MULTIDIMENSIONAL MODELS FOR IDENTIFYING GIFTED AND TALENTED CHILDREN

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Abstract
The need to identify and define who are gifted and talented children, and for the proper placement into gifted education programs is the focus of this paper. The study explored critical five models found to be relevant for the development of giftedness identification instruments appropriate for a multi-sociocultural society like Nigeria. These models included the Munich models of giftedness, Renzulli's three-ring conception of giftedness, Sternberg's Triarchic Model of giftedness, Piirto's Concept of Talent Development, Clark Model of Gifted and Talented Identification and Revised Bloom's Taxonomies Model by Anderson and Krathwohl's Taxonomy. It was concluded that a multidimensional model will be best for the identification of giftedness and talent of youngsters in a wide culturally diverse society.

Keywords: Multidimension, Models, Gifted, Talent, Children

Historical perspective of giftedness

Historically, the identification of gifted and talented students has been inextricably linked to intelligence tests. In the early part of the 20th century, Terman (1916, 1925) focused on developing and administering the Stanford-Binet Intelligence Scale, based on the earlier work in France by Binet. In the minds of many, the phrase “gifted and talented” is synonymous with an intelligence test score of at least 135 which has always informed the identification of gifted students in the Nigerian gifted academy (Dada, 2008). Use of single score for selection into these gifted education programs focuses only on logical-mathematical domains (Ford & Grantham, 2003). Therefore, many students with high potential outside these domains are not recognized, and this leads to the cultivation and development of various nascent talents and gifts in Nigeria as rightly observed by Jega and Ibju, (2017). Giftedness has been an evolving construct over the course of the twentieth century observable in the shift from perspectives that conflated giftedness with IQ to incorporate a more broad and dynamic view as reflected in the following models:

a) Munich Model of Giftedness, Gagné's (2003)
b) Differentiated Model of Giftedness and Talent
c) Sternberg's (2003) model of successful intelligence
d) Gardner's (1983) theory of Multiple Intelligences
e) Joseph Renzuli's three-ring conception of giftedness among others.

Also, the purported percentages of the gifted have likewise expanded from around the top one to 10 percent. This broadened and multidimensional view of giftedness has provided the need for the development of local and culturally-friendly identification tools that ensure a range of valuable potentials are cultivated to provide conducive environments for talents to flourish.

Intelligence is not sufficient to identify and explain giftedness as it over-relies on verbal skills resulting in major under representation of culturally diverse and economically disadvantaged students (Subotnik, Olszewski-Kubilius & Worrell, 2011). Therefore, due to the multidimensionality of giftedness, it is inadequate to limit the identification of gifted students to high scores in achievement tests as seen both in policies and practice in Nigeria. It is therefore necessary to include a diversity of psychological dimensions and its combination in this identification (Bland, Sowa & Callahan, 2010; 2005; Stern-berg, 2001). Modern conceptualizations of giftedness and talent argue that the IQ test is limited by only testing verbal and quantitative abilities, leaving out other important abilities and factors such as personality, ecology, bodily, musical, and artistic skills (Gardner, 1992).

Beyond IQ: **Synthesis of multi-dimensional identification models in Nigeria**

Gifts and talents are exhibited in many valuable areas, therefore, no single test can capture a gifted student's dynamic abilities (Benbow & Minor, 1990). The multi-dimensionality of the concept suggests that psychological assessment must include other psychological dimensions and consider the impact of contexts in its development. The current study based on a multi-dimensional gifted concept makes a multi-factor classification model necessary. Contrarily, most gifted identification attempts based on IQ scores contradict newer theories of giftedness, because there are various forms of giftedness. This current study is based on the following points:

i. Traditional IQ methods are not sufficient for the diagnosis of giftedness. Intelligence tests need to be supplemented by tests that simultaneously measure divergent-convergent problem-solving abilities, such as those from Facaoaru (1985).
ii. The Status diagnostic approach to measuring complex cognitive abilities should be supplemented by process diagnostic methods as highlighted in Munich Dynamic Ability–Achievement Model according to Perleth (2001)
iii. Finally, appropriate measurement of the concept of giftedness necessitates instrumentation at different levels, that is, consideration of various methods based on the level of abstraction and degree of complexity of the variables being studied.

A major and ongoing paradigm development in thinking about giftedness is a shift from a traditional view of giftedness as a measurable, trait-based construct to a multi-dimensional view that acknowledges that giftedness and talent may be understood, recognized, and developed in different ways by different communities and cultures (Ministry of Education, 2002; Gagne, 2010).

Identification

The field of gifted research is beginning to move beyond the simplistic notion of finding the perfect identification tool for a more comprehensive approach. To make an enduring classification, there is a need to acknowledge that giftedness involves more than just ability, performance or potential in a domain; and that the classification may shift across developmental periods (Sternberg, 2004). The range of conceptualizations communicates that giftedness is a complex and multi-faceted construct, with several highlighting the process of developing potential into gifts, a role in which school-based programs should be engaging (Worrell &Erwin, 2011).

