Influence of Sex and Superstitious Beliefs on Pupils Academic Performance in the Early Years' Science in South Eastern Nigeria

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Abstract
The sex of early childhood pupils studying science may make them react differently to natural circumstances or situations around them. This may be due to the way they were brought up from infancy to view natural phenomena around them from the perspective of supernatural forces. This study was therefore designed to investigate the influence of sex and superstitious beliefs on academic performance of pupils in early childhood science. The independent variables were sex and the levels of superstitious beliefs of pupils while the dependent variable was academic performance of pupils in the early years' science. The ex-post factor research design was adopted for the study. A sample of four hundred (400) pupils was randomly selected for the study through the stratified and random sampling techniques from a population of fifteen thousand, four hundred and sixty-three (15,463) primary six pupils. A total of twenty (20) out of three hundred and seventy- two (372) public primary schools were used. Data for the study were collected through a forty (40) item three-point Likert-scale type questionnaire called Superstitious Beliefs Questionnaire (SBQ), and a twenty (20) item Science Achievement Test (SAT). The data collected were analyzed using two-way analysis of variance (ANOVA). All the hypotheses were tested at five percent ($P < 0.05$) level of significance. A post hoc pair-wise comparison was made using Fisher's least significant difference (LSD) to compare the means of various levels of main effects and interaction effects. The result showed that though girls held more superstitious beliefs than boys, it did not significantly affect their performance in primary science. The interaction of sex with superstitious beliefs did not significantly influence the academic performance of pupils of primary science. However, male and female pupils' academic performance in early childhood science differed for different levels of superstitious beliefs regarding good luck and impending danger. Results concerning good luck and impending danger showed that higher number of male pupils tended to hold fever superstitious beliefs than female pupils, thus performed better in achievement test.

Keywords*: sex, superstitious beliefs, academic performance, early childhood science*

1. Background to the Study

Superstition has been seen as an irrational belief in supernatural agency, black magic, witchcraft, spirits apparitions and deities which are deep rooted but unfounded (Newport & Strousberg, 2001; Wiseman & Watt, 2004; Vyse, 2009). Nduka (1982) noted that such beliefs are propositions that are accepted as true by a society. The acceptance of a proposition as true

means valuing the proposition without any logical or empirical consideration. These propositions are irrationally maintained by ignorance of the laws of nature or by faith in magic or chance (Vyse, 2009). The practitioner believes that the future or the outcome of certain events can be influenced by certain specified behaviours. Most Africans are highly superstitious because of the environment and process of upbringing. According to Ezeife (1993), even a superficial interaction with African rural dwellers will reveal that in most villages, superstitions affect the thinking, belief, reasoning and action of both the youth and the old. Reasoning and thinking are cognitive factors which are among the major factors that affect academic performance (Lovell, 1978).

Several studies have shown that pupils often bring with them to the classroom alternative conception of science. These alternative conceptions differ fundamentally from the knowledge that is transmitted by the science teacher. Many researchers have labeled this phenomenon as alternative framework (Driver, 1989) or student's prior/pre-instructional knowledge (Posner *et al.*, 1982). These studies contended that student's prior knowledge does interfere with the learning of scientific concepts, attitudes, process and products, thus, their academic performance. Ingle & Turner (1981) and Undie *et al.* (2015) claimed that learning of science in Africa has been made difficult by the conflict of science and culture. By this, their study tended to suggest a possible influence of superstition on pupils cognitive development and their academic performance in primary science. Whiting & Whiting (1990) emphasized that unique cultures allocate values differently and that those values have consequences on behaviour. They further claimed that value differences are accounted for with child rearing practices, family structure and belief system. Child rearing practices with regard to sex are prominent in Africa. This may have a direct or indirect effect on superstitious beliefs and academic performance with regard to sex.

