

Determining Effectiveness of Learners' Intellectual Skills in Supporting Authentic Learning within a Competency Based Education Model in Secondary School Education: A Case of Kenya

Karen T. Odhiambo Ph. D and George Okoth Ouma M. Ed

Psychology Department, University of Nairobi, Kenya

Abstract: This study was carried out to determine IQ levels, learner preference of intellectual skills as well as impact of IQ on academic performance in secondary schools in Kenya. The study was based on the fact that learning today requires a shift in philosophy that relies on intellectual frame of mind, a forerunner of critical thinking skills and metacognitive perspectives of learning in the 21st Century. The study adopted a descriptive research design with a total of 160 students, 20 per school out of 8-schools identified. The study revealed that majority of learners who took the test attained below average intelligence IQ range at 85 - 114 with 56.06% male and 31.82% female learners in this IQ range. The other dominant category of learners attained above average intelligence with IQ range of 115 – 129 with 36.36% male and 45.45% of females. The study also revealed that the males tend to prefer technical tasks such as logical mathematical and bodily-kinesthetic compared to girls who were more inclined towards linguistics, musical and interpersonal intelligence. As for the results on academic performance in relation to intellectual skills, the relationship was inverse. It can be concluded that intellectual patterns arising from the study reflect a narrow sense of intellectual abilities leading to disjointedness in the learning process without the depth required. There is need for more research for a more solid theoretical foundation to be able to draw comparisons and determine trends regarding learner intelligence in secondary schools in Kenya.

Key Terms: Intellectual Skills, IQ, Competency Based Education, Kenya, 21st Century Skills, Critical thinking,

I: BACKGROUND

In this era of the 21st Century learning, the requirement is for “competency-based education,” which is a shift in educators view of learner and learning processes. The desired outcome is learning that create connections regarding learner, curriculum design, dialogic pedagogy, authentic assessment leading to demonstrated outcome. This should lead to a lifelong and sustainable learning experience. From the intellectual point of view, it is for learners to demonstrate their strengths and to perform optimally a process that arises from their intelligence function. According to Beane (1990), intellectual function has been found to be disjointed and fragmented resulting in obstacle in learning processes and attainment. Kenya has adopted “Competency Based Curriculum (CBC)” (MOE Kenya, 2017) based on the performance or competency system

of educating that is currently being embraced by the world globally. This study comes at an opportune time as Kenya is in the early stages of Competency Based Curriculum (CBC) implementation in Kenya. There is need to determine if the basic underlying attributes of intelligence on which CBC success is relies is functional and operating at their optimum thus the study.

As the world embraces competency-based education akin to performance-based learning, the call for intellectual skills (IQ) is urgent. IQ is important as it forms a basis as a forerunner for critical thinking skills and cognitive abilities such as metacognitive skills (Gardener, 1993; Sternberg 1997). There is need for education that will meet the needs of the learner as a new way of educating within education philosophy. This has resulted in redefinition of education systems and goals. The result is a focus on active learning in a new way that requires constructs such as self-regulation, meta-cognition and knowledge construction approaches. The goal is for authentic real-life experiences that are sustainable and lifelong. This has brought to bear the need to consider attributes of learning regarding intelligence skills. According to Gardner (1993), intelligence is the basic foundation of education skills needed for such learning found within the framework of this shift. This has raised the bar on competency-based education. Thus, the desire to determine the efficiency and effectiveness with which learning, learners experience, and learning process is functional and if it is meeting the goals of education today. The desire is for one that leads to autonomous and independent learner. This study explored intellectual skills as given by IQ levels within the frame of “Gardner’s Theory”. There was need to determine the state of intellectual skills of learners to and determine if the basis needed is at functional level even as the world shifts to competency-based education.

Many difficulties in learning have been brought about by incompetence in intelligence skills such as critical thinking and creativity (Drummond and Selvarat (2009). Intelligence is the basic foundation of these skills. Skills on the other hand are the ability to use one’s knowledge effectively and readily in execution or performance. The literature on competency-

based learning reflects levels below acceptable performance in most intelligence skill areas. Thus, it can be assumed that the intelligence is below level of acceptable performance to facilitate learning as desired in the 21st Century. According to Gardner (1983, 1999) states that it is worth noticing that any education and examination systems should focus on developing and evaluating intelligence of students in any education set up. This can only be done if one knows the IQ levels of learners and implications that arise. This is more so as the world shifts from traditional approaches of learning of recall and understanding of knowledge to performance related approaches of knowledge construction, transformation and use. From the psychological perspective regarding theories of learning it is a shift from behaviorism to constructivism. Behaviorism is more of a process of knowing the external reality, while constructivism has to do with engaging, grappling and seeking to construct that knowledge. Authorities in education such as Vygotsky, L. S. (1987) argue for a complete constructivist approach while others believe a merger of the two. This however is not a discussion for this study and will be explored in yet another study. Further, it is important to carry out such a study in the developing world context because of the historical challenges that have plagued the education system in these contexts such as gender, equity, equality and performance. It is also important and to determine if the new thinking puts education a position leads to maximizing learning and making a difference in learning.

Intelligence is recognized through functional capacity of cognitive process and metacognition processes. Metacognitive is the process that recognizes one's own cognitive abilities and directing the learning towards authentic approaches that demonstrates real life situations (Shraw, 1998). Shraw further states that, metacognition is central to intellectual skills. This has to do with memory, comprehension, understanding, reasoning and abstract thought. Learning required today need change in these conditions considered necessary that determine student learning in the knowledge economy we live in. Flavell (1979, 1981) states that metacognition becomes an individual's thought above one's cognition by observing one's own cognitive activities. Metacognition is key to success in various areas of competence of verbal, reading, writing, language, memory and social interaction. Interest is in these constructs as they reflect ability to develop cognitive performance. Learners with these metacognitive skills generally have self-confidence and self-efficacy, traits that drive learners and so is of interest in the current shift in thinking in education. The intention is for self-mediators who reflect on and gradually develop their cognition processes. A study that determines intellectual skills brings to bear awareness on basic foundation on which cognitive competency relies. Not much has been explored in developing world context regarding intellectual traits of learners regarding their IQ.

Intelligence includes the capacity of knowledge and ability to acquire and organize as well as communicate that knowledge construed without which there is little else in terms

of mental faculties. Inability to acquire and maintain knowledge results in inability to think about and evaluate that knowledge. This is important as knowledge is the basis of mental faculties. Inability to acquire knowledge as a result of being incapacitated intellectually results in problems in storage of the information acquired leading to inability to store, process and to understand. These abilities also coincide with Blooms Taxonomy (Bloom, 1956) of high-level skills. Combining knowledge in this way has a bearing on learning in the 21st century which requires construction of knowledge within the new thinking. This perspective calls for a competency based learning system and that has a bearing on pedagogy and learner engagement resulting in a self-regulated system of learning that is dialogic in nature resulting in authentic learning.

The term intelligence is common and is used widely whether loosely or not. It is a simple term that has a great bearing on learning abilities and processes included in learning. As stated earlier, this does not remove the fact that it is a term that has been debated among the psychologists for years (Strauss, 2013). Intelligence has been defined in many ways consider higher level abilities such as abstract reasoning, mental representation, problem solving, and decision making as well as the ability to learn, emotional knowledge, creativity including adaptation to meet the demands of the environment and society effectively. Psychologist Robert Sternberg defined intelligence as "the mental abilities necessary for adaptation to, as well as shaping and selection of any environmental context (1997). Others such as Gardner (2004) introduced **Gardner multi-skill approach** whose theory guided this study. The measure for intelligence is generally "Intelligence Quotient (IQ)", a score determined by an IQ Test such as Garner's Multi-Skill Test.

IQ is designed to measure a person's intelligence and general ability. The literature shows that Psychologists have over the years revised the intelligent test every few years to maintain the 100 IQ average. Intelligence is typically measured with a full-scale IQ (FSIQ) test. The FSIQ contains a battery of diverse tasks designed to assess different aspects of cognition, including basic math skills, matrix reasoning, spatial reasoning, verbal comprehension, and memory, though the specific content can vary across tests (Johnson, Bouchard, Krueger, McGue, & Gottesman, 2004). Issues have been raised as to how these tests reflect western education or culture (Ceci, 1991; Nisbett, 2009; Serpell, 2000; Wicherts, Dolan, & van der Maas, 2010). Capturing these differences across all these general abilities with a single metric may appear to overlook important factors such as cultural diversity. However, studies have been carried out and have been able to anchor IQ levels within certain levels across cultures. This is possible because the same factors are the ones that are extracted over and over (Johnson et al., 2004; Reynolds et al., 2013; Schrank & McGrew, 2001). The g-factor is robust against different methods of analysis, populations, cultures, and test batteries (Carroll, 1993; Deary, 2000; Wicherts et al., 2010) and is relatively stable throughout one's life span

starting at 2-years old (Deary, Pattie, & Starr, 2013; Gignac, 2014; Spinath, Ronald, Harlaar, Price, & Plomin, 2003).

