An application of Renzulli's Three Ring concept in a low income setting in Dar es Salaam, Tanzania

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Abstract

Some research suggests that in developing country contexts school stakeholders typically believe that children from poor backgrounds are incapable of learning or having ability. This results in children struggling to achieve their potential. In order to dispel such myths this thesis utilizes a universally recognized concept to measure qualities through pen and paper tests. The thesis describes and analyses data from 847 children from class 4 and 5 in seven government schools in Kinondoni, Dar es Salaam, Tanzania. The overriding research interest is the application of Renzulli's three-ring concept. Seven questions are considered to explore each of Renzulli's rings – schoolhouse giftedness, creativity and commitment.

The findings show relationships between student test scores and the likelihood of being nominated by peers, teachers and self as gifted. The school identification indicators tended to correlate with each other. Teachers believe that a child's ability is inherited and that poor parents are not interested in their child's schooling. However, irrespective of teacher beliefs, this study found very little relationship between family background and the indicators of giftedness. There was an increased likelihood of girls rather than boys reporting themselves as self confident and positive towards learning.

Creativity was found to be a multidimensional construct with regards to divergent thinking with the total creativity index score correlating significantly positively with teacher experience, gender and self-confidence. No creativity measure was related to family wealth. Commitment was multidimensional, intrinsic and extrinsic factors being the two primary scales. Extrinsic motivation and creative strengths were found to be positively associated.

The overall findings inform school stakeholders that disadvantaged children from poor settings have the potential to be creative, committed and possess ability. This

could allow for a change in policy so that children can be encouraged, nurtured and provided opportunities to attain their levels of capability.

Acknowledgement

This thesis is dedicated to Professor Joe Renzulli, who is not only an inspiration but makes a fantastic cup of coffee.

Pictured above: Steve Humble and Professor Joe Renzulli. March 2015 at The Neag School of Education, University of Connecticut, USA.

Thanks to my supervisor, Dr Chris Haywood. I will always remember the times shared in Tanzania with great fondness.

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Chapter One: Introduction

1.1 Introduction

1.1.1 Context

Having completed the testing of children in a poor part of Kinondoni, Dar es Salaam, Tanzania, certificates were handed out and those found in all three of Renzulli's rings were called to receive their prizes. Parents were in attendance as were the head teachers and other students. One girl stepped forward to receive her award with her father standing behind adoringly. Much was said in Kiswahili as she beamed a smile that will never be forgotten. The father stepped forward and was informed that his daughter was not only high ability, but also possessed great creativity skills and commitment. He shook his head. Why? It became apparent that he, the local car mechanic, believed that "only the rich can be gifted" and "we are poor, my daughter cannot have these talents".

He's not alone.

Research in developing contexts has shown that others agree with his hypothesis. That is that first generation learners are not capable of great things. That being from a family where parents are illiterate implies the inability to achieve. Teachers, government officials and other school stakeholders typically believe that children from poor areas are incapable of learning or achieving greatness (Iyer and Nayak, 2009; Dixon, 2012; Frasier, 1987). This comes as no surprise. Having gathered student outcome and family data from other poor parts of the developing world it has become apparent that children with talents exist but are typically ignored (Humble, 2015). This research therefore set out to explore issues around ability, commitment and creativity amongst children living within poor communities in Dar es Salaam. Informing policy and practice amongst schools and education departments is also a focus of this research.

Some consider carrying out research around giftedness as contentious. Identifying and nurturing gifted children through enrichment programmes can be regarded

as elitist, lacking inclusivity, providing inequitable opportunities and resulting in social inequality. Issues surrounding fairness in opportunity and equal rights for excellence are often put forward as arguments against identifying and nurturing individuals. Indeed, how can it be determined who has the potential for excellence, how can it be measured and what does it mean in different cultures and contexts?

There seems to be a divide and thus heated debate about philosophical arguments around egalitarianism vs. elitism. It is generally agreed that every child should receive the most appropriate and quality education available. However, there are children who will display talents and cognitive ability that implies they learn faster and at higher levels than others. The quandary is should these children attend a differentiated academic experience to other children? Would that be considered unfair? When it isn't deemed unfair seems to be in the arena of sport. This has become mainstream through the use of Lottery Funding in the UK to support outstanding sports men and women who might achieve excellence winning medals at world sporting events. Our society even admires, rewards and exalts gifted athletes. Then why not for those gifted academically? Equally, focusing on children with specific learning difficulties does not attract the same debate around equality or opportunity. Providing special services and support programmes for students with learning difficulties is not regarded as contentious. The requirement in education for all students to reach a minimum standard of proficiency allows for the extra funding to be considered fair and just. However, it could be argued that gifted children also require special services and support to nurture their specific learning requirements. This contentiousness spreads into the international arena where money is generally focused on Education For All (EFA). That's increasing the number of children attending school, leaving no girl behind and ensuring the disabled gain access too[1]. The Sustainable Development Goal (SDG) 4 makes no mention of provision for or identification of the gifted.

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[1] http://www.un.org/sustainabledevelopment/education/#b7990e9a6d4827466;
https://www.gov.uk/guidance/girls-education-challenge;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/67664/edu-chi-disabil-guid-note.pdf

1.2 Motivation and Focus

This part of the introduction considers four reasons concerning the undertaking of this thesis.

1.2.1 Why look at high potential in a developing context?

A range of influences impact on the researchers decision around what makes for a research topic that will bring new ideas and thoughts, that are meaningful.

First, a personal life's journey will not only inform, but also embed ideas and skills that make research unique to the individual. Having taught mathematics for around twenty years it had become apparent that children have different learning styles, needs, requirements and face different challenges. In 1981 Professor Sir Christopher Zeeman in association with 'The Royal Institution' began the 'Master class Programme'. This programme focuses on mathematics, engineering and computer science through a series of classes run during out of school time. Schools are invited to nominate students within these subject areas to attend and experience unique sessions that go beyond the school curriculum. The aim is to inspire, excite and reveal the beauty that is held within these subjects. Having been invited to lecture on the 'Master Programme' for a number of years, it became apparent that children who attended were capable of being stretched to points that schools were not able to support. In order to develop areas where superior potential could be present, children needed to be provided with the greatest range of opportunities possible. By developing talent and cultivating the next generation of leaders, scientists, artists and the like, then enrichment programs are needed to not only develop good lesson learners but to stimulate the love of learning. This interest in gifted education and the need to supplement traditional schooling was one aspect of the journey.

Second, fate and destiny are also major parts. Being in the right or wrong place at a certain time can affect life choices. Meeting Professor Pauline Dixon, and hearing her vision for dispelling myths around the poor being incapable of giftedness also had a significant impact. In order for countries to benefit from economic growth, societies need to develop the cognitive skills of their population. This seemed not

to be occurring in sub Saharan Africa. However, there is a paucity of research around the identification of gifted students in developing contexts. What has been carried out, typically in rural areas, focuses on the cultural meaning and definition of giftedness in such settings. There is therefore a gap in the literature that this research begins to address.

1.2.2 Why low income families?

The story provided of the car mechanic and his daughter is one anecdote that illustrates perceptions around the inability for the poor to possess talents. It was therefore decided to carry out the research where poor children reside to investigate this belief as well as teacher and parent attitudes around ability, creativity and commitment. The research therefore took place in Kinondoni, a poor municipality in northern Dar es Salaam. The areas chosen to carry out the research were the poorest of Kinondoni lacking in infrastructure, with roads in very bad repair and no piped water to housing. Collection of refuse is sporadic resulting in 'tipping' of rubbish in streams and streets, latrines are inadequate and flooding during monsoon season adds to health risks[2].

1.2.3 Why the work in Dar es Salaam, Tanzania?

Tanzania (known as Tanganyika) gained independence from British colonial rule in 1961. It amalgamated with Zanzibar in 1964 to form the United Republic of Tanzania. The census of 2012 indicated a population of around 45 million. Life expectancy at birth is 61 years. Figures show that almost half of the population are between the ages of 0 and 14 years[3].

Education is divided into a 2 – 7 – 4 – 2 – 3+ structure, starting with a 2 year pre-primary education for children between 5-6 years. Pre-primary is followed by Primary Education (Standard I-VII), which is free and compulsory for all children between 7-13 years. At the end of Primary there is the Primary School Leaving Examination (PSLE) used for selection into secondary level schooling (Kassile, 2014). Secondary education is made up of two cycles, first Forms 1-4 (14-17 year olds) followed by 2 year Advanced Level (Form 5 and 6).

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[2] http://www.unicef.org/tanzania/Advocacy_brief_Kinondoni.pdf
[3] Wikipedia.org/wiki/demographics_of_Tanzania

According to BEST[4] (Basic Education Statistics Tanzania) the Net Enrolment Rate for the participation in primary education stood at 89.7% in 2013. The main reason provided for children dropping out of Primary schooling was found to be 'parental ignorance' (Ministry of Education and Vocational Training, 2014, p. 22). More girls than boys continued their education until the last grade of primary (65 per cent boys and 73 per cent girls). Around 60 per cent of children made the transition from primary to secondary education. Only 23% of children completed the last grade of the secondary school cycle in 2009, with around only 5% of the population taking A-level qualifications. In 2015 Tanzania was spending 3.48% of GDP on Education (total GDP in 2015 $44.9 billion U.S. dollars).

There were two overarching reasons for the research to be undertaken in Tanzania. First this research was linked with an ESRC project funded to Newcastle University under the 'Development Frontiers' banner. This thesis around the application of Renzulli's three ring concept was not 'formally' part of the ESRC project but data gathered around the Ravens Progressive Matrices test was used by the project. Second, it was felt that Tanzania was fairly typical of the surround countries concerning the government's policy (lack of) around gifted education for the poor. Tanzania's economic status is also quite representative of neighbouring African countries. The findings of this research then may be generalizable for other sub-Sahara African countries of similar standing.

Within the Tanzanian 'Education and Training Policy' document of 1995 there is a reference by Professor Sarungi, the Minister of Education and Culture to the 'screening for talented, gifted and disabled children'. The policy to be adopted had been informed by internal and external review. Amongst the recommendations were the following:

> 'to promote access and equity through making access to basic education available to all citizens as a basic right; encouraging

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[4] http://www.pmoralg.go.tz/noticeboard/tangazo-1023-20141229-Basic-Education-Statistics-BEST/

equitable distribution of educational institutions and resources; expanding and improving girls' education; screening for talented, gifted and disabled children so that they are given appropriate education and training, and developing programmes to ensure access to education to disadvantaged groups' (Ministry of Education and Culture, 1995, p. 5).

However, twenty years later the idea of screening to allow for 'appropriate education and training' had disappeared within education policy documents. What does remain is the requirement for human capital to be developed. Therefore a 'subliminal' theme around the nurturing of talents remains.

'Tanzania Development Vision 2025 aims at achieving a strong competitive economy through creativity, innovativeness and a high level of quality skills, in order to respond to development challenges and adapt to the changing market and technological conditions in the regional and global economy. Tanzania's human capital development has not been adequate to meet the growing development challenges and to facilitate the search for solutions to the development problems that the country faces. In particular, education has neither been geared towards integrating individuals into the competitive markets, both at local and international levels, nor towards innovatively engaging Tanzanians in entrepreneurship and self employment activities' (Ministry of Education and Culture, 2014, p.5).

In other East African countries, such as Kenya, there is at least 'on paper' written strategies that include the identification and nurturing of gifted children. Regarding Early Childhood Care and Education the 'Education For All 2015 National Review' states that there is need to 'Develop a mechanism for early detection of children with special needs including the gifted and talented' (Ministry of Education, Science and Technology, 2014, p.34). Other strategies to achieve universal basic education include a need to 'review and implement the policy on inclusive education for pupils with special needs including the gifted and

talented' (p.56). For Uganda the only reference is that for a good primary education there needs to be a development of children's 'gifts and potentials' (Ministry of Education and Sports, p. x., 2015). Documents from other countries surrounding Tanzania (Rwanda and Zambia) show no reference to gifted education policy (UNESCO, 2015; Ministry of Education (Republic of Rwanda), 2015; Ministry of Education, Science, Vocational Training and Early Years (Zambia, 2014).

1.2.4 Why Renzulli's Three Ring concept?

There is general agreement that the identification of giftedness should engender multiple methods, informants and criteria (Ford and Trotman, 2000; VanTassel-Baska, Feng and De Brux, 2007; Bélanger and Gagné, 2006). It was thus decided to subscribe to Renzulli's schoolhouse giftedness definition regarding lesson learning and test taking intelligence along with identifying giftedness through multiple methods, informants and criteria. The research investigates whether 'pen and paper' tests focusing on schoolhouse giftedness, along with peer and pupil nomination and identification of self-confidence, are appropriate in a sub-Saharan African setting to reveal the extent of possible untapped talent. The ontological stance of the researcher carrying out this thesis is one of naïve realism, thus it is asserted that giftedness is measurable. The researcher has taken an objective stance through a depersonalised approach to gathering and analysing the data. The research paradigm is also positivist, taken that the researcher's background is one of mathematics. Statistical and mathematical techniques are central to the research methods adopted by positivists. Thus the research is constantly looking for measurability, predictability, objectivity, patterning and causality. It was felt that the Renzulli paradigm around ability, creativity and commitment could be investigated appropriately taken the ontological, epistemological and paradigm stance of the researcher. It could be argued that, as seen in Chapter Two, this thesis could have developed the work of Professor Sternberg in Africa. However, it was felt that this thesis, if it wanted to provide a unique contribution to the literature, should set out research that

considered the application of Renzulli's three ring concept within school settings in Dar es Salaam.

1.3 The Thesis

The answers to the 'four reasons' posed above (in section 1.2) in this introductory chapter have provided an explanation for the motivation and focus of this research.

The overriding research interest of this thesis is 'The application of Renzulli's Three Ring concept in a low income setting in Dar es Salaam, Tanzania'. Seven questions are considered in order to explore the overall research interest looking at each ring in turn:

- In school settings in Dar es Salaam what are the relationships between student test outcomes, their own self perceptions and those of their peers and teachers?
- Does the likelihood of being identified as gifted vary according to family background and school characteristics?
- What are the relationships between pupil, school and teacher characteristics and pupil outcomes?
- Is the creativity construct of Divergent thinking (DT) dimensionally equivalent in an African as in a western setting?
- How do any creative dimensionalities correlate to an individual's contextual factors including education, social environment, family and personal factors?
- What are the intrinsic and extrinsic motivational characteristics for a set of poor high ability children?
- Investigate whether motivation dimensionalities correlate to an individual's contextual factors including education, creativity, social environment, family and personal factors.

Chapter Two details the literature around the research questions and the overall research interest. The Chapter begins by providing a brief history of giftedness research and then looks at the work of three modern day exponents who have developed the way we presently think about the multidimensionality of intelligence and giftedness – Sternberg, Renzulli and Gardner. The next part looks at the literature around commitment and creativity, linking these with Renzulli's

rings. As this research sets out to consider giftedness amongst the poor, the Chapter then discusses literature on the major dilemmas surrounding the identification and support regarding children within these marginalised groups. The Chapter then looks at research that has been carried out around giftedness in sub-Saharan Africa relating to IQ testing and the characteristics, cultural and social effects of giftedness.

Chapter Three considers the research methodology. The methodology of a research based inquiry is important, this Chapter sets out the researcher's assumptions, principles, and procedures that have been utilized to describe, explain and justify method selection. The first part of this Chapter discusses the researcher's ontology, epistemology, methodology, research paradigm, research design and the mixed methods approach. The Chapter goes on to describe how using this methodology for this research the researcher endeavors to carry out research that is valid, meaningful and exemplary. The Chapter concludes by discussing the validity and reliability measures, and ethical considerations that have been take to ensure high quality research.

Chapter Four sets out the research findings from the first phase of the research, reporting on the 'schoolhouse' giftedness data collection. The first three research questions are explored in this Chapter. The analysis in this Chapter looks to understand how the data is related and what correlations can be made with background information about pupils, their schools and families. The Chapter firstly explores the descriptive statistics and the correlations between the four identification strategy indicators of giftedness – teacher, peer, test scores, self confidence – to answer the first research question. Then regression analysis is used to answer the next two research questions.

Phase two of the research is explored in Chapter Five. This Chapter looks at two of Renzulli's rings – creativity and motivation - with a subset of 'talented' students who were identified in Chapter Four. Four research questions are answered in this Chapter. The first part of the Chapter deals with creativity, to determine whether the creativity construct is divided into two factors - innovative and adaptive - and

thus dimensionally equivalent in an African setting as in western settings. The Chapter then considers how any creative dimensionalities could correlate to an individual's contextual factors including education, social environment, family and personal factors. Following on from the section on creativity the Chapter looks at Renzulli's commitment ring to answer the final two research questions. Firstly, this part of the chapter answers the question of how intrinsic and extrinsic motivational characteristics are related for a set of poor high ability children. Secondly these motivation dimensionalities are investigated to find any correlations with an individual's contextual factors. These factors include education, creativity, social environment, family and personal factors. The Chapter ends with vignettes of eight children who appeared in the centre of the three rings – schoolhouse, creativity and commitment. These eight children scored in the top quartile in both the creativity and commitment tests in phase two of this research. It was decided to meet with these children and some of their parents (or guardians) to carry out a short interview to learn more about their lives and aspirations.

Chapter Six sets out a discussion around the findings concerning schoolhouse giftedness, creativity and commitment. Thus comparing the results of this research as shown in Chapters Four and Five with the literature as set out in Chapter Two. The chapter starts by looking at teacher beliefs, identification and attitudes followed by student outcomes, self perception and peer nominations. Parental attitudes and perceptions are compared to those from other sub Saharan Africa literature. Creativity and commitment are looked at from the aspect of dimensionality as well as contextual factors, which include education, social environment, family and personal factors.

The final Chapter starts by setting out the answers to the research questions. Following this some concluding remarks are made around the application of Renzulli's three ring concept in Dar es Salaam, highlighting the uniqueness of this study. To end this Chapter, some policy implications and suggestions for the way forward for this type of research are made.

Chapter Two: Literature Review

2.1 Introduction

This chapter sets out literature that informs the research questions and the overall research interest. First, in order to set the scene, the meaning of 'giftedness' is investigated. This is then followed by looking at three modern day exponents who have significantly contributed to the way we think about the multidimensionality of intelligence and giftedness – Sternberg, Renzulli and Gardner. Taking further the work of Renzulli, the three components making up Renzulli's rings are then discussed in more detail. The fourth part looks at the literature around commitment and creativity, linking with Renzulli's rings. As this thesis is considering giftedness and talent amongst the poor, the fifth part sets out literature that discusses the major dilemmas surrounding the lack of marginalised groups being supported through gifted programmes and identification processes. The focus then looks at the research that has been undertaken around giftedness in sub-Saharan Africa. The work relating to IQ testing and the use of the Ravens Standard Progressive Matrices test, specifically is the focus of the next part; issues around the cross-cultural transferability of the test as well as questions about different score levels is investigated. The next part looks at research that has been carried out in sub Saharan Africa. The cultural and social effects around the considered attributes and characteristics of giftedness are explored. Finally the chapter concludes with a summary.

2.2 What is giftedness?

Various words are used interchangeably with the term giftedness. These include 'genius', 'talented', 'high-ability', 'high potential', 'able', 'superior', 'exceptional', etc. Western norms around the notion of giftedness have long been etched into our culture. In ancient times gifted children were seen as supernatural beings. Plato in Greece and Confucius in China used the words 'heavenly children' to describe them. There are also references made in the Bible to giftedness, 'Having then gifts differing according to the grace that is given to us' (Romans 12:6). The Renaissance period developed the concept of genius seeing it as a transcendent human power given to religious figures such as prophets, saints and apostles. The

gods had given this power miraculously to other men such as Michelangelo and Leonardo de Vinci. At this time being a genius implied possessing or being possessed by demons or gods (McMahon, 2013). This notion however was changing by the time of the eighteenth century. If genius was not transcended from the heavens where did it come from? There was contention between the belief of human equality and the very existence of perceived genius in individuals. The phenomenon of genius therefore needed to be scrutinised scientifically.

2.2.1 A brief history of measuring giftedness

Education systems throughout the world possess a commonality around the use of outcomes. They look to create an ordered rank of ability of students through pen and paper tests at the end of different educational stages. It was Francis Galton in 1869 who first attempted to use standardised testing to measure 'intelligence'. Galton's attempt was merely an extension of this idea of classifying the population on knowledge learnt in school to try to rank 'intelligence'. His book 'Hereditary Genius' (1869) records the first attempt to study genius. His cousin, Charles Darwin, inspired this work on variations in the population. In statistical analysis he created the concept of normal variation, standard deviation and regression lines. Concepts that are used throughout this PhD. Galton was also a pioneer in the area of eugenics, creating the phrase 'nature versus nurture'. Galton's work looked to find some correlations between intelligence and reflexes. He abandoned this work when he was unable to show that any such correlations existed.

Alfred Binet and Theodore Simon published the Binet-Simon test in 1905, which focused on verbal abilities to identify children who had mental retardation. It was thought at the time, that these children were 'sick' and should be removed from school and put in asylums. The Binet-Simon scale (1916) gave a measure of the child's mental age. Lewis Terman's (1925) work was inspired by the Binet-Simon scale using it as a springboard to identify children with above average abilities rather than those with learning difficulties. The result was the Stanford-Binet Intelligence Scales and generally acknowledged as one of the first tests to try to identify intelligence. This test was used extensively during the First World War being regarded as one way to evaluate and assign army recruits to different roles

in the services (Kaplan and Saccuzzo, 2009). This led to a rapid development of mental tests.

> 'The testing movement grew enormously in the United States because of the demand for a quick, efficient way of evaluating the emotional and intellectual functioning of thousands of military recruits in World War I. The war created a demand for large-scale group testing because relatively few trained personnel could evaluate the huge influx of military recruits' (Kaplan and Saccuzzo, 2009, p. 15).

The Binet-Simon intelligence test was in years to come standardised by Thurstone with standardised mean and standard deviation (Thurstone, 1987).

Owing to the demand brought on by the First World War, David Wechsler in 1939 produced an intelligence test that accepted the concept of general intelligence, but also looked at dividing this concept into two areas of verbal and performance. The test:

> 'contained several interesting innovations in intelligence testing. Unlike the Stanford-Binet test, which produced only a single score (the so-called IQ, or intelligence quotient), Wechsler's test yielded several scores, permitting an analysis of an individual's pattern or combination of abilities' (Kaplan and Saccuzzo, 2009, p. 16).

Charles Spearman in 1904 was the first person to formalise test outcome correlations between school subjects, suggesting that 'schoolhouse' ability could be said to be a 'general intelligence factor', which he called 'g' (Spearman, 1927). Spearman and others regard 'g' as a form of 'human intelligence'. Spearman's concept of being able to assess 'human intelligence' through formalised testing was developed further by John C. Ravens in 1936. Ravens developed the Ravens Standard Matrices Test initially for research purposes. His test could be taken irrespective of the reading, language and writing skills of those taking the test.

Raven found whilst doing his research that generally IQ tests were difficult to administer and to interpret as they were assessing a wide range of intelligent attributes. The focus of the ideas behind creating the Ravens Standard Progressive Matrices (SPM) was to have a test that was less time intensive and more focused. The SPM looks to test two discrete factors of Spearman's general intelligence 'g'; first to use stored information (reproductive ability) and second to think deductively (meaning making). These aspects of intelligence are called 'fluid intelligence' or 'fluid reasoning' originally identified by Raymond Cattell (1963). It is the ability to identify patterns and relationships using logic. Again, as in the First World War, this test became important to evaluate and assign army recruits to different roles. Unlike with the Binet-Simon intelligence test that had to be administered at an individual level, the SPM could be taken by large numbers of soldiers quickly. As the test could be taken irrespective of the reading, language and writing skills it was ideal as many at the time wanting to 'sign up' were illiterate and came from a range of educational backgrounds (Kaplan and Succuzzo, 2009). Interestingly the test is still used today around the world owing to the ease of administrating the tests and being able to take it independently of language ability and construct. For example mine owners in South Africa use the test to differentiate the workforce into different roles. Miners speak a number of different languages but the SPM can be carried out irrespective (Wicherts, et al., 2010).

2.2.2 The concept of multiple measures

The last section introduced the idea conceived by Wechsler that general intelligence could be tested looking at more than one concept. Research suggests that IQ as an only measure is limiting and that children from poor backgrounds do not fare well using this technique (Baldwin, 1985; Renzulli, 1978; Treffinger and Renzulli, 1986; Tannenbaum, 1983; Torrance, 1979). Sternberg (1982) and Gardner (1983b) have corroborated this stating that intelligence should be evaluated through a range of methods and therefore not relying on factor analytic psychometric measures such as IQ. It is now generally accepted that 'intelligence' cannot be measured through a single score. With Sternberg and Gardner's contribution came models that looked at giftedness from a multifactor construct

of abilities (Gardner, 1983b; Sternberg, 1985a; Calero et al, 2011). Others have also proposed that identification should engender multiple methods, informants and criteria (Ford and Trotman, 2000; VanTassel-Baska et al., 2007, Bélanger and Gagné, 2006; Campbell et al., 2007; Borland, 2008; Heller, 2005). It has been suggested that teacher nomination should be part of the multidimensionality owing to the unique position teachers' hold to observe students in different situations throughout the school day (Siegle, 2001). Two methods around identification are one that is structured using checklists and rating scales, the other answering open ended questions revealing the beliefs of the teacher around the concept of giftedness (Davis et al., 2011). Teacher rating scales have come under some criticism regarding the restrictions focusing on predetermined traits and behaviours (Borland and Wright, 1994) others state that these scales and criteria are important as without them the teacher relies on their own beliefs (Pierce et al., 2007; Siegle, 2001; Siegle, et al., 2010; Siegle and Powell, 2004). Research has shown teacher identification to correlate with 'high intelligence, high cognitive thinking, high potential' and other learning process factors such as 'good comprehension, good memory and advanced vocabulary' (Hernández-Torrano et al., 2013, p. 182). Teachers are more likely to focus on children who are good readers than those who do well in mathematics (Hodge and Kemp, 2006; Siegle et al., 2010). Those children who are able and willing to help other students, are self confident and are 'teacher pleasers' who do work neatly, on time' typically are more likely to be chosen (Davis et al., 2011, p. 69; Persson, 1998; Chan, 2000). Where teachers support students within their classroom environment it has been shown that this can lead to improved academic and social outcomes for the child. This in turn leads to better consequences around employment and achievement potential (Silver et al., 2005; Baker et al., 2008; O'Connor et al., 2011)

Peer nomination can be added to the multidimensional identification process and has been found to be an appropriate way to identify a range of students including minority and those who are culturally diverse (McCoach and Siegle, 2007; Campbell, et al., 2000; Cox and Daniel, 1983; Tongue and Sperling, 1976). Some research has shown there to be a statistically significant correlation between teacher and peer nomination (Kaya, 2013; Blackshear, 1979). However according

to Heyman and Dweck (1998) the nomination of one's peers may be more associated with some mutual beneficial goals or friendship links.

A system of identification ideally would also reflect its cultural characteristics and preferences (Mpofu et al., 2012; Sternberg et al., 2001; Sternberg et al., 2002; Sternberg and Grigorenko, 2002; Grigorenko, 2008; Heller and Feldhusen, 1986; Heller et al., 2000). Mandelman et al., (2010a) take this idea even further stating what needs to be reflected is consideration of economical, political, cultural and psychological dimensions related to gifted education in a specific country. During the 1970s 'theories of intelligence and creativity began to emphasize multidimensional constructs and the role of environmental influences' (Plucker and Callahan, 2014, p. 391).

The focus now turns to three main exponents – Renzulli, Gardner and Sternberg – who have 'broadened educators conceptions of what talent and giftedness can be and where it can be found' (Plucker and Callahan, 2014, p. 391). Each of the three theoretical approaches proposed by Renzulli, Gardner and Sternberg accentuate the importance sociocultural context plays when defining and identifying giftedness. Their influence on the field of gifted education began in the late 1970s with the publication of Renzulli's (1978) three-ring conception of giftedness, which was to become 'perhaps the most well known model in the field' (Plucker and Callahan, 2014, p. 391). Indeed the concept has been described as 'the most well known conception of giftedness in the US and possibly throughout the world' (Feldhusen, 1986, p. 33). It was also 'among the first efforts to make creative productivity a goal of gifted education' (Plucker and Callahan, 2014, p. 391). In 1983 Gardner published the 'Theory of Multiple Intelligences (MI Theory)', in his book *Frames of Mind* and Sternberg his 'Triarchic Theory' in 1988 (Sternberg, 1988). All three concepts – the three rings, MI and Triarchic theory 'appealed to educators who wished to expand notions about how students are considered to be gifted and talented' (Plucker and Callahan, 2014, p. 391).

2.3 Renzulli, Sternberg and Gardner multidimensional thinking around giftedness

2.3.1 Renzulli

Renzulli (1998, 2005) argues that the term 'gifted' should be used as an adjective rather than an noun and that it's about identifying developing talent rather than labelling students as 'gifted' or 'not gifted'. With this in mind Renzulli's theory suggests identifying a range of traits – schoolhouse ability, creativity and task commitment.

2.3.1.1 Renzulli Introduction

For over 40 years Professor Joseph S. Renzulli has worked in the field of gifted education. He has not only developed the theoretical ideas around gifted research but also simultaneously produced practical applications. This is contrary to most theorists who usually leave the practical applications to others (Renzulli 1999). As Renzulli states:

> 'I have never been content with developing theoretical concepts without devoting equal or even greater attention to creating instruments, procedures, staff-development strategies, or instructional materials for implementing the various concepts.' (Renzulli, 1999, p.4)

Through this practical work Renzulli feels that he has been able to add credibility to the theory and if required suggest future areas of research. This practical work has also kept him in touch with the grassroots i.e., children, teachers, parents and schools. This has helped him develop his three-ring concept into a practical intervention known as the Schoolwide Enrichment Model (SEM), which attempts to embed Renzulli's theoretical concepts more securely into the school curriculum. According to Renzulli (2005):

> 'we should therefore do everything in our power to make appropriate modifications for students who have the ability to

cover regular curricular material at advanced rates and levels of understanding' (p.253).

In order to support learners demonstrating schoolhouse giftedness Renzulli suggests curriculum compacting to accommodate advanced learners within a school programme. This idea of the Schoolwide Enrichment Model is explored more later.

2.3.1.2 Renzulli Three Ring Concept

For Renzulli (1978) there are three interlocking clusters of traits that creative productive people consistently show and these are above average ability (schoolhouse giftedness), task commitment, and creativity. Renzulli (1999) stated that he should have highlighted certain words in his original definition illustrating that it is not just the possession of such talents that is important but the capability of developing such talents:

> 'Gifted and talented children are those possessing or **capable of developing** this composite set of traits and applying them to any potentially valuable area of human performance.' (Renzulli, 1978, p.261)

The figure below sets out a graphic representation of the three-ring definition of giftedness initially proposed by Renzulli in 1978 (how Renzulli derived this concept is discussed more below). One of the rings Renzulli calls 'Schoolhouse' giftedness, defining this as test taking or lesson learning giftedness, typically correlating with IQ measures - 'students who score high on IQ tests are also likely to get high grades in school' (Renzulli, 2005, p. 253). This schoolhouse giftedness consists of status information, consisting not only of test scores, but also teacher ratings and peer recommendations (Renzulli, 1998).

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Figure 1 Graphic representation of the three-ring definition of giftedness
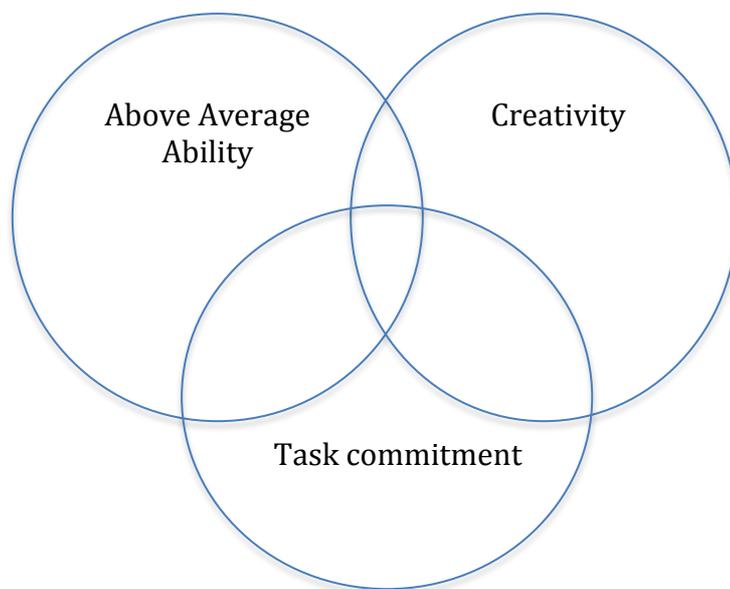
Task commitment forms another ring and according to Reis and Renzulli (1982) implies motivation, perseverance, endurance, hard work, dedicated practice, self-confidence, and a belief in one's ability to carry out important work. Renzulli suggest that those who populate the ring of 'tasks commitment' are more likely to become involved in particular problems or area of study and utilise the most appropriate form of human expression to communicate this. Personal traits of those committed to task are that they are self-confident with strong egos. They have the belief in their own ability to carry out important work being driven to achieve without the feelings of inferiority. Other characteristics include the setting of high standards for one's work; maintaining an openness to self and external criticism; developing an aesthetic sense of taste, quality, and excellence about one's own work and the work of others.

Finally, the creativity ring implies the originality of thinking, in conjunction with flair and originality. Testing for creativity is not a simple task however. E. Paul Torrance, as discussed below, was a key pioneer in the area of psychometric approaches to the study of human creativity. The Torrance Tests of Creative Thinking (TTCT) developed in 1966 has been translated in more than 35 languages (Millar, 2002). It is the most used and reference creativity test (Davis,

1997, Lissitz and Willhoft, 1985). Renzulli suggests that creativity could also be analysed through self-reports about creative accomplishment (Reis and Renzulli, 1982). Creative productive giftedness implies that children can be put to work on a problem that interests them and this can challenge their investigative activity (Renzulli, 1998).

The table below sets out certain traits as defined by Renzulli concerning ability, commitment and creativity. However 'the three ring conception of giftedness emphasizes the interaction among the clusters rather than any single cluster' (Renzulli, 1998, p. 32).

Table 1 Renzulli three ring concept

Ability	Task Commitment	Creativity
General Ability High levels of abstract thinking, verbal and numerical reasoning, spatial relations, memory, and word fluency; Adaption to and the shaping of novel situations encountered in the external environment; The automatization of information processing; rapid, accurate and selective retrieval of information. *Specific Ability* The application of various combinations of the above general abilities to one or more specialised area of knowledge or areas of human performance (the arts, leadership, administration). The capacity for acquiring and making appropriate use of advanced amounts of formal knowledge, tacit knowledge, technique, logistics, and strategy in the pursuit of particular problems or the manifestation of specialised areas of performance. The capacity to sort out relevant and irrelevant information associated with a particular problem or area of study or performance.	The capacity of high levels of interest, enthusiasm, fascination and involvement in a particular problem, area of study or form of human expression; The capacity for perseverance, endurance, determination, hard work, and dedicated practice. Self confidence, a strong ego an a belief in one's ability to carry out important work, freedom from inferiority feelings, drive to achieve; The ability to identify significant problems within specialised areas; the ability to tune in to major channels of communication and new developments within given fields; Setting high standards for one's work; maintaining an openness to self and external criticism; developing an aesthetic sense of taste, quality and excellence about one's own work and the work of others.	Fluency, flexibility, and originality of thought; Openness to experience; receptive to that which is new and different (even irrational) in the thoughts, actions and products of oneself and others; Curious, speculative, adventurous, and mentally playful; willing to take risks in thought and action, even to the point of being uninhibited; Sensitive to detail, aesthetic characteristics of ideas and things; willing to act on and react to external stimulation and one's own ideas and feelings.

Source: Renzulli (1998)

2.3.1.3 Development of Renzulli giftedness

Renzulli's three-ring concept grew out of his research on the nature of human abilities looking at a great range of case studies of people who had made great accomplishments, yet would not have been selected merely on IQ scores (Renzulli, 1978, 1982a, 1986). Renzulli first published the Enrichment Triad Model (Renzulli, 1977) and the Three-Ring Conception of Giftedness (Renzulli, 1978) in the late nineteen seventies. The development of the commitment and creativity aspects to three-ring concept could have been formed in Renzulli's mind at a young age as he recounts:

> 'Where did this idea come from? As early as elementary school I remember wondering about some of the differences among my classmates. Bob and Joan, for example, were good lesson learners and unquestionably the smartest kids in the school, but they never seemed to have any good ideas for addressing practical problems such as raising money for a class trip, starting a school newspaper, or coming up with some fun things to do for our school's annual variety show or field day. Then there were kids like Ronnie and Harold, clearly struggling learners so far as schoolwork was concerned, but by the time they reached eighth grade they were running a very successful bicycle repair business out of Ronnie's garage' (Renzulli, 2011 pp.306).

Renzulli goes on to say how this observation and others like it during his school and college days influenced his research. In later years he reports a fascination with biographies of well-know people and how these personal stories led him to the conjecture of the additional two rings of task commitment and creativity to the identification and classification of giftedness (Renzulli, 1982b).

2.3.1.4 Criticism of Renzulli's model

Renzulli's ideas challenged traditional orthodoxy in gifted research and the reaction to his work was mixed. For example Busse and Mansfield (1980) gave very positive approval writing their article 'Renzulli is right' published in *Gifted*

Child Quarterly. By contrast Jellen (1983) suggesting that Renzulli's work inferred a national disease in gifted education. Other 'misunderstandings' (Renzulli, 1999, p.9) and criticism of his three-ring concept continued with several papers (Jarrell and Borland, 1990; Jellen, 1983, 1985; Kontos et al., 1983). The criticisms mainly focused on the expansion of identification using not only IQ scores but other measures and multidimensional approaches. Renzulli addressed most of these misunderstandings stating that the resistance to his work in the early days was that in the late 1960s and early 1970s most gifted programs used single-criterion IQ scores as cut-offs (top 1% or 3.5%) to identify students for special programs (Renzulli, 1985, 1988c, 1990; Renzulli and Owen, 1983). It was also a time prior to the landmark theories of Robert Sternberg and Howard Gardner who also, like Renzulli, suggested new ways of identifying giftedness. Renzulli's idea was that children could possess these three key characteristics, however not necessarily all at a very high level. Such children could clearly be on a journey allowing their development of such talents. His critics of the time, he suggests, were not fully aware of this part of his definition and therefore argued – 'what about those children that are not gifted in creativity or lack commitment?' (Webb et al., 1982; Davis and Rimm, 1985; Gallagher, 1985; Maker, 1982). These critics were generally suggesting that Renzulli's theory failed to take into account the "gifted underachievers". This has been proven to be untrue, as was shown in one of the few intervention studies looking at how to counteract underachievement in gifted students by using the Enrichment Triad model (Baum et al., 1995). More recent criticisms around multiple criteria identification stem from the decisions that are to be taken around the combining of multiple measures (McBee et al, 2014). Where more than one assessment is to be taken into account questions arise around the use of cut off scores, mean scores or the use of 'and' or 'or' to identify students as gifted. This implies that the use of different models for combining scores from multiple assessments will favour some students over others. According to McBee et al, this in some cases causes false positives, when a non gifted child is identified, or false negatives, when a gifted student is not identified (McBee el al, 2014, p. 75).

Some suggest that creativity is superfluous to the gifted construct (Hunsaker and Callahan, 1995; Pfeiffer, 2003). Pfeiffer believes that creativity could be a personality characteristic, a cognitive style or a problem-solving strategy (Pfeiffer, 2002). Renzulli has also been criticized in that motivation, task commitment and creativity are all secondary considerations as they are not part of giftedness, but part of a talent development process (Van Tassel-Baska, 2005).

Critics state that there is a gap between gifted programmes and the development of gifted theory, which has been supported by empirical studies (Ziegler and Phillipson, 2012; Dimitriadis, 2016; Subotnik et al., 2011; Plucker and Callahan, 2017). Dimitriadis (2016) believes that there is little empirical evidence to support Renzulli's 'School Enrichment Model' (SEM), formally known as the 'Enrichment Triad' and the 'Revolving Door Identification' models. According to Dimitriadis (2016),

> 'without support from theory and research, a program for the gifted cannot achieve internal consistency, from goal setting to services to evaluation. It cannot provide proper evaluation, as it lacks a sound scientific base and reliable criteria; it cannot be transferable as a good practice example; and it cannot be defensible against common criticism, which often links gifted programs with "inequality" and "elitism"' (p. 222).

In agreement Subotnik et al., (2011) believe that the distinction between enrichment and acceleration is 'fuzzy' and that there is 'almost no formal evaluations of the effects' of enrichment programmes (p. 23). Setting out different models that have been adopted in schools in the United States around developing talent, they state that no comparisons of these models have been undertaken (including Renzulli's Enrichment Triad) using experimental studies in order to 'determine their relative effectiveness for developing talent' (p. 29). Indeed Ziegler and Phillipson (2012) question enrichments models believing that they do not focus on individual's learning competencies or motivation. Typically enrichment strategies may be ineffective as they are only implemented in the classroom on an occasional basis. This allocation of an inadequate amount of time

leads to ineffective implementation of the programme. However when the enrichment programme is a 'pull out' such as a Saturday or summer school programme there have been found to be positive academic effects (Kim, 2016; Steenbergen-Hu and Moon, 2011). The meta-analysis carried out by Kim (2016) does have its issues owing to a dearth of information around environmental and demographic variables, causing the interpretation of the findings to be taken with caution (Kim, 2016, p. 113).

2.3.1.5 Renzulli's Enrichment model

Renzulli's work around the three ring concept tends to focus on the effectiveness of interventions based on the model (Plucker and Callahan, 2014). However with colleagues Sally Reis and Linda Smith, the Revolving Door Identification Model attempted to validate the three ring conception (Renzulli et al., 1981; Renzulli, 1988a). This allowed for an action information component to be added to the identification process. Children initially identified as above average ability were then put in a 'talent pool' and were exposed to a comprehensive range of enrichment experiences. The responses to the experiences were then used to establish into the areas of study students should 'revolve', therefore providing them with more tailored advanced enrichment opportunities.

Once talented children are found then their talents need to be cultivated. The Enrichment Triad model uses a method called 'Type III Enrichment' to help develop gifted children. This practical method has its foundations in the philosophical areas of 'deductive' and 'inductive' learning. The deductive model being a standard formal learning environment, delivered through classroom lessons with students arriving at the perceived 'right answer'. The inductive model suggests a more natural chain of learning that is found in business/research when problems are tackled through project based working. This results in a write-up and presentation to peers. The inductive model project work does not have fixed outcomes and evolves over time and so fits Renzulli's view of 'Type III Enrichment' (Renzulli, 1982a, 1994).

Some of the key features of Type III Enrichment Renzulli (1999) states are:

a) Each learner is unique and so the learning experience should take this

   into account – abilities, interests and learning styles.

b) The role of enjoyment and how learning is more effective when students enjoy what they are doing.

c) Personalisation of learning and how learning is richer when students feel ownership.

d) Teachers' role as a supporting assistant to help on the journey of understanding and using methodological resources.

e) A focus on products and services is often seen by creative individuals as important as they wish to have an impact on a particular audience. Renzulli sees this point as important as he believes that this brings 'energy, task commitment, and even passion to their work' (Renzulli, 1999, p. 24).

Using these theories - 'three rings' and 'Type III Enrichment' - Renzulli with Reis (Renzulli and Reis, 1985, 1997) developed the 'Schoolwide Enrichment Model' (SEM). This SEM stage continues to the present day and attempts to embed Renzulli theoretical concepts more securely into the school curriculum. The SEM concept is intended to offer a board range of challenging and enjoyable enrichment activities for ALL students independent of abilities and learning styles. This is a research move by Renzulli to say 'we all have talents' and with good learning principles all students can achieve stating 'a rising tide lifts all ships' (Renzulli, 1999, p. 41). Renzulli (1992) also suggests that school programmes should attempt to respect individual differences of learners and one possible vehicle for this is through a 'whole school enrichment model' (Renzulli and Reis, 2014; Renzulli, 2012).

According to Renzulli:

  'there are very few educators who cling tenaciously to a 'straight IQ'
  or purely academic definition of giftedness. "Multiple talent" and

"multiple criteria" are almost the bywords of the present-day gifted student movement' [5].

Renzulli (1999) has stated that 'regrets...I've had a few' (p.15), saying that he would have liked to have spent more time researching how personality and environmental factors influence giftedness. Such work he speculates may have led him to propose another ring composed of interpersonal, intrapersonal (reflecting the work of Gardner, 1983b) and emotional intelligence (around the work of Goleman, 1995). As has already been stated Renzulli believes he is both a pragmatic and theoretical researcher. Hence he suggests that his three rings offer the main factors seen in talented children, yet with the recognition that there are a whole host of more minor factors that interplay to make the gifted whole (Albert, 1975; Albert and Runco, 1986; Simonton, 1978; Sternberg, 1984, 1985b; Delisle et al., 1982).

2.3.2 Gardner

Most theories of giftedness are connected to theories of intelligence. The g-theory is IQ over a particular threshold. Gardner defines giftedness as multiple intelligences where IG is recognised as a high level of performance in a particular domain. Gardner proposes the use of the term intelligence as a property that 'all' human beings possess. His hypothesis states that giftedness is typically associated with and identified by mathematics and verbal ability (Gardner, 1999). However 'giftedness' may be present in other fields such as music, dance and art hence the concept of 'multiple intelligences'. According to Gardner (1983b) 'I decided to call these faculties 'multiple intelligences' rather than 'assorted abilities' or 'sundry gifts'' (p. xi).

2.3.2.1 Gardner's Multiple Intelligence origins

In his book *'Intelligence Reframed'* Gardner discusses reasons behind the development of his Multiple Intelligence theory. He questions why, when he studied development psychology, it was thought that 'the career of science represented the pinnacles or "end-states" of human development' (Gardner, 1999,

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[5] Available from http://gifted.uconn.edu/schoolwide-enrichment-model/semexec/

p. 28). Indeed this beholden to scientific paradigms focused the route of the development of intelligence tests such as IQ.

From these initial thoughts he asked himself questions about what optimal human development means in society. Stating that an epochal event for him was to hear a lecture by the eminent neurologist Norman Gechwind on the counterintuitive affects of strokes and brain damage. He was interested at first in how the artistic faculties changed under conditions of brain damage (Gardner, 1983a). This work with children with brain-damage at Boston University Aphasia Research Centre and gifted children at Harvard's Project Zero (Krechevsky, 1994), led him to conjecture that:

> 'People have a wide range of capacities. A person's strengths in one
> area of performance simply do not predict any comparable strengths
> in other areas' (Gardner, 1999, p. 31).

This notion that we are a species exhibiting multiple intelligences Gardner first wrote about in his book '*Frames of Mind*'. He proposed that when studying human cognition, seven intelligences are a group of factors that should be considered.

2.3.2.2 Gardner's Multiple Intelligence theory
Initially Gardner identified seven forms of intelligence (Gardner, 1983b):
1. Linguistic – allows individuals to communicate and make sense of the world through language;
2. Logical-mathematical – enables individuals to use and appreciate abstract relations;
3. Interpersonal – recognise and make judgements about other people's feelings and intentions;
4. Intrapersonal – distinguish among their own feelings, to build accurate mental models of themselves and draw on these to make decisions about their own lives;
5. Bodily Kinaesthetic – allows individuals to use all parts of their body to create products or solve problems;

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6. Spatial – makes people able to perceive visual or spatial information, to transform this information and to recreate visual images from memory;

7. Musical – allows people to create, communicate and understand meanings made out of sound.

In 1999 he proposed an eighth intelligence – 'naturalistic' (the ability to discern patterns in nature and to use features of the environment). Others, such as Chapman (1998-2004) have highlighted an existence of a ninth intelligence – 'existential intelligence' - which encompasses 'spiritual' and 'psychic powers'.

2.3.2.3 Measuring Multiple Intelligences

The central thesis of Gardner's work on Multiple Intelligences (MI) is that any human is capable of achieving one or more of the seven (now eight) intelligences within the theory, although each one has an independent processing property that requires a different skill set to master. The practice of achieving one or more of the intelligences rests with the application of culturally-relevant learning stimuli that are exposed to children and adults who interact with activities that demonstrate such traits (Gardner and Hatch, 1989).

Gardner believes that the traditional standardised IQ test does not recognise all of the MI traits. For example to some degree linguistic IQ tests may include spatial elements like word searches and oral directions but they do not identify other Multiple Intelligences. Some have suggested pen and paper tests that are able to assess student strengths in each of the intelligences through a self report checklist design (Chan, 2006, 2008, 2010).

Although Gardner believes that self-reporting may have problems concerning reliability he does not totally dismiss such assessments of MI stating that:

> 'much can be learned about how people conceive of themselves, and through comparisons of response patterns found among and across different groups of subjects' (Gardner, 2011, p. xiv).

Alternative methods for measuring MI traits, according to Gardner, are more conducive and undertaken through observational and practical relevant tasks. For example in order to identify children with high spatial intelligence Gardner suggests a test involving children in a mechanical activity assembling and dismantling a meat grinder. This infers that the child's ability to remember spatial information is a good predictor of spatial intelligence rather than having them talk through how they completed the task. In this example, and to test one aspect of the MI theory, the suggestion is that the learning element is content specific and relative to what is described as 'adult end states' which broadly relates to the manifestations of MI skills commonly found in jobs and activities that adults perform at the highest level. Gardner and Hatch (1989) suggest children developing such skills are working on a problem that views the child, in this case, as a mechanic who applies necessary techniques to dismantle and re-arrange the equipment similar to the way a qualified adult engineer would rebuild a car engine. They suggest that identification methods for MI traits need to include 'appropriate materials' for testing, the taking into account of children's environmental experiences and prior exposures and the use of observational techniques to consider performance in various situations over time. When considering MI traits it is important, according to Gardner, to allow children to explore new learning domains they may not have encountered otherwise. This allows opportunity to discover new areas of learning that the child may excel at or become deeply curious about.

Indeed, Gardner developed his own assessment activities, introducing children to a wide range of activities and tasks. Project Spectrum was a nine-year research and development project based on Gardner and David Feldman's theories. During the course of the project assessment materials and curricular were developed which are described in detail in *The Project Spectrum Preschool Assessment Handbook* (Krechevsky, 1994). This approach identifies children's strengths and sets out individualised learning around these strengths.

2.3.2.4 Criticisms of Gardner's MI

2.3.2.4.1 Lack of validation

There is little to no validating data for Multiple Intelligences (MI) theory and therefore utilising MI to improve classroom learning some regard as questionable (Waterhouse, 2006a,b; Willingham, 2004; Klein, 1997). However, classroom application is regarded as one way of validating MI rather than through experimental methods as 'intelligence is not a tangible object that can be measured' (Chen, 2004, p. 22; Hoerr, 2003; Shearer, 2004). Waterhouse (2006a) rejects the claim that classroom validation provides evidence on two counts, first this assumes the validity of the intelligences and second this does not take account of the Hawthorne effect initiated by the intervention itself, which could discount any effect of MI. Klein (1997) states that MI theory is 'neither empirically plausible nor pedagogically useful' (p. 389). According to Willingham (2004) a theory of intelligence needs to be consistent with data. The data suggests there is *some* factor (g) that contributes to many intellectual tasks. MI does not include this factor.

