

EFFECT OF INDIVIDUALISED INSTRUCTION ON THE ACADEMIC PERFORMANCE OF PUPILS' IN BASIC SCIENCE AND TECHNOLOGY

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Abstract

Poor Performance in basic science and technology at the primary school level of education might be as a result of inappropriate use of teaching strategy by the teachers. Based on this reason, the researcher examined the effect of individualized instruction on academic performance of pupils in Basic science and technology in Ilorin East LGA Kwara state. Pre-test post-test quasi-experimental control group research design was adopted. Purposive sampling technique was used to select primary 5pupilsschools because of their ability to answer questions on performance test. Random sampling technique was used to select 4 schools, two public and two private. Pupils Basic science and Technology Performance Test (PBTPT) was used as pre-test and post-test respectively. The instrument was validated by the science teachers. Thus, Pearson Product Moment Correlation (PPMC) was used to determine the reliability coefficient of the instruments and the reliability coefficient of 0.83 was obtained. The treatment lasted for 6 weeks and it was carried out by the researcher and the research assistants who are class teachers of the schools selected. The procedure adopted was to give pre-test developed based on the topics chosen to the pupils before the treatment. After this, those in the experimental group were taught the selected topics using individualized instruction and control group were taught using conventional method. Data collected were analyzed using Analysis of Covariance (ANCOVA). All the hypotheses were tested at 0.05 level of significance. The results showed that, there was a significant effect of treatment on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = 12.498$; $P < 0.05$), there was no significant effect of gender on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = .711$; $P > 0.05$), there was no significant effect of school-type on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = .4.082$; $P > 0.05$), It was concluded that individualized instructional method is effective in teaching basic science. Based on the findings, the following recommendations were made that individualized instructional method should be adopted by science teachers as the strategy to be used for the content delivery and that gender and school types should be considered while using individualized instructional strategy.

KEY WORDS: Individualized instruction, Basic science, Technology, Gender, School-type

Introduction

Basic Science and Technology Education is the way in which learners in basic schools try to learn and understand their environment, observe and explore their environment. Science should be introduced to children even before they get to primary school in order for the children to learn quickly while in primary school. Children at their early years learn quickly using all their senses and the whole body to take sensation and to experience the global village they are. By this time in their lives, they like playing with most of their time. Through play activities, they explore and develop social, emotional, psychomotor, language and physical developments (Ewesor&Beatrice, 2015). Children are biologically prepared to learn. They are inquisitive and eager to satisfy their curiosity at the slightest opportunity (Concenizio & French, 2002)

The National Policy on Education (2004) stated one of the objectives of primary education as the laying of a sound basis for scientific and reflective thinking. This is based on the Federal Government of Nigeria adoption of science education as an instrument par excellence of national development (Ogunkola, 2000). Therefore, many subjects are been taught at the primary level of which basic science and technology is one of the core subjects. Almost all young children in all environments do science and they engross in scientific thinking, constructing a framework of relationship within which factual information can be organized into meaningful and useful concept (Brewer 2007). Ogunleye (2000) averred that science as human activity concerned with the understanding of our world. Science is also regarded as the cornerstone of technological and development of any nation. To achieve the objective of laying a sound basis for scientific and reflective thinking, the teaching of science especially at primary level must be given attention.

As one may be aware that science is the basis on which modern day technological breakthrough is gummed. Some scholars according to their own views have averred Science. Igwe (2003) opined that science as a systematic study of the nature of the behaviour of the material and physical universe through observation, experimentation, measurement and recording. Up to date, countries in the world, especially developing ones like Nigeria, are struggling to develop technologically and scientifically, since the world is turning Scientific and all proper functioning of lives depend greatly on Science. According to Ogunleye (2006), Science is a dynamic human activity concerned with knowledge of our world. This understanding helps man to know more about the universe with the help of technology.

Technology is the systematic ways of making and doing things. It also refers to the application of Arts, science, processes, ideas, skills, tools and machines to solve human problem. Technology includes the use of both sophisticated (highly advanced) and non-sophisticated (simple) tools and method to work effectively (Layeleye, 2005). In the past, service delivery in educational setting has been done through numerous means; from verbal communication to prints and use of instructional materials like pictures and charts. As technology is creating changes in all aspect of our societal life, it is also changing our expectations of students learning, how they learn, and where they learn so as to function in the new world order (Abimbade, 2005).