From Simplicity to Complexity

At the beginning of modern gifted education, giftedness was judged almost solely by IQ and consisted of a very small fraction of the student body. For example, Terman (1925) and Torrance, (1969) decided that individuals with an IQ ≥ 140 should be deemed gifted; Hollingworth (1926) favored 130, whereas Whipple (1919) chose 115. Terman (as cited in Hollingworth, 1926) also put

forth an IQ-based stratification that depicted the educability of students, from "feebleminded" (below 70 IQ) to "genius or near genius" (above140 of IQ. As early as the 1920s, Hollingworth (1926, p.202) noted the possibilities of giftedness in various domains and argued that students "may be far more excellent in some capacities than others". Later, Bentley (1937) called for an advanced curriculum for students who demonstrate aptitude in specific areas such as art, music, or mathematics.

In the multi-dimensional concepts, following behavioral characteristics are considered as *indicators* of giftedness and talent in childhood and adolescence: cognitive aptitudes like intellectual precocity, quick comprehension and high speed of learning, being quick to pick up concepts, often ahead of the usual time, distinct curiosity, a large vocabulary for one's age, creative (original) ideas and methods to solve complex problems, sensitivity for problems, spontaneous inclination toward challenging and difficult tasks and thought problems, distinctive metacognitive competencies, etc. With respect to the Munich Models of Giftedness, these cognitive variables serve as predictors.

For the identification of gifted students to reflect a broad spectrum, it must be based on the psychometric versus the expert-novice paradigm. The psychometric models are focused on the individual potential, which should be identified for diagnostic or prognostic purposes. The *expert-novice* approach focuses on personality and social-cultural conditions in which intelligence plays only a slight role. This combined paradigm ensures that the child is considered in multidimensional unbiased ways to optimize the amount of insight into what we call giftedness or talent (Heller, Perleth & Lim, 2004).

The Munich models of giftedness (Perleth, 2001)

The Munich longitudinal is based on a psychometric classification approach with a multi-factorized focus within a network of non-cognitive and social moderators, as well as achievement-related variables in the expanded version (Perleth & Heller, 2001). The model expansively considered seven relatively independent ability factor groups (predictors), and a range of performance domains (criterion variables), personality factors (e.g., motivational), and social-ecological factors that moderate the translation of potentials into demonstrated abilities in various domains as reflected in figure 1. As depicted in the MMG, the conceptualization of giftedness reflects a multi-factorized ability construct that encapsulates other non-cognitive traits such as motivation, control expectations, and self-concept. In this model, predictors of talent include intelligence, creativity, social competence, musicality, artistic abilities, psycho-motor skills, and practical intelligence (Perleth, 2001).

The six moderating variables that depend on personality characteristics include achievement motivation, hope for success, control expectations, the thirst for knowledge, coping with stress, positive self-concept, and other environmentally moderated variables include educational style, home environmental stimulation, parental education level, family climate, school climate, among others. Finally, the performance area of manifestations includes mathematics, technology, musical-artistic area, etc. The model is presented in figure 1.

Later, the model was expanded by Ziegler and Perleth in 1997, considering new research on expertise and how it develops in gifted people, resulting in the Munich Process Model of Giftedness. In this new model, individual/ability factors (perceptual, cognitive, and motor dispositions, domain-specific knowledge), have the same role as predictors from the initial model. According to the Process Model, a process of active learning accompanied by a facilitator consisting of individual, personality, and environmental factors, raises the level of expertise through outstanding achievement in various fields of human activity (Heller, 2005). The triangle in the 2nd version of this model symbolizes the formation of expert knowledge through deliberate practice.

The third variant of the model—The Munich Dynamic Ability-Achievement Model- developed by Perleth in 2001 distinguished three stages of expertise development: at preschool age, school age, at university, or profession. The model indicated the presence of individual characteristics that factors who are predisposing to learning and then competence needed for crossing all expertise stages. During the first level, general skills (creativity or intellectual or social) are targeted, second stage is period of schooling (knowledge acquisitions in different academic areas) are predominating and stage focuses on specialization and the development of expertise in a particular field. Depending on the area, specialization can begin earlier (Heller, 2005). The model is presented in figure 2.