2.3.2.4.2 Cognitive Neuroscience

Gardner (2004) asserts that the eight intelligences he has posited in his MI theory are 'consistent with how most biologists think about the mind and brain' (p.214). Each of the intelligences is brain based and operates from a separate area of the brain with neurological evidence supporting the thrust of MI theory (Gardner, 1999). However, multiple intelligences theory lacks adequate empirical support through cognitive psychology and cognitive neuroscience (Waterhouse, 2006a,b; Sternberg, 1994; Allix, 2000; Gardner and Connell, 2000; Sternberg and Grigorenko, 2004). Gardner (1999) believes that each of his intelligences occur via different sets of neural mechanisms and that each intelligence has its own separate neural processing pathway (p.99). Nevertheless according to cognitive neuroscience research, cognitive skills share brain-processing pathways (Koelsch et al., 2004; Norton et al., 2005; Lieberman, 2002; Adolphs et al, 2003; Morgane et al, 2005; Phelps, 2006). The majority of research shows there to be two large-scale information processing pathways or processing streams in the brain (Arnott et al., 2004; Himmelback and Karnath, 2005; Irwin and Brockmole, 2004). A more

recent study using MRI scans on 16 participants undertaking 12 tasks and collecting data from 44,600 participants online looked at how different functional networks in the brain were used during task tacking (Hampshire et al., 2012). As in other neuroscience research the findings show there are two main pathways, one component is heavily loaded around short-term memory and the other around logical rules. Hampshire et al., (2012) therefore state that their findings 'provide evidence to support the view that human intelligence is not unitary but, rather, is formed from multiple cognitive components' (p. 1233). As in previous research these processing pathways are not functionally isolated from one another and therefore do not support Gardner's assumptions that each intelligence has its own separate neural processing pathway (Waterhouse, 2006a; Klein, 1997).

2.3.2.4.3 Criteria for new intelligences – signs and talents

Gardner (2011) states there are eight 'signs' of an intelligence[6] and uses these criteria/signs upon which to set out his eight intelligences. However Willingham (2004) believes that only a majority of the criteria need to be satisfied in order for Gardner to prescribe his intelligence. Willingham states that the majority of 'signs' are easy to satisfy and most of the criteria are weak, thus many more 'intelligences' could be 'discovered' and 'defined' using the criteria as set out by Gardner. Indeed, 'the issue of criteria by which new intelligences are posited is crucial, and it is in the selection of criteria that Gardner has made a fundamental mistake' (Willingham, 2004, p. 22).

Gardner has renamed what others term talents, abilities or skills into intelligences (Calik and Birgili, 2013; White and Breen, 1998; Willingham, 2004). Gardner himself states 'call them all 'talents' if you wish; or call them all 'intelligences' (Walters and Gardner, 1986, p. 175) even saying that 'I am quite confident that if I had written a book called 'Seven Talents' it would not have received the attention that *Frames of Mind* received' (Gardner, 2011, p xi). Feldman (2003) has accused

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[6] Potential isolation by brain damage; The existence of idiots, savants, prodigies and other exceptional individuals; An identifiable core operation or set of operations; A distinctive developmental history, along with a definable set of expert 'end-state' performances; An evolutionary history and evolutionary plausibility; Support from experimental psychological tasks; Support from psychometric findings; and Susceptibility to encoding in a symbol system.

Gardner of using the term 'intelligence' to confront the psychological establishment that 'cherish IQ tests' (Gardner, 2011, p xi). Willingham (2004) accuses Gardner of using the term Multiple Intelligences in order to attract the attention of educators and this has lead to confusion among readers (p. 24).

2.3.3 Sternberg

Sternberg as a child suffered from test anxiety and therefore did not perform as well as he may have done. Believing in his own ability, Sternberg hypothesised that the tests did not reflect his true knowledge and ability. Thus his interest in the inability of a single test measurement to indicate true intelligence was nurtured[7].

It is of interest that Sternberg, within the literature, often uses the terms intelligence and intellectual giftedness interchangeably to present models of individuals' abilities and achievements (Sternberg, 1985a, 1985b, 1988, 1999).

Sternberg developed a model known as the Triarchic Theory of Intelligence (Sternberg, 1985a, 1988). He believes that intelligence is multidimensional and consists of high-level performance in analytical, creative and practical thinking. The triarchic theory consists of three intelligence parts - componential, experiential and contextual. Componential intelligence is reflected in IQ scores, experiential intelligence relates to novelty and creativity and contextual intelligence is about practical intelligence or having some kind of 'street smart' ability. Sternberg's Triarchic Theory of Intelligence formed the underpinning to his augmented theory of successful intelligence known as the WICS – Wisdom, Intelligence, Creativity, Synthesized (Sternberg, 1997, 1999 and 2005). The 'new' component suggests that 'wisdom' is the application of intelligence, creativity and knowledge towards a common good (Sternberg, 2003).

The theory is that creativity is needed to generate new and exciting ideas, but it is analytical intelligence that is required in order to assess if these ideas are good

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[7] www.psychology.about.com/od/profilesmz/p/robert-sternberg-htm

ones. One needs practical intelligence to execute the ideas and promote them to others and finally wisdom to ensure the ideas are being used for the 'common good'. Successful entrepreneurship requires successful intelligence (Sternberg, 2004). In a nutshell Sternberg states that WICS implies that individuals, especially leaders require:

1. 'To have a creative vision for how they intend to make the world a better place, not just for them, but for their family, their friends, their colleagues and others;

2. the analytical intellectual skills to be able to say whether their vision and that of others is a good vision;

3. the practical intellectual skills to be able to execute their vision and to persuade others of its value; and

4. the wisdom to ensure that their ideas represent a common good, not just their own interests or those of their friends and family' (Sternberg, 2004, p. 4).

Some criticise multiple dimensionality owing to the concepts within the construct not being equal attributes. For example with Sternberg's WICS (Wisdom, Intelligence, Creativity, Synthesized) model Koro-Ljungberg (2003) believes that the term 'synthesized', is not a coherent concept nor is it linguistically comparable to wisdom, intelligence and creativity. Synthesized shows how the concepts are connected and therefore is not a concept itself. The second criticism put forward by Koro-Ljungberg is that Sternberg's model is inconsistent epistemologically. That is wisdom and creativity are subjective, viewed from within, and are difficult to view objectively through a positivist and predictive stance. The criticism is that the WICS model presents an epistemological conflict where some of the concepts cannot be measured objectively and therefore there is not consistency with the epistemological assumptions (Denzin and Lincoln, 2011).

Successful entrepreneurs require a higher social competence compared to unsuccessful ones (Baron, 1998; 2000a, b; Baron and Markman, 2000). Sternberg was interested in the work of Baron and started looking at social competences associated with giftedness. For Sternberg social competence include:

1. Social perception (success and accuracy in perceiving others);
2. Impression management (inducing positive reactions in others);
3. Persuasiveness (the ability to change others' views or behaviour in the 'desired' direction);
4. Social adaptability (being comfortable in a range of situations).

According to Sternberg, entrepreneurs need to possess a balance of analytical (IQ-based), creative, and practical (tacit) intelligence: a 'strategic merger' of these intelligences. All three intelligences, Sternberg believes, can be developed through experience.

Sternberg devised a new battery of assessments termed the 'Aurora assessment battery' (for 10-12 year olds) which consisted of five modules - a group administered paper and pencil assessment, a parent interview, a teacher rating scale, an observation schedule and a self assessment. Each module considered memory, analytical, creative and practical thinking (Mandelman et al., 2010b).

Sternberg is one of the only gifted exponents who has carried out work in sub-Saharan Africa. His work in this regard is featured in the section on giftedness in Africa.

We have set out, in this chapter so far, a brief history and the development of giftedness testing and assessment. The focus then moved on to the more recent views of three of the main experts in this field – Renzulli, Gardner and Sternberg. Traditionally giftedness was measured through some form of IQ test and this was particularly the case during World War I and II. However, multidimensionality over rode the idea of a unitary measure. Renzulli's work and others, suggests that adding other dimensions, such as creativity and commitment, could enable a greater insight around the term 'giftedness' and 'intelligence' not only in the classroom but also in the workplace.

Gardner's MI theory can be tested using 'appropriate materials' working with children in small groups, observing and evaluating role-play around specific tasks. In Tanzania children would not have encountered such role-play in school. If the MI theory tests were carried out it would have had to been in Kiswahili. It was felt that this researcher, a realist and objectivist, carrying out a positivist research paradigm was not suited to such an investigation. Therefore an investigation into MI theory in a sub-Saharan African setting was not carried out for this project. However in order to utilise children's self perceptions of intelligences Chan's (2006) MI paper and pencil test (something the children would be more used to) was used as part of the investigation into identification strategies. Regarding Sternberg, his triarchic model, as in Renzulli's three-ringed concept, has ability and creativity as two of the components. Sternberg's ideas concerning the Aurora assessment battery are used in this research in order to investigate the schoolhouse ability ring. The testing for this was made up of four of the five components making up the Aurora assessment battery – group administered pen and paper tests, parent interviews, teacher ratings, and self assessment. Finally, it was felt that this researcher's philosophical position and research paradigm fitted well with Renzuilli's three ringed concept and its possible measurement in an African setting with poor children. Therefore a decision was made to explore further the testing of creativity and commitment through pen and paper tests. The next sections look at the development of ideas around testing for creativity and commitment, focusing mainly on Torrance and Amabile as this thesis uses their seminal work in an African setting.

2.4 Creativity and Commitment

2.4.1 Creativity

There are various definitions of creativity (Jensen, 1996; Treffinger et al., 2002; Rhodes, 1961; Gardner, 1993; Sternberg and Lubart, 1993). These definitions consider a range of traits including individual's behavior, personality, problem solving ability, knowledge, task focus, cognitive ability, past experiences and thinking styles. All are carried out within environments and societies (Treffinger et al., 2002; Rhodes, 1961; Gardner, 1993; Sternberg and Lubart, 1993; Runco and Nemiro, 1994). In more recent years a link has been identified between the

perception of creativity and its association with society's view of the quality of creative products generated by an individual (Csikszentmihalyi, 2000). One of the most important characteristics that distinguish people who are creative is that they often possess a desire and ability to work hard in their chosen profession. There is a link between work ethic and extrinsic motivation and one's creative accomplishment (Berry, 1981; Ochse 1990)

There have been many creativity tests, rating scales and instruments developed over the years (Hunsaker and Callahan, 1995; Kaufman and Kaufman, 1983; Kaufman et al., 2008; Plucker and Renzulli, 1999; Runco, 1999; Jensen, 1996; Hoepfner and Hemenway, 1973). Almost all of the earliest tests for creativity were focused on the ideas of divergent thinking (DT). Divergent thinking is often contrasted with convergent thinking (CT). Convergent thinking allows for only one or a limited few possible different solutions to a given problem whereas divergent thinking allows for many possible solutions to be explored fostering unexpected connections. Divergent thinking tests are the main method for research into creativity. However there are critics of divergent thinking who believe it devalues the role that problem solving takes in the creative process (Davies, 1973; Dombroski, 1979; Sternberg and Davidson, 1992). According to Runco (1991):

> 'the evaluation of the creative process has received very little attention. This is surprising because it is a vital component of the creative process, and is required whenever an individual selects or expresses a preference for an idea or set of ideas' (p.312).

Some of the earliest creativity tests include - Structure of the Intellect (SOI) divergent production tests (Guilford, 1967), Tests of creative thinking (Torrance, 1962, 1974), and tests on divergent thinking by Wallach and Kogan (1965) and Getzels and Jackson (1962). One of the most used and referenced creativity test is that developed by E. Paul Torrance (Hebert et al., 2002) who based his ideas around the work of J. P. Guildford (1950; 1967). Guilford (1950) described creativity as being grounded in the ability to manipulate ideas in fluent, flexible,

elaborate and original ways. He went on to propose the Structure of the Intellect (SOI) model, which was based on 24 distinct types of divergent thinking (Guilford, 1967). These 24 types are grouped into four categories Figural, Symbolic, Semantic and Behavioral, which are then subdivided into six areas: units, classes, relations, systems, transformations, implications. The Torrance Tests of Creative Thinking (TTCT) are based on many of the aspects of the SOI model (Torrance, 1962, 1966, 1967, 1972).

2.4.1.1.The Torrance Tests of Creative Thinking

Although Torrance based his TTCT around Guildford's SOI, his own definition of creative thinking is as:

> 'a process of sensing gaps, or disturbing, missing elements; forming
> ideas or hypotheses concerning them; testing these hypotheses; and
> communicating the results, possibly modifying and retesting the
> hypotheses' (Torrance, 1962, p. 16).

The Torrance Tests of Creative Thinking (TTCT) was developed in 1966 and measured fluency, flexibility, originality and elaboration, taken from Guildford's DT factors (Guildford, 1959). By 1998 the test had been updated and consisted of six sub-scores: fluency, originality, elaboration, abstractness of titles, resistance to premature closure and creative strengths. The test has been translated into more than 35 languages (Millar, 2002). It is the most used and referenced creativity test (Davis, 1997; Lissitz and Willhoft, 1985). Research has shown that TTCT scores are a good forecaster of creativity (Cramond et al., 2005; Cropley, 2000; Ferrando Prieto, 2006; Kim, 2006; Sawyers and Canestaro, 1989; Torrance et al., 1973; Torrance, 1981a, 1981b; Torrance and Wu, 1981; Treffinger, 1985; Torrance and Safter, 1999; Torrance, 2002; Clapham, 1996; Runco and Mraz, 1992; Runco et al., 2010). Howieson (1981) working on figural and verbal tests, revisited participants after a 10-year period and confirmed the predictive validity of the TTCT. Both Yamada and Tam (1996) and Plucker (1999) have re-analyzed data originally collected by Torrance (1969) and established that the TTCT index of creativity is a reasonable predictor of creative achievement in adults. Wechsler (2006) looked at creativity in a Brazilian population, also found an association

between creative achievement and verbal and figural TTCT scores. The literature also re-enforces the TTCT predictive ability of creativity, under the conditions where the samples are of high IQ children (Clapham et al., 2005; Hocevar, 1979a, 1979b, 1981; Ignatz, 1982; Milgram and Milgram 1976; Milgram and Hong, 1994; Renco, 1986; Cline et al., 1962)

2.4.1.2 Multi and uni dimensionality of creativity

An individual who provides rapid and novel responses can be said to possess a more innovative style of creativity. Those with an adaptive style give more detailed responses with a greater depth of thought (Kim, 2006; Puccio et al., 1995; Oliveira et al., 2009). Initially it was proposed by Kirton (1976) that a single dimension, which ranged from an innovative to an adaptive orientation, reflected a person's attitude to creativity, problem solving and decision making (Kirton, 1976; Puccio et al., 1995). This uni-dimensionality was first questioned and investigated by Kim (2006) who postulated that these could indeed be two separate dimensions (Kim, 2006; Kim et al., 2006). Using secondary data, Kim (2006) analysed data from the TTCT Figural Form A for 504 Grade 6 students (246 boys and 258 girls). Confirmatory factor analysis was conducted in order to test the fit of several different factor models in order to investigate the dimensionality of creativity. The results indicated that the best-fit model was a two factor one made up of an innovative factor containing fluency, originality and resistance to premature closure, and an adaptive factor made up of elaboration and abstractness of titles. All of the correlation coefficients between the variables were high, with the most correlated between fluency and originality (0.844). Subsequent research carried out by Krumm et al., (2014) in Argentina undertook a similar study with Spanish speaking children. The study was undertaken with 577 Argentinian school children ranging in age from 9 years to 14 years. Their findings showed that using confirmatory factor analysis a model of two correlated factors (adaptive and innovative) best explain creativity. The innovative factor contained fluency and originality and the adaptive factor elaboration, abstraction of title and resistance to premature closure. The findings show that frequency and originality are highly correlated.

Both Kim (2006) and Krumm et al., (2014) find that fluency and originality are

nestled within the same factor and that this is to be expected as those who possess a large number of ideas are more likely to be more original (Torrance and Safter, 1989). These two studies provide psychometric evidence to support that the creativity construct could be multi-dimensional consisting of two factors.

2.4.1.3 Creativity literature in Africa

Research on creativity in Africa is still in its infancy from the perspective of psychological testing as opposed to anthropological studies (Mpofu et al., 2004; Myambo and Mpofu, 2004). The fact that there is a rich heritage of creativity throughout Africa's history is not disputed. African art and sculptures are sold all over the world and feature in many of the great museums in the Western world. In sub-Saharan Africa the Nigerian government is leading the way in celebrating creativity, declaring the 14th September as National Day of Creativity in Nigeria. The national creativity awards are part of this celebration in order to acknowledge creative talents. In South Africa there is the South Africa Creativity Foundation (SACF) and the Global Creativity Network (GCN), which offer researchers and creative individuals support and advice. As a result of modernization in Africa and communities changing and evolving to meet the needs of Western style urbanization, successful societies require creative innovation and adaption. As colonial heritages diminish, ever growing numbers of Africans migrate to the cities to seek work mainly in retail and marketing (Bekker, 2001; Franchi and Swart, 2003).

However, in rural areas creative expression in Africa is still highly influenced by gender, with males and females having very different domains within their communities regarding creativity. For example among the Kung San of Namiba and Botswana, women are considered to be creative in embroidery and men in healing (Shostak, 1993). Religion and beliefs shape creativity. In Islamic culture creativity is not the creation of something new but looking at the way the past is explored. In traditional paintings and sculpture living beings cannot be illustrated; the use of geometric patterns can only be shown for decoration (Patai, 2002). Western styles of art are still not widely accepted in traditional Islamic art. These values are not held in traditional African religions such as Bantu, where animals

and humans are often found on ornaments, sculptures and painting. Cave paintings found in sub-Saharan Africa dating back thousands of years often show animals and humans. Christian religion does not impose any such limitations on creative arts.

Research into creativity receives mixed reviews. Innovation is seen as a social rather than an individual characteristic - innovative products and work being regarded as a social collective rather than the fact that individuals are being innovative (Khaleefa, 1999). It is the individual who is creative and the social group innovative. Alternatively it has been suggested that creativity in African settings is a collective rather than an individual characteristic (Oyowe, 1996; Mogaji, 2004).

Pencil and paper tests to measure creativity have been used by very few researchers (Khaleefa et al., 1997; Akinboye et al., 1989; Osam, 1998; Mogaji, 1999). The tests have included The Consequences Test (CT; Guildford and Guildford, 1980), the Alternative Uses Test (AUT; Guilford et al., 1978), the Creative Personality Test (CPT; Gough and Heilbrun, 1980), the Creative Activities List (CAL; Habibb, 1999), and the Adjective Check List (Gough and Heilbrun, 1980). The main findings of the work around creativity reveal the following issues.

Khaleefa et al., (1997) looked at the differences in creativity of school children in rural and urban Sudan. Their results seem to suggest that urbanization has a positive effect on fluency, with traditional Islamic education in the rural setting creating higher scores on verbal creativity. The work also suggests that modernization improves creativity relative to traditional rural settings. Osam (1998) tends to agree that urban settings have an influence on creativity finding that children (6 years to 12 years) who had been exposed to a greater amount of mass media tend to score higher in the tests of creativity. Studies in Nigeria show that highly creative school students are usually above average in academic performance but not necessarily the top students (Akinboye et al., 1989; Mogaji, 1999). The research interpreted this by suggesting that highly creative students may often wish to learn things that are of interest to them. Interestingly using the

'Alternative Usage Test' amongst Nigerian workers, females had a higher mean creativity scores than their male counterparts.

A large amount of creativity research in Africa is focused around literature and art, looking at criteria to judge the quality of creativity in literature. This is characterized by looking for adaptive flexibility, creative anticipation, closure and creative leaps (Ouarasse and Van de Vijver, 2004; Abdel-Hamid, 1998). This creative work in literature is naturally linked to performing arts and music, and how adaptions can be made in performance around choreography (Mogaji, 2004; Olaniyan, 2004). Olaniyan (2004) interviewed prominent musicians looking at their creative influences and how they evolve their music. The findings show that the musicians perform creatively moving around with the celebrants using unaccompanied vocal declamation, solo and chorus responses without the use of cumbersome musical instruments. Creativity was also shown in the compositions through the use of different time patterns, vocal techniques and group singing.

Throughout the literature there is a consistency regarding the belief that in Africa creativity is related to knowledge, intelligence and wisdom (Mpofu et al., 2006; Mpofu et al., 2004; Khaleefa, 1999; Khaleefa et al., 1997; Sternberg, 2003). In contrast in Western culture creativity is seen as distinct from other human abilities (Albert and Runco, 1999; Sternberg 2003). However, with increasing modernization and cultural shifts it is likely there will be a shift towards a sharing overlap with other human abilities. Creative innovation in Africa can be explained through social expression and artistic talent, thoughtfulness needs to be upheld in that these are contradictory and challenge Islamic customs. Adaptive creativity is best explained by the way one copes with the environment and tends to show itself in the creative expression of African communities (Habibb, 1999).

2.4.2 Commitment

A person's special fascination and involvement with an area of interest has consistently shown to be the 'precursors of original and distinctive work' (Barron, 1969, p.3). Task commitment represents the energy brought to bear on a particular task or problem or specific area of work. It is a focused form of

'motivation' that Renzulii (1986, 1988b, and 1999) labels task commitment as discussed above. That is a belief in one's own ability to carry out important work and how this can be applied to one's own area(s) of interest. Task commitment can be described as perseverance, endurance, hard work, dedication, self-confidence, belief in one's own ability to carry out important work and how these actions can be applied to one's area(s) of interest (Zuckerman, 1979).

2.4.2.1. Task commitment – extrinsic and intrinsic motivation

Task commitment can be divided into two motivation factors (Herzberg, 1966). The concept of engaging primarily in an activity for its own sake is called 'intrinsic motivation'. Intrinsic motivation arises and leads to action, when a person feels both self-determined and competent to pursue an area of interest, feeling both competent and autonomous (de Charms, 1968). On the other hand 'extrinsic motivation' is usually linked to the desire to obtain rewards, such as to satisfy a goal or obtain recognition (Deci and Ryan, 1985). Interesting Hennessey and Amablie (1998) suggest that:

> 'working for reward, under circumstances that are likely to occur naturally in classrooms and work places every day, can be damaging to both intrinsic motivation and creativity.' (p. 675)

The Work Preference Inventory (WPI) created by Amabile et al., (1994) is a short paper and pencil personality instrument to assess the various aspects of motivation. Looking at these motivation traits intrinsic and extrinsic motivation can be defined as follows:

1. Intrinsic Motivation – there are two secondary scales 'challenge' and 'enjoyment' and these can be divided into six categories *self-determination, competence challenge, task involvement, curiosity, enjoyment, and interest*;
2. Extrinsic Motivation – has two secondary scales – recognition and compensation – divided into five categories concerned *with competition, evaluation, recognition, money or other tangible incentives, and constraints imposed by others.*

Amabile et al., (1994) using the WPI with 1,363 undergraduate students over a four year period investigated the factor structure regarding student motivation. This was carried out in order to ascertain whether the scale (the WPI) is uni or multi-dimensional. The analysis showed a two-factor model as the best fit with the factors representing intrinsic and extrinsic motivation. These two motivations were shown to be distinct processes that are, at the primary level, orthogonal. Both the intrinsic and extrinsic factors could then be divided into two secondary scales. For the intrinsic motivation the secondary scales were called challenge and enjoyment. These were shown to be moderately correlated. For the extrinsic motivation the secondary scales were compensation and outward, again moderately correlated. In terms of correlation across these secondary scales the research found very low and mostly negative correlations.

Those students who scored highly on the intrinsic motivation section tended to express higher levels of interest in certain areas of academic study. The research also shows that there is no correlation between intrinsic and extrinsic relationship traits, but one does not undermine the other. Further work by Amabile using the WPI shows a causal relationship between intrinsic motivation and creativity (Amabile 1996). According to Amabile, the 'WPI motivation scores should be related to pencil-and-paper measures of creativity' (1994, p. 953). In the research she uses scores from the Creative Personality Scale (Gough, 1979) and shows that intrinsic scores correlate positively with creativity and extrinsic scores correlate negatively with creativity.

Cognitive flexibility and complexity in creativity are highest under strong intrinsic motivation (McGraw 1978). In contrast relatively algorithmic aspects of performance appear to be cultivated by extrinsic motivation. Research also shows that there is a positive reinforcing affect on intrinsic motivation by extrinsic factors that support one's sense of competence or that enable deeper involvement within a task. This is called 'extrinsics in service of intrinsics' (Collins & Amabile, 1999), with a person's high commitment towards a task seemingly to be a result

of this synergistic effect. Galton (1869, 1974) and Terman (1954) both state that task commitment is an important aspect of talent. According to Galton:

> 'By natural ability, I mean those qualities of intellect and disposition, which urge and qualify a man to perform acts that lead to reputation. I do not mean capacity without zeal, nor zeal without capacity, nor even a combination of both of them, without an adequate power of doing a great deal of very laborious work. But I mean a nature which, when left to itself, will, urged by an inherent stimulus, climb the path that leads to eminence and has strength to reach the summit - on which, if hindered or thwarted, will fret and strive until the hindrance is overcome, and it is again free to follow its laboring instinct.' (Galton, 1869, p. 33, as quoted in Albert (1975), p. 142).

Research findings by Roe (1952) and MacKinnon (1964, 1965) support the findings of Galton and Terman that the creative-productive person is far more task-oriented and involved in their work than are people in the general population, with MacKinnon (1964) saying:

> 'It is clear that creative architects more often stress their inventiveness, independence and individuality, their enthusiasm, determination, and industry.' (1964, p. 365).

Others have supported Roe and MacKinnon, notably Nicholls (1972) and McCurdy (1960), who show a similar pattern of characteristics regarding task commitment and creativity in gifted children. Factors related to task commitment consistently play an important part in the range of traits possessed by highly productive people. Deci and Ryan (1991) report that in several studies positive motivation is linked to a range of educational outcomes, such as 'doing more schoolwork' and 'staying on at school' (Daoust et al., 1988; Vallerand, 1991) as well as positive academic performance (Pintrich and De Groot, 1990; Lloyd and Barenblatt, 1984; Haywood and Burke, 1977; Andabwa and Poipoi, 2012).

According to Banfield (1970) hope as a word can be defined as a person's orientation towards the future. However, in relation to motivation and commitment hope is typically goal directed with links to extrinsic and intrinsic motivation. The direct influences that hope has on motivation towards effects on current mood and positive future scenarios is well documented (Husman et al., 2000; Presbury et al., 2002; Human-Vogel, 2006). The idea that despite your circumstances you can achieve your goals (Maddux, 2002; Maree et al., 2008) has relations to hope and self-efficacy. It can be said that self-efficacy 'operates through its impact on cognitive, motivational, affective, and decisional processes' (Bandura, 2006, p. 170) to give the confidence, belief and hope that the abilities we have can produce the results. Alternatively where self-efficacy is low then there is little confidence in a person's ability to be successful at achieving a particular goal (Maddux, 2005).

Sternberg and Grigorenko (2002) suggest that intelligence is dynamic and that it is about developing a set of skills to help in your life in certain area(s). Implying that someone can be 'gifted' in one domain but not in another. According to Sternberg (Sternberg and Lubart, 1995; Sternberg and O'Hara, 1999), intelligence is just one of six forces that generate creative thought and behaviour. These are intelligence, knowledge, thinking styles, personality, motivation, and the environment that forms gifted behaviour as when viewed from a creative-productive perspective.

In the classroom intrinsic motivation could be considered as goal mastery through understanding new skills and improving competence. Students learning in this manner have been shown to actively seek challenging tasks, continue to be persistent and show high intrinsic motivation (Ames, 1992). Looking at specific subjects, Gottfried (1985, 1990) found correlations with intrinsic motivation related to mathematics and reading. Extrinsic motivational attributes being shown through the alternative orientation, which is performance-approach goal, with the student's main objective to show competence and recognition (Meece, et al., 2003). However, in the classroom intrinsic and extrinsic motivation may not be bipolar constructs, there could be situations where these factors collaborate

(Harter, 1981). By looking at why a child prefers to engage reflects either intrinsic interest or extrinsic approval. Under some circumstances intrinsic and extrinsic motivation need not work in opposition. Research shows that children's intrinsic motivation toward schoolwork can be improved utilising external reward conditions (Deci and Ryan, 1985; Hennessey et al., 1989; Hennessey and Zbikowski, 1993). Similarly, motivation in school to achieve can also be described through goal orientation (Vedder-Weiss and Fortus, 2010).

Amabile et al., (1994) suggest that it could be possible to better understand and hence predict motivational behavior in a variety of social situations including school. In the school context scales of intrinsic and extrinsic motivation for the classroom have been designed in order to look at the interplay between intrinsic vs. extrinsic motivation through a range of contrasting self-perception questions (Harter, 1981; Lepper et al., 1973).

2.4.2.2 Commitment in Africa

The following section looks at research and studies that have considered the commitment and motivation of African students. The terms commitment and motivation are being used interchangeably here owing to the notion that task commitment, as considered in the research by Amabile (1996, 1998, 1998), can be divided into two motivation factors (Herzberg, 1966). Research in sub-Saharan Africa in the area of motivation and therefore commitment is limited to South Africa (Dass-Brailsford, 2005; Fraser and Killen, 2005; Fraser and Nieman, 1995; Sikhwari, 2007). Studies in motivation have tended to focus on either intrinsic or extrinsic motivation; only a few have considered both areas of motivation (Dass-Brailsford, 2005; Davis et al., 2006; Muller and Louw, 2004; Suki et al., 2011). Research has looked at how intrinsic and extrinsic motivation affects students' academic performance at the University of Cape Town (Suki et al., 2011). The findings show that there is a direct relationship between student's motivation and academic performance, with intrinsic motivation playing a more important role when it comes to explaining academic performance. Comparable results were found in other studies with similar groups of university students from other areas of South Africa (Davis et al., 2006; Muller and Louw, 2004). Looking at the KwaZulu-Natal of South Africa and ways at supporting resilience, goal orientation

and motivation has been shown to help township youth cultivate life skills and promote school learning (Dass-Brailsford, 2005; Donald et al., 2006; Kombarakaran, 2004; Malindi and Theron, 2010; Theron and Malindi, 2010). Goal orientation is one way of looking at motivation by students to achieve in school and gives an understanding of why and how they engage in academic work (Vedder-Weiss and Fortus, 2010).

A study looking at the motivation to learn science for disadvantaged students in Grade 12 within six township schools, found that motivation was goal orientated (extrinsic) rather than the desire to gain mastery (instrinsic) (Ramnarain, 2013). This finding, however, is not surprising due to the focus on passing tests in school, thus raising concerns around the rote teaching pedagogy that is often seen in developing contexts (Ramnarain, 2013). Other studies in South Africa have also found extrinsic motivation to take precedence. A study in Pretoria found that for grade nine students there was a greater extrinsic motivational effect but only for black girls and white boys. Interestingly black students were motivated significantly by mastery goals (intrinsic motivation) over other racial groups. The research suggests that this could be a legacy of the Bantu Education system where black children had been at a disadvantage (Schulze and Van Heerden, 2015).

The literature above illustrates how important motivation is when considering a child's schoolhouse ability as well as creativity. Much of the literature (Amabile, 1994, 1996, 1998; Roe, 1952; MacKinnon, 1964, 1965; Nicholls, 1972; Sternberg and Lubart, 1995; Sternberg and O'Hara, 1999) shows a positive association between creativity and intrinsic motivation. Indeed there is also a positive correlation between intrinsic motivation and mathematics and reading in children (Gottfried, 1985, 1990). Both intrinsic (mastery, challenge and enjoyment) and extrinsic (through goal setting) motivation are important for children to engage in a school setting (Vedder-Weiss and Fortus, 2010; Ames, 1992; Meece et al., 2003).

2.5 Giftedness - the poor and minorities

Poor and minority students are typically overlooked for gifted programmes owing to the limitation of low socioeconomic environments to support and develop

talented youth (Frasier 1987; Card and Giuliano, 2013; Campbell et al., 2007). Even in the USA, 'a disproportionate number of potentially gifted children of color, economic disadvantage, or both' are not 'adequately' provided for in gifted programmes (Pfeiffer, 2003, p. 165). Slocumb and Payne (2000) state that:

> 'We would like to identify more minority and poor students, but they just don't qualify. They do not meet our criteria.' and…. 'We did identify several minority and poor students, but they dropped out of the program within six weeks. We just cannot keep them in' (Slocumb and Payne, 2000, p.23).

In America throughout the 20th century, gifted education programmes have grown greatly now serving 7% of the population. Alongside this growth has been a debate over how to select 'gifted' children. In the 1970s critics argued that IQ tests were not sufficient and racially biased with Renzulli at the forefront of this debate (Renzulli, 1978; U.S. Department of Education 1993). More recently the work of Card and Giuliano (2013) shows that this is still an issue with only 3.6% of black and 4.2% of Latino students in America being selected for gifted programs as opposed to just under 8% of white children. This disparity occurs because fewer teachers and parents in poor areas recommend children to be put forward for gifted programmes, this is not so regarding children from the suburbs and wealthier communities (Card and Giuliano, 2013). Some research suggests the de-emphasisation of standardized tests when searching for potential giftedness amongst the economically disadvantaged (Borland and Wright, 1994; Borland et al., 2000). This research shows that focus needs to be on site-appropriate methods, observations, dynamic assessment and a concept termed best performance (Borland and Wright, 1994). Project Synergy, a research and development project from Colombia University, specifically considered nontraditional ways to identify potentially gifted students from economically disadvantaged backgrounds, to work with parents and teachers to allow for the development of potential and finally place those identified into gifted academic programmes. Card and Giuliano (2013) state that their 'study suggests that there is a lot of talent out there that people are missing' (p. 23). Some of the literature

documents that the main reason for the lack of minorities on gifted programmes links to racial issues (Miller 2004). However, there are a great number of studies that have found that generally children from all poor backgrounds are greatly underrepresented on gifted programmes (Bernal, 2002; Ford and Harris, 1999; Ford et al., 2002; Grantham, 2003; Lee et al., 2008; Worrell, 2007, 2009; Wyner et al., 2007; Ford et al., 2008).

The reasons for this are many and varied. Poverty plays a substantial role with poor parents' lacking the monitoring of their children's school progress in conjunction with providing cultural enrichment outside of school, such as attending concerts, visiting museums and eating in restaurants (Robinson, et al., 2002). It has been found that children from poor homes are less likely to benefit from parental story telling and support around literature in comparison to children from wealthier homes. This has been shown to affect poor children's literacy development (Aikens and Barbarin, 2008). It is suggested that families from poorer backgrounds have less time to participate in different activities. This could partly be to deal with the lack of financial resources and having to concern themselves with day-to-day basic survival issues (Sampson, 2002; Gottfried et al., 1994). Bloom (1985) finds:

> 'strong evidence that no matter what the initial characteristics (or gifts) of the individuals, unless there is a long and intensive process of encouragement, nurturance, education and training, the individuals will not attain extreme levels of capability in these particular fields' (Bloom, 1985, p. 3).

According to Kay (2000), 'children are simply much more likely to achieve success if they come from a certain type of family' (p. 151).

Findings in the late 20th Century indicate that the qualities of home life that promote achievement are similar, and are not dependent on income level if parents are willing and able to spend the time with their children (Bradley et al., 1987; Coleman, 1969; Murphy, 1986; Rosenbaum et al., 1988; Scott-Jones, 1987; Slaughter and Epps, 1987). The entire August 1988 issue of Ebony magazine gives

a number of examples of this. In particular the article by Brown (1988) 'Model Youths: Excelling Despite the Odds' that looks at reassessing support for talented youth in the black community in America.

There are a number of studies that indicate poverty has a damaging effect on child development (Bradley and Corwyn, 2002; Kamper and Mampuru, 2007; Powers, 1996) and a negative impact on school success and achievement (Kamper, 2008; Zorn and Noga, 2004). Children's cognitive abilities by the 3rd grade are typically lower for those who are chronically poor than those who have never been poor (Allhusen et al., 2005). Often these children from very poor homes have no space in their house to do homework in peace and quiet (Kamper, 2008; Kamper and Mampuru, 2007). In these homes there are usually no books or other reading materials and the culture of education itself may be poorly understood (Gorski, 2005; McLoyd, 1998).

These factors naturally impact on motivation. Studies suggest that student's personal beliefs about their own capacity and self-esteem impact greatly on motivation and hence learning in school (Gwirayi and Shumba, 2007; Aldridge et al., 1999). Caring and competent teachers are also key to supporting this self-esteem giving students the belief that they 'can do'. This is shown in the work of Garcia-Reid et al., (2005) with vulnerable street children.

Despite these negatives there is also evidence that poverty can have a very positive effect on resilience, making some children who experience extreme poverty during the first five years of schooling determined to complete their schooling (Horning, Rouse and Gordon, 2002).

In a study in South Africa with different ethnic groups (White, Black, Coloured and Indian) of students looking at the correlations between hope and motivation, it was found that the way hope functions differed by ethnic group, with black students being typified as very hopeful (Maree et al., 2008). Hope as a concept was also found to correlate highly with motivation and finding ways to achieve goals.

Student's aspirations are closely linked to the concept of goal-attainment and hope alluding to multidimensionality of the construct (Ciarrochi et al., 2007). In South

Africa it has been found that inequalities in adolescents' aspirations exist with 14.5% of Coloured people believing they are unable to achieve their aspirations as opposed to 8.6% of Blacks, 3.2% of Whites and 2.3% of Indians (Leoschut, 2009). In a study in Cape Flats, Cape Town looking at children's aspirations and expectations it was found that adolescents from low-income environments had high aspirations for themselves (Hendricks et al., 2015). The study also demonstrates the predictive utility of self-efficacy in relating to aspirations of these disadvantaged adolescents in Cape Town. This supports previous research that stronger perceived self-efficacy correlates to higher aspirations (Bandura, 1997; Bong and Clark, 1999; Bong, 2001; Bandura, 2001; Bandura and Locke, 2003; Boxer et al., 2011; McKay et al., 2012; Sawitri et al., 2014). It is also interesting to note that a study from Zambia, that considered multiple intelligences, found that girls gave higher estimates about their abilities than males (Furnham and Akande, 2004). Also in South Africa when considering the ratings of white and black South Africans, whites were more likely to rate their relatives more highly when asked to rate where they believed their own and child's intelligences lay on a normal distribution curve (Furnham and Akande, 2004).

2.6 Research in Africa

There is little research that has been carried out with poor children living in slums or low-income areas of sub-Saharan Africa regarding the identification and nurturing of giftedness. This part of the chapter sets out what does exist. It starts by looking at issues regarding testing (associated with Renzulli's schoolhouse ring) with a focus on the cross-cultural transferability, not only of tests, but the standardising scoring. The next section is divided into different African country research. The first sets out that undertaken in Zimbabwe regarding how intelligence is viewed in different cultures. The second from Kenya again looks at 'practical intelligence' vs. 'schoolhouse intelligence' and questions what the meaning in such a setting is regarding intelligence and giftedness. The third part considers Botswana and how tests specifically designed from an African setting might be developed. The final parts look at the research that has been carried out in the areas of creativity and commitment (Renzulli's other two rings) and

highlights the small amount of research that has been carried out in these areas in an African setting.

2.6.1 Scoring and achievement in gifted tests by African children

Reviews of the literature conclude that the average IQ of Black sub-Saharan Africans lies below 70 (based on western norms and conventional IQ tests) (Lynn, 2003; Lynn and Vanhanen, 2002, 2006). Indeed 'it has been suggested that Black Africans living in non-Westernised settings might score relatively poorly on conventional tests for intelligence' (Sternberg et al., 2002, p. 157). Using a systematic literature review others such as Wicherts et al., (2009) believe the figure is somewhat higher when using the Draw-A-Man (DAM) test, Kaufman-Assessment Battery for Children (K-ABC), or the Wechsler scales (WAIS and WISC). The suggestion here is that the average score for children from sub-Saharan Africa rises to around 81.8. Wicherts et al., (2010) carried out a systematic literature review of selected published data on performances of the Raven's Progressive Matrices (RPM) and the Coloured Progressive Matrices (CPM) in sub-Saharan African countries. In the West, both tests are generally accepted as good predictors of '*g*' and these predictors are now being examined in African countries in a plethora of work. The authors' specific aims were to estimate the average IQ score of Africans who have taken the test and to investigate a 'Flynn Effect', that is, whether IQs are improving across Africa. They include studies from multiple African countries that justify inclusion by selecting those that confer to the rules administered for both SPM and CPM tests, sample sizes representable of populations (including local and national) and studies that have no specified time limit for test users. They use another review investigating the same criteria conducted by Lynn and Vanhanen's (2002) *IQ and the wealth of nations,* critiquing their methodological approach for not justifying how studies were selected and why some studies with small sample sizes (not representable of country populations) were featured in their analysis. The major finding shows a disagreement with Lynn and Vanhanen (2002) in relation to IQ in sub-Saharan African countries. The authors in their analysis suggest IQ scores in Africa (based on RPM and CPM) are somewhere between 78 (UK standards) and 80 (US standards), 11 IQ points higher than Lynn and Vanhanen (2002) reported.

The study also investigates the reliability of the Raven's test based on African samples (countries include Nigeria, Ghana, South Africa, Congo, Kenya, Uganda and Zambia) suggesting a high level (.80) of concordance in line with what is found in Western studies. However, they report that the retest reliability conducted after 6 months (.59) is quite low and concurs with the literature. Interestingly, from the studies cited there exists a positive rank order of reliability and publication date, that is, reliability improves with newer published studies.

Convergent validity was also investigated and reported as being low in comparison to British samples. However, they point to 16 studies that demonstrate some significance of the value of SPM and CPM measures within African–only educational settings. The studies included have a range of scores from low to moderately high, but all positively report SPM and CPM as being predictively valid. For example, Sternberg et al., (2001) examined children in rural Kenya found a moderately weak correlation of CPM in English and Math achievement ($N = 85$, $r = 0.19$), and in the same study reported significantly negative correlations for practical intelligence (tacit knowledge). For the latter, although quite low, the authors do suggest the existence of factors loaded on achievement and the SPM/CPM tests. One relatively high correlation included the work by Maqsud (1980) who examined boys from a Nigerian primary school reporting a significant correlation of SPM on English and arithmetic ($r = 0.59$) tests scores. However, the authors adopt a cautious approach when considering both Ravens tests including the Advanced Progressive Matrices (APM) and their predictive associations on educational outcomes.

Some question whether IQ scores of Africans are valid. Indeed can such tests developed in Anglo-centric contexts ever be applicable in an African setting? This is considered more fully later in this chapter (Sternberg et al., 2002; Mpofu and Ortiz, 2009; Mpofu et al., 2012; Mpofu et al., 2014). Are such testing regimes and comparisons a continuation of the cultural imperialism of testing regimes and schooling frameworks? The differences between rural and urban settings are therefore considered in detail below (Ngara and Porath, 2004, 2007; Serpell,

1977, 1993a, 1993b; Sternberg et al., 2001). Some doubt the ability to compare scores to western samples especially when interpreting 'g' (Barnett and Williams, 2004; Ervik, 2003; Hunt and Carlson, 2007; Hunt and Sternberg, 2006), however, others consider this unproblematic (Herrnstein and Murray, 1994; Lynn, 2006; Rushton and Jensen, 2005).

Klingelhofer (1967) used the Ravens Standard Progressive Matrices to test 3,692 secondary school children in Tanzania. These children were made up of different Tanzania tribes as well as Asian children living in Tanzania. The findings show that when looking for any significant difference in scores there were none between different Tanzania tribes or Asian community sub-groups. However, considering differences in mean level Standard Progressive Matrices scores there was a significant difference between all African and all Asian pupils. Reasons suggested for this included cultural factors, such as Asian students living in town, starting school earlier and from literate families. Another suggestion is that in Asian languages compared to Kiswahili there are terms such as 'divergence' and convergence' which assist with some concepts used in the Progressive Matrices tests, but such concepts don't exist in Kiswahili.

> 'The India languages are apparently more effective and economical in dealing with these complex abstract notions and represent an additional cultural factor which is probably involved with the PM scores' (Klingelhofer, 1967, p. 212).

The data also show a statistically significant inverse relationship between age and score, possibly showing that older children in their grade are late starters or slower learners.

Different explanations have been given for this including genetic differences (Herrnstein and Murray, 1994), cultural differences in interpretations of test questions (Cole et al., 1971), that cognitive tests scores are influenced by the amount of schooling and therefore when children profit less from their school environment (such as in Tanzania government schools) scores will be lower (Ceci

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and Williams, 1997) and that static testing focuses on developed ability that children in difficult circumstances may not have had an opportunity to 'develop' (Sternberg et al., 2002). Children who are not familiar with tests (not test-wise) concerning content and or format may not perform as is their capacity in static testing.

Sternberg et al., (2002) suggest that African children taking 'conventional' western IQ tests may not be correctly identified owing to them being unaccustomed to the methods or unfamiliarity of taking such tests (p. 142). Thus they suggest 'dynamic' testing as opposed to 'static' testing. Dynamic testing implies measuring the 'psychological processes involved in learning and change' (p. 143) along side feedback from the examiner after each task so providing a two-way interactive relationship between examiner and examinee. Static testing examines pre-existing skills where feedback is not provided during the test and where the relationship remains neutral between the examiner and examinee (Humble et al., 2016).

Using the concept of dynamic testing Sternberg et al., (2002) tested 458 children in standards 2-5 in rural villages near Bagamoyo, Tanzania. 358 were in the experimental group who experienced dynamic testing and 100 in the control group who experienced static testing. The hypothesis was to investigate whether dynamic testing exposed the mental abilities of children more than the static testing. The tests/tasks included syllogisms as well as sorting and twenty questions. Children were given a pre-test and a post-test. Those in the experimental group benefited from an intervention teaching cognitive skills and strategies that contribute to greater success of the specific test(s) (pretest-intervention-posttest design). The control group had no intervention. The intervention was less than an hour per task. The intervention was not specifically on the post-test but on skills that could be used to help understand how to carry out the test more efficiently and effectively.

The findings reveal that the experimental group improved more than the control group from pre to post testing. Ranking order also changed. The correlation

between pre-test and post-test for the experimental group was weak. The control group correlation was substantial and significantly higher than the experimental group. The research however suggests that dynamic testing is a supplement to static testing but not a substitute.

Other studies in Africa have used the Goodenough-Harris Draw-a-Man test (DAM: Goodenough, 1926; Harris, 1963; Badri, 1965a, 1965b; Fahmy, 1964; Hunkin, 1950; Richter et al., 1989; Bakare, 1972; Bardet et al., 1960; Minde and Kantor, 1976; Nwanze and Okeowo, 1980; Ohuche and Ohuche, 1973; Skuy et al., 2001). However administrating this test has been found to be problematic when children find it difficult to conceptualise their own image or have little experience of the use of drawing/writing implements. Points are also scored for clothes. Where children in rural areas of Africa do not wear clothes then it is difficult for them to score points for this (Wicherts et al., 2009).

Kathuria and Serpell (1998) set out a new framework for assessment of intelligence using a culturally relevant test, the Panga Munthu Test (PMT) ('build a person' test). The test is mediated through clay modelling (previous studies included wood). The test was randomly given to children (n=1,696 male, n= 1,527 female)) from grades 1-5 in urban and rural school settings in the Zambia. A 25-point likert statement was used to assess the likeness of each of the participant's models. Typical items on the likert would be- *'Head and body distinguishable'* and *'eyes: two eyes must be present'.* A binary score of 'yes' or 'no' was rated against each statement, which helps to reduce marker bias or potential ambiguity. The authors mention the benefit of this test based on the fact that some children may not use a pen and pencil in rural areas, they also make connections with children who do not attend school and therefore may not have access to such tools. Nevertheless, the test itself is similar to Goodenough (1926) 'draw a man' assessment that has been standardised in India, China and Germany and is often used to measure intellectual maturity and intelligence in younger children. It is championed because of the cultural appropriateness and distinctive form of humans and its universal appearance.

ANOVA of PMT scores using gender, grade and residence were used that had significant effects for grade (means grew as children matured) but no effects for residence. Gender was slightly significant with females surpassing males in the first grade and the other way around in the other grades. Multiple regression analysis was also conducted and found grade as the biggest predictor of PMT scores. The results suggest that these measures are not related to school success and that children using materials they are familiar with (in this case clay) can also perform well. The study has implications for identifying intelligence and generalised learning by a) incorporating localised instructional media relative to socio-cultural backgrounds and b) involving teachers, peers and families in this process.

This section has illustrated that there are different factors that need to be taken into account when applying western tests to African communities. These include cultural norms, environmental factors, language, and the expectations that pre-existing skills allowing the test to be taken in a way to make it meaningful have already been developed. The chapter now moves onto to look at research in different African countries and takes these issues further.

2.6.2 Culture and giftedness

Certain forms of giftedness are universal while others depend on the nature of culture. Culture is important when considering giftedness as it reflects 'people's way of life, their unique practices, beliefs, attitudes, communication styles, customs, rituals and values representing their worldview' (Ngara and Porath, 2004, p. 195). Studies by Ngara and Porath (2004, 2007) used questionnaire narratives with sixteen Zimbabwean teachers around Shona culture and thirty Zimbabwean teachers of Ndebele cultural background to investigate views on giftedness within Shona and Ndebele cultures. In Zimbabwe 80 per cent of the population come from the culture of and speak the language of Shona and 15 per cent are from the Ndebele language and cultural group. What transpired was that in Shona culture giftedness was seen as an unusual ability, which was blessed in an individual through ancestry allowing expertise to be performed even in challenging areas. In Ndebele cultures giftedness was regarded as an unusual

outstanding ability blessed from birth, which then displays in extraordinary performances and expertise, which include creativity and inspirational power.

Shona intelligence reflects logical reasoning, foresight, rationality, scepticism, vigilance, alertness and cautiousness (Mpofu, 2004). Mpofu (2002) found that Zimbabwean college students stated that intelligence consisted of five areas:

- Interpersonal relations/expertise (indigenous view of intelligence including empathy and a social spirited view of intelligence);
- Planning, decision making and problem solving;
- Resource management and utilisation;
- Education (cognitive or academic success – modern view) and local culture;
- Work and productivity.

The research found that in Shona and Ndebele the definition of giftedness included those set out in the tables two and three.

Table 2 Shona and Ndebele definition of giftedness

Shona definition of giftedness	Ndebele definition of giftedness
Something special giving selectively	Something selectively given to individuals
Ability or aptitude for performing some task	Inborn/ability or aptitude (like father like son)
Inborn/present from birth	Outstanding ability/excellence
Outstanding, unusual, rare, special	Unusual, unique, and amazing competence/expertise
Involves expertise, excellence	Creative/artistic/performances
Reflected in skilled tasks.	