Kolawole (1999) illustrated part of earliest traits display by a child is his manipulative skills and that he should be exposed to handling many objects in the environment. This is an implication that any effective teaching should be rest effectively on a basis of adequate resources which is very essential when it comes to teaching and learning of Basic science and technology. All the same, the efforts to make science and technology education effective, there has been poor performance of students in science at the secondary school final examination which have consequently led to the low enrolment in tertiary level of education in science related courses (Okoronka, 2004). This poor performance has been traced to the poor science and technology teaching and learning pupils are exposed to at the primary level which is to serve as the basic foundation. This lack of interest in secondary school students and undergraduates has generated much concern about the teaching and learning processes of science and technology especially at the foundation level which is the primary level which usually lead to poor academic performance (Balogun, 2000).

Poor pupils' basic science and technology performance, according to Aremu (2003), is one that is measured by examiners as falling below an anticipated standard. Yusuf and Saadu, (2017) submitted that this poor performance has been attributed to the inability of the pupils to learn, unlearn, and re-learn and the inadequacies in parents efforts to make pupils' read at their various home in order to master and discover new thing on their own different from what they have been taught and exposed to in school. Neglecting the fact that the teacher is a major

influential agent with principles and practices put in place in the teaching and learning procedures in the classroom i.e, both teaching and learning depend on the abilities of teacher to drive home lessons with the appropriate use of instructional materials.

Olakulehin (2007) advocated that any inadequacies in the classroom principles and routines of teachers are likely to influence the achievement, attitude and behaviour of the learner since pupils are the product of such action. Afolabi (2003) also stated that always times poor-achievement by pupils' performance are always linked to the inability on the part of pupils to understand what has been taught neglecting the fact that the totality of what took place around the learners amount to what influences the learners' performance most especially the teachers and their classroom practices in Basic science. This was also evident in pupils' performance in Basic Science and Technology according to Yusuf and Saadu,(2017) in Common Entrance Examination result 2016,2017, 2018 and 2019 respectively where about 65% of the pupils failed aspect of Basic science and Technology in Ekiti Local Government Area of Kwara State. Due to inappropriate use of classroom instruction such as individualised instruction.

Individualised instruction is an instructional mode that is tailored to the need and ability of individual learners. It is an individual-oriented method which seeks to identify the needs of individual, be it physical, social, emotional or intellectual. Individualised instruction means giving suitable instruction to each student. It is not teacher centered, and different students-centered and the purpose is helping students learn what they need using their own learning style and at their own pace (Mbakwem,2001)

Individualised instructional method promotes maximum interaction between and among Social Studies students to enhance efficient decision making while discussing and analyzing social issues. Oyibe and Nnamani (2014) stated that "the method encourages the development of critical thinking and inquiry spirit through interaction, negotiations and clarifications of basic content or ideas because through individualised learning, students enjoy the liberty to advance their own ideas and to benefit from the ideas and views of others. The use of individualised instruction in teaching Social Studies, basic science and the like in schools enables the teachers to see each learner as a unique being that possesses certain peculiar traits, potentials, and abilities. Therefore, it is expected that the teacher should ensure that the unique qualities are carefully put into consideration in the teaching/learning process.

Nnamani and Oyibe (2016) in their study of the effects of individualised instructional method on secondary school students' achievement social studies. Found that students taught Social Studies using individualized instructional method performed better than those taught Social Studies using traditional instructional method. The study also proved that female students in both experimental and placebo groups performed better compared to the performance of male students in Social Studies classroom instruction

Nela,Vesna and Jelena (2018) submitted that Teachers aware and believed that individualised instruction approach is necessary to use in teaching and learning science subjects like mathematics, basic science and technology, etc. This claim is also supported with the fact that they believed that the reasons offered supporting the adaptation and adjustment of the teaching process to different learning abilities of students, relating to both student activity and teacher activity, are valid, and that this is necessary to be done. The results of their study revealed that there students taught using individualized instruction performed better than those students taught using conventional method of teaching in science subjects