Adler (1996) found out that male college students surpass female students in their understanding of science. Similarly, James (2008), quoting Kalu (1990), reported that boys have superior mental and spatial abilities making them better suited for certain mathematical manipulation while girls on the other hand are better in language and writing skills. Thus, boys excel in mathematics and other sciences and girls do better in verbal related subjects. The possible existence of sex differences in intellectual development and problem solving ability has also been investigated. Jacob *et al.* (2002) reported that boys were more successful than girls in solving science problems. Girls differed from the point at which they develop logical abilities, and boys and girls begin to show differences in logical thinking abilities at about eleven years of age.

Zembar & Blume (2009) revealed that in the United States, girls who take up sciences showed a preference for biological science (44% versus 66% for boy), while boys who had out-of school experiences with mechanical and electrical activities choose topics in the physical sciences and engineering (78% versus 22% for girls). Furthermore girls based their selection on what they should know, while boys selected science topics on the basic of what they wanted to know; and by the time they reach adolescence, children have a well-defined identify. The same study by Zembar & Blume (2009) show that girls' regard for science began to decline in junior high school. For example, equal percentage of third grade girls (67%) and boys (66%) responded that what they learned in science classes was useful in everyday life. In seventh grade, both boys' and girls' responses continue to be fairly high (54% and 59%, respectively). However boys retained that attitude through high school while girls' perception of the utility of science fell by 11%. The same is found to be true of interest in a science career. Boys and girls responded the same in the 7th grade but many girls lose

interest by the eleventh grade (Jones *et al.*, 1992).

In an analytical review of students on sex differences, Maccoby & Jacklin (1976) supported the following stereotype opinions that male and female pupils differ. Boys on the average excel in visual–spatial ability. Girls on the average have greater verbal ability than boys. Boys on the average excel in science and mathematics. To account for these differences, they stated that there is a consensus of opinion that the dichotomy is not due to natural differences in the intelligence of the two sexes. Rather, it is attributed to environmental influence. Very early in life, boys are given the chance to tinker with toy objects (for example, building blocks, racing cars and simple machines) that involve many principles inherent in science. Girls often lack this experience and thus, they enter science classrooms feeling insecure about their abilities (Harlen, 1985). Girls then begin to believe they cannot do mathematics and effectively engage in sciences as well as boys. In a task on observation and classification of different samples involving three intact British classes and random sample from second to fourth grade in American classes, Howe & Shayer (1981) observed that boys perform better than the girls on the task. There was a differential effect of experience on the performance of boys and girls though the differences were not significant. However, no sex-related differences in pattern of development of ideas were observed. Alokan (2010) found no sex related effect on pupils' problems and academic performance in general. Other studies that have found significant sex differences in science achievement in favour of girls are those of Etuk-Iren (2001) and Button (1975).

Ecles (2001) reported an overall tendency for boys to hold fewer superstitious beliefs than girls. However, he found the mean difference to be small and insignificant. Zarour (1975), similarly, found that females held more superstitious beliefs with percentages significantly higher than males, but only at the eleventh grade. Angrist (1969) studied sex differences and noted that girls performed better on verbal test and achieved better grades, and that girls are more fearful and nervous while boys show greater confidence, knowledge and higher aspirations. Grose & Simpson (1982) also found a significant difference between male and female students and their attitude towards superstitious beliefs. Females score significantly higher on the attitude and superstition scales, with means of 6.0 as compared to 5.63 and 5.1 for males, respectively.

Though the results of studies on sex-related differences in knowledge and achievement, in general, are inconsistent. Majority of these dealing on science indicate significant differences in favour of males. However, work on the combined influence of sex and superstitious beliefs on academic performance of pupils in childhood science are limited. The objective of this study was to investigate the relationship between pupils' sex, their superstitious beliefs and their academic performance in early childhood science in Eastern Nigeria.

1.1 Research questions

This research attempted to answer the following question: to what extent do sex and superstitious belief influence academic performance of early childhood pupils in science.

1.2 Statement of hypotheses

In other to obtain answers to the research questions, the following null hypothesis was formulated:

There is no significant relationship between sex, superstitious beliefs and pupils' academic performance in early childhood science.