The attributes or characteristics of giftedness were stated as shown in Table 3.

Table 3 Attributes/characteristics of giftedness

Shona	Ndebele
Succeeding where most people fail/excellence	Wisdom/great wit and foresight
Ability to outwit others, smart talk	Succeeding where others fail/excellence
Craft literacy	Creative/strategist/cunning/capacity to solve problems
Awesome expertise	Unique, artistic/stylistic and amazing performance
Motivation/energy	Ability to learn fast
Humility/introversion	Awesome craftiness and expertise
Ability to learn fast/develop fast	Perseverance/great endurance and brave person
Visionary, insightful/expert	Early acumen and interest in a domain
Perseverance	

The first set of definitions for the Shona culture seems to point to practical intelligence and the second set successfulness. The research also found that giftedness is both biological and spiritually blessed correlated with the individual's ancestors. Gifts are entrusted in an individual for the good of society. Boasting about one's gift is definitely discouraged. It is thought that spirits can curse you and take a gift away. It is interesting to note that in Shona folklore it is the humble, quiet and despised person who typically turns out to be the hero (Tortoise and the Hare for example). Shona culture believes that gifted achievers start from humble beginnings and fight their way up to greatness against all odds (Ngara and Porath, 2004). One needs to find their gift and use it to benefit all around you.

The definitions for the Ndebele culture is that it is unusual outstanding ability blessed from birth, which will allow competencies and creative expertise. Regarding the attributes and characteristics of giftedness then in the Ndebele culture it includes how the individual applies strategies, cunning and ingenuity to gain success. Success then is an indicator of possible gifts in an individual.

Mpofu et al., (2012) agree that concepts of giftedness are based on what is socially meaningful. Giftedness or the assessment of intelligence is built on local, social and environmental conditions. When adults (with no formal schooling) in rural Chewa in North Eastern Zambia were asked which children they believed displayed intelligence they chose children who could carry out tasks and errands within their village community (Serpell, 1977, 1993b). Intelligence in rural Chewa was made up of four indigenous constructs where wisdom and aptitude account for cognitive aspects and responsibility and trustworthiness social aspects of intelligence:

1. nzelu (wisdom),
2. chenjela (aptitude),
3. tumilika (responsibility)
4. khulupilika (trustworthy).

Again the children's performance in this idea of intelligence did not correlate with their school achievement.

Mpofu et al., (2012) believe that Wechsler's first definition of intelligence that is 'the ability to think rationally, act purposefully and deal effectively with one's environment' (p.14) is closely aligned with that in sub Saharan African cultures.

This reminds us how narrow the definition of intelligence has become and focused on school-related behaviours minimising its social significance. One of the key qualities that define human ability in the African context is social responsibility or social interest. Giftedness is regarded as serving social interest values.

2.6.3 Practical intelligence and academic intelligence

Sternberg et al., (2001) tested 85 children in a rural village in Western Kenya in order to consider if academic and practical intelligence (tacit knowledge) are separable and are distinct constructs. The hypothesis is that measures of both kinds of intelligence are important in a number of situations. In order to test this the children aged between 12 and 15 years took tests in their tacit knowledge (dependent variable) regarding natural herbal medicines that could be used to fight indigenous illnesses. Tests were also taken on intelligence and achievement as well as data gathered on the children's background in order to control for socioeconomic status. These tests were the Dholuo vocabulary scale, English Mill Hill Vocabulary Scale, the Raven Coloured Progressive Matrices an English achievement and maths achievement test. The results showed that there was either a trivial correlation between academic and practical intelligence or there was a significantly negative correlation. The hypothesis states that 'conventional ability' tests on their own might tell us substantially less that if we knew about people's competence in practical situations within their daily lives.

The 'practical' intelligence test was based around natural herbal medicines that the children often use to treat themselves and others, sometimes with or without parental involvement. Initially the test had 30 stories, each giving a scenario of an illness or manifestation and the options of how to treat the illness were given. Correct, incorrect and false positive answers were options. False positive answers gained a negative score.

The results showed that the tests used to highlight academic intelligence were positively and significantly correlated with each other as well as with age. However the practical knowledge test was negatively correlated with all of the tests for academic intelligence along with socio-economic status (SES). After controlling for age and SES the negative correlation between tacit (practical) knowledge and English test scores remain but there is a trivial correlation of tacit knowledge with maths achievement. But it is difficult to gain much from this research owing to the very small sample size and it taking place in just one village.

However the idea is interesting concerning the difference between practical and academic intelligence.

The same team (Prince et al., 2001) also reports in *Anthropology and Medicine*, which goes into more depth about the testing of the children around their knowledge on herbal and pharmaceutical medicines. The research looked at children's knowledge and perceptions of illness and medicines. Children drew maps of their village indicating where they could buy pharmaceuticals as well as citing where plants and bushes could be found that had healing properties. Tables were completed concerning the children's knowledge on herbal medicines, the illnesses treated, the part of the plant used and the method of preparation. Medicines also were asked about, in a similar manner, including dosage and administration of the drugs. The overall findings were that children knew about herbal remedies but had little knowledge about correct dosage. Their knowledge was learnt informally as part of their everyday life. The practice of passing on knowledge of herbs from one generation to the next through grandmothers and mothers is cited. Within this Luo community (Grigorenko et al., 2001) four terms were referenced when talking about intelligence:

1. Rieko (smartness, power, competence);
2. Luoro (considerateness, obedience and willing to share);
3. Winjo (appropriate respect to adults, elders and authoritative figures);
4. Paro (innovativeness, creativity and task persistence).

This idea again shows that multiple intelligences not only exist in a western setting but also in different African cultural environments. Therefore a single test cannot be used to identify such intelligences but required a multi-identification process.

2.6.4 Test Development

Mpofu et al., (2014) set about to construct a testing framework, through a partnership with teachers, learners and parents. The study was located in Botswana and had the goal of producing tests that were co-created as part of the wider social system. They adopted interpretive research methods to identify goals

that would be mutually accepted and then tested under the agreed framework. Firstly, learners, NGO's, educators and professional school counsellors, education program officers and parents were invited to attend a concept-mapping event. This method encouraged the participants to talk about their experiences. These were ranked and quantitative techniques applied that were later developed into descriptive maps based on the popular emergent themes. Then, respondents were asked to think about a testing framework that could be used in Botswana schools in order to address the learning needs of students. The respondents were asked to list ten phrases or statements that the framework should address. These statements were provided to the participants in a randomly mixed order and discussed within the group. The goal of this exercise was to comprehend and clarify the meaning of the statements among the participants. Then, upon completing this clarification process, three members of the project team edited the statements to remove duplications, resulting in 100 unique statements that then were printed on cards.

A sorting and rating task was then setup. Each participant was given all 100 cards, numbered from 1-100, they were asked to sort them into clusters based on their similarity in meaning, followed by a rating of importance for the development of the framework. During the sorting phase, participants were asked to cluster the statements into piles in a way that made sense to them and then to record the numbers for each statement to indicate those statements that were grouped in the same cluster. Participants were also asked to individually provide short descriptive labels for each of their clusters based on their interpretation of the cluster's perceived core meaning. During the statement-rating phase, participants rated each statement to its importance mapping a framework for test use in schools using a 5-point Likert-type scale (1 = relatively unimportant).

The results reported that educator's preferences included guidance and learning attainment with aptitude testing considered higher rather than social and personal development factors. However, for school counsellors, preferences for test usage for personal and social development were found to be the opposite of what educators reported. Furthermore, learners and parents expressed

preferences that linked knowledge transition from teachers to students. An obvious point but the study reported that perhaps one of the reasons for this is due to the student-teacher/counsellor relationship which is stronger under a unified framework that operates in knowledge partnership and goal creation. The study infers the importance of test creation in developing worlds through partnership between schools, communities, learners and personal/social development factors.

2.7 Conclusion

In this chapter a wide range of literature has been explored, from the meaning of giftedness, its association with intelligence and the development of its measurement. A brief summary of the main theories proposed by three of the leading exponents who have broadened the concept of giftedness - what it can be and where it can be found – were set out. As this research focuses on the application of Renzulli's concept in a poor sub-Saharan African setting the chapter moves on to look at the research that has been carried out to explore the theory, structure and testing of creativity and commitment. These are two of Renzulli's rings, the other being schoolhouse giftedness/ability. The next part considered why the poor are often overlooked, offering some possible thoughts as why, when selection is taking place for gifted programmes. Finally the chapter ends by looking at various aspects that have been researched in African settings: first the use of tests and their cross cultural transferability; second how intelligence is viewed in different cultures; third linking with cultural meaning the differences between practical and academic intelligence and fourth the development and designing of specific tests for Africa.

Chapter Three: Methodology

3.1 Introduction

The last chapter set out the relevant literature around the identification of talented or gifted children. This chapter considers the research methodology. It is crucial to describe the methodology of a research based inquiry in order to consider the assumptions, principles, and procedures (Schwandt, 2007) that have been utilized to describe, explain and justify method selection (Carter and Little, 2007). The inquirer's gaze has been structured through methodology and the method is the 'how to' of social inquiry (Greene, 2006, p. 94). The collection, analysis and interpretation of data all constitute method, 'it is through methods that methodology and epistemology become visible' (Carter and Little, 2007, p. 1325).

Guba (1990) states that paradigms are characterised through their 'ontology' (what is reality?), epistemology (how do you know something?) and methodology (how do you go about finding out something?). So this indicates how we view knowledge, how we see ourselves in relation to this knowledge and the methodological strategy we use to discover the knowledge.

This research was undertaken to investigate the research questions:

- In school settings in Dar es Salaam what are the relationships between student test outcomes, their own self perceptions and those of their peers and teachers?

- Does the likelihood of being identified as gifted vary according to family background and school characteristics?

- What are the relationships between pupil, school and teacher characteristics and pupil outcomes?

- Is the creativity construct of Divergent thinking (DT) dimensionally equivalent in an African as in a western setting?

- How do any creative dimensionalities correlate to an individual's contextual factors including education, social environment, family and personal factors?

- What are the intrinsic and extrinsic motivational characteristics for a set of poor high ability children?

- Investigate whether motivation dimensionalities correlate to an individual's contextual factors including education, creativity, social environment, family and personal factors.

The first part of this chapter sets out the philosophical position, first through ontology, followed by epistemology and research paradigms. Then the research design is explained for phases one and two by considering the sampling technique, access, methods of testing and interview and the analytical tools employed. Third an investigation into the validity and reliability of the various protocols is undertaken. Finally the chapter sets out the ethical stance employed and ends with a conclusion.

3.2 Philosophical Position

This researcher follows a positivist approach. This researcher's ontological stance is naïve realism in that the belief is that reality is understandable and that by observing events and objects it is possible to establish patterns between these. The epistemological stance is one of objectivity. Data were gathered in an impartial way through non leading questions avoiding bias. The methodological design is a multi stage convergent mixed methods study. The quantitative and qualitative research findings were used as different research strategies to consider different notions around the concepts of giftedness.

3.2.1 Ontology

Ontology refers to our assumptions of what constitutes truth and knowledge (Dillon and Wals, 2006; Ramey and Grubb, 2009; Burrell and Morgan, 1979). According to Cohen et al., (2000) as researchers we are seeing the world through either an objective or subjective lens. This is our own view on the reality of the situation, taking an objective or subjective view of reality. Ontological assumptions affect our view on what is real and what we see, it also considers whether what we see is a product of our individual consciousness (Cohen et al., 2000). If the underlying assumptions regarding ontology are not addressed the researcher might be blinded on certain parts of the research and phenomena as

they are not open to question, consideration or discussion. There are two opposing, exclusive categories constituting ontological theories – realists and relativist (Blaikie, 2007). Realism can be divided into three categories, naïve, critical and historical (Denzin and Lincoln, 2011). Naïve realism (sometimes termed shallow realism) according to Losch (2009) regards objects 'as originals that are adequately represented by our sensations' (p. 86). Therefore it is up to the researcher to observe objects and events in order to ascertain patterns between these objects and events (Blaikie, 2007). According to Scott (2005), realism requires criticality because explaining and describing events is fallible and open to critique. Ordering, categorization and relationships in the world cannot always be justified as different categories and relationships can always be found (Scott, 2005). Historical realism according to Lincoln and Guba (2000) is a 'virtual reality shaped by social, political, cultural, economic, ethnic and gender values; crystalized over time' (p. 165). Relativist ontologies, that is those that are non-realist and according to Raskin (2008) anti-realist, challenge realism or the independence of perception (Miller, 2002).

The ontological stance of this researcher is one of naïve realism, taking the philosophical stance regarding reality that 'what exists in the real world is no different to what appears in everyday life' (Bruner and Haste, 1987, p. 88). Giftedness, it is asserted therefore, can be measured. When Terman developed the concept of giftedness in the early 20th century, it was measured only by an IQ score (Terman, 1925). This conventional testing, which dates back to Terman as well as Binet and Simon (1916) and Spearman (1927), focuses on analytical abilities and memory while excluding creativity and practical ability (Sternberg, 2010). However, with Renzulli's, Sternberg's and Gardner's contributions came models that looked at giftedness from a multifactor construct of abilities (Gardner 1983b; Sternberg, 1985a; Renzulli, 1998; Calero et al., 2011). Where models and theories differ is when investigating which abilities to measure, which abilities are meritorious and considering how the abilities go above and beyond general intelligence (g) (Sternberg, 2010).

3.2.2 Epistemology

Epistemology is the study and examination of 'how we make knowledge' (Dillon and Wals, 2006; p. 550). It is the study, theory and justification of knowledge (Schwandt, 2007; Carter and Little, 2007). The philosophical assumptions that are derived from the epistemological stance influence and guide research practice, including methodology (Carter and Little, 2007).

Blaikie (1993) describes epistemology as 'the theory or science of the method or grounds of knowledge' (p.6). Foundational to any research is the researcher's epistemological stance, which determines decisions when shaping the methodology (Carter and Little, 2007). There are three influences that epistemology has on research (Carter and Little, 2007). First the interactivity between researchers and participants, where participants are either regarded as subjects to be studied or contributors to the research. Different epistemological stances influence researcher/participator relationships. One stance (the objective) would imply that when gathering data the researcher asks non-leading questions, avoids bias, puts aside prior knowledge that could influence the study, observes real attitudes, motivations and beliefs through a depersonalized approach. If the research were subsequently repeated in the same or similar setting, then the results and findings would approximate the initial findings. The other position (subjective) would encourage the researcher to interact with the participants allowing a joint creation of the understanding of the overall objective. It is the communication between the researcher and participants, through free interaction, that allows 'multiple ways of seeing' (Carter and Little, 2007, p. 1321). Different contexts and times will generate distinctive observations, the researcher needing to form an understanding of the settings in which the variances are observed (Charmaz, 2006; Clarke, 2005)

Second, the epistemology influences the way in which the quality of data gathering and analysis is demonstrated (Angen, 2000). In the objective stance feedback on transcript from participants, triangulation, analyzing data once all the data have been collected and using a predefined method for analysis, and using multiple observers or peers to check data through level of concordance are all ways in

which the quality of methods is demonstrated. Regarding the subjective stance multiple sources and participatory feedback are used to gather more data rather than for triangulation and verification. An important data source is the researcher's own participation, experiences, and reactions. The researcher is inextricably linked with every part of the research process. Data analysis is carried out as soon as data collection has begun and when peers or observers these are no longer for verification or concordance but for widening the focus and framework of the research (Carter and Little, 2007).

Finally the epistemological stance influences the way the researcher communicates and disseminates the research findings (Mantzoukas, 2004). The subjective standpoint implies the researcher writes using their own voice, telling their own story including the 'struggles, defeats, and triumphs of the research process' (Carter and Little, 2007, p. 1322). Research sometimes is presented in less conventional approaches and encouraging the audience to become 'active interpreters' (ibid, p. 1322). On the other hand when disseminating the research from an objectivist epistemology the researcher's report summarizes the facts with no information about the researcher themselves being divulged and written in the third person. The two different epistemological positions are incommensurable.

In this study participants typically answered predetermined questions. Although there was corroboration around what was said during interviews and the findings of the project when looking for participatory feedback, on the whole the researcher retained decision-making and power throughout (Heron and Reason, 1997). This researcher stayed as unobtrusive as possible, reporting accurately the attitudes, beliefs and values of the participants (Carter and Little, 2007). The focus here has been on repeatable procedures (Strauss and Corbin, 1998). Data in this research were gathered from multiple sources in order to allow for triangulation. The data were gathered in two parts, as there were two data gathering periods. In each case data were analysed once all of the data had been collected using statistical techniques and predefined qualitative methods. The dissemination and voice is written in a scientific style in the third person and as an anonymous

author.

3.2.3 Research Paradigm

A research paradigm is a belief system or theory that guides the research by establishing a set of practices. Disciplines tend to be governed by a paradigm (Guba, 1990). The stance taken by the researcher in their epistemology, ontology and methodology together constitutes a 'paradigm' (Guba, 1990, p.17). It is the 'basic set of beliefs that guides action' (ibid., p. 17). According to Denzin and Lincoln (2011) there are five alternative inquiry paradigms:

- Positivist;
- Post positivism;
- Critical theory;
- Constructivism;
- Participatory.

A researcher who works within a realist or critical realist ontology, an objective epistemology and utilises experimental, quasi-experimental, survey and meticulously expressed qualitative methodologies are the beliefs and guides of positivists and postpositivists (Denzin and Lincoln, 2011; Onwuegbuzie, 2002). Postpositivism amends and critiques positivism. First, regarding the ontological stance both believe that reality exists (realism) but the postpositivist believes that reality is imperfect and can only be known in a probabilistic sense (critical realism). Second, concerning epistemology both are objectivists, but again the postpositivist position is to modify this objectivism where findings are termed 'probably true' rather than 'true' (Denzin and Lincoln, 2011). Again with the methodology, both are experimental and manipulative, with positivism being mainly quantitative and post-positivism quantitative and possibly including qualitative methods.

Critical theory has an ontology that is historical realism, with a subjectivist epistemology and uses methodology that is explicitly prescriptive and normative. The research aim is not merely to comprehend situations and experiences but to change them. It seeks to 'emancipate the disempowered, to redress inequality and to promote individual freedoms within a democratic society' (Cohen et al., 2000, p. 28).

Constructivism consists of relativist ontology, subjective epistemology and naturalistic methodological procedures. Grounded theory and pattern theory are typically used for the presentation of findings. Finally a participatory paradigm holds a relativist ontology, critical subjective epistemology and typically uses action research for its methodology.

3.2.3.1 Positivism

It is claimed that positivists remain detached from the participants by creating distance in order to remain emotionally neutral to make clear distinctions between reason and feeling and science and personal experience. Positivists make clear distinctions between fact and value judgement they see objectivity using consistent rational and logical approaches (Denzin and Lincoln, 2011). Statistical and mathematical techniques are central in the research methods adopted by positivists. They adhere to specific structured research techniques. Positivism endeavours for measurability, predictability, objectivity, patterning, and causality (Carter and Little, 2007).

3.2.3.2 Criticisms of Positivism

One of the main criticisms of positivism is that of reductionism, that is that 'social processes are reducible to relationships between and actions of individuals' (Bullock and Trombley, 1999, p. 737). Social facts as revealed through research carried out using a positivist paradigm, do not exist without the influence of social and historical constructs (Horkheimer, 2002). According to Horkheimer, removing the researcher from the investigation and allowing them only to be an observer fails to consider these social and historical conditions. Social reality does not exist objectively nor independently, thinking in this way supports only the status quo and does not challenge the conservative representation of social reality.

> 'Positivism as such, however is proud of the fact that it is not concerned with the "nature" of things but only with appearances and thus with what things actually offer to us of themselves' (Horkheimer, 2002, p. 37).

Other criticisms of positivism also come from religious and philosophical arenas stating that positivism fails to identify more abstract and non-observable relationships (Evans, 1993).

3.3 Mixed Methods

The method of a research project is formed by the actions of the researcher and the participants (Carter and Little, 2007). In quantitative research, there is a linear progression where rigour is partly dependent upon sampling. Data collection, analysis and reporting are not necessarily iteratively related (Cohen et al., 2000, Schwandt, 2007 and Creswell, 2003). In qualitative research there is a continuous iterative cycle – sampling, data collection, data management, analysis and reporting. These phases are continuously being used to modify the research focus and its integrity (Glaser and Strauss, 1967). According to Carter and Little (2007):

'Objectives, research questions, and design shape the choice of methodology, and methodology shapes the objectives, research questions and design' (p. 1323).

Therefore the process is a two directional operation. Methodological approaches shape the research design and the questions asked. The methodology determines, guides, and shapes the study design, objectives and questions (Charmaz, 2006; Clarke, 2005; Glaser and Strauss, 1967, Strauss and Corbin, 1998).

A mixed methods research design is a procedure mixing both quantitative (e.g., experiments, surveys) and qualitative (e.g., focus groups, interviews) methods for collecting and analysing data in a study in order to understand a research problem (Creswell and Plano Clark, 2011). This integration is assumed to provide a better understanding of the research problem than would otherwise be provided when using one of these approaches singularly. There is a greater breadth and depth of understanding and corroboration. There has been a rise in the number of studies in education that have incorporated mixed methods (Creswell, 2002; Tashakkori and Teddlie, 2003). Bryman (2008) and Johnson et al., (2007) have called for a

greater use of mixed methods in order to ensure a range of sources is used to provide meaning to the study reality. According to Johnson, et al., (2007)

> 'Mixed-methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the purposes of breadth and depth of understanding and corroboration' (p. 123).

By collecting, integrating and converging different kinds of data, researchers are able to examine the phenomenon from different vantage points. Triangulation is one of the most advantageous characteristics of conducting mixed methods research (Creswell, 2002). Cohen and Manion (2000) state that triangulation is an 'attempt to map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one standpoint' (p. 254).

A mixed methods approach can be accomplished using three basic designs 1) exploratory sequential; 2) explanatory sequential; and 3) convergent. In a sequential design one phase of the mixed methods study builds on the other, whereas with convergent the phases are merged comparing quantitative and qualitative results. In an exploratory sequential design the qualitative data is gathered first and is used to inform subsequent quantitative data collection (Onwuegbuzie et al., 2010). Quantitative data is first collected and analysed in an explanatory sequential design and used to inform qualitative data collection and analysis (Ivankova et al., 2006). Regarding convergent or sometimes termed concurrent design, both qualitative and quantitative data are gathered and analysed at the same time. The process may be interactive and data collection iterative driving change, however it is more common that data collection using qualitative and quantitative techniques occur in parallel. Analysis is carried out well into the data collection phase or after completion (Creswell, 2002). A multistage mixed methods framework utilises multiple data collection phases and according to Nastasi et al., (2007) may use combinations of exploratory sequential,

explanatory sequential and convergent approaches. The methodology for this research is a multistage convergent mixed methods study.

There are a number of advantages to mixed methods research. Creswell (2002) states that using a combination of quantitative and qualitative data in research combines the advantages of each form of data. Quantitative data can provide generalizability as well as limit the potential for biased interpretations. Qualitative research allows for a greater understanding of context and setting. Using the two approaches provides a more complete understanding of the research problem as well as explaining more comprehensively the research findings. Merging the two forms of data and determining how to interpret results that diverge are regarded as two of the main disadvantages of mixed methods research (Creswell, 2002; Driscoll et al, 2007). Mixed methods studies can be complex to plan and undertake requiring each method to maintain standards of rigour and quality (Wisdom et al., 2011; Wisdom and Creswell, 2013).

This thesis undertakes an investigation to dispel the myth that children who are first generation learners and from poor households are incapable of learning or having abilities. In depth qualitative research will provide a rich description of views, beliefs and meaning around giftedness in such poor settings as Kinondoni. The qualitative phase provides an understanding of any stigma within education settings that may exist owing to social and cultural beliefs and views.

The quantitative research is associated with a positivist stance believing that reality can be measured and observed objectively. Therefore the testing of children and the gathering of background data from different school stakeholders allows for an exploration around student outcomes, identification of giftedness and relationships with teacher and home characteristics.

This mixed methods approach will result in a richer understanding of different aspects of giftedness within a school setting that operates for children living in poverty.

Prior to data collection there needs to be a research plan or structure that ensures that the evidence obtained allows the overall research aim and questions to be answered. A research design sets out a logical structure for the inquiry. Therefore during the research design phase one needs to ask 'given this research question (or theory), what type of evidence is needed to answer the question (or test the theory) in a convincing way?' (De Vaus, 2001, p. 9). In order to collect the relevant evidence the research design needs to consider issues around sampling and data collection including tests, questionnaires, surveys and interviews that allow the research questions to be answered. The positivist approach that this researcher is taking implies that the research design endeavours to strive towards measurability, predictability, objectivity, patterning, and causality (Carter and Little, 2007).

Owing to the lack of time required around marking and inputting data along with restraints on finance it was decided to carry out the research in two stages: first to find children of 'high ability' (and to answer research questions 1-3) and second, once these data had been marked, inputted and analysed to consider a sieved subset of children to undertake the creativity and commitment to task part of the research (to investigate research questions 4-7).

Figure 2 below shows the two stages and the measures collected in order to answer the research questions as stated above. The first stage, which was to identify children of high ability, used both quantitative and qualitative data collection methods and analysis. This is explored more fully in the sections that follow in this Chapter (3.3.1 and 3.3.2), but in brief here, the quantitative data were made up of five tests (Student Multiple Intelligences Profile (SMIP), the Gmade mathematics test, the Ravens Standard Progressive Matrices Test (SPM), and a Kiswahili and English reading test). A student questionnaire also gathered quantitative data around the children's backgrounds and household characteristics. Teacher questionnaires provided information around teacher experience, qualifications as well as the nomination of gifted children in the class. Qualitative data were collected using teacher interviews allowing the researcher to explore the meaning and significance of the quantitative findings. The interviews elicited the teacher's

views around the meaning of giftedness, the challenges and problems faced as a teacher in low-income settings, as well explicitly detailing the process undertaken to identify children that are deemed by the teacher to possess ability and creativity. The second stage considered the four research questions focusing on creativity and commitment. The quantitative data were gathered from 125 children using the Torrance Tests of Creative Thinking and a survey around commitment and motivation. In depth interviews were carried out with eight parents and eight pupils to explore and probe in greater detail the opportunities of families living in such communities. This enabled the researcher to explore the beliefs, values and expectations within such families that could not easily be obtained from questionnaires. The eight children were asked to talk about their hopes, dreams and expectations as well as school and family life.

Figure 2 Multistage convergent mixed methods study

Stage 1   Stage 2

Quantitative Data Collection

Quantitative Data Collection

Analyse → Interpret and inform

Analyse → Interpret

Qualitative Data Collection

Qualitative Data Collection

Discussion Chapter 6

Summary and the Way Forward Chapter 7

Policy Implications

Quantitative measures Pupil testing and questionnaires: Self rating scale (SMIP), Gmade, Kiswahili, Reading, Ravens IQ: Background and household data. Teacher questionnaires	**Quantitative Analysis** SPSS MlWin	Develop sample for stage 2	**Quantitative measures** Pupil Testing: Torrance Tests of Creative Thinking, Commitment and Motivation Survey	**Quantitative Analysis** SPSS STATA
Qualitative measures Teacher interviews	**Qualitative Analysis** Verbatim transcriptions		**Qualitative measures** Parent and Pupil interviews	**Qualitative Analysis** Verbatim transcriptions
Pupil N = 847 Teacher N = 21 Teachers interviews N = 7	Results Chapter 4	Results Chapter 4 Section 4.5	Pupil N = 125 Pupil & Parent interviews N = 8	Results Chapter 5

3.3.1 Stage One

3.3.1.1 Sampling

The research took place in Kinondoni, a poor municipality in northern Dar es Salaam. The areas chosen to carry out the research were the poorest of Kinondoni lacking in infrastructure, with roads in very bad repair and no piped water to housing. Collection of refuse is sporadic resulting in 'tipping' of rubbish in streams and streets, latrines are inadequate and flooding during monsoon season adds to health risks[8].

The schools in this sample were lacking in facilities, the majority without desks or chairs and almost all without electricity and hence lighting. Regarding the research participants, the average number of people living in the 'household' was 9, 44% of the homes had toilets outside the premises and only half had a room to be used as a separate kitchen. Regarding the father's employment, the largest category was 'cleaner or helper' followed by 'market trader' and 'service worker'. One third of the father's had either no schooling or primary only. Half of the mothers were cleaners or helpers again with around one third having no education at all.

Initially seven government schools took part in this research, they were opportunistically sampled and all within the Kinondoni district of Dar es Salaam. There are two leading methods of sampling – probability (random) or non-probability (purposive) sampling (Cohen et al., 2000). The first implies that initially the whole population is known and that every member has an equal chance of being selected for the project. Regarding non-probability sampling the chances of being selected within the population are unknown. Within probability sampling there are several types: simple random, systematic, stratified, cluster, stage and multi-phase sampling (Cohen et al., 2000). For non-probability samples the types are opportunity, quota, purposive, dimensional and snowball sampling. This research used opportunistic sampling.

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[8] http://www.unicef.org/tanzania/Advocacy_brief_Kinondoni.pdf

On arriving in Kindondoni one school was initially visited in order to start the process of identifying schools and therefore students who were willing to take part in the research. Once one school had agreed the next nearest eligible school (Primary and within the poor area of Kinondoni) was then identified, through the help of the headteacher and then visited continuing this process until the desired sample size of children had been obtained. This sampling procedure was used owing to the initial lack of local knowledge including school localities, poverty and infrastructure availability, the desire of schools to participate and the number of children in each class in the schools. Prior to this visit, consent for the research to go ahead had already been received from the District Education Officer as well as the Tanzania Commission for Science and Technology (COSTECH) (see the section on ethics below). However there were very little data regarding school infrastructure and the initial investigation on the ground needed to be carried out on foot, taking one school at a time.

Data were gathered initially from 847 pupils in class 4 and 5. This first part of the research was to investigate how high ability and talented pupils were currently identified and why, in a low-income setting. Initially children aged around 10-11 years were targeted. This research was part of a bigger ESRC funded project. The project was to be a longitudinal study, where it was necessary to re-identify those children who had participated in the first stage the following year. As many of the children would progress within the same Primary School, or at least in the same locality in the Primary sector, starting with children in class 4 and 5 would allow for a larger number of children to be located in the second year. If an older age group had been selected it would have been more difficult to revisit and locate them in different secondary schools or indeed as 'dropouts'. The ESRC longitudinal study planned to work with those children who had been identified as gifted providing them with skills to improve human capital and networks with local entrepreneurs and philanthropists.

3.3.1.2 Quantitative: Tests and questionnaires

Initially 847 children volunteered to participate in the project. Testing took place within the children's own class in their own schools and occurred in the morning for all participants. A team of five education masters students from the University College Dar es Salaam, helped with the administration of the tests. They had been given special training by this researcher specifically for this task and project. They were supervised at all times by the researcher. This part of the overall testing procedure lasted for about three hours. Descriptive statistics have been produced using the SPSS package. Three teachers from each school, who taught the children in class 4 or 5, also participated for this part of the research. They completed a questionnaire asking about their own family background as well as their nomination of three gifted children in their class. The teachers were also asked to give their understanding of the term 'giftedness'. This part of the research aimed to answer the first three research questions and find children of high ability through multiple measures hence Renzulli's first ring. This formed the first visit, which was followed by three months of inputting and analysing data.

Responses to a pupil questionnaire were collected alongside an 'internal' measure of self perception of giftedness (see appendix 1). Students in groups of 40-50 completed these tests and questionnaire. In order to address issues around cross cultural transportability of tests, pilots were carried out in Morogoro schools, west of Dar es Salaam. Teachers and educationalist in Nairobi devised the Kiswahili test, and therefore changes, to be more consistent with Kiswahili spoken in Tanzania, were made after the pilot through discussions and in collaboration with local teachers. The internal consistency for the Kiswahili test with its ten items for 847 students was shown to be 0.8 using the Cronbach's Alpha. Similar procedures were carried out for developing mathematics and English reading tests[9]. The questionnaire included a set of background questions, thoughts around giftedness and nomination of gifted pupils in the same class, and a self-perception questionnaire Student Multiple Intelligences Profile (SMIP).

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[9] Cronbach's Alpha for each of the tests >0.8

The Gmade maths test was made up of 30 items taken from the Pearson Gmade standardised maths tests for Grades 1, 2, 3, and 4. Items were chosen so as to illicit a spread of results, thus ranging in perceived difficulty. The test had only maths terms in it and thus being more valid testing ONLY maths and not reading in Kiswahili or English as these would be tested separately. The test was piloted with a small group of children in Morogo, Tanzania. Any questions that caused problems were discussed in order to change mathematical symbols where necessary to those used in Tanzania. Teachers were also consulted as to the validity of the tests comparable to the maths curriculum in Tanzania. Again changes were made when questions were regarded as inappropriate. The Cronbach's Alpha for the maths tests with its 30 items and 847 participants is 0.824 implying a good internal consistency.

The IQ test used in this case is the Ravens Standard Progressive Matrices Test (SPM). This test has been used in multiple studies in sub-Saharan Africa as discussed in Chapter Two. The SPM sets out to measure the 'eductive' component of 'g' defined in Spearman's theory of cognitive ability. According to the SPM manual:

> 'Eductive ability is the ability to forge new insights, the ability to discern meaning in confusion, the ability to perceive, and the ability to identify relationships' (Raven et al., 2000, p. xi).

The SPM therefore tests the ability to 'generate new, largely non verbal, concepts which make it possible to think clearly' (ibid, p. xi). Looking at the Cronbach's Alpha for this set of 847 children and the 60 items, the reliability statistics has a measure of 0.823, which implies a good internal reliability.

The data included the following information on identification:
- Whether or not the teacher identified the pupil as gifted;
- The proportion of pupils in the class who identified the pupil as gifted;
- Scores on a set of tests: Ravens Standard Progressive Matrices, English reading, mathematics and Kiswahili;

- Identified as gifted through a self-report checklist the SMIP.

3.3.1.3 Qualitative: Interviews

According to Becker and Geer (1957) there are three main limitations regarding the use of interviews when gathering sociological data. In order to be aware of an interview's limitations and weakness, it is important for the researcher to have knowledge of these three limitation to overcome as much as possible the potential issues. First it is important not to miss any details that seemingly could be taken for granted by both the interviewer and interviewee. Second, when carrying out interviews in different cultural settings, the interviewer needs to make themselves aware of local meanings and connotations. Once the interviews are underway the interviewer becomes more aware of such undertones and implications and understand 'the life worlds within a group of respondents' (Gaskell, 2000, p. 44). And third, the interviewer should not take anything for granted and be aware that an interviewee may distort their account because of their own experiences and beliefs about a topic. Throughout the interview process these types of limitations have been considered and working with local researchers helped to provide information and expertise around cultural norms and local meaning.

One teacher was interviewed in each of the seven schools (see appendix 7 for transcripts). The teacher was one of the subject teachers. This researcher handpicked the teachers and therefore purposive sampling was the method used for this part of the research. All of the teachers were women. It order to avoid partisanship no interviewee was provided any preconceived ideas around views of giftedness from the researcher. Semi-structured interviews allow flexibility, making the interview more of a discussion. According to Patton (1987) 'the purpose of interviewing… is to allow us to enter the other person's perspective' (p. 109). The participants were encouraged to share their views, feelings and experiences in conversations carried out with the researcher. As the semi-structured interviews were carried out in the teacher's own school and in a relaxed ambience, this provided them with confidence to express their opinions.

Bryman (2001, p.313) believes that such situations encourage the interviewee to 'ramble' and 'go off at tangents' unhindered by structured questions.

This therefore allows the interviewee to raise matters and issues that may have been omitted from the interview (Denzin, 1970; Silverman, 1993; Carr and Kemmis, 1986). The wording of the semi-structured interviews was carefully selected, without the use of any leading questions. This part of the research was carried out face to face by the researcher with the interviewees. At the start of each interview the interviewee was told about the nature of the project, without giving any preconceived ideas being relayed. Confidentiality was assured stating that all participants would be anonymised in any articles and books that may be produced as a result of the project and that the researcher would be writing their thesis using their interviews. The researcher asked the questions in English and all interviews were recorded using Dictaphones. Some of the teachers had a greater comprehension of the English language than others and were able to respond in English. In a few cases, when the teacher didn't understand certain vocabulary, an interpreter re-asked the question in Kiswahili and translated this into English. This can cause issues around accuracy of what is being said. However when listening and transcribing the interviews, every detail was checked so as to avoid any confusion or mistranslation about the ideas that were being conveyed. Objectivity and accuracy have been pursued in order to report the findings. New codes and ideas have constantly been searched for when analysing each of the verbatim-recorded interviews.

3.3.1.4 Quantitative Analysis

Initially data were inputted into the SPSS statistical package and descriptive analysis was used to check for any disparities around data entry. The first part that looked to compare teacher and peer identification, test scores and general descriptive data was all carried out using SPSS. This was also used to undertake the ordinary linear and logistic regression. Nine separate outcome measures were considered. As this dataset contained a relatively large number of variables, many of the background variables are likely to be highly correlated with each other. A data reduction strategy based on rotated principal factor analysis was therefore

adopted. According to Child (1970) factor analysis can impose an orderly simplification when there are a large number of variables with interrelated measures.

3.3.1.5 Qualitative analysis

In grounded theory, theory is derived from the data and not given at the beginning of the research. In grounded theory coding categories are continuously being discovered and generated throughout the data collection process (Strauss and Corbin, 1998, p. 27). Word by word and line-by-line coding was carried out for each of the verbatim comments made of each interview. Quotes have been utilised in the following chapters in order to provide the participant's views. These quotes portray a picture of the participant's views and experiences concerning giftedness and teaching in poor areas of Dar es Salaam. For some the use of computer packages (such as NVivo) for qualitative data analysis can help to generate codes and analyse texts. There are others such as Stroh (2000) who believe there are drawbacks when using such packages and suggests this can alienate the researcher from the data:

> 'Researchers can be distanced from their data, relying on perceived automation of analysis, rather than retaining the closeness of the data so vital to qualitative data analysis' (Stroh, 2000, p. 241).

Rather than becoming absorbed in technology around an additional analysis package this researcher decided not to use computer assistance in the analysis of the qualitative data.

3.3.1.6 Effect Sizes

The work of Schagen and Elliot (2004) is used to explain the coefficients (B) in terms of 'pseudo effect sizes' or 'quasi effect sizes'. This gives a common approach when comparing binary and non-binary variables so the relative effects can be measured. As with binary variables the effect size is the impact of switching between two states and with non-binary it is an 'average switch' (Schagen and Elliot, 2004, p. 29).

Firstly, this section will consider binary variables using logistic regression and then non-binary using linear regression.

Logistic Regression

The column headed 'B' gives the coefficients in the logistic regression model, and 'SE' gives the standard error in this. The column 'exp(B*SD)' gives the odds ratio multiplying factor for a change in the independent variable of one standard deviation (or from 0 to 1 for binary variables). This odds ratio is obtained from the expected distribution function:

$$E(Y|x) = \pi(x) = Exp(g(x))/(Exp(g(x)) + 1)$$
$$\text{With } g(x) = b_0 + b_1 x$$

Logistic regression produces an estimate for $\pi(x)$

		Dependant variable y= $\pi(x)+\varepsilon$	
		No (0)	Yes(1)
Independent variable x	No (0)	1- $\pi(0)$	$\pi(0)$
	Yes(1)	1-$\pi(1)$	$\pi(1)$

Odds ratio for 'yes' peer identified is $\pi(1)/ 1-\pi(1)$

And 'no' is $\pi(0)/ 1- \pi(0)$

Giving the ratio for 'yes' relative to 'no' as

$[\pi(1)/ 1-\pi(1)] / [\pi(0)/ 1- \pi(0)] = Exp (b_1)$

Producing the standard odds ratio exponential for the independent variable (in this example case peer) to the dependant variable (in this example case teacher). (Hosmer et al., 2013)

For example, following contingency table illustrates data on teacher and peer identification.

	Not identified by teacher	Identified by teacher
Not identified by peers	808	10
Identified	22	7

by peers		

Peer identified is 7/22 and not identified by peer is 10/808, giving the $\widehat{OR}$ of 7x808/22x10 = 25.7 or b_1= ln(25.7)=3.24 and standard error = $[1/808 +1/10 + 1/22 + 1/7]^{1/2}$ = 0.538. The 95% confidence interval can be calculated of b_1 as 3.24 ± 1.96x0.538. If your peers identify you the likelihood of being identified by your teacher is increased by 25.7 times.

Note in Chapter Four, Section 4.8.3, this teacher indicator of giftedness is considered in a multivariable model and it is shown that peer identification is significant and increases the likelihood of being identified by your teacher.

Linear Regression

For non-binary the pseudo effect size can also be calculated by looking at 'average switch' between the states. Using a Standard Normal Distribution (mean=0, SD=1) there are three possible ways to obtain the pseudo effect size factor. Firstly by looking at the difference between the means either side of the origin an upper bound of 1.58 (means -0.79 and 0.79 = $\sqrt{\frac{2}{\pi}}$) can be obtained as a factor. The lower bound of the non-binary pseudo effect size can be obtained from the difference in medians, giving 1.35 (first and third quartiles -0.675 and 0.675 = $\sqrt{2}$ erf^{-1}(½)[10]. In between these two approximations there is a third option, obtained by selecting two random values of X and looking at the expected value of the absolute difference between these values. The root mean square can be used to obtain an approximate value expected difference. This expected value of the square of the difference is 2 when the standard deviation is 1. Therefore the root mean square is the square root of 2, approximately 1.41 (Schagen and Elliot, 2004, p. 30).

From the above there are three different possible values:
- 1.58 from the distance between split means;
- 1.35 from the distance between split medians;

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[10] https://en.wikipedia.org/wiki/Half-normal_distribution

- 1.41 from the root mean square difference between two random values.

The factor of 1.41 is between 1.35 and 1.58 and is suggested by Schagen and Elliot (2004) as a good pseudo effect size coefficient.

In Chapter Four, section 4.9 and Chapter Five, section 5.6 the formula $100*B*1.41*s/S$, is used to calculate the 'impact' and 'Quasi effect size', with s as the standard deviation of the background measure (independent variable X) and S the standard deviation of the outcome (dependant variable Y).

3.3.2 Stage Two

3.3.2.1 Sampling

A total of 125 primary students living in economically deprived areas of Dar es Salaam, Tanzania participated in this study. The research documented in Chapter Four provides 47 children in Renzulli's ring one. This was assumed too small a subset on which to carry out the investigation into Renzulli's two rings – creativity and commitment. Therefore 78 children also identified as high ability through multiple methods, but using other IQ tests other than the Ravens (Wechesler Abbreviated Scale of Intelligence (WASII) and Naglieri Nonverbal Ability Test (NNAT2)) in the overall ESRC project were included in this second part in order to provide a larger sample.

3.3.2.2 Quantitative: Tests

The second visit was to explore the other two of Renzulli's rings – commitment and creativity. To this end a 'sieved talented' subset of 125 children undertook the Torrance Tests of Creative Thinking (TTCT) Figural Form A and an adapted 'inventory' utilising as a springboard both the Work Preference Inventory (WPI) (Amabile et al., 1994) and the Scale for Rating Behavioural Characteristics (Renzulli and Hartman, 1981). The TTCT-Figural (Form A), used in this research, includes three activities. In the first activity, the subject is asked to draw a picture based on a stimulus that is provided on the test page. This activity is to evaluate originality (O), elaboration (E), and abstractness of title (AT). The second activity requires the individual to draw pictures, using ten incomplete figures as a starting

point, to which titles are added. Activity two is to evaluate fluency, originality, elaboration, abstractness of title, and resistance to premature closure. Activity three consists of three pages of sets of parallel lines, and the individual must draw using these parallel lines as part of their picture. This activity evaluates fluency, originality, and elaboration (Torrance et al., 1992). The children are given 10 minutes to complete each of these three activities. The TTCT-Figural has never been trialled in sub-Saharan Africa. Therefore the constructs are based on western assumptions. Examples of these Tanzanian children's work from the TTCT-Figural can be seen in Chapter Five.

The adapted 'inventory' was made up of 12 items each relating to either intrinsic or extrinsic characteristics of motivation – six in each category. The students rated the degree to which they perceived each of the 12 items on the checklist as descriptive of themselves using a four-point scale ranging from 1 (Never or almost never true of you), 2 (Sometimes true of you), 3 (Often true of you) and 4 (Always or almost always true of you).

Testing took place within the children's own classes in their own schools. Children in groups of 10–20 completed the TTCT and the adapted inventory. Testing was carried out in the morning for all participants. On this occasion only three education masters students from the University College Dar es Salaam helped administered the tests. These 'administrators' had been given special training from the researcher regarding the TTCT and given a script utilizing TTCT guidelines translated into Kiswahili. The administrators also read out the commitment questions in Kiswahili, although the version had also been written into Kiswahili it was decided that reading out the questions would help those who might have issues reading. SPSS and STATA were used to analyse the data for both the creative and commitment parts of this research.

3.3.2.3 Qualitative: Interviews

Qualitative data gathering was carried out with the final participants who were found to be at the centre of Renzulli's three rings. Semi-structured interviews were carried out with these 8 children and their parents who were encouraged to share their views, feelings and experiences in conversations carried out with the

researcher. School and classroom observations also allowed for an insight to be gained into the schools' physical facilities, amenities as well as the teaching processes carried out in the schools. These observations were used to triangulate information gained from the teachers, parents and pupils.

3.3.2.4 Marking the TTCT

The TTCT-Figural (Form A), used in this research, includes three activities. In the first activity, the subject is asked to draw a picture based on a stimulus that is provided on the test page. This activity is to evaluate originality (O), elaboration (E), and abstractness of title (AT). The second activity requires the individual to draw pictures, using ten incomplete figures as a starting point, to which titles are added. Activity two is to evaluate fluency, originality, elaboration, abstractness of title, and resistance to premature closure. Activity three consists of three pages of sets of parallel lines, and the individual must draw using these parallel lines as part of their picture. This activity evaluates fluency, originality, and elaboration (Torrance et al., 1992). The children are given 10 minutes to complete each of these three activities. The TTCT-Figural has never been trialled in sub-Saharan Africa. Therefore the constructs are based on western assumptions.

Fluency

The fluency score captures the number of ideas the student draws for activities two and three. In these activities one point is given for each completed figure. If two or more of the figures have been combined into one picture then one point is still given for each of the figures used. In Figure 3, 6 points would be scored. Note that if an item is not scored for fluency it is eliminated from all further scoring.

Figure 3 Example of Fluency scoring
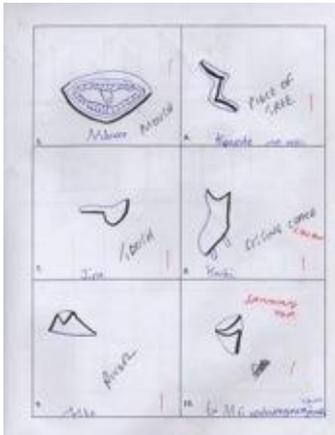
Originality

Regarding originality, credit is given to the unusualness of the response in all three of the activities. In each of the activities certain responses are scored as zero as they are assumed to be statistically usual (common) responses. Looking at the example below in Figure 4 it can be seen that a zero score would be allocated to what is known as 'section nine' (bottom row, first column) for 'mountain' and in 'section ten' (bottom row, second column) for a 'duck'. Both of these responses were found a number of times in the students' papers. From the original incomplete figure a mountain and a duck would be the most commonly drawn as the original shape suggests that image.

Figure 4 Scoring example of Originality

Elaboration

To score marks in the elaboration section for activities one, two and three, Torrance suggests that the scorer needs to ask 'what is the minimum level of detail that I must see for this to be a _____'. One point is given every time detail is added through shading or decoration.

Figure 5 Example of elaboration
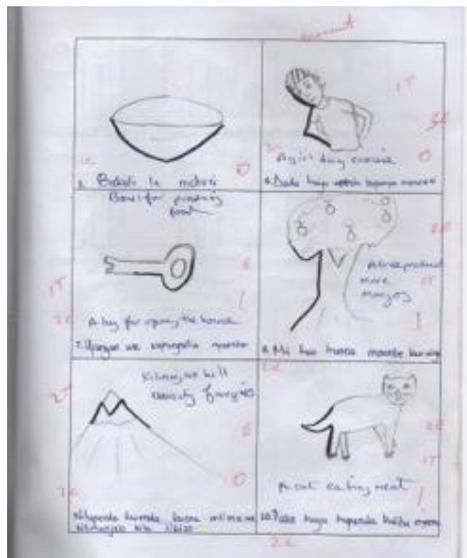
Note that the elaboration score in Figure 5, is given in section 6 (first row, second column) for the detail added to the boy and his clothes. In section 7 (second row, first column) one point is given for the extra detail in the key and in 9 (third row, first column) to show the mountain has a snowy top. The added fruit in the tree in section 8 (second row, second column) also scores one point owing to this extra detail.

Abstractness of Titles

In activities one and two students are given a score from zero to three for the quality of the title they attach to the figures they draw. They score zero for naming the figure, 1 for a simple descriptive title and 2 if that title includes a slight modification beyond the specific, e.g., 'dog' scores zero, 'dangerous dog' scores 1, and 2 points for something more descriptive such as 'a dog with style'. Three points are given for a title that tells more of a story. In Figure 5 the title would have scored 2 points, stating a 'hill for attracting foreigners' as this goes beyond merely describing the picture as a hill and is more descriptive.

Resistance to premature closure

In activity two the student is required to draw something original from an incomplete figure. Marking around 'resistance to premature closure' implies giving more marks when figures are not completed with a straight line. This allows for more opportunity regarding a creative design. In activity two a zero is scored if the figure is closed by the quickest route, 1 point if the figure is closed but detail is added outside of the closed region and 2 points if closure doesn't happens or does but through irregular lines.

Figure 6 Example of resistance to premature closure
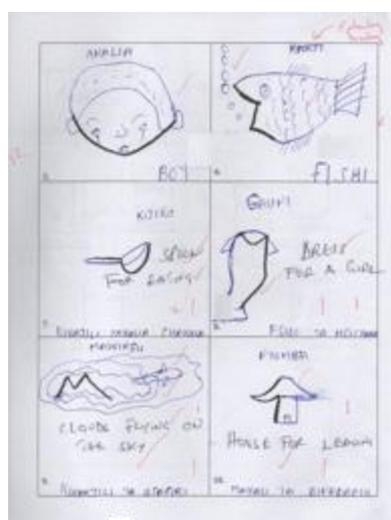
In section 6 (first row, second column) the 'fish' is a lovely example of a 2 point score. The figure is closed but not simply and in fact extra detail is added outside the closure. Another example showing 2 points is seen in section 8 (row two column two) with a picture of a dress where there is no closure at all.

This completes the five main areas of scoring on the TTCT. Additional areas of creativity that are also scored in the TTCT are set out in the following section.

Checklist of Creative Strengths

Below are listed 13 creative strengths utilised in the Torrance scoring scheme. Torrance's scoring mechanism suggests that not all 13 need to be present in the child's work to score in the creative strengths category.