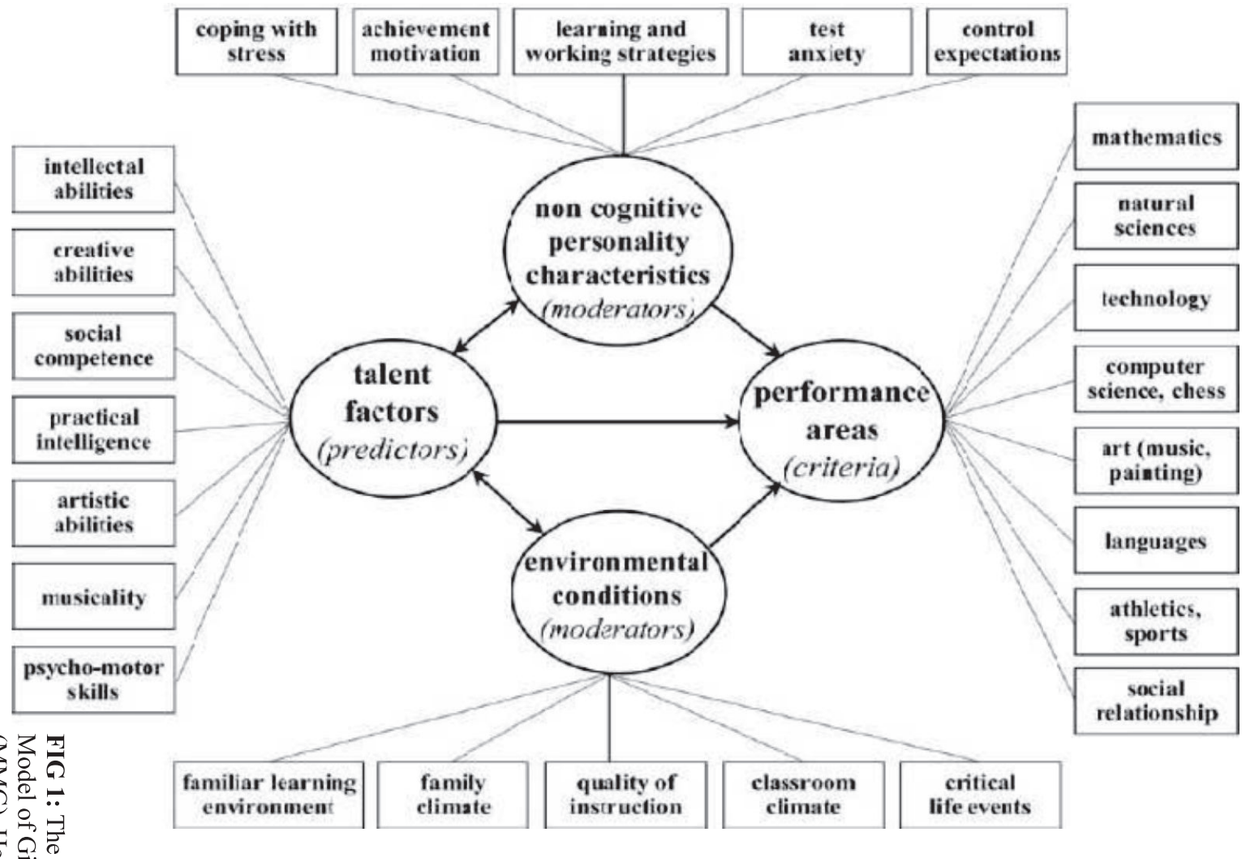

FIG 1: The Munich Model of Giftedness (MMG), Heller et al, 1992

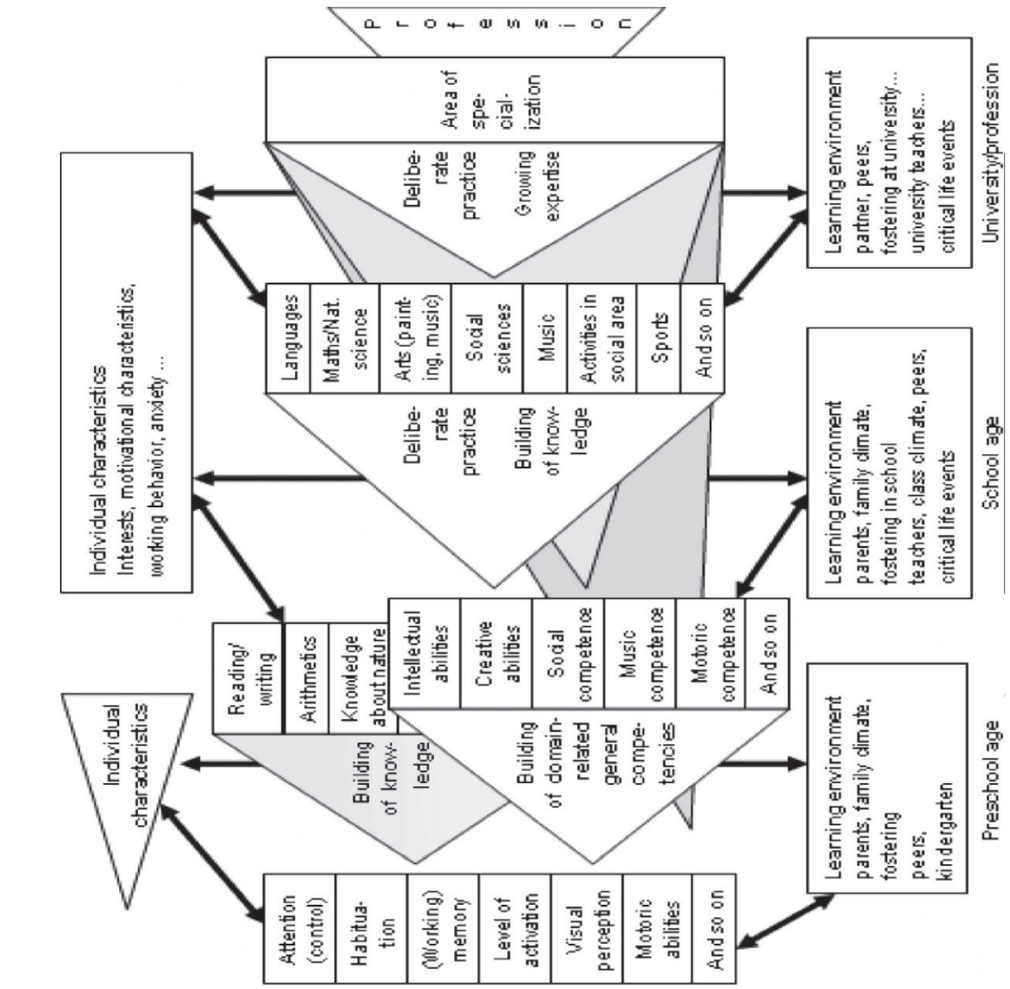

Fig 2: The Munich Dynamic Ability-Achievement Model according to Perleth (2001, p. 367).

The three-ring conception of giftedness (Renzulli, 1977, 2005)

Renzulli (1982) shifted the focus from gifted individuals to gifted behavior, conceptualized three - ring model for the components of giftedness involving interactions among clusters of human traits: above-average ability, task commitment, and creativity. This model indicates a shift from the single logical tests and cut out a chunk of other useful indicators and areas of giftedness. This important work states that gifted individuals show that they possess three particular traits that interlock and affect each other.

Renzulli recognises two categories of giftedness: schoolhouse and creative-productive giftedness identified in persons with high scholar results through the standard tests. Creative-productive giftedness places the premium on the development of original material and products that are purposefully designed to have an impact on one or more target audiences (Renzulli & Delcourt, 1986). Renzulli original model (1977) explains creative-productive giftedness as the intersection of three categories of human characteristics: general aptitudes or specific ones; high levels of involvement into tasks and high levels of creativity; and the schoolhouse giftedness being at the intersection between

superior abilities and involvement into tasks.

According Renzulli; above-average ability (high ability) is having high levels of verbal and numerical reasoning, abstract thinking, spatial relations, memory, fluency and automatization of information processing, which referred to the rapid, accurate, and selective retrieval of information. Task commitment is the ability to commit, to