

## Application and interpretation of intelligence and IQ test results in Zambian schools: An uphill battle for mathematics Teachers

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### Abstract

Pupils' academic performance in mathematics has over the years remained a thorny issue not only to government, teachers and parents but to the pupils themselves too. It is not uncommon for pupils in Zambian schools at all levels to perform extremely exceptional in social science subjects but only to obtain a fail in mathematics. Although the trend is slowly changing, the subject is believed to be dominated by males than female pupils. Teachers have gone further to label certain group of pupils as not being intelligent. Surprisingly, a pupil may be labelled dull in mathematics and yet the best in English language or History for example. One wonders what criteria mathematics teachers use to categorise pupils as either being intelligent or not? The concept of intelligence becomes a factor at this point. What teachers and educationist may fail to appreciate is that the level of intellectual capacity differs from one individual to another and will determine how they will succeed in various activities they decide or are asked to take part in. It will also determine the performance in schools, the quality of decisions they make as well as the efficiency at work. These benefits of intelligence arouse interest of organisations such as schools or any other business institutions in predicting the level of achievement of people in any activities and where their services will be needed. It is for this reason a highly controversial but very much beneficial intelligence quotient (IQ) test was developed. The knowledge of someone's intellectual capacity has different impacts on their consideration in the society. This can be helpful or disgraceful depending on the IQ test outcomes. This paper argues that intelligence should be discussed in context and right perspectives. Further, the intelligence assessment results should be handled with greatest caution and this paper aims at highlighting this critical aspect.

**Keywords:** Academic performance, Intelligence Quotient (IQ), Intelligence Test Results

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### 1. Introduction

#### Historical Perspective of Intelligence Tests

The idea of testing intelligence began in 1904 in France, when the psychologist Alfred Binet was commissioned by the French government to find a method that would assist to differentiate between children who were 'intellectually normal' and those who were 'inferior' (slow learners). This was intended to put the latter into special schools where they would receive more individual attention. This would help the government to avoid the disruption they caused in the education of intellectually normal children. Such thinking was a natural development from Darwinism and Eugenic Movement that dates back to Sir Francis Galton in 1869, the famous scientific polymath who promoted the idea that for the society to prosper, the weakest should not have babies, as this would affect the genetic stock of future generations. This is why Thomas and Loxley (2007) [22]. Concluded that his followers were contemptuous of any impact education might have on raising the achievement of the so called 'least able'.

Binet scale, also known as Simon-Binet scale, in recognition of Théophile Simon's assistance, was developed and the work was led by Binet himself. The Binet scale constituted a revolutionary approach to the assessment of individual mental ability. However, Binet cautioned against misuse of the scale or misunderstanding of its implications. He said that the scale was designed with only one purpose in mind; this was to serve as a guide to identify children in the schools who required

special education. It was not to be taken as a general device for ranking all pupils according to their mental worth. Kerry Taylor-Smith (2011) [12] advanced that Binet also noted that "the scale", did not permit the measure of intelligence, because intellectual qualities are not super possible, and therefore cannot be measured as linear surfaces are measured". In agreement to the above, Kerry Taylor-Smith (2011) [12] further confirms that since, according to Binet, intelligence could not be described by a single score, the use of the intelligence quotient (IQ) as coined by Lewis Terman in America in 1916, as a definite statement of a child's intellectual capacity would be a serious mistake. In addition, Binet feared that IQ measurement would be used to condemn a child to a permanent condition of stupidity, thereby negatively affecting his/ her education and likelihood.

In this regard, it can be argued that Benet's scale had a profound impact on educational development in the UK, the USA and elsewhere. However, the American and UK educators and psychologists who championed and utilised it and its revisions failed to heed Benet's caveats concerning its limitations. Soon intelligence testing assumed an importance and respectability way out of proportion to its actual value. In their study, Thomas and Loxley (2007: 45) [22] further present "Belief in the importance of intelligence and in the test that purportedly measured it gave rise to a selective and segregate education system, following the high profile work of some influential educational psychologists and this kind of thought

is still revered especially in considering children’s failure at school”.