(1) *Emotional Expressiveness:* this can be communicated through the titles and in drawings. Looking for 'sad, happy, joy, love, anger, hate, mean, scared, lost, terrified, ecstasy, lonely, etc., an example can be seen in Figure 6, that is a boy crying;

(2) *Storytelling articulateness*: looking for the ability to communicate a story or an idea;

(3) *Movement or Action*: an indication of movement and action obtained from the title and/or the figure. Indicators include: running, flying, floating, dancing, reaching, kicking, eating, drinking, swimming, etc., an example of this is seen in Figure 5 with a boy doing exercises;

(4) *Expressiveness of titles*: with a title that attempts to abstract and express emotion and feeling;

(5) *Synthesis of incomplete figures*: where two or more sections are combined to produce a single figure;

(6) *Synthesis of lines*: where two or more sections are combined to produce a whole picture;

(7) *Unusual Visualisation*: a creative person may look and perceive the world from a different view-point. Points are scored here for a visual perspective other than static, upright and a straight-on view;

(8) *Internal visualisation*: a drawing, which contains internal aspects of things that are not seen;

(9) *Extending or breaking boundaries*: the drawing goes beyond the boundary or extends the lines given to create a picture;

(10) *Humour*: points are given for humorous and surprising titles and drawings;

(11) *Richness of Imagery*: a picture that is strong, sharp and distinct;

(12) *Colourfulness of Imagery*: a picture that has an exciting appeal in the sense of taste, touch, smell, feel, sight, etc.;

(13) *Fantasy*: the picture uses fairy tales, fantasy, literature, etc.

Only one of the students out of the 125, scored in the fantasy category with the picture of a 'dragon' as seen in Figure 7.

Figure 7 Example of fantasy – dragon
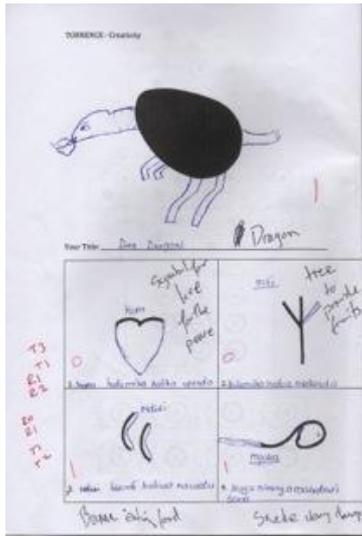
3.3.2.5 Quantitative Analysis

When analysing the data regarding the two rings, creativity and commitment, and in order to answer research questions four to seven the following techniques were used – descriptive statistics, factor analysis (exploratory and confirmatory), and multiple linear regression analysis. Again SPSS was used but in addition STATA was utilised to perform the confirmatory factor analysis (CFA).

Exploratory factor analysis (EFA) was initially conducted in order to determine the number of factors that could adequately represent the data. CFA utilising STATA was then performed to examine the latent structure of the creativity and commitment constructs. In order to establish which model provided the best fit the χ^2 test and the fit indices were calculated. A range of fit and comparison-based indices, including chi-square, was used to determine which model provided the best fit for this data (Bentler, 1990; Browne & Cudeck, 1993; Steiger, 1990).

Analyses had already been carried out on the whole data set utilising regression analysis. This was done in order to consider associations between student ability,

learning outcomes, school data, teacher data and background/family data. Certain factors were found to be statistically significantly correlated to student ability and outcomes. The analysis carried out in Chapter Five only used those significant variables as it was hypothesized they were more likely to show any correlation with creativity and commitment. Multiple regression was carried out using SPSS to show any correlations between student ability, background factors and creativity and commitment measures.

3.4 Cross cultural transportability of tests

The use of foreign or imported tests to study psychological constructs in settings other than where they were developed is contentious (Greenfield, 1997; International Test Commission, 2010; Mpofu and Ortiz, 2009). The presuppositions behind test items and testing procedures cannot be assumed to translate cross-culturally. Observed scores could reflect less about the ability or construct of interest and more about the gaps where the imported instrument misrepresents the performance of culturally diverse others. Yet, instruments aimed to measure a particular psychological construct may be applied to respondents with cultural diversity often without proven cross-cultural population comparability (Abubakar et al., 2002; Mpofu et al., 2014; Mpofu et al., 2015; Hambleton and Patsula, 1999; Hambleton et al., 2005; Stansfield, 2003). At the same time researchers are keenly interested in achieving equivalence or comparable measures of basic psychological constructs and their indicators across cultures. This enables comparative analysis for (a) a more complete understanding of abilities across the developmental stages and (b) for the design and evaluation of interventions that support children or learners in their development or growth. There is also a need to understand the potential for cross-cultural adaptation of existing measures of human abilities. The evidence would be of value to allow the tailoring of instruments to different contexts and to modify or develop new measures more appropriate to each setting (Hambleton, et al., 2005; Mpofu, et al., 2015). One of the aims of this study was to investigate the cross-cultural transportability of the TTCT for use with Kiswahili speaking children in Tanzania.

Understanding respondents' referent terms for human abilities is critical for appropriate test targeting and guiding the appropriate use of measures (ITC, 2010; Saklofske, et al., 2015). It is unclear whether and how western constructs for abilities like creativity and their measures translate to African settings (Mpofu, et al., 2006). Questions arise as to the context validity of the test questions and also the response demands on examinees. There is also evidence to suggest the importance of the cultural worth of specific abilities and their indicators. African respondents may link their abilities to contexts without generalizing them to their own personal qualities. This means one may be perceived to be creative in certain demand settings (social problem solving; networking with others) without the presumption that the person would be creative in how he or she handles school-like tasks or those that demand responses to hypothetical or decontextualized questions (Mpofu et al., 2006; Serpell, 2011a,b; Sternberg et al., 2001). Performance in a particular way on certain tasks would define creative behaviour for them.

The Torrance Tests of Creative Thinking are more akin to school-like tasks in the type of questions and demands for expressive writing. Evidence is needed on whether they would generate expected responses from Kiswahili speaking Tanzanian school children. The children may have psycho-behavioural scripts that are based on previous learning within an opportunity structure (e.g., family, cultural group, community). For instance, social propiquinty and the social timeliness with which a child responds to collective needs with others is a valued cultural behaviour in sub-Saharan culture (Mpofu, et al., 2012; Serpell, 2011a, b). An investigation into the mastery related demands processes would therefore define creativity (Sternberg, 2003) perhaps more than a response to pen and paper test items.

3.5 Validity and Reliability

Seale and Silverman (1997) believe that the quality of a research design can be improved by using more rigorous analytical approaches, thus improving validity and reliability. Others have suggested that there are common questions that can be asked in order to judge validity and reliability, however these are difficult to

categorise (Muijs, 2010; Murphy et al., 1998). Also ensuring that the research strives to be reliable and valid is necessary for the findings to be meaningful (Adelman et al., 1980; Nisbet and Watt, 1984; Hitchcock and Hughes, 1995).

3.5.1 Validity

Validity is required in both qualitative and quantitative research however it is impossible to secure 100 per cent validity in quantitative research owing to standard errors and in qualitative research owing to biases (Cohen et al., 2000). According to Cohen et al., (2000):

> 'in qualitative data validity might be addressed through the honesty, depth, richness and scope of the data achieved, the participants approached, the extent of triangulation and the disinterestedness or objectivity of the researcher' (p. 105).

Regarding quantitative research, validity is improved through appropriate sampling, instrumentation that is applicable and that the statistical analysis is carried out in a way that is suitable for the data as well as the research interest and questions being asked (Cohen et al., 2000; Gronlund, 1981).

There are many types of validity, Cohen et al., (2000, pp. 105-106) list a total of eighteen. For qualitative methods Maxwell (1992) argues there are five types of validity – descriptive, interpretive, theoretical, generalizability and evaluative (pp. 284-285). What follows are the six types that this research endeavoured to apply – internal, external, content, construct, predictive and concurrent.

Internal and external validity can be strived for in both qualitative and quantitative research. Regarding internal validity the data collected needs to reflect and support the issues being investigated (Cohen et al., 2000, p. 107).

In order to secure internal validity in qualitative analysis the following methods can be employed:
- Peer debriefing;

- Triangulation;
- Prolonged engagement in the field;
- Member checking;
- Persistent observations;
- Negative case analysis.

All of the above apart from negative case analysis were carried out in this research. Peer debriefing was carried out with three academics in the USA at the University of Connecticut who commented on the data and the quantitative data procedures for analysis. This was helpful in the fact that suggestions around the order of analytical procedures using STATA were discussed and highlighted as a different approach. Comments were also made regarding further statistical techniques that could be employed to consider the data in more depth (Brown, 2006).

Different questionnaires (those for teachers, parents and pupils) were designed for the different participants and thus approached the same issues around the ideas of giftedness from different levels. This strived to ensure the data were triangulated from diverse viewpoints. Observations, documents and school records were all used to triangulate data. Two visits to Dar es Salaam resulted in the researcher being immersed in the field. Each of the project schools has received a report concerning the research findings that were gained from their parents, teachers, and pupils thus engendering member checking. The seven school heads have commented on the findings verbally giving their feedback acting as respondent validation.

For external validity, this assesses the degree regarding the generalizability of the results to a wider population. For researchers who follow a positivist stance generalizability is generally taken as given (Bogdan and Biklen, 1992). The quantitative data obtained regarding the children's ability, creativity and commitment as well as their family background information may to some degree be generalised to the wider population. There is no reason to believe that the participants in this research differ from the broader populace who live in similar poor setting. According to Bogdan and Biklen (1992) what's important is not

whether the findings are generalizable to the populace as a whole, but that they are generalizable with regards to similar settings, situations and people. The schools that participated in this research were opportunistically chosen, first walking in a poor area of Kinondoni to locate one school and then finding schools close by for ease of gathering data. The data show the sample themselves to be consistent regarding family background. However generalizability of the findings are only slightly hampered by not having a truly random sample of government schools in the whole of the Kinondoni district. Therefore any generalisations should bare this in mind.

Four other types of validity cited in Cohen et al., (2000) are: content, construct, predictive and concurrent. According to Cohen et al., (2000) content validity implies that 'the instrument must show that it fairly and comprehensively covers the domain or items that it purports to cover' (p. 109). Indeed the quantitative testing and the questionnaires for the parents and teachers allowed the main issues to be addressed whilst allowing every participant to express their views, the meaning of and beliefs around giftedness as well as provision for gifted children in schools. 'Construct validity must demonstrate that the categories that the researchers are using are meaningful to the participants themselves' (Cohen et al., 2000, p. 110). The literature review carried out in Chapter Two allowed for the types of tests to be used during the research to be identified and helped establish the categories to be examined and measured. Maximising construct validity implies the use of multiple sources of evidence as well as member checking. This research endeavoured to achieve construct validity through these approaches. Concurrent and predictive validity are deviations of each other. Predictive validity occurs when the research builds upon itself. This occurred through the two visits to Dar es Salaam where the first round of research data correlated highly with the second round of data. Concurrent validity implies correlations between data gathered using different instruments. This was the case in this research where the different instruments provided data that concurred.

3.5.2 Reliability

Reliability was also strived for during this research. There are three main types of reliability – stability, equivalence and internal (Cohen, 2000, p. 117). Stability reliability implies that the researcher will elicit similar findings when gathering data from comparable participants either over different time periods or between groups of students who come from similar populations. In order to investigate stability reliability the Mlwin package was used in order to look for the variance between schools. The findings showed there to be no statistically significant variance across the schools concerning test scores, family background and school factors. Appendix 4.1 contains an example of the Mlwin calculations that were performed. The second type is equivalence reliability. This was not aimed at for this research as it is typical used either when looking at pre and post testing, control and intervention groups and inter-rate reliability. Checks were made throughout all the analysis in this work for multi-collinearity. Diagnostic checks using tolerance and variance inflation factor methods were used to test for collinearity between the variables. It was found that no significant multi-collinearity issues were present. Finally the internal consistency reliability of the tests was carried out using Cronbach alpha and Kuder-Richarson (KR-20) (see Appendix 8).

3.6 Ethics

3.6.1 Issues around gifted identification

There are specific issues when carrying out research that aims to identify children who may be of high ability, creative and committed. Some of the issues include:

1) Protect the rights and welfare of the student while promoting improvement in the quality of their lives;

2) Do no harm to the students while looking after their psychological welfare and maintaining public trust;

3) Responsibilities in assessment/intervention;

4) Be acquainted with ones own limitations and strengths in training and experience and engaging in activities consistent with ones competencies;

5) Maintain sensitivity to mental, emotional, political, economic, social, ethnic characteristics of those identified as high ability;

6) Protect the rights of all individuals involved;

7) Ensure that concerns for the protection of the rights and welfare of students is communicated to school administration and staff;

8) Consider definitional disagreements of intelligence – conflicts of cultural values and behaviours – break between research and practice as well as Gardner (Multiple intelligence) vs Sternberg (Triarchic Theory) vs Renzulli etc;

9) Consider definitional disagreements of high ability (giftedness) by culture i.e., Africa – emphasis on skills that maintain harmony of intergroup relations;

10) Issues around the development of assessment under scientific theory rather than cultural values, societal beliefs, socio-political climate.

Some of the solutions to consider:

- Education staff members at school and seeking professional development around diversity issues related to the identification of 'high' ability children;
- Using a multiple criteria method;
- Adopting a pluralistic perspective – assimilating the definitional disagreements into one cohesive perspective that uses multimodal/multidimensional view that accounts for the variability in the expression 'high ability' (gifted);
- Definition based on research;
- Look at the environmental factors and individual factors of each student;
- Use a multiple criteria method – student interview, evaluation scales, parent interview, teacher interview, observation, performance based assessments, a battery approach to different tests;
- Tests should be administered in home language.

There are many issues surrounding 'gifted' education. Controversies include:

- The definition of gifted;
- The measurement giftedness;

- The marginalisation of girls as well as excluding children from poor backgrounds;
- What constitutes gifted education? Should children be denied a 'normal childhood' by taking them away from their mixed ability classroom;
- Is a programme for the gifted high priority when resources could be given to struggling students?

Academic advantage can lead to a negative impact on emotional development. Social pressures put on high ability children can also imply more support is needed at a psychological level. Arguing that high ability children in the US should benefit from gifted programmes Renzulli states that 'sure I'd like to see every kid have the best education they can have. But, until the time we have a truly world-class system for all kids we need to have special opportunities and resources for kids who otherwise are going to get lost in an underachieving and dumbed-down curriculum'[11].

3.6.2 BERA and Newcastle guidelines

The guidelines from BERA (British Educational Research Association) have been followed in order to allow ethical considerations to be made during the process of conducting this research. This has taken place so as to ensure that an ethically acceptable position has been met and that all actions have been justifiable and comprehensive. In this respect as per the guidelines ethical considerations have been followed under the headings:

- Responsibility to participants;
- Responsibility to sponsors of research;
- Responsibilities to the community of educational researchers;
- Responsibilities to educational professionals, policy makers and the general public.

With regards to all participants, including children, teachers, head teachers and parents, they were treated 'fairly, sensitively, with dignity, and within an ethic of

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[11] New Your Times, Feb 25th 1996, Robin Pogrebin.
http://www.nytimes.com/1996/02/25/nyregion/gifted-programs-necessary-elitism.html

respect and freedom from prejudice regardless of age, gender, sexuality, etc.,' (BERA, 2011, p. 5). Prior to the research being carried out all participants were told about the project and asked if they would agree to their participation, which was to be carried out without duress. All children and teachers were told they could stop being part of the process at any time and could withdraw. Letters were given to the school, teachers and for the children to take home in order to gain consent from the parents. Examples of letters are set out in the appendix and they were translated into Kiswahili. Meetings were held with some parents in the form of focus groups in order to explain why the research was taking place and where their children stood in the process. Confidentially and anonymity was promised to students and schools. Consent was sought not only from the schools, teachers, parents and children but also from the local authorities which included the District Education Officer as well as applying for and gaining a research permit from the Tanzania Commission for Science and Technology (COSTECH). A letter providing a research permit from the Municipal Director of Kinondoni was issued granting the research to take place in the Municipal Primary Schools in the wards of Kigogo, Kawe, Tandale, Manzese and Kwembe. This letter and the research permit was shown at every school upon making initial contact.[12]

The five researchers that helped collect the data were recruited from the University College Dar es Salaam and a letter of formal endorsement of the good character of each researcher was obtained as per the BERA guidelines.

Every effort was made to put the participants at their ease and for the experience to take place without any distress or discomfort. All necessary steps were made to reduce any sense of intrusion in order to put the participants at ease. With regards to confidentiality and anonymous treatment of data, as soon as the testing or questioning of participants was complete all booklets and transcriptions were wrapped and kept secure ready for transportation back to the UK.

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[12] Research permits and examples of letters are provided in the Appendix 2.

During the early stages of this study full ethical approval was provided by Newcastle University's ethical committee after the completion of a full ethical approval review.

3.7 Conclusion

This research is gathering empirical evidence using a multistage convergent mixed methods approach. This chapter has outlined the ontology, epistemology, research paradigm, methodology and research design. Describing the methodology of this research-based inquiry has allowed the researcher to endeavor to carry out research that is valid, meaningful and exemplary. Evidence has been gathered from multiple sources in order to facilitate triangulation. Conditions to necessitate both validity and reliability have been satisfied. Theoretical questions have guided the analysis and the case has been used to illustrate, represent and generalize theory. The following chapters – Four and Five – document the findings of the research undertaken in Kinondoni, Dar es Salaam, in May 2014 and February/March 2015.

Chapter Four: School house giftedness - Stage One

4.1   Introduction

Set out in this Chapter are the research findings from the data that were collected to investigate 'schoolhouse' giftedness during the first data collection phase in Tanzania. The objective was to explore different ways of measuring 'schoolhouse' giftedness, and see how they related to each other and to background information about pupils, their schools and families.

The research questions to be explored in the initial analysis of the data are:

- In school settings in Dar es Salaam what are the relationships between student test outcomes, their own self perceptions and those of their peers and teachers?
- Does the likelihood of being identified as gifted vary according to family background and school characteristics?
- What are the relationships between pupil, school and teacher characteristics and pupil outcomes?

The first research question addresses the subjective measures related to the children's own self-perceptions and those of their peers and teachers, and how these are interrelated; section 4.3 and 4.4 analyse and discuss these. The remaining two questions are answered using objective measures that are analysed through regression. The findings are reported towards the end of this chapter in sections 4.8 and 4.9. These two research views – subjective and objective – are then discussed in relation to the literature in the discussion set out in Chapter Six.

A total of 847 children volunteered to participate in this project, and letters were sent home and meetings arranged (where requested) to explain the project and the whole procedure that was to take place. Testing took part within the children's own class in their own schools, and occurred in the morning for all participants.

Education Masters students from the University College Dar es Salaam helped to administered the tests. They had been given special training by the researcher specifically to assist in gathering the data. The testing procedure lasted for about 3 hours in each of the seven schools.

Children were tested using the Ravens IQ, reading, mathematics and Kiswahili tests. A questionnaire was completed by the pupils and their teachers, which in part ascertained who they would identify as the top three 'gifted' children in their class giving reasons why. Finally a pupil questionnaire made up of questions around multiple intelligences was used to help to develop a scale of giftedness self-perception (see appendix 1).

4.2 Descriptive statistics

Of the 847 children who took part in this first phase of data collection, about half were boys and half girls (n=416; n=431) with 2/3rds Muslim and the remaining Christian. Just over half the children lived in a family where an elder member could speak or write English fluently with the majority (80%) having a brother or sister who could read English. The average number of brothers and sisters was three, with equal number (1/3rd) of the sample being either the eldest, youngest or middle child. There were a wide range of ages, with a minimum of 8.17 years and a maximum of 15.33 years; the mean age was 11.01 and a median of 10.83. All of these children came from grade 4 and 5 in seven opportunistically sampled government schools. With regards to family possessions as wealth indicators:

- Around 2/3rds did not own a car or motorcycle;
- Just over half owned a bicycle;
- 89% of the children were in a family that owned a mobile;
- The majority said they had electricity;
- The average number of rooms in the home was 3;
- 90% of the homes were made of concrete or brick with 6% being semi permanent structures;
- 42% of the homes had a toilet outside the premises with half having a separate kitchen;
- The mean number of people living in the 'household' is 9;

- 90% of the fathers and 67% of the mothers had an income;
- Almost all of the children said their mother or father paid for their school uniforms and books.

For those answering the question, regarding the father's job the biggest category was 'cleaner or helper' (28.8%) followed by 'service and sales worker' (16.7%). 72% of fathers have secondary or lower education with almost one third having no school or primary only (Tables 4 and 5).

Table 4 Father's Employment

	Frequency	Percent
Armed forces	21	2.6
Manager	2	0.2
Professional	24	2.9
Technicians and associate professionals	17	2.1
Clerical support workers	77	9.4
Service and sales workers	137	16.7
Craft and related trades	98	12.0
Plant and machine operators	131	16.0
Cleaners and helpers	236	28.8
Dead or does not work	77	9.4
Total	820	100.0

(27 missing cases)

Table 5 Father's Highest Education Level

	Frequency	Percent
No school	45	5.3
Primary	201	23.7
Secondary	289	34.1
Secondary advanced	123	14.5
College	60	7.1
University	129	15.2
Total	847	100.0

Just under a half of mothers are cleaners or helpers (45.7%) with one third being in the category of 'housewife'. Around one third have a primary or no education (Tables 6 and 7).

Table 6 Mother's Employment

	Frequency	Percent
Armed forces	2	0.2
Professional	25	3.0
Technicians and associate professionals	14	1.7
Clerical support workers	23	2.8
Service and sales workers	84	10.2
Craft and related trades	15	1.8
Plant and machine operators	9	1.1
Cleaners and helpers	378	45.7
Housewife	277	33.5
Total	827	100.0

(20 missing cases)

Table 7 Mother's Highest Education Level

	Frequency	Percent
No school	34	4.0
Primary	233	27.5
Secondary	330	39.0
Secondary advanced	119	14.0
College	50	5.9
University	81	9.6
Total	847	100.0

Students in groups of 40 to 50 completed a series of tests and questionnaires. Table 8 provides the descriptive statistics for these tests. There is quite a large standard deviation (SD) for the Raven's standardized scores (SD = 12.72) as well as the reading scores (SD = 8.49).

Table 8 Test Score Statistics

	N	Min	Max	Mean	Std. Dev	Υ_1	B_2
Standardised Ravens IQ*	841	55	120	64.75	12.72	1.30	1.00
Standardised reading score	847	69	122	75.21	8.49	1.70	1.57
Reading age**	847	5	16	7.23	1.33	1.54	1.52
Maths score	847	0	29	19.77	4.85	-0.94	1.23
Kiswahili score	845	0	10	4.92	1.83	-0.25	0.18

Υ_1=Skewness, β_2=Kurtosis[13] *Standardised scores for Ravens IQ tests according to western norms.
** Reading age according to UK norms

Two tests show statistically significant differences regarding gender. In the IQ test boys slightly outperform girls, the mean for the boys is 66 and for the girls 63

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[13] Acceptable limits for Skewness & Kurtosis ±2 (Field, 2000: Trochim and Donnelly, 2006; Gravetter and Wallnau, 2014) with a value of zero if perfectly Normal.

(Table 9). An independent t-test shows this to be statistically significant (t(835.497)=3.205, p<0.01). In the Kiswahili test, which only contained ten items, girls outperform boys (mean 5.06 compared with 4.77; t(843)=-2.282, p<0.05).

Table 9 Standardised Ravens IQ score by gender

	N	Mean	Std. Dev.	Min	Max	Median
boy	414	66.17	12.870	55	105	60
girl	427	63.37	12.442	55	120	55
Total	841	64.75	12.724	55	120	60

Regarding the maths tests Christians perform marginally better than Muslims with the mean being 20 and 19 respectively (Table 10). A t-test shows this to be statistically significant (t(746)=2.390, p<0.05).

Table 10 Maths Score by religion

Religion	N	Mean	Std. Dev.	Min	Max	Median
Christian	254	20.33	4.854	0	28	21
Muslim	494	19.43	4.935	1	29	20
Total	748	19.73	4.924	0	29	20

4.3 Identification Strategies

4.3.1 Teacher Identification

One of the questions the teachers were asked in the questionnaire was how they identified gifted pupils. Of the 847 pupils in the dataset, 17 (2.0%) were identified by their teacher as gifted (See Appendix 1 for Teacher Questionnaire). The reasons given by teachers can be divided into three main categories:

a) Answers questions well in exams and test (54%);

b) Doesn't forget what I have taught them and they only require a small amount of teaching (26%);

c) I can tell they are talented when I talk to them and see them as they come from a good home (20%).

From the above, it seems that teachers use the oral questioning approach to identify pupils as gifted, as well as traditional tests and examinations. Semi-structured interviews with the teachers also asked questions around the meaning

and identification of gifted children in their own class. See Appendix 7 for the full transcription of the seven teacher interviews. One factor that came out strongly during these interviews was the impact of family background on children's giftedness. For example one teacher stated that:

> 'Children coming from learnt families, educated families do well and those who come from illiterate families, don't do as well. Because those coming from educated families, parents normally take care, and inspect what children are writing in schools, and they help them in several ways which is different from non-educated families.' (Teacher 7)

Another teacher stated that:

> 'Family background is important – because it depends on where the child is coming from. The family background contributes a lot.' (Teacher 2)

Other teachers supported the belief that background plays a significant part when looking at giftedness. One said that 'family background matters' (Teacher 3) another that giftedness is 'right from the birth' (Teacher 4) and finally 'it is something that is inborn, it is a gift' (Teacher 5).

Teachers also felt that poor children were disadvantaged from their home environment:

> 'Children who come from poor families, they go home, there is no meal and there is nowhere they can study' (Teacher 4)

Other teachers support this comment concerned that it is poor illiterate parents who are having a negative impact:

'It's about the community, yeh, the community surrounding us, especially the parents… they are having a negative perception… it is because they did not go to school or their level of education' (Teacher 2).

This level of education crops up again when one teacher talks about parents who are 'uneducated' and do 'not try with their children. They will not ask what they are doing at school as they are so ignorant' (Teacher 7).

However, as an additional feature, the same teachers believe that children who are gifted carry out exercises in the class 'very quickly' (Teacher 7). These gifted children can be used 'to help other children, to grasp the lessons very well' and teachers use 'capable children or talented children to help the weak ones' (Teacher 4). Teachers tend to believe that they are 'giving a chance to the clever children to lead the class' (Teacher 7). Teachers therefore consider giftedness to encompass a range of activities that include social and cognitive strengths. Therefore it could be suggested that when asking a teacher to identify children the process can be vague and ambiguous with diverse interpretations.

Regarding gender, the main consensus from the teacher interviews was that girls are more gifted than boys at this age, as girls concentrate more in class and do not waste time playing.

'Boys like playing and they are not settled. Because girls are settled and they concentrate whereas boys waste most of their time in playing and they don't concentrate. So girls they concentrate on the issues.' (Teacher 5)

Other teachers said 'girls normally concentrate', 'do much better work', and 'are the better ones' (Teacher 6, 4 and 3). Data supports the fact that girls are statistically significantly better at Kiswahili than boys and so may show better communication skills in class and therefore more useful in helping the teacher. When asked whether any training had been given to help identify gifted children

or indeed nurture them the teachers typically said 'no'. The interviews stated that 'there isn't any' training and that 'it hasn't been introduced' (Teachers 4 and 7).

In order to begin to answer the first research question regarding the relationship between student outcomes and other identification methods, we begin by looking at the outcome/teacher comparison. The table below shows the mean, standard deviation and effect size for two groups of pupils and their four test scores. The two groups being - 'teacher identified' and 'teacher not identified'.

Table 11 Comparison of Teacher identification with test results

Test	Teacher identification	Mean	Std. Deviation	Effect size
IQ standardised score	Not gifted	64.56	12.592	
	Gifted	73.82	15.962	0.65
	Total	64.75	12.724	
Standardised reading score	Not gifted	75.02	8.27	
	Gifted	84.41	13.29	0.87
	Total	75.21	8.492	
Maths score	Not gifted	19.69	4.837	
	Gifted	23.76	3.580	0.97
	Total	19.77	4.848	
Kiswahili score	Not gifted	4.90	1.827	
	Gifted	5.71	1.829	0.44
	Total	4.92	1.830	

$t_{IQ}(839)=-2.984$, $p<0.01$. $t_{Read}(16.256)=-2.902$, $p<0.01$. $t_{tmaths}(17.219)=-4.604$, $p<0.01$. $t_{Kisw}(843)=-1.798$, $p>0.05$

It is interesting to note that the mean scores for those 'not identified' as gifted by the teacher are lower than those 'identified'. This could imply that teachers are nominating students as 'gifted' in relation to higher test scores. T-tests show that all of the differences in the mean scores are statistically significant apart from the Kiswahili score. The final column, labelled 'Effect size' (Cohen's d) [14] is a dimensionless measure of the difference in average test scores between those identified as gifted and the rest. It is equal to the difference in mean scores as a fraction of the overall pooled standard deviation score. On the Cohen's d effect size

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[14] An example of how the effect size (Muijs, 2010) is calculated is shown here for the IQ Standardised score = (73.82 – 64.56) / (12.592+15.962)/2 = 0.65

scale 0.2 is weak, 0.21- 0.5 is modest, 0.51-1.00 is moderate and greater than 1.0 is a strong effect. The highest effect size values are for the reading and maths scores, but the value for IQ also gives a moderate effect size.

4.3.2 Pupil Identification

The pupil questionnaire asked children to identify the three 'top' children in their class and why they had selected them. The children's responses indicated that they thought of 'top' in relation to 'schoolhouse' ability. Nearly all students gave reasons such as 'good with school work' or best in a particular subject such as i.e., maths and/or reading. These responses were used to define 'peer identification of giftedness' in relation to the children's school setting. Consideration of the pupil identification of giftedness gave the following results.

Table 12 Pupil Identification of 'top' three children

Category	No.	%
Not identified by more than 15% of the class	818	96.6%
Identified by between 15%-20% of the class	8	0.9%
Identified by between 21%-25% of the class	10	1.2%
Identified by around 33% of the class	6	0.7%
Identified by around 50% of the class	5	0.6%

As shown in Table 12, altogether 29 pupils (3.4%) were identified as gifted by over 15% of their peers, and 21 (2.5%) were identified by over 20% of their peers. Figure 8 and 9 show how the test scores vary related to pupils' identification of gifted peers. These two figures show how mean scores vary for the different categories of peer identification. From these Figures we can see that there is an increasing trend in average scores relative to the percentage of peers identifying a pupil as gifted. The more peers identified a child as gifted then the more likely they were to have higher test scores. This could imply that pupil identification has a correlation to test score.

Figure 8 Test scores versus class identification
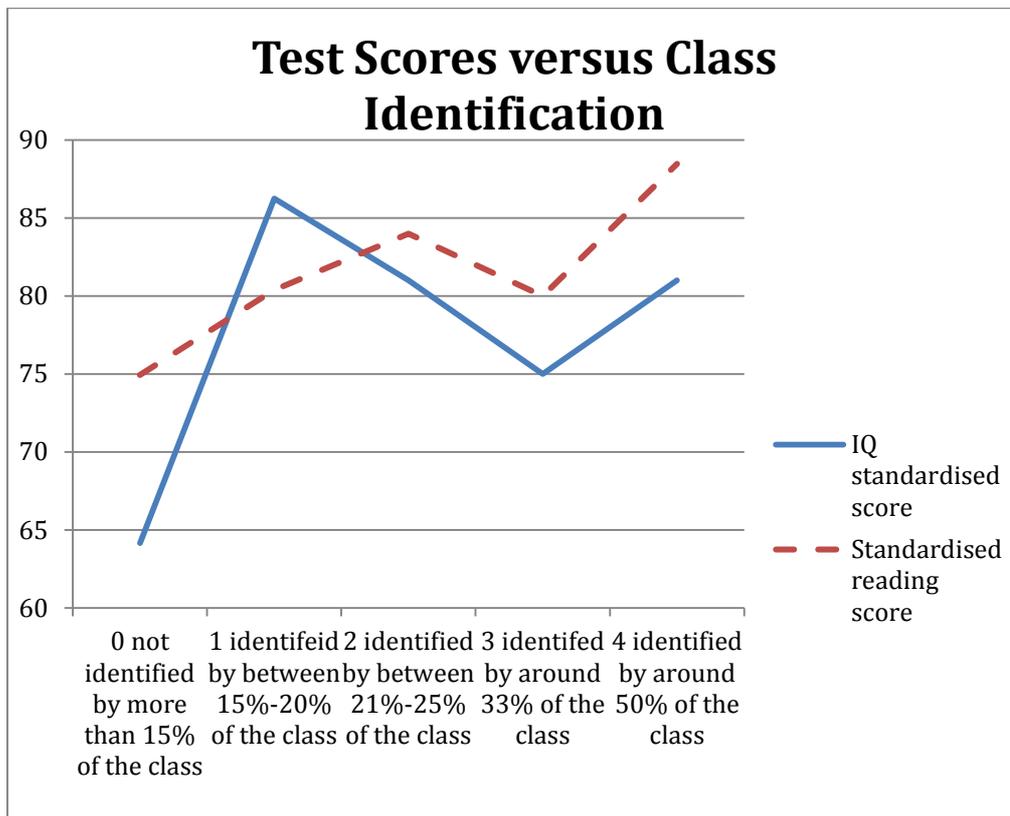
Figure 9 Test scores versus class identification
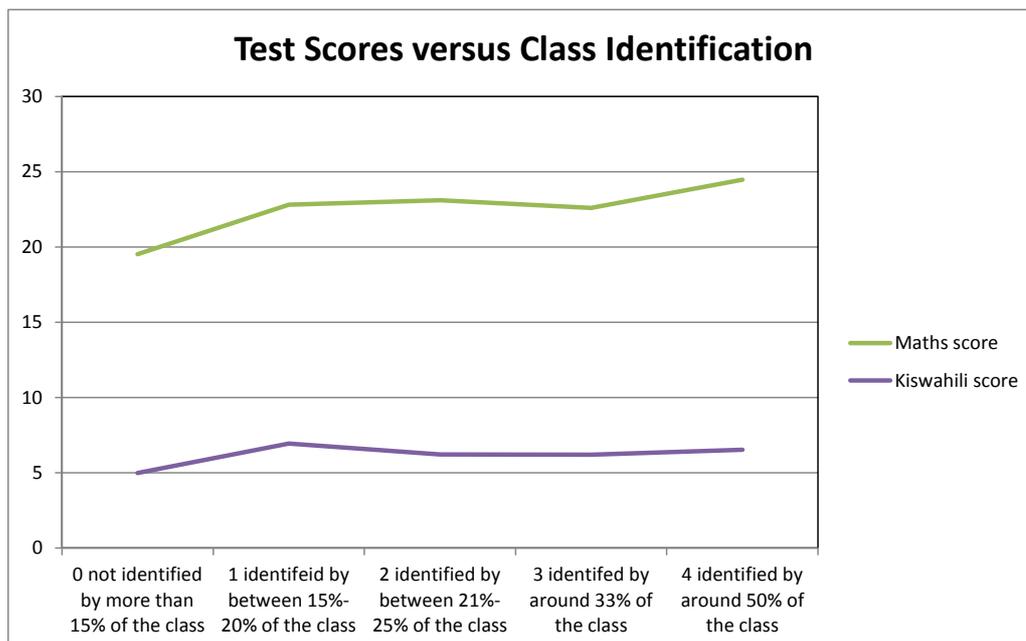
Table 13 shows the mean, standard deviation and effect size of the four tests scores for those identified and not identified by more than 20% of their peers.

Table 13 Comparison of Peer identification with test results.

Test	Peer identification	Mean	SD	Effect size
	Not gifted	64.38	12.326	
IQ standardised score	Gifted	79.29	18.727	0.96
	Total	64.75	12.724	
	Not gifted	74.98	8.118	
Standardised reading score	Gifted	84.19	15.606	0.78
	Total	75.21	8.492	
	Not gifted	19.70	4.840	
Maths score	Gifted	22.71	4.291	0.66
	Total	19.77	4.848	
	Not gifted	4.89	1.827	
Kiswahili score	Gifted	6.10	1.578	0.71
	Total	4.92	1.830	

$t_{IQ}(28.932) = -5.11$, $p < 0.01$. $t_{Read}(28.683) = -3.160$, $p < 0.01$. $t_{tmaths}(845) = -3.913$, $p < 0.01$. $t_{Kisw}(843) = -4.427$, $p < 0.01$

The effect sizes are similar to those for teacher identification with all having a moderate effect size, IQ and reading, having the greatest effect size. The t-tests show that all of the differences in the mean scores are statistically significant. Looking at how the children's test scores correlate shows, as would be expected, that there is a positive significant correlation between all of the test outcomes (Table 14).

Table 14 Correlations

	Standardised scores for IQ test	Standardised reading score	maths score
Standardised score for IQ test			
Standardised reading score	.299**		
maths score	.332**	.356**	
Kiswahili score	.266**	.260**	.415**

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

4.3.4 Test Scores – Single Scale Measurement

In order to derive an indicator based on test scores, which will be parallel to those based on teachers and peer groups, the test results were combined using principal components analysis to give a single scale. This was standardised to have a mean

of 50 and standard deviation of 10[15]. It can be seen from the tables below that all of the components of 'Allscore' (the variable name for the single measurement of student outcome) are approximately equally weighted (0.66, 0.68, 0.77, 0.69) in the significantly largest eigenvalue factor (1.965). Therefore on balance each of the results plays a significant part in the measure 'Allscore'.

Table 15 Exploratory Factor reduction for Allscore

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.965	49.135	49.135	1.965	49.135	49.135
2	.765	19.122	68.257			
3	.703	17.570	85.827			
4	.567	14.173	100.000			

Extraction Method: Principal Component Analysis.

Table 16 Component Matrix for Allscore

	Component 1
Standardised score for IQ test according to western norms	.664
Standardised reading score	.675
Maths score	.770
Kiswahili score	.690

Extraction Method: Principal Component Analysis.

4.3.5 Self Perception – Components for analysis

This research used an adapted version of Chan's model of SMIP, a self-report checklist designed to assess student strengths in each of Gardner's intelligences (Chan, 2006, 2008, 2010; Gardner, 1983b). The pupil questionnaire included 22 items asking the pupils to describe themselves, on a 5-point scale ranging from 1 ('least like me') to 5 ('most like me'). Table 17 shows the mean and standard deviation for the 22 items in the SMIP questionnaire. These items have been discussed in Chapter 2 when considering Gardner's multiple intelligence theory and include seven of the intelligences linguistic, logical mathematical, inter and intra personal, spatial, musical and naturalistic.

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[15] Note: To standardise the following code was used in SPSS: compute allscore = trunc(50 + 10*Fac1_1 + 0.5)

Table 17 Pupil self-decription questionaire SMIP

	Mean	Std. Deviation
I enjoy talking and playing with words	3.44	1.436
I enjoy writing am fluent and expressive	3.84	1.291
I read a lot for pleasure	3.81	1.331
I sing and hum a lot	2.80	1.421
I enjoy listening to music	3.14	1.514
I play an instrument	2.79	1.542
I actively search the patterns	2.76	1.394
I collect categorize and study things	3.34	1.466
I play with numbers	4.01	1.317
I remember landmarks	3.68	1.388
I know directions	3.38	1.498
I enjoy drawing	3.61	1.373
I handle objects skillfully	3.13	1.441
I understand and like myself	3.92	1.380
I am self confident	3.80	1.288
I show understanding and appreciation to others	3.57	1.331
I am kind and loving and caring	3.99	1.292
I listed and respect others feelings	3.66	1.382
I like to make friends	4.10	1.297
I derive a lot of pleasure from looking at natural phenomena	3.76	1.296
I have a hobby that involves nature	3.31	1.385
I love to watch birds or animals	3.57	1.430

Exploratory factor analysis with principal components analysis was used as a data reduction technique to reduce this larger set of measures to a smaller and therefore more manageable number of composite variables. This indicated that a two-factor model explained 22% of the variance. Table 18 shows rotated factor loadings for this model, with loadings less than 0.3 blanked for clarity. Considering the two factors, the first seems to be related to having a self-confident and positive attitude to learning reading, writing and mathematics. The second factor primarily relates to being musical and dextrous. According to Guadagnoli and Velicer (1988) a factor with ten loadings greater than 0.4 is stable for a sample size greater than 150. Field (2000) suggests retained factors should have at least three items with a loading greater than 0.4. Looking at factor two in table 18 the factor is almost retainable. However, in subsequent analysis only factor 1 (self confident and positive attitude to learning) is utilised.

Factor scores were estimated for each pupil, and standardised to have a mean of 50 and standard deviation of 10.

Table 18 Exploratory factor analysis of SMIP

Item	Factor 1	Factor 2
I enjoy talking and playing with words		
I enjoy writing: I am fluent and expressive	0.424	
I read a lot for pleasure	0.479	
I sing and hum a lot		
I enjoy listening to music		
I play an instrument		0.392
I actively search the patterns		0.306
I collect categorize and study things		0.414
I play with numbers	0.578	
I remember landmarks	0.366	
I know directions		0.398
I enjoy drawing	0.354	0.312
I handle objects skilfully		0.362
I understand and like myself	0.613	
I am self-confident	0.583	
I show understanding and appreciation to others	0.400	
I am kind and loving and caring	0.595	
I listen and respect others' feelings	0.473	
I like to make friends	0.633	
I derive a lot of pleasure from looking at natural phenomena	0.518	
I have a hobby that involves nature	0.302	
I love to watch birds or animals		

Extraction Method: Principal Component Analysis. Rotation Method: Varimax

4.3.5.1 Using SMIP to look at gender and religious differences in attitudes

To look at issues of gender and religion the pupil questionnaire (SMIP) asking the pupils to describe themselves, was turned into a 3-point scale by grouping the items as follows ranging from 1, 2 ('least like me'=1) 3 in the middle (=2) and 4, 5 ('most like me'=3). The main findings are given below with the detailed analysis around these questions given appendix 4.1.

Regarding the SMIP questions they suggest that there is a significant difference in gender preferences for girls to like writing more than boys ($\chi^2(2)=6.354$, $p<0.05$) due to their answers to the question in the category 'I enjoy writing, I am fluent

and expressive'. This could support the comments from the teacher interviews that girls seem to be more engaged in lessons.

Boys show a significant difference in three of the questions. Boys have a significant preference for playing ($\chi^2(2)=24.88$, $p<0.001$) an instrument, with 183 of the 414 saying this was 'most like me' and only 119 of the 428 girls in this same category. Also in the area of listening to music the significant difference occurred in the 'least like me' section with 173 (of 428) girls selecting the category as opposed to 138 (of 414) boys ($\chi^2(2)=6.377$, $p<0.05$). The final significant difference regarding gender was related to the question 'I handle objects skilfully' with the boys response being significantly more positive to this ($\chi^2(2)=14.358$, $p<0.001$).

Looking now at the differences in gender and religion. In relation to the question 'I play with numbers' no difference is seen in the boys responses yet the Muslim girls show a slight preference ($\chi^2(2)=5.984$, $p<0.05$) as opposed to the Christian girls. Similarly in the question response to 'I understand and like myself' there are slightly more Muslim girls rating this as being like them ($\chi^2(2)=7.025$, $p<0.05$). Muslim girls responded positively to the question 'I listen and respect others feelings' ($\chi^2(2)=8.305$, $p<0.05$), with a significant number of Muslin boys and girls also rated this question as 'most like me' ($\chi^2(2)=13.662$, $p<0.001$). With regards to natural phenomena Muslims showed a significant positive difference when asked the question 'I have a hobby that involves nature' ($\chi^2(2)=11.065$, $p<0.01$) with Muslim boys 142 (out of 254) expressing this.

4.4 Comparing teacher, peer, self perception and test score identification

Four identification methods - teacher, peer, self-perception and test scores - have now been considered. Test scores have been attributed a single scale and self-perception made up of two dimensions. This will allow comparisons between these four identification methods.

The peer group (over 15%) was used to compare with the teacher-identified group, showing only agreement regarding 808 'not identified' and 7 'identified' (Table 19). Cohen's kappa is a measurement of the agreement occurring by

chance. The Cohen's kappa measure of exact agreement for peer and teacher identification is 0.286, which is highly significant (p<0.01). However, this does not imply complete agreement between teachers and pupils about who should be regarded as gifted, the Cohen's kappa value showing fair agreement (Landis and Koch, 1977). Measure of agreement between two categories is found using Cohen's kappa. This measure looks at the relative observed agreement (p_0) and expected hypothetical probability chance agreement (p_e) by the equation ($p_0 - p_e)/(1-p_e$). Landis and Koch (1977) suggest the following scale for Cohen's kappa measure:

0–0.20 as slight

0.21–0.40 as fair

0.41–0.60 as moderate

0.61–0.80 as substantial,

0.81–1 as almost perfect agreement.

Hence the agreement between teachers and pupils, although significant, only rates as fair with only agreement on 7 out of 39 children.

Table 19 Comparison between Pupil and Teacher Identification

	Not identified by teacher	Identified by teacher
Not identified by peers	808	10
Identified by peers	22	7

$\chi^2(1)=74.776$, p<0.01

Using the indicator of combined test scores (Allscore), the top 2.0% on this scale had combined scores of above 70 (17 individuals). Taking this indicator (top 2.0%) and comparing it with the indicators from teachers and peer groups, the relationships are given in the tables below. A Cohen's kappa measure of 0.039 shows only very slight agreement between teacher identification and scores (Table 20). Supported by the fact the chi-square test showing no significant relationship between these variable. In contrast the Cohen's kappa of 0.286 and a significant chi-squared result implies an association between identification by peer and identified by test scores (Table 21).

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Table 20 Comparison of teacher identified and test score identification

	Not identified by teacher	Identified by teacher
Not identified by test scores	806	16
Identified by test scores	16	1

$\chi^2(1)=1.3$, p>0.01

Table 21 Identified by score and peer

	Not identified by peer group >20%	Identified by peer group according to greater than 20% of the class
Not identified by test scores	806	16
Identified by test scores	12	5

$\chi^2(1)=73.981$, p<0.01

It is interesting that there is only quite a small overlap between test identification and giftedness identified by teachers and peer groups. It is therefore possible to suggest that the last two methods take into account aspects of pupils identified 'giftedness' over and above their purely academic ability, as measured by tests.

The following tables (Tables 22-24) show how the SMIP factor scores are related to teacher identification, peer group identification and test score identification.

The tables show significant effect sizes around factor 1 and how this is related to test measures. Implying that personal self-confidence and gifted measures are related. Factor 2 seems to have less significance when looking at its correlation with giftedness.

Table 22 SMIP and teacher identification

Factor	Teacher identification	Mean	Std. Deviation	Effect size
Factor 1 - self-confident and positive attitude to learning reading, writing and mathematics.	Not gifted	50.53	9.944	
	Gifted	50.71	9.623	0.018
	Total	50.53	9.932	
Factor 2 - musical and dextrous	Not gifted	49.26	9.91	
	Gifted	43.00	7.738	-0.709
	Total	49.14	9.906	

$t_{f1}(840)=-0.073$, $p>0.05$, not significant. $t_{f2}(840)=2.589$, $p<0.05$, significant

Table 23 SMIP and Peer identification

Factor	Peer group identification	Mean	Std. Deviation	Effect size
Factor 1 - self-confident and positive attitude to learning reading, writing and mathematics.	Not gifted	50.50	9.926	
	Gifted	51.67	10.351	0.115
	Total	50.53	9.932	
Factor 2 - musical and dextrous	Not gifted	49.21	9.826	
	Gifted	46.19	12.58	-0.270
	Total	49.14	9.906	

$t_{f1}(840)=-0.925$, $p>0.05$, not significant. $t_{f2}(29.397)=1.624$, $p>0.05$, not significant

Table 24 SMIP and Allscore identification

Factor	Test score identification	Mean	Std. Deviation	Effect size
Factor 1 - self-confident and positive attitude to learning reading, writing and mathematics.	Not gifted	50.47	9.902	
	Gifted	56.82	8.502	0.690
	Total	50.60	9.911	
Factor 2 - musical and dextrous	Not gifted	49.30	9.901	
	Gifted	44.12	7.793	-0.586
	Total	49.19	9.886[16]	

$t_{f1}(832)=-2.623$, $p<0.01$, significant. $t_{f2}(840)=2.143$, $p<0.05$, significant

The graph below shows how the mean factor scores are related to the different categories of peer group identification as gifted.

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[16] These figures are slightly different owing to 8 children having missing data regarding 'allscore'.

Figure 10 SMIP Factor Scores related to Peer Identification
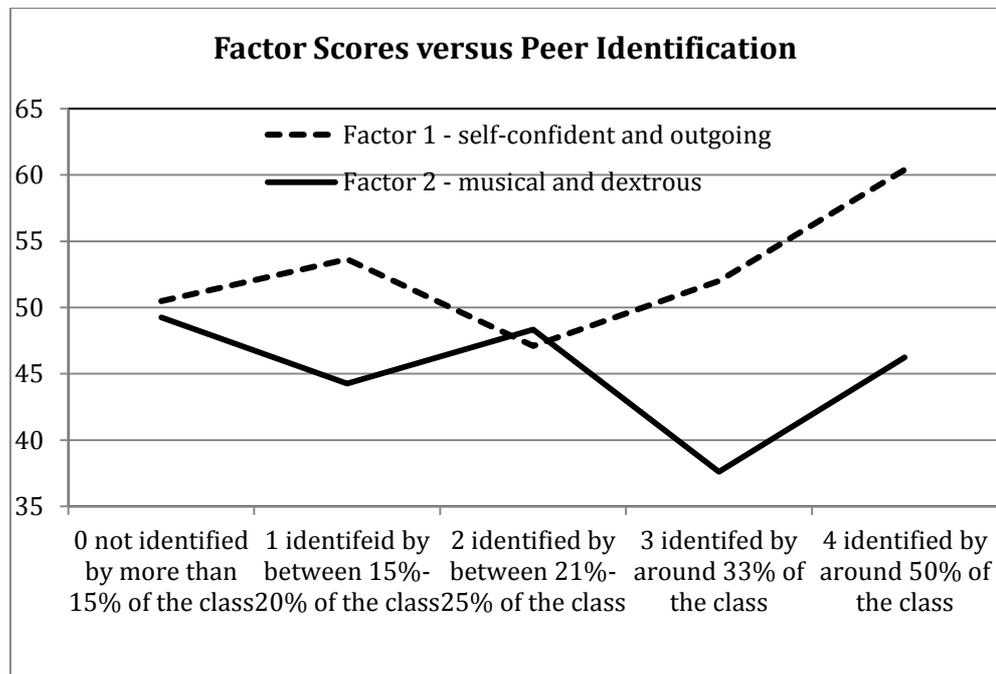
Thus far in this chapter the research has considered four ways in which a gifted pupil may be identified:

- By a teacher, using a range of possible methods;
- By their peer group in the class;
- By test scores;
- Through their responses to a self-perception questionnaire.

To develop an indicator of giftedness, the next section will take all these factors into account and look for a method, which considers multiple data sources, combining subjective and objective data.

