

Multiple Intelligence Tests as Determinants of Students' Performance in Mathematics in Junior Secondary Schools in Ekiti State

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Abstract:

This study investigated the multiple intelligence test as predictor of students' performance in Mathematics in Junior Secondary Schools in Ekiti state. This study specifically examined the contribution of multiple intelligence test variables (verbal, logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) to students' academic performance in Mathematics; and to determine if multiple intelligence test discriminated between male and female students. The descriptive research of the survey design was used in this study. The population for this study consisted of all Junior Secondary School Two (J.S.S. II) students in secondary schools in Ekiti State, of which 200 was selected using multistage sampling procedure. Two instruments tagged Multiple Intelligence Test (MIT) and Mathematics Performance Test (MPT) were used to collect data. The face and content validity procedure of the instruments were determined by employment of Mathematics Education and Tests and Measurement experts. The test re-test method of reliability was adopted. A correlation co-efficient value of 0.82 and 0.84 were obtained for MIT and MPT respectively. The data collated was analyzed using inferential statistics of multiple regression and t-test at 0.05 level of significance. The findings indicated that multiple intelligence test contributed to students' academic performance in Mathematics. Also, male students performed better than female students in multiple intelligence test. It was recommended among others that teachers should frequently

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measure the multiple intelligences among students and use the feedback to improve students' performance in Mathematics.

Keywords: Multiple Intelligence Test, Performance, Mathematics, Predictor, Academic,

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Introduction

Mathematics influenced each and every facet of human existence is by in some capacity. Numbers have a significant role in almost every facet of human life, including politics, economics, geography, science, and technology. Statistics, accounting, and engineering are examples of fields where numbers play an important role. In light of its numerical and symbolic character, mathematics has a central role in human growth and progress. Ekiti State Ministry of Education results show that students' low performance in mathematics throughout the years has been blamed on the difficulty of the subject (Ministry of Education, Statistics Division, 2019). Students' performance has been shown to differ from person to person and school to school in the same view.

The poor performance of students in mathematics could be attributed to certain factors which include inadequate mastery of the subject matter by the teacher, inadequate instructional (both human and material) resources, inappropriate teaching methods and various assessment techniques used by the teacher to get the most accurate information from the learners. In order to get a sample of the students' behaviour, these strategies might include multiple Intelligence level assessments.

A test may be described as a tool for measuring people's behaviour. According to Opara (2014), a test is a measuring apparatus or method that is used to qualify behavior or assist in the understanding and prediction of behaviour. Indeed, Oluwatayo (2009) identified some vital purposes of reliable and valid test items. These include certification after completing a prescribed course of study, for diagnosing learning difficulties, for selection into higher educational programme (aptitude test), for providing feedback on teaching-learning process, for gauging effectiveness of teaching methodology and for providing a basis for self-evaluation.

The ability to solve problems or produce goods that are seen as valuable in one or more cultural contexts is referred to as intelligence (Gardner & Hatch, 1989). Individual variations among students are taken into account to the fullest extent possible while implementing a curriculum based on multiple intelligences. In this method, a teacher uses numerous intelligences described by Howard Gardner to accomplish the lesson's goals. Students' answers on a scale of several intelligences, including verbal, logical, visual, physical, intrapersonal, interpersonal, musical, and natural intelligence, are used to determine the general intelligence of the class. The term "intellect" is used to describe a variety of other kinds of mental abilities and capabilities, rather than just the ability to solve problems logically and linguistically. Visual – spatial (picture-smart), verbal – linguistic (word-savvy), logical – mathematical (number and reasoning-savvy), and somatic kinesthetic (movement-savvy) intelligences are some examples (body smart). Others are musical rhythmic (musical), inter-personal (people smart), and intra-personal (self-smart) intelligence as well as naturalist (nature-smart) intelligence (Thomas, 2006).

Joan and Robert (2017) define verbal/linguistic intelligence as the capacity to use language to persuade others, the capacity to utilize mnemonics to aid in memory, the capacity to use oral and written language in explanations, and the capacity to use language to study how it works. Intelligence in the areas of logic and mathematics includes an awareness of logical patterns and correlations, the capacity to reason about extensive chains of reasoning, assertions and propositions (such as "if-then" and "cause-effect"), functions, and other abstract concepts.