Despite such deviations, psychometric tools are still being used by significant numbers of educational psychologists in the various countries of the world. Kasschau (2003) <sup>[10]</sup>, presented data to support their argument that these tools have been revised and modernised and typically include tests such as the revised versions of the Wechsler Adult Intelligence Scale or WAIS – R for eighteen years old people and above; the Wechsler Intelligence Scale for Children or WISC – III for children aged six to seventeen ; the Wechsler Preschool and Primary Scale of Intelligence or WPPSI for children four to six and half years old, and the British Ability Scale or BAS in their updated forms but their roots and core constructs remain unaltered. The shortcomings of these tools have been known for so long and debated on among educational psychologists, in educational establishments and beyond. Yet scores and test results are still demanded particularly around those for whom measurement is the most difficult. There is a wealthy literature concerning the role and negative impact of IQ testing as argued by Leyden (1978) <sup>[14]</sup>, Leadbetter (2005) <sup>[13]</sup> and Venables and Farrell (2009) <sup>[23]</sup>. and yet educational psychologists and later on Mathematics teachers still spend more time undertaking formal special education evaluations using psychometric assessment including IQ tests (Shapiro *et al.*, 2004; Venables and Farrell, 2009) <sup>[20, 23]</sup>. What then are the right interpretations and application of intelligence tests results among Mathematics teachers? While! Valuable reasons are unearthed hereunder.

**2. Significance of intelligence tests results**

According to Fletcher and Hattie (2011) <sup>[5]</sup>, the first intelligence test is done when we are born, the Apgar test whose score contributes to prediction of subsequent survival and development. However this test does not have its results questioned as much as those of intelligence test. Efforts are made to overcome the unwanted effects of the IQ test results. Moreover, its value is seen in that it offers a powerful understanding of real-life behaviour, and is one of the most powerful predictors of many job related performances. A critical aspect to consider is that some dimensions of intelligence are more powerful in some situations, cultures, instances and on some occasions than others. The following are some of the uses of intelligence and IQ tests.

**2.1 Prediction of Earnings**

IQ score results have been found to be one of the factors of individuals’ earning. Commenting on the practical applications of intelligence IQ test results Jencks (1972) <sup>[9]</sup>, found that men inducted into the Korean war and had IQ of above 110 had personal incomes of 34% above the national average while those with IQ below 90 had personal incomes about 34% below the National average after they returned to civilian life. However, even if it is an important dimension, the

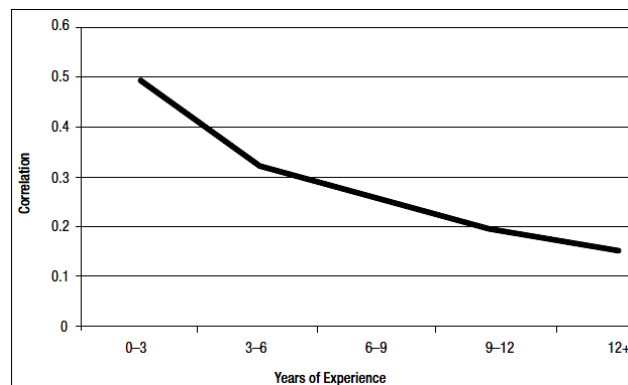
intelligence does not act alone to determine the earnings; commitment, motivation and opportunity are also critical variables to be considered.

**2.2 Prediction of Job Performance**

Schmidt and Hunter (2004) <sup>[19]</sup> have made related arguments, as have many others that the general intelligence is the best predictor of job performance and that testing specific to the aptitude required for the job appears to contribute little or nothing to prediction. They summarised findings from 400 researches and found that the best predictor of job performance is general intelligence or whatever is measured by IQ tests. There is a significant positive correlation between job performance and IQ test results; so the more complex the job, the better IQ is a predictor of that job.

**2.3 Prediction of Job Training Performance**

Experience is one of the factors that are considered by many to contribute to good performance in job. However, Schmidt and Hunter (2004) <sup>[19]</sup> have proved this statement to be wrong. In their research, they found the correlation between experience and job performance to be low and this correlation grows lower as the experience increases. Their findings are illustrated in figure 1 below:



**Fig 1:** Relationship between years of job experience and performance ratings: IQ predicts and explains performance at tasks that require problem-solving (Adapted from: Fletcher and Hattie, 2011:33) <sup>[5]</sup>.

It is clear from the graph above; the relationship between experience and performance ratings is 0.49 for those who had been on the job for 0–3 years. This relationship drops rapidly to a low 0.15 for those who had been on the job 12 years and up. In agreement to the above, Flynn (2008) <sup>[6]</sup> confirms that in today’s schools, the emphasis is on problem-solving on the spot. Students need skills to think faster, think different, smarter and be creative to deal with many new and often unstructured problems. These problems are considered to be the major dimensions as to what intelligence means today.