Wichert, Dolan, and van der Maas (2009) in their study stated that the average IQ of sub-Saharan Africans is about 80. This was from a study of 29 acceptably representative samples on tests and these gave sub-Saharan Africa IQ of 6.0. Those of Standard Progressive Matrices gave an IQ of 66. The international studies of mathematics, science, and reading gives sub-Saharan African IQ of 66. On average this amounts to *IQ of 68* as the best reading of the IQ in sub-Saharan Africa. This will give direction towards the standard for comparison in this study. According to psychologists 68% of most people in the world have an IQ between 85 and 115. A small fraction have a very low IQ basically below 70% and very high IQ above 130. The average IQ in USA is at 98. News articles generally put Albert Einstein at an IQ of 160. According to estimates by means of biographical data, Einstein's IQ has been estimated to sit anywhere between 160 and 180. That would firmly place the physicist in the genius territory. However, he wouldn't exactly be among the top-scoring crowd (<https://www.zmescience.com>). An IQ score over 140 indicates a genius or nearly one. 120-140 IQ levels is classified as superior intelligence while 90-109 is assumed as normal or average. The results in this study confirm Alfred Binet work of 1912 where he argues that up to 95% of learners fall between IQ levels of 70 and 130 (Stanford-Binet scale, 1916). The researcher hopes to determine the general context or parameters regarding IQ score parameter among secondary learners in Kenya.

1.1 Statement of the Problem

With the new demands of the competency-based education and the knowledge era that has brought in new demands for learners and learning in the world, it is important to explore what the underlying or intelligence level is so as to determine if the learners have the capacity to carry out the new types of relationships arising in the learning process as well as cognitive learning processes. Consider cognitive competencies and managing and reflecting upon these competencies as capacity has to do with not only competency but also cognitive capacity arising from the need for learner to be an active learner managing their own learning towards autonomy and independence. With appreciation of and importance of Critical Thinking skills, and the fact that intelligence is a theoretical fore runner for these capacities and competencies, the study is significant and justified. This study is important if not necessary as Kenya embarks on implementation of its competency-based education system launched in 2017. The need to determine learner IQ levels to gauge their intellectual skills becomes even more urgent as a result. Taking the stand point based on the shift as articulated knowledge of intellectual capacities can help facilitate change desired as education struggle to re-examine education theorists' beliefs on how learning can best occur more so in developing world context where little research has been carried out in this area. Further, when research has been carried out in the past in this

area it is not drawn out comprehensively enough to support theoretical perspectives on the context but only leads to simple descriptive conclusions. This study was regarded as an exploration with a view of using the research to form a basis of thinking through education during the competency-based era of a shift in education within the difficult context of Africa and so Kenya.

1.2 Purpose of the Study

The purpose of this study was to determine if learners' intellectual skills are functional and appropriate for competency-based education in Kenyan Secondary Schools that ensures critical thinking skills.

1.3 Objectives of the Study

This study sort to:

- a) Establish the levels of intellectual skills by establishing IQ level among learners in secondary schools.
- b) Find out the gender perspective of the intellectual skills given the IQ measure levels obtained.
- c) Determine the effect that arises given IQ as a measure of intellectual ability and academic performance among the learners taking the IQ test.

II: LITERATURE

2.1 Conceptual and Historical Perspective of Intelligence

There are as many definitions of the term intelligence as there are scholars who defined it. Some of these scholars and their definitions include_ Alfred Binet, who defines intelligence as judgment, otherwise called "good sense", "practical sense", "initiative", the faculty of adapting one's self circumstances. David Wechsler (2008), on the other hand defined intelligence as the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment. Lloyd Humphrey (1831), defined intelligence as the resultant process of acquiring, storing in memory, retrieving, combining, comparing and using new contexts information and conceptual skills. Cyril Bart (1940), argues that intelligence is innate general cognitive ability. *To my mind* he says, a human intelligence competence entails a set of skills of problem solving, enabling individual to solve genuine problems or difficulty that he or she encounters, and when appropriate, to create an effective product. Also entails the potential for finding or creating problems and thereby laying the groundwork for the acquisition of new knowledge (Howard Gardner). Linda Gottfredson(2005a), says intelligence is the ability to deal with cognitive complexity.

From the above and many other definitions, one can define intelligence as a very general mental capability that among other things, involve the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill or test taking smarts. Rather, it reflects a broader and deeper capability for comprehending

our surrounding. “Catching on,” “making sense” of things, or figuring out what to do. Depending on where ones reading originates, the first concept of IQ was developed by either the German psychologist or philosopher Wilhelm Stern in 1912, or by Lewis Terman in 1916, depending on which sources one consult. Intelligence testing was first done on a large scale before either of these dates. In 1904 psychologist Alfred Binet was commissioned by the French government to create a testing system to differentiate intellectually normal children from those who were inferior. Thus, the IQ scale called the "Binet Scale," (and later the "Simon-Binet Scale") was developed. Sometime later, "intelligence quotient," or "IQ," entered our vocabulary. Lewis M. Terman revised the Simon-Binet IQ Scale, and in 1916 published the Stanford Revision of the Binet - Simon scale of Intelligence also known as the Stanford-Binet.

Today, intelligence is generally understood as the ability to understand and adapt to the environment by using inherited abilities and learned knowledge. Many new intelligence tests have arisen, such as the University of California Matrix Reasoning Task (Pahor et al., 2019), that can be taken online and in a very little time. Also, new methods of scoring these tests have been developed too (Sansone et al., 2014). Admission into university and graduate schools in the USA rely on specific aptitude and achievement tests, such as the SAT, ACT, and the LSAT – these tests have become a huge part of people’s lives. Humans are incredibly intelligent beings and we rely on our intellectual abilities every day. Although intelligence can be defined and measured in countless ways, man’s overall intelligence as a species makes man incredibly unique and has allowed man to thrive for generations on end.

2.2 Towards a Test of Intelligence

The origins towards a test of intelligence dates back to the early 1900s when the French government enlisted the help of psychologist *Alfred Binet* to understand which children were slow or going to be slow learners requiring more assistance in the classroom (Binet et al., 1912). Together with his colleague Theodore Simon, Binet began to develop a test based on areas such as memory and problem-solving skills. They tested these questions on groups of students aged three to twelve to help in standardize the measure. Binet realized that some children were able to answer advanced questions that their older peers were not able to answer. From this he created the concept of a mental age, or how well an individual performs intellectually relative to the average performance at that age (Cherry, 2020). Binet finalized the scale, called the Binet-Simon scale, that became the basis for the intelligence tests still used today. It is a set of 30-items and is designed to measure judgment, comprehension, and reasoning which Binet deemed the key characteristics of intelligence. He then made his way to the USA and thus the Stanford-Binet Intelligence Scale were developed and are today still commonly used.

When the Binet-Simon scale made its way over to the United States, Stanford psychologist *Lewis Terman* adapted

the test for American students, and published the Stanford-Binet Intelligence Scale in 1916 (Cherry, 2020). The Stanford-Binet scale is a contemporary assessment which measures intelligence and is based on five features of cognitive ability, including fluid reasoning, knowledge, quantitative reasoning, visual-spatial processing and working memory. Both verbal and nonverbal responses are measured. The test used a single number, referred to as the intelligence quotient (IQ) to indicate an individual’s score. The average score for the test is 100. Scores from 90 to 109 is considered to be in the average intelligence range and from 110 to 119 are considered to be High Average. Superior scores range from 120 to 129 and anything over 130 is considered Very Superior. To calculate IQ, the student’s mental age is divided by his or her actual (or chronological) age, and this result is multiplied by 100. If your mental age is equal to your chronological age, you will have an IQ of 100, or average. If, however, your mental age is, say, 12, but your chronological age is only 10, you will have an above-average IQ of 120.

$$IQ = (\text{intelligence age}/\text{actual age}) \times 100.$$

2.3 The Theoretical basis of and Growth of Intelligence Overtime

Each of these theories give a perspective that shows IQ theoretical basis and growth overtime and so is presented in this manner as evolving from the theoretical perspective of various theorists. It gives the background of the concept of intelligence and how it has evolved and developed overtime.