The capacity to properly detect and modify one's visual-spatial environment is a key component of visual/spatial intelligence. Colour sensitivity, line sensitivity, shape sensitivity, form sensitivity, and the ability to perceive, graphically depict visual or spatial thoughts, and to position oneself in the spatial matrix are all part of this process (Thomas, 2006). To have bodily-kinesthetic intelligence, one must be able to utilize the body in a variety of ways, be adept at expressing oneself physically, be able to create things with one hands, and be able to work with items using both fine and gross motor movements in the body (Joan & Robert, 2017). When it comes to mathematics and physical science, the researcher observed that students don't frequently utilize their bodies as a means of expressing what they're thinking or understanding. Mathematical patterns or trends in a function may be mimicked through dance, for example, This intelligence is used in the physical construction of an entity specified by an equation.

Having a musical intelligence is being able to recognize musical forms, distinguish between them, modify them, and express oneself via music. Musicianship is a skill that is frequently disregarded in school. Some mathematics and physics ideas, on the other hand, may benefit from this intelligence (Thomas, 2006).

Interpersonal intelligence is the capacity to recognize and distinguish between the emotions, intents, motives, and feelings of others. As part of this skill, one must be able to discern between a wide range of interpersonal indicators, as well as be able to react successfully in a pragmatic manner. People-related concepts and knowledge are often relevant to students with a high degree of interpersonal intelligence (Elbaz, 2006).

Internal Intelligence refers to one's capacity for self-knowledge, sensitivity to one's own strengths and limitations as well as one's inner emotions, goals, motives and temperaments, as well as one's potential for self-discipline and self-understanding. The ability to discern subtle differences and patterns in nature, as well as the practical application of this talent, are the hallmarks of Naturalist Intelligence (Afanah & Khazendar, 2004).

Gardner argues that the eight intelligences seldom work together. The multiple intelligence approach advocated by Armstrong (2000) suggests that teachers should use a variety of instructional techniques, such as the use of words and numbers as well as logic and music as well as group activities and physical activities, as well as pictures, self-reflection, and the physical environment, in order to meet the diverse learning styles of their students. As a result, instructors must ensure that they evaluate their pupils' progress in ways that allow them to make the most of their innate intellect. Using visual aids they've created themselves, students may make oral presentations, write reports, and show graphic designs, concept maps, models, as well as their own projects and original ideas.

Teaching and learning mathematics according to the idea of multiple intelligences results in students having an increased grasp on mathematical concepts and a greater ability for teachers to adapt their teaching methods in light of students' individual preferences as well as scientific or technological advances (Afanah & Khazendar, 2004). Due to the diversity of intelligences that individuals have and due to the importance of exploring and identifying these abilities, this study investigated the multiple intelligence test as predictor of students' performance in Mathematics in Junior Secondary Schools in Ekiti state. This study specifically examined:

1. the contribution of multiple intelligence test variables (verbal, logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) to students' academic performance in Mathematics; and
2. If multiple intelligence test discriminated between male and female students.

Research Hypotheses

The following research hypotheses were generated and tested in this study:

1. Variables of multiple intelligence test (verbal, logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) will not significantly contribute to students' academic performance in Mathematics.
2. Multiple intelligence test will not significantly discriminate between male and female students.

Methodology

This study used a descriptive research approach with a survey design. Every Junior Secondary School Two (J.S.S. II) students in Ekiti State's secondary schools served as the study's population for this study. A total of 200 J.S.S. II students from eight schools were included in the study's sample. A multistage sampling technique was used to pick the sample. The first step was to randomly choose four of Ekiti State's sixteen Local Government Areas (LGAs). In the second stage, simple random sampling was used to choose two schools from each of the four (LGAs). In the third stage, considering the gender of students a stratified random sampling procedure was used to pick 25 J.S.S. II students from each of the eight schools.