4.5 Schoolhouse giftedness – Indicators

This section looks to identify a group of pupils who could be considered using a multidimensional approach as possessing schoolhouse giftedness. The aim of finding this subset is so they can then receive further testing (in phase 2) in order to define a smaller subset of children appearing in all three of Renzulli's rings.

Four indicators have thus been discussed above regarding identification:

1. Teacher indicator (17 pupils – 2.0%);

2. Peer group, combining categories 1 to 4, i.e. at least 15% of the peer group identifying the pupil as gifted (29 pupils – 3.4%);

3. Test scores, being in the top 15% - i.e. a combined standardised score of more than 60 (109 pupils – 12.9% of total students in sample);

4. Self-assessment – self-confident and positive attitude to learning reading, writing and mathematics (factor 1) in the top 20% (169 pupils – 20.0%).

Of the four indicators, it is suggested that the one based on test scores was likely to be the most robust and objective in such a developing country context. These children would be used to pen and paper tests. Therefore teacher identification could be less appropriate due to the time teachers spend outside the classroom, peer identification owing to 'friendships' and 'camaraderie' choices and finally the self-perception with regards to the unfamiliarity of rating ones own thoughts and character.

Table 25 Identification of pupils using four indicators

Pattern	Number
----	584
---I	133
--S-	62
--SI	29
-P--	9
-P-I	1
-PS-	8
-PSI	4
T---	8
T-S-	2
T-SI	0
TP--	3
TPS-	2
TPSI	2

(T = teacher; P = peers; S = test scores; I = self-assessment)

For this reason, the 'combined indicator of potential giftedness' was taken to contain the test score criterion and at least one of the other three criteria. Using this definition 47 pupils (5.5%) were found. Table 25 shows the different combinations of the four indicators and the number of pupils in each pattern

category. The highlighted cells are those that meet the combined criterion outlined above.

4.6 Schoolhouse giftedness - Summary

This part of the Chapter has set out to answer the first question around Renzulli's schoolhouse giftedness ring:

> In school settings in Dar es Salaam, what are the relationships between student test outcomes, there own self-perceptions, and those of their peers and teachers?

It has been interesting to note that there is a positive association between teacher identification and pupil outcomes. The largest effect could be seen between teacher identification and mathematics and reading scores. This highlights the trend that teachers choose children who are good readers to help support their class teaching and therefore consider these children to be 'gifted'. Teachers tended to believe that children from poorer homes were unlikely to be able to achieve at school owing to their family background. Similar findings regarding test scores and peer identification were apparent. That is peers tended to judge schoolhouse giftedness on how well the children in their class did on tests. Again the effect size concerning comparisons of peer identification with test results are similar to the teachers' however with a greater effect size regarding the IQ scores. When using the criteria of the top 2.5% of combined score, teachers only identify one child out of the seventeen in this category, whereas the peers identify 5. Moving onto the SMIP, there is a greater effect size concerning children's self assessment and test score. It is interesting to note that all of the effect sizes are negative for 'factor 2' that considers musicality and dexterity. It could be conjectured that these attributes or intelligences are not visible at the school level and in the classroom; therefore not seen as a way to identify giftedness in a schoolhouse setting. It was decided to construct a multidimensional identification strategy combining four indicators – teacher, peer, test scores, self assessment – and using test score as the initial criteria and setting the parameter to include at least one of the other four indicators. 47 children were identified using this strategy and were to enter into phase 2 of the research project.

4.7 Combining factors for analysis - wealth and school

Before fitting a model to predict whether a child will be identified as gifted by one of the four identification strategies, it is necessary to collapse some of the household data into a smaller set of combined factors. Otherwise there are too many independent variables to fit a sensible model to the data. There were a number of questions in the background survey collected about the items that the family possess and the kind of accommodation they have. These have been combined into a smaller set of measures using principal component analysis, rotated using the Varimax procedure[17]. A 3-factor solution was found to be optimal with Eigenvalues of 3.418, 1.828 and 1.564. Table 26 shows the rotated factor loadings for the factors on the initial variables – loadings less than 0.3 in absolute value have been omitted for clarity of interpretation.

Table 26 Rotated factor loadings for pupil background factors

Variables	Factor 1	Factor 2	Factor 3
The family owns a car or jeep	0.480		
The family owns a scooter or motorcycle	0.489		
The family owns a bicycle	0.403		
The family owns a cell/mobile			
The family owns a radio			
The family has electricity			0.733
The family has a TV			0.739
The family has a gas stove	0.428		
The family owns land	0.367		
The family owns a taxi	0.592		
The family has a computer	0.493		
The family has a generator	0.542		
The family has a market stall or plot of land	0.383		
Number of rooms in the family home			
Type of building in the home			
The toilet is inside the premises		0.943	
The toilet is outside the premises		-0.983	
The house has a separate kitchen			

Extraction Method: Principal Component Analysis. Rotation Method: Varimax

The combined factors were given the following descriptions:

1. **Wealth:** The quantity of material goods or possessions the family has

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[17] Principle component analysis is concerned with establishing which linear components exist and how a particular variable contributes to that component. The rotation produces a solution with the best simple structure maximizing factor loadings close to one and minimizing those close to zero. Loadings greater than or equal to 0.3 are salient, relating meaningfully to a primary or secondary factor (Brown, 2006).

2. **Looinside:** The toilet is inside the family home (factors seem to cancel each other)
3. **Electric:** The family has mains electricity and a TV. (Electricity seems to have some importance in this data set)

These three factors explain 30.3% of the variation in this set of data. Factor scores were derived for each pupil, and standardised to a mean of 50 and standard deviation of 10[18].

Table 27 shows the means of these scores for pupils who were identified as gifted (combined indicator = test score (top 15%) + one other identification method) and those not. The only significant difference was for the third factor, 'electric'.

Table 27 Background factors linked to scores

	Wealth	Looinside	Electric
Not identified	49.96	50.88	49.59
Identified	47.74	51.34	52.38
Overall	49.83	50.90	49.74
S.d.	10.297	9.846	10.127
Effect Size	-0.216	0.046	**0.276**

This implies that those pupils from homes with access to electricity and a TV may be more likely to be identified as gifted. It is unclear why this is but one can speculate that in homes with electricity children will be able to study for longer periods of time due to electric lights. Therefore it could be the case that children from these homes will spend more time reading their school books in the evenings. No evidence was collected to support these thoughts but future research in this area would be interesting. Other independent variables used in the modelling are shown in Table 28.

Table 28 Descriptive data for Independent variables

Outcome	Variable name	Mean	Standard deviation

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[18] PCA gives factor scores as standardized to reflect a z-score (Brown, 2006). These have then been standardized using a T-score which is a shifted Z-score scaled to have a mean of 50 and standard deviation of 10.

Pupil teacher ratio	ptr	35.72	8.724
School factor1-playground,Tv &computers	Schfact1	50	10
School factor2-Adminstrators & musical instrument	Schfact2	50	10
Teacher gender (female =1)	teachergender		
Average age class	avage	11.01	0.326
Average IQ standardised score in class	avIQss	64.75	2.675
Average reading standardised score	avreadss	75.21	1.819
Teacher experience (No. years teaching)	teachex	28.98	8.885
Teacher qualifications	teachqual	2.82	0.381
Gender (girl=1)	gender		
Age	age	11.02	1.166
Eldest in the family (0/1)	eldest		
Youngest in the family (0/1)	youngest		
An elder member can speak or write English (0/1)	englisw		
Brother or sister can read English (0/1)	brotherenglish		
Number of brothers and sisters	brosis	3.34	2.867
Working father/guardian (0/1)	maleincome		
Working mother/guardian (0/1)	femaleincome		
Fathers highest education	fathered	3.40	1.446
Mothers highest education	mothered	3.19	1.280
wealth	wealth	50	10
looinside	looinside	50	10
electric	electric	50	10

With regards to school-level data, as with the previous large sets of measures exploratory factor analysis with principal components analysis was used as a data reduction technique to produce a more manageable number of composite variables (details of this analysis are given in the appendix 6).

The school-level data collected yielded two factors:

- **Schfact1:** The school has a playground, TV and a computer
- **Schfact2:** The school has administrators and musical instruments.

It must be noted that the school sample size is very small with only seven schools participating in this research. Therefore the findings around these two school factors (Schfact1, Schfact2) need to be given careful consideration during the analysis. Factor scores were standardised to a mean of 50 and standard deviation of 10. Having collapsed the household 'wealth' data and school level data into smaller sets of combined factors, analysis could proceed using logistic regression.

4.8 An investigation into the likelihood of being identified as gifted

The question to be considered here is:

> Does the likelihood of being identified as gifted vary according to family background and school characteristics?

Set out here is the logistic regression analysis that allows for an investigation into which variables have a significant effect on the likelihood of being identified as gifted.

4.8.1 Introduction

A logistic regression model was fitted using a 'step up' (forward) approach and checked using the 'enter' default method. In the 'step up' approach significant variable are added to an initial null model until all significant variables have been added. Each of these five indicators of giftedness were used in the analysis:

1. **Combind1**: the **combined indicator of giftedness** based on a child being rated in the top 15% on test scores with one or more of the following – identified by the teacher; identified by at least 15% of their peers; in the top 15% of self-identified pupils.

2. **Tiden**: identified by teacher as gifted

3. **Peer15**: identified by 15+% of peers as gifted

4. **Top15**: in top 15% on combined test score

5. **Selfind**: identified as gifted by self-completion questionnaire. The top 20% of the children in the factor relating to self-confident and positive attitude to learning reading, writing and mathematics, were labelled using the indicator.

4.8.2 Logistic regression

The analysis starts by carrying out logistic regression with regards to the combined indicator looking for significant variables that set out the likelihood of being in the combined indicator (combind1). The table below shows only the significant variables (gender, age, englishw, schfact2, avIQss). The column headed 'B' gives the coefficients and 'SE' gives the standard error. Regarding Exp(B) the transferal of this into the final table (Table 33) requires some calculations for those variable that are not binary into the form 'exp(B*SD)'.

Table 29 Ordinary Logistic regression - combined indicator of giftedness

	B	S.E.	Wald	df	Sig.	Exp(B)
gender	1.055	.349	9.147	1	.002	2.872
age	-.548	.173	10.071	1	.002	.578
englishw	-.783	.324	5.855	1	.016	.457
schfact2	.045	.019	5.630	1	.018	1.046
avIQss	.279	.050	31.106	1	.000	1.322
Constant	-17.861	3.994	19.997	1	.000	.000

Cox and Snell (0.062), Nagelkerke (0.178), P[χ^2(5)=54.159]<0.01

Measures show that the model fits the data well, with the likelihood ratio test (χ^2(5)= 54.159, p < 0.01), implying that the model as a whole fits significantly better than an empty model with no predictors.

The results show there are 5 independent variables that have a significant effect on the likelihood of being in this combined indicator. In terms of negative factors, the older you are and if an elder member of your family can speak English fluently (englishw) the less likely you are to be in this set of children. Looking at the positive independent variables, if your school (schfact2) has administrators and musical instruments and few other facilities (e.g., electricity, TV, computers), if you are a girl, higher average reading standardised score and higher average IQ standardized score in the class, the more likely you are to be in the gifted indicator according to combined tests. The finding that attending a school that has administrators and musical instruments but few other facilities increases the likelihood of being in the combined indicator may be one that requires further enquiry. The small sample size of schools as stated earlier in this chapter is a major statistical weakness. It seems counter intuitive that owing to the school having poor facilities a child is more likely to be part of the combined indicator.

As set out in the methodology chapter the column labelled exp(B*sd) in Table 33, sets out the multiplying factor for the odds ratio (likelihood) depending on a change in the independent variable. For age this comes out at 0.528. This means that the older you are (by one standard deviation) your likelihood of being in the combined indicator giftedness is reduced by 0.528. For gender the effect size is 2.872. This means that if you are a girl you are 2.782 times more likely of being in the combined indicator giftedness as opposed to being a boy. The same procedure of logistic regression was carried out for the other four identification indicators.

Next the teacher identification indicator (tiden) is considered. Logistic regression results indicate there are no independent variables that have a significant effect on the likelihood that the teacher will identify a child as gifted. The indicator of giftedness next considered is that of peer identification (peer15). This indicator implies that a child is identified as gifted by more than 15% of the children in their class.

Table 30 Logistic Regression - Peer identification

	B	S.E.	Wald	df	Sig.	Exp(B)
fathered	.380	.139	7.481	1	.006	1.462
mothered	-.877	.225	15.188	1	.000	.416
Constant	-2.151	.595	13.073	1	.000	.116

Cox and Snell (0.021), Nagelkerke(0.080) , P[χ^2(2)=17.712]<0.001

As shown in Table 30 two independent variables have a significant effect on the likelihood that a peer identifies the child as gifted. The higher your fathers education then you are more likely to be identified by your peers. The only negative factor is mother's education implying that the higher her education the less likely you are to be identified by your peers. These data around parental education attainment were solicited from the pupil questionnaire. The variables are therefore reliant upon children knowing the education level of both parents. This therefore may cause the findings to be questionable, such as in this case where mother's education level is a negative factor around peer identification.

Regarding a child being in the top 15% of test scores is the next gifted indicator. There are 5 independent variables that have a significant effect on this likelihood (Table 31). In terms of negative factors, the older you are and the longer your teacher has been teaching (teachex), the less likely you are to be in the top 15% of test scores. The reason for the correlation with age could be due to the class demography and that the older children have been kept back due to poor class results. Regarding the finding around teacher experience, the caveat is that the sample size of teachers is small (21) and therefore this result may indicate a random correlation. It would generally be expected that the greater the teacher experience the more proficient the teacher would be at teaching their subject.

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Hence a child in their class would have a greater likelihood of being within the top 15% of test scores than those in classes where teachers had less experience.

The positive independent variables include the peers' average IQ scores. Interestingly you are more likely to be in the top 15% if you have electricity in the home.

Table 31 Logistic Regression – Top 15% of Scores identification

	B	S.E.	Wald	df	Sig.	Exp(B)
schfact2	.028	.013	4.902	1	.027	1.028
teachex	-.028	.012	5.900	1	.015	.972
avIQss	.222	.034	42.832	1	.000	1.248
age	-.603	.121	25.028	1	.000	.547
electric	.035	.014	6.030	1	.014	1.036
Constant	-12.320	2.626	22.016	1	.000	.000

Cox and Snell (0.098), Nagelkerke (0.182) , P[χ^2(5)=87.017]<0.001

If a child identifies itself as self confident through a self-perception questionnaire then they are in a group known as 'selfind'. Exploratory factor analysis was applied to the 22 self-perception questions resulting in two factors. One of these seemed to show factors related to self-confident and positive attitude to learning reading, writing and mathematics, and the other musical and dexterous qualities. The top 20% of the children in the factor relating to self-confident and positive attitude to learning reading, writing and mathematics, was then called selfind. The results of the logistic regression show that there are 7 independent variables that have a significant effect on this likelihood.

Table 32 identified as gifted by self-completion questionnaire

	B	S.E.	Wald	df	Sig.	Exp(B)
schfact1	-.145	.024	37.551	1	.000	.865
schfact2	.072	.013	29.354	1	.000	1.074
teachex	-.131	.024	30.511	1	.000	.877
teachqual	1.292	.438	8.715	1	.003	3.639
gender	.513	.187	7.560	1	.006	1.670
age	.157	.079	3.969	1	.046	1.170
electric	.029	.010	8.026	1	.005	1.029
Constant	-1.270	1.353	.882	1	.348	.281

Cox and Snell (0.101), Nagelkerke (0.161), P[χ^2(7)=90.583]<0.001

Table 32 shows that in terms of negative factors, if a child attends a school that

possesses a TV, computers, and a playground (schfact1) and whose teacher has been teaching for a greater number of years (teachex), then you are less likely to be self confident. Regarding the positive independent variables –if you are a girl, if you are older, if you have electricity at home, if your teacher has more qualifications and your school has fewer facilities then the more likely you are to be more self confident. For example, in relation to gender you are 1.670 times more likely to be more self-confident and positive attitude to learning if you are a girl as opposed to being a boy. This might be regarded as surprising from a western cultural perspective, and could be worth further research into the factors, which appear to make girls more likely, to be identified as gifted based on their own self-confidence. Other surprising findings are around teacher experience and better school facilities having a negative affect on children's self-confidence. It would seem more intuitive that when teachers have been teaching for many years they will engender positivity amongst their pupils, also that attending a school with better facilities would encourage pupils' attitudes towards learning. Owing to the small sample size both for teachers and schools in this study further research into these factors and their relationship to children's self confidence would need to be investigated.

4.8.3 Summary of findings

The following table summarises the results, as discussed above, of the ordinary logistic regression modelling in terms of significant coefficients for each variable expressed as an effect size (Schagen and Elliot, 2004). In Table 33, the number is the exp(B*sd), giving the factor by which the likelihood of the outcome is increased by one unit increase in the background variable. Values less than one reduce the likelihood and those greater than one increase the likelihood. Blank cells in the table are variables where the coefficient is not significant at the 5% level.

Table 33 Ordinary Logistic Regression

	Significant odds multiplier				
Outcome	**Combind1**	**Tiden**	**Peer 15**	**Top 15**	**Selfind**
Variables[19]					
ptr					
schfact1					0.235**
schfact2	1.568*			1.323*	2.054**
teachergender					
classsize					
avage					
avIQss	2.109**			1.811**	
avreadss					
teachex				0.780*	0.312**
teachqual					1.636**
gender (girl)	2.872**				1.670**
age	0.528**			0.495**	1.201*
eldest					
youngest					
englisw	0.457*				
brotherenglish					
brosis					
maleincome					
femaleincome					
fathered			1.732**		
mothered			0.325**		
wealth					
looinside					
electric				1.419*	1.336**

The values in the table above are 'exp(B*SD)' These give the odds ratio multiplying factor for a change in the independent variable of one standard deviation (or from 0 to 1 for binary variables). *p<0.05, **p<0.01

This part of the research set out to answer the following question:

Does the likelihood of being identified as gifted vary according to family background and school characteristics?

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[19] Diagnostic checks using tolerance and variance inflation factor methods were used to test for collinearity between the independent variables. It was found that no significant multicollinearity issues were present. The variance inflation checks for 'father income', 'mother income', 'father education' and 'mother education' gave values of 1.061, 1.073, 1.767 and 1.783 (respectively), all below 10 and close to 1. (Myres, 1990, Bowerman and O'Connell, 1990). For tolerance check, the values were 0.943, 0.932, 0.566 and 0.561 (respectively), all above 0.2. (Hosmer, Lemeshow and Rodney, 2013). Collinearity diagnostic checks to see if the matrix was ill-conditioned, gave low eigenvalues, also indicating that the values were not dependent. Casewise diagnostics revealed that the sample was linear, with less than 10% outliers (Field, 2000)

The results of modelling the first set of giftedness indicators (logistic factors) against background variables highlight the following. First girls tend to be more likely to be marked as gifted by themselves and the combined indicator. Secondly, the higher your fathers education the more likely you are to be identified by your peers as gifted. This effect could be due to children knowing of a fathers 'status' and associating this with their classmates. Thirdly, school and family background variables have no relationship with teacher identification. Finally if the child has electricity in the home then this increases the likelihood of them being more self confident, positive to learning and in the top 15% of test scores. Access to electricity could have implications for these children being able to study at home after dark and possibly having access to technology. However, it must be remember that this is correlation, not necessarily causation. The Chapter now continues to look at a different set of giftedness indicators – pupil outcomes.

4.9 The relationships between pupil, school and teacher characteristics and pupil outcomes

This part of the Chapter considers the research question:

> What are the relationships between pupil, school and teacher characteristics and pupil outcomes?

Ordinary linear regression is used owing to the fact that the outcome (pupil score) is approximately a continuous variable. The procedure followed is similar to that carried out in the section above. Ordinary linear regression is undertaken to identify all the significant variables using a 'step-up' (forward) procedure and checked using the 'enter' default method.

4.9.1 Introduction

In this piece of modelling, we attempt to predict pupils' test scores from their background and school variables. The pupil scores used in this analysis have originated from the following:

- **IQss** - IQ standardized score – Raven's Standard Progressive Matrices;
- **Readss** - Reading standardized score – 'Single Word Reading Test' (National Foundation for Educational Research);

- **Maths** - Mathematics score, test items taken from GMADE 1 to 4 (Pearson)
- **Kiscore** - Kiswahili score.

We consider each score in turn and end with a summary of the overall findings to answer the research question.

4.9.2 IQ (Ravens) Standardised Score

Table 34 shows the results from the ordinary regression regarding the IQ score, thus using a step-up procedure that terminates when all significant variables have been included.

Table 34 IQ score relations to background variables

Variables	B	Std. Error	Sig.	S.d.	Impact	Quasi ES
(Constant)	103.95	6.590	.000			
age	-1.758	0.381	.000	1.166	-2.899	-0.13
wealth	-0.091	0.041	.028	10	-1.287	-0.10
gender	-3.343	0.854	.000	1	-3.343	-0.26
electric	0.132	0.042	.002	10	1.867	0.15
teachergender	-2.228	1.057	.035	1	-2.228	-0.18
teachqual	-6.538	1.155	.000	0.381	-3.523	-0.28

Adjusted r^2=0.088, P[F(6)>13.388]<0.001

Measures show that the model fits the data well, with the F-ratio test (P[F(6)>13.388]<0.001), implying that the model as a whole fits significantly better than the base model with no predictors. The adjusted R^2 value suggests that only 8.8% of the IQ score can be accounted for by the model, 91.2% of the variability in IQ being accounted for by other variables[20].

In the above table:
- **B** is the estimated coefficient (change in IQ score per unit change in background variable);
- **Std. Error** is the standard error in the above;
- **Sig.** is the significance;
- **S.d.** is the standard deviation of the background variable ('one' means it is a binary variable);
- **Impact** is a measure of the expected change in the outcome (i.e. IQ score) for an 'average' change in the background variable (0 to 1 for binary; √2xstandard deviation otherwise) - BxSd.xsqrt(2)

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[20] Rough guide for model fit is <0.1 poor, 0.11-0.3 modest, 0.31-0.5 moderate, >0.5 strong fit Muijs(2010).

i.e. *A child is 1.867 IQ points higher than if they did not have electricity*;
Impact on 'Age' is -1.758x1.166x$\sqrt{2}$=-2.899

- **Quasi ES** is the above impact measure divided by the standard deviation in the outcome (dependant variable). i.e 1.867/S.d. of IQss = 1.867/12.724= 0.15

The analysis implies there are 6 independent variables that have a significant effect on IQ score, all but one are negative. Girls tend to get lower IQ scores than boys (despite being more likely to be identified as gifted). Older pupils also tend to get lower scores. This could be due to the year group structure in Africa, where children stay behind a year if they do not progress. The more qualified your teacher and if they are female and the more possessions in the family then your IQ score tends to be lower. The only positive variable is having electricity in the home. Teacher qualification and gender (being a female teacher) having a negative affect on student IQ scores seem counter intuitive. As stated earlier the small sample size of teachers may provide results that assume correlations that are false. Indeed why would a teacher's gender or qualifications affect IQ scores negatively or positively? These results may be unreliable and therefore any interpretation must be taken with caution.

Looking at the column labelled Quasi ES, this gives the average change in the outcome expressed as a percentage of the outcomes standard deviation for an average change in the background variable. For example in this case, your IQ score would be 0.26 IQ points lower if you are a girl and by looking at the Quasi ES (effect size) you can say this decreases your IQ score by 26% of the IQ standard deviation

4.9.3 Reading standardized scores (Readss)

These questions are from NFER standardized reading test (National foundation for Education Research). The analysis shows 4 independent variables that have a significant effect on this likelihood. There are two negative factors that show, the older you are and the higher your teacher's qualifications, there is a likelihood that your reading score will be reduced. The positive independent variables are the teacher's gender and that the school facilities are quite poor (schfact2). If your teacher is a female and you attend a school with fewer facilities then there is likelihood that your reading score will be higher. Looking at the Quasi ES (effect

size), the older the child then you can say this decreases their reading score by 43% of the reading standard deviation (Table 35). However one should question the findings for the teacher and school variables and their association with reading scores. The negative finding around teacher qualification and the positive around teacher gender (female) and fewer school facilities can only be interpreted with the caveat of data being from small samples.

Table 35 Ordinary Linear Regression results - Reading and background

Variables	B	Std. Error	Sig.	S.d.	Impact	Quasi ES
(Constant)	95.283	4.597	.000			
age	-2.214	0.244	.000	1.166	-3.651	-0.43
schfact2	0.157	0.039	.000	10	2.220	0.26
teachergender	3.339	0.971	.001	1	3.339	0.39
teachqual	-2.142	0.750	.004	0.381	-1.154	-0.14

Dependent Variable: Standardised reading score adjusted r^2=0.129, P[F(4)>30.893]<0.001

4.9.4 Maths scores (Maths)

The maths test is a combination of items from the Pearson GMADE standardised mathematics tests 1 to 4. The results show there are 9 independent variables that have a significant effect on this likelihood (Table 36).

Four out of the nine independent variables are negative factors. These are household wealth, if you have more brothers and sisters, your age and your teacher's qualification. This analysis shows that these factors could reduce your maths score. For example, by having more brothers and sisters looking at the Quasi ES (effect size) shows that this decreases your maths score by 9% of the maths standard deviation.

The five positive independent variables are if you have electricity in your home, your father has a higher education level, if your pupil teacher ratio is larger, your school has fewer facilities and your teacher is a female. All of these factors imply that there is a greater likelihood that you could obtain a higher maths score.

Concerning the negative effect of teacher qualification and the positive of teacher gender (female) and the school has fewer facilities on mathematics outcomes it must be noted that the small sample sizes (21 teachers and 7 schools) reduce the

likelihood that these findings reflect a true effect. These positive results seem spurious. Teacher qualifications would generally be expected to have positive correlations with tests scores and poor school facilities a negative correlation. These results are counter to expectations and therefore highlighting a possible false discovery rate owing to small sample sizes.

Table 36 Ordinary Linear Regression results - Maths and background

Variables	B	Std. Error	Sig.	S.d.	Impact	Quasi ES
(Constant)	22.863	2.797	.000			
age	-0.506	0.137	.000	1.166	-0.832	-0.17
brosis	-0.109	0.053	.042	2.701	-0.416	-0.09
schfact2	0.125	0.022	.000	10	1.768	0.36
ptr	0.127	0.038	.001	8.724	1.567	0.32
teachergender	2.922	0.564	.000	1	2.922	0.60
teachqual	-4.643	0.792	.000	0.381	-2.502	-0.52
fathered	0.290	0.111	.009	1.446	0.593	0.12
wealth	-0.055	0.016	.001	10	-0.778	-0.16
electric	0.094	0.015	.000	10	1.329	0.27

Dependent Variable: Standardised reading score adjusted r^2=0.175, P[F(9)>19.679]<0.001

4.9.5 Kiswahili (Kiscore)

The Kiswahili test was made up of ten items. The results show that there are 6 independent variables that have a significant effect on this likelihood.

Table 37 Ordinary Linear Regression results - Kiswahili and background

Variables	B	Std. Error	Sig.	S.d.	Impact	Quasi ES
(Constant)	12.241	2.173	.000			
gender	0.329	0.122	.007	1	0.329	0.18
eldest	-0.559	0.156	.000	1	-0.559	-0.31
youngest	-0.347	0.153	.024	1	-0.347	-0.19
teachqual	-0.914	0.159	.000	0.381	-0.492	-0.27
aveage	-0.511	0.187	.006	0.326	-0.236	-0.13
electric	0.021	0.006	.000	10	0.297	0.16

Dependent Variable: kiscore score adjusted r^2=0.084, P[F(6)>12.849]<0.001

In terms of negative factors, if you are the eldest or youngest child in your family, and the higher your teacher's qualifications, and the greater the average age of the class then you are more likely to obtain a lower Kiswahili score. For example, the

data show that you are better at Kiswahili if you are not the eldest or youngest in the family. There are two positive independent variables. These are if you are a girl and if you have electricity in the home. Your Kiswahili score would be 0.329 Kiswahili points higher if you are a girl and looking at the Quasi ES (effect size) you can say this increases your Kiswahili score by 18% of the Kiswahili standard deviation (Table 37). Once again the small number of teachers in this sample seems to be highlighting findings that do not reflect a true effect. The negative correlation around teacher qualification and student scores in Kiswahili again shows a significant effect that is most likely false.

4.9.6 Summary of findings

The following table summarises the results of the ordinary regression as applied to the 4 different score outcomes:

- IQ score
- Reading score
- Maths score
- Kiswahili score

Table 38 Ordinary Linear Modeling

| Outcome | Significant odds multiplier | | | |
	IQ score	Reading	Maths	Kiswahili
Variables				
ptr			1.567 (0.32)**	
schfact1				
schfact2		2.220 (0.26)**	1.768 (0.36)**	
teachergender	-2.228 (-0.18)*	3.339 (0.39)**	2.922 (0.60)**	
classsize				
avage				-0.236 (-0.13)**
teachex				
teachqual	-3.523 (-0.28)**	-1.154 (-0.14)**	-2.502 (-0.52)**	-0.492 (-0.27)**
gender (girl)	-3.343 (-0.26)**			0.329 (0.18)**
age	-2.899 (-0.13)**	-3.651 (-0.43)**	-0.832 (-0.17)**	
eldest				-0.559 (-0.31)**
youngest				-0.347 (-0.19)*
englisw				
brotherenglish				
brosis			-0.416 (-0.09)*	
maleincome				
femaleincome				
fathered			0.593 (0.12)**	
mothered				
wealth	-1.287 (-0.10)*		-0.778 (-0.16)**	
looinside				
electric	1.867 (0.15)**		1.329 (0.27)**	0.297 (0.16)**

Impact size (quasi effect size) *p<0.05, **p<0.01

Table 38 above shows the results for ordinary regression of test scores, using a set of background and school variables. The table shows significant impact coefficients, which is the estimated change in the outcome for an 'average' change in the given background variable. The figure in brackets is the 'quasi effect size', the former measure divided by the standard deviation of the outcome (Schagen and Elliot, 2004). Blank cells in the table are variables where the coefficient is not significant at the 5% level.

This part of the research set out to answer the question:

> What are the relationships between pupil, school and teacher characteristics and pupil outcomes?

Based on ordinary linear regression modelling some conclusions from the analysis are:

- Children who are older are less likely to perform well on the IQ, reading or the mathematics test, but eldest children are less likely to perform well in Kiswahili;
- Girls are more likely to perform better on the Kiswahili test but less likely to gain a higher IQ score;
- Average class age is negatively related to Kiswahili scores;
- Father's education is positively related to mathematics score;
- Electricity in the home is positively related to all of the test scores apart from reading. This factor appearing again as it did in the identification strategies;
- Family wealth is negatively related to IQ and mathematic scores;
- Schools with fewer facilities are positively related to scores in reading and mathematics.

The significant effects that were found in this research concerning teacher and school variables are not included in this list. As stated above the correlations associated around teacher gender, experience and qualifications as well as the availability of school facilities could, owing to the small sample size, be called into question, producing random correlations. The findings being illogical and counter-intuitive seem to reflect this statistical weakness and limitations of the data.

4.10 Conclusion

The analysis of this data has helped to illuminate the complex interplay of factors, which relate to the identification of potentially gifted children in sub-Saharan Africa. Our data testing for schoolhouse giftedness, using a multidimensional

approach shows that talented children do exist in poor areas of Dar es Salaam. The data from this chapter can now be used to obtain a smaller subset of 'talented' pupils and the interplay of Renzulli's other two rings – creativity and commitment.

Chapter Five: Creativity, Motivation and Vignettes of the gifted - Stage Two

5.1 Introduction

This chapter looks at two of Renzulli's rings – creativity and motivation - with a subset of 'talented' students who were identified using the multidimensional identification approach set out in Chapter 4. It was not possible in the confines of this research to look at the whole set of 847 students due to time and monetary limitations. Therefore it was decided to test the whole sample regarding schoolhouse ability and then re-test a subsample on a second visit to Tanzania around creativity and commitment. This chapter looks at the results obtained from both the creativity and commitment measures.

Taking creativity first, one of the aims of this study is to determine whether the creativity construct is divided into two factors - innovative and adaptive - and thus dimensionally equivalent in an African setting as in western settings. It was then considered how any creative dimensionalities could correlate to an individual's contextual factors including education, social environment, family and personal factors (personality, intelligence, knowledge and experience). This work also seeks to build on the findings of studies by Krumm et al., (2014), Kim (2006) and Kim et al., (2006), which were derived from Kirton's theoretical proposal (1976, 1978, 1982, 1987, 1989). Therefore the first part of the chapter sets out to answer the research questions:

• Is the creativity construct of Divergent thinking (DT) dimensionally equivalent in an African as in a western setting?

• How do any creative dimensionalities correlate to an individual's contextual factors including education, social environment, family and personal factors?

Second, task commitment represents the energy brought to bear on a particular task or problem or specific area of work. It is a focused form of 'motivation' that Renzulii (1986, 1988b, and 1999) labels task commitment – a belief in one's own ability to carry out important work and how this can be applied to one's own area(s) of interest. This part of the research sets out to consider:

- What are the intrinsic and extrinsic motivational characteristics for a set of poor high ability children?

- Investigate whether motivation dimensionalities correlate to an individual's contextual factors including education, creativity, social environment, family and personal factors.

5.2 Participants

A total of 125 primary students living in economically deprived areas of Dar es Salaam in Tanzania (females =54%; age range 8- 12 years, M=10.03, SD= 0.842) participated in this study. These 125 were a 'talented' subset obtained from the original total of 847 students. The research documented in Chapter 4 provides 47 children who obtained a test score in the top 15% as well as being identified by at least one of the three other identification indictors (teacher, peer and self). This sample was assumed too small a subset on which to carry out the investigation into the other two rings. Therefore an additional 78 children also identified in the overall ESRC project as 'high ability' but using different IQ tests (WASII and NNAT2) were added to make a larger sample.

5.3 Measures

5.3.1 Creativity test – The Torrance Tests of Creative Thinking

The researcher only had two weeks to locate the subset of students, set up test dates and travel to the different schools. Therefore it was decided to use the Torrance Tests of Creative Thinking creativity measure as it is quite simple to administrate to large disperse samples of students in a limited time frame. The Torrance Tests of Creative Thinking are more akin to school-like tasks in the type of questions and demands for expressive writing. The TTCT is one of the most used pen and paper tests for creativity and therefore considered more appropriate for this set of children in Dar es Salaam. Testing took place within the children's own classes in their own schools. Children in groups of 10–20 completed the TTCT.

5.3.2 Commitment test – the Work Preference Inventory and the Scale for Rating Behavioural Characteristics

This research used an adapted version of both the Work Preference Inventory (WPI) (Amabile et al., 1994) and the Scale for Rating Behavioural Characteristics (Renzulli and Hartman, 1981). The adapted 'inventory' was made up of 12 items each relating to either intrinsic or extrinsic characteristics of motivation – six in each category. The students rated the degree to which they perceived each of the 12 items on the checklist as descriptive of themselves using a four-point scale ranging from 1 (Never or almost never true of you), 2 (Sometimes true of you), 3 (Often true of you) and 4 (Always or almost always true of you). This was read out in Kiswahili (see appendix for test). The Chapter now proceeds by setting out the creativity analysis, followed by the findings from the commitment testing.

5.4 Creativity

5.4.1 Analysis - Confirmatory factor analyses (CFA)

Exploratory factor analysis was initially conducted in order to determine the number of factors that could adequately represent the data. An initial estimation yielded two factors with eigenvalues exceeding unity, accounting for 57% of the total variance. Confirmatory factor analyses (CFA) utilizing STATA was then performed to examine the latent structure of the creativity construct to explore the uni - and multi-dimensionality of creativity to answer the first creativity question:

'Is the creativity construct of Divergent thinking (DT) dimensionally equivalent in an African as in a western setting?'

Kim's hypothesis (2006; Kim et al., 2006) is the basis of the first theoretical model (Model 1) regarding the conformation of the creativity construct. Thus, the latent innovative factor (INNO) comprises the abilities of fluency (F) and originality (O), and the latent adaptive factor (ADAP) comprises elaboration (E), abstractness of titles (AT), and creative strengths (CS). The dimension of resistance to premature closure (RPC) is included in both the innovative factor and adaptive factor. Model 2 is the same as Model 1 in all respects but with the dimension of resistance to

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premature closure only included in the latent innovative factor. For Model 3 the creative strengths dimension was removed from the model - thus the latent innovative factor comprising of fluency and originality and the adaptive factor consisting of resistance to premature closure, elaboration and abstractness of titles. A fourth model is the same as Model 3 but the adaptive factor includes one other item - creative strengths[21] (Figure 11).

Figure 11 Hypothesized models of creativity construct
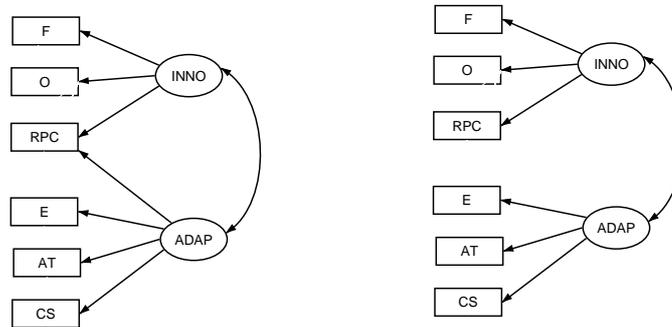
Model 1   Model 2
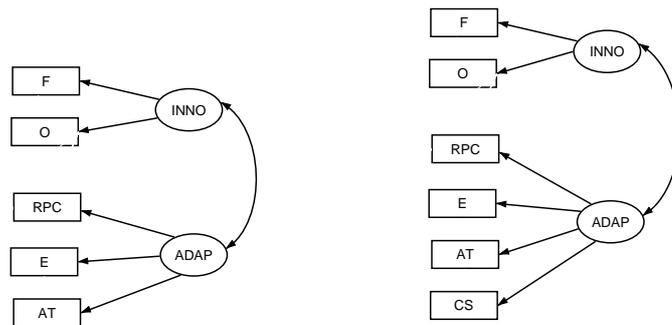
 Model 3   Model 4

INNO=Innovative; ADAP=Adaptive; F=Fluency; O=Originality; RPC=Resistance to premature closure; E=Elaboration; AT=Abstractness of titles; CS=Creative strengths.

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[21] See Appendix 9 for regression functions for the creativity models

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5.5 Results – Creativity Construct uni-dimensional or multidimensional

In order to establish which model provided the best fit the χ^2 test and the fit indices were calculated. A range of fit and comparison-based indices, including chi-square, was used to determine which model provided the best fit for these Africa data (Bentler, 1990; Browne & Cudeck, 1993; Steiger, 1990). The fit indices are shown in Table 39 and include Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Square Residual (S-RMR), Coefficient of Determination (CD), Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI). Hu and Bentler (1999) suggest various cut offs for these fit indices. To minimize Type I and Type II errors one should use a combination with S-RMR or the RMSEA. In general good models should have an S-RMR <0.08 or the RMSEA <0.06 with the fit index values > 0.9. Information regarding RMSEA, S_RMR, CD, TLI and CFI on these models and the correlations of the individual measures is given in Table 39. Gender difference with regards to age was investigated for boys (n=58) aged 8 to 12 (M=10.09, SD=0.90) and for girls (n=67) aged 8 to 12 (M=9.9, SD=0.79). The difference between ages between boys and girls is not significant, t (123) = 0.668, Cohen's d=0.23. The fit indices of Model 3 with the pattern of factor loadings held invariant and including covariance shows the best fit with CD, TLI and CFI all greater than 0.90 and the S-RMR less than 0.08. Model 4 was untenable (see Table 39 and Figure 12). The two factor model (Model 3) was further analysed by evaluating the parameter estimates. The large values of the factor loadings indicated that the creative measures were a good indication of their factors. However the low factor loading for abstractness of titles is relatively low (0.2) implying that it does not relate as highly to the adaptive factor as do elaboration (0.66) and resistance to premature closure (0.53).

Table 39 Fit Indices of the Models

Competing Model	χ^2	df	RMSEA	S-RMR	CD	TLI	CFI
				Fit Index			
Uni-dimensional	65.312	9	0.224	0.100	0.913	0.660	0.796
Model 1	36.962	7	0.185	0.099	0.993	0.767	0.891
Model 2	37.995	8	0.173	0.102	0.993	0.796	0.891
Model 3	8.444	4	0.094	0.047	0.981	0.945	0.978
Model 4	*Untenable*						

Figure 12 Estimated Models of Creativity construct
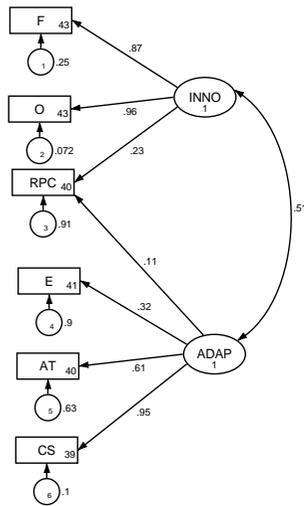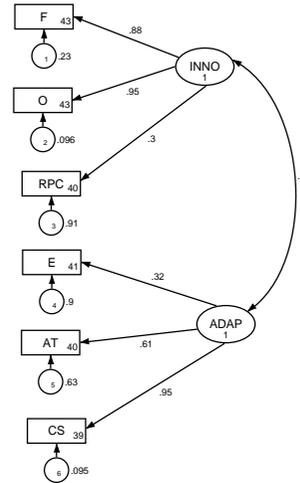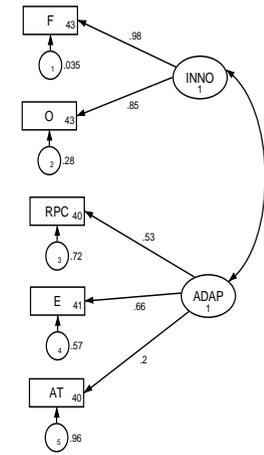
Model 1   Model 2   Model 3

Note: INNO=Innovative; ADAP=Adaptive; F=Fluency; O=Originality; RPC=Resistance to premature closure; E=Elaboration; AT Abstractness of titles; CS=Creative strengths. Standardised scores are similar to standardised regression coefficients i.e. one standard score increase in Innovative (INNO) is 0.98 standardised score increase in Fluency (F). The value of 0.98 means that Innovative accounts for 96% (0.98^2=0.96) of the variance in the Fluency indicator with an error or unexplained proportion of 4%. Hence Fluency = 0.98xINNO + constant. The value of one in the oval indicates that the factor is interpreted as a Z-score.

Table 40 contains the correlation matrices for each of the creative measures of the TTCT. The correlation coefficients were all significant (either at the 0.01 or 0.05 level of significance) apart from abstractness of title (AT) with elaboration (E) and resistance to premature closure (RPC) with abstractness of title (AT). The correlation coefficients between fluency (F) and originality (O) were very high (0.83).

Table 40 Correlation of creative measures

	F	O	E	AT	RPC	CS
F						
O	.83**					
E	.44**	.38**				
AT	.22*	.28**	.06			
RPC	.34**	.25**	.37**	.07		
CS	.37**	.47**	.30**	.58**	.21*	

Note. F=fluency, O= Originality, E= Elaboration, AT=Abstractness of title, RPC =Resistance to premature closure, CS =Creative strength. ** p <.01, * p < .05

CFA were also conducted with one general factor (uni-dimensional construct) in order to compare this with Model 3 (two factors). The chi-square value and the fit indices were poor, suggesting that the two-factor model was a much better fit ($\chi^2(9)$ = 65.312, RMSEA = 0.224, S-RMR=0.1, CD=0.913, TLI=0.66, CFI=0.796 – fit indices for the one factor). Thus the two-factor model was retained as the best model of fit. This implies that the creativity construct is best explained by a model of two correlated factors as in Model 3.

5.6 Creative Dimensionalities and correlations with contextual factors

The two creativity dimensions - innovative and adaptive - were used to explore the context of, and investigate the interaction between, the individual personnel background factors and creative behaviour. This sets out to answer the research question:

'How do any creative dimensionalities correlate to an individual's contextual factors including education, social environment, family and personal factors?'

It can be conjectured that the background and the environment in which a person lives play an important role in helping to form personality and behaviour. Prior

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analyses have been carried out on the whole data set utilizing regression analysis. This was done in order to consider associations between student ability, learning outcomes, school data, teacher data and background/family data. Certain factors were found to be statistically significantly correlated to student ability and outcomes. This analyses retained only those significant variables as it was hypothesized they were more likely to show any correlation with creativity. These contextual factors of educational, social and family were examined to consider their influence on creativity measures. Table 41 below provides the variables and their meaning.

Table 41 List of variables

Variable name	Label
peer15	Identified by at least 15% of your peers as gifted
tiden	Identified by the teacher as gifted
ciden	Identified by at least 1 peer as gifted
selfind	Self-confident and positive attitude to learning
creativity	Score on a creativity survey[22]
IQss	IQ standardised score (Ravens, NNAT2 or WASI)
readss	English reading standardised score
maths	Mathematics score
kiswahili	Kiswahili score
ptr	Pupil teacher ratio
schfact1	The school has a playground, TV and a computer
schfact2	The school has administrators and musical instruments
teacherage	The teacher's age
classsize	The size of the class
avage	Average age in the class
avIQss	Average IQ standardised score in the class
avreadss	Average reading standardised score in the class
teachex	Teacher experience
teachqual	Teacher qualification
gender	Child's gender
age	Child's age
eldest	The child is the eldest child in the family
englisw	A member of the family is fluent in English
brosis	Number of brothers and sisters
fathered	The father's education level
mothered	The mother's education level
wealth	Wealth as determined by a wealth index
looinside	The family home has a toilet inside the home
electric	The family home has electricity in the home.

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[22] Renzulli and Hartman(1981), see Appendix 1 for questions.

A model was constructed to examine how innovative and adaptive creativity measures correlated with these factors. Literature indicates that, although creative thinking is partially hereditary, the context in which an individual grows up, and in which they live, plays a major role in whether their latent potential will be expressed (Isaksen et al., 2000). Multiple regression was carried out using SPSS and the results are provided in Table 42 showing any correlations with the creativity measures – fluency, originality, elaboration, abstractness of title, resistance to premature closure – and the total creativity index. The table shows the variables with significant correlations only (p<0.01), their impact size and their quasi effect size related to the TTCT measure. As set out in Chapter Four the quasi effect size is the impact coefficient divided by the standard deviation in the outcome (Schagen & Elliot, 2004).

Table 42 Linear Regression on Background and Creativity Measures

	Significant odds multiplier					Total Creativity index
	Innovative Latent Factor		Adaptive Latent Factor			
Outcome	F	O	E	AT	RPC	
Achievement Outcomes						
Iqss						
readss						
maths						
kiswahili						
Other-Identifiers						
peer15						
tiden						
ciden						
Self-Identifiers						
selfind		0.267 (0.24)**		0.313(0.30)**		5.212 (0.30)**
creativity			0.348 (0.32)**		0.282(0.25)*	
School factors						
ptr						
schfact1					-0.721 (-0.63)*	
schfact2		-0.325 (-0.3)*	-0.396 (-0.36)*	-0.424 (-0.41)**		
teacherage						
teachex		0.735 (0.67)**		0.792 (0.76)**	0.325 (0.28)*	10.875 (0.62)**
teachqual		-0.339 (-0.31)**				
classsize						
Peer factors						
avage		1.499 (1.38)*				
avIQss				0.829 (0.80)**	-0.634 (-0.55)*	
avreadss		1.148 (1.05)**				
Family						
gender		0.349 (0.32)*		0.279 (0.27)*		
age				0.315(0.30)*	0.411 (0.36)**	
eldest		0.452 (0.41)**				7.259 (0.41)*
englisw	0.618 (0.56)**	0.473 (0.43)**				8.181 (0.47)*
brosis						
fathered						
mothered					0.324 (0.28)*	
wealth						
looinside						
electric						
R²	0.112	0.308	0.132	0.503	0.187	0.413
F(p-value)	7.679 (0.001)	7.448 (0.000)	6.136 (0.001)	24.081 (0.000)	9.264 (0.000)	13.812 (0.000)

Blank cells in the table are variables where the coefficient is not significant at the 5% level. *p<0.05, **p<0.01

In Model 3 shown in Figure 12, the latent innovative factor (INNO) consisted of only the two most highly correlated items fluency and originality. It can be seen from the results set out in Table 42 that there are 5 independent variables that

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have a significant effect related only to the latent innovative factor. These are average age in students class (avage), average standardized reading score in students class (avreadss), teacher qualification i.e., certificate, degree, diploma (teachqual), you are the eldest in the family (eldest) and an elder member of the family can speak or write English fluently (englisw). With two of these factors 'eldest' and 'englisw' featuring heavily in the overall Creativity Index. There is one negative and four positive factors. In terms of the negative factor (teachqual), the more qualified your teacher the more likely you will tend to have a lower innovative score. With respect to the positive independent variables (avage, avreadss, eldest, englishw), if your class is older, if your classes average English reading score is higher, if you are the eldest in your family and someone in your family can speak English then the more likely you are to obtain a higher innovative score. The analysis implies that if you are older or you are in an environment whether at home or at school where people excel in English you are more likely to have greater ability to produce more uncommon or unique responses. Looking at the quasi effect size (Quasi ES), this gives the average change in the outcome expressed as a percentage of the outcomes standard deviation for an average change in the background variable. To show the meaning of this, when considering the child being the 'eldest' in the family and looking at the corresponding quasi effect size, it can be said that being the eldest increases your innovative score by 41% of the originality standard deviation.

The latent adaptive factor (ADAP) consists of the following creativity measures: resistance to premature closure, elaboration and abstractness of titles. Table 42 shows there are 2 negative and 3 positive independent variables that have a significant effect related to only the children's adaptive factor. These are the highest education qualification the mother obtained (mothered), age of the child (age), average standardized IQ for the whole class (avIQss) and standard of school equipment provision (schfact1). The fifth factor relates to a questionnaire given to the students around their own creativity self-belief. The average standardized IQ in the class seems to have mixed effects on the adaptive factor showing both positive and negative quasi effect size. The other factor showing a negative effect is that of the school's equipment provision, saying this decreases your resistance

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to premature closure (RPC) score by 63% of the RPC standard deviation. With respect to the positive independent variables, if you are older, if your mother has had more education and if you think you are creative, then the more likely you are obtain a higher adaptive score. Being older is significant to two items in the adaptive factor, both abstractness of titles (AT) and resistance to premature closure (RPC), and having a similar level of effect on both. Your own self perception of your creativity effects both elaboration (E) and resistance to premature closure (RPA), with the largest quasi effect size increasing your elaboration score by 32% of your elaboration's standard deviation.

Other factors that have a positive significant effect on the creativity score across both innovative and adaptive factors are the number of years your class teacher has been teaching (teacherx), if you are a girl (gender) and self-confident and positive attitude to learning reading, writing and mathematics (selfind). There is a positive correlation between confidence (self perception score) and two of the creativity items as well as the overall creative index. Teacher experience also affects positively the total creativity index. In terms of negative factors, there is only one, the school factor that stipulates that the school has available desks and musical instruments only (schfact2), and hence not as 'affluent' a school compared with others (schfact1). It is interesting to note that pupil achievement, other identifiers and family factors relating to wealth did not relate to any of the creativity measures or constructs.

