could have an enormous detrimental effect on their self-concept and motivation in schooling.

In the era of education reforms, the potential of the school environment to promote students' motivation, self-concept and creativity has been emphasised for successful lifelong learning (for example, Curriculum Development Council, Hong Kong, 2001; Education Commission, Hong Kong, 1984; 2000, 2002; UNESCO, 2000). These characteristics are often believed to be typical of the talented and yet lacking in the disaffected students. Particularly for those gifted students who achieve far below average, the continual failure in academic achievement may further intensify their misbehaviour to an unacceptable level. In the following discussion, we focus on the three important factors that are believed to be crucial for lifelong education and the issues related to the gifted but disaffected students.

School Motivation

Motivation is important in schooling because students' academic behaviour and achievement are thought to be closely associated with their motivation in schoolwork (Ames, 1992; McInerney, Roche, McInerney, and Marsh, 1997; McInerney, Yeung, and McInerney, 2001; Wentzel, 1998). Compared to performance goal orientations, mastery goals are thought to be vital for students' desirable academic outcomes. Hence an effort goal orientation, as opposed to a praise orientation for example, tends to have stronger impacts on educational outcomes (for example, McInerney et al., 2001; Wentzel, 1998). For those students who have talents in the "wrong" area, their constant failure in the mastery of knowledge and skills in the academic domains of schooling probably provides a negative reinforcement that may continually diminish their motivation in schoolwork. However, given their talents in certain areas that provide them with satisfaction of excellence even though these areas may be irrelevant to academic pursuit in a traditional sense, they could possibly maintain a reasonably high level of motivation and be willing to invest an effort in schoolwork. Hence, it is unclear whether the disaffected gifted would be less motivated in schoolwork than their peers in the school.

Self-Concept

Numerous studies have shown good relations of academic self-concept to academic achievement and academic behaviour (for example, Chapman and Tunmer, 1997; Eccles and Wigfield, 1995; Marsh and Yeung, 1997a, 1997b; Yeung and Lee, 1999). Whether a student finds himself, or herself competent in academic work tends to impact on academic achievement. Thus recent research has provided ample evidence that an individual's academic self-concept is developed primarily on previously successful experiences in academic work (Marsh and Yeung, 1977a, 1997b; Yeung and Lee, 1999). On the basis of the evidence, the constant failure in academic work renders those students who are about or less than average in academic ability but gifted in non-academic areas difficulty in developing a positive self-concept associated with academic work. Nevertheless, self-concept in the school setting needs to be considered in general terms and in

terms of specific curriculum domains (Yeung and Lee, 1999; Lee, Yeung, Low, and Jin, 2000). Since a global school self-concept would probably represent cognitively a combination of self-concepts in a wide range of curriculum areas in the high school, it is unclear whether the disaffected gifted would maintain a reasonably high school self-concept, given their talents in certain areas, whether they be recognised as important or not in the school setting.

Creativity

Many educators argue for the importance of creativity in the curriculum (Hughes, 2001). However, the implementation of a curriculum with an emphasis on creativity is difficult because basic education tends to strictly follow highly structured contents and teaching methods that inevitably inhibit possibilities of creativity (Tan and Law, 2000). This could be even more difficult in Hong Kong, given the highly competitive, segregated, and outcome driven features of the Hong Kong schooling (Tsang, 1992). Furthermore, creativity may be threatened by the increased emphasis on the objective criteria of assessment in all aspects of learning (Runco, 2001) together with the generally lack of time and opportunity of students to exhibit their creative abilities (de Alencar, 2001). Thus for those students who are gifted in any non-academic area, their capabilities of creativity would not have any chance to flare.

The literature on creativity has identified various factors that may contribute to student creativity (Giorgis and Johnson, 2001; Goertz, 2000; Kusa, 1999; Runco, 2001). Among these factors are two important constructs that are the focus of the present study. They include originality and imagination.

Originality

This construct is characterised by an ability to initiate original ideas. Many researchers have identified originality as a major indicator of creativity (Goertz, 2000; Joy, 2001; Runco, 2001).

Imagination

This construct is characterised by thinking in a non-traditional way. Researchers have implied the importance of non-traditional thinking in creative children (for example, de Souza-Fleith, 2000; Morse, Morse, and Johns 2001; Runco, 2001; Stokes, 2001; Winebrenner, 2001).

Unfortunately, these factors that reflect, at least partly, children's creativity may not be associated with academic achievement (Saeki, Fan, and Van Dusen, 2001). Hence, those gifted students who are able to perform outstanding tasks only in non-academic areas may have these specialties undetected in the conventional school setting of Hong Kong. The gifted students' original ideas that do not comply with expectations based on an academic perspective and their ways of thinking that do not match traditional recognition would remain but a source of vigor for undesirable behaviours.

THE PRESENT STUDY

The present study examines the self-concept, motivation, and creativity of 6th Graders in a primary school of Hong Kong who are disruptive low achievers in class. Conventional thinking anticipates that these students would have low self-concept, poor school motivation, and deprived creativity. Nevertheless, based on Gardner's (1993, 2000) theory of multiple intelligence, we might expect that these disaffected students would be similar to other students in their self-concept and motivation, but particularly strong in their creativity so that they would have higher perceptions of their originality and imagination.