2 Research Methodologies

2.1 Research design

The study was designed to investigate the influence of sex and superstitious beliefs on the academic performance of pupils in early childhood science. An expost-facto design was used to investigate the possible cause and effect relationship between the variables studied. The independent variable was sex and superstitious beliefs of pupils and the dependent variable was academic performance in early childhood science.

2.2 Study area

The research covered the entire five Local Government Areas under Ogoja Educational Zone of Cross River State, Nigeria. Ogoja Educational Zone of Cross River State has five Local government Areas: Obudu, Obanliku, Bekwara, Ogoja and Yala. Each of these has a semi-urban setting which serves as the local government headquarters.

2.3 Sample population/sampling technique

Twenty (20) out of three hundred and twenty seven early childhood schools in Ogoja Educational Zone of Cross River State were randomly selected for the study. Four (4) schools were randomly selected from each of the five Local Government Areas and twenty primary six pupils were randomly selected from each school selected. There were therefore four hundred (400) pupils that constituted the sample population of the study out of a total of fifteen thousand, four hundred and sixty three (15,463) primary six pupils. Out of this total number, eight thousand, nine hundred and forty one were males (8,941), while six thousand, five hundred and twenty two (6,522) were females.

2.5 Instrumentation

After a careful study of theoretical literature in related subjects, the researchers developed two instruments to carry out the study in order to generate data. These were:

1) Superstitious Beliefs Questionnaire (SBQ)
2) Science Achievement Test (SATQ)

The superstitious beliefs questionnaire (SBQ) had 40 questions and these were used to collect data on pupils' superstitious beliefs and practices. The questionnaire was constructed in parts, adapting from the categorization of Bajah (1981). The categories and the number of items in each of the categories included:

1) Good luck (10 items)
2) Bad luck (10 items)
3) Indicators of impending danger (10 items), and
4) Perceived effects (10 items)

The total number of items of all the categories was 40. The questionnaire was face validated by one of the supervisors, an expert from the Department of Curriculum and Teaching, University of Calabar, Nigeria, to arrive at the 40 items used. The researchers developed science achievement test questionnaire. It was a multiple choice objective test. Because of face validation by one of the supervisors of this work, the total number of items was reduced from thirty to twenty. The number was then distributed as six items for reasoning, six for understanding and eight for creativity. The questions for the test were drawn from the early childhood curriculum, generally, and centred on those concepts claimed to have been taught in primary five. This test was used to determine the levels of the primary six pupils' reasoning, understanding and creative abilities.

2.6 Procedure for data collection

The questionnaire for this study was administered to the respondents by the researchers personally. Care was taken to ensure that the same steps in questionnaire administration and timing were the same in all the schools involved. In all the schools, no permission was refused. The pupils were then informed about the purpose of the exercise. They were instructed not to write their names to ensure anonymity, honesty, sincerity and independence in response to reflect their beliefs, feelings and knowledge. The respondents were further assured that the instrument did not constitute any or part of their school assessment but were only meant to aid research in superstitious beliefs and science achievement. The pupils were asked to be careful to avoid mutilation.

The administration of the questionnaire was undertaken during the first term of 2010/2011 school year. Two schools were sampled in a day, giving eight working days to complete data collection with the help of the teachers. All the 400 copies of the questionnaire were returned for data computation and analysis.

2.7 Data preparation and scoring

The entire instrument was coded and scored by the researchers. In superstitious beliefs questionnaire, pupils were expected to answer "True" or "False" or "I don't know" to the items on the questionnaire, which were classified according to the variables they were designed to test. Each was score as "True" (2 marks), "False" (1 mark) and "I don't know" (0 mark).

In science achievement questionnaire, each correct item was scored one mark for the entire twenty questions. This means a respondent could score a maximum of twenty marks: six marks each for understanding and reasoning and eight marks for creativity.

2.8 Procedure for data analysis

Each set of data collected was analyzed using the following procedure.

Hypothesis: There is no significant influence of superstitious beliefs on the academic performance of male and female pupils in early childhood science.

Independent variables: sex and superstitious beliefs.

Dependent variable: achievement in science.

Statistical test: Pearson product moment correlation.