2.3.1 Spearman’s Two Factor Theory of Intelligence:

Spearman’s two factor theory of intelligence came to being in 1904. It proved to be monumental in history of mental testing and has proved to be of importance as his famous 2-factor theory (Guilford Psychological Methods). According to Spearman, these traits are not stand alone but they have a common element in the cognitive abilities displayed by learners. Some of these are critical thing, creativity, problem solving as well as process-oriented abilities such as metacognitive skills. He denoted the term as letter “g” or general intelligence primarily a mathematical quantity and the specific letter by letter “s” or specific factor peculiar to each ability. In brief, Spearman’s Theory hold the view that every individual measurement of every intellectual ability may be resolved into the two factors $S = a_1g + a_2s$, where the letters “a₁” and “a₂” represent the “weights” or “loads” of the two factors ‘g’ and ‘s’, respectively

Spearman and others who follow him do admit to some factors such as, “verbal ability, numerical ability, and possible factor of mental speed, mechanical ability, attention and imagination”. There was also C-A-V-D, Completion, Arithmetic, Vocabulary, and Understanding of directions and discourse. Of course, he has had some criticism by lead psychology theorists such as Thorndike. E. L. Thorndike who devised a test composed of 3-kinds of intelligence. These were social, concrete and abstract. This was probably the first multi-

factor theory of intelligence. It was not based on factor analysis ability test.

2.3.2 Sampling Theory_ Godfrey Thompson:

Godfrey is based in Britain and is Spearman's most active critic who claims that the two-factor theory is not the only possible explanation of the facts of intelligence. He states that intelligence facts may be explained on the hypothesis that there are multiple or group factors in intellectual abilities, each of which is common to a limited number of different intellectual ability, and therefore, less restricted in its range than any of Spearman's specific factors, and yet not of universal range as is his G factor. He is known as the sampling theory that bear the assumption that every test samples a certain range of the elementary human *abilities*. Some with a wide range, some with a narrow range. He does believe in a "g" factor but argues that it is not its basic entity. That it is a constant combination of the ability composition (Thomson, G. H. (1939). *The factorial analysis of human ability*).

2.3.3 Multifactor Theory of intelligence _ Thurston:

The theory holds that the performance on a certain test depends on one or more common factors, each weighted according to its significance for success in the task. It is also based on various methods of factor analysis. Thurston (1946) rejected the General theory of intelligence and adopted his own. He states that multifactor theory holds the view that the human intelligence includes abilities or factors found are "Space, perceptual speed, numerical facility, verbal comprehension, rote memory, induction, word fluency, deduction and general reasoning."

These are referred to as primary mental abilities. The abilities appear to be different, they are related to each other. "Though Charles Spearman has been credited with being the father of factor analysis, he and his followers did not want to admit importance of group factors. They played up the role of 'G' factor. This was especially true of Cyril Burt, Philip Vernon, and R. B. Cattell." "It was Thurstone who popularized the multifactor theory and methods in psychology. Geometrically, the multiple factor model is a set of dimensions or vectors extending from the same origin, each vector representing a common factor." They argue that "The nearer to a certain factor vector a test vector lies, the greater is the involvement of the test with that factor, and the greater is its "loading" on that factor. A factor loading is also the correlation between a test (an empirical variable) and the factor (a purely ideal variable)." He applied factorization and oblique rotation of correlations among a number of cognitive factors.

2.3.4 Hierarchical Theories: Cyril Burt (1949) and Vernon (1960):

These authors give an alternative scheme for the organization of factors. Hierarchy theory focuses on levels of organization and issues of scale, with a specific focus on the role of the observer in the definition of the system. That

instead of analyzing the whole structure, hierarchy theory refers to the analysis of hierarchical levels, and the interactions between them. At the top of the hierarchy, Vernon places that 'G' factor or the general cognitive factor. At the next level he places two broad group factors, corresponding to verbal-educational and practical-mechanical aptitudes. These major factors may be further sub-divided. This theory of intelligence postulating that the abilities constituting intelligence are arranged in a series of levels (of a hierarchy) ranging from general to specific. The verbal educational factor may be sub-divided into verbal and numerical sub-factors, and the practical mechanical factor into mechanical information, spatial, and psychomotor ability. At the lowest level of the hierarchy are the special factors. "Such a hierarchical structure thus resembles an inverted genealogical tree, with 'g' at the top, 's' factors at the bottom, and progressively narrower group factors in between."

2.3.5 Theory of Fluid and Crystallized Intelligence_ R. B. Cattell's Theory:

General intelligence is composed of two factors, that is, fluid intelligence-G and crystallized intelligence-Gc. This is similar to Vernon's distinction of intelligence-A which is product of heredity and intelligence-B, which is due to environment. Fluid intelligence, like 'intelligence A', depends more on heredity and crystallized ability on environment. The two are concerned with the ability to perceive relationships while fluid-ability is general to many fields, and crystallized intelligence is specific to certain fields such as like school learning. Fluid intelligence is used much more in tasks requiring adaptation to new situations, while crystallized intelligence is used to tasks where habits have become fixed. He applied oblique rotations in his factor analysis. These two factors, of fluid and crystallized intelligence are distinct but are related.

2.3.6 Cognitive Development Theory of Intelligence_ Jean Piaget:

Piaget has given a theory of intelligence of cognitive development related, not based on factor analysis. He believed cognitive development takes place in a series of four stages – Sensory motor stage (up to 2 years) when the child learns to exercise simple reflexes and coordinate various perceptions, leading to general operational stage (from 11 to 15 years). That during adolescence the child can perform more abstract operation. Intelligence increases up to the date of 15 years, it is achievement that increases after 15 years, intelligence, according to him, is the ability to solve new problems.

2.4 Theoretical Basis of the Study _ Howard Gardner (1983, 1987)

2.4.1 Theory of Multiple Intelligence [MI]_ Howard Gardner's:

Howard proposes that people are not born with all of the intelligence they will ever have. This theory challenged the traditional notion that there is one single type of intelligence,

sometimes known as “g” for general intelligence, that only focuses on cognitive abilities. Following the work of Thurstone, American psychologist **Howard Gardner** built off the idea that there are multiple forms of intelligence. He proposed that there is no single intelligence, but rather distinct, independent multiple intelligences exist, each representing unique skills and talents relevant to a certain category.

Gardner (1983, 1987) initially proposed seven multiple intelligence, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, and intrapersonal, and he has since added naturalist intelligence. Gardner holds that most activities such as dancing will involve a combination of these multiple intelligences such as spatial and bodily-kinesthetic intelligences. He also suggests that these multiple intelligences can help us understand concepts beyond intelligence, such as creativity and leadership leading to stewardship. Although Gardner this theory has widely captured the attention of the psychology community and greater public, it does have its faults

Figure 1: The Eight Multiple Intelligence Guiding the Test Content

Intelligence Types	Nature	Descriptor
Bodily-kinesthetic	Dancers, athletes, surgeons, crafts people	Ability to use one's physical body well.
Interpersonal	Sales people, teachers, clinicians, politicians, religious leaders	Ability to sense other's feelings in tune with others.
Intrapersonal	People who have good insight into themselves and make effective use of their other intelligences	Self-awareness or the ability to know your own body and mind.
Linguistic	Poets, writers, orators, communicators	The ability to communicate well both orally and writing
Logical-mathematical	Mathematicians, logicians	Ability to learn higher mathematics of complex logical arguments.
Musical	Musicians, composers	Ability to learn, perform, and compose music.
Naturalistic	Biologists, naturalists	Ability to understand different species, recognize patterns and classify natural objects.
Spatial	Sailors navigating without modern navigational aids, surgeons, sculptors, painters	Ability to know where you are relative to fixed locations; to accomplish tasks requiring three-dimensional visualization; and placement of your body

(Source _ Gardner, 2004).