**2.4 Diagnose Problems**

Fletcher and Hattie (2011) <sup>[5]</sup> observe that when a child is always bored, acting out or not engaged, such a child is

referred to a counsellor, guidance expert or educational psychologist who preferably measures the child's intelligence. The comparison between the child actual achievement in class and IQ test results can lead to specific treatment to correct the behavioural or academic problems. If the child, for example performance is far below his/her level of intelligence, this could lead to a recommendation for more challenging and engaging work. If the opposite is the case, it may be that the work needs to be tailored to provide more appropriate challenges.

## 2.5 Help improve Pupils' IQ

In a study conducted by Richard (2013) <sup>[18]</sup> it was established that one of the most important uses of IQ test is in developing interventions. He demonstrates that measuring intelligence is essential to figuring out how to increase it. As he rightly points it out, some group differences in IQ are large, and much evidence indicates that it would be difficult to overcome a broad array of racial disparities if IQ differences could not be ameliorated. Richard (2013, 11) <sup>[18]</sup> further observes: "IQ tests help us to track the changes in intelligence of different groups (and of entire nations) and to determine if interventions intended to improve intelligence are working" (p11) <sup>[18]</sup>. As argued earlier, though the IQ testing is very useful in so many ways, it has been very controversial since the time it was introduced. Some of the controversies are discussed below.

## 3. First Controversy

Intelligence testing is one of the ideas which were received with a lot of controversies in the world of social sciences. They were based, among more points, on use of single test score and the confusion between nature and nurture's contribution on the intelligence. Berninger and O'Donnell, (2005) <sup>[1]</sup> views much of the current controversy surrounding intelligence tests has been localised to educational applications. They say that since learning disability (LD) discrepancy models were initiated and used, the singular IQ score became overused or magnified as a central marker of intelligence. The full-scale scores were most certainly viewed as representing an individual's total intellectual capacity. This singular view translated into a parsimonious description of learning disabilities and transformed into the LD discrepancy model of learning disability identification.

That is why Berninger and O'Donnell (2005) <sup>[1]</sup> concluded that for many years, educational professionals were confined to strict eligibility guidelines set forth by federal and state agencies that demanded narrow statistical formulae using obtained IQ scores while ignoring psychometric principles such as measurement error. Fletcher *et al.* (2002; Fletcher, Lyon, Fuchs, & Barnes 2007) <sup>[3, 4]</sup> add that these constraints led to relatively easy placement decisions but poor intervention choices and program outcomes. According to Witt & Gresham (1985) <sup>[24]</sup> and in agreement with Fletcher, *et al.* (2002) <sup>[3]</sup> demonstrated that the latter, along with

inappropriate expectations of treatment validity rising from single scores eventually led to the demise of the LD discrepancy model. Kaufman & Lichtenberger, (2006:20) <sup>[11]</sup> traversed the LD discrepancy model by maintaining that "the global IQ on any test, no matter how comprehensive, does not equal a person's total capacity for intellectual accomplishment" as observed by. He also maintained that over-interpretation of global IQ scores was inappropriate and clinically unsound.

On the issue around nature and nurture, Kaufman argues that environment versus heredity debates are applicable to policy decisions about group intelligence data but lose power when applied to finding out what an individual has learned from his or her life experiences (Kaufman & Lichtenberger, 2006) <sup>[11]</sup>. Group data describing general characteristics and general observations are appropriate in many cases, but group data has also, in the past, translated into policies and generalizations about intelligence being an immutable construct. However, individuals present a unique and singular life. It has been found that the brain has millions of cells that are genetically programmed to unfold and then are pruned and paired. These periods of growth and pruning are also filtered by environmental factors that influence which cells live and which cells die. Perry (2002) <sup>[17]</sup> and Perry & Pollard (1997) <sup>[16]</sup>, made related observations that experiences change brain structure and vice versa Therefore, cognitive neuroscience has started to illuminate how "nurture" interacts with "nature" and vice versa.