As stated in Chapter Four, which sets out the first stage of this research, having small samples sizes for teachers as well as schools reduces the chance of detecting true effects around these variables. Correlations between variables may be owing to coincidence or possibly an unseen factor (possibly a common response variable, Button et al., 2013). Therefore the correlations between school factors, teacher experience, and teacher qualifications with the creativity measures set out in the section above and summarised in Table 42 could be inconclusive highlighting spurious relationships and correlations.

5.7 Thoughts on creativity and giftedness – Teachers and Parents

5.7.1 Teacher Identification

In practical situations, teacher nomination is one of the most common methods for identifying gifted students. However, teachers tend to prefer gifted children who are low in creativity to those who are highly creative (Anderson, 1961). Research has shown that teachers tend to identify students who are 'achievers' and 'teacher pleasers' as gifted rather than creative students who may be disruptive or unconventional (Davis and Rimm, 1994; Oliphant, 1986; Rimm and Davis, 1976; Ritchie, 1980).

In total, out of the 125 children identified during Phase One, the teachers named 18 as being 'gifted'. To see if teachers recognized the children whose creativity or IQ score was statistically significantly different from those not identified an independent sample t test was carried out. The results show no significant difference between the means of the students' creativity index [$t(123)=0.426$, $p>0.05$] nor the means of IQ standardized scores [$t(123)=0.772$ $p>0.05$] between the teacher identified and non-teacher identified children. This seems to imply that teachers did not recognize either of these skills in their students. In fact when considering all the test results it is only the children's English reading standardized score that gives a significant difference [$t(123)=-3.575$, $p<0.001$] (Table 43).

Table 43 Identified and not by teacher

	Teacher identified the child as gifted	N	Mean	Std. Deviation
IQss	no	107	87.74	12.242
	yes	18	85.28	14.024
Creativity Index	no	107	93.85	17.593
	yes	18	91.94	17.461
Maths	no	107	24.55	2.194
	yes	18	24.39	3.071
Readss	no	107	84.85	10.053
	yes	18	94.00	10.006
Kiswahili	no	107	6.78	1.254
	yes	18	6.89	1.605

When teachers were asked why they nominated a specific child as gifted (they were asked to nominate three in their class) typical responses were very focused on classroom performance saying 'does well in class/daily work/ exams' or 'controls the class when I'm not there' 'leads others in the lesson' 'gives help to weak pupils' 'good at reading' 'good at English' 'quick, confident and smart' 'self-respect and clean'. No teacher used the word 'creative' or 'creativity' as a reason for nomination.

5.7.2 Comments from parents

Interviews with the parents revealed the opposite view regarding giftedness to the teachers' in relation to creativity. A random sample of children took home a household survey and returned them the following day. When surveying a sample of around 100 parents about what they understood to be meant by being 'gifted', about one third used the word, without being prompted, 'creative' or 'creativity' in their responses. Some examples included:

'Is innovative, creative and inquisitively curious to know more'.
'By looking at the way they do things differently'.
'Is a child that does lots of great things which are creative using their brain and cooperating with other children'.
'Creative and intelligent'.
'Likes to create things'.
'Write creative poems'.

Parents tended to link the word 'creative' with children being able to do things by themselves and acting as an individual. One quoted that the child who is gifted would 'go into work that was creative' when they grew up; another that 'the child will be self reliant and create new ideas when they grow up'. When asked if gifted children should be treated differently at school a variety of answers around the same theme included, 'yes, because they need to have time to show their creativeness and develop their creativity', 'yes, to increase their knowledge, creativeness and increase their ability to study more', 'yes, to help them is school activities and allow them to become more creative and understanding'.

5.8 Creativity - Summary

This part of the chapter has looked at answering two of the research questions pertaining to creativity. It has been shown that the creativity construct of divergent thinking for this group of Tanzanian children is dimensionally equivalent to those findings from western research. Second, regarding the overall creativity index, teacher experience, gender and self-perceptions of giftedness all significantly positively affect the total creativity index. It is interesting to note that pupil achievements, 'other identifiers' and family factors relating to wealth do not relate to any of the creativity measures. Below are examples of some of the children's drawings from the TTCT test (Figure 13).

Figure 13 Drawings from the TTCT

Activity 1 – Picture Construction

Your Title: Dra Dragoni

TORRENCE - Creativity

Your Title: flower
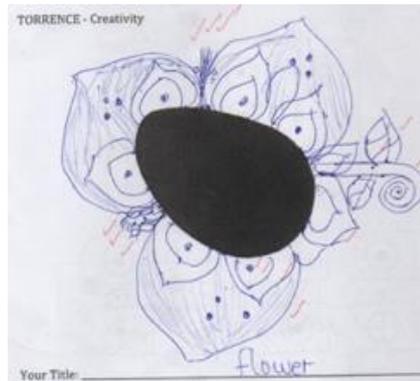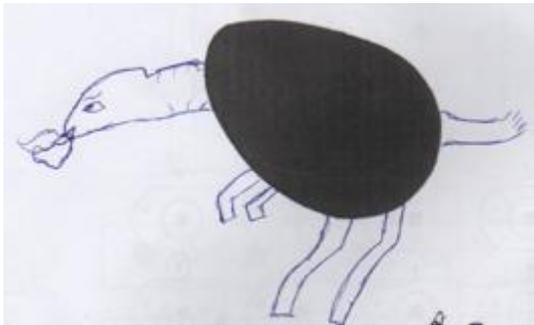
Activity 2 – Picture Completion

mtu

Kipepeo

Samaki

Activity 3 - Lines

Nyumba

MIGUU

MEZA

uice na maji

Simu
CELLPHONE

Rula
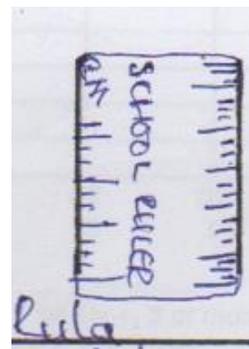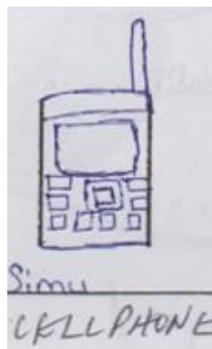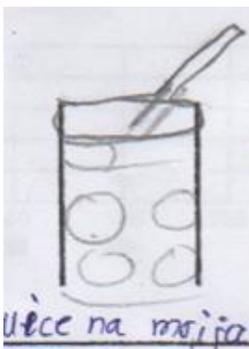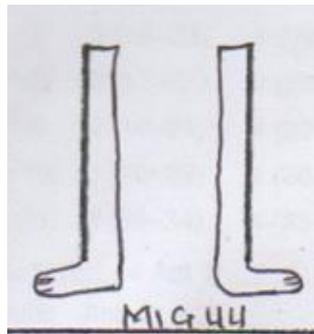
5.9 Commitment

Turning now to consider Renzulli's ring around commitment, the two research questions considered are:

- What are the intrinsic and extrinsic motivational characteristics for a set of poor high ability children?
- Investigate whether motivation dimensionalities correlate to an individual's contextual factors including education, creativity, social environment, family and personal factors.

Task commitment, according to Renzulli (1986, 1988, 1999), is a focused form of motivation. It is generally considered there are two motivational traits. The following descriptions set out the two primary scales, intrinsic and extrinsic motivation that can then be subdivided into secondary scales.

1. Intrinsic Motivation – there are two secondary scales 'challenge' and 'enjoyment' and these can be divided into six categories *self-determination, competence challenge, task involvement, curiosity, enjoyment, interest*.
2. Extrinsic Motivation – has two secondary scales – recognition and compensation – divided into five categories concerned *with competition, evaluation, recognition, money or other tangible incentives, and constraints imposed by others*.

This first part of the section looks at the intrinsic and extrinsic motivational characteristics for this sub-set of children hence investigating the first research interest on motivation.

The pupil questionnaire included 12 items asking the pupils to describe themselves, on a 4-point scale ranging from 1 ('never') 2 ('sometimes'), 3(a lot') to 4 ('always').

5.9.1 Descriptive statistics – motivation

Tables 44 to 46 show the mean and standard deviations (SD) for each of the twelve items in the questionnaire[23].

Table 44 Mean and SD for Extrinsic Motivational characteristics

Extrinsic Motivation	Mean	SD	Υ_1	β_2
Ext1. I want other people to find out how good I really can be at my work.	2.79	0.96	0.21	-1.51
Ext2. I am strongly motivated by the recognition I can learn from other people.	2.97	0.92	-0.19	-1.30
Ext3. I am concerned about what other people think of my work.	3.07	0.98	-0.30	-1.57
Ext4. I am concerned about how other people are going to react to my ideas.	2.93	0.94	0.31	-1.10
Ext5. To me, success means doing better than other people	2.90	0.91	0.08	-1.55
Ext6. I believe that there is no point in doing a good job if nobody else knows about it.	3.02	0.92	-0.17	-1.53

Υ_1=Skewness, β_2=Kurtosis

Table 45 Mean and SD for Intrinsic enjoyment motivational characteristics

Intrinsic enjoyment motivation	Mean	SD	Υ_1	β_2
Injoy1. I am more comfortable when I can set my own goals.	2.23	0.96	0.33	-0.84
Injoy2. I prefer to figure things out for myself.	2.80	1.01	-0.21	-1.14
Injoy3 I am very curious about many things! I ask questions all the time about everything and anything.	2.17	0.84	0.79	0.23

Υ_1=Skewness, β_2=Kurtosis

Table 46 Mean and SD for Intrinsic challenge motivational characteristics

Intrinsic challenge motivation	Mean	SD	Υ_1	β_2
Inchal1. The more difficult the problem, the more I enjoy trying to solve it.	2.32	1.013	0.27	-1.00
Inchal2. I enjoy trying problems that are completely new to me.	1.66	1.033	1.31	0.28
Inchal3. I prefer work that stretches my abilities to work I know I can do well	1.44	0.826	1.15	1.81

Υ_1=Skewness, β_2=Kurtosis

From the above tables it can be seen that the scores for intrinsic challenge were much lower than for the other scores. In fact in general the intrinsic motivation items scores are lower on average than the extrinsic item scores. This could suggest that the attitude amongst most children is that they prefer work they can do and get the right answer too.

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[23] Acceptable limits for skewness & Kurtosis ±2 (Field, 2000: Trochim & Donnelly, 2006; Gravetter & Wallnau, 2014)

Significant gender differences, after adjusting the level of significance for multiple comparisons using the Bonferroni procedure[24], were observed in only one item. Girls report that they are 'strongly motivated by the recognition I can earn from other people.' (girls M = 3.12, SD = 0.913; boys M=2.79, SD = 0.913; t (123) = -1.992, p<0.05).

This is also supported from interviews with teachers who state that girls are more competitive (and therefore motivated) than boys in class:

> 'There is a lot of competition going on the expectation that she has is that they do very well and sometimes the girls will do better than the boys because of the competition and that the girls tend to be more competitive.' (Teacher 3)

As well as being more competitive in class their attitude is to concentrate more during lessons:

> 'I don't know but because boys are like playing and they are not settled. Because girls are settled and they concentrate whereas boys waste most of their time in playing and they don't concentrate. So girls they concentrate on the issues.' (Teacher 5).

Teacher 6 thinks this could be due to the activities that girls have had to do at home from a young age 'Girls normally concentrate on domestic activities'. Teacher 4 suggests that this could be due to maturity 'They know themselves, girls know themselves more than boys.'

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[24] The Bonferroni procedure adjusts the confidence for each individual interval, so that simultaneous level is correct.

5.9.2 Commitment – Exploratory factor analysis

Exploratory factor analysis (EFA) using maximum likelihood (ML)[25] was initially conducted in order to determine the number of factors that could adequately represent the self-perception motivational questionnaire to investigate the construct of the structure as applied to these African children. Gender effects were not evaluated in this model, as reported above when looking at the descriptive data, only one of the items showed any significant variation due to gender

Table 47 EFA: Promax-rotated three-factor pattern

	1	2	3
Intrinsic Enjoyment 1		57	
Intrinsic Enjoyment 2		67	
Intrinsic Enjoyment 3		57	34
Intrinsic Challenge 1			62
Intrinsic Challenge 2	32		70
Intrinsic Challenge 3			74
Extrinsic 1	41	48	
Extrinsic 2	78		
Extrinsic 3	65		
Extrinsic 4	66		
Extrinsic 5	70		
Extrinsic 6	64	73	

Extraction Method: Maximum Likelihood, Rotation Method: Promax with Kaiser Normalisation. Rotation converged in 6 iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy 0.771, Bartlett's Test of Sphericity chi-square 266.939, df 66, sig .000. Note: Only loadings of magnitude above 0.30 are shown. Decimals in factor loadings are omitted. Promax oblique rotation provides a more realistic representation of how the factors are interrelated

Figure 14 Scree plot for Motivation

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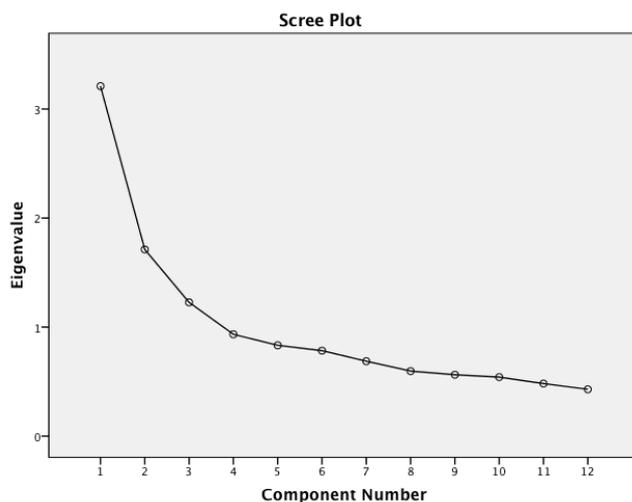
[25] Maximum likelihood is the most commonly used estimation method in CFA allowing for statistical evaluation.

An initial estimation yielded the smallest number of factors to be three (Table 47), with eigenvalues exceeding unity, accounting for 51% of the total variance. It can be noted from the scree test (Figure 14) that the point where the graph changes shape and the substantial decline in the magnitude of the eigenvalues occurs is where there are three eigenvalues greater than one. A three-factor solution is supported using the logic of the Kaiser-Guttman rule, when an eigenvalue is less than 1.0, the variance explained by a factor is less than the variance of a single indicator.

The postulated model obtained from EFA, can be summarised by twelve separate equations.

$F_i = a_i f_1 + e_i$ (i=1 to 6)

$F_i = a_i f_2 + e_i$ (i=7 to 9)

$F_i = a_i f_3 + e_i$ (i= 10 to 12)

Factor (F one to six) represents extrinsic latent factor, factor (F seven to nine) represents intrinsic enjoyment latent factor and factor (F ten to twelve) intrinsic challenge.

5.9.3 Commitment – Confirmatory factor analysis

Confirmatory Factor Analysis (CFA) utilizing STATA was then performed to examine the latent structure of the motivational characteristics. In order to establish which model provided the best fit the χ^2 test and the fit indices were calculated. A range of fit and comparison-based indices, including chi-square, was used to determine which model provided the best fit for these Africa data (Bentler, 1990; Browne & Cudeck, 1993; Steiger, 1990). The fit indices are shown in Table 48 and include Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Square Residual (S-RMR), Coefficient of Determination (CD), Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI). Hu and Bentler (1999) suggest various cut offs for these fit indices. To minimize Type I and Type II errors one should use a combination with S-RMR or the RMSEA. In general good models should have an S-RMR <0.08 or the RMSEA <0.06 with the fit index values > 0.9.

Information regarding RMSEA, S_RMR, CD, TLI and CFI on these models and the correlations of the individual measures is given in Table 49.

Table 48 Tests for Invariance of Motivational Characteristics using CFA

Competing Model	χ^2	df	RMSEA	S-RMR	CD	TLI	CFI
				Fit Index			
Model 1: one factor model	95.296	54	0.078	0.083	0.789	0.764	0.807
Model 2: Three-Factor Model	101.869	54	0.084	0.121	0.949	0.727	0.776
Model 3: Three-Factor Model with pattern of factor loading, factor variances and covariance's held invariant	63.667	51	0.045	0.066	0.935	0.923	0.941

Model 3 shows the best fit with RMSEA and S-RMR < 0.07 and the CD, TLI and CFI > 0.92. In Model 3, all three factors are assumed to be correlated with each other. The model has 27 parameters to estimate, twelve factor loadings (a_1 to a_{12}), twelve unique variances (e_1 to e_{12}) and three correlations. The observed correlation matrix has twelve variances and 66 correlations, a total of 78 terms. Consequently the postulated model has 78-27=51 degrees of freedom.

Table 49 Standardised Solution of Motivational characteristics

Motivational characteristics	1	2	3
Extrinsic 1	67		
Extrinsic 2	56		
Extrinsic 3	49		
Extrinsic 4	61		
Extrinsic 5	61		
Extrinsic 6	54		
Intrinsic Enjoyment 1		40	
Intrinsic Enjoyment 2		48	
Intrinsic Enjoyment 3		55	
Intrinsic Challenge 1			75
Intrinsic Challenge 2			38
Intrinsic Challenge 3			40
Factor Correlation			
Extrinsic			
Intrinsic Enjoyment	78		
Intrinsic Challenge	-6	38	

It can be seen from Table 49 that the data fit the three factor model moderately well and that there are correlations among the dimensions. The intrinsic challenge and extrinsic motivation scales are essentially orthogonal with correlation of -0.064. Intrinsic enjoyment and extrinsic motivation are well correlated (r=0.78) and intrinsic enjoyment and challenge moderately correlated (r= 0.38). Next the two higher-order-factor models were tried. These were set as follows:

- One-second-higher-order factor model – all paths from the higher order factor to the three motivational characteristics were estimated.

- One-second-higher-order factor model – one factor one being 'Intrinsic'

First and second order models were not tenable. Therefore only the original model 3 was used in further analysis. In answer to 'What are the intrinsic and extrinsic motivational characteristics for a set of poor high ability children?' the data show that motivation for these children can be divided into two primary scales – intrinsic and extrinsic. Intrinsic motivation can then be divided into two secondary scales of challenge and enjoyment, which is dimensionally equivalent to findings from western research (Figure 15).

Figure 15 Three-Factor first order model - Extrinsic and Intrinsic motivation
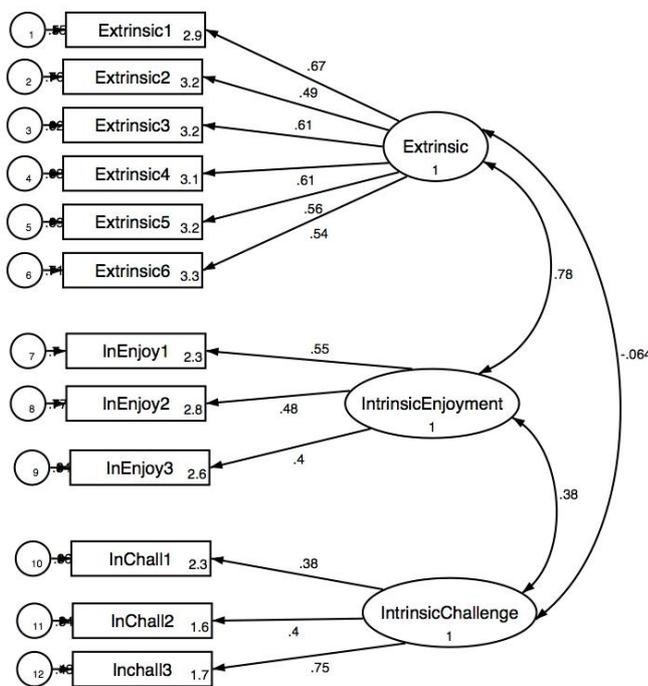
5.9.4 Motivation dimensionalities and correlations with contextual factors

The two motivational dimensions – intrinsic and extrinsic - were used to explore the context of, and investigate the interaction between, the individual personnel background factors and creative behaviour. However, it can be conjectured that the background and the environment in which a person lives play an important role in helping to form personality and behaviour. Therefore this part sets out to look at the second research interest around commitment that is to:

> 'Investigate whether motivation dimensionalities correlate to an individual's contextual factors including education, creativity, social environment, family and personal factors'.

As with the creativity analysis around the correlation with contextual factors prior analysis has been carried out on the whole data set and therefore only the factors found to initially be statistically significant have been retained. In addition six creativity constructs were included in the analysis. These contextual factors of educational, creativity, social and family were examined to consider their influence on motivation measures. The three motivation latent factors scores representing – extrinsic, intrinsic enjoyment and intrinsic challenge – obtained from the CFA were standardised to a mean of 50 and standard deviation of 10. These standardised variables were then used in the following ordinary linear regression. Table 50 provides the variables that statistically correlate with extrinsic motivation.

Table 50 Extrinsic Motivation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-17.251	6.990		-2.468	.015
Creative Strength	.581	.172	.303	3.370	.001
teachex	-.043	.019	-.201	-2.236	.027

Dependent Variable: Extrinsic Motivation $r^2=0.097$, $P[F(2)>6.524]<0.002$

From the above table the quasi effect sizes can be calculated for teacher experience and creative strengths thus:

- Teachex SD=10, gives Impact = 0.608, and Quasi ES = 0.061 (negative)
- Creative strengths SD =2.66 gives, Impact = 2.186, Quasi ES= 0.219

There are 2 independent variables that have a significant effect related to extrinsic motivation. The negative factor is related to your teacher's experience. The impact, is the measure of the expected change in the outcome (Extrinsic motivation) for an average change in the background variable. With Teachers experience this is -0.608, therefore implying that the more experience your teacher has the less likely you are to be extrinsically motivated. Note the effect size is fairly small at 0.061. Teacher experience throughout this research has been found to be significant, in some cases positive and others negative, in ways that are illogical. The sample size for teachers is small (21). Statistically small sample sizes are likely to provide a high number of false discovery rates and effect size inflation. In this case teacher experience was found to be negatively associated with extrinsic motivation. Experienced teachers, it could be conjectured, are the most likely to be able to provide tangible incentives and recognition to their students in order to nurture extrinsic motivation. Therefore, as in other parts of this thesis, this result needs to be considered with caution.

Looking at the positive independent variable of creative strengths, then the higher an individual's creative strength score, the higher extrinsic motivation. The creative strengths quasi effect size suggests that this increases your extrinsic motivation score by 22% of a extrinsic motivation standard deviation.

Table 51 Intrinsic Challenge Motivation

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-7.238	7.094		-1.020	.310
Elaboration	.032	.015	.178	2.047	.043
schfact1	-.080	.028	-.276	-2.912	.004
ptr	.050	.024	.198	2.071	.041

Dependent Variable: Intrinsic Challenge Motivation r^2=0.103, $P[F(3)>4.632]<0.004$

There are three statistically significant factors when considering Intrinsic Challenge Motivation – elaboration, schfact1 and ptr (Table 51). Calculating the quasi effect sizes for elaboration, school factor 1 and pupil teacher ratio thus:

- Elaboration SD=14.13, gives Impact = 0.639, Quasi ES=0.064
- Schfact1 SD = 10, gives Impact=1.13, Quasi ES=0.113 (negative)
- Pupil teacher ratio SD =8.7235, gives Impact=0.617, Quasi ES=0.062

There are three independent variables that have a significant effect on this likelihood. The negative factor is related to schfact1 and implies that if your school has better facilities, then you are less likely to be 'intrinsic challenge' motivated. This seems contradictory as it would seem that children attending schools with better facilities (schfact1) would be more likely to be intrinsic challenge motivated and so a positive association would seem more likely. This result therefore could be owing to the small number of schools taking part in this research and therefore this result may be inconclusive or indeed false.

There are two independent variables that have a significant positive effect on this likelihood. The higher your creative elaboration score (E) and the great the pupil teacher ratio (ptr) your 'intrinsic challenge' motivated is increased by around 6% of the intrinsic challenge standard deviation. Class size and your own skills in elaboration seem to be highly important when looking at Intrinsic Challenge Motivation.

Table 52 Intrinsic Enjoyment Motivation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.730	.942		2.897	.004
Creativity index	.024	.010	.215	2.441	.016

Dependent Variable: Intrinsic Enjoyment Motivation r^2=0.046, P[F(1)>5.959]<0.016

When looking at 'intrinsic enjoyment motivation' there is only one statistically significant factor, the creativity index (Table 52). Calculating the quasi effect size for the creativity index provides:

- Creativity index SD = 17.516 gives Impact=0.59, Quasi ES=0.06

For the overall creativity index this comes out with a quasi effect size of 0.06. This means the higher your creativity index your likelihood of being motivated through intrinsic enjoyment is increased by 6%.

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Table 53 Identified and not by teacher

	Teacher identified the child as gifted	N	Mean	Standard Deviation
Extrinsic	no	107	17.47	3.67
	yes	18	18.94	4.25
Intrinsic Enjoyment	no	107	7.12	1.89
	yes	18	7.67	2.38
Intrinsic Challenge	no	107	5.21	1.86
	yes	18	6.55	2.62

In total, out of the 125 children identified during Phase One, the teachers named 18 as being 'gifted'. To see if teachers recognized the children whose motivation was statistically significantly different from those not identified an independent sample t test was carried out. The total scores in each of the three sections were calculated and are shown in Table 53. The results show no significant difference between the means of the students' extrinsic motivation [t(123)=-1.545, p>0.05] nor the means of Intrinsic Enjoyment [t(123)=-1.091 p>0.05] between the teacher identified and non-teacher identified children. This seems to imply that teachers did not recognize either of these aspects of motivation in their students. The children's Intrinsic Challenge motivation gives a small significant difference (t(19.995)=-2.101, p=0.049). Implying that children who are motivated by challenge were more likely to be identified by their teachers.

5.10 Commitment Discussion

The work above looks at how two broad types of motivation could be uni-dimensional or have separate dimensions. Harter (1981) suggests that in the classroom intrinsic and extrinsic motivation may not be bipolar constructs and postulates that there could be situations where these factors collaborate. This is seen from the analysis above with high correlations between extrinsic and intrinsic enjoyment. This is also reflected in the regression analysis with Intrinsic Challenge being linked to mainly school factors, whereas extrinsic and intrinsic enjoyment linked to creativity. In the classroom intrinsic challenge motivation could be considered as goal mastery with students learning in this manner have been shown to actively seek challenging tasks (Ames, 1992). This could support why it was found that teachers identified gifted students who were challenge

motivated. As with previous research (Amabile 1996) intrinsic motivation and creativity have been shown to be correlated.

5.11 The Gifted

In total 847 children in 7 schools were included in the first phase of this research, looking for children of 'high ability' through a multidimensional identification procedure. From this first phase, children who scored in the top 5.5% on a combination of IQ, maths, reading and Kiswahili scores and were included in at least one other identification criteria were then selected to participate in Phase 2. In total 125 children participated in Phase 2 taking the creativity and commitment tests and questionnaires.

Table 54 Eight children in the centre of Renzulli's rings

Child ID	School ID	Age	Gender	IQ ss score	Read	Math	Kiswahili	Self perception score	Phase 1 pattern	Creativity Index by Age	Commitment score
									Phase 1		**Phase 2**
Child C	School 4	10	boy	107	84	24	7	39	SP	98	41
Child G (not interviewed)	School 3	12	boy	105	91	26	10	47	SPI	117	39
Child E	School 2	10	boy	96	99	29	7	43	SPTI	110	44
Child D	School 2	10	girl	107	89	27	9	39	STP	105	41
Child A	School 1	11	girl	100	80	26	8	48	SPI	104	38
Child H (not interviewed)	School 1	9	boy	100	82	26	7	35	SPI	127	38
Child B	School 1	10	girl	115	97	27	7	48	SPI	125	40
Child F	School 2	10	girl	108	85	28	8	45	SI	126	41

T = teacher; P = peers; S = test score; I = self assessment

Table 54 sets out the multidimensional pattern of the eight children who appeared in the centre of the three rings – schoolhouse, creativity and commitment. In Phase 2 these children scored in the top quartile in both the creativity and commitment tests. It was decided to meet with these children and if possible one of their parents (or guardians) to carry out a short interview to learn more about their lives and aspirations.

5.12 Gifted children's vignettes

Child A

The family originated from Zanzibar. Child A's parents moved owing to the need to take forward their family business. Child A was born in Dar es Salaam. There are seven people in her family, including five children who are 15 years, 13 years then Child A is 11 years and two more children aged 8 and 3 years. The family sells goods in the market. According to her mother, speaking in Kiswahili, but translated by an interpreter, when Child A was a baby she could speak many words:

'She was and still is a very calm child", she says. "She was born 2 months premature. She gets a little bit of help from her older sister who is 13 years and who is just as clever. She reads school books at home. Her personality and character is calm, relaxed and cool. Her favorite subjects are English and Maths. Her brother helps her with English as I cannot speak or read English. In my family there are differences between the boys and girls. I'm lucky to have girls as they are closer to me and my husband and a greater help to my family.'

The mother finds the school attended by her child to be communicative and responsive to parental demands and needs, always supportive of the children who go there. The mother would like Child A to become a doctor owing in part to the child's personality and character, always wanting to be helpful to others. However regarding the possibility of actually becoming a doctor the mother states, "*According to our lives it is difficult*".

When asked about ability and talent the mother says that she believes everyone has the ability to be clever, but '*some are chosen more by God than others. God helps her to be how she is*'.

Child B

Child B is an only child whose family originates from the coastal region of Tanzania the father moved the family to Dar es Salaam for better business opportunities. The family sells rice in the local market and lives in a one-bedroom home, which is about a ten minute walk from her school. Her daily routine starts at 5.30am where she drinks tea and eats bread.

Child B's mother says:

'*As a baby or small child she did not want to interact with other children but she talked very much. She learned to read Kiswahili when she was just three years old. Her character is such that she always wants to know something greater than her age. She likes maths, science and art. I cannot speak or write English so her "Auntie" helps her if she needs it. She does try to take control of situations and is sometimes quite 'bossy' and what seems to fit is that she wants to be a policewoman when she grows up*'.

Child B's Mum believes that all children have the same ability but '*good teachers make the difference*'.

According to Child B, '*I love my mother very much and we wash and cook together. We also dance and sing at home; we have a happy house*'.

When asked to comment about school, Child B said she believes she is a good student as she listens to her teachers and does what is required. Her favourite subject is maths and she likes her maths teacher, as he is calm towards the children, he also taught her '*how to write and post a letter*'.

Asked about her personal qualities she stated that she respects her elders, helps her parents and makes an effort in her daily studies. The most difficult thing she has ever had to deal with were hard questions at school. The teacher asked her questions she couldn't answer and she got very upset and angry and reported this to her parents. Child B said that the clever children sit at the front of the class and therefore stop the class from being silly.

Child C
The family comes from the Arusha region, which is close to Kilimanjaro, the area of the Masai. His Dad worked in the army and then joined a Japanese aid agency called JAKA, which is the same as DFID in Japan. He is the youngest of four children - 23 years, 20 years, 14 years and then Child C who is 10 years. According to his father:

'It isn't only me who thinks he is talented, the whole community values his abilities. He seems able to programme phones and he hasn't had any IT lessons. He is very headstrong and has strong arms and he is very clever. He is a miracle and talked first before he could walk'.

Child C stated that he enjoys playing football and watching the news and is interested in current affairs. He likes his fellow peers and is very happy all of the time. He doesn't know what he will do when he grows up as he keeps changing his mind. He initially wanted to be a pastor but now he wants to be a pilot. His Dad says he wants him to be whatever he wants and he has had this opinion and attitude with all of his children. Child C's father says:

'teachers can sometimes be a problem and children have natural ability and talent that has to be nurtured. As a parent I can empower the giftedness of my own children. Teachers in Tanzania don't know individual children as individuals. It is only parents that can help promote the children's talent'.

Child D

Again the family comes from a rural area. There are four children in the family aged 20, 10, 8 and 1 and a half. Her Dad is a car mechanic and works in someone else's garage. Child D's father says that she has been no different to his other children. She is a happy child always playing with others. She likes to read her schoolbooks at home (the Kiswahili books). The father thinks some children are 'born clever', and that parents are the key to nurturing that ability. However, when told that his daughter was one of only eight children appearing in all three rings of the testing he was totally shocked. He could not believe that a child of his could be gifted and said *'this can't be. You have to be rich to be clever. Poor children aren't clever like rich children'.*

Child E

Child E sleeps with his mother and older brother who is 14, in a one room home situated close to the school. He has no toys or reading books, only school books. Child E believes his home is a 'happy' one. He walks to school through small streets, meeting his friends along the way. When asked about school he said he felt he was *'intelligent and studied very hard and that my teachers are proud of me'.* His friends are mainly boys but only the 'clever' children in the class.

When asked about his three wishes he went silent for a few moments and said 'chicken' and then after a bit more thought stated he couldn't think of anything else to wish for only 'chicken'.

Child F

Child F's house is of a similar structure to the school made of cement and a tin roof. There are two rooms and therefore she shares one of these with her 17-year-old sister. Child F says her home is a 'happy one'. Her day starts at 6am when she makes tea and her father brings in bread for her to eat. She washes and walks to school on small roads and is about 5 minutes away. She believes that the most important thing for her parents is for her to attend school. She has chores she needs to do, sometimes before and sometimes after school - washing dishes, clothes and windows. She would like to be a lawyer when she grows up as she has

been to court before with her 'Auntie'. Her three wishes are to open a big clothes shop, buy a Toyota car and live in a farm with cows and chickens. The most difficult thing to happen was being kept down in class as she didn't do well in the lessons. What she learned from this is to listen to the teacher and study hard.

5.13 Conclusion

This chapter sets out the results of Phase 2 of the research. First the two research questions regarding creativity were explored. The creativity construct of divergent thinking was analysed, the findings showing a dimensionality equivalent to research from western countries. There was also an investigation into any correlations between creativity and individual contextual factors. The second part looked at the questions around commitment, finding that motivation for this set of children is multidimensional and can be grouped into two motivation constructs - intrinsic and extrinsic. The correlations with school factors show a variety of connections between intrinsic enjoyment and intrinsic motivation. Having applied Renzulli's three ringed concept within this poor school setting of Kinondoni, 8 children have been identified as appearing in the overlapping centre of the rings, i.e., top 5.5% in tests and school identification + top quartile score in creativity + top quartile score for commitment. Vignettes are presented from the interviews undertaken with these children to give a little flavor of their individual lives and thoughts. The next chapter will draw the whole thesis together by providing a discussion of these findings in relation to the literature as set out in Chapter Two.

Chapter Six: Discussion

6.1 Introduction

This Chapter provides an overall summary of the research findings and compares these with the literature in the field of giftedness. The Chapter structure follows the phases of the research – schoolhouse ability, creativity and commitment. This research used a multidimensional identification strategy – teachers, peers, testing – agreeing with the concept that giftedness can no longer be measured through a single psychometric measure (Gardner, 1983b; Sternberg, 1985, a, b; Calero et al., 2011; Ford and Trotman, 2000; Van Tassel-Baska et al., 2007; Bélanger and Gagné, 2006).

6.2 Schoolhouse ability

The first part of this research was to consider research questions around the concept of 'schoolhouse' giftedness. Different ways of measurement as well as correlations to background, school and family variables were investigated. There were three overall research questions that were explored in this phase of the research:

- In school settings in Dar es Salaam what are the relationships between student test outcomes, their own self perceptions and those of their peers and teachers?
- Does the likelihood of being identified as gifted vary according to family background and school characteristics?
- What are the relationships between pupil, school and teacher characteristics and pupil outcomes?

The general themes that transpired from these enquiries are set out below taking in turn each of the stakeholders and comparing the findings with the existing literature.

6.2.1 Teachers

The teacher questionnaire showed there were three main methods used by teachers to identified gifted children in their class, either by test scores, oral questioning or general observation. Comparing teacher identification through the naming of individual pupils in their class shows that test scores are highly

correlated with identification; mathematics and reading having the highest effect size. However, when considering teacher and peer identification the agreement is quite limited with the Cohen's kappa measurement showing fair agreement. Teachers only agree with peer identification on 7 out of 39 children. Put another way, teachers disagree with peer identification on 32 out of 39 children.

Teacher interviews supported the point around reading. They often spoke about children who could help others in the class and act as leaders when the teacher left the class unattended, which typically implies standing at the front reading.

Children who are motivated by challenge were more likely to be identified by their teachers. This again would support the idea that teachers are identifying 'very visible children'. Hernandez-Torrano et al., (2013) found similar results in their research, with teachers in Spain, stating that teachers typically nominated children with 'good comprehension, good memory and advanced vocabulary' (p. 182). Similarly teachers in the US were more likely to nominate children who are good readers as opposed to the mathematicians (Hodge and Kemp, 2006; Siegle et al., 2010).

The teacher interviews also highlighted the belief that family background and environment was important, having an impact on the child's ability and nurturing of giftedness. The teachers in Tanzania highlighted several aspects regarding home environment including lack of space to study, lack of parental support and interest in schoolwork, lack of nutritional provision and the inability of parents to assist their children. The literature supports these teachers' views stating that poverty plays a substantial role concerning children's development and ability. That is owing to the family environment there is little support to nurture poor children. Several reasons are given including the lack of financial resources, lack of leisure time owing to work commitments and the day-to-day survival focus of the poor (Robinson et al., 2002; Aikens and Barbarin, 2008; Sampson, 2002; Gottfried et al., 1994; Kamper, 2008; Kamper and Mampuru, 2007; Zorn and Noga, 2004; Allhusen et al., 2005; Gorski, 2005; McKoyd, 1998).

Card and Giuliano (2013) also found that teachers often overlooked children from poor families to participate in gifted programmes. In general children from poor backgrounds, as in this study are underrepresented when identifying giftedness (Bernal, 2002; Ford and Harris, 1999; Ford et al., 2002; Grantham, 2003; Lee et al., 2008; Worrell, 2007; Wyner et al., 2007; Ford et al., 2008). The literature also shows that school stakeholders' have preconceived ideas around first generation learners and their incapacity for possessing talent (Iyer and Nayak, 2009; Dixon, 2012; Humble, 2015; Frasier, 1987).

The teacher interviews also suggested that teachers believed that girls 'at this age' were more likely to be gifted than boys owing to their commitment to studies. The analysis shows that girls were more likely to be in the top 15% on test scores as well as being identified by one of the other processes. However in the IQ test girls were less likely to score highly than boys.

6.2.2 Pupil

As part of the multidimensional strategy to identify giftedness, 847 poor children from Kinondoni took four tests – IQ, Mathematics, Kiswahili and English Reading. Regarding the non-verbal matrix reasoning test, the Raven's IQ, the results show that the mean standardized scores for this set of children is 64.75, which is relatively low compared to western norms. Lynn (2003) also concludes that the average IQ of Black sub-Saharan Africans lies below 70 based on western norms (Lynn, 2003; Lynn and Vanhanen, 2002, 2006). As shown in Chapter Two there is some contention here around the use of such Anglo centric tests in an African setting (Sternberg et al., 2002; Mpofu, 2012; Mpofu et al., 2014). But the findings from this research agree that the test scores are lower. As in other findings these data show that poor children do not fare well on such tests and therefore it is a limiting sole measure when looking for giftedness (Baldwin, 1984; Renzulli, 1978; Treffinger and Renzulli, 1986; Torrance, 1979).

Regarding the association with other test scores, the IQ score was found to statistically significantly positively correlate with all of the other test results. The literature supports this finding when Renzulli (2005) states that 'students who

score high on IQ tests are also likely to get high grades in school' (p.253). Sternberg agrees that tests used to highlight academic intelligence positively and significantly correlate with each other (Sternberg, et, al., 2001).

Through the pupil questionnaire, children were asked to identify three pupils in their own class they believed were gifted. There was a correlation between children identified by more than 15% of their peers and those in the top 15% of test results. There is also a high statistically significant correlation between teacher and peer identification. Other research corroborates this finding (Kaya, 2013; Blackshear, 1979). Pupil identification shows a statistically significant positive correlation to test score. The mean test scores of those identified as gifted by their peers is significantly higher on every test than those not identified. This goes against the supposition of Heyman and Dweck (1998) indicating that these children in Tanzania weren't peer nominating owing to friendship or mutual beneficial goals.

Girls tended to be more likely to report themselves as being gifted through a self-perception questionnaire and the combined indicator (rated in the top 15% of scores plus one or more other strategy). Other research undertaken in Zambia shows that females give higher self estimates than males when asked about their own giftedness (Furnham and Akande, 2004).

6.2.3 Parent

As discussed in Chapter Five, parents that were interviewed in this research tended to think that children who were gifted often were from birth and that children who possess natural ability are typically given this by God. This belief was typical in the west until the eighteenth and nineteenth centuries (Galton, 1869; McMahon, 2013). It is also shown to be the case in other studies such as in Zimbabwe where outstanding ability is blessed from birth (Ngara and Porath, 2004, 2007).

Parents seemed to focus more on children who were creative, innovative and curious as those they would identify as gifted. They did not seem to associate test

outcomes or ability at school as a major indicator. Parents tend to focus on what seems important within their own cultural and community setting emphasizing creativity and self-reliance. Also children, they believed, will improve their community through their giftedness once they have become adults. Other studies also highlight the importance of culture when identifying giftedness owing to the values that represent the community's worldview (Ngara and Porath, 2004, 2007; Serpell, 2007, 1993, 2011; Sternberg et al., 2001; Grigorenko et al., 2001).

The findings suggest that parents do not perceive that those talents promoted in schools outweigh children's other characteristics. This tends again to agree with the literature that shows school programmes in sub Saharan Africa generally focus on a test driven, rote learning pedagogical system and not cultural and creative aptitudes (Kasfir, 1983; Mandaza, 1986; Serpell, 1993; Serpell and Boykin, 1994; Mpofu et al., 2012).

6.3 Creativity

There are two research questions that looked at the idea of creativity and were investigated during the second phase of the project:

- Is the creativity construct of Divergent thinking (DT) dimensionally equivalent in an African as in a western setting?
- How do any creative dimensionalities correlate to an individual's contextual factors including education, social environment, family and personal factors?

This creativity part of the research was partly based on the studies by Krumm et al., (2014), Kim (2006) and Kim et al., (2006), which were derived from Kirton's theoretical proposal (1976, 1978, 1982, 1987, 1989).

This research suggests, in agreement with other studies, a model of two correlated factors that best explain creativity. This result in an African setting demonstrates again that the TTCT is not uni-dimensional, as proposed by various authors for western settings (Chase, 1985; Clapham, 1998; Heausler & Thompson, 1988; Hocevar, 1979a, 1979b; Hocevar & Michael, 1979; Runco & Mraz, 1992; Treffinger, 1985). These results also do not coincide, with the theoretical proposal of

Torrance et al., (1992) that the TTCT is composed of five separated abilities (i.e., fluency, originality, elaboration, resistance to premature closure and abstractness of titles) and creative strengths.

Of particular interest is the finding that African learners with material poverty conceived ideational fluency and originality to strongly define creativity. These findings agree with those from other studies (Kim, 2006; Krum et al., 2014). This study therefore goes on to provide additional psychometric evidence supporting that the creativity construct could be multi-dimensional consisting of two factors. Trustworthiness of this finding is supported by the fact that these learners come from a cultural template in which ease and aptness of participation is a valid ability to achieving social ends (Mpofu et al., 2015). One surprising aspect is that fluency and originality were reliable measures with school like tasks in what is a predominantly performance or practical oriented culture. This is also an unexpected finding from school learners who are unaccustomed to being asked to use their imagination and think differently to others. The pedagogical approach of teaching in these schools is rote learning. Children are never asked to voice their own opinions or think for themselves but just regurgitate information provided by the teacher (Kremer et al., 2013; Duflo et al., 2015). Adaptation was relatively weakly operationalized in this sample compared to innovation; and in particular the abstractness of title appears to lack in ecological validity for these learners. It is unclear why generating labels for drawing configurations may have been a different creative expression demand for these learners. Future studies could consider qualitative inquiry to unravel how these learners interpreted this abstraction task. Findings could inform the design or selection of a more credible abstraction task for the Kiswahili speaking learners.

The sample was rather homogenous in socio-cultural background, which could constrain variability of responses from an undetermined restriction of range of response effects. Nonetheless, findings from the regression analysis show some connections between family background and self-perceptions and the innovative and adaptive factors of creativity. These analyses show that there are significant correlations (some positive and some negative) regarding one's background, environment and creative ability. In African communities the environment and

how one copes with this has shown to affect creative expression (Habib, 1999). The child's relative age position in the family, peers in the class, if a member of the family is fluent in English, and mother's education seem to have a significant effect on creativity. It is interesting to note that this study shows that pupil test scores are not correlated with creativity. Studies in Nigeria also found this to be the case (Akinboye et al., 1989; Mogaji, 1999). In general the literature shows there to be a belief that in Africa creativity is related to knowledge, intelligence and wisdom (Mpofu et al., 2006; Mpofu et al., 2004; Khaleefa, 1999; Khaleefa et al., 1997; Sternberg, 2003). In contrast creativity in western cultures is regarded as distinct from other human abilities (Albert and Runco, 1999; Sternberg, 2003). This research tends to show that for this set of African children living in urban Dar es Salaam, creativity is not correlated with other abilities measured through test scores and identification methods of giftedness apart from the self-identifier.

In particular being the eldest child in the family was associated with higher innovation and adaptation scores. This finding is expected in a cultural setting in which children substitute-parent their siblings as part of the family division of labour in what is essentially a substance economy setting. Previous studies (Serpell, 1993, 2011a,b, Sternberg et al., 2001) have documented the cultural importance of 'child-parenting' in sub-Saharan cultural settings. Older children have much expected of them by family and community as they play 'adults' to siblings and learn to creatively interpret and apply social practices for their welfare and that of the collective. Similarly children living within a literate family would be expected to score higher on school like tasks from the advantage of both home and school exposure to pen and pencil type activities.

Teachers were less reliable in identifying children with higher measured creative abilities compared to parents. This finding may be explained by the fact that the teachers value maintenance of an orderly or structured learning environment in a discipline enforcement way than the creative expression potential of students. As a matter of fact students with creative expression may be (mis)perceived by teachers having behaviour compliance problems (Torrance, 1962) compared with peers who are more compliant. Nonetheless, students who know how to 'please

the teacher' in a way are creative in their social impression management. That being the case, being teacher compliant per se would not in itself rule out significant creative potential in individual students. Often teachers also have a smaller scope of context of learner observations compared to parents, which also would add to their comparative unreliability in identifying students with higher measured creativity. Parents are advantaged in that regard, and the fact that parent endorsement of creativity in their children tends to be supported by TTCT data, suggests that the creativity constructs measured by the TTCT have validity in the Tanzanian context.

6.4 Commitment

During the second phase of the research ideas around extrinsic and intrinsic motivation were explored in order to investigate the two research questions:

- What are the intrinsic and extrinsic motivational characteristics for a set of poor high ability children?
- Investigate the motivational dimensionalities correlate to an individual's contextual factors including education, creativity, social environment, family and personal factors.

This research shows that motivation for this set of children can be divided into two primary scales – intrinsic and extrinsic. As in other research these are two distinct processes (Amabilie et al., 1994). The mean scores for the items making up the intrinsic challenge factor were much lower than for the other scores. This could suggest that the attitude amongst most children is that they preferred work they could do and get the right answer to. From an education pedagogy of rote learning you may have assumed this would have been the case. The diet in class is of problems they do and are familiar with and are rewarded by the teacher for repeating the right answer by rote. Therefore new and challenging problems, where the individual child needs to construct the answer using their own knowledge, rather than the whole class knowledge is rated lower. Therefore extrinsic motivation is about recognition given by others, rather than intrinsic, which is more of an internal motivation. In slums and low-income areas of sub-Saharan Africa, children typically attend schools where rote learning is the order of the day (Hoadley, 2012; Tabulawa, 2013; Nomlomo and Vuzo, 2014; Dixon et

al., 2015). Rote learning and teaching to the test makes it easier for government schoolteachers who have, in the main become demotivated and removed from their educationalist roles and responsibilities (Chireshe and Shumba, 2011; Tooley, 2009; Kremer et al., 2006). In South Africa when studying disadvantaged students in six townships Ramnarain (2013) also found that extrinsic motivation had a greater effect on scholars. Similar findings were shown in a study from Pretoria (Shulze and Van Heerden, 2015).

The intrinsic factor was then divided into two secondary scales of challenge and enjoyment. For this set of children it was felt inappropriate to gather data around the extrinsic motivation of monetary reward, so only external recognition was investigated (outward). Therefore the extrinsic factor could not be divided into two secondary scales as in other research (Amabile et al., 1994). First this research showed a moderate correlation between the intrinsic secondary scales of challenge and enjoyment in agreement with the research (Amabile et al., 1994; Hennessey and Amabile, 1998). In terms of correlation across the secondary scales (extrinsic, intrinsic enjoyment and intrinsic challenge) the research found a high correlation between extrinsic motivation and intrinsic enjoyment. There was moderate correlation between extrinsic and intrinsic challenge. Finally as with Amabile et al., (1994) extrinsic motivation and intrinsic challenge were found to be orthogonal.

When investigating how the motivational dimensionalities correlate with individual's contextual factors it was found four factors positively correlate and two factors negatively correlate with a child's motivation. Regarding extrinsic motivation there is one positive factor – the creative strength score of the child in the TTCT – and one negative factor – the number of years experience the child's teacher has in the profession. The creative strengths impact size is large at 2.186. This means an increase of one standard deviation in your creativity strengths score increases your extrinsically motivation score by 22%.

There are three factors, two positive and one negative, correlated with intrinsic challenge - children who are motivated by personal challenges. The two positive

are elaboration (creativity score item) and pupil teacher ratio. The positives imply that children who enjoy elaborating and providing extra detail and who attend a larger class at school are more motivated by personal challenges. The negative is 'schfact1' stating that the school has a playground, a television and a computer. However as stated in Chapter Five and throughout the results chapters, the school factors may produce results that do not reflect a true effect. Therefore this finding may be false or inconclusive. Concerning intrinsic enjoyment – children motivated by their own personal enjoyment in a topic – there is only one correlated factor which is positive and that is the overall creativity index of the child. The impact of the creativity index is 0.59, implying that an increase in one standard deviation in the creativity index score increases intrinsic enjoyment by 6%. The positive correlation between intrinsic motivation and creativity follows the findings of other research (Amabile et al., 1994; Amabile, 1996; McGraw, 1978; Sternberg and Lubart, 1995; Sternberg and O'Hara, 1999). Indeed Roe (1952) and MacKinnon (1964, 1965) supported the hypothesis that people who are creative are more likely to be task oriented.

However, this research did not agree with other findings around motivation in the literature. First, for this group of Tanzanian children, there was a positive association with creative strengths and extrinsic motivation unlike in Amabile et al., (1994) where there was a negative correlation. Second, this research did not find a correlation between self-confidence and motivation as in Bandura (2006) and Maddux (2005). There seems no clear reason why this should be the case. Third, research around academic performance and motivation in developing and developed contexts, typically show a positive and significant correlation (Gottfired, 1985, 1990; Suki et al., 2011; Davis et al., 2006; Muller and Louw, 2004). One possible explanation regarding the anomaly with other research could be that as the research set out in this thesis already had sieved children with higher scores to take part in both the creativity and motivational phases all of the children were high scoring.

