The Dynamics for Differential Performance of Secondary School Students in Mathematics

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Abstract
The study reconnoitered the dynamics for differential performance of secondary school students in mathematics. Two hundred and fifty (250) secondary school students are randomly selected from twenty five (25) senior secondary schools transversely nine local government areas in the three senatorial districts of Ekiti State which comprises of fifteen (15) public schools and ten (10) private schools. A general question was generated and answered descriptively, while three hypotheses were formulated and tested using t-test and ANOVA statistics. The result show that significant difference existed between male and female performance as well as their attitude with respect to their academic performance in mathematics. Significant difference equally existed in the views of students across different age groups on the variation in differential performance of secondary school students in mathematics at $p<0.05$. It is recommended that government at all level as well as the stakeholders should provide more teaching – learning facilities in schools to make the learning environment more attractive and that teachers should diversify their methods of teaching in order to embrace individual differences.

Keywords: Dynamics, gender, mathematics, attitude, age, performance, secondary schools.

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1 Introduction

Mathematics is used throughout the world as an essential tool in many fields, including natural science, engineering, medicine, finance and the social sciences. According to Lassa (1999), mathematics is used in finding the answers to questions and problems which arise in everyday life and in trade and professions. Mathematics therefore is about general objective and not just about numbers as it helps to study the happenings and situations in greater details, with the use of well-defined notations or symbols.

Right from the onset, there has been some students that perform very well in mathematics and there are some with low expectation. That is, their performances are very low and not encouraging. There are several factors that are responsible for this dynamics in differential performance of students academically.

Academic performance connotes the actions of a person or group when given a learning task. It was argued that academic performance of a student depends on his learning style by Awotunde (1997) who opined that academic performance is the behaviour exhibited by an individual, which was noticeable after one has undergone a stipulated programme in the school. This programme could be a course work for a particular class, period of time or a whole school periods.

Abe (2003) argued that academic achievement is the level of performance that is exhibited by an individual, that is, the extent to wish one is able to accomplish a task, trade, profession, training or learning. It was equally viewed as the level of proficiency and knowledge demonstrated by an individual after learning has occurred.

Abe & Gbore (2003) in their study on comparability of students' performance in multiple choice and true – false mathematics achievement test, found that there was no significant difference between the performance of boys and girls on multiple choice and true – false test format. In another study, Adebayo & Adams (1983) attempted to establish the impact of sex and school types in the biology achievement test, 150 forms were given to students using 50 multiple choice questions. The result showed that there was no significant difference in the scores of boys and girls respectively.

Daramola (1982) investigated the influence of location and sex difference on the knowledge of basic physics by senior secondary school 3 students in Kwara State. The sample for the study consisted of 172 boys and 110 girls making a total of 282 students. The result of the study revealed that male and female students' scores on the test were not significantly different. Famejuro (1986) & Okonwo (1983) showed the difference between cognitive structure and gender of students in mathematics and sciences, looking at the issue closely, development of sex difference is intricately facilitated and interwoven with the gradual process of socialization of many families, peer group and age, grades, religious institutions, schools and mass media. Thus, sex differential, connotes the acquisition of distinct sex roles for boys and girls

Factors likes the child's attitude towards mathematics and science subjects, his/her socio-economic status and heredity have been forwarded as having effect on the performances of students in mathematics. In addition, parents assume that their children will be uninterested in a school subject just because they weren't when they were younger.

Interest they say is the bedrock of any meaningful achievement and interest which is related to attitude seems to be the most important thing that leads to success. The learners' attitudes surely affect their academic performance because it is what learners are interested in that they can perform better in. Aminu (1987) observed that performance of learners can be assumed to be the cumulative effect of the teacher's effort. In teaching, this means that academic performance is the result of what teacher has been teaching which has been evaluated through acquired knowledge of the learners' performance is the notable action or degree of achievement that boys and girls show about the same like for mathematics but girls show greater dislike for calculating numerically.

The performance of students in mathematics have not been sufficiently researched in the country. The age of the learner also affect the performance of the learner. According to Piaget, the major developmental change in cognition is that the cognitive process become shaper and more elaborate with age. As he has pointed out in school setting, male and female adolescence are able to have abstract concepts and complexity rules more easily than younger children. Their capacity to deal with mathematical work and to abstract propositions increase. This is partly due to maturation process, increasing practice and experience in those areas that occur as children climb up the educational ladder.