At the individual level, intelligent testing suggests that the clinician must try to determine the cognitive neuroscience involved with each subject in terms of cognitive strengths and weaknesses and then how the patterns evidence in everyday activities: Kaufman & Lichtenberger (2006:21) <sup>[11]</sup>, equally argued that the goal of the intelligent tester is to deduce when one or more subtests may be an invalid measure of a person's intellectual functioning for more subtle reasons: distractibility, poor arithmetic achievement in school, sub-cultural differences in language or custom, emotional content of the items, suspected or known lesions in specific regions of the brain, fatigue, boredom, extreme shyness, bizarre thought processes, inconsistent effort and the like.. Indeed, it further been suggested that future efforts to elaborate and discover the mechanisms of biological intelligence will "likely fall to the neuropsychologist and behavioural neurochemistry for resolution." Others have maintained that future views on intelligence should include reductionist and emergent's approaches.

## 4. Second Controversy

As mentioned earlier, the intelligence test results do not always do what they are intended to. Due to different reasons, they can take the user to a different direction. In many ways IQ has become synonymous with people rather than with the actual concept itself. For example, mention the name Albert

Einstein and the response will invariably include a reference to 'high IQ', 'very intelligent' or 'brilliant'. Einstein's immense contribution to understanding the physical laws of the universe is well known, even though he was not a university professor when he published his seminal 1905 paper, he was working as a patent clerk in Switzerland. But it is instructive to note that Einstein was not always viewed as one who would make a significant contribution to the world. One of Einstein's teachers admonished the future genius, saying 'Nothing will become of you' and 'Your presence in the class destroys the respect of the students'. Bodanis (2000: 5) [2]. further observed: "Einstein failed to get promoted from patent clerk third class to patent clerk second class in 1905 because he needed to wait until he had become fully familiar with mechanical engineering". In this respect, Gardner (1989) [8], identified five ways in which the IQ test results can be misapplied as follows:

#### **4.1 Acceptance of a Test Title for What the Test Measures**

There is a tendency for unsophisticated test users to accept the name assigned to a test as an accurate and complete description of the variable being measured. Since titles must be brief, they cannot convey all that the user needs to know about the kind of behaviour to be measured. All tests are open to this kind of uncritical abuse. Since there are so many facets of cognitive ability, it is obvious that no test can be an adequate measure of them all. Only full knowledge of the items can reveal what is being measured. Furthermore, the testing situation may completely change the expected behaviour.

If a non-English speaking or blind pupil is given an "aptitude" test in printed English, it obviously doesn't measure any aspect of "aptitude" or "intelligence" except lack of knowledge of English or lack of vision. In a less obvious area, a test labelled "Science Achievement" may be an acceptable test to sample the science curriculum for students in a particular fifth grade science course but fail to function as a science test at all for most pupils if the reading difficulty is at the high school level. A test producer's claims for an achievement test or an aptitude test do not mean that it will function as such in all circumstances with all pupils. Failure to examine the manual and the items carefully in order to know the specific aspects of cognitive ability to be tested (memory, vocabulary, type of reasoning, etc.) can result in misapplication by virtue of selecting an inappropriate test for a particular purpose or situation.

#### **4.2 Discarding the Error of Measurement in Test Scores**

Every test score contains an error of measurement. It is a misuse of any test score or any observation to accept it as a fixed, unchanging index containing no error. It is impossible to say with certainty that an individual's observed score gives his "true" performance on the general domain about which inferences are to be made. The best that can be done is to

estimate experimentally the standard error of measurement and then use that value to set up a band within which a probability can be stated about the "true" score's being within that band. That 1) we cannot accept an SAT (Scholastic Achievement Test) score of 550 as a precise measure, 2) we must accept a range of scores, and 3) we must then expect to be wrong a certain proportion of the times do not mean that the SAT does not furnish useful data. It does mean that the test score is being misused if knowledge of the size of the errors of measurement is not used in interpreting the score.

In the case of most standardised test scores, the magnitude of the errors is made explicit, not hidden or unknown. In fact, the errors in essay grading or any other type of evaluative data have far larger but usually unknown errors of measurement. Some people reject the notion of basing decisions on probabilistic data. However, probability estimates are involved in almost all decisions. For example, the decision to cross a busy street at a particular instant is not made with a probability of 1.0 of doing so safely.

#### **4.3 Applying a Single Test Score for Decision Making**

Misapplication of tests occurs when scores are not considered and interpreted in the full context of the various elements that characterise pupils, teachers, and the general educational environment involved. For a test score represents only a sample from a limited domain and does not include the variety of factors that might influence that score. For example, in decisions determining admission to college, SAT scores should not be used in isolation and are in fact usually considered along with the pupil's high school record and other relevant data, such as teacher's or supervisor's recommendations concerning motivation, leadership ability, creativity, involvement in extracurricular activities, etc. All of these can then be evaluated against the student's socioeconomic background, along with consideration of any social obstacles or unusual physical demands required of the student to reach his current educational level.