have perseverance and determination, and to be completely dedicated to the task they are doing. Creativity is having fluency, flexibility, and originality of thought. The model is very important to the identification of gifted children because it recognizes non-intellectual traits, such as task commitment. However, the major shortcomings include the inability to recognize children who are repressed and in unstimulating environments and underachieving students as gifted and talented children (Peters & Gentry, 2012). The model is presented below as figure 3.

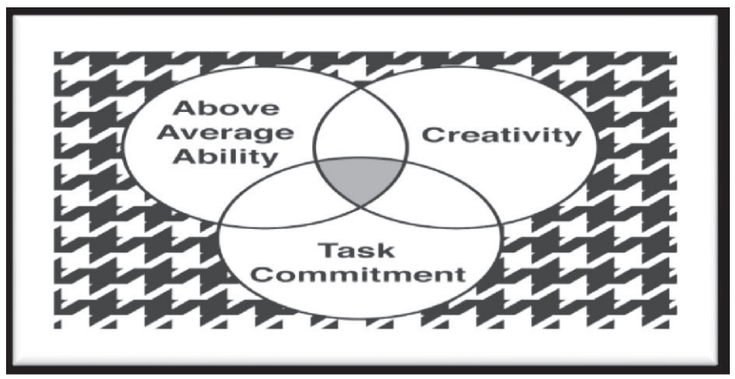

Fig. 3: Renzulli Identification Model of Giftedness

Sternberg's Triarchic Model of giftedness (Sternberg, 1985)

Sternberg's theory stated that teaching and assessment rigidity lead to children failure to reach their full performance potential. Sternberg developed a multidimensional model which permits the identification of gifted and talented people, considering the diversity of ways in which the phenomenon can be expressed to teachers or other stakeholders. Concept of successful intelligence and Triarchic is the basis of this model which was derives from how the theory of successful intelligence comprises three sub-theories: a componential sub-theory, dealing with the components of intelligence; an experiential sub-theory, dealing with the importance of coping with relative novelty and of automation of information processing; and a contextual sub-theory, dealing with the processes of adaptation, shaping, and selection (Taber, 2010). Successful intelligence is ;

(I) ability to achieve one's goals in life, given one's socio-cultural context,

(ii) by capitalizing on strengths and correcting or compensating for weaknesses

(iii) in order to shape and select environments

(iv) through a combination of analytical, creative and practical abilities (Sternberg, 2001, p.328).