There are numerous debates on the association between gender and their respective performances in mathematics. Gray (1975) determined the existence of sex difference in intellectual development performance and she concluded that boys are more successful than girls in science. Canon (1980) also found that boys performed better in numerical ability compare to the girls counterparts. Niemivirta (1997) reported that there is a difference in academic interest between genders. The research highlighted that males are more extrinsically motivated while females are more intrinsically motivated in terms of furthering their education.

However, given the same opportunity with adequate motivations, it is yet to be proved either biologically or psychologically, why boys could perform better than girls in mathematics. It is on the basis of this argument that this study was carried out to find out the extent to which sex factor affected the academic performance of students in mathematics.

1.1 Purpose of the Study

The study sets out clearly to investigate the dynamics for differential performance of secondary school students in mathematics in Ekiti State, Nigeria. Based on these, three research questions were formulated to assist the study.

1.2 Research Questions

From the purpose of the study stated above, the following three research questions were formulated for the study.

1. Is there any significant difference between male and female students in their academic performance in mathematics?
2. Is there any significant difference in the attitude of male and female students in private and public schools towards their academic performance in mathematics?
3. Is there any significant difference in the performance of male and female students in mathematics with respect to their ages?

1.3 Hypotheses

Based on the research questions above, the following hypotheses were formulated to guide the study.

H_1: There is no significant difference between male and female students in their academic performance in mathematics
H_2: There is no significant difference in the attitude of male and female students in private and public schools towards their academic performance in mathematics
H_3: There is no significant difference in the performance of male and female students in mathematics with respect to their ages

1.4 Methodology

The study is a descriptive research of survey type which elaborate firmly the dynamics for differential performance of secondary school students in mathematics. It is a survey type which aimed at collecting data on and describing in a systematic manner the characteristics, features or facts about a given population.

1.5 Population

The target population for the study consist of all public and private secondary schools in Ekiti State totaled three hundred and twenty (320) secondary schools which comprise of two hundred (200) public and one hundred and twenty (120) private secondary schools.

1.6 Sample and Sampling Techniques

A sample of two hundred and fifty (250) secondary school students was randomly selected from twenty five (25) senior secondary schools. The twenty five (25) schools were purposively selected from the three hundred and twenty (320) public and private schools in both rural and urban areas from nine (9) local government areas across the three senatorial districts of Ekiti State.

1.7 Instrument

The instruments used for the study is a questionnaire designed to collect the opinion of students on the dynamics for differential performance of secondary school students in mathematics in Ekiti State. The instrument was prepared by the researchers and modified based on some attitudinal variables of students towards mathematics. Respondents were asked to respond by ticking the appropriate response using the adaptation of 4 point likert scale ((strongly agree (SA), agree (A), disagree (D), strongly disagree (SD))

1.8 Validity of Instrument

The face and content validities were established by three test and measurement experts from mathematics department, College of Education, Ikere – Ekiti and it was represented to two test and measurement experts from the Institute of Education, Ekiti State University, Ado – Ekiti. While the construct validity and reliability was determined by the researcher using Cronbach Alpha. The result of the estimate was 0.72 and this index is considered high and significant enough for this kind of study and it corroborate the stance of Macintosh (1974) who argued that reliability coefficient of any instrument should range between 0.50 – 0.85 and above. The completed questionnaire were collected from the respondents and analyzed accordingly. There was no instrument mortality.

1.9 Data Analysis

The data collected were analyzed descriptively to answer the general question while *t-test* statistic and ANOVA was used to test the three hypotheses formulated at 0.05 level of significance using SPSS version 20.

2 Results

This section explains the descriptive analysis and the hypotheses using *t-test* statistic and ANOVA. The test statistics were used to test the six hypotheses formulated at $p<0.05$.

Table 1: View of the students on the dynamics for differential performance of students in mathematics.