2.4.2: The IQ Scale of Measure:

The scoring of an IQ test is not the same for everyone, because age is used in determining a score. Intelligence quotient is determined by the "intelligence age" (IA) in relation to the chronological age of the person being tested. IQ scales can differ from each other. Americans use scales with IQ values above 200, but the mean value of most scales is an IQ of 100. This represents normal intelligence. Question arising has to do with whether one is smart? That, if

your IQ is 130, that puts you nearly as much to do with success as their IQ level. In other words, your IQ score is not the only requirement for success.

2.5 Relationship between Intelligence and academic performance

According to “Howard Gardner” in his theory of multiple intelligence, learners perform better academically if challenged with tasks that provoke their mental preference. There is a contrary view by J.E. Ormrod (2010) argues that high IQs does not necessarily predict high academic performance. However, this author will not follow this direction of thought. Studies carried out vary. Watkins, Lei and Canivez (2007) stated there has been considerable debate regarding the causal precedence of intelligence and academic achievement. Some researchers view intelligence and achievement as identical constructs. Others believe that relationship between intelligence and achievement is reciprocal. Still others assert that intelligence is causally related to achievement. They also report that students’ achievement relies most strongly on their cognitive abilities through all grade levels.

Historically the question that is always asked is if “intelligence” influences “academic performance” question has been addressed by researchers. The relationship between measure of intelligence and achievement is significant to research, if there is a strong relation between them it might be deduced that the intelligence test has an important contribution in connection with other variables for instant curriculum, study program, the teacher, the characteristics of the school and others in scholastic performance (Nagleire and Bornstein, 2003).

In current years, several researchers have shown more interest in the relationship between intelligence and academic achievement. Researchers mentioned that there is empirical evidence for a strong association between general cognitive ability and academic achievement, there is still anywhere from 51% to 75% of the variance in academic achievement that is unaccounted for by measures of general cognitive ability alone (Rohde and Thompson, 2007). Additionally, understanding the nature of the relationship between general *cognitive ability and academic achievement* has widespread implication for both practice and theory (Rohde and Thompson, 2007).

Academic achievement of students in high school strongly correlates at 0.50 to 0.70 with intelligence scores (Jensen, 1998), but in another study researchers experienced the hypothesis that the relationship between general intelligence and academic achievement was in large part associated with a mental speed component. At the beginning the divided variance between general intelligence and academic achievement was nearly 30% (Luo, Thompson and Detherman, 2003). On the other hand, after controlling for the mental speed component the shared variance between general intelligence and academic performance was decreased to approximately 6% (Luo et al,2003). These results strongly

show that the items of intelligence such as mental speed component and maybe other substances are a significant intervener between intelligence and academic performance. It is therefore important to determine in a given study on intelligence the academic performance of those taking the intelligence test to determine if there is bearing on their academic attainment which is akin to their cognitive function. This would allow for a more comprehensive conclusion.

2.6 Implication of intellectual Skills in Education

Guided by Gardner's theory as the basis of the study _ Gardner's (1993) theory seem to answer many questions for experienced teachers who all had students who were bright but did not do well in their tests. It is stated in the theory that all students learn in different ways making it possible to understand their strengths and weaknesses. This helps to enable teachers to support students to try new ways of learning. Teachers can also help learners according to learners' ability. Learning has been more of linguistic and logical mathematical oriented which is also the scientific way in the classroom this according to Armstrong (2000). These usually lead to single measures. Gardner's theory has many talents and can be of use to the society since the measures are multiple in nature requiring learner engagement and self-regulated type of learning. Learning is therefore inquiry based requiring knowledge construction. Multiple measures lead to accommodating more students who are generally referred to as underachievers. The result is different outlets of learning. These outlets include learning operations and process of cognitive and metacognition.

Of course, more time could be needed in planning a multi-skill learning. There is also need for administrative support patience and persistence as well as the right attitude and motivation. Thus, the right environment for MI classroom learning is needed. The result is different outlets of learning. Of course, more time could be needed in planning a multi-skill learning. There is also need for administrative support patience and persistence as well as the right attitude and motivation. Thus, the right environment for MI classroom learning is needed. The result is different outlets of learning.

As stated by Gardner (1993), for intellectual skills to be appreciated they must reflect the cognitive capacities of individual learners. These being for learners' effort and ability to solve daily life and professional life problems effectively and efficiently, they become part and parcel of the learning content and process. According to Saban (2004), since it is seen in every learning action, outcome of learning and problem-solving skills a product and process of critical thinking it can also be developed and enhanced subsequently and change. They can be developed through curriculum process, pedagogy, assessment forms, as well as cognitive and learning styles. It is also recognized that it cannot be in one dimension but that each learner has a variety of intelligence and at different levels. Of important is that it is student centered. This is in harmony with the current thinking by the education authorities of self-regulated learning that provides

depth of learning through various education processes providing different education dimensions in education environment (Lyer, 2006).

Many activities and models can be administered in the process of teaching and learning that are based on this theory. Thus, the theory brings a new point of view to educators emphasizing individual differences instead of defining one as smart or stupid (Bumen, 2005). Since intellectual skills attributed are appropriate to students' intelligence types increases students' academic achievements. Bumen further states that when this is not in sync to their intellectual modalities, then the learners have difficulty in their learning in many areas such as their self-confidence, knowledge, critical thinking skills as well as metacognitive even as they start to think about their professions with the help of education applications.

III: RESEARCH METHODOLOGY

3.1 Background

This study was based on descriptive survey design. The population was secondary level 3, or form 3 apx. 12,000 in 60 public secondary schools. 8 schools were randomly selected and 20 learners in each of the 8 schools identified as respondents. Howard's test of intellectual abilities was used to determine the IQ. These were compared to an agreed upon standard_ Table 3.1.1 below and analyzed. Analysis was basically logical reasoning by comparison.

The IQ test had open and close-ended items. The test was divided in three parts;

- General information, the IQ questions.
- The second part of the consisted of 35 standardized I.Q questions extracted from Howard IQ test. The IQ test had a total of 42 items.
- The third part contained student's academic achievement as extracted from the learners end of year exam results.

A response rate of 75% which was considered adequate for the study. The IQ Test is guided by Table 2.4a

3.1.1 Criteria for Standard Measure for Comparison Applied in the Study

This study will use the given standard of measure found below.

Table 1: Standard of Measure for the Study

IQ Level	IQ Range	Descriptor
Genius	145-159	High Mental Ability
Gifted	130 - 144	Mentally Gifted
Above Average	115 - 129	Mental Abilities Above Normal
Average	85 - 114	Normal Mental Ability
Below Average	70 - 84	Mental Ability Below Expectation
Challenged	Below 70	Almost Mentally Retarded

SOURCE: Gross, Miraca U.M. (2000).

IV: RESULTS OF THE STUDY

The author set out to determine IQ as a measure of Intelligence using Howards Intelligence Test. The results are given below:

4.1 Learners' Response by Gender

A response rate or returns of the questionnaire of 94.20% and 88.00% for Males and Females was attained respectively. This is a total of 110 out of 120 respondents giving overall rate of return as 91 % which is well within the acceptable range of 75% return rate.

Table 2: Response Rate

Type of school	Male			Female		
	No. of IQ test papers issued	No of IQ test papers received	Percentage of male respondent	No. of IQ test papers issued	No of IQ test papers received	Percentage of female respondent
Public	40	38	95%	30	24	80%
TOTAL	70	66	94.2%	50	44	88%

4.2 IQ Parameter Levels of Secondary School Learners

The results in Table 4.2a) show that majority of the students both boys and girls (46.36%) had an IQ range of between 85 and 114 which psychologists consider as average or normal intelligence. Another dominant group was those of above average intelligence (40%) at an IQ of between 115-129. On the other hand, 12.73%) of the students were considered gifted with IQ level of 130-144. While no student exhibited mental ability related to geniuses or challenges.

Table 3: Secondary School Learners Level of IQ

IQ Level	Frequency (f)	Proportion of Learners (%)	IQ Level	Mental Ability Description
Average	51	46.36	85-114	Normal mental ability
Above Average	44	40.00	115-129	Mental abilities above normal
Gifted	14	12.73	130-144	Mentally gifted
Below Average	1	0.91	70-84	Mental ability below expectation
Genius	0	0	145-159	High mental capabilities
Challenged	0	0	Below 70	Almost mentally retarded
TOTAL	110	100		

4.2.1 Summary of Results on Secondary School Learners IQ:

In summary, majority of learners exhibited normal mental abilities as well as mental abilities above normal ranges of between 85 - 115 and 116 - 129 at 46.36% and 40.00% respectively. The results confirm Alfred Binet work of 1912 where he argues that up to 95% of learners fall between IQ

levels 70 and 130 (Stanford-Binet scale, 1916). There was no learner who was mentally challenged neither was there an attainment of genius. Only one male learner exhibited mental ability that was below average at 82 as shown earlier in table 4.2.