To determine the points of significant difference, a post hoc, pair wise comparison of the levels of superstitious beliefs among boys and girls, and academic performance was done using Fishers least significant difference (LSD) technique for the main effects and interaction effects (Denga, 2003).

3. Results

Hypothesis: There is no significant influence of superstitious beliefs on the academic performance of male and female pupils in early childhood science.

The hypothesis was tested for each of the four components of superstitious beliefs using two-way analysis of variance (ANOVA), with each of the components having three levels, namely, high, medium and low. The results (Table 1) indicated that the main effects of sex for each of the components of superstitious beliefs were not statistically significant ($P \geq 0.05$). This meant generally that sex did not significantly influence pupils' academic performance in early childhood science.

However, the main effects for each of the four components of superstitious belief were statistically significant ($P \leq$ o.o5). This meant that the levels of each of the four components of superstitious beliefs significantly influenced the pupils' academic

performance in early childhood science. On the other hand only the interaction effects of sex and good luck (F=4.309) or sex and impending dangers (F=7.072) were statistically significant since the calculated F values are greater than the critical F value of 3.00 at .05 significant level. This meant that male and female pupils' academic performance in early childhood science differed for different levels of superstitious beliefs regarding good luck and impending danger.

Table 1: Two-way analysis of variance (ANOVA) of the influence of sex and levels of superstitious beliefs on pupils' academic performance in elementary science

Source of Variance	Sum of squares	Df	Mean square	F	Sig. level
Sex	.580	1	.580	.005	.942
Good luck	16102.956	2	8051.478	72.740*	.000
Sex x Good luck	953.862	2	476.931	4.309*	.014
Error	34756.066	314	110.688		
Total	51813.464	319			
Sex	2.897	1	2.887	.023	.880
Bad luck	14198.342	2	7099.171	56.494*	.000
Sex x Bad luck	287.081	2	143.540	1.142	.320
Error	39458.150	314	125.663		
Total	53946.470	319			
Sex	185.126	1	185.126	1.432	.232
Impending danger	9763.680	2	4881.840	37.775*	.000
Sex x Impending danger	1827.947	2	913.974	7.072*	.001`
Error	40579.877	314	129.235		
Total	52356.630	319			
Sex	11.824	1	11.824	0.093	.761
Perceived effects	11525.941	2	5762.970	45.245*	.000
Sex x Perceived effects	282.936	2	141.468	1.111	.331
Error	39995.371	314	127.374		
Total	51816.072	319			

* P<.05. Critical F (1,314), Critical F (2,314) = 3.00

A post hoc, pair wise comparison of the levels of superstitious beliefs and sex was done using Fishers least significant difference (LSD) technique for the main effects and interaction effects (Table 2). For good luck, bad luck and explanation of perceived effects, there was a significant difference between any pair of levels. However, for impending danger, there was no significant difference in the academic performance of pupils in high and medium levels. The result for good luck showed that there was a significant difference between all pairs of mean scores except male high/female high, male medium/female medium. Similarly, for superstitious beliefs regarding impending danger, all pairs of mean score were significantly different except male high/female medium, female high/male medium and male low/female low.

Discussion

The results indicated that superstitious beliefs among male and female pupils taking early childhood science were the same and these did not affect their academic performance

differently (Table 1). This was expected. Baily (1962) had shown that though boys had an overall tendency to hold fewer superstitious beliefs than girls, there was no significant difference between them in their beliefs. Consequently, both sexes performed the same in their studies.

The result of the current study might appear to conflict with that of Zarour (1975) who reported a significant difference between male and female pupils in superstitious beliefs with females holding higher beliefs than males. Consequently, male pupils performed significantly higher than female pupils in science. However, their study was undertaken at the 11^{th} grade. At grades higher than primary, researchers have reported that the environment and society protected by tradition and belief systems defined the limit the female pupils could go (Adler, 1996; Kalu, 1990; James, 2008). This may explain what appears to be a difference in superstitious beliefs and its effects on the performance at higher grades.

