

Effects of two puzzle-based instructional strategies on primary school pupils' learning outcomes in social studies in Ondo State, Nigeria

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ABSTRACT

The persistent poor achievement being recorded in Social Studies at the primary school level in Nigeria has been attributed to inadequate instructional resources and the use of lecture methods which do not promote active participation of pupils in the teaching-learning process. Most previous studies have not explored the use of Three Dimensional Puzzle-Based Strategy and Paper and Pencil Puzzle-Based Strategy especially in Social Studies classroom which encourage active pupils' participation. This study therefore determined the effects of Three Dimensional Puzzle-Based Strategy (TDPS) and Paper and Pencil Puzzle-Based Strategy PPPS on pupils' achievement and attitude towards Social Studies. It also determined the moderating effects of gender and school location on the dependent variables. The study adopted pretest-posttest, control group, quasi-experimental design, using a 3x2x2 factorial matrix. Two hundred and forty primary 4 pupils from six primary schools purposively selected from three Local Government Areas of Ondo State, participated in the study. Instruments used were: Social Studies Achievement Test ($r = 0.82$), Social Studies Attitude Questionnaire ($r = 0.84$), Instructional Guide on Three Dimensional Puzzle-Based Strategy, Instructional Guide on Paper and Pencil Puzzle-Based Strategy, and Instructional Guide on Modified Conventional Teaching Method. Four hypotheses were generated and tested at 0.05 level of significance. Data were analysed using Analysis of covariance and Scheffe's post hoc test. Treatment had significant main effect on pupils' post achievement score in Social Studies ($F_{(2,227)} = 112.203$; $p < 0.05$). Pupils exposed to TDPS attained highest post achievement mean score ($\bar{x} = 13.103$) in social studies, followed by PPPS group ($\bar{x} = 8.841$) and control group ($\bar{x} = 5.882$). Also, there was significant effect of school location on pupils' achievement in Social Studies ($F_{(1,227)} = 222.203$; $p < 0.05$). Pupils in urban schools had highest achievement mean score ($\bar{x} = 12.093$) than their counterparts in rural schools ($\bar{x} = 6.452$). Similarly, gender has no significant effect on pupils' achievement in Social Studies ($F_{(1,227)} = 1.571$; $p < 0.05$). The two way interaction effect of treatment and gender on pupils achievement in Social Studies was not significant ($F_{(2,227)} = 81.793$; $p < 0.05$). The TDPS and PPPS were effective at improving pupils' achievement and attitude in Social Studies. It is therefore recommended that TDPS and PPPS should be used by Social Studies teachers in order to facilitate active participation of pupils in the classroom and also improve their learning outcomes in the subject.

Keywords: Three-dimensional puzzle strategy, paper and pencil puzzle strategy, social studies, primary schools.

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INTRODUCTION

Social studies as a school subject has occupied an important position in the school curriculum. The subject has been recognized as an effective tool for citizenship

education in Nigeria. It is also a subject that equips the learners with critical thinking and problem solving skills which enable them to tackle problems and issues that

may arise in their socio economic life. According to Akinlaye et al. (1996), social studies in the school curriculum should help all types of students at all levels to develop the ability to adapt to the ever changing environment. Akintunde and Akinola (2006) also argues that since Social Studies is interested in everything about man in relation to all aspects of his environment; the subject incorporates all aspects of reforms and innovations that are geared towards the sustenance of man's environment. In a related study, Falade (2007) asserts that Social Studies enable man to learn about the problem of survival in their environment.

However, despite the importance and relevance of social studies in the school curriculum, it has been observed that the teaching of the subject has been characterized with the use of conventional teaching method where the teacher alone does the talking while the learners remain passive. This has failed to deal effectively with the problem of individual differences and also lead to poor attitude of learners towards the subject. There is therefore, a need to search for more effective instructional strategies that are likely to improve learning outcomes in primary school Social Studies. Such strategies perhaps, include three dimensional puzzle-based instructional strategy and Paper and pencil puzzle-based strategy.

Aremu and Aiyelagbe (1997) describe puzzle as anything in form of toy, usually requiring children to put pieces of materials together to form a specialised whole. In the same vein, Scott (2002) defines puzzles as problems that are fun to solve. Shapiro (2005) also refers to puzzles as problems or games that challenge ingenuity. The Cambridge Advance Learner Dictionary (2008) defines puzzles as a game or toy in which you have to fit separate pieces together or a problem or question which you have to answer by using skill of knowledge.

Aremu and Aiyelagbe (1997) claim that puzzles make learning to be fun and exciting to the learner, thereby leading to the achievement of desirable outcomes. Nair and Pool (1999) also posit that puzzles help children to actively practice important skills and also improve thinking skills of the learners. In the same vein, Anany and Mary (2002) argue that the use of puzzles in teaching and learning improve understanding of abstract concepts and develop problem-solving abilities in students. Gardner (2006) remarks that puzzles-solving is an active type of learning as it engages students with materials more than passive type of review does. He further stresses that the use of puzzles in teaching and learning develop critical thinking and problem solving skills in learners. Research studies according to Idowu and Ige (2007), on the use of puzzles in teaching and learning in Nigerian schools have been scored very low because they are often used for entertainment and relaxation and as such, studies that investigated puzzles especially in concepts that are abstract in nature are very

scarce.