6.5 Limitations

As with all research, there are limitations and implications for future research based on the current study's findings. These are discussed with a particular focus on the methodological implications around the interpretation of the findings and the constraints of its generalizability and applications to practice.

The number of schools (seven) and teachers (21) in the quantitative part of this study is rather small. Time constraints as well as cost did not allow for a greater number of schools to take part within this research. Therefore where significant relationships in the data have been found with regards to school facilities as well as teacher characteristics they must be considered with caution. Significant relationships concerning teacher qualifications as well as teacher experience in some cases are counter-intuitive. For example a teacher's qualification level negatively related to all test scores as well as some of the innovative latent factors of creativity. Teacher experience was found to be negatively correlated with pupils' confidence as well as a pupil being in the top 15% in test scores. Future research carried out with a significantly greater number of teachers and schools could investigate these findings with a greater level of accuracy and therefore generalizability towards policy implications.

The pupil questionnaire aimed to collect data around family background, household wealth, education levels and employment status within the family. It must be acknowledged that there could be limitations in the self-reporting of some of these variables that were taken at face value. For example, a child may not have the knowledge around parental education levels therefore findings around this component need to be interpreted with caution. Therefore this study showed that the higher the father's education level, the more likely a child to be identified by their peers as gifted, with the opposite being found for mother's education.

This research highlights several interesting areas and therefore ways forward for this type of research. Further investigation could take place around the time children spend in the family home and the involvement they have with their parents. Future work in poor urban settings in sub-Saharan Africa could benefit

from exploring the intricate interplay of school environments, teacher beliefs and children's self-confidence.

6.6 Conclusion

This Chapter has set out a discussion that considers the findings of this research compared to others as set out in Chapter Two (Literature Review) around the identification of giftedness. The majority of the findings of this research are supported within the literature. The final Chapter goes on to summarise the results around the research questions as well as consider the overarching research aim which was to carry out an application of Renzulli's Three Ring concept in a poor areas of sub-Saharan Africa.

Chapter Seven: Summary and the way forward

7.1 Introduction

The last Chapter carried out a discussion around the findings of this research and others within the field. This final Chapter starts by setting out the answers to the research questions that inform the research interest. This leads to a concluding remark about the application of Renzulli's three ring concept in Dar es Salaam also highlighting the uniqueness of this study. Policy implications as well as the way forward for this type of research bring this thesis to an end.

7.2 Overall Research Aim and Findings

In order to inform the overall research interest of the application of Renzulli's three ring concept in poor parts of Dar es Salaam, seven research questions were formulated. First each of the questions is considered in turn and the major highlights regarding the findings are given. Second these answers are used to discuss the application of Renzulli's concept in a sub-Saharan African setting with poor children.

7.2.1 Highlights of key findings

In this section a brief summary of the answers to each of the research questions is looked at in turn highlighting the key finding.

- In school settings in Dar es Salaam what are the relationships between student test outcomes, their own self perceptions and those of their peers and teachers?

There was a correlation between children identified by more than 15% of their peers and those in the top 15% of test results, showing that peers tended to judge 'schoolhouse' giftedness on how well they do in tests. Girls tended to be more likely to report themselves as being gifted through a self-perception questionnaire and the combined indicator (rated in the top 15% of scores plus one or more other strategy).

Teacher's used three main methods to identified gifted children in their class - test scores, oral questioning or general observation. Test scores are highly correlated with teacher identification, with reading and mathematics having the highest effect size. Teacher interviews supported that children's reading ability was an important identification criterion. They often spoke about children who could help others in the class and so the need to be articulate. Teachers agree with peer identification on 7 out of 39 children, or put the other way, teachers disagree with peer identification on 32 out of 39 children. The Cohen's kappa measurement shows only fair agreement. One possible explanation for this could be the small number of teachers in the sample. This could be attributed to the small number of teachers identifying fewer children (17 in total) from the entire sample in their classes than the 29 identified by the peers (847) who gave more names.

- Does the likelihood of being identified as gifted vary according to family background and school characteristics?

The five identification indicators – combined scores, teacher identification, peer identification, in the top 15% of test scores and self identification – tended to be correlated with each other and with test scores.

The teacher highlighted in interviews the belief that family background and environment was important, having an impact on the child's ability and nurturing of giftedness. Interestingly when running the regression analysis there were only four significant household variables that had an effect on whether the child was identified. The father having a higher education along with electricity being available in the home had positive effects, whilst a family member being able to speak in English and the mother having a higher education both had negative effects. As suggested in Chapter Four the data around parental education were collected via the student questionnaire. This brings about issues concerning children actually knowing their parents' education status. Therefore this variable could, in part, be misleading owing to misreporting. The mother's education having a negative effect on the likelihood of being identified as gifted (which

seems rather illogical) and the father's having a positive effect on the likelihood must be viewed with caution.

Regarding the teacher characteristics, if the teacher has more experience, that is teaching for longer then the less likely the child would be confident or in the top 15% of test results. A teacher with higher qualification however would have a positive effect on self-confidence and the child's attitude to learning. Throughout the results chapters, it has been discussed, that the findings concerning teacher experience, gender and qualifications must be considered carefully owing to the small sample size of 21 teachers. It seems rather illogical that the more experienced the teacher, the less confident and less likely their pupils are to be in the top 15% of test results. Generally, it would be expected that the finding would be the reverse, that is, the more experienced the teacher, the greater the likelihood of pupils scoring well on tests (top 15%) and having higher self confidence. The finding around teacher qualifications having a positive effect on confidence and attitudes to learning, although more logical, is derived from the same small teacher sample with its limitations and statistical weaknesses. In order to investigate these relationships further, more research is needed in low-income settings with sample sizes that do not compromise the conclusions drawn from the study.

Where a child is studying amongst peers who score higher in the IQ test or if the school has fewer facilities then there is a higher likelihood of being identified through the combined indicator or being in the top 15% of test scores. Only seven schools took part in this study. This causes major issues with the findings that highlight significant relationships associated with school facilities. The finding cited here, that fewer facilities increases the likelihood of identification and higher test scores for pupils again seems inconsistent. This is most likely resulting from the weakness in the data. As with teacher characteristics the effect of school facilities needs greater enquiry.

• What are the relationships between pupil, school and teacher characteristics and pupil outcomes?

The four pupil outcomes – IQ, reading, mathematics, and Kiswahili– were found to be significantly correlated with each other, and tended to be correlated with some identification indicators and a range of background factors. The important points are that if you perform well in any of the pupils outcomes you are more likely to obtain a higher score on each of the others. Regarding the pupils, their age significantly negatively affects outcomes, that is the older children score less well. Finally children in homes with electricity tended to perform better on all tests apart from reading.

- Is the creativity construct of Divergent thinking (DT) dimensionally equivalent in an African as in a western setting?

This research suggests, in agreement with other studies, a model of two correlated factors that best explain creativity. Of particular interest is the finding that African learners with material poverty conceived fluency and originality to strongly define creativity. This study therefore goes on to provide additional psychometric evidence supporting that the creativity construct could be multi-dimensional consisting of two factors.

- How do any creative dimensionalities correlate to an individual's contextual factors including education, social environment, family and personal factors?

Overall teacher experience, self confidence, being the eldest in the family and having a family member able to speak English all significantly positively affect the total creativity index. Pupil achievements, 'other identifiers' and family factors relating to wealth do not relate to any of the creativity measures. As stated earlier in this section as well as in Chapter Four and Five, correlations between variables that include teacher experience are inconclusive, possibly leading to spurious relationships and correlations. The linear regression that considers environment, background and creativity measures, shows that the greater the teacher experience the greater the likelihood that a child scores higher on the innovative

and adaptive latent factors as well as the total creativity index. Teacher experience affects positively the total creativity index with an effect size of 0.62, the highest of all of the statistically significant independent variables. Even in the event that this reflects a true effect, owing to the small sample size of teachers it is likely that the estimate of the magnitude of the effect provided by this study is exaggerated (Button et al., 2013; Ioannidis, 2008).

- What are the intrinsic and extrinsic motivational characteristics for a set of poor high ability children?

This research shows that motivation for this set of children can be divided into two primary scales – intrinsic and extrinsic - these are two distinct processes. The research also found a high correlation between extrinsic motivation and intrinsic enjoyment. Extrinsic motivation and intrinsic challenge were found to be orthogonal.

- Investigate whether motivation dimensionalities correlate to an individual's contextual factors including education, creativity, social environment, family and personal factors.

There was a positive association with creative strengths and extrinsic motivation unlike in other findings around motivation in the literature where there was a negative correlation. Regarding Intrinsic motivation the research showed that children who enjoy elaborating and providing extra detail and who attend a larger class at school are more motivated by personal challenges.

7.2.2 Renzulli's concept in Dar es Salaam

The research set out in this thesis is unique. First, the application of Renzulli's three ring concept has not been carried out in a developing context with poor children before. Second, the validity of the concept has only been explored through the use of a school enrichment model within the US initially known as the 'Revolving Door Identification Model'. This model implies the use of an action identification component that investigates the progression of children given

enrichment opportunities. These activities 'turn on' abilities that were originally revealed during the process of identification. Third, the TTCT has not been utilised in a sub-Saharan African setting.

This research has shown that the application of Renzulli's three ring concept in a poor urban sub-Saharan African setting is possible yielding measurable qualities comparable with those found in developed contexts. When testing children to consider two of the rings around commitment and creativity the dimensionalities were found to be of the same construct as those in an Anglo centric culture. Regarding the schoolhouse giftedness ring, it was shown that IQ scores were related to other test scores, however as set out in other research IQ could not be regarded as a single indicator of giftedness. Concerns regarding the use of standardised tests as well as those that are not culturally specific seem not to be supported by the findings of this thesis. Countries such as Tanzania, at least in the urban areas of large cities, are becoming more developed and thus more westernised owing to technological development and globalisation. Over the last ten years there has been what is regarded as 'impressive economic progress' in countries such as Tanzania with an average growth rate per capita of around 4 per cent since 2002 (McKay and Thorbecke, 2015, p. 2). Factors contributing to this impressive growth include more democratic and accountable governments; improved economic policies; and the positive effects of new technology (Radelet, 2010). This could be one possible explanation as to why such tests, within these urban communities, are more cross-culturally applicable than for research that was carried out twenty years ago. This indeed may not be the case in rural areas. One indication of this is the attitude of parents when asked about their perceptions of giftedness. Many of the parents of children in Kinondoni originate from rural Tanzania. As stated in the vignettes in Chapter Five, families have migrated to the city in order to profit from the burgeoning economy. Therefore these parents still perceive giftedness as 'God given' as well as associating creativity with giftedness. This could reflect their more rural background. Conversely teachers, typically from a higher social standing and the capital city itself have different views and beliefs around giftedness.

7.3 Policy Implications

7.3.1 Expectations of pupils in disadvantaged areas

Empowering communities, both within and outside school, through knowledge exchanges and dialogues could dispel issues around assumptions that children from poorer backgrounds are less likely to be able to attain their potential and development. Poor children who may be first generation learners need support from teachers and school to reach their potential.

Personal beliefs about capabilities influence motivation and learning with poverty cultivating inequalities in aspirations and under achievement. The beliefs of teachers, families and children themselves around capabilities and ability are far reaching. Teachers tend to believe that children who are good readers are high ability therefore disadvantaging those from illiterate homes with lower levels of vocabulary. The lack of nurturing at school and the inability of illiterate parents to support their child may cause underachievement. Support from teachers within their classroom environment can lead to improved academic and social outcomes, leading in turn to better consequences around health, employability and achievement potential. Regarding policy implications it would seem that it might be beneficial for teachers to have the opportunity through teacher training initiatives to explore other ideas of what ability might mean in such cultural settings. This could include looking at children's task commitment and creativity.

7.3.2 Schoolwide Enrichment Model

Changing school policy that could be shown to raise the cognitive skills of all children, including the gifted would be an important force for economic growth (Hanushek and Woessman, 2012; Hanushek and Kimko, 2000; Becker, 2002). An intervention could focus on children's creativity, motivation, and interests in order to show teachers and governments how different practices, moving away from rote, can stimulate learning. This could be done through a 'Schoolwide Enrichment Model (SEM)' intervention, such as that based around the idea of Renzulli Learning with the focus on student centered inquiry and project based learning (Renzulli and Reis, 2014). Through three goals children are provided enriched learning experiences and learning standards. The goals are to develop

talents in all children, provide a broad range of advanced level enrichment experiences, and advanced follow up opportunities for children based on their strengths and interests. The opportunities are given to students to apply, deepen and extend their learning through stimulating projects and tasks that engage students – they think, reason, evaluate and create. Such an intervention could transform potential giftedness into real talents, thus improving the prospects for societies and nations to capitalise on currently underutilised or unrecognised cognitive skills.

Initially a pilot scheme around the implementation and evaluation of the SEM progamme could be initiated in the seven primary schools that participated in this study in Kinondoni, Dar es Salaam. This could be an enrichment 'pull out' programme, undertaken either after school or as a Saturday School type intervention. The enrichment programme would not replace regular curriculum but provide children enrichment activities that targeted personalising parts of the student's learning environment. One way forward would be for the seven schools to implement enrichment clusters for all of their students who wanted to become part of the programme. The clusters would serve non-graded groups of students who shared a common interest and who could get together, either on a Saturday or during an after school block of time, to pursue that interest. The interest would be explored with the children taking on the roles of 'young professionals' and delivering as a final output, a product or service to an audience. The children would work together as a team with a division of labour within that group. In each school a coordinator would be identified to be a member of the enrichment team that would take part in the pilot. The coordinators would undertake training to enable them to implement the programme as well as coordinate with parents and the community around the ideas and vision. The coordinator would facilitate a cluster, based upon their own interests aligned with those of the pupils. Each of the clusters would be organised around themes, disciplines and topics. These for example could include music, theatre, creative writing, design, entrepreneurship, nature and the environment. The children in each cluster would undertake learning in the contexts of real and present problems looking at new content, improved thinking processes and interpersonal skills. The clusters would create

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situations in which the children could apply their interests to self-selected problems or study areas. The students are no longer lesson learners but inquirers where the teacher is not an instructor but a mentor, partner and facilitator. One such example could be a 'newspaper cluster' and the production of a school newspaper. Students in the cluster could explore specific issues around the project such as writing, cartooning, reporting, photography and editing. The final output would be the production of the newspaper.

If the programme were shown to work in such settings it would need to be sustainable and scalable. A buy in would need to be secured with the Ministry of Education, the head teachers along with other school stakeholders, parents and community. The implementation of such a programme would rely on Tanzanian teachers who volunteered to become coordinators having time to commit not only to the session themselves but to an initial and on going training programme. They would need to overcome anxieties around developing relationships with students outside of their teacher persona in a more mentorship and facilitator role. Also teachers may be initially reluctant to work with children of different ages and abilities in one cluster group. The parents and the communities would need to see the value of their children attending such a programme. One way forward is the production of outputs from the clusters. However value judgements around the use of children's time in these enrichment groups compared with rote learning, cramming, or carrying out part time work or household chores is a difficulty that would need to be overcome within the communities and cultural settings such as in Tanzania.

7.4 The way forward

This research has helped to illuminate the complex interplay of factors, which relate to the identification of potentially gifted children in sub-Saharan Africa. Testing for schoolhouse giftedness, creativity and commitment, using a multidimensional approach shows that talented children do exist in poor areas of Dar es Salaam. The research could move forward in a number of ways. Firstly, if gifted identification were to continue to use such tests as the Ravens IQ as part of the multidimensional process (i.e., non verbal reasoning) then issues around dynamic and static testing could be more thoroughly explored. As suggested by

Sternberg et al., (2002) poor children with unequal learning opportunities, may not fare well on such tests. Therefore using a dynamic approach, where an intervention is carried out to deliver instruction to children around different tasks within the test, may allow for outcomes that suggest a more true evaluation of children's potential. It would be interesting to undertake this both in urban and rural settings within a sub-Saharan context, first to replicate Sternberg's ideas as well as to justify whether or not non-verbal reasoning tests are still applicable in such a setting. The work could also be trialled gathering the data within the home setting rather than a school venue to investigate whether there was any influence regarding testing environments. Secondly the work could move forward through action research and investigating not only the appropriateness but also the impact of a transformational pedagogical tool in classrooms operating in slum areas. The intervention could focus on children's creativity, motivation, and interests in order to show teachers and governments how different practices, moving away from rote, could stimulate learning within these communities. The goal would be to develop talents in ALL children, provide a broad range of advanced level enrichment experiences, and opportunities based on strengths and interests. This could transform potential giftedness into real talents, thus improving the prospects for societies and nations to capitalise on currently underutilised or recognised cognitive skills.

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Appendices

Appendix 1 Questionnaires and surveys

STD 5/6 KISWAHILI test

Chagua jibu lililo sahihi

1. Mwizi _____ ndiye aliyetuibia juzi
   A. huyu huyu   B. yuyu huy   C. huyo huyo   D. uyu uyu

2. Mtoto alilala _____ mpaka _____
   A. chopi-che   B. chew-che   C. fofoo-chwe   D. fofofo-che!

3. Andika tarakimu hii kwa maneno: 500,000
   A. milioni mia tano   B. elfu tano elfu   C. nusu milioni   D. elfu hamsini

4. Mtu anapokuwa na mwito wa kulifanya jambo hatimaye atapata njia ya kulifanya bila shaka.
   Methali inayofaa maneno haya ni:-
   A. penye nia pana njia B. kikulacho ki nguoni mwako
   C. wawili si mmoja   D. kidole kimoja hakivunji chawa

5. Kuandika barua rasmi, neno litumiwalo kuonyesha kiini cha barua yako ni
   A. kichwa   B. mada   C. mintarafu   D. maamkizi

6. Tunaishi katika maskani _____
   A. mazuri   B. pazuri   C. masuri   D. mzuri

7. Ni upi mpangilio uletao mfululizo ufaao wa wakati?
   A. alfajiri, asubuhi, adhuhuri, alasiri, magharibi
   B. alasiri, asubuhi, alfajiri, magharibi, adhuhuri
   C. asubuhi, alfajiri, alasiri, adhuhuri, magharibi
   D. alfajiri, asubuhi, alasiri, adhuhuri, magharibi

8. Kanusha sentensi hii

   Mtoto hulia kila asubuhi
   A. mtoto hakulia kila siku   B. mtoto hajalia kila asubuhi
   C. mtoto hatalia kila asubuhi   D. mtoto halii kila asubuhi

9. Tegua kitendawili hiki:
   Mti wangu una matawi kumi na mawili na kila tawi lina majani kadiri thelathini
   A. mwaka   B. karne
   C. mwongo   D. siku (mchana na usiku)

10. Randa ni kifaaa cha kulainisha mbao. Je maana nyingine ya neno hili ni?
    A. fanana   B. panga
    C. zurura   D. kata

About your class mates

Who are the 'top' three children in your class? And why?

1st Top Name…………………………. Why?……………………..

2nd Top Name …………………………Why?……………………

3rd Top Name…………………………. Why?……………………

About yourself

1. Your Age: ……. Years and ………Months
(NB: If not known the researcher needs to get the information from the school records)

2. Sex (0) Boy ☐   (1) Girl   ☐

About your Family (anyone in the extended family living in the family home)

3. Can any elder member of your family write **and/or** speak English fluently?

        (0) No   ☐☐   (1) Yes   ☐

4. Are there any older brothers or sisters that can read English in your family?

        (0) No   ☐☐   (1) Yes   ☐

5. How many brothers and sisters do you have in your family (not including you)?   _____

6. Who pays the fees or for books or uniforms for your schooling? (Tick as many boxes as apply to you)

    (1) Father/Mother   ☐
    (2) Guardian (male/female)   ☐
    (3) Elder brothers or sisters   ☐
    (4) Other relatives   ☐
    (5) Neighbours   ☐
    (6) Other   ☐please specify _____

7. Which position in the children do you come in your family?

    (1) Eldest   ☐
    (2) Youngest   ☐
    (3) In between, not eldest or youngest   ☐

8. What language do you speak at home? _____

About your Home

9. Does your family own any of the following items? Please tick all that your family has:

	Family owned asset	Please tick here if your family has the item
1	Car or Jeep	
2	Scooter or motorcycle	
3	Bicycle	
4	Cell phone / Mobile	
5	Radio	
6	Electricity	
7	TV	

8	Gas Stove	
9	Cultivated land	
10	Cattle	
11	Goats, sheep and/or chickens	
12	Taxi or Boda-boda	
13	Computer	
14	Generator	
15	Shop or Housing plot	

10.   How many rooms in the house does your family have for their own use?_____

11.   What type of building is your home?
  (1)   Brick or concrete building   □
  (2)   Semi-permanent building   □
  (3)   Wood and tin sheet building   □
  (4)   Mud building   □
  (5)   Other (please specify)   □   _____

12.   Does your house have a toilet?
  Within the premises   (1) Yes   □   (0) No   □
  Outside the premises   (1) Yes   □   (0) No   □

13.   Does your house have a separate kitchen for your family to use? (1) Yes □(0) No □
14.   How many people live in your home? (Please include yourself)

		Number			Number
a	Men		c	Women	
b	Boys		d	Girls	

About your mother and father

15.   Does your father (male guardian) have an income?
  (1) Yes   □   (0) No   □

16.   Does your mother (female guardian) have an income?
  (1) Yes   □   (0) No   □

17.   What does your father (male guardian) do as a job?

18.   What does your mother (female guardian) do as a job?

19.   Do you help your parents (guardians) before/after school with chores?
  (0) No □   (1) Yes □   If yes what do you help with?

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20. What was the highest level of education your father (male guardian) completed? (only tick one)

    (1)   No school   ☐
    (2)   Primary school   ☐
    (3)   Secondary School   ☐
    (4)   Secondary Advanced   ☐
    (5)   College   ☐
    (6)   University   ☐

21. What was the highest level of education your mother (female guardian) completed? (only tick one)

    (1)   No school   ☐
    (2)   Primary school   ☐
    (3)   Secondary School   ☐
    (4)   Secondary Advanced   ☐
    (5)   College   ☐
    (6)   University   ☐

Student Creativity Characteristics Survey:

Creativity Characteristics:	1	2	3	4
	Least like me	A little like me	Much like me	Most like me
1. I come up with a large number of ideas and solutions to problems and questions. I think my answers are clever.				
2. I like to express myself and sometimes I won't give in to what I think is right.				
3. I like taking risks. I am adventurous and like danger				
4. I 'imagine a lot' by saying to myself 'I wonder what would happens if' I like thinking through ideas				
5. I think things are funny when others don't				
6. I am emotional and sensitive				
7. I love looking at beautiful things. I see beauty in everything.				
8. I'm happy to be different. I am an individual				

SMIP (24 items)_ Eng

		Least like me	A little like me	Moderately like me	Very much like me	Most like me
1.	I enjoy talking and playing with words.	①	②	③	④	⑤
2.	I enjoy writing; I am fluent and expressive.	①	②	③	④	⑤
3.	I read a lot for pleasure and information.	①	②	③	④	⑤
4.	I sing, hum a lot (on key).	①	②	③	④	⑤
5.	I enjoy listening to different kinds of music; I can notice different tones and easily remember melodies.	①	②	③	④	⑤
6.	I play instruments; I can easily master the skills of playing.	①	②	③	④	⑤
7.	I actively search the patterns, cause-effect, and logical relationships.	①	②	③	④	⑤
8.	I collect, categorize, study and analyze things.	①	②	③	④	⑤
9.	I play with numbers; I enjoy arithmetic "problems".	①	②	③	④	⑤
10.	I remember landmarks and places that I have visited.	①	②	③	④	⑤
11.	I know directions, can draw and follow maps.	①	②	③	④	⑤
12.	I enjoy and I am good at drawing, painting, and making models.	①	②	③	④	⑤
13.	I am graceful, and have agile use of my body; I am good at gymnastics.	①	②	③	④	⑤
14.	I am expressive with dance, gestures, body language and movements.	①	②	③	④	⑤
15.	I handle objects skilfully; I can fix things.	①	②	③	④	⑤
16.	I understand and like myself; I can control my emotions.	①	②	③	④	⑤
17.	I am self-confident, active and have self-initiative; I always look on the bright side.	①	②	③	④	⑤
18.	I show understanding and appreciation to others; I always reflect on what I have done.	①	②	③	④	⑤
19.	I am kind, friendly, loving, caring, and considerate.	①	②	③	④	⑤
20.	I listen attentively, recognize others' emotions, and respect their feelings.	①	②	③	④	⑤
21.	I like to make friends and get along well with others.	①	②	③	④	⑤
22.	I derive a lot of pleasure just from looking at natural phenomena like clouds, trees, mountains, or other formations.	①	②	③	④	⑤
23.	I have a hobby that involves nature in some way (e.g., bird watching, butterfly collecting).	①	②	③	④	⑤
24.	I love to watch birds or other animals and to follow their habits (e.g., nesting, feeding) and find out other things about them.	①	②	③	④	⑤

Parent interview

1)   What do you understand by high ability or gifted children?

2)   Do you think any of **your** children are gifted or have high ability?
(1) Yes   ☐ (0) No ☐

3)   How would you know if one of your children was high ability or gifted?

4)   What do you think high ability or gifted children end up doing when they are grown up?
_____

5) Do you think high ability children should be treated differently to other children?

(1) Yes ☐ (0) No ☐

6) If yes what should the different treatment be? _____

These questions are all regarding your child in Class 6

7) Does your child have an excellent memory? (1) Yes ☐ (0) No ☐ (2)don't know   ☐

8) Does your child have a long attention span and an intense focus?

(1) Yes ☐   (0) No ☐(2)don't know   ☐

9) Did your child have an early and large vocabulary at an early age?

(1) Yes ☐   (0) No ☐ (2) don't know   ☐

10) Does your child have an extreme curiosity, asking complex and probing questions?

(1) Yes   ☐   (0) No   ☐☐(2)don't know   ☐

11) Does your child learn very quickly? (1) Yes   ☐   (0) No   ☐☐(2)don't know   ☐

12) Does your child have an exceptional aptitude for maths?

1) Yes ☐   (0) No ☐☐(2)don't know   ☐

13) Does your child have an active imagination/creative?

(1) Yes ☐   (0) No ☐☐(2)don't know   ☐

14) Does your child have ain intense interest in books and words?

(1) Yes ☐   (0) No   ☐☐(2)don't know   ☐

Teacher Questionnaire

About you

1. What is your age? ………………………………

2. What is your gender? 1) Female □ 0) Male □

3 How many years have you worked in **this** school as a teacher? …………………

4. How many years in total have you been working as a teacher? ………………

5. What is your nationality? (i.e., where were you born?) ……………………………

Your education

5. What is your highest education level, not taking teachers' training into account. Please tick only one.

    0) Primary Level   □
    1) Vocational training Level   □
    2) Secondary Level   □
    3) College certificate Level   □
    4) Diploma level   □
    5) BA, BSc, HND or equivalent   □
    6) MA, MSc or equivalent   □
    7) PhD   □

6.What type of teacher training have you received? (Please tick only ONE)

    0) None   □
    1) Lower Primary   □
    2) Upper Primary   □
    3) Junior Secondary   □
    4) Senior Secondary   □
    5) Graduate   □
    6) Post graduate Diploma/Certificate in Education   □
    7) Masters in Education   □

You as a teacher at your school

7. What is your monthly salary from teaching at **this school** (not including private teaching)? Shillings. ……………… Per month

7b. How many children are there **in total** in this school? ……………

7c.How many children are there in total in your class? ……………..

7d. How many boys and how many girls are there in your class (Class 6)?

Boys ☐ Girls ☐

8. Which of the following best describes why you became a teacher? **Pick three ranking them in order from 1ˢᵗ to 2ⁿᵈ to 3ʳᵈ reason**

a) I like to teach/like my subject/self fulfilment	
b) Inspired by other teachers	
c) Family pressure/others decision	
d) Convenient timing	
e) Respectable job/good social status	
f) Permanent job which offers financial security	
g) Good salary	
h) No other secure job available	
i) Not a high pressure job	

9a. How would you rate your satisfaction with your **choice** of being a teacher?

0) Very dissatisfied ☐
1) Dissatisfied ☐
2) Quite satisfied ☐
3) Very satisfied ☐

9b. Please give a reason for your answer to 9a, regarding your satisfaction with your choice to being a teacher

10. What language of instruction do you mainly use in your Class?

0) Kiswahili
1) English
2) Other _____(please specify)

High ability/Gifted children in your class

8. How would you recognise a high ability/gifted child in your class?

9. Who are the 3 most gifted children in your class giving reasons why?

(i)   Name …………………………………….

        Why you believe this child is gifted

(ii)   Name …………………………………….

        Why you believe this child is gifted

(iii)   Name …………………………………....

        Why you believe this child is gifted

Commitment and Motivation survey

Commitment and motivation survey	1	2	3	4
	NEVER	SOMETIMES	LOTS	ALWAYS
1. I am concerned about what other people think of my work.	☐	☐	☐	☐
2. The more difficult the problem, the more I enjoy trying to solve it.	☐	☐	☐	☐
3. To me, success means doing better than other people.	☐	☐	☐	☐
4. I prefer to figure things out for myself.	☐	☐	☐	☐
5. I am very curious about many things! I ask questions all the time about everything.	☐	☐	☐	☐
6. I enjoy trying problems that are completely new to me.	☐	☐	☐	☐
7. I prefer work that stretches my abilities to work I know I can do well.	☐	☐	☐	☐
8. I am concerned about how other people are going to react to my ideas.	☐	☐	☐	☐
9. I am more comfortable when I can set my own goals.	☐	☐	☐	☐
10. I believe that there is no point in doing a good job if nobody else knows about it.	☐	☐	☐	☐
11. I am strongly motivated by the recognition I can learn from other people.	☐	☐	☐	☐
12. I want other people to find out how good I really can be at my work.	☐	☐	☐	☐

Appendix 2 Permission documents for research

Figure 16 Kinondoni permission letter for research to be conducted

HALMASHAURI YA MANISPAA YA KINONDONI
ALL CORRESPONDECES TO BE ADDRESSED TO THE MUNICIPAL DIRECTOR

TEL : 2170173,
FAX NO. :2172606
In reply please quote :

MUNICIPAL DIRECTOR,
KINONDONI MUNICIPAL COUNCIL,
P.O. BOX 31902,
DAR ES SALAAM.

REF: PF. KMC/ED/U.21/13/14

Date: 25th April, 2013

Newcastle University, ECLS, King George VI Building
Newcastle Upon Tyne,
ENGLAND.

RE: **RESEARCH PERMIT TO IDENTIFY, HIGH ABILITY CHILDREN FROM LOW INCOME FAMILIES – ATTENDING SCHOOLS IN KINONDONI MUNICIPALITY**

Refer to the heading above.

Permission have been granted to conduct research to 50 Municipal Primary Schools as attached. However some schools can be picked from Kigogo ward, Kawe, Tandale, Manzese and Kwembe to fulfill objective of the research.

For further assistance please contact education department.

Sincerely,

H. J. Gwimile
FOR: MUNICIPAL DIRECTOR

Figure 17 COSTECH research permit

Appendix 3 Consent Forms

Pupil Consent Form and Participant Information Sheet.

PROJECT TITLE: An Application of Renzulli's Three Ring Concept in a low income setting in Dar es Salaam, Tanzania

INTRODUCTION - My name is Steve Humble and I am a researcher from Newcastle University interested in improving educational experiences for teachers and children all across the world. Newcastle University has been given some money by our government in the United Kingdom to carry out research in Tanzania. We have been doing research for a very long time. We enjoy it and look forward to spending time with you.

WHAT IS THE STUDY ABOUT? - You are invited to be involved in a project that is trying to look at the way children can help each other with their learning. If you take part in the study your name will not appear in any documents. Everything will be anonomised. We will at the end of the study come back and talk to you about what we found out. So please take whatever time you need to discuss the study with your family and friends, or anyone else you wish to. The decision to join, or not to join, is up to you. You can withdraw at any time!

WHAT IS INVOLVED IN THE STUDY? - If you decide to participate you will be asked to take part in workshops where you will use new technology to discover different ideas and think about your communities and issues within those. You will always have someone with you to help you at all times. The study can stop at any time and if you want you can be taken out of the study. If you stop you will not lose any benefits.

BENEFITS TO TAKING PART IN THE STUDY - The benefits of taking part in the study will include finding out how children like you use technology for the first time and how children can help each other learn. We can't guarantee that you will personally experience benefits from participating in this study. However, others may benefit in the future from the information we find in this study.

CONFIDENTIALITY - We will take the following steps to keep information about you confidential, and to protect it from unauthorized disclosure, tampering, or damage:
All results will be given numbers or letters– they will have no names and there will be no way of finding out who did what. We need to protect who you are and your results so all the information will be kept on a computer with that is protected.

INCENTIVES - We hope that if you participate we will give you a certificate, a pen and a notebook.

YOUR RIGHTS AS A RESEARCH PARTICIPANT? - Participation in this study is voluntary. You have the right not to participate at all or to leave the study at any time. Deciding not to participate or choosing to leave the study will not result in any penalty or loss of benefits to which you are entitled. It will not harm your relationship with your teachers.

Consent of Subject (or Legally Authorized Representative)
Signature of Subject or Representative   Date

Parent Consent and Information Form

Participation Opt Out Form

You need only complete this form and return it to your child's school if you DO NOT wish your child to participate in all or part of the study PLEASE NOTE: IF YOU DO NOT RETURN THE FORM, YOUR CHILD WILL AUTOMATICALLY BE INCLUDED IN THE STUDY.

PROJECT TITLE: An Application of Renzulli's Three Ring Concept in a low income setting in Dar es Salaam, Tanzania

INTRODUCTION - My name is Steve Humble and I am a researcher from Newcastle University interested in improving educational experiences for teachers and children all across the world. We have been involved in research for over two decades and are committed to generating knowledge and understanding that can be used by other researchers, policy makers, teachers and teachers.

WHAT IS THE STUDY ABOUT? - Your child is invited to be involved in a project that is trying to look at the way children can help each other with their learning. We will at the end of the study come back and talk to you about what we found out. So please take whatever time you need to discuss the study with your family or the school or anyone else you wish to. The decision for your child to join or not to join, is up to you and can withdraw them at any time!

WHAT IS INVOLVED IN THE STUDY? - If you allow your child to participate they will be involved in 2-3 workshops we will run in school time. They will do this in the class and they will always have someone with them to help them at all times.

BENEFITS TO TAKING PART IN THE STUDY? - The benefits of taking part in the study will include finding out how children use technology for the first time and how children can help each other learn. We can't guarantee that your child will personally experience benefits from participating in this study. However, others may benefit in the future from the information we find in this study.

CONFIDENTIALITY - We will take the following steps to keep information about you confidential, and to protect it from unauthorized disclosure, tampering, or damage: All results will be given numbers or letters– they will have no names and there will be no way of finding out who did what. We need to protect who you are and your results so all the information will be kept on a computer with that is protected.

Please initial - I confirm that I have read and understood the participant information about the study. I have had the opportunity to consider the information. I understand that participation is voluntary and that I would be free to withdraw my child at any time, without giving a reason

However if you ARE NOT willing for your child to be observed as part of this study, please initial here ……………………………………………………

_____
Name of child

_____ _____ _____
Name of parent/guardian Date Signature

Information Sheet and Consent Form

Head teacher, Teacher and Ministry of Education Officials

Introduction – I am a researcher from Newcastle University who is interested in supporting and enhancing young people's experiences in international contexts. I have been involved in research for over two decades and am committed to generating knowledge and understanding that can be used by other researchers, policy makers, teachers and teachers. This is a UK government sponsored project that is supported by Newcastle University.

What is involved in the study? - This research project aims to provide teachers with a quick and effective method identify children who are gifted and talented in a number of different areas. The project will select around 50-60 schools randomly within a slum area. We initially want to establish how, if at all, identification of high ability students currently takes place. It will explore teacher and pupil perceptions of what makes a student high ability or gifted. Once this has been established the research will use a range of methods (including a battery of tests and teacher assessments) to systematically screen all grade six children (aged around 10-11 years old) the participating schools.

Comparisons will then be made using these test results with those children identified by teachers using the accepted thinking and methodology. Alongside this, the self-perception of those children identified to have potential and high ability will be explored. Using these data, a low cost but scientifically valid (i.e., reliable and diagnostically accurate) identification method for high ability children will be created and field-tested. Alongside this, the research will discuss with the schools what could make these tests sustainable. Self-perception of ability will also be investigated with those children identified to have potential and high ability. We will also explore how such an identification mechanism may be scaled up to include other schools in the area.

Benefits to taking part in the study? - The benefits of taking part in the study will include developing a test that will identify children who are gifted and talented. We are also hoping to help teachers recognize gifted and talented children. We can't guarantee that you will personally experience benefits from participating in this study. Others may benefit in the future from the information we find in this study.

Confidentiality - We will take the following steps to keep information about you confidential, and to protect it from unauthorized disclosure, tampering, or damage:

All the information and interviews will be anonymized and they will be treated as confidential. The information sheets will be written up and the originals will be destroyed. Only the research team will have access to this data.

Your rights as a research participant - Participation in this study is voluntary. You have the right not to participate at all or to leave the study at any time. Deciding not to participate or choosing to leave the study will not result in any penalty or loss of benefits to which you are entitled, and it will not be disclosed.

At any time please ask the researcher to stop the research.

Consent of Subject (or Legally Authorized Representative)

Signature of Subject or Representative   Date

PARTICIPANT DEBRIEFING

Thank you for taking part in the Newcastle University study on the support and nurturing of high ability children from areas in Dar es Salaam, Tanzania. Your participation was extremely gratefully received. It has enabled us to analyse the data/information you gave, our researchers submitted and that of other schools and participants.

The overall purpose of the research project was to conduct the research and development to help create a new way and method of children teaching each other through peer teaching.

The following are the major draft findings of the component of the study you were involved with:

[Insert major findings of the particular component of the study]

We value your comments, suggestions, queries and observations on these findings. If you wish to address any such comments in writing or by telephone, please do so to any of the following team members listed in the letter ahead above.

We may wish to follow up these comments with you. If you are happy for us to do so, please include your contact details. Equally, you may wish for your comments to be anonymous. We are also happy to receive anonymous comments.

Your comments and the discussion at the meeting will be taken into account in the revised version of the findings. Any comments again which we include will be made anonymous. The revised findings will be published on our website in approximately one month's time.

Again, thank you so much for your help in making this research possible.

Signed

Steve Humble,   Date

Appendix 4 Multilevel modelling

Multilevel modelling was performed initially on the data in order to investigate stability reliability using the Mlwin package. The findings showed there to be no statistically significant variance across the schools concerning test scores, family background and school factors. Therefore linear and logistic regressions are used in this thesis. Below is an example of the multilevel modelling calculations that were performed.

Table 55 Multi level modelling

$$IQss_{ij} \sim N(XB, \Omega)$$
$$IQss_{ij} = \beta_{0ij}\text{cons}$$
$$\beta_{0ij} = 65.080(0.928) + u_{0j} + e_{0ij}$$

$$\left[u_{0j} \right] \sim N(0, \Omega_u) : \Omega_u = \left[5.955(3.628) \right]$$

$$\left[e_{0ij} \right] \sim N(0, \Omega_e) : \Omega_e = \left[156.214(7.659) \right]$$

$-2*loglikelihood(IGLS\ Deviance) = 6648.113(841\ of\ 847\ cases\ in\ use)$

$$IQss_{ij} \sim N(XB, \Omega)$$
$$IQss_{ij} = \beta_{0ij}\text{cons} + 0.499(0.094)\text{maths}_{ij} + 12.854(2.165)\text{peer15}_{ij} + 0.224(0.052)\text{readss}_{ij} + 0.770(0.163)\text{avIQss}_j +$$
$$-3.769(0.786)\text{gender}_{ij} + 0.735(0.237)\text{kiscore}_{ij} + -0.740(0.242)\text{avreadss}_j + -1.084(0.356)\text{age}_{ij}$$
$$\beta_{0ij} = 53.635(17.831) + u_{0j} + e_{0ij}$$

$$\left[u_{0j} \right] \sim N(0, \Omega_u) : \Omega_u = \left[0.000(0.000) \right]$$

$$\left[e_{0ij} \right] \sim N(0, \Omega_e) : \Omega_e = \left[123.951(6.052) \right]$$

$-2*loglikelihood(IGLS\ Deviance) = 6424.863(839\ of\ 847\ cases\ in\ use)$

Multilevel modelling results Linear regression model With school-level variables

IQ standardised score Random part of model	S.d. =	12.724		
Base case	**Value**	**Std. Error**	**Sig**	**% of total var**
School variance:	5.955	3.628	10.1%	3.7%
Pupil variance	156.214	7.659	0.0%	96.3%
Total	162.169			
Full model				
School variance:	0.000	0.000		0.0%
Pupil variance	123.951	6.052	0.0%	100.0%
Total	123.951			
Reduction in variance		School	100.0%	
		Pupil	20.7%	

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Fixed part of model

Variable	Coefficient	Std. Error	Sig	S.d.	Impact	Quasi ES
cons	53.635	17.831	0.3%			
AvIQss	0.770	0.163	0.0%	2.675	2.913	0.23
maths	0.499	0.094	0.0%	4.848	3.421	0.27
readss	0.224	0.054	0.0%	8.492	2.690	0.21
kiscore	0.735	0.237	0.2%	1.83	1.902	0.15
age	-1.084	0.356	0.2%	1.1661	-1.788	-0.14
peer15	12.854	2.165	0.0%	-1	12.854	1.01
Avreadss	-0.740	0.240	0.2%	1.81938	-1.904	-0.15
Gender	-3.769	0.786	0.0%	-1	-3.769	-0.30

Appendix 5 SMIP Gender and religious differences in attitudes

Gender differences

Table 56 Gender differences for girls in SMIP and writing

| | | The child's gender | | |
		boy	girl	Total
I enjoy writing: I am fluent and expressive	1	81	73	154
		52.6%	47.4%	100.0%
	2	77	57	134
		57.5%	42.5%	100.0%
	3	256	298	554
		46.2%	53.8%	100.0%

(Chi-squared=6.354, df =2, p=0.042)

Table 57 Gender differences boys in SMIP and music

| | | The child's gender | | |
		boy	girl	Total
I enjoy listening to music	1	138	173	311
		44.4%	55.6%	100.0%
	2	85	65	150
		56.7%	43.3%	100.0%
	3	191	190	381
		50.1%	49.9%	100.0%
Total		414	428	842
		49.2%	50.8%	100.0%

(Chi-squared=6.377, df =2, p=0.041)

Table 58 Gender differences for boys in SMIP and musicical Instruments

| | | The child's gender | | |
		boy	girl	Total
I play an instrument	1	168	231	399
		42.1%	57.9%	100.0%
	2	63	78	141
		44.7%	55.3%	100.0%
	3	183	119	302
		60.6%	39.4%	100.0%
Total		414	428	842
		49.2%	50.8%	100.0%

(Chi-squared=24.88, df =2, p=0.000)

Table 59 Gender differences boys in SMIP and dexterity

| | | The child's gender | | |
		boy	girl	Total
I handle objects skilfully	1	117	174	291
		40.2%	59.8%	100.0%
	2	94	83	177
		53.1%	46.9%	100.0%
	3	203	171	374
		54.3%	45.7%	100.0%
Total		414	428	842
		49.2%	50.8%	100.0%

(Chi-squared=14.358, df =2, p=0.001)

Religion

Muslin boys were found to express different views from Christian boys when asked – 'I enjoy talking and playing with words' as they feel it is more like them.

Table 60 Religion differences with SMIP and words

The child's gender			Religion of the child Christian	Muslim	Total
boy	I enjoy talking and playing with words	1	43	80	123
			35.8%	31.5%	32.9%
		2	30	40	70
			25.0%	15.7%	18.7%
		3	47	134	181
			39.2%	**52.8%**	48.4%
	Total		120	254	374
			100.0%	100.0%	100.0%
girl	I enjoy talking and playing with words	1	35	66	101
			26.9%	27.5%	27.3%
		2	28	40	68
			21.5%	16.7%	18.4%
		3	67	134	201
			51.5%	55.8%	54.3%
	Total		130	240	370
			100.0%	100.0%	100.0%
Total	New sp1	1	78	146	224
			31.2%	29.6%	30.1%
		2	58	80	138
			23.2%	16.2%	18.5%
		3	114	**268**	382
			45.6%	**54.3%**	51.3%
	Total		250	494	744
			100.0%	100.0%	100.0%

Table 61 Chi-Square tests for Religion differences with SMIP and word

The child's gender		Value	df	Asymp. Sig. (2-sided)
boy	Pearson Chi-Square	7.303[b]	2	**.026**
	Likelihood Ratio	7.242	2	.027
	Linear-by-Linear Association	3.311	1	.069
	N of Valid Cases	374		
girl	Pearson Chi-Square	1.386[c]	2	.500
	Likelihood Ratio	1.363	2	.506
	Linear-by-Linear Association	.156	1	.692
	N of Valid Cases	370		
Total	Pearson Chi-Square	6.961[a]	2	**.031**
	Likelihood Ratio	6.858	2	.032
	Linear-by-Linear Association	2.284	1	.131
	N of Valid Cases	744		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 46.37.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 22.46.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 23.89.

With regards to the question on the SMIP - 'I play with numbers' – Muslim girls see like them more than Christian girls

Table 62 Religion differences with SMIP and Numbers

The child's gender			Religion of the child		
			Christian	Muslim	Total
boy	I play with numbers	1	24	39	63
			20.0%	15.4%	16.8%
		2	8	35	43
			6.7%	13.8%	11.5%
		3	88	180	268
			73.3%	70.9%	71.7%
	Total		120	254	374
			100.0%	100.0%	100.0%
girl	I play with numbers	1	26	29	55
			20.0%	12.1%	14.9%
		2	17	23	40
			13.1%	9.6%	10.8%
		3	87	**188**	275
			66.9%	**78.3%**	74.3%
	Total		130	240	370
			100.0%	100.0%	100.0%
Total	I play with numbers	1	50	68	118
			20.0%	13.8%	15.9%
		2	25	58	83
			10.0%	11.7%	11.2%
		3	175	368	543
			70.0%	74.5%	73.0%
	Total		250	494	744
			100.0%	100.0%	100.0%

Table 63 Chi-Squared test on Religion differences with SMIP and Numbers

Chi-Square Tests

The child's gender		Value	df	Asymp. Sig. (2-sided)
boy	Pearson Chi-Square	4.700[b]	2	.095
	Likelihood Ratio	5.038	2	.081
	Linear-by-Linear Association	.066	1	.797
	N of Valid Cases	374		
girl	Pearson Chi-Square	5.984[c]	2	**.050**
	Likelihood Ratio	5.842	2	.054
	Linear-by-Linear Association	5.835	1	.016
	N of Valid Cases	370		
Total	Pearson Chi-Square	4.979[a]	2	.083
	Likelihood Ratio	4.846	2	.089
	Linear-by-Linear Association	3.394	1	.065
	N of Valid Cases	744		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 27.89.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.80.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.05.

With regards to the question on the SMIP 'I understand and like myself' – no difference is seen with the boys but there is with girls

Table 64 Religion differences with SMIP and self

			Religion of the child		
The child's gender			Christian	Muslim	Total
boy	I understand and like myself	1	19	48	67
			15.8%	18.9%	17.9%
		2	15	32	47
			12.5%	12.6%	12.6%
		3	86	174	260
			71.7%	68.5%	69.5%
	Total		120	254	374
			100.0%	100.0%	100.0%
girl	I understand and like myself	1	28	44	72
			21.5%	18.3%	19.5%
		2	20	18	38
			15.4%	7.5%	10.3%
		3	82	**178**	260
			63.1%	**74.2%**	70.3%
	Total		130	240	370
			100.0%	100.0%	100.0%
Total	I understand and like myself	1	47	92	139
			18.8%	18.6%	18.7%
		2	35	50	85
			14.0%	10.1%	11.4%
		3	168	352	520
			67.2%	71.3%	69.9%
	Total		250	494	744
			100.0%	100.0%	100.0%

Table 65 Chi-Square Tests on Religion differences with SMIP and self

The child's gender		Value	df	Asymp. Sig. (2-sided)
boy	Pearson Chi-Square	.545[b]	2	.761
	Likelihood Ratio	.554	2	.758
	Linear-by-Linear Association	.518	1	.472
	N of Valid Cases	374		
girl	Pearson Chi-Square	7.025[c]	2	**.030**
	Likelihood Ratio	6.787	2	.034
	Linear-by-Linear Association	2.689	1	.101
	N of Valid Cases	370		
Total	Pearson Chi-Square	2.579[a]	2	.275
	Likelihood Ratio	2.513	2	.285
	Linear-by-Linear Association	.476	1	.490
	N of Valid Cases	744		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 28.56.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.08.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.35.

With regards to the question on the SMIP – 'I listen and respect others' feelings'

Table 66 Religion differences with SMIP and words

The child's gender			Religion of the child		
			Christian	Muslim	Total
boy	I listen and respect others' feelings	1	37	56	93
			30.8%	22.0%	24.9%
		2	19	30	49
			15.8%	11.8%	13.1%
		3	64	168	232
			53.3%	66.1%	62.0%
	Total		120	254	374
			100.0%	100.0%	100.0%
girl	I listen and respect others' feelings	1	31	40	71
			23.8%	16.7%	19.2%
		2	28	33	61
			21.5%	13.8%	16.5%
		3	71	**167**	238
			54.6%	**69.6%**	64.3%
	Total		130	240	370
			100.0%	100.0%	100.0%
Total	I listen and respect others' feelings	1	68	96	164
			27.2%	19.4%	22.0%
		2	47	63	110
			18.8%	12.8%	14.8%
		3	135	**335**	470
			54.0%	**67.8%**	63.2%
	Total		250	494	744
			100.0%	100.0%	100.0%

Table 67 Chi-Square Tests on Religion differences with SMIP and words

The child's gender		Value	df	Asymp. Sig. (2-sided)
boy	Pearson Chi-Square	5.692[b]	2	.058
	Likelihood Ratio	5.628	2	.060
	Linear-by-Linear Association	5.186	1	.023
	N of Valid Cases	374		
girl	Pearson Chi-Square	8.305[c]	2	**.016**
	Likelihood Ratio	8.200	2	.017
	Linear-by-Linear Association	6.533	1	.011
	N of Valid Cases	370		
Total	Pearson Chi-Square	13.662[a]	2	**.001**
	Likelihood Ratio	13.499	2	.001
	Linear-by-Linear Association	11.304	1	.001
	N of Valid Cases	744		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 36.96.
b. b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.72.
c. c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 21.43.