Sternberg opined that intelligent behavior results from a balance among analytical, creative and practical abilities.

According to Sternberg (1999), intellectual giftedness has multiple loci that cannot be captured by a single number. Many gifted individuals will be missed during identification if multiple sources of giftedness are not examined. Sternberg's (1985) triarchic theory of intelligence, like Gardner's (1983) theory of multiple intelligences, is a comprehensive, flexible, and inclusive theory, which contends, “Giftedness as a social construct that manifests itself in many ways and means different things to different cultural groups. Both Gardner and Sternberg acknowledged the multifaceted, complex nature of intelligence and how current tests fail to do justice to this construct”

(Colangelo & Davis, 2003). Sternberg later expanded his triarchic/WICS theory, which eventually evolved into the theory of successful intelligence which states:

People are successfully intelligent to the extent that they have the abilities needed to succeed in life, according to their own definition of success within their socio-cultural context. They succeed by adapting to, shaping, and selecting environments, by recognizing and then capitalizing on their strengths, and by recognizing and then compensating for or correcting their weaknesses. In line with Sternberg, gifted children identification needs to recognize creativity, intelligence, and wisdom (Subotnik, Karp &Morgan, 2010). The model is presented in figure 4.

The Piirto Pyramid is a model which considers genetics, personality, IQ, talent, and environmental influences that are essential in developing talent (Broda, 2007). Piirto Pyramid basic assumptions include Creativity which is domain-based; Environmental factors are extremely important in the development of talent; Talent is an inborn propensity to perform in a recognized domain; Creativity and talent can be developed, Creativity is not a general aptitude but is dependent on the demands of the domain.