#### **4.4 Misinterpretations of Test Scores**

There is substantial misunderstanding, not just among laymen, but also among many educators, of the meaning of test scores. Most people believe that they understand the meaning of a raw score or of that particular raw score converted to a percent of items answered correctly, as in the case of many criterion-referenced tests. However, even in this most elementary illustration; more is involved than a single number indicates. Forty-five items answered correctly out of fifty easy items has a substantially different meaning than forty-five items answered correctly out of a sample of fifty very difficult items from the same domain.

The interpretation of a raw score converted to a percentile score causes even more problems. The statement that "In a norm-referenced test half the pupils must fail" is neither a good nor a poor performance. It merely indicates that among

the group used as a frame of reference this score was higher than that reached by 20 percent of its members. If the group were of high ability or had unusual skills, a percentile rank of 20 might indicate an excellent or even remarkable performance. The misinterpretation of grade equivalents is even more common. A grade equivalent is the score that was exceeded by 50 percent of the group at the specific time when the test was given. It does not represent a standard to be attained. It does not represent the grade in which the pupil should be placed.

#### **4.5 Associating Cause of Behaviour Measured to Test**

It is common, especially for critics of testing, to confuse the information provided by a test score with interpretations of what caused the behaviour described by the score. A test score is a numerical description of a sample of performance at a given point in time. A test score gives no information as to why the individual performed as reported.

Claiming that it does, whether intended as a positive attribute or a criticism, is tantamount to test misapplication. Furthermore, no statistical manipulation of test data, even though combined with the best additional data, will permit more than probabilistic inferences about causation or future performance. Kasschau, (2003) <sup>[10]</sup> presented similar arguments that as we cannot say that baseball player has a low batting average because he does not get a lot of hits, we cannot even say that a student does poorly in school because he has a low IQ score. IQ tests measure the same skills that schoolwork requires. An IQ score measures performance; it does not explain it.

#### **4.6 Intelligence Tests Results are Socio-Economic Bias**

It has been observed that intelligence test scores have not only become associated with a person's ability to perform certain tasks, but with self-worth. At worst such assessments have been used to wrongly place pupils from ethnic minority cultures in special schools and units. As far back as 1968 this was reported in ILEA and elsewhere where pupils from an African Caribbean background were particularly over represented in special education. The PLASC and School Level Annual School Census (2002) revealed that Black Caribbean pupils were over represented in Pupil Referral Units (5.8% compared with 1.5% in mainstream schools). Of even more relevance to the misuse of psychometrics test was the finding that 3.6% of Pakistani pupils were in Special Schools. However, this might have been due to other factors such as pupils live in poverty or pupils being assessed and doing badly because the test was culturally biased.

Gallannaugh and Dyson (2008) <sup>[7]</sup> have considered the disproportional presence of students from different social groups in the UK special needs system. They argue that disproportional is a reality in England, as in the United States, though it cannot be understood simply in relation to racial minorities. Nor, within a non-disability-based system, does it

arise principally from the misidentification of students as having impairments. Instead, they argue, it reflects broad educational and social inequalities.

#### **4.7 Difficulties Applying IQ Testing with Disabled Pupils and the Elderly**

Siegel (1992) <sup>[21]</sup> proposed that the IQ test be abandoned in the analysis of the disabled child. According to most definitions although they are not conclusive intelligence is made up of the skills of logical reasoning, problem solving, critical thinking, and adaptation. This seems reasonable, until one examines the content of IQ tests. Intelligence, as tested in all IQ tests, includes virtually no skills that can be identified in terms of such a definition of intelligence. Further, Siegel gives a detailed analysis of the subtests of the Wechsler Intelligence Scale for Children-Revised (WISC-R). This IQ test is composed of Verbal and Performance sections, and is often used in diagnosis of learning difficulties. In each subtest of the Verbal scale, performance is in varying degrees dependent on specific knowledge, vocabulary, expressive language and memory skills, while in the Performance scale, visual-spatial abilities, fine motor coordination, perceptual skills, and in some subtests speed, is essential for scoring. As she (Siegel) rightly points out, IQ tests measure, for the most part, what a person has learned, not what he or she is capable of doing in the future.