S/N	ITEMS	RESPONSES								DECISION
		SA	%	A	%	D	%	SD	%	
1	Sex has effect on the performance of students in mathematics	22	22	32	32	34	34	12	12	Disagree
2	Students like solving mathematics on their own	9	9	23	23	46	46	22	22	Disagree
3	Attitude of boys and girls affects their performance in mathematics	18	18	39	39	25	25	18	18	Agree

4	Age differences had effect on the performance of boys and girls in mathematics	22 22	38 38	25 25	15 15	Agree
5	Students perceived mathematics as a less difficult subject	10 10	30 30	43 43	17 17	Disagree
6	Students will be happy if mathematics teachers organize extra lessons apart from school time	27 27	38 38	19 19	16 16	Agree
7	Students would like mathematics to be made optional to every students	18 18	40 40	24 24	18 18	Agree
8	Students should not be allowed to use the internet whenever they have mathematics problems	19 19	29 29	30 30	22 22	Disagree
9	Students are of the opinion that only science students should offer mathematics	26 26	28 28	29 29	17 17	Disagree
10	Students have a general idea that mathematics is the most difficult subject	32 32	36 36	13 13	19 19	Agree

2.1 General Question

What is the general view of students on the dynamics for differential performance of secondary school students in mathematics in Ekiti State?

Table 1 above show that the respondents indicate agree to items 3, 4, 6, 7 & 10 while the respondents opinion is centered on disagree to items 1, 2, 5, 8, & 9.

2.2 Hypotheses Testing

H_{01}: There is no significant difference between male and female students in their academic performance in mathematics

Table 2: *t* – test analysis of the response of male and female students

Sex	N	Mean	SD	df	$t_{(cal)}$	$t_{(tab)}$	Decision
Male	130	35.02	5.08	248	2.126	1.96	S
Female	120	35.73	6.32				

$p < 0.05$ level of significance. S = Significant.

The mean view of male students is (35.02) which is less than the mean view of female students (35.73) with a mean difference of (0.71) which is marginal. Its measure of variability has difference of (1.24). The *t-test* analysis show that $t_{(cal)}$ (2.13) is greater than the $t_{(tab)}$ (1.96) at $p < 0.05$ level of significance. This implies that there is significant difference between the views of male and female students in their academic performance in mathematics hence the null hypothesis is not upheld.

H_{02}: There is no significant difference in the attitude of male and female students in private and public schools towards their academic performance in mathematics

Table 3: *t* – test analysis of the response of male and female students

Sch.	N	Mean	SD	df	$t_{(cal)}$	$t_{(tab)}$	Decision
Private	110	19.17	5.861	248	3.002	1.96	S
Public	140	15.25	4.862				

$p < 0.05$ level of significance. S = Significant.

The mean view of students in private schools is (19.17) which is greater than the mean view of students in public schools (15.25) with a mean difference of (3.92). Its measure of variability has difference of (0.999). The *t-test* analysis show that $t_{(cal)}$ (3.002) is greater than the $t_{(tab)}$ (1.96) at $p < 0.05$ level of significance. This implies that significant difference exist between the views of students in private and public schools with respect to the attitude of male and female students in their academic performance in mathematics hence the null hypothesis is not upheld.

H_{03}: There is no significant difference in the performance of male and female students in mathematics with respect to their ages

Table 4: **ANOVA analysis of views on age difference of students**

Groups	Sum of squares	Df	Mean of squares	$f_{(cal)}$	$f_{(tab)}$	Decision
Between Groups	71.23	2	35.62	4.14	3.07	S
Within Groups	832.08	247	8.58			
Total	903.31	249				

$P<0.05$ level of significance. S = Significant

The sum of squares between groups (71.23) is less than the sum of squares within groups (832.08) with a difference of (760.85). The ANOVA statistical analysis show that $f_{(cal)}$ (4.14) exceed $f_{(tab)}$ (3.07) at $p < 0.05$ level of significance. This imply that there is significant difference in the views of students across different age groups on the variation in differential performance of secondary school students in mathematics, hence the null hypothesis is not upheld.