4.3 Learners level of IQ by Gender

Regarding gender, 22.73% of the female students were considered gifted with an IQ range of between 130-144 compared to the boys' with only 6.06%. 45% of girls were found to be above average compared to the boys' 36.36% at IQ levels of 115-129. Majority of the boys, 56.06% had average mental capability while girls at this level were 31.82% at IQ level of 85-114. No female was below average whereas 1.52% of the boys fell in this category at 70-84. There was no student scoring below 70 IQ level or almost retarded or even genius which is at 145-159. There was none below 70 IQ level considered retarded.

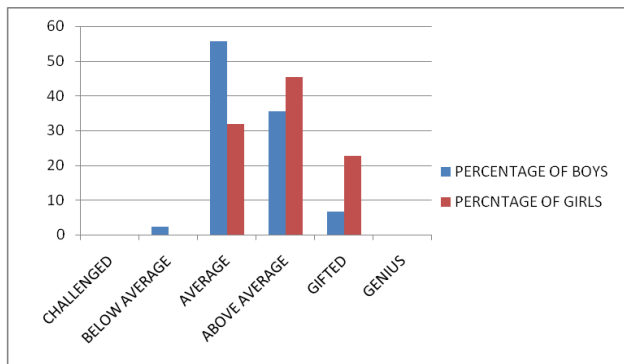
Table 4: IQ Levels by Gender as a Measure of Intelligence

IQ LEVEL	Male (%)	Female (%)	IQ LEVEL	Mental Ability
Genius	0	0	145-159	Normal mental ability
Gifted	6.06	22.73	130-144	Mental abilities above normal
Above Average	36.36	45.45	115-129	Mentally gifted
Average	56.06	31.82	85-114*	Mental ability below expectation
Below Average	1.52	0	70-84	Below mental capabilities
Challenged	0	0	Below 70	Almost mentally retarded
TOTAL	110	100		

4.3.1 Summary of the Results regarding Learners Level by Gender

The learners reflect intellectual abilities that vary between mental abilities above normal, mentally gifted and mental ability below expectation. This reflects abilities related at most on skills such as critical thinking and metacognitive skills. Very few were below mental abilities, basically males learners with 1.52% but not females below expectation. This is good thing. This contradicts some of the IQ levels established for Africa South of the Sahara. Female students seem to hold mental abilities above normal compared to male students or giftedness. There was no evidence of geniuses, that is those having normal mental abilities, meaning skills such as critical thinking and metacognitive skills are not evidenced despite these being critical in the new thinking. It could be stated in summary that the learners did not display evidence of the desired optimum function of intelligence as prescribed by Gardner (1993). The results further confirm Alfred Binet work of 1912 that states that up to 95% of learners fall between IQ levels 70 and 130 _Stanford-Binet scale, 1916.

Fig2: Graphical Representation of IQ Levels across Gender



Summary:

According to the findings, majority of the learners, both males and females alike did fall between the “under average” and “above average” categories of mental abilities. However, comparatively the percentage of girls were at higher levels of intelligence that is of giftedness, with an IQ range (130 - 144) and above average (115 - 129). This was higher than that of boys in that 22.73% girls and 6.06% of boys were considered gifted, also 45.45% of girls and 36.36% of boys were in the above average category. Interestingly, boys were dominant at lower intelligence with 56.06% of the male learners compared to 31.82% of female learners who fell below the average intelligence of 85 - 114. In addition, 1.52% of the males attained below average mental capability of between 70 - 84 with no females in this category. From this finding, one can conclude that there tend to be more female learners at a given level of IQ range such as 115-129 and 130-144 IQ levels compared to male learners.

4.4 Comparison of IQ levels derived and Other Established IQs of other Populations

- IQ Measure with Typical IQ Score of 100 on average:

Half the boys and 1/3 the girls fell within this range. This would mean that male students were better equipped with intelligence skills but only half giving them an advantage in their academic attainment.

- Learners IQ Compared to Established Standard IQ for Sub-Saharan @ 68%:

None of the students attained an IQ of 68%. This was a good sign. However, there may be need to determine with further studies why the average as given of 68% is below average. Further there may be need to carry out studies across more contexts in Kenya such as public verses private schools, urban verses rural, high achievers nationally verses low achievers for a more comprehensive overview.

- Learners IQ Compared to Derived IQ levels of IQ from various studies:

The intellectual levels seem to be low even for the study by Wicherts, Dolan, and van der Maas study with an average IQ score of 70. This study had higher IQ scores compared to IQ

levels of 70. This reflects a situation whereby the study results are much higher than the established standards and criteria arising from other studies. This calls for more studies to determine patterns and trends to help form theories that describe the state of Africa more so Kenya.

Table 5: Parameters of Intellectual Established Abilities of IQ

Source of Established IQ Scales of Measure in various contexts and studies	IQ Scale for Sub-Saharan Given
Wicherts, Dolan, and van der Maas (2009) Study -On race differences in Intelligence: Sub-Saharan Blacks	Below 70
Standard Progressive Matrices (SPM) - Psychology _ parameters https://psychology.jrank.org	66
International studies of mathematics, science https://doi.org/10.1016/j.sbspro.2010.03.231	66
Average IQ Score	70

Derived from the general literature

4.5 Learners Mental Ability Orientation by Gender: Parameters of interest on Intellectual Abilities

Howard Gardner argues that students learn better when they are allowed to learn what *interests* them. As a result, the researchers looked at the mental orientation of the learners regarding the interests against the of intellectual abilities. The results show that majority of the male learners’ preference was 28.89% towards interest in *Bodily-Kinesthetic* parameter of Intelligence compared to 04.55% of the female learners. Another 17.78% of the males were more interested and leaning towards *Logical-Mathematical* related problems compared to 13.64% of females. Female students on the other hand exhibited preference towards *socializing* at 31.81% compared to 15.56% of the boys. Another 18.18% leaned towards *Linguistic and music*. The results show that skills did vary across the 7-intelligence types but in the case of male learners it was quite low between 15.56% Musical, interpersonal, linguistic, intrapersonal and visual-spatial. At the extreme high end for male learners’ interest levels were at 28.89% regarding bodily-Kinesthetic while females were between 4.55 of kinesthetic and visual special up to 31.81% Interpersonal. The results are summarized in the table 4.3a) below

Table 6: Preference to Intelligence Type

INTELLIGENCE TYPE	Male (%)	Female (%)	Overall (%)
Bodily-Kinesthetic	28.89	4.55	16.73
Logical-Mathematical	17.78	13.64	15.71
Musical	15.56	18.18	16.87
Interpersonal	15.56	31.81	23.68
Linguistic	15.56	18.18	16.87
Intrapersonal	15.56	9.09	12.33
Visual-Spatial	0%	4.55	1.28
TOTAL	100	100	Apx.100

4.5.1 Summary of the results:

With preference for intellectual types rather low for male learners from as low as 15.56% (intrapersonal, linguistic,

interpersonal, musical) to 28.90% on bodily-kinesthetic. For the female learners the range was between 04.55% bodily-kinesthetic, visual-spatial). As for the female students the range varied from 04.55% visual spatial; bodily kinesthetics), 31.81%(Interpersonal). In both cases more learners were found to have interest all IQ types other than Visual-Spatial. However, the prevalence across the attributes was not good enough to realize the multiplicity of learning skills required in the 21st Century. The fact that learning was more linguistic means learning was still scientifically oriented resulting in single measures regarding education assessment. This reflects learning that may not be self-regulated that leads to knowledge construction. Learning was still at knowledge determined and not knowledge constructed.