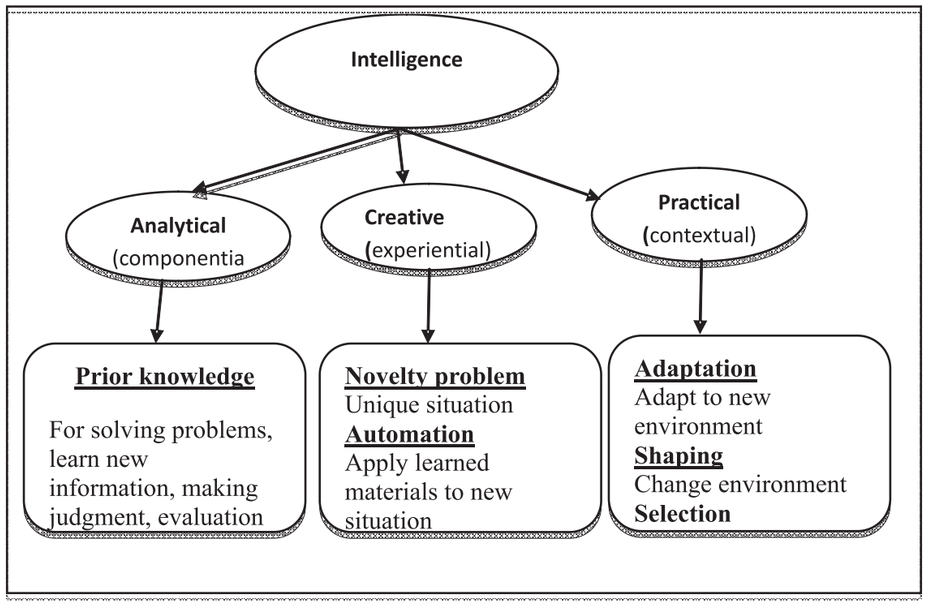

Fig 6: Sternnerg's triarchic theory of intelligence

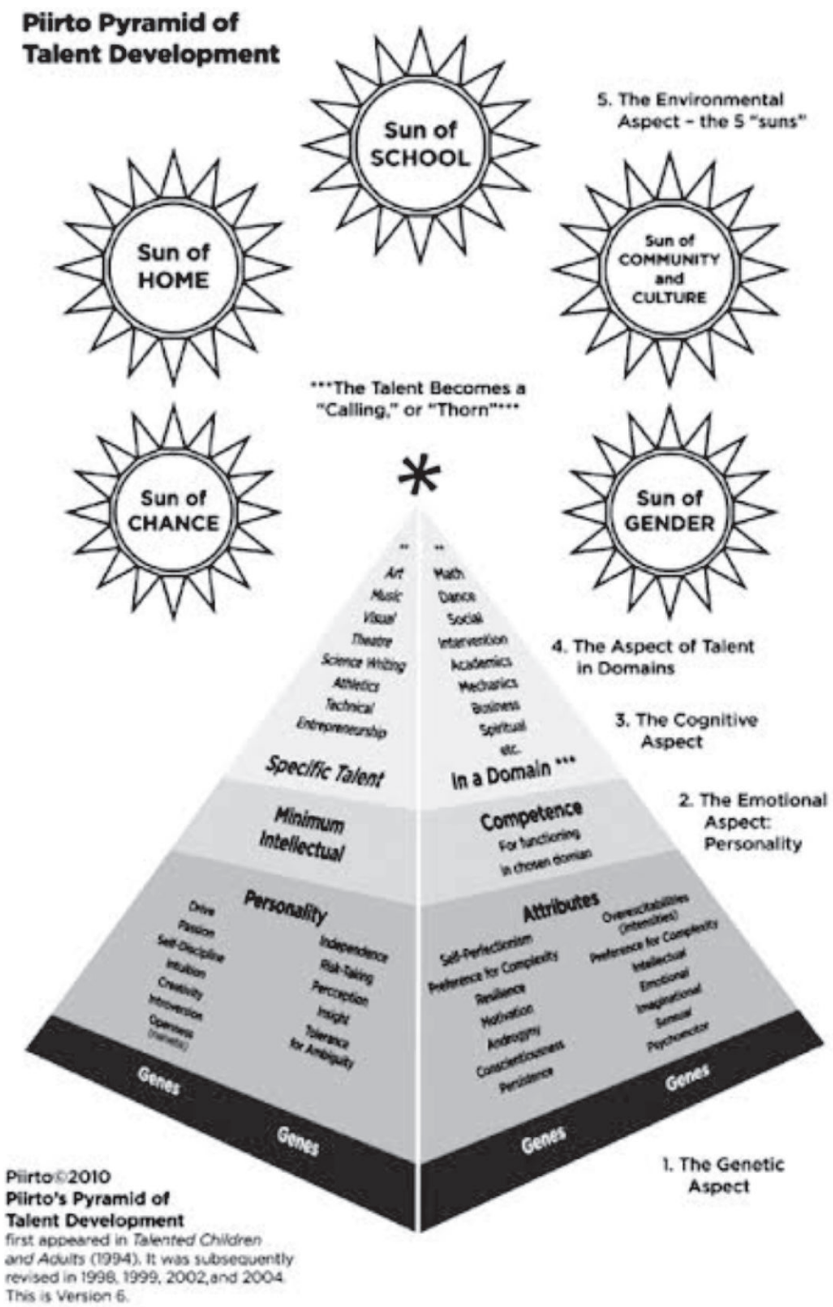

Fig 5: Piirto's Concept of Talent Development (1999)

Each domain has its predictive behavior that is, for the most part, evident in childhood (Piirto, 2019).

1. ***The Genetic Aspect:*** Piirto accorded great importance to genetic heritage. Humans have certain predispositions which are buttressed by studies of twins reared in different environments. These studies have indicated that, as humans become adults, their genetic heritage becomes more dominant. The early childhood environment has more importance for children than as adults.

2. ***The Emotional Aspect: Personality Attributes:*** Many studies have emphasized that successful creators in all domains have certain personality attributes in common. These make up the base of this model. Emotional aspects are the affective aspects of what a person needs to succeed, and they rest on the foundation of genes. Among these are androgyny, creativity, introversion, intuition, naiveté or openness to experience; over-excitabilities, passion for work in a domain, perceptiveness, persistence, preference for complexity, resilience, self-discipline, self-efficacy, and volition, or will. This list of items shows that creative adults achieve effectiveness partially by the force of personality. Successful talented adults possess such foundations attributes that may be innate, developed and directly taught.

3. ***The Cognitive Aspect:*** Although the cognitive dimension in the form of an IQ score seems to have been overemphasized, it is certainly essential. IQ is best seen as a minimum criterion with a certain level of intellectual ability necessary for functioning in the world. Having a high IQ is not necessary for the realization of most talents. Rather, college graduation seems to be necessary (except for professional basketball players, actors, and entertainers), and most college graduates have above-average IQs but not stratospheric IQs.

4. ***The Talent Aspect: Talent in Domains:*** According to Pirrto (1995b) the talent itself —inborn, innate, mysterious—should also be developed. It is the tip of the Piirto Pyramid. These include mathematics, visual arts, music, theatre, sciences, writing and literature, business, entrepreneurship, economics, athletics, dance, the spiritual and theological, philosophy, psychology, interpersonal, and education (Csikszentmihalyi, 1995). These are all well-defined academically, and if a person has a talent in a domain, he or she can find people who can advise how to enter the study in any of them.