There is an additional problem in the use of IQ tests with individuals with learning impairments. According to Siegel (1992) <sup>[21]</sup>, it is a paradox that IQ scores are required of disabled people because many of these persons have difficulty in one or more of the component skills that are part of these IQ tests, memory, language, fine motor skills, and so on. The effect is that they may end up having a lower IQ score than a person who does not have such problems, even though they may both have identical reasoning and problem-solving skills. The lower IQ score, therefore, may be a result of the learning impairment, and IQ scores may underestimate the real 'intelligence' of the disabled individual.

Besides all these critics above, we can add that psychologists and educators use these intelligence test results to distribute the limited resources of our society regardless the probable errors in them. It is in this way that the so called rewards such as special classes for gifted students, admission to college, and employment or the opposite with special education placement are provided. The consequence is that those who do not qualify for these resources based on intelligence test scores may feel angry and as if the tests are denying them opportunities for success. Many negative predispositions have been initiated, aspirations lowered and self-fulfilling prophecies created. It is therefore important for the education actors to adequately use the intelligence test results in order to benefit the learners.

## 5. Appropriate Application of IQ Test Results by Mathematics Teachers

As already noted above, Binet himself designed the IQ test for good reason, not to promote whatever kind of social segregation but education for all, based on their intellectual needs. In most cases however, these tests are associated with any kind of selection, which does not take into consideration the individual and cultural differences. There is need for the teachers to overcome these abnormalities in testing. The following are some observations that should be considered: Firstly, IQ test like any other tool, if misused, can have severe detrimental effects. For example, people who do poorly on IQ tests in class may not always be the ones that need the most help. Second, IQ tests in schools can be especially demoralising to the learners who frequently fail in school because the scores serve as a confirmation that causes the learners to accept their own inabilities thereby lowering their motivation and in extreme cases drop out. Thirdly, teachers may have little expectations from learners who score less on the test and these expectations can be communicated to these learners through verbal and non-verbal cues. Fourthly, in accordance with Santrock, cited in Munsaka and Matafwali, (2013) <sup>[15]</sup>, suggesting that IQ test scores be used only to get information about children, and not to stereotype or pigeon-hole students.

The following observations are presented as regards to how teachers should interpret and use intelligence and IQ test results: Firstly, teachers should not get negatively judge students because of the low IQ score they have got on the IQ test. They ought to bear in mind that a student's performance can be improved if the environment is enriched. Secondly, IQ test should not be used as the only indicators of students' intelligence, since the intelligence test only tests students' analytical skills, and they do not adequately test creative and practical intelligence, Thirdly, Munsaka and Matafwali (2013) <sup>[15]</sup> observe that caution must always be taken when interpreting IQ test scores so that the other areas of competence which are not tested by the IQ tests due to practical as well as cultural constraints are taken into consideration. This implies that a low IQ score is by no means indicative of dullness. This is big lesson mathematics and other educationist should pay attention with interest and learn so that they can be proactive rather than reactive in the interpretation and application of intelligence and IQ test results in their respective mathematics classrooms.

## 6. Conclusion

It has been argued and highlighted in this paper that wherever, there are people, there will always need for some way of making intelligence decisions about people later on pupils in mathematics lessons. The truth is that pupils and people in general are not the same in that they have different skills and abilities. Therefore, it has been demonstrated in this paper that it would be wrong for mathematics teachers and other

educationist to think of intelligence as a fixed, innate ability as opposed to that which develops in context. Hence, coming back to the main focus of this article, it has generally been agreed by many researchers in principle that intelligence tests were designed for a good reason. It should be clear among Mathematics teachers that if these intelligence test results are well used and interpreted, they can directly or indirectly contribute to the effective and efficient teaching of mathematics in schools while keeping in mind individual pupil's differences. As argued in the paper that knowing the IQ of a learner is one of the best roads to understanding them and hence to help in improving their academic performance not only in Mathematics but as well as their intellectual capacity. It should furthermore be acknowledged by Mathematics teachers that interventions have substantial effects on IQ and academic achievement hence the need to interpret and apply intelligence test results in context. For example, there is clear evidence that school affects intelligence; that is better schools produce better effects, and that the calibre of the individual teacher is of great importance. This means that, no matter how low the intellectual capacity of a learner appears to be, as long as a pupil is educable, it can be upgraded. Therefore, labelling of pupils based on intelligence test results should be done with caution because there are number of factors to be considered. Arguably, any mathematics teacher should take the helping and facilitating role. In this regard, the mathematics teacher should be equipped with the adequate knowledge of the pupil and be able to use it to scaffold such a pupil at individual level. Admittedly, among the content of this knowledge should be that of pupils' IQ with the objective of advancing the interest of the pupil first. Sadly intelligence and IQ test results have not only been misinterpreted and misapplied by most of our mathematics teachers but they have also been a source of social segregation in most mathematics classrooms.