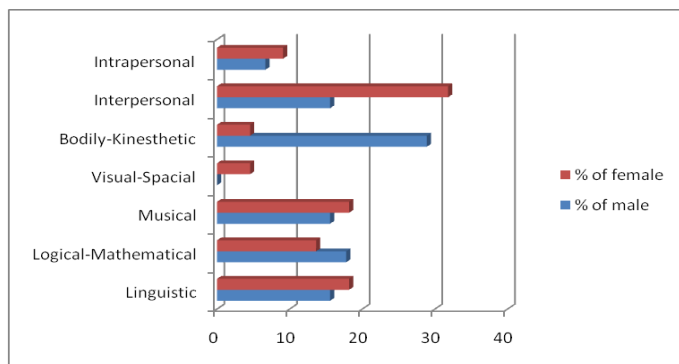


Fig 3 Interest on Intelligence by Gender

4.5.2 Summary of the results:

4.5.3 Summary Results Implications:

The issue of multiplicity of intellectual skills was not clearly evidenced in that the result did not show multiplicity of intellectual skills at play across all the attributes assessed. The challenge that arose was that there was bound to be a problem among the learners as this could jeopardize the desired process for learning that involves not just acquisition of knowledge but construction, storing information, retrieving and use of new content information. Thus, skills of problem solving and conceptualization did not seem to be effective or operating at its maximum. To be able to carry out all these activities and align cognitive processes there was need to develop and reflect multiplicity regarding intelligence among the learners and for teachers to be aware, knowledgeable as well as having capacity. The other problem was ability to connect learning with curriculum, pedagogy, assessment and policy. Learning today reflects different outlets thus authentic. Due to lack of an orientation across the intellectual skills, the right attitude may not be attained according to results in this study. This has a bearing on self-determination that also has a bearing on cognitive capacity. This may further have a bearing on academic performance as intellectuality can only be appreciated if it has traits of optimum cognitive competencies.

4.6 Relationship between intelligence and academic performance

According to Howard Gardner in his theory of multiple intelligence, learners perform better academically if challenged with tasks that provoke their mental preferences. Richard in his study on the relationship between teacher perception on intelligence and academic performance found out that there is a slight positive correlation between intelligence and academic performance at 0.2 in low social class and 0.4 positive correlation among high social class. However, this study agrees with the work of J.E Ormrod, 2010 who argued that high IQ does not necessarily predict high academic performance. The study indicated that there was a slight positive correlation between general intelligence and academic performance at about 0.173 at significance level of 0.221 and 0.178 at significant level 0.214 according to Spearman’s correlation and Pearson’s correlation respectively among the female student.

The study also showed that there was an inverse correlation between learners’ intelligence and their academic performance at - 0.12 among the male students. It also showed that the relationship between intelligence of both gender and their academic performance was also inverse at - 0.38.

Table 7: IQ Rating and Academic Performance by Gender

IQ LEVEL	Male Average IQ score	Male Average academic Performance	Female Average IQ score	Female Average academic Performance	Overall Average Academic Performance
		Score in %		Score in %	
Genius	-	-	-	-	-
Gifted	131	40.5	133	54.678	132
Above Average	121	54.779	122	54.986	121.5
Average	104	56.03	105	49.549	-
Below Average	82	-	-	-	-
Challenged	-	-	-	-	-

From the table-7 above, male learners with average intelligence of 104 performed better academically with a mean percent of 56.03% than their counterparts who are perceived to have higher intelligence that was above average intelligence at 121 and gifted at IQ 131 with academic mean percentage scores of 54.779% and 40.5% respectively. This led to the negative correlation of - 0.12 between IQ and academic performance among the males as described earlier and demonstrated in the line graph below.

The results also shows that female students with average IQ of 122 performed better with a mean percentage of 54.986%. This was in comparison with learners with higher

intelligence at IQ at 133 as well as those with lower intelligence at IQ of 105 who scored an academic mean percentage score of 54.678% and 49.549% respectively. This led to the slim positive correlation among the girls IQ and academic performance at 0.173 percent as described above and presented in the graph below.

According to the results, the outcome was a negative correlation between intelligence and academic performance at -0.38, meaning that academic performance does not necessarily depend on intelligence but the nature of task given, time of the test among other factors, this according to Howard in his MI theory.

Illustrations are given in Figures 4.5a) and b)

Fig 4 Comparing IQ Ratings and Academic Performance among Male Learners

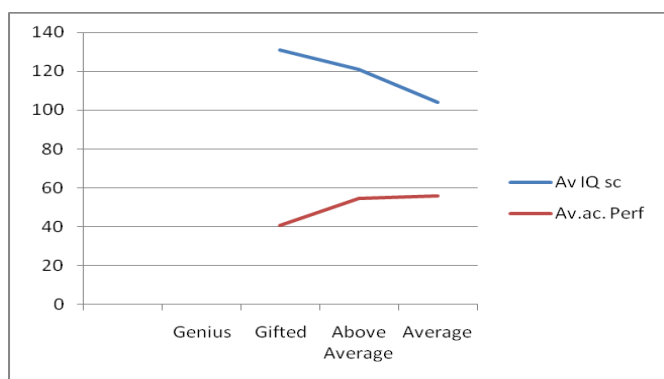


Fig 5 Comparing the IQ and Academic Performance among Female Learners

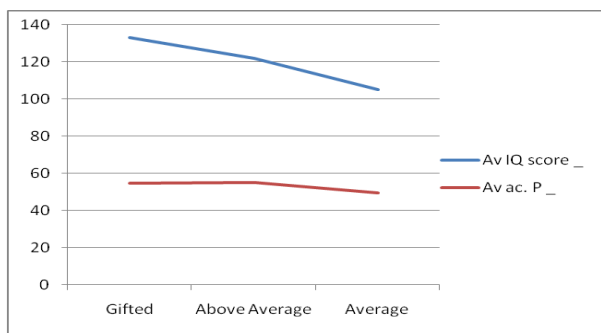
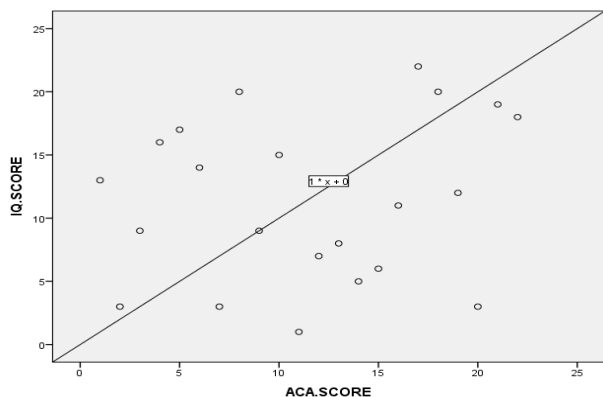


Fig 6 Scatter Diagram Relationship between IQ and Academic Performance



According to the table 4.5a), and the graphs shown as 4.5a) and 4.5b), males who were average in intelligence tended to perform better academically than their counterparts who were considered above average or even gifted. On the other hand, the research showed that girls with IQ above average performed better than the gifted on the average. The scatter diagram above showed how slim the relationship between IQ and academic performance was. This was as evidenced by lack of clear pattern of the scatter to warrant a line connecting the better part of the dots as seen on the graphs above.

V: DISCUSSIONS OF THE RESULTS

5.1 Discussions of the Study Results

The study set out to determine IQ-levels, preference of intellectual skills and academic attainment of secondary school learners in secondary schools in Kenya looking at mathematics performance. The basis was the fact that learning today requires a shift in philosophy of learning that today requires change within the intellectual frame as one of the fore-runner of critical thinking skills. This according to Howard Gardner’s theory states that regarding multiple intelligence, learners perform better in their learning if their mental preference is provoked to their optimum. With the world leaning towards new thinking and new philosophy of competency-based education within the 21st Century, competency-based education, the shift in educators view of learner and learning processes has to change. The need for learning that creates connections that determine learning that is authentic and demonstrated is paramount. From the intellectual point of view, it is for learners to demonstrate their strengths and to perform optimally with what matches their intelligence. If intellectual capability leads to cognitive competencies needed to learn as well as cognitive behaviors such as learning styles and motivation and self-determination, then the results of this study show that there is a challenge as the intellectual preferences do not show optimum provocation regarding the results of the study. This means learning may not be in-depth and that engagement in the learning may not be adequate to lead to development of intellectual skills while learning. The idea of demonstrated learning as well as ability to construct knowledge may not be realized in the case of secondary learners in secondary schools in Kenya. Further, by the results showing that intellectual skills were found to be disjointed and fragmented, may mean that there is a possible obstacle to educating.

A meta-evaluation study carried out by Beane (1990) found the same. A meta-evaluation study carried out by the author on the same topic came up with equivalent come with the results showing that intellectual skills were found to be disjointed and fragmented thus an obstacle. Having adopted “Competency Based Curriculum (CBC),” (MOE Kenya, 2017) based on the performance-based learning that is being embraced globally, this study revealed that there was need to review further and come up with strategic action as intellectual skills can be developed in learners. This study comes at an

opportune time in the early stages of CBC implementation in Kenya. There is need to determine if the basic underlying factors of intelligence on which CBC success is based are functional and operating at their optimum.