5. ***Environmental "suns":*** The four aspects (genetics, personality, intelligence, talent) on this imagistic pyramid could illustrate the intra-psychic developmental influences on the individual person. Additionally, everyone is influenced by the environment, indicated by the five "suns," which may be likened to certain factors in the environment. These are: The Sun of Home; the Sun of Community and Culture; the Sun of School; the Sun of Gender and the Sun of Chance. The three major suns that refer to a child being gifted according to Piirto (2009) include a positive and nurturing home environment, a community and culture that convey values compatible with the educational institution, and that provides support for the home and the school. Other, smaller suns are the influence of gender.

6. ***The Thorn— Feeling the Call:*** Although necessary, the talent presence is not sufficient. Many talented people are not developing it through appropriate work. Emotional investment is the impetus for one acquiring self-discipline and capturing the passion and commitment to developing talent. It takes obsession and dedication and energy to chase an idea for years, working on it with a sense of purpose and sacrifice, even in the face of rejection from others. Thus, Piirto puts an asterisk, or "thorn" on the pyramid to

exemplify that talent is not enough for the realization of a life of commitment.

Clark Model of Gifted and Talented Identification (2002)

Multidimensional screening involves a rigorous examination of teacher reports, family history, student inventories, and work samples and perhaps the administration of group achievement and group or individual intelligence tests. Gifted identification test battery development will involve the school or district level reviews of information and determines whether the results indicate a potential for giftedness and justifies the referral of the child to the identification committee. If the committee believes there is sufficient evidence to continue, the parents are asked if they would like to refer their children for more extensive testing to determine whether they qualify for gifted services. The committee then examines the development of the children that includes screening data, parent interviews, test protocols, individual intelligence tests, tests in the specific content area, and creativity tests. These data are compiled, organized, and presented to the identification committee for consideration. This model will form the basis of the preliminary assessment. The synopsis of the procedure involved in this mode in Chronological order is as follows: Nomination- (teacher, principal, psychologist, parent, peers, self-nomination), Teacher report on student functioning, Family history, and student background, Peer identification, Student inventory of interests, Student work and achievements, Variety of test, e.g., group achievement, group intelligence, etc.

Revised Bloom's Taxonomies Model by Anderson and Krathwohl's Taxonomy 2001

Revised model of the Bloom's taxonomy by Anderson and Krathwohl's taxonomy was adopted in 2001 because the 1956 model did not include the affective and the psychomotor domains. Cognitive objectives emphasize memory and reasoning, affective objectives emphasize emotion, while psychomotor objectives emphasize physical ability. The Taxonomy of Educational Objectives is a scheme for classifying educational goals, objectives, and most recently, standards. The original Taxonomy consisted of six categories. They were arranged in a cumulative hierarchical framework; achievement of the next more complex skill or ability required achievement of the prior one. The original Taxonomy volume emphasized the assessment of learning with many examples of test items (largely multiple choice) provided for each category (Krathwohl, 2002).

The revision of the original Taxonomy is a two-dimensional framework: Knowledge and Cognitive Processes. The former most resembles the subcategories of the original *Knowledge* category. The latter resembles the six categories of the original Taxonomy with the *Knowledge* category named ***Remember***, the *Comprehension* category named ***Understand***, *Synthesis* renamed ***Create*** and made the top category, and the remaining categories changed to their verb forms: ***Apply***, ***Analyze***, and ***Evaluate***. They are arranged in a hierarchical structure, but not as rigidly as in the original Taxonomy.

Bloom vs. Anderson/Krathwohl Taxonomies of the Cognitive Domain

	Bloom's Taxonomy 1956		Anderson and Krathwohl's Taxonomy 2001
1	***Knowledge*:** Remembering or retrieving previously learned material. Examples of verbs that relate to this function are: Know, identify, recall, name, relate, list	1	***Remembering*:** Recognizing or recalling knowledge from memory. When m emory is used to produce or retrieve definitions, facts, or lists etc.
2	***Comprehension*:** The ability to grasp or construct meaning from material. Examples of verbs that relate to this function are: Restate, explain, describe, express, infer, etc.	2	***Understanding*:** Constructing meaning from different types of functions be they written or graphic messages or activities like interpreting, exemplifying, comparing, or explaining.
3	***Application*:** The ability to use learned material, or to implement material in new and concrete situations. Eg. Apply, relate, organize, employ, deploy, translate, exhibit, use, operate, etc	3	***Applying*:** Carrying out or using a procedure through executing or implementing. *Applying* relates to or refers to situations where learned material is used through products like models, presentations, interviews or simulations.
4	***Analysis*:** The ability to break down or distinguish the parts of material into its components so that its organizational structure may be better understood. Examples of verb s that relate to this function are: Analyse, compare, inquire, probe, examine, contrast, categorize, differentiate, etc	4	***Analysing*:** Breaking materials or concepts into parts, determining how parts relate to one another, or relate to an overall structure. Mental actions included in this function are *differentiating, organizing, or distinguish between* the components. When analysing, one can illustrate this mental function by creating spreadsheets, or graphic representations**.**
5	**Synthesis:** The ability to put parts together to form a coherent or unique new whole. Examples of verbs that relate to this function are: Compose, produce, plan, design, assemble, formulate, collect, propose, develop, arrange, construct, organize, originate, derive, document, etc.	5	**Evaluating:** Making judgments based on criteria and standards through checking and critiquing. Critiques, recommendations, and reports are some of the products that can be created to demonstrate the processes of evaluation. In the newer taxonomy, *evaluating* comes before creating.
6	**Evaluation:** The ability to judge, check, and even critique the value of material for a given purpose. Verbs that relate to this function are: Judge, assess, argue, decide, validate, consider, evaluate, compare, choose, rate , estimate, select, appraise, etc.	6	**Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. Creating requires users to put parts together in a n ew way, or synthesize parts into something new**.**