3 Discussions of Findings

The following were found from the descriptive analysis from Table 1. It is shown that 34% of the respondents disagree that sex does not have effect on the academic performance of students in mathematics, which therefore indicated that sex is a major factor among others in determining the performance of students in mathematics. 46% disagree that that students like solving mathematics questions on their own. 39% agree that attitude of boys and girls affects their performance in mathematics, 38% agree that age difference plays a significant role in the performance of boys and girls in mathematics. 43% disagree that students perceived mathematics as a less difficult subject, 38% agree that students will be happy if mathematics teachers organize extra lessons apart from the usual school time. 40% agree that students would like mathematics to be made optional to every students, 30% disagree that students should not be allowed to use the internet whenever they have mathematics problem, by implication the use of internet should be encouraged as it will serve as a motivation to arouse the interest of students in mathematics. 29% disagree that students are of the opinion that only science students should offer mathematics while 36% agree that students have a general idea that mathematics is the most difficult subject.

It was equally discovered from the study that, at $p < 0.05$ there is significant difference between male and female students in their academic performance in mathematics and also there is variation in their mean perception (0.71). The mean perception of male students (35.02) is less than the mean view of female students (35.73) with the mean variation of (0.71) which is marginal. Its measure of variability has difference of (1.24).
Also, significant difference exist between the perception of students in private and public schools with respect to the attitude of male and female students in their academic performance in mathematics. This findings agreed with that of Jonah K.K et al (2013) who reported that majority of the students (boys and girls) in his study had a positive attitude towards learning mathematics. However, when comparing the attitudes of boys and girls, the results demonstrated that boys were more inclined to positive attitudes than girls. It can be inferred that the attitudes of the respondents were dependent on their gender. This study is equally supported by the findings of Perie, Moran & Luktus (2005), Forgasz, Leder & Vale (2000), Fennema (2000) and Asante (2010). However, this study is at variance with the findings of Ogunkunle (2007), John T.A et al (2015) and Hydea & Mertzb (2009) which concluded that girls have reached parity with boys in mathematics.
The findings of this study further revealed that significant difference existed in the performance of students in mathematics due to age factor. This is corroborated by the findings of Cahan & Cohen (1989), Artman, Cahan & Avni-Babad (2006) and Luyten (2006) which reported that the age of a learner also affect the performance of the learner.

4 Conclusion

Students like and dislike mathematics differently during the study. The steady decline in the girls' fondness of mathematics perhaps account for the corresponding decline in their performance in the subject over the years. In almost a similar degree to the boys, the girls seem to feel that mathematics is important to their future while the boys perceived it as

their area of strength. The pupils' perception on the importance of mathematics accounts for the gender differences and attitudes towards learning of mathematics. From the findings, it can be seen that amongst pupils who had positive attitudes, more boys than girls perceived that their peers thought mathematics was an important subject. The findings also show that there were more girls who had negative attitudes towards learning of mathematics and perceived that their peers thought mathematics was not an important subject. The results obtained showed that majority of the students (boys and girls) had a positive attitude towards learning of mathematics. The maturity stage of the students also played a significant role as age was seen as a major factor in achieving good academic performance in mathematics. It takes some level of maturity for a student to be able to comprehend some abstractness of mathematics concepts.

However, when comparing the attitudes of boys and girls, the results demonstrated that boys were more disposed to positive attitudes than girls. From these findings, it can be inferred that the attitudes of the respondents were dependent on their gender. Relatively, it can be concluded from the responses of this study that the significance or insignificance of mathematics to the students' future career in the modern technological world affects their attitudes towards learning of mathematics.

5.0 Recommendation

Sequel to reviews made, facts encountered and the findings of this study, the following recommendations were offered.

There is need for both state and federal ministries of education and NERDC to improve the quality of mathematics teachers nationwide by regular training and retraining as this will positively enhance the teaching of Mathematics in various secondary schools for maximum academic output.

Mathematics teachers also need to diversify their methods of teaching. This is because teaching methods plays a dominant role in building, promoting and determining students' attitude towards mathematics and it brings parity between male and female students.

Government, communities and school administrators should ensure that all the secondary schools in the state and the nation at large are fully equipped with good facilities. Modern and internet linked libraries must be built in the schools as internet is relevant in stimulating the students' interest in learning mathematics, Abe T.O & Popoola O.E (2015).

Only the competent, experienced and qualified mathematics teachers should be allowed to teach in secondary school with proper remuneration.

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