The outcome of the study reveals that majority of the third-year secondary school students who took the test in Nairobi fall under average intelligence IQ range denoting at (85 - 114) with 56.06% of male and 31.82% of female learners in this IQ range. The other dominant category was above average intelligence IQ range of (115 – 129) with 36% of boys and 45.45% of girls within this range. The study also revealed that boys tend to prefer technical tasks such as logical mathematical and bodily-kinesthetic compared to girls who were more inclined towards linguistics, musical and interpersonal intelligence. The results have a bearing on performance in that the skills that are covered within intellectual skills have a bearing on cognitive competencies needed which are also relevant to attainment of the 21st Century skills that would enhance use and appreciation of critical thinking skills. There was no clear impact and effect between academic performance and intellectual skills of the respondents in the study. Infact there was inverse relationship.

5.1.1 Further discussion on implications on education regarding the results of the study:

IQ-Levels: With intelligence skills acknowledged as the basis on which cognitive skills, processes as well as behavior attributes of learner and learning processes are built on, when multi-Intelligence are not evidenced there is a problem. By not evidencing geniuses and with low evidence of gifted regarding gender, it would appear that learning cannot be at its optimum in these schools. With IQ Levels not showing genius or normal mentality with gifted or above average at only 46.36% with IQ range at 85-114; and 40.00% at IQ range of 115-129 of those who took the test, one would say that there could arise a *disjointedness* in the learning where by all the intellectual skills are not applied in the learning despite exhibiting skills such as creativity related of design, invent, perform, construct, replicate justify and rationalize among others. There seem to be no *harmony* among application of existence of instinctual skills. This creates a challenge to learner centered learning requiring actions that result in demonstrated outcome of life long capabilities. No harmony means a theory of IQ on instinctual capabilities cannot grow to a pattern of performance of a theoretical basis that describes the existence of IQ that defines intelligence traits. This lack of comprehensive evidence of intellectuality also has a bearing on scientific learning approaches related to bodily kinetic and linguistic verbal skills. The lack of competence as shown by lack of visible evidence has a bearing on psychological attributes which are important such as self-determination, motivation, perception and attitudes held over the shift in educating today intended. This would then result in lack of effectiveness and lack of efficiency in the way learning happens considering the learner is at the center at managing their learning towards independence and autonomy of the

learner. However, there was a minimum number of learners attaining below IQ of 70 performance.

Gender and IQ Levels: Regarding levels of IQ arising from gender perspective, male students leaned more towards average performance or mental ability at 56.06% as well as above average IQ. Compared to female learners, the female learners did lean more towards above average of 45.45% and were also spread between gifted and average attainment. The kind of education desired today requires comparable level of intellectual skills as they are needed to invoke what is desired for a learner centered curriculum and self-regulated learning which relies on intellectual skills as spelt out. Skills to invoke this is not at an optimum.

Preference to Intellectual Skills: Regarding gender perspectives of intellectual skills, there was no clear pattern that could lead to a theoretically founded gender perspective just as it is on the overall results of the study. Further previous studies on the literature does not provide a trend. This has implications on lessons that can be learned from this study and how conclusive one can apply general statements on preference to intellectual skills currently. As a result, one cannot gauge the whole picture to determine trends and points of concern. This would mean that even the traditional skills of logical intelligence as well as verbal intelligence that have driven the learning paradigm previously are of concern. In a number of studies reviewed, generally only two intellectual skills verses desire for multiple skills are generally evidenced meaning there will be or there is a challenge in the need to make the shift in the new thinking by those who are key to the process such as the teachers and learners. This is in regard to the philosophy and classroom practice. By the intellectual skills not evidenced within the depths desired, it would mean that critical skills that lead to optimum cognitive operations and thinking styles on learning are not guiding or steering learning. Consider learning styles and, self-determination and motivation.

Gender and Preference to Intellectual Skills: The learners did evidence some preference of sorts across the intelligence skills. At the highest was Bodily Kinetic by males at 28%. On the lower side was Bodily Kinetics and Intrapersonal regarding the females. For males, interpersonal, linguistics and intrapersonal was almost at par. This reflects some intelligence but not at it's optimum. Thus, the challenge is that this could be a drawback to cognitive competency levels envisaged. Though the scope of preference was broad it is not in-depth so as to result in maintenance and development of competent learning competencies. There is need for a learner to have a broad perspective of intelligence skills to activate the kind of learnedness desired. The researchers are of the opinion that even if not evidenced as desired, it is possible to develop these skills given the learning strategies such as self-regulated learning (SRL) that have arisen since inception of the new thinking. This can be developed through teachers by emphasizing behaviors such as learning styles. There could also be a problem in teacher preparedness if not lack of

experience. There could be further need to develop teacher skills as well. The challenge is to provide within the framework different dimensions of strategies in the education environment. The fact that the commonest skills did not show clear harmony or patterns, may mean that there is no clear stand to base intelligence perspective among secondary education learners in Kenya. Overall, the results do have a bearing on knowledge acquisition and construction as well as skills required to maximize learning that includes critical thinking.

VI. CONCLUSION

One can conclude that the patterns of intellectual abilities arising from the study and the fact that these have effects on cognitive competence and cognitive operations necessary for the 21st century learning, does leads to the conclusion towards a narrow sense of intellectual abilities among secondary school learners in Kenya. This is a challenge as it would mean that there is disjointedness in the learning process and that learning does not provide the depth required. This may also result in low achievement rates regarding academic performance which was also found wanting in this study. The fact that intellectual skills were not in sync with the whole parameter of Gardner's' intellectual modalities does show that the learners could be having difficulty resulting in learning not optimized. This may further mean that the process of constructivism, that is integrated engagements while learning is in jeopardy. There would also be a problem with the intended self-regulated process that is intended to develop critical learning skills. The results show that the practice does not reflect a solid theoretical foundation to formulate established practiced. One of the recommendations is therefore to re-think the place of intelligence as IQ and to come up with an inbuilt process of developing these skills in the learners during the learning process.

Generally, the results do not lead towards a conclusive theoretical perspective that create insight on how students learn or if it is at it's optimum. Thus, it was difficult to determine with the IQ levels arising and preferences therein on how sensitive learning was to the learning context and if learning arising can provide the linkages and connection desired in learner centered learning that can be demonstrated to emulate lifelong experiences. The new approach to learning desires construction of knowledge towards authentic real-life situations. With the challenge arising regarding the state of intellectuality derived from the study as evidenced, it may not be possible to develop authentic, autonomous and democratic learners who would be in control of their learning and are managing their learning within the classroom towards authenticity. It is thus a challenge taking into consideration a balance between academic, practical, learners learnability, their knowledge and their strengths and weaknesses. In fact, the results do not lead to clear statements as to whether the learners would transform into how students actually learn. The researchers are of the opinion of the call for more forecast research that targets different context, types and level of

learners such as primary and tertiary as well as across discipline areas. Only then can a solid theoretical approach towards learners' intelligence be determine and used as building blocks for teachers, managers, parents, community and policy makers. The study brings a new point of view to educators in Kenya and has probably opened a Pandora. Thus, in order to come up with a more comprehensive view and perspective of intelligence to guide the ongoing discussion, there is need to carry out further studies based on this study so as to try and reveal the whole picture. There is need for solid theoretical approaches with a view to identify the common aspects of similar studies so as to build on to the emerging knowledge. This would be towards the performance based as an agenda for intellectual skills as building blocks and as it is perceived useful to education policy managers, practitioners, learners, parents, and community as well as education researchers.

The need for multiple orientation of use of intelligence skills while learning requires learners' engagement and self-regulated type of learning. This leaning towards the scientific mode of learning that is illustrated by linguistic and logical mathematical that leads to single performance is not adequate and is devoid of self-regulated strategies. Learning that requires engagement and self-regulated type of learning that leads to knowledge construction and not knowledge as determined, that which is 21st Century skill oriented seems to be out of reach at this moment of competency-based education in Kenya. For developed countries this is a bigger disadvantage as it may mean that learners do not stand to benefit as the results show lack of multiplicity. There is need to create awareness and to develop these intellectual skills within the education environment for the new shift in thinking to pick up and grow and succeed.