Since male and female pupils of primary science hold the same superstitious beliefs and perform at par in their academics, it means both sex were created equal. Both sex, therefore have equal potential to take up any discipline and succeed without bias, given the same environment and orientation.

The main effects due to good luck, bad luck, perceived effect and impending danger significantly influenced academic performance in primary science. This also was expected. The significant effect is a confirmation that the level of each of the four components of superstition as established in hypothesis I, when averaged over sex, had a contributory effect on the academic performance in primary science.

There was no significant interaction between sex and bad luck or sex and perceived effect (Table 2). However, there were significant interactions between sex and good luck and also between sex and impending danger. For these attributes, therefore, there were significant differences between male and female pupils in their superstitious beliefs, thus, academic performance. Generally from the results concerning good luck and impending danger higher number of male pupils tended to hold fever superstitious beliefs than female pupils, thus, they performed better in achievement test. Though the results of studies on sex-related differences in superstitious beliefs or knowledge and achievement in general are inconsistent, majority of these based on science achievement indicated significance in favour of male pupils' spatial abilities, making them better suited for certain scientific manipulations, while girls were better in languages and writing skills. These findings are supported by other research findings such as those by Maccoby & Jacklin (1976), Oakes (1990), Janovic 1994) and Etuk-Iren (2001). Maccoby & Jacklin (1976) however, attributed any such dichotomy between boy and girl pupils to environmental and not to genetic influence.

Table 2: Pair wise comparisons of the mean academic performance of male and female pupils for various levels of superstitious beliefs regarding good luck and impending danger

Component of Superstitious belief	Sex	Level	N	1	2	3	4	5	6	
Good luck	1. Male	High	15	27.500[a]	1.000[b]	10.338*	3.349*	25.921*	21.535*	25.921*
	2.Female	High	13	8.829[c]	28.500	9.338*	2.349*	24.921*	20.535*	
(MSE=110.6)	3. Male	Medium	93	6.417	6.948	37.838	3.011	15.5583*	11.197*	
	4.Female	Medium	66	6.592	7.109	3.711	40.849	12.572*	8.186*	
	5. Male	Low	142	6.258	6.801	3.078	3.428	53.421	4.386	
	6.Female	Low	71	6.549	7.070	3.634	3.935	3.345	49.035	
Impending danger	1. Male	High	40	35.156[b]	10.915*[b]	8.386*	4.111	19.219*	18.231*	
	2.Female	High	17	7.140[c]	46.071	2.529	6.804*	8.304*	7.316*	
(MSE=129.2)	3. Male	Medium	120	4.548	6.374	43.542	4.275*	10.833*	9.845*	
	4.Female	Medium	94	4.705	6.487	3.434	39.267	15.108*	14.120*	
	5. Male	Low	90	4.757	6.508	3.474	3.676	54.375	0.988	
	6.Female	Low	39	5.615	7.174	4.603	4.758	4.785	53.387	

Note: a = Mean scores are along the principal diagonal, b = Difference between mean scores are above the principal diagonal, .c = Critical LSD values are below the principal diagonal, P < .05.

Sex difference in relation to superstitious beliefs as it influenced achievement in science had also been reported. Baily (1962) reported an overall tendency for the male pupils to hold fever superstitious beliefs than girls, though not significantly. Zarour (1975) similarly found that female pupils held more superstitious beliefs than male pupils, but this difference started exhibiting only from the eleventh 11th grade (Jacob *et al*., 2002).

4.1 Summary of the study

The results obtained from this study showed that:

1) Academic performance in early childhood science was not sex related.
2) Though girls held more superstitious beliefs than boys, it did not significantly affect their performance in primary science.
3) The interaction of sex with superstitious beliefs did not significantly influence the academic performance of pupils of primary science.

4.2 Conclusion

It may be concluded that in the teaching/learning situation, both male and female pupils of early childhood science have equal ability to learn or undertake any field of study without bias. On the whole, it should be borne in mind that superstitious beliefs still have a significant influence on the academic performance in early childhood science irrespective of sex of the pupil.

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