Akinbobola (2005) and Fakorede (1999) stress the view that gender differences predicted academic achievement in favour of male students. Esugbohunge (2000) also reveals that boys had edge over girls in academic achievement. Okeke (2001) in his review of studies equally concludes that gender differences exist in student's achievement in science and any other subject.

Another learning characteristic that can influence students' learning outcome in Social Studies is school location. In related studies, Akintunde and Akinola (2006) and Falade (2007), contend that schools located in urban areas have recorded better performances than those in the rural settings. Olagunju (2002) report that school location in favour of urban centres has significant effect on student attitude towards mathematics and chemistry and any other school subjects.

Statement of the problem

This study investigated the effectiveness of three-dimensional puzzle-based instructional strategy, and paper and pencil puzzle-based instructional method on pupils' learning outcomes in primary school social studies. The study also examined the influence of gender and school location on pupils learning outcomes in Social Studies.

Hypotheses of the study

The following null hypotheses were formulated and tested in the study at $P < 0.05$ level of significance.

HO₁: There is no significant main effect of treatment on pupils' academic achievement in social studies.

HO₂: There is no significant main effect of gender on the pupils' academic achievement in social studies.

HO₃: There is no significant main effect of school location on pupils' academic achievement in social studies.

HO₄: There is no significant interaction effect of treatment and gender on pupils' academic achievement in social studies.

Scope of the study

This study was carried out in primary schools in Ondo State. Six co-educational schools were used in all. Six schools were randomly selected from each of Odigbo, Ondo west and Owo Local Government Area of the state. The effects of three-dimensional puzzle-based strategy and paper and pencil puzzle-based instructional strategy on pupils' learning outcomes were examined. The effect of gender and school location was also covered. Primary

four pupils were used.

METHODOLOGY

This study adopted the pretest-posttest, control group quasi, experimental design. A 3x2x2 factorial matrix made up of two experimental groups (three-dimensional puzzle packages and paper and pencil puzzle packages) and one control group (conventional teaching method). Gender at two levels (male and female) and school location at two levels (rural and urban) was utilized.

Selection of participants

The participants for the study were 240 primary 4 pupils from six schools purposively selected from 3 Local Government Areas in Ondo State. Two schools were randomly selected from each Local Government Area and assigned to the same treatment group. To this end, two schools were assigned three-dimensional puzzle-based instructional strategies, two for paper and pencil-based instructional strategy while the remaining two were for control. Two intact classes of primary 4 pupils were randomly selected from each of the schools.

Research instruments

The following research instruments were developed and used for the study:

- (i) Social Studies Achievement Test (SSAT)
- (ii) Social Studies Attitude Questionnaire (SSAQ).
- (iii) Instructional Guide on Three Dimensional Puzzle (IGTDP)
- (iv) Instructional Guide on Paper and Pencil Puzzle (IGPPP)
- (v) Instructional Guide on Modified Conventional Teaching Method (IGMCTM)

Social studies achievement test (SSAT)

The instrument is divided into two sections, A and B. Section A consists of the personal data of the participants containing the gender, age, local government and school. Section B consists of twenty five multiple choice items with four options. The instrument was validated using experts review and the internal consistency reliability measure was calculated using KR-20 formula. 35 items survived, this yielded a reliability value of 0.71 and an average means difficulty value of 0.45. This implies that the test is neither too simple nor too difficult.

Social studies attitude questionnaire (SSAQ)

It consisted of two sections: Sections A and B. Section A is made up of the personal data of the participants, such as name of school, sex, local government area and class. While section B consists of twenty items Questionnaire reflecting the positive and negative attitudinal disposition to Social Studies. It has Yes or No alternatives. The scoring ranges from 2 to 1 for positive responses 1 to 2 for negative responses. This instrument is subjected to face and content validities through experts review.

Instructional guide on three dimensional puzzles (IGTDP)

The guide was designed for the teachers who were trained for the

study and who were randomly assigned to teach using three dimensional puzzle packages. The guide gives direction to the teachers on the roles they are to play in the class and the activities the pupils should engaged in. Instructional guide was subjected to validation using face and content validity through expert review.

Instructional guide on paper and pencil puzzle (IGPPP)

This is a stimulus instrument that guides the teachers on the role they were expected to play in the classroom and the activities each pupil was expected to engage in. The instructional guide was subjected to validation using face and content validity through expert review. Their criticisms, observations and suggestions were taken into consideration to improve the quality of the instrument. This instructional guide was used for experimental group 2.

Instructional guide on conventional teaching method (IGCTM)

This instrument was developed and used to teach pupils in the control group. The researcher prepared the lesson which include three main parts (introduction, presentation and conclusion), based on Social Studies topics. The guide was also validated through peer/experts review.

Data analysis

The data collected were analysed using Analysis of Co-variance (ANCOVA) to determine the main and interaction effects with pretest scores as covariates. The Multiple Classification Analysis (MCA) was used to determine the magnitude of the differences