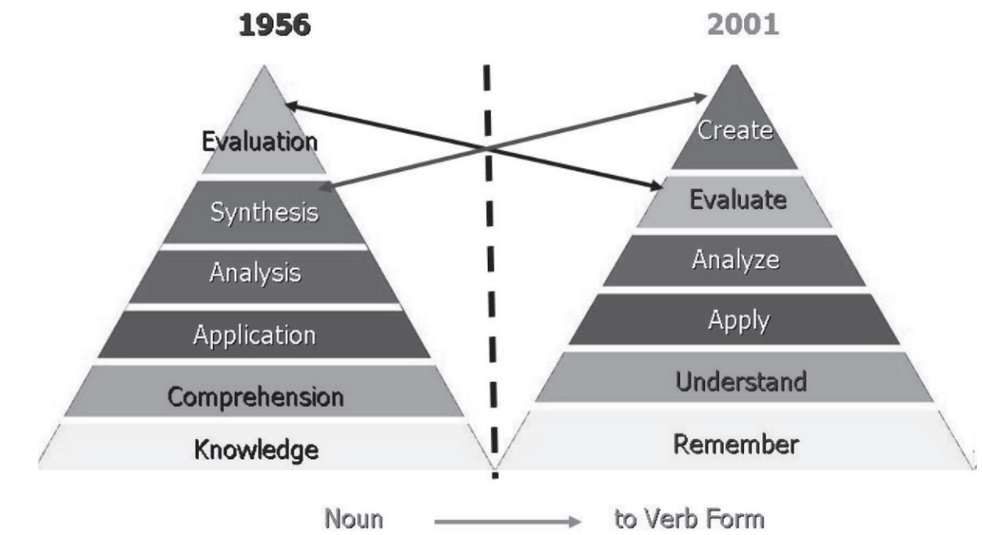

Fig 7 Bloom vs. Anderson/Krathwohl Taxonomies of the Cognitive Domain

Levels of Knowledge– The first three of these levels were identified in the original work, but rarely discussed or introduced when initially discussing uses for the taxonomy. Metacognition was added in the revised version.

Factual Knowledge –It is the knowledge that is basic to specific disciplines. This dimension refers to essential facts, terminology, details or elements students must know or be familiar with in order to understand a discipline or solve a problem in it.

Conceptual Knowledge –It is knowledge of classifications, principles, generalizations, theories, models, or structures pertinent to a particular disciplinary area.

Procedural Knowledge –It refers to information or knowledge that helps students to do something specific to a discipline, subject, or area of study. It also refers to methods of inquiry, very specific or finite skills, algorithms, techniques, and particular methodologies.

Metacognitive Knowledge–Knowledge of cognition in general. It is strategic or reflective knowledge about how to go about solving problems, and cognitive tasks, including contextual and conditional knowledge and knowledge of self.

These levels of knowledge were indicated in Bloom's original work – factual, conceptual, and procedural. One of the things that clearly differentiate the new model from that of the 1956 original is that it lays out components nicely so they can be considered and used. This feature has the potential to make teacher assessment, teacher self-assessment, and student assessment easier or clearer as usage patterns emerge.

Conclusion

A multidimensional perspective in the identification of giftedness and talent could help in the professional fulfilment of many people possessing performance potential in this field in Nigeria. In gifted education, one size does not fit all. Diversity exists across a range of dimensions including the very nature of giftedness itself. While this diversity is complex and complicated, it is an asset and needs to be recognized, provided for, and valued. In doing so, teachers will not only be catering to gifted students from minority cultures but they will also be providing a model for accommodating alternative perspectives that can be used in all multicultural educational

contexts to benefit all students regardless of their ability level. Research cited previously shows that students from minority cultures are under-represented in gifted programs in many nations and a wide variety of causes contribute to this situation.

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