METHOD

The participants were 99 sixth Graders from primary schools in Hong Kong (age ranging from 11 to 16 years). They responded to a survey administered in class. Based on comments and ratings obtained from the teachers of the 6th Grade classes, 20 students were chosen to represent the most disruptive of the 6th Grade students. These students were identified to be disaffected, inattentive, and disruptive but possessed some 'peculiar' abilities in various non-academic areas. Typically, they were found to be relatively stronger than their peers in areas such as sports or art, which were unfortunately not usually treated as important as the more academic curriculum areas such as language and math in the schools of Hong Kong. Apart from demonstrating their talents in some non-academic areas in the school curriculum, these students were particularly witty in spontaneously generating ideas and developing behaviours that are not socially acceptable. Hence to the teachers and their peers, these students were so disruptive that even with the presence of only a few of them, teaching and learning processes in the classroom were often seriously hampered. This sub-sample of disruptive students was compared against the other 6th Graders (n=79). About 75 per cent of the disaffected group was over-aged (age > the normal age of their peers of about 12 years).

Material

A questionnaire was designed for the purpose of the present study. Apart from items for collecting demographic data, there were a total of 16 items forming four constructs. They were Academic Self-concept, Effort (that is, an important mastery goal orientation), Originality, and Imagination. The students responded on a Likert-type scale from 1=absolutely disagree to 5=absolutely agree. The items of the four constructs are presented in the Table 1. The responses were coded such that higher scores reflected more favourable perceptions.

Table 1. Response Items and Alpha Reliabilities of Factors

Factor	Items	Alpha
Self-concept		0.69
	I am good at most school subjects.	
	Most school subjects are easy to me.	
	I learn quickly in most school subjects.	
	I have always done well in most school subjects.	
Effort		0.73
	I work hard to try to understand something new at school.	
	I am always trying to do better in my schoolwork.	
	I try hard to solve problems.	
	The harder the problem the harder I try.	
Originality		0.73
	I sometimes solve problems in a way nobody else has tried before.	
	I can think of many new ideas.	
	I sometimes see things quite differently from other people.	
	I have many innovative ideas.	
Imagination		0.66
	I like to imagine things I like to do.	
	I like to think that I will be a person very different from others.	
	When I read a story or watch a movie, I like to think I am the person in the story.	
	When I grow up, I wish to do something people have never thought about.	

Preliminary Analysis

We first examined the alpha reliability of each of the four constructs. Then we conducted a principal components analysis to test the ability of the 16 items to form 4 distinct factors. Based on the constructs established in the preliminary analysis, the scale mean of each construct was computed by taking the average of the items pertaining to each construct.

Comparisons Between Groups of Students

The critical concern of the present study was whether students perceived by teachers as disruptive differed in their academic self-concept, effort goal orientation, originality and imagination from the other students at the same level of schooling. To test potential between-group differences, a one-way analysis of variance (ANOVA) was conducted for each of the four constructs as dependent variables and group as the independent variable. The analysis was conducted with SPSS (Norusis, 1994a, 1994b; Nie, 1994).

RESULTS

Preliminary Analysis

The alpha reliability estimates for the four constructs were good (alphas=0.69, 0.73, 0.73, and 0.66 respectively for Self-concept, Effort, Originality, and Imagination). Principal components analysis of the 16 items with varimax rotation (Nie, 1994) revealed four distinct factors with eigen values of 4.46, 1.76, 1.43, and 1.26 respectively explaining 56 per cent of the total variance. As expected, the 16 items formed four distinct a priori constructs. The factor loadings were 0.78, 0.72, 0.60, and 0.60 for Self-concept, 0.68, 0.75, 0.75 and 0.57 for Effort, 0.62, 0.81, 0.52, and 0.69 for Originality, and 0.70, 0.70, 0.79, and 0.50 for Imagination. The items of each of the four constructs were averaged to form a scale score for subsequent analysis. The correlations among the four scale scores were then examined. The correlations were small to moderate (ranging from 0.28 to 0.47), providing support for the discriminant validity of the four constructs. Results of the preliminary analysis thus provided support for the construct validity of the measures that were used in the subsequent analyses.

Between-Group Differences

To test whether students with disruptive behaviours differed from the other students in their self-concept, effort, originality and imagination, an ANOVA was conducted for each variable. The means and standard deviations of the scores for the two groups of students are presented in Table 2. The One-way ANOVA found that the two groups of students did not differ in their academic self-concept, $F_{(1,97)}$=0.13, MSE=0.93, and in their effort goal orientation, $F_{(1,97)}$=3.84, MSE=0.84, $p > 0.05$. However, the group differences were statistically significant for Originality, $F_{(1,97)}$=5.40, MSE=0.99, $p < 0.05$ and for Imagination, $F_{(1,97)}$=12.63, MSE=0.94, $p < 0.001$. Thus the students who were perceived to be disruptive showed higher levels of originality and imagination and they were no lower than the other students in their self-concept and school motivation.