Two instruments tagged Multiple Intelligence Test (MIT) and Mathematics Performance Test (MPT) were used to collect relevant data for the study. Multiple Intelligence Test (MIT) consisted of two sections. Section A sought for demographic information about the respondents while section B consisted of fifty intelligence test question with two options (Yes or No) which elicited information on verbal, logical, visual, bodily, self (intra-personal), social (inter-personal), and musical. There were two sections to the Mathematics Performance Test (MPT). There were 50 objective questions in Mathematics with four alternatives (A to D) as taught by teachers of Mathematics in sections A and B. Section A asked for demographic information on the respondent's school, gender, identity number, and local government area.

The face and content validity of the instruments were determined by the employment of Mathematics Education and Test and Measurements experts. The instruments were said to have facial relevance and consistent with the subject matter, the instrument was meant to measure. In ascertaining the reliability of the instruments, the test re-test method of reliability was adopted. A correlation co-efficient value of 0.802 and 0.837 were obtained for MIT and MPT respectively, which were considered high enough to make the instruments reliable. The responses obtained were collated and analysed using inferential statistics of multiple regression and t-test analysis at 0.05 level of significance.

Results

Research Hypothesis 1: Variables of multiple intelligence test (verbal, logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) will not significantly contribute to students' academic performance in Mathematics,

Table 1: Multiple regression analysis showing the contribution of variables of multiple intelligence test on students' academic performance in Mathematics

R= 0.886, R²=0.785, Adjusted R²=0.781						
Variables	Unstandardized Coefficients		Standardized Coefficients Beta	T	Sig.	Remark
	B	Std. Error				
(Constant)	37.527	4.113		9.124	.000	
Verbal	.507	.063	.410	8.048	.000	Accept
Logical	.622	.080	.519	7.775	.000	Accept
Visual	.535	.081	.435	6.605	.000	Accept
Bodily	.518	.069	.425	7.507	.000	Accept
Self (intra-personal)	.551	.086	.447	6.407	.000	Accept
Social (inter-personal)	.509	.082	.408	6.207	.000	Accept
Musical	.401	.071	.327	5.648	.001	Accept

(F (6, 193) = 17.052; p < 0.05).

Table 1 showed the combination of the independent variables (verbal, logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) account for 78.5% of the variance on students' academic performance in Mathematics ($R^2_{(6, 193)}$ adjusted = 0.785). The analysis of variance of the multiple regression data yielded an F-ratio value which was found to be significant at 0.05 alpha level (F= 17.052; p< 0.05). This implies that the null hypothesis was rejected.

Variables of Mathematics intelligence (verbal, logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) significantly contributed to students' academic performance in Mathematics as Verbal ($\beta = 0.507$; t= 8.048; p < 0.05), Logical ($\beta = 0.622$, t = 7.775; p < 0.05), Visual ($\beta = 0.535$, t = 6.605; p < 0.05), Bodily ($\beta = 0.518$, t = 7.507; p < 0.05), Self ($\beta = 0.551$, t = 6.407; p < 0.05), Social ($\beta = 0.509$, t = 6.207; p < 0.05) and then Musical ($\beta = 0.401$, t = 5.648; p < 0.05). Hence, variables of multiple intelligence test (verbal,

logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) significantly contributed to students' academic performance in Mathematics. The logical component of the intelligence test has the highest effect on students' academic performance in mathematics while the musical component has the least.

Research Hypothesis 2: Multiple intelligence test will not significantly discriminate between male and female students

Table 2: t-test analysis for gender difference in Multiple intelligence test

Variations	N	Mean	SD	Df	t-cal	p-value
Male	93	35.94	2.26	198	16.375	0.000
Female	107	29.03	3.63			

P<0.05

Table 2 shows that the t-cal value of 16.375 is significant because the p-value of $0.000 < 0.05$ at 0.05 level of significance. This implies that null hypothesis is rejected. Hence, multiple intelligence test significantly discriminated between male and female students as male students performed better than female students with a mean difference of 6.91.

Discussion

The findings of the study revealed that variables of multiple intelligence test (verbal, logical, visual, bodily, self (intra-personal), social (inter-personal) and musical) significantly contributed to students' academic performance in Mathematics. The logical component of the intelligence test has the highest effect on students' academic performance in Mathematics while the musical component has the least effect. Cooper (2010) discovered a statistically significant correlation between student math success and the application of the theory of multiple intelligences and metacognitive abilities. Nwagu and Nwagu (2013) demonstrated that students taught using the Multiple Intelligences Approach acquired more knowledge than students taught using the conventional teaching approach. Al-Alwan (2008) found that among 4th graders, linguistic, logical-mathematical, spatial, and bodily-kinesthetic intelligences were the most often favored.