REFERENCES

- [1] Al-Balhan, E. M. (2006). Multiple intelligence styles in relation to improved academic performance in Kuwaiti middle school reading. *Digest of Middle East Studies*, 15(1), 18–34.
- [2] Armstrong, T. (2000). *Multiple intelligences in the classroom* 2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development
- [3] Bloom, B.S. (1956). *Taxonomy of Educational Objectives, Handbook The Cognitive Domain*. David McKay, New York.
- [4] Binet, T. & Simon T. (1912). A method of measuring the development of the intelligence of young children. *The Courier Co. _ Lincoln Illinois*
- [5] Campbell, L., & Campbell, B. (1999). *Multiple intelligences and student achievement: Success stories from six schools*. Alexandria, VA: Association for Supervision and Curriculum Development.
- [6] Campbell, L., Campbell, B., & Dickinson, D. (1996). *Teaching and learning through multiple intelligences*. Tucson, AZ: Zephyr Press.
- [7] Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511571312>
- [8] Checkley, K. (1997). The first seven . . . and the eight: A conversation with Howard Gardner. *Educational Leadership*, 55(1), 8–13.
- [9] Ceci, S. J. (1991). How much does schooling influence general intelligence and its cognitive components? A reassessment of the

- evidence. *Developmental Psychology*, 27(5), 703–722. <https://doi.org/10.1037/0012-1649.27.5.703>
- [10] Deary et. Al. (2013). The stability of intelligence from age 11 to age 90 years: the Lothian birth cohort of 1921_
- [11] Demirel, Ö. (1998, December). Developing integrated skills through multiple intelligences in the EFL classrooms. Paper presented at the Fifth EFL Skills Conference, The American University, Cairo, Egypt.
- [12] Denig, S. J. (2004). Multiple intelligences and learning styles: Two complementary dimensions. *Teachers College Record*, 106(1), 96–111.
- [13] Douglas, O., Burton, K. S., & Reese-Durham, N. (2008). The effects of the multiple intelligence teaching strategy on the academic achievement of eighth grade math students. *Journal of Instructional Psychology*, 35(2), 182–187.
- [14] Deary, Pattie, Starr (2013). The stability of intelligence from age 11 to age 90 years: the Lothian birth cohort of 1921. *Psychol Sci* 2013 Dec;24(12):2361-8.
- [15] Drummond H. P. and Selvaratnam M., (2009). Intellectual Skills Needed for the Effective. Fasko, D. (2001). An analysis of multiple intelligences theory and its use with the gifted and talented. *Roeper Review*, 23(3), 126–130.
- [16] Gardner H. (2004). *Audiences for the Theory of Multiple Intelligence*
- [17] Gardner, H. (1993a). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books. (Original work published 1983)
- [18] Gardner, H. (1993b). *Multiple intelligences: The theory in practice*. New York: Basic Books.
- [19] Gardner, H. (1999). *Intelligence reframed*. New York: Basic Books.
- [20] Gardner, H. (2002, Winter). The three faces of intelligence. *Daedalus*, 139-142.
- [21] Gardner, H. (2004). *Changing minds*. Boston: Harvard Business School Press.
- [22] Gignac, Karatamoglou, Wee, Palacios (2014). *Personality and Individual Differences* 56(1):34-39. DOI:10.1016/j.paid.2013.08.020
- [23] Gross, Miraca U.M. (2000). "Exceptionally and profoundly gifted students: An underserved population". *Understanding Our Gifted*. 12 (2): 3–9. Retrieved June 1, 2020.
- [24] Iein, P. D. (1997). Multiplying the problems of intelligence by eight: A critique of Gardner's theory. *Canadian Journal of Education*, 22(4), 377–394.
- [25] Johnson, M. (2007). An extended literature review: The effect of multiple intelligences on elementary student performance (Master's thesis, Dominican University of California, San Rafael, CA, USA). Retrieved from <http://eric.ed.gov/>
- [26] Johnson, Bouchard, Krueger, McGue, & Gottesman, (2004). The structure of human intelligence: It is verbal, perceptual, and image rotation (VPR), not fluid and crystallized
- [27] Kornhaber, M., Fierros, E., & Veenema, S. (2004). *Multiple intelligences: Best ideas from research and practice*. New York, NY: Pearson/Allyn and Bacon.
- [28] Laidra K. H Pullmann H. Allik J. (2007). Personality and intelligence as predictors of academic achievement: A cross-sectional study from elementary to secondary school. *Personality and Individual Differences: Volume 42, Issue 3, February 2007*, Pages 441-451.
- [29] Lewis M. T. (1916). *The Uses of Intelligence Tests*. First published in: *The measurement of intelligence* (Chapter 1) Boston: Houghton Mifflin
- [30] Nisbett, R. E. (2009). Review of Intelligence and how to get it: Why schools and cultures count. *New York Times*. Times Topics: Education and School
- [31] Pahor A. et. Al. (2021). Multisensory Facilitation of Working Memory Training. *Journal of Cognitive Enhancement* volume 5, pages386–395 (2021)
- [32] Phillips, D. C. (1995). The good, the bad, and the ugly: the many faces of constructivism. *Educational Researcher*, 24 (7), 5-12
- [33] Reynolds et al (2013). Failure of working memory training to enhance cognition or intelligence
- [34] Serpell, R. (2000). Intelligence and culture. In R. J. Sternberg (Ed), *The Handbook of Intelligence* (pp.549-577). Cambridge, UK & New York, USA: Cambridge University Press.
- [35] Sternberg, R. J. (1997). The concept of intelligence and its role in lifelong learning and success. *American Psychologist*, 52(10), 1030–1037.
- [36] Sternberg, R. J. (2003). *A Broad View of Intelligence: The Theory of Successful Intelligence*. *Consulting Psychology Journal: Practice and Research*, 55(3), 139–154.
- [37] Spinach B., Spinach F. M., Riemann (2003). Implicit theories about personality and intelligence and their relationship to actual personality and intelligence. *Personality and Individual Differences: Volume 35, Issue 4, Pg. 939-951*
- [38] Uçak, E., Bağ, H., & Uşak, M. (2006). Enhancing learning through multiple intelligence in elementary science education. *Journal of Baltic Science Education*, 2(10), 61–69.
- [39] Visser, B. A., Ashton, M. C., & Vernon, P. A. (2006). Beyond g: Putting multiple intelligences theory to the test. *Intelligence*, 34(5), 487–502.
- [40] Wechsler D., (2008). *The National Adult Reading Test: Restandardisation against the Wechsler adult intelligence scale—fourth edition*. Accepted 25 Aug 2016, Published online: 14 Sep 2016
- [41] Wicherts J. M. (2009). The impact of papers published in *Intelligence* 1977–2007 and an overview of the citation classics. *Intelligence*, Volume 37, Issue 5, September–October 2009, Pages 443-446
- [42] Watkins M.W. & Canivez G. L. (2007). Psychometric intelligence and achievement: A cross-lagged panel analysis. *Intelligence: Volume 35, Issue 1, January–February 2007*, Pages 59-68
- [43] Vygotsky, L. S. (1987). *The Collected Works of L. S. Vygotsky* (Vol. 1). In R. W. Rieber and A. S Carton (Eds), Plenum Press, New York and London
- [44] White, D. A., & Breen, M. (1998). Edutainment: Gifted education and the perils of misusing multiple intelligence. *Gifted Child Today Magazine*, 21(2), 12–17.
- [45] Wicherts, J. M., Dolan, C. V., Carlson, J. S., & van der Maas, H. L. J. (2010). Raven's test performance of sub-Saharan Africans: Average performance, psychometric properties, and the Flynn Effect. *Learning and Individual Differences*, 20(3), 135–151. <https://doi.org/10.1016/j.lindif.2009.12.001>

AUTHORS

1. **Dr. Karen T. Odhiambo** is a lecturer at the University of Nairobi, Kenya with specialization as an evaluator more so Education Psychology_ Measurement and Evaluation and Programme Evaluation_ Monitoring and Evaluation. Extended professional areas are Education Assessment, Social Development, Sustainable Frameworks; Constructivist approaches towards curriculum design, dialogic learning, learner assessment and performance within competency based 21st Century framework; Learning approaches of self-regulated constructivists approaches towards critical thinking skills.
2. **George O. Ouma** _ Graduate of University of Nairobi _ Masters in Measurement and Evaluation (M. Ed)