Christian Girls different – 'I derive a lot of pleasure from looking at natural phenomena'

Table 68 Religion differences with SMIP and nature

The child's gender			Religion of the child		
			Christian	Muslim	Total
boy	I derive a lot of pleasure from looking at natural phenomena	1	23	53	76
			19.2%	20.9%	20.3%
		2	19	41	60
			15.8%	16.1%	16.0%
		3	78	160	238
			65.0%	63.0%	63.6%
	Total		120	254	374
			100.0%	100.0%	100.0%
girl	I derive a lot of pleasure from looking at natural phenomena	1	18	**46**	64
			13.8%	**19.2%**	17.3%
		2	29	30	59
			22.3%	12.5%	15.9%
		3	83	164	247
			63.8%	68.3%	66.8%
	Total		130	240	370
			100.0%	100.0%	100.0%
Total	I derive a lot of pleasure from looking at natural phenomena	1	41	99	140
			16.4%	20.0%	18.8%
		2	48	71	119
			19.2%	14.4%	16.0%
		3	161	324	485
			64.4%	65.6%	65.2%
	Total		250	494	744
			100.0%	100.0%	100.0%

Table 69 Chi-Square Tests Religion differences with SMIP and nature

Chi-Square Tests

The child's gender		Value	df	Asymp. Sig. (2-sided)
boy	Pearson Chi-Square	.172[b]	2	.917
	Likelihood Ratio	.173	2	.917
	Linear-by-Linear Association	.171	1	.679
	N of Valid Cases	374		
girl	Pearson Chi-Square	6.721[c]	2	.035
	Likelihood Ratio	6.549	2	.038
	Linear-by-Linear Association	.010	1	.921
	N of Valid Cases	370		
Total	Pearson Chi-Square	3.624[a]	2	.163
	Likelihood Ratio	3.582	2	.167
	Linear-by-Linear Association	.160	1	.689
	N of Valid Cases	744		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 39.99.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 19.25.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 20.73.

Muslim boys more than Christian – 'I have a hobby that involves nature'

Table 70 Religion differences with SMIP and hobby

| The child's gender | | | Religion of the child | | |
			Christian	Muslim	Total
boy	I have a hobby that involves nature	1	45	68	113
			37.5%	26.8%	30.2%
		2	29	44	73
			24.2%	17.3%	19.5%
		3	46	142	188
			38.3%	55.9%	50.3%
	Total		120	254	374
			100.0%	100.0%	100.0%
girl	I have a hobby that involves nature	1	45	59	104
			34.6%	24.6%	28.1%
		2	25	54	79
			19.2%	22.5%	21.4%
		3	60	**127**	187
			46.2%	**52.9%**	50.5%
	Total		130	240	370
			100.0%	100.0%	100.0%
Total	I have a hobby that involves nature	1	90	127	217
			36.0%	25.7%	29.2%
		2	54	98	152
			21.6%	19.8%	20.4%
		3	106	**269**	375
			42.4%	**54.5%**	50.4%
	Total		250	494	744
			100.0%	100.0%	100.0%

Table 71 Chi-Square Tests Religion differences with SMIP and hobby

Chi-Square Tests

The child's gender		Value	df	Asymp. Sig. (2-sided)
boy	Pearson Chi-Square	10.066[b]	2	**.007**
	Likelihood Ratio	10.135	2	.006
	Linear-by-Linear Association	8.514	1	.004
	N of Valid Cases	374		
girl	Pearson Chi-Square	4.204[c]	2	.122
	Likelihood Ratio	4.134	2	.127
	Linear-by-Linear Association	3.222	1	.073
	N of Valid Cases	370		
Total	Pearson Chi-Square	11.065[a]	2	**.004**
	Likelihood Ratio	11.009	2	.004
	Linear-by-Linear Association	11.027	1	.001
	N of Valid Cases	744		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 51.08.
b. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 23.42.
c. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 27.76.

Appendix 6 Factor analysis for school facility reduction

Selecting school factors VARIABLES used in factor analysis –

Playground, television, computers, admin computers, musical instrument

Table 72 School factor 1 and 2

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cum %	Total	% of Variance	Cum %	Total	% of Variance	Cum %
1	2.117	42.333	42.333	2.117	42.333	42.333	2.101	42.021	42.021
2	2.046	40.923	83.257	2.046	40.923	83.257	2.062	41.236	83.257
3	.504	10.075	93.332						
4	.244	4.882	98.214						
5	.089	1.786	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
the school has a playground	.717	.553
the school has a television	.889	.013
the school has computers for pupils	.838	-.415
the school has administrators	.140	.956
the school has musical instruments	.274	-.818

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

- School factor 1 – Playground, TV and computers for pupils
- School factor 2 – Admin and musical instruments

Appendix 7 Transcriptions of teacher interviews

Teacher interview 1

INT: How did you become a teacher?

Initially when she was competing the school there was a bad situation in employment, so that was the only option, teaching was the only option for her. At the same time her dad was a teacher so decided to follow the same path as her father.

INT: What subject was that?

Because he was teaching in a college she didn't know what subjects that h was teaching.

INT: Do the children see the female and the male teachers differently?

They treat them just the same.

INT: What are the challenges that you face or experience as a teacher?

It is a main factor is that the children come from an environment where most of the parents are not educated. It becomes difficult for them to get co-operation from the parents when they have issues to discuss with them. Some of them, so co-operation between the parents and the teachers is a little bit difficult.

INT: How do the children view their teachers?

The relationship between the teachers and the students in the school is very good as it has been happening that some of the children have got family problems. Instead of solving them there they come and talk to the teachers about these problems that they have and they seek the advice.

INT: Do you think that that will stay the same in the future?

No – it will stay the same.

INT: This project is about gifted and talented children. When I say gifted and talented, what does it mean to you?

These are children who do well in classes, they are really easy to teach, they have a heart of volunteering to do tasks. She can test them in those areas. She can see them from those areas.

INT: And are some of those children more gifted and talented than others?

They are different.

INT: Why is that?

There are some who are like they are like that because they are naturally, some of them because of the environment that they come from. Because they come from different environments, different homes. Some come from poor families where they only get one meal. Some come from families from all of the meals, so you cannot compare the two. The one who comes from the poor family is somehow will not do as well as the ones who come from the less poor family.

INT: Are you teaching any student that you are teaching who you would see as gifted?

Yes.

INT: Can you tell me a little bit about them?

Some of them can do well at addition, some of the do well at drawing. The teacher also asks for support from the student.

INT: So what is it like teaching them?

After a teacher has taught very little the child goes beyond what they have taught them.
We are doing tests at how well boys and girls do – what do you think that we will find?
They don't differ much and it might be some, but it wont differ.

INT: Some people say that boys are better logic and girls are better at creativity. How do you think about that?

There is truth in it.

INT: Why?

She says that the children at home. You can observe that what kinds of things that do at home. The boys are more speculative than those girls who are doing it.

INT: Are there different groups of boys in this school?

There are some groups but not at a very big scale. Yeah – she gives an example that one boys is an absconder and then the day after another one joins and then another one joins. When you ask one why did you abscond from lessons they say it sui because someone told us to abscond.

INT: Is that the same for girls?

Very rare for girls. Very rare.

INT: We are identifying gifted and talented children, do you think that this is a good thing?
It is a good thing?

Yes

INT: Why is that?

By identifying gifted and talented children, it makes it easier to give them support to develop them,. It is different from if the whole matter is left to the parents. Some won't have the skills to identify such a children.

INT: So with those who you have identified as gifted and talented in your class, what do you do with them?

They help them in many ways, some are very bright and they don't have exercise books, they help them. Some come here and they are sick and they come from help and the grandparents that they are living with don't have the ability to buy them medicine, the teachers help them and give them medicine.

INT: And in the classroom do you anything different?

What they do is just to continue to encourage them, to encourage them to do better and better.

INT: And what about the other children, how do they view the gifted and talented children?

They have got a good relationship – they co-operate in anything.

INT: So they don't feel de-motivated and inferior.

No.

INT: And what age do you feel that you can identify someone who is gifted and talented?

At nine years, at ten years.

INT: We have used tests to find out gifted and talented children, what would you do?

What she would do is oral conversation – however the children would not get all of the answers right but she would focus on the basic ideas that the child has, I means the basic concepts that the child has, that the child will be given.

Teacher interview 2

INT: Can you tell me a little bit about why you wanted to become a teacher?

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Well from the beginning I used to have a certain teacher, I was standard seven yeah? It was my maths teacher , he used to tech me English and mathematics I was not so good at mathematics but I was so impressed by the way he was teaching English and not only that he was having a heart of caring the way that he treated the students or the pupils by name , that is what impressed me. I wanted to be become an important person like teachers, yeah, but I wanted to become a teacher because of me, yeah? I wanted to do that for me, it is part of my heart.

INT: Do you think that the children see male and female teachers differently? Mmmm yeah…

INT: In what ways,

You know when you come to women they have a compassionate heart and sometimes also men they are, but it depends on the way that you open your heart to the kids. For instance here when I started to work here what I found is that the pupils were this much closer to men than they were girls or women and what I identified then is that the man of having the heart of embracing them, sometimes, so what I found and you may find it that the girl students or the boys are so fierce them just telling them, just telling them what they are facing, even into their own families. On the other side I can say that they are not differ, it is a case of how you do open your heart. How you can affect them, because they use even I to express what they are going through in their homes. I found that there are some kids, one was suffered from TB but the teachers were there and no-one identified that and I was new, the time when I started to work. She came and she told me and I just went to them and told them. Do you know abut this kid, she is suffering from this, this, we are not aware of that, but I was knew she was. So I like them and the way that I am interacting with them. I am not that proud of myself but even if you just go and ask them, so sometimes I act like the kids so sometimes I open to ask them what they are going tough in their homes. I can that they are not much differ but the way that you open heart how do look after them.

INT: What are the problems or challenges that you face as a teacher?

Firstly it is about the community, yeah the community that is surrounding us, especially the parents, they are not co-operate much with us. They are having a I don't know a negative perception or it is cos they are not going to school or their level of education or what. But that is the first one. They are not cooperate with us sometimes we do face with the kids in trying to communicate with them, you just go home and tell your parents you want to see her and you want to speak to them but they are not responding positively or sometimes that they can come but they are reacting much and even you can not telling them what is going on. But also there are some contributions, some normal contributions, a tuition fee, but they are perceiving it negatively. It's like teachers are so poor that they want it for their own benefit but no, you know whoever is assisting someone sometimes you have to appreciate, not only by money but also you talk you can see by their heart of the conversation that they are not doing that so it is discouraging very much. They are having a lot of contributions but that is for their own benefits. So sometimes you

feel like depressed. The other thing is about the response of the pupils in the class. But this one I cannot blame them much because it is a problem of their environment and also for instance in the subject of English this is a big disaster...

INT: Really?

Yeah, I remember that I started to teach English last year even at standard four, I had never faced any such kind of pupils. The class were very very hard. Even at standard four they even failed to introduce themselves like – my name is , I come from, my mother, you know just the other day I felt like crying, not felt, I cried cos I...you see ... we have a festival and that is a big challenge and that is because it their mother tongue, but even if they are trying the problem is that if they are going back to their family they are just going to use Swahili so that is not a help, that is a very big challenge and even if you are going to improve their performance, they have a lot of A's in Swahili but when it come to English,...it is a very big challenge.

INT: How do the pupils treat their teachers?

Those all the older pupils, but now the pupils are so young so they are responding positively. Full of respect so.

INT: So do you think that will stay the same for the future?

I can not foresee that, but you know the way they treat, the way you see are behaviours that is from their homes, that is from how their parents behave, how the parents on how the parents are moulding her and that depends on how the families she or he comes from. Family background is important – because it depends on where the child is coming from. The family background contributes a lot But they are not bad, they are good in general.

INT: We are looking at gifted and talented children. When I say the term gifted and talented, what doe that mean to you?

Gifted and talented. Let me try. That is one who is born with or that is someone is being higher by being taught, so just like them over there, so which one is correct, someone who is born with or someone who is taught or is implanted, I am in between, I am in-between.

INT: So some can learn and some can inherit it...

But it can be inherited yes.

INT: Are there any children in your class at the moment who you would identify as gifted and talented?

Yes.

INT: Can you tell me a little bit about them?

I had a second year student she left here. She is probably form four today. You are starting teaching before ending the lesson is over, Janice, she knows, everything. And when you are trying to asks a question, she is the first one to rise up and even if she is not correct you can see that she is having something in her head, so it was like that. It was not only that but she used to be a number one from before standard, to standard one up to standard seven. Can't we call her a what? A gifted one?

INT: Yes, it sounds very much like it...

She was top of the class from standard one up to standard seven. And I was trying to make like follow her where she went and ion secondary, they do stay the same. So I think she is a gifted one but not only in class but also when you are discussing with her questioning her, the way she respond and you see something in her it is not normal.

INT: So what was it like teaching that child?

It was a good class though she took number one up to standard seven but there was a lot of competition in that class. And I remember that class, I like it very much it was very interactive, very interactive.

INT: Right, one of the area that we are looking at is gender. So in these classes here they are doing test and we are going to look at what is going to happen between the boys and the girls. What do you think we might find?

Oh yeah, oh yeah??? I think that yiou may find it positively to girls. More than boys, that is what I normally find when I am teaching. Girls are so intelligent, when you ask them what questions, they are the first ones to raise hands that is what I identify.

INT: Why do you think that is?

(Laughs...) Probably that they are paying much attention when you are teaching more than boys. You see the boys they like much play even if when you give them break what you find is maybe some groups of girls just making some stories and you might find them in the class doing their homework but most of the boys just on the playground just playing football but even when you are posting the results of the exams, you know it is the girls who are checking for the top numbers

INT: Some people say that boys are better at rational logical tasks and that girls are better at creative task, how do you feel about that?

Is this is like a perception, well probably but not certainly. As I have told you, when I am teaching them in the class. The girls, they are reasoning sometimes maybe sometimes more than guy, so I can only give like a perception but from what I have observed, girls are sometimes logical and reasoning but also creative so it is not to side on one side or the other. All I can say is that what I have have said before, they

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are not different, they are not different, they are all equally. But it is also how to treat them. You know we are teachers we are the ones who are staying with the kids, more, much time more than parents. But we are the ones to make them, to mould them. To have those who have a reasoning ability or a creative ability we are the one, at the end of the day we can find them equally. But how do you prepare them, how do you prepare them.. are you agree with that perception or sometimes you have to encourage them, you can do this, you can reason not like you are creative but you can reason, you can think, yes. Yes.

INT: In the school do you think that there are different groups of boys?

In this school? Generally?

INT: Yes generally.

In terms of what intellectually….behaviours…oh yeah as I have said before you see how it is with their attitude to their teachers, negative or positively. We have the school one and we have the one who is very humble, who is obeying we are having this kind of different kids as it is according to the family that they are coming from.

INT: And the same with the girls?

Yes – the same.

INT: So from your perspective, is it good to identify gifted and talented children.

Why not? Why not? You know sometimes our pupils even adults, think that they may have something but herself or himself cannot identify it. I have that something but you are the one who cannot identify. And you can identify ait and you can say move on, you have something. You can do it, it can help you for the future, so that is good, me I like that, I like that.

INT: And at what age do you feel that you can see gifted and talented children?

But for me I think it is there at the beginning, I am having something in, you are my parent, you are my teacher you don't tell at the end of the day I am moving from here primary and then I am going on to secondary and I have found no teacher who not taking care, who is a friend to me, to make me on. So what is inside me can disappear. You see. For instance eh? I have a certain friend, her father is a doctor so her parents wanted her to become the same but you wanted to check her science subject from form 2 to form 5-6. To her it was a hard task, what ended it was between four and at last she has now decided to take accounts. But her parents wanted her to become a doctor. But what if we could do it before. If we could do it before. So it could be done something and she is doing something and she was not aware of that and she would say that she does not want to be like her parents and be a doctor and she could make a decision. You see, it is good if it is just important from the beginning.

INT: And how do the other children treat those who are gifted and talented? How do they feel about them?

For us we treat them, you know sometimes others become envy, but other they wanted to acquire what is within their fellow students, that is what happens. And what happens with the envy ones, do they withdraw, how do they respond? They withdraw, they are just pretending that they know much, some kinds of words, you know much than us.

INT: What about any staff development any training for teachers to identify gifted and talented children?

Nowadays...oh yeah....i remember I used to be in primary I used to see those kinds...we are not no we have never, I never seen such kind of seminars.
Firstly, you have to let the parents know what you have identified something in the kids, firstly, and the other thing is to induct them in the spirit of something that, they have something, they have to move a=on and what is the advantage for their future. You see they can have that spirit of moving on. So that is what you can do, if you have something and then you can motive them.

INT: We are using tests to identify gifted and talented children, what would you use?

Sometimes we do use exams but also oral question, or you may also provide a second task that you want them to do it in a group discussion and then you just come and you present. The way that they do present their work you may identify sometimes you may find a pupil present something and then you feel something, that is not normal, it is beyond her or his capacity.

Teacher interview 3

INT: How did you come to be a teacher?

Her mother was a teacher she wanted to go into to teaching because of her mother.

INT: Are there any differences between the way pupils see male or female teachers?

There is not difference between being a male or female teacher it is just what you are as human nature

INT: What are the challenges?

The number of students, the number of children, it is too big. Teaching learning resources are inadequate. The environment is not very conducive

INT: How do children treat their teachers?

The children love the teachers. They are listening and they understand the instructions that they are being given.

INT: Do you think that this will stay the same in the future?

The way they see in the future it may change because the environment where the children are coming from have a negative impact on children.

INT: What kinds of environments are those?

In the areas where the children are coming from they are cinema and video places where children go on to watch movies. There is no one who can control or limit children from not attending those session. They tell them that they are supposed to be learning at home but nobody is doing that.

INT: Moving on to the project itself, the research that we are carrying out is looking at gifted and talented children, when I say gifted and talented, what does this mean to you?
These are exceptional children.

INT: Why are the exceptional?

It is right from the birth, such children show differ attributes which if parents are keen enough they trust them and assist them and when they come to school the teachers can also do so. But the problem is that they are unique and then keep assisting them and they move forward.

INT: Are there children that you have taught or that you are teaching that you have identified as gifted and talented?

Some of them who are already here were exceptional and gifted but they are going to go academically far. There are some of them who are also observing who will be going far too.

INT: Tell me a little those children, how did you notice them as gifted?

When teaching in the classroom and when the teacher looks at them, you find them concentrating differently from others. During class sessions, when the teachers gives them assignments and exercises, the children does them all right and if she call them and do oral presentations she finds them answering as she explained in the class.

INT: And what is it like teaching them?

She feels quite happy.

INT: Why?

You know when a child is perceiving well and understanding lessons you as a teacher feel comfortable because you know that your input in the child is received positively and the children keep on liking the lessons. So that makes the teacher and the child happy and they both want to attend.

INT: One of the aspect of the research is that we are looking at how the girls and the boys will perform. In the tests. What do you think we might find?

There is a lot of competition going on the expectation that she has is that they do very well and sometimes the girls will do better than the boys because of the competition and that the girls tend to be more competitive. Girls are the better ones.

INT: Some people say that girls are better at creative things and boys are better at logical things. How do you feel about that?

She believes in both girls and boys have the same capacities only that if girls are assisted in doing something they can do the same as boys.

INT: And how do you think other children in the class view the gifted and talented children.

Most cases they try to struggle so they can attain the same as the talented ones.

INT: Is there a bad feeling between those who are gifted and those who are seen as not gifted?

They feel that it is normal.

INT: Are there different groups of boys in the school?

In the school they are all together after school sessions there maybe different groups and the same with girls.

INT: So from your view is it good it identify gifted and talented children?

It is good so that their talents that they have can be developed.

INT: And do you do anything with those gifted and talented children in your class?

What she is doing is a bit different from others. She doesn't like other feeling bad after they have failed. What she is doing is that she is giving them exercises or tests and then promises them that the top 10 will be given prizes and she implements that and she does that and delivers that because she doesn't like them to feel inferior. So those that are in the top 10 list can also feel that they are good at what they do.

INT: Are there any kinds of teacher training or staff development provided in your area?

There is none in the area. But the government has been promising them that there are training and seminars but they don't have this.

INT: And do you discuss the academic development of the children with parents?

With some parents. Some parents come and they co-operate with you and some parents never.

INT: And which are the kinds of parents that don't co-operate?

Most of the parents here not co-operate with the teachers. They have a very negative response when they are told to come and discuss the issues relating to their children relating to academics. They feel as if they are being bored or that they are coming to be bored. They at their business too.

INT: Our project has been about identifying gifted and talented children. What would you do to identify gifted and talented children?

They set tests with very high pass marks and they find them scoring very high. They can get about 800 maths out of a 1000 and sometimes they bring new things in the class and you find them doing things in ways that they have not been taught.

Teacher interview 4

INT: Can you tell me how you came to become a teacher?

I became a teacher because when I was around standard for I was told to go for certain grades, and the teacher told me that me along with other children should go in the future to become a teacher.

INT: Do you like being a teacher?

Yes I do, it is my employment it helps me and my family, it is also good because the curriculum often changes, but it also helps other families and it helps when the curriculum changes, that people will benefit from it. And it is something about myself, I am improving every day because I am teaching children.

INT: What is it like being a teacher in Tanzania?

I think it is good, because in many ways I am saving the nation. I really like the idea that I am educating people, I don't really care about the payment from the government, because I will be paid by God in future, and that is why I am serving people.

INT: Do you think that it matters if you are a male or a female teacher?

It doesn't really matter because both help to children for example if some boy get some health problems he will report to Mount teacher and if a girl get some

problems female problems she will go to a female teacher, because then it doesn't matter.

INT: So what are the challenges you have as a teacher in Tanzania?

One of the challenges teachers give to children is exercises so we give them homework. But when children go home they don't do their homework instead they go and watch videos in the street, that's what they do and then sometimes at home the TV won't be accessible to them so they take money and go to the street, to watch the videos. But when they come to school one of the challenges is that the teachers would like to punish them so that they won't repeat such a thing, so they will concentrate on their studies. But again, punishments are not allowed in the school so you will find that there is no way that you can control children.

INT: So punishment is not allowed?

No the government does not allow it. But one challenge is that the environment is not very conducive for children really. Because there is often a house that has more than five families and children do not get time to sit down and concentrate on their studies, if they try then something is happening next door, it will interrupt the learning process of the children, and sometimes because of the high population and the environment that they come from, there may be a celebration going on outside and children become convinced to stop learning and join the celebrations. Children come who from poor families, they go home, there is no meal and there is nowhere where they can study so they are told to go and find used bottles for recycling, and they are sold and to find metal strips, metal strips and they are boards and sole by the factory. And also at times at home there is no fire, no fuel for the fire so often they are sent out the fine wood, so they can make something to eat. So there is no time to concentration or study.

INT: The research that we are carrying out focuses on gifted and talented children, when I say gifted and talented what you think that mean to you?

This is about the child who can do something when you give him something to do, so for me I can tell who was gifted and talented by looking at the child, by looking at how far they concentrate in the lesson, and I can identify them by looking at their exercises, and I can tell who is doing good and who is doing bad. Also another thing, some children just be identified as gifted and talented by just looking at them, however because of their poor situation at home, you will see them taking care of themselves. Despite their poor situation at home.

INT: So do you think that some children are more gifted and talented than other children?

The difference between the children is that there are those who are gifted and those who want. And the reasons behind this. Some children are very clever because that is an inborn feeling. But those who are experiencing difficulties they also have their weaknesses, but they can make, they can become talented and gifted.

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INT: Do you think that family background makes a difference?

Yes, family background. There is a big impact on families, by parents for example, their parents and grandparents or their mum and dad, a child goes back home and finds that the two parents are a confrontation, and they would like the parents care, the children will experience difficulties in their studies and sometimes they lose their concentration in their studies. Children who come from single parents have a very difficult situation because once they go home, they don't know what the situation will be will there be food will they be able to study, it makes a big impact on the lives. Also think about orphans. Because they can get very depressed if they don't have parents they can be trying to concentrate but this just doesn't happen because once they remember that they don't have parents this really depresses them.

INT: Are there any children that you have taught you would identify as gifted and talented?

Previous or current ones?

INT: Any really?

Yes

INT: and why would you say that they are gifted and talented?

Such children, when you go in the classroom you can put the question from a lesson that you have not taught before, and you can ask them about the question, and he or she will answer that question.

INT: And what is it like teaching those children?

I feel very comfortable teaching the children because teaching these children is very satisfying.

INT: So we have impact gifted and talented in general, we are now looking at gender. So we are doing research with all the children, do you think there will be difference in gender and what we find?

Now there is no difference. In the classroom there are many girls who do much better work than the boys.

INT: And why are they doing better?

They know themselves, girls know themselves more than boys. Even personal hygiene.

INT: How do the other children view those children who are gifted and talented?

There is an attitude by the teachers, but they encourage children, capable children or talented children to help the weak ones and they encourage them by providing religious books. So if you help your fellows who do not do too well God will pay your family. So it is a good thing, so gifted children, the children teachers are encouraging gifted children to help those who are weak, they Carissa because they say that the Bible and the Koran, says that those who are capable should be helping those who are not. And then god will pay them for their good deeds.

INT: But what about those children who are not gifted how did they see those gifted children?

What makes them feel very bad, is that at the end of the year when they have examinations they can see their friends getting a price. They become rewarded for their high-performance so they feel very depressed.

INT: So do they fight with each other?

No they do not fight with each other.

INT: In this school do you think that they are different groups of boys?

Now not here. You don't get different groups of boys here because it is of a small age, there are no groups because they contribute nothing to the school.

INT: And the same the girls?

Yes. But it is in the older schools and colleges the group formed because of their age because they convince each other to be together.

INT: At what age can you identify or find gifted and talented children?

Right from standard one, you can find out who is gifted and talented by just looking at what the children are doing.

INT: Is a good thing to identify gifted and talented children?

It is good identifying talented children so you can help those who were not talented.

INT: So if you notice someone who is gifted and talented do you do anything different in the class?

Once it has been identified of the gifted children in the classroom, I tell the gifted children to help the ones who are weak so that they can move altogether. Once the child knows writing and reading, they may not be able to do wonders, but it will open their minds and to find the direction that they want to go into.

INT: Are you aware of any staff of professional development around looking at gifted and talented children in your district?

I just want you to know you can get good children and local children just by looking at them. These are the skills I have acquired by going to Teachers College. You can see who is going to be the most talented and gifted in the class, you can see that from right at the beginning is just how you look at them.

INT: Do you discuss the academic check development of the children with their parents?

Yes and we have a good relationship with the parents. What is happening is that teachers and parents this school are engaged in a partnership in making decisions. And we involve them in planning the school and the parents agreed to contribute. And there is a positive response to that by the parents.

INT: Finally we have coming to identify gifted and talented children, how would you identify them?

I could use examinations, but I can also tell by looking at them.

Teacher interview 5

INT: You didn't want to be a teacher, you wanted to work in a bank, to be a business woman. I didn't think of being a teacher. Do you think it makes a difference whether it matters being a primary school teacher and a woman?

Yes I think that it matters. Because it is an employment.

INT: But as a woman..?

They must have something to do rather than being in the kitchen or taking care of children

INT: Are there any difficulties or challenged being a teacher?

Yes

INT: What would they be?

Children are of different behaviours so it is hard to control them. Everybody comes from their families, he or she comes from their different families, they come with different attitudes and some of them are really difficult to control.

INT: How do you control them?

She is looking at them and uses tough language to them.

INT: How do the pupils treat you as a teacher?

There are no inconveniencies that they cause, there are no really difficulties, just like a parent, it is the same as the way it is at the school.

INT: Do you think this will be the same in the future?

Children look differently depending on the gender of their teachers. So they also look at how they can clip them, how you can control them.
INT: So how would they treat a male and female teacher differently, can you give me an example?

They can play jokes on female teachers because maybe they are polite but it depends on the strength of the teachers themselves, they look at how the teacher is strong in the classroom ~

INT: And they think most females are not strict?

Yes this is the case.

INT: So the project is looking at gifted and talented children, when I say gifted and talented children what does that mean to you – is it a good term to use?

Yes – Gifted and talented is a good term.

INT: Do you think that some children are more gifted and talented than others?

Yes.

INT: Why, is that?

You can identify in her manner, the way that she or he listens in the class. She concentrates on things that are given by teachers. The way she does the exercise in the class, rapidly and concentrates.

INT: Do you think that those children come from particular backgrounds?

No.

INT: Why not?

She says that it is something that is inborn, it is a gift, it is a gift from god. Someone can come from a rich family that is very capable and someone can come from a poor family and he or she is very capable.

INT: Do you remember who you have taught who you would say is gifted and talented?

She said that she had some.

INT: And why were they gifted?

You can observes things, she said that the way that she perceives things, the ways that she listens to the teachers, they can be easily identified.

INT: And what was it like teaching them?

It was very comfortable and it was very easy to understand them, they can see them.

INT: So what about boys and girls – do you think that boys and girls are more talented?

Girls are more talented than boys.

INT: Why?

I don't know but because boys are like playing and they are not settled. Because girls are settled and they concentrate whereas boys waste most of their time in playing and they don't concentrate. So girls they concentrate on the issues.

INT: And those who are gifted and talented, how do the other girls, the other children treat them?

There are those who are very helpful and supportive of others.

INT: In this school would you say that there are different groups of boys?

Yes in this school they come from almost identical families they all have the same attitudes and behaviours.

INT: Is it good to identify gifted and talented children?

Yes it is good to identify them.

INT: Why?

It makes the teacher teach them easy, it is easy to help them whatever, if they are ~ the ones who gifted in the class, these are the ones that we pick to lead the class. They can teach the class.

INT: Could you identify gifted and talented children at a particular age?

You can identify them from standard one.

INT: Really…

You can see…it is those behaviours, concentrating…

INT: So what happens when you identify them?

So they just continue, because it is not a school for talented children, you just continue teaching them as you would the others as this is not a school for the gifted and talented children. Maybe after finishing standard seven they can be going onto the talented school.

INT: Would it be good to have some kind of after school club / Saturday school for those students?

If it is possible it is not bad to have.

INT: Do you discuss the academic development with their parents?

There are meetings that hold for parents when to discuss about particular children. So after every year when they move from one class to another class they normally hold meetings with parents, to discuss issues and talking about children.

INT: Is there any staff development for teachers around gifted and talented children?

No.

INT: What is the relationship between teachers and parents?

There is a good co-operation, there is a good relationship, a good relationship and if there is a problem with the pupils then the teachers call in the parents and they talk about it.

And the parents like the teachers?

They are happy yeah, they like it.

INT: Is there a difficulties with men and women and their children – is it difficult for a young girl in the school to report, would young girls report if they were having a bad time with their male teacher?

It has not happened in this school – male teachers embarrass the female pupil hasn't happened, she hasn't happened n in these years but it might be done earlier.

INT: Is there anything that you would do to identify gifted and talented children?

Yes she would do it by giving regular tests and then she can learn by giving the children regular tests and exercises.
Teacher interview 6

INT: Tell me how you became to be a teacher?

So her choice was not to teach, her choice was to be a police woman, unfortunately when the posts were announced she was selected to join the prison, but since she

was not interested in joining the prison, seeing as she was interested in being a police woman, she dropped that post and decided to move into teaching.

INT: Are you happy being in teaching?

Yes, I am very happy with the children, I am very interested in the children and I think that I can make them like they are like my own, they are my family. There are many challenges from the pupils, how we can solve things, how we can treat each other. I like that.

INT: Do you think that the children see differences between male and female teacher?

You see at this primary school we have few male teachers, you see we have many female teachers and only two male teachers. One of them is the head teacher, the principal and the other is like me who only teach in like class 6 and 7. So we only have man. So I don't have experience how the student feel between woman and man.

INT: What are the challenges and problems that you face as a teacher?

We have many challenges. Lack of material, we have very few books~ and there are some parents who do not know their responsibility to their children. So when they come here, they don't wash their face, you ask about them and you find out that there is a single mother, there is a single father. They have many problems.

INT: Ok – how do you feel that the pupils view the teachers? Do you have a good relationship with the pupils?

You know, before this areas, most them before the pupil were not educated. Most of them we are taking more challenges to told them if you give you children some primary education they will come and help you and most of them and now they want them to do. You know about our country, you know the parents have no job, but now I think we are going that way. It is a good a relationship. If you come to be a doctor or a president of our country, think of me as your teacher, we are you r parents, even before your parents, but for me I am proud to be a teacher because even if you don't going to be the president but do some work, this is a gift, this is a gift for me as their teacher.

INT: We are here doing a project on gifted and talented children, when you hear this term gifted and talented what does it mean to you?

The talented pupils are those who do the best in education and in pe and I think like this.

INT: Are some children more gifted and talented than others?

I think there is..in my class I have 3 , 4, 5 pupils who is good in drawing, good in mathematics, they know about their environment and they have a bad

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environment and they do well, they are able to do well and this is something which I see as talented.

INT: Where does that come from? Why are they like that?

Most of them it is their environment, they can use pc's they can use other sources and they can get it from other people, and they can get it from myself, I am a teacher I like my job, if you don't like to read you don't come to be a teacher like me now. They say thank you. Thank you.

INT: Do you think that family make as a difference to the children?

Somehow, there are some who can get it from other pupils and some that can get it from there, surrounded by other people who can learn yes it makes a difference, the environment is very important.

INT: Are there any particular children who are gifted and talented in your class that you would say are gifted and talented?

I have.

INT: Can you tell me a little more about them?

I have pupil called D A She is very interested in one day to be a teacher. She needs to be a teacher. She wants to teach others. You one day when we go to have our meetings, she teaches others. She stands at the front of the class and she teaches others about what to do. She gets the exercise book and she starts to read it and then she asks them to start answering the questions. And I am very…like this, I am proud of this, of us.

INT: What is it like teaching them?

I am proud, they want to be like me, they want to do what I am doing.

INT: This project is looking at gifted and talented children and we are looking at how girls and boys might perform in those tests, how well they will do. What do you think we will find?

I think that girls, they can do well than men. That why I think it is men there are 3 or 4 who are good but the girls there are many of them. Girls normally concentrate in class more than boys.

INT: Why is that? Why might do better?

There are some pupils who come to school to learn, they know their responsibilities. I know that isn the class that she is bright but in her head she is fright.

INT: Some people say boys are good at logic and girls are good at being creative – what do you say about that?

I think they say that because you know the environment that we are living because many girls have more and many things to do they go home. But the boys they go to play but the girls wash with their mammy, clear the house, to cook. That is for girls or women. There is no work for men, that is why I think they can say that but I think that they can make the changes.

INT: And how do the other children, view feel about the gifted children?

There are those who want to be like them and those who try and do more and more practice they become good and they like because they answer their questions, they can see that they can do this, they try and ask you first the talented. I can't answer this question and then I ask the talented and the talented says that can you try and she try and I think that they want to be like he? To be like the talented pupils.

INT: Some feel inferior, demotivated?

Most of them, you know they learn in our environment and we have to teach in this environment but most them time, you can have this money may be a 100 or maybe a 150 and you can write it ion the blackboard and they can answer the question and you can say who can answer the question I will give you this money. I think this is only a small money, but it think it makes them more motivated in their study.

INT: In this school, are there different groups of boys? Like naughty or popular boys?

Yes, the y are in groups.

INT: What kind of groups?

I think that there is a group who like the football, you know the time they have like for physical exercise they can like play football, they games that they play there is small balls and they dodge the ball. Who like it they can go and do this – show me the leisure they like this. Then there are the other groups who like stay alone. They don't do anything and they just sit there with ther heads down.

INT: Is that the same for the girls?

Yes it is similar

INT: Ok from your perspective is it a good thing to identify gifted and talented children?

Yes it is.

INT: Why?

Yes because you can help them to study and then they can go on to be the president from there. You can do this from a small age. They can good be a good player and they can prepare a talent and then he or she in her lower stage. So you can teach them and prepare them in the lower stage to do better as they grow up.

INT: So wat what age can you identify a gifted and talented child?

I think it is when they have started to speaking. When they have started to speak you know that they are gifted or not. They can ask you when they are like this what is this mother? What is this? She is wanting to be very curious, he wanted to know. You need to let him know how to know. And you can help them.

INT: When you notice or identify gifted child, do you get them to do different things in the class?

There are is some of them who is good in drawing and I can give them the picture and they can draw, a map of Tanzania, they can draw things. So I say to them come and draw this on the blackboard.   They can show others how talented they are and that they know how to draw. Then they can get something from him or her.

INT: And in this areas is there any form of development for gifted and talented children?

No. Nothing.

INT: Do you discuss the academic development of the children with the parents?

We discuss it with them. We call them here and we tell them that this girl, like this. I think it is good a men and you let her show her talented.

INT: Is it a good relationship with the parents?

Yes we have. But not 100%. Most of them we have a good relationship.

INT: And finally we are using test to find gifted and talent children. What would you do to find gifted and talented children?

You know I am studying them, when I am with them I am studying them, you know that you can stay with them with a long time, you can see them you. And if I can give them test I can give them a test and you can get them say 200 I think it is good for them. Or English, mathematic or science you can go on like this.

Teacher interview 7

INT: So why did you want to become a teacher

It was mathematics, I really liked mathematics, so I thought I would become a maths teacher, since I was young. Also I was interested in sitting with children.

INT: When did you know that?

When I was in standard six, there is a teacher that I really liked in standard six and I really wanted to be like them.

INT: What is it like being a teacher in Tanzania?

I'm interested in helping the society and getting rid of ignorancy.

INT: And are teachers respected?

Yes for sure. But not completely. The parents, some parents do not respect teachers. They say why should I send my children to school. They are only going to learn from me, in the house or at work.

INT: How does that make you feel?

Sad very sad. As a teacher you try to make a difference, try to make a change but the parents don't like them being at school. Not all parents just some.

INT: Do you think it makes a difference and if you are male teacher or a female teacher?

Well female teachers are usually much more close to children but now teachers.

INT: Why is that?

Well it is something to do with heritage, with female parents staying at home looking after children, whilst male parents they go looking for work. They leave the house they are not with children most of the time. So it is difficult for the children to be with the male teacher. But for the female teacher children are used to it. So children connect with humanity to better.

INT: So tell me about the challenges that you experience as a teacher?

The number of pupils in classrooms, is too big.

INT: So how does that make a difference?

It is argued that teachers should be with children in groups of eight. Teachers will try to organise groups of pupils within groups of eight and those groups should be in groups of eight. So it becomes difficult with so many children to organise lessons, instruction in this size of group. So if you are in a classroom and you have to visit a groups this becomes difficult within 40 minutes because you can't visit each group.

INT: So how did the pupils treat the teachers?

Well teachers who do not do the responsibilities, like spent time teaching children, are not respected by the children. So those teachers who do their job well, our very respective of the teachers.

INT: Do you think this will change in the future?

This situation will change if the government will put more priorities, more resources into education. Considering the fast growth in population. This place for instance, is highly populated, the number of children is more than other places, so if the government could put more investment in education, then there will be changes, for the better.

INT: So we are doing a project on gifted and talented children, so what does gifted and talented mean to you, when I say that work those words?

It is from the way that children perceive the lessons, for example I didn't have a good background in English, but I was very good in other subjects. Summer background was not very good and the teaching was not very good. I can understand you, but I cannot be able to talk back. So you can identify gifted children by the way that they understand that teacher, and the exercises that they give them. And the difference in time by the time they get the exercises and by the time that they finished them, it is very quickly. So if those who can perceive the lessons, what is expected, are able to do their work quicker, are the talented children.

INT: So if children are doing their lessons faster than others, while some children doing those lessons slower than others?

First, it is the effort of the children themselves, and secondly it is something natural. That is what I believe.

INT: So what kind of skills, what kind of talents, are valued in Tanzania in society?

Games and sports,

INT: ...and what kind of skills are valued in schools?

Academic subjects. Competence academic subjects.

INT: Are there any children that you are taught that you would have identified as gifted and talented?

Yes I have.

INT: Can you tell me about them a little bit more?

In mathematics you have children who can learn the formulas and apply them appropriately. And in science, there are some children who do good drawings, and sometimes better than how a teacher can do. Sometimes the children are that good you ask you asked the children to write on the board, to draw a map of Africa or a map of Tanzania and they can do nice a map than the teacher.

INT: So what is it like teaching their children?

When teachers such children, it is easy, the only inadequacy is that there is a lack of books and a lack of resources which can bring the children on further, learning materials, there is a lack of learning materials.

INT: So why would it be easy?

Because I like my job, I love the children, and the children make that job which easier.

INT: Does family background matter to whether the children is gifted or talented?

Children coming from learnt , educated families do well and those who come from illiterate families, don't do as well. Because those coming from educated families, parents normally take care, and inspect what children are writing in schools, and they help them in several ways which is different from non-educated families.

INT: Why?

Because the parents who are uneducated will not try with their children. They will not ask what are you writing at school, because they are also ignorant, because they can't read or write. This means that it helps if the parent is educated.

INT: So we have looked at skills and talents in general with looked at how you have viewed skills and talents, so now I would like to move a little bit onto gender. So my first question around gender is, one of the aspects of the research, is that we are looking at how girls and boys will perform the tests. In your view, what do you think that we might find?

I don't have a very clear answer to that, but what I do know is that in this school, what I have found is that, there is serious competition between boys and girls. If boys perform well the girls will feel the jealousy, you know, they have serious feelings about the boys, they feel jealous and so they struggle to perform better than the boys next time. And there is a competition going on to see who can be the best the boys or the girls.

INT: This is crude, but it has been suggested that girls are more creative and the boys are more logical, how do you feel about this?

She thinks that female children that girls are created because they adapt that from women, from the mothers at home. So the creativity, the attitude comes from observing the mother at home.

INT: How do the other children view gifted and talented children?

They get scared of the bright ones, because they feel that they are inferior and they abandon themselves from being the student. What the teachers do to curb this, is that they take four clever children, and they put one in one group and one in another so they introduce the clever ones into the group so they feel that they are included..

INT: In the school would you say that there are different groups of girls and boys, in?

I haven't seen any groups of boys and I haven't seen any different groups of girls..

INT: So from your perspective is it good to identify gifted and talented children?

It is important to know both, talented and non-talented. It is important to identify them because there are children who are not capable, so if you work with them closely, they normally improve. But those who are mentally retarded, you just move with them slowly to make them feel that they are in the school.

INT: When you see someone as gifted and talented? What do you do?

You recognise them through tests, and after recognising them we give them prizes as subject teachers, to the children to motivate them, all they can be awarded them by the school at lunch. And sometimes to help the children, to grasp the lessons very well, the teacher gives a chance to the clever children to lead the class.

INT: What age can you identify gifted and chip talented children?

From standard one.

INT: Do you discuss academic development with the parents?

We have staff parent meetings once a year.

INT: And do the parents attend?

The response sometimes is not very positive, what they what we do for those who do not turn up, we write special letters to call them to come to school.

INT: Other any types of staff development, professional development in your district, for gifted and talented children?

It hasn't been introduced.

INT: We are looking at ways of identifying gifted and talented children, what would you do to identify children?

Just by thinking or recognising the way someone talks, you can find out how he or she is thinking, and that is the way that you can identify gifted and talented children. It is just like how things are happening now I can hear you talking, and you can understand what I'm saying, and it is like that, and you can see how capable I am in understanding you, you can understand how intellectual someone is.

Appendix 8 Reliability

These test were invented by Kuder and Richardson for binary data and developed into a more general method by Cronbach for all data. These tests give a measure of the internal consistency reliability - less than 0.5 unacceptable; 0.5 to < 0.6 poor; 0.6 to <0.7 questionable; 0.7 to < 0.8 acceptable; 0.8 to < 0.9 good; 0.9 and greater excellent. The results of the internal consistency are given in the section that looks at tests in phase one. Measure of agreement between two categories is found using Cohen's kappa. This measure looks at the relative observed agreement (p_0) and expected hypothetical probability chance agreement (p_e) by the equation ($p_0 - p_e$)/(1-p_e). Landis and Koch (1977) suggest the following scale for Cohen's kappa measure:

0–0.20 as slight

0.21–0.40 as fair

0.41–0.60 as moderate

0.61–0.80 as substantial,

0.81–1 as almost perfect agreement.

Scale reliabilities for commitment test

Three motivational characteristics assessed: Extrinsic, Intrinsic Enjoyment and Intrinsic Challenge and the Cronbach Alpha for these questionnaires are as follows:

Intrinsic Enjoyment 0.459

Intrinsic Challenge 0.492

All 6 Intrinsic 0.538

All 6 Extrinsic 0.753

All 12 Intrinsic and extrinsic 0.719

Overall the internal consistencies of the scales are acceptable. Data checks on the results of the Creativity CFA model used in section 5.5 were performed (Brown, 2006).

Variance

A check on the variance can be made as follows: With the completely standardised model for Fluency = $a_1f_1+e_1$ in Figure 13, Model 3. This figure is reproduced below.

Figure 18 Model 3 Creativity
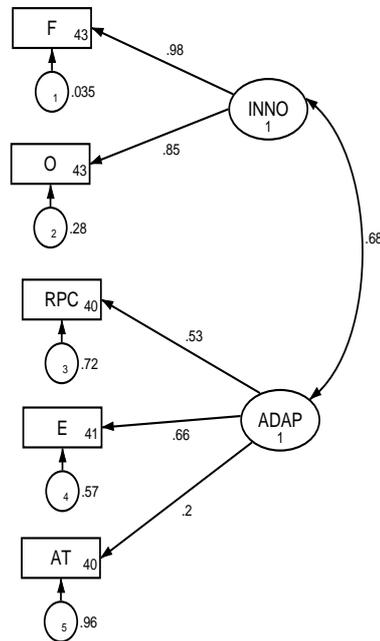
Using VAR(Fluency) = $(a_1)^2(1) + e_1$

Gives VAR(Fluency) = $(0.98)^2(1) + 0.035$ approximately equal to 1

The squared factor loading represent the proportion of the variance in the indicator that is explained by the latent factor. For example from the data in Chapter 5, the 'fluency' $0.98^2=0.96$, indicating that latent factor accounts for 96% of the variance in the 'fluency'. The error term (e_1) is the proportion not explained 0.035. This gives a total of approximately 1 (0.96+0.035) in the standardised model.

Covariance

A check on the covariance can be made as follows:

Completely standardised model for COV(F,O)

Fluency = $a_1f_1+e_1$

Originality = $a_2f_1+e_2$

Using COV (F,O) = $(a_1)(1)(a_2)$

Again using data from Chapter 5, gives COV (F,O) = (0.98)(1)(0.85)= 0.833, a

covariance of 0.83 as seen in the table above. Similarly, calculating the covariance of RPC and E,

RPC = $a_3 f_2 + e_3$

Elaboration = $a_4 f_2 + e_4$

Using COV (RPC,E) = $(a_3)(1)(a_4)$

Gives COV (RPC,E) = (0.53)(1)(0.66)= 0.3498, gives a good estimate of the covariance of 0.37.

Unstandardised values

Unstandardised values can be obtained from standardised ones by using the unstandardized standard deviations (SD), obtained by taking the square root of the variances given in the SPSS output.

For example for a_4:

Unstandardised a_4 = (Standardised a_4) (SD 'E') (SD Adaptive)

This supports the models fit to the correlation of creative measures.

Appendix 9 Regression Functions for the Creativity Models

The regression functions depicted in Figure 11, Chapter 5 above regarding each of the models are as follows. Model 1 can be summarised by seven separate equations:

Fluency = $a_1f_1+e_1$

Originality = $a_2f_1+e_2$

RPC = $a_3f_1+e_3$

RPC = $a_4f_2+e_3$

Elaboration = $a_5f_2+e_4$

Abstraction = $a_6f_2+e_5$

CS = $a_7f_2+e_6$

Where f_1 represents innovative latent factor and f_2 represents the adaptive latent factor, which are assumed to be correlated. The model has 14 parameters to estimate, seven factor loadings (a_1 to a_7), six unique variances (e_1 to e_7) and one correlation between innovative and adaptive. The observed correlation matrix has six variances and 15 correlations, a total of 21 terms. Consequently the postulated model has 21-14= 7 degrees of freedom.

The regression functions for Model 2 can be summarised by six separate equations:

Fluency = $a_1f_1+e_1$

Originality = $a_2f_1+e_2$

RPC = $a_3f_1+e_3$

Elaboration = $a_4f_2+e_4$

Abstraction = $a_5f_2+e_5$

CS = $a_6f_2+e_6$

f_1 represents innovative latent factor and f_2 represents adaptive latent factor, which are assumed to be correlated. The model has 13 parameters to estimate, six factor loadings (a_1 to a_6), six unique variances (e_1 to e_6) and one correlation between innovative and adaptive. The observed correlation matrix has six variances and 15 correlations, a total of 21 terms. Consequently the postulated model has 21-13= 8 degrees of freedom.

Finally for Model 3 the regression functions can be summarised by five separate equations:

Fluency = $a_1f_1+e_1$

Originality = $a_2f_1+e_2$

RPC = $a_3f_2+e_3$

Elaboration = $a_4f_2+e_4$

Abstraction = $a_5f_2+e_5$

f_1 represents innovative latent factor and f_2 represents adaptive latent factor, which are assumed to be correlated. The model has 11 parameters to estimate, five factor loadings (a_1 to a_5), five unique variances (e_1 to e_5) and one correlation between innovative and adaptive. The observed correlation matrix has five variances and 10 correlations, a total of 15 terms. Consequently the postulated model has 15-11=4 degrees of freedom. No detail is given for Model 4 as it was found to be untenable.

Glossary of terms

ADAP	Adaptive Latent Factor
APM	Advanced Progressive Matrices
AT	Abstractness of title
BEST	Basic Education Statistics Tanzania
BERA	British Educational Research Association
CD	Coefficient of Determination
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
COSTECH	Commission for Science and Technology
CPM	Coloured Progressive Matrices
CT	Convergent Thinking
CS	Creative strengths
DAM	Draw-A-Man
DT	Divergent Thinking
E	Elaboration
EFA	Exploratory Factor Analysis
ES	Effect Size
ESRC	Economic and Social Research Council
F	Fluency
GCN	Global Creativity Network
GDP	Gross Domestic Product
INNO	Innovative Latent Factor
IQ	Intelligence Quotient
K-ABC	Kaufman-Assessment Battery for Children
MI	Multiple Intelligences
NGO	Non-governmental Organisation
NFER	National Foundation for Educational Research
NNAT2	Naglieri Nonverbal Ability Test (2nd Edition)
O	Originality
PM	Progressive Matrices
PMT	Panga Munthu Test
PSLE	Primary School Leaving Certificate
RMSEA	Root Mean Square Error of Approximation
RPC	Resistance to premature closure
RPM	Ravens Progressive Matrices
SACF	South Africa Creativity Foundation
SDG	Sustainable Development Goals
SEM	Schoolwide Enrichment Model
SES	Socio Economic status
SMIP	Student Multiple Intelligences Profile
SOI	Structure of the Intellect
SPM	Standard Progressive Matrices
SPSS	Statistical Package for Social Scientists
S-RMR	Standardised Root Mean Square
TLI	Tucker-Lewis Index
TTCT	Torrance Tests of Creative Thinking

UNESCO   The United Nations Educational, Scientific and Cultural
           Organization
WAIS   Wechesler Adult Intelligence Scale
WASII   Wechesler Abbreviated Scale of Intelligence (2nd Edition)
WISC   Wechsler Intelligence Scale for Children
WPI   Work Preference Inventory