Table 2. Means, Standard Deviations and Analysis of Variance Results

Groups		**Disruptive**	**Control**	**Univariate**	**MSE**
	N = 99	20	79	**$F_{(1,97)}$ df**	
Self-Concept	M	**3.33**	**3.41**	0.13	0.93
	SD	(1.08)	(0.93)		
Effort	M	**4.43**	**3.98**	3.84	0.84
	SD	(0.91)	(0.92)		
Originality	M	**4.04**	**3.46**	5.40*	0.99
	SD	(1.06)	(0.98)		
Imagination	M	**4.79**	**3.92**	12.63**	0.94
	SD	(0.84)	(1.00)		

Students responded to the items on a 5-point scale with higher ratings reflecting more favourable responses.
* $p < 0.05$, ** $p < 0.001$

DISCUSSION

The results reflect that the disaffected students perceived themselves as no different from their 6th Grade schoolmates in self-concept and effort goal orientation that are believed to be crucial for study in the school setting and for lifelong learning. Both groups had mean scores well above 3 on a 5-point scale for both constructs. Interestingly, however, whereas the groups did not differ in the scores of self-concept and effort, those disaffected students scored significantly higher in originality and imagination. The disaffected students seemed to have a high creative capability that may not be detected in their schoolwork performances.

These findings not only cast doubt on the assumption of the weaknesses of those disaffected students, but also queries the ability of the school in making a difference on students' learning outcomes (Coleman et al., 1966; Rutter et al., 1979; Mortimore et al., 1988). The findings also challenge the adequacy of the school curriculum, the teaching approaches, the assessments, and the relevance of existing policies on teaching and learning. Given the reasonable levels of self-concept and motivation and the superiority in creative attributes, why have the disaffected students performed academically weaker than the other students? What has gone wrong in the school curriculum or was there something missing in the assessment system such that the strengths of these particular students have been neglected? Has the school system failed to cater for those students who have the potential to excel in non-academic areas of learning? Has the current school curriculum been so limited in scope such that too much emphasis has been placed on academic excellence and too little attention has been paid to other valuable learning outcomes? With the current education reform emphasising the development of the whole person (Curriculum Development Council, Hong Kong (2001), it seems that curriculum designers would need to seriously reconsider the current school curriculum. It would be a disaster to disregard the needs of the gifted and talented and allow the school system to destroy them and turn them into underachievers instead.

Apparently, the findings are consistent with earlier research on underachieved students (for example, Torrance, 1965; Wallace, 1983; Whitmore, 1980). Although academically weak compared to other students, underachievers could have outstanding abilities in some non-academic areas. Unfortunately, in a vigorously competitive school system with a strong focus on academic work, the talents of students who are gifted in non-academic domains are seldom recognised. The high originality and imagination scores of those gifted but disaffected students with low academic performance in the present study seems to imply that:

- The current provisions of the schools may not suit the needs of all students, and may be even deficient in meeting the needs of some gifted students.
- Some of the disaffected students may be able underachievers (Torrance, 1965) who are not provided with the opportunity to demonstrate their abilities in the conventional tests and exams.
- Despite being creative, the output of these students may not be recognised by their teachers. This may be due to the fact that they have a poor relationship with their teachers such that their performance and behaviour are mostly perceived to be negative.
- The disruptive behaviour and misconduct of the students could be a means of attention-seeking, and perhaps revenge for being unrecognised; and for those new immigrants, a gesture of accusing the inequality and inequity of schooling.
- For some students, in order to remain affiliated to their peer group, they would avoid being outstanding, so they tended to perform as badly as their peers. This could be perceived as meeting their safety needs in a social context.

As supported by the literature (Erikson, 1963, 1968; Gardner, 1993; Wallace, 1983; Whitmore, 1980), there are reasons to believe that the disaffected students in the present study could be the unfortunate able underachievers to whom special attention has not been given. They not only demonstrated the characteristics of underachievers (Torrance, 1965) in terms of their academic performance, but they also had poor high absence rates, disruptive behaviours and poor relationships with teachers and peers. Furthermore, many of such students have unfortunately misused their creativity such that it has unfortunately become an unwelcome resource for generating discipline problems in the classroom.

In sum, this study has revealed a new area of concern to educators and curriculum designers. The fact that disaffected students could be gifted children who have not been provided with the opportunity to exercise their talents calls for a re-consideration of the current school curriculum and pastoral care. It is clear that at least some able underachievers may not have received the necessary educational support. Their creativity has not been respected, and their potentials are not being tapped to their fullest extent. Curriculum designers, teachers, educators and policy makers should consider ways to provide these students with adequate learning opportunities by creating the necessary conditions in the school to exercise their creativity and multiple intelligence (Gardner, 2000; Renzulli and Reis, 1997). By doing this, we can hopefully nurture the disaffected students' creativity components fully and help them become useful citizens in future.

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