## 7. References

1. Berninger VW, O' Donnell L. Research-supported differential diagnosis of specific learning disabilities, 2005.
2. Bodanis DE=MC<sup>2</sup>: A Biography of the World's most Famous Equation. New York: Berkeley Books, 2000.
3. Fletcher JM. Assessment of reading and learning disabilities: A research-based, intervention-oriented approach. *Journal of School Psychology*, 2002; 40:27-63.
4. Fletcher JM, Lyon GR, Fuchs LS, Barnes MA. *Learning Disabilities from Identification to Intervention*. New York: Guildford, 2007.
5. Fletcher RB, Hattie J. *Intelligence and Intelligence Testing*. New York: Routledge, 2011.
6. Flynn JR. *What is Intelligence? Beyond the Flynn Effect*. Cambridge: Cambridge University Press, 2007.
7. Gallannaugh F, Dyson A. *The Journal of Special Education*. DOI: 10.1177/0022466907313607

- Disproportionality in Special Needs Education in England. England: University of Manchester. 2008; 42(1):36-46.
8. Gardner E. Five Common Misuses of Tests. ERIC Digest, 1989, 108.
  9. Jencks C. Inequality: A Reassessment of the Effect of Family and Schooling in America. New York: Harper & Row, 1972.
  10. Kasschau R. Understanding Psychology. New York: McGraw-Hill, 2003.
  11. Kaufman AS, Lichtenberger EO. Assessing Adolescent and Adult Intelligence (3rd ed.) New York: Wiley, 2006.
  12. Kerry Taylor-Smith. Is there any point in IQ tests? Just what is the point of an IQ test – should we bother with them and are they accurate? Accessible, 2011. at: <http://www.labnews.co.uk/comment/editorial-comments/point-iq-tests/11/02/2014>
  13. Leadbetter J, Activity theory as a Conceptual Framework and Analytical Tool within the Practice of Educational Psychology, Educational and Child Psychology, 2005; 22(1):18-28. ISSN: 0267-1611.PLASC and School Level Annual School Census 2002
  14. Leyden G. Reconstructing Educational Psychology. W E C Gillham: Croom Helm, 1978.
  15. Munsaka E, Matafwali B. Human Development from Conception to Adolescence: Typical and Atypical Trends. Lusaka: University of Zambia press, 2013.
  16. Perry BD, Pollard D. Altered brain development following global neglect in early childhood. Society for Neuroscience: Proceedings from Annual Meeting, New Orleans, 1997.
  17. Perry BD. Childhood experience and the expression of genetic potential: what childhood neglect tells us about nature and nurture? Brain and Mind, 2002; 3:79-100.
  18. Richard EN. Schooling Makes You Smarter. What Teachers Need to Know about IQ. American Educator |Spring, 2013.
  19. Schmidt F, Hunter J. General mental ability in the world of work: Occupational attainment and job performance. Journal of Personality and Social Psychology. 2004; 86(1):162-73.
  20. Shapiro ES, Angello LM, Eckert TL. School Psychology Review, - questia.com, 2004.
  21. Siegel LS, Metsala E. An alternative to the food processor approach to subtypes of learning disabilities. N. N. Singh & I. L. Beale (eds.), Learning Disabilities: Nature, Theory, and Treatment. New York: Springer-Verlag. 1992, 45.
  22. Thomas G, Loxley A. Deconstructing Special Education and Constructing Inclusion. 2<sup>nd</sup> edition. New York: Open University press, 2007.
  23. Venables K, Farrell P. A Psychology for inclusive education: new directions in theory and practice / edited by Peter Hick, Ruth Kershner and Peter Farrell, 2009.
  24. Witt, J.C., & Gresham, F.M. (1985). Review of the Wechsler intelligence Scale for Children-Revised. In J.V. Mitchell (Ed.), Ninth Mental Measurements Yearbook (pp.1716-1719). Lincoln, NE: University of Nebraska Press.