Male students outperformed female students on the multiple intelligence test, which was shown to be skewed in favor of male students. Alabdulkarim and Alhelew (2014) found that male students develop in self- and body intelligence whereas female students advance in verbal intelligence, which lends credence to the conclusion of this study. Alsalamah (2012), on the other hand, revealed no statistically significant differences in numerous IQ tests between pupils based on gender. In terms of multiple intelligences patterns, Aljarah and Rababah (2011) observed no differences between male and female students.

Conclusion

Sequel to the findings of this study, it was concluded that multiple intelligence test contributed to students' academic performance in mathematics, and that male students performed better than female students in multiple intelligence test.

Recommendations

Based on the findings of this study, it was recommended that Mathematics teachers should design their teaching methodologies with the dominant multiple intelligences. Also, teachers should frequently measure the multiple intelligences among students and use the feedback to improve students' performance in Mathematics.

References

- Afaneh, I., & Khazendar, N. (2004). Levels of multiple intelligences for basic education students in Gaza and its relationship with achievement in mathematics and tendencies towards it. *Journal of Human Studies*, 2(12), 323-366.
- Alabdulkarim, S. O., & Alhelew, B. S. (2014). Multiple intelligences prevalent among children in Riyadh, *Journal of Modern Education Association*, Issue 20, 71-110.
- Al-Alwan, A. F. (2008). Identifying the intelligence preferences among 4th and 8th graders in accordance with multiple intelligence theory, *Dirasat Journal*, 6(2), 454-474.
- Aljarah, A. D., & Rababah, H. A. (2011). Multiple intelligences and its relationship with solving problems among outstanding students in Jordan, Umm Al Qura University. *Journal of Educational and Psychological Science*, 3(1), 69-120.
- Al-Salameh, E. (2012). Multiple intelligences of the high primary stage students. *International Journal of Psychological Studies*, 4(1), 196-204.
<http://dx.doi.org/10.5539/ijps.v4n1p196>
- Armstrong, T. (2000). *The multiple intelligences in the classroom*, 2nd. Alexandria, Virginia USA.
- Cooper, F. (2010). *An examination of the impact of multiple intelligences and metacognition on the achievement of mathematics students*. Capella University.
- Elbaz, K. (2006). The effectiveness of the primary school science program in light of the multiple intelligences theory in the development of achievement and natural intelligence and learning patterns amendment. In *Tenth engineering conference of the Egyptian society for engineering education, Engineering education present and visions of the future challenges* (No. 1, pp. 8-33).
- Gardner, H., & Hatch, T. (1989). Multiple Intelligences go to school: Educational implications of the theory of Multiple Intelligences. *Educational Researcher*, 18(8), 4-9.
- Joan, V. & Robert, J. (2017). Using Multiple Intelligence Theory in the Mathematics Classroom. *Mathematics Educator*, 8(5), 108 – 117
- Nwagu, E. & Nwagu, E. (2013). Effectiveness of multiple intelligences teaching approach in drug education of pupils in Enugu State of Nigeria. *Journal of Education and Practice*, 31(9), 21-24
- Olofin, S.O. and Kolawole, E.B. (2020). Effect of Kolawole's Problem-Solving Teaching Strategy on the Academic Performance of Secondary School Students in Mathematics in Nigeria. *Advances in Social Sciences Research Journal*, 7(2) 68-77. DoI:10.14738/assrj.72.7749.



- Oluwatayo, J. A. (2013). Gender differences and performance of secondary school students in mathematics testsg. *European Journal of Educational Studies*, 3(1), 173-179.
- Opara, I. M. (2014). *Psychological Testing, Principles and Techniques*. Owerri Career publisher
- Thomas, A. (2006). *Multiple intelligences in the classroom* (2nd ed.). Translation Dhahran national schools, Educational Book House, Kingdom of Saudi Arabia.

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