GENDER DIFFERENCE AND PROBLEM SOLVING SKILLS IN MATHEMATICS

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Abstract

This paper investigated gender difference and student's problem solving skills in mathematics probability by senior secondary school students with a view to determining differences in operational steps and levels of achievers. A total of 300 male and female students were randomly selected from 10 schools in the three educational zones of Niger State. The study is a survey type of research. The instrument used for data collection was an essay test item on probability (ETIP). Three mathematics educators validated the instrument (face and content). The reliability coefficient of the instrument was obtained as 0.87. Data collected were analyzed using difference of means and Anova. The study revealed that: There is no significant difference between the operational steps adopted by male and female studentsand also that there are differences in the operational steps adopted by different levels of achievers. Conclusion and recommendation were given accordingly.

Keywords: Gender, operational steps, mathematics probability, achievers.

Introduction

Gender is the distinction made between words to indicate a difference of sex in the object they denote. Psychologist and researchers have looked into the gender differences in achievement motivation and expectation of failures and came out with many logical reasons. In the past, girls were seen as not being able to achieve as much as boys in the aspect of science, humanities or arts (Linda 2000). Other researchers still proved that there was no significant sex difference in the students' performance in science subjects (Inomesia, 1999). James (2000) also reported that if female students were given positive learning environment that motivates learning, they would achieve as much as their male counterpart. It is observed that under-achievement is a characteristics of members of the minority race.

For example poor children and a lot of girls find it difficult to imagine success in academic and white-collar career related settings (Adam, 1999).

Female student generally show less self-esteem and confidence than male students when it comes to their ability to perform academic task (but more self-esteem in relation to their social abilities such as empathy (Carol, 1997).

There are multitudes of reasons why female students often have less self –esteem and confidence than male students when it comes to academic abilities especially in the area of mathematics probability. The misconceptions students have about the concepts in probability makes it very difficult for them to grasp the topic (Gould, 1991).

This area of mathematics is of great importance to our everyday life and to the technological development of our nation (Wilensky, 1994). Therefore, this study seeks to ascertain gender difference and students problem solving skills in mathematics probability by senior secondary school students with a view to finding the differences in the operational adopted by them. It also aims at determining differences

in the operational adopted by different levels of achievers.

Methodology: The research design adopted for this study is the survey type. The data for the study was collected directly from the students in the selected schools in Niger State. The primary data collected was used to determine the difference in the operational steps adopted by male and female students and levels of achievers.

Sample: The sample for this study was made up of three hundred (male 192 and female 108) students were randomly selected from ten co-educational government owned secondary schools in Niger State. The target population for the study was the year III Senior Secondary (SS) III Mathematics (20,350) students in Niger State.

Instrumentation

The instrument used for this study was five (5) Essay Test items on probability (ETIP) drawn from past questions of Senior School Certificate Examination (SSCE) Conducted by West African Examinations Council (WAEC) and National Examinations Council (NECO). This instrument was subjected to face and content validity by three experts with a postgraduate degree in mathematics and at least ten years of professional experience. To determine the reliability of the test instrument, a field test was carried out using 20 boys and 20 girls randomly selected from SS III class of a different school from the sampled schools. The set of scores obtained was used to calculate the reliability coefficient of the test instrument. The reliability coefficient of the test instrument was obtained as 0.87, which shows a test of high reliability.

Results

Table 1: Mean difference on male and female students' operational steps.

Group	N	S	S^2	$\overline{X}$	Z_c value	Z_t value
Male	192	16.69	278.60	30.51		
Female	108	17.55	308.05	29.48	0.4965	1.96

- Not significant at the 0.05 level.

Table 1 presents difference of means comparison of the male and female students score in mathematics probability calculation. Z_c - value of 0.4965 was not significant at the 0.05 level ($/z_c/<z_{t-\alpha/2}$ i.e $0.4965<1.96$). On this basis, H_{01} was accepted. This is an indication that there is no significant difference in the operational steps adopted by male and female students in solving mathematics probability problems. In other words, the operational steps adopted are not affected by gender.

Table 2: Mean scores of Different levels of achiever according to operational steps.

Operational steps	Lower Achievers	Average Achiever	High Achiever
1	2.83	12.43	16.56
2	2.84	11.97	15.47
3	3.15	9.41	17
4	1.84	8.91	16
5	0.96	8.54	0

Table 3 : Anova on operational steps of different Achiever levels.

Achiever levels	F_c	F_t	Decision
Achiever level	36.36*	10.13	Reject $H0_2$
Lower achiever	358.96*	10.13	" "
Average achievers	13.28*	10.13	" "

- Significant at the 0.05 level

Table 2 revealed the mean scores of different levels of achievers according to operational steps. Table 2 was used to carry out the calculations of Anova comparison on operational steps adopted by students according to achiever levels. Table 3 above revealed calculations according to achiever levels. The F_c – calculated values (36.36,358.96, and 13.28) for low, average and high achievers are significant at the 0.05 level. In each case that is, low, average, and high achievers F_c –calculated values are greater than the critical Ft –table value (10.13) at the 0.05 level. On this basis, Ho_2 was rejected and it alternative accepted. Hence, there were significant differences in the operational steps adopted by different levels of achievers in mathematics probability problems. The average achievers (F_c -358.96) performed better than the low (36.36) and high achievers (F_c -13.28) in the mathematics probability calculation. The higher achievers did well in step 1-4 (table2) but none of them was able to evaluate the fractions in step 5. The low achievers could not perform well because they were unable to apply the operational steps correctly as other levels of achievers.

Discussion

This study investigated gender difference and students' problem solving skills in mathematics probability by senior secondary school students. The finding of this study indicates that:

There is no significant difference in the operational steps adopted by male and female students in mathematics probability calculations. There were differences in operational steps adopted by different levels of achievers in mathematics probability calculations. The result of the study reported are similar to the earlier finding in the related

studies (Inomesia, 1999 and James, 2000). From these findings, it is clear that operational steps adopted in mathematics probability calculation are not affected by gender. The implication is that female student can do as well as their male counterparts if given equal opportunity.

The findings of Gould (1991) in the study on misconceptions student have about the concept of probability would have contributed to the differences in operational steps adopted by different level of achievers. Likewise Edwin (1996) asserted that students difficulties in probability calculation arise from operational steps adopted. From these findings therefore, it implies that performance of different level of achievers (low, average, high) depends on how each achievers level is able to understand the operational steps adopted in solving the problems.

Conclusion and recommendations

Finally, the conclusion is that government, parents –teachers association, and other professional bodies should continue to make profound contribution to the creation of positive learning environment for a better performance. During classroom instruction, teachers should check the operational steps adopted by the students in solving mathematics probability problem with a view to correcting their mistakes to enhance better performance in mathematics. Similar study should be carried out using other mathematics topics with a view to identifying student's problem that lead to poor performance.

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Appendix
Computer result on analysis of variance (Anova) used on different levels of achievers.

Univariate F-tests with (1, 3) d f .

Variable	Hypothesis	Error SS	Hypoth. M.S	Error M.S	F
A	165.78001	1.38552	165.78001	.46184	358.95551
H	471.87735	106.56351	471.87735	35.52117	13.28440
L	12.75683	1.05256	12.75683	.35085	36.35945

Where

A= average Achiever
H=high Achiever
L=low Achiever

Formula used to calculate the mean Difference on male and female students' operational steps.

Where

$$Z_c = \frac{\bar{X}_m - \bar{X}_F}{\sqrt{\frac{s^2 m}{n_m} + \frac{s^2 f}{n_f}}}$$