Some researchers have reasonably carried out studies on many strategies that would promote the understanding and facilitate the acquisition of some scientific skills in basic science and technology. In public library programme it has been documented and reported all-round the globe. For instance, Olasehinde,(2005). The availability, teacher's awareness and utilization of primary school environmental science resources, Salami and Olotu, 2014 Teachers' Awareness

and Improvisation Skills of Scientific Visual Resources as Determinant Of Pupils Learning Outcomes in Basic Science and Technology, Yusuf and Saadu (2017) also investigated the effects of utilisation of ICT gadgets on academic performance of pupils in Basic science and technology, Nnamani and Oyibe(2016) researched into the effects of individualised instructional method on secondary school students' achievement social studies.

Some researchers recommended the adoption of individualised instruction in the teaching and learning of pupils in all subjects especially in basic science and technology because of its reported effect on pupils' performance and their attitude towards learning of basic science and technology. Therefore, individualised instruction is given priority in this research work. Though from the foregoing, some researchers had investigated into some strategies from different fields, none has worked on the effects of individualised instruction on academic performance on pupils in basic science and technology especially from the location where this study covered

Gender difference in science subjects like, basic science and technology, numeracy, etc is referred to crucial aspect of school achievement (Schrader & Helmke, 2003). However, the picture of gender differences in basic science and technology, numeracy achievement is less clear (Hannover & Kessels, 2011; Stanat et al, 2012). While in some studies boys exceeded girls in basic science and technology, numeracy achievement, in some other studies no gender differences in basic science and technology and numeracy achievement were found. Machin and Pekkarinen (2008) submitted that mixed evidence for gender differences in school performance could be illustrated in part by a higher difference of males in comparison to females' school performance especially in basic science and technology. Yusuf and Saadu (2017) also maintained that there was no significant effect of gender on academic performance of pupils in basic science and technology. This is one of the existing gaps which triggered the conduct of this study to establish whether or not that the performance is gender stereo-type

Better understanding of the effect of school variables on learning is necessary because policy may influence the characteristics of public schools, and the cost of private schools through vouchers and scholarship. Abia (2005) stated that, besides to educational materials supplied to school, the geographical location of a school also influences teaching and learning of students and hence the level of pupils' academic performance. Therefore, type of school dictates what is taught, how it is taught and what materials are available. Abia further maintained that where educative materials are deprived, pupils suffer from academic deterioration and mental imbalance. Also, where the teacher relates positively with the pupils, the school became their academic endeavour while some researchers submitted that there are differences between the performance of pupils from private school and public school respectively. This is also what informed the conduct of this study to establish whether or not the performance of pupils in any subjects especially in basic science and technology is base school-type.

Statement of the Problem

Basic Science and Technology Education is the processing which pupils in basic schools try to learn and understand their environment, observe and explore the environment. It has to do with laying of a sound basis for scientific and reflective thinking. This is based on the Federal Government of Nigeria adoption of science education as an instrument par excellence of national development. It is one of the core subjects offered at both pre-primary and primary school level. Poor performance in basic science and technology at this level of education might be consequences of inappropriate use of classroom principles and practices to include improvisation of instructional materials to aid understanding of the subject matter in the absence of real-materials by the teachers. This has been a source of focus to all elites in education more especially that basic science and technology is a major subject in schools. The poor academic

performance in basic science and technology was also evidence in 2019/2020 common entrance examination and during the interschool competition where pupils failed the aspect of basic science and technology. Based on this reason, the researcher investigated the effects of individualised instruction on pupils' academic performance in basic science and technology in Ekiti Local Government Area of Kwara state.

Research Hypotheses

The following research hypotheses were formulated to guide the study

H₀₁: There is no significant main effect of treatment on academic performance of pupils in basic science and technology in Ekiti Local Government Area of Kwara State.

H₀₂: There is no significant main effect of gender on academic performance of pupils in basic science and technology in Ekiti Local Government Area of Kwara State.

H₀₃: There is no significant main effect of school type on academic performance of pupils in basic science and technology in Ekiti Local Government Area of Kwara State.

H₀₄: There is no significant interaction effect of treatment and gender on academic performance of pupils in basic science and technology in Ekiti Local Government Area of Kwara State.

H₀₅: There is no significant interaction effect of treatment and school-type on academic performance of pupils in basic science and technology in Ekiti Local Government Area of Kwara State.

H₀₆: There is no significant interaction effect of gender and school-type on academic performance of pupils in basic science and technology in Ekiti Local Government Area of Kwara State.

H₀₇: There is no significant interaction effect of treatment, gender and school-type on academic performance of pupils in basic science and technology in Ekiti Local Government Area of Kwara State.

Methodology

This study adopted the pre-test post-test quasi-experimental control group research design. Purposive sampling technique was used to select 4 primary schools because of certain characteristics (Boy and Girl) that relevant to the conduct of this study while random sampling technique was used to select 2 schools one public and one private. Pupils' Basic science and Technology Performance Test (PBTPT) was used. This instrument was used as pre-test before the treatment was administered and also as post-test after the treatment. It was given to both experimental and placebo groups based on topics from the curriculum which pupils were exposed to. The instrument was validated by the science teachers. Items used were established using test retest. Thus, the Pearson Product Moment Correlation (PPMC) was used to determine the reliability coefficient of the instruments. These were found to be reliable at 0.83. The treatment lasted for 6 weeks and was carried by the researcher and the research assistants. The procedure adopted was to give the pre-test developed based on the topics chosen to the pupils before the treatment began. After this, those in the experimental group were taught the selected topics using individualised instruction and control group were taught using conventional method. After the teaching and learning exercises, the test was administered to the two groups again. Data collected was analysed using Analysis of Covariance (ANCOVA). All the hypotheses was tested at 0.05 level of significance

Results

Research Hypothesis One: There is no significant main effect of treatment on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State.

Table 1: Showing the summary of Analysis of Co-variance (ANCOVA) on the effects of individualized instruction on academic performance of pupils in Basic science and Technology in Ilorin East Local Government Area of Kwara state

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	11440.320 ^a	8	1430.040	3.947	.001
Intercept	8721.751	1	8721.751	24.070	.000
Pretest	21.994	1	21.994	.061	.806
Treatment	4528.844	1	4528.844	12.498	.001
Gender	257.604	1	257.604	.711	.401
Schooltype	1479.116	1	1479.116	4.082	.046
Treatment * Gender	630.138	1	630.138	1.739	.191
Treatment * Schooltype	24.685	1	24.685	.068	.795
Gender * Schooltype	5.211	1	5.211	.014	.905
Treatment * Gender *	6.710	1	6.710	.019	.892
Schooltype					
Error	31162.311	86	362.352		
Total	349550.000	95			
Corrected Total	42602.632	94			

Table 1 shows the effect of treatment on academic performance of pupils in Basic science and Technology. Therefore, there was significant effect of treatment on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = 12.498$; $P < 0.05$). Thus, the hypothesis was rejected in the light of the result since the significant level (.001) was less than the 0.05. This implies that treatment had significant effect on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State

Research Hypothesis Two: There is no significant main effect of gender on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State.

Table 1 shows the significant main effect of gender on academic performance of pupils in Basic science and Technology. Therefore, there was no significant effect of gender on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = .711$; $P > 0.05$). Therefore, the hypothesis was not rejected in the light of the result since the significant level (.401) was greater than the 0.05. This implies that gender had no significant effect on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State

Research Hypothesis Three: There is no significant main effect of school type on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State.

Table 1 shows the significant main effect of school-type on academic performance of pupils in Basic science and Technology. Therefore, there was no significant effect of school-type on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = .4082$; $P > 0.05$). Therefore, the hypothesis was not rejected in the light of the result since the significant level (.046) was greater than the 0.05. This implies that gender had no significant effect on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State

Research Hypothesis Four: There is no significant interaction effect of treatment and gender on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State.

Table 1 shows the significant interaction effect of treatment and gender on academic performance of pupils in Basic science and Technology. Therefore, there was no significant interaction effect of treatment and gender on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = 1.739$; $P > 0.05$). Therefore, the hypothesis was not rejected in the light of the result since the significant level (.191) was greater than the 0.05. This implies that interaction effect of treatment and gender had no significant on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State

Research Hypothesis Five: There is no significant interaction effect of treatment and school-type on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State.

Table 1 shows the significant interaction effect of treatment and school-type on academic performance of pupils in Basic science and Technology. Therefore, there was no significant interaction effect of treatment and school-type on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = .068$; $P > 0.05$). Therefore, the hypothesis was not rejected in the light of the result since the significant level (.795) was greater than the 0.05. This implies that interaction effect of treatment and school-type had no significant on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State

Research Hypothesis Six: There is no significant interaction effect of gender and school-type on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State.

Table 1 shows the significant interaction effect of gender and school-type on academic performance of pupils in Basic science and Technology. Therefore, there was no significant interaction effect of gender and school-type on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = .014$; $P > 0.05$). Therefore, the hypothesis was not rejected in the light of the result since the significant level (.905) was greater than the 0.05. This implies that interaction effect of gender and school-type had no significant on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State

Research Hypothesis Seven: There is no significant interaction effect of treatment, gender and school-type on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State.

Table 1 shows the significant interaction effect of treatment, gender and school-type on academic performance of pupils in Basic science and Technology. Therefore, there was no significant interaction effect of treatment, gender and school-type on the academic performance of pupils in Basic science and Technology ($F_{(1; 86)} = .019$; $P > 0.05$). Therefore, the hypothesis was not rejected in the light of the result since the significant level (.802) was greater than the 0.05. This implies that interaction effect of treatment, gender and school-type had no significant on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara State

Discussion of Findings

The result of the study showed significant effects of treatment on the academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara state. The finding was supported by the findings of Nnamani and Oyibe (2016) submitted

that students taught with Social Studies using individualized instructional method performed better than those taught with Social Studies using conventional instructional method. The result was also in agreement with the findings of Nela, Vesna and Jelena (2018) who submitted that Teachers are aware and believe that individualised instruction approach is necessary to use in teaching and learning science subjects like mathematics, basic science and technology, etc. This claim is also supported with the fact that they believed that the reasons offered supporting the adaptation and adjustment of the teaching process to different learning abilities of students, relating to both student activity and teacher activity, are valid, and that this is necessary or desirable to be done. The results of their study indicated that these students taught using individualized instruction performed better than those students taught using conventional method of teaching in science subjects

The findings of this study also indicated that there was no significant effect of gender on academic performance of pupils in basic science and technology in Ilorin East Local Government Area of Kwara state. This was concurred with the findings of Yusuf and Saadu (2017) who submitted that there was no significant effect of gender on academic performance in basic science and technology ($F_{(1; 21)} = 1.405$; $P > 0.05$). This was in contrary with the findings of Nnamani and Oyibe (2016) who found that female students in both experimental and control groups performed better compared to the performance of male students in Social Studies classroom instruction and Machin and Pekkarinen (2008) submitted that mixed evidence for gender differences in school performance could be illustrated in part by a higher difference of males in comparison to females' school performance especially in basic science and technology vi-sa-viz interaction effect of gender and school-type on academic performance of pupils in basic science and technology in Ilorin Local Government Area of Kwara state. This implies that academic performance is gender nor school-type stereo-type it depends on the strategy used by the teachers. Therefore, parents, guardians should not discriminate in enrolling their wards in public or private schools.

Conclusion

Based on the above discussion, it can be clearly stated that individualized instruction can enhance and facilitate better academic performance of pupils in basic science and technology than the conventional method of teaching and learning especially in primary schools.

Recommendations

In the light of this conclusion, the following recommendations were made:

1. Basic science and technology teachers should be enlightened on the effectiveness of jigsaw strategy on pupils' academic performance in basic science and technology as well as in other subjects
2. Practising teachers should be encouraged to learn the use of individualized instruction through seminars and workshops.
3. Pupils' academic performance should not be determined based on their gender and school type because, the two factors have been discovered not to be strong factors that hinder the academic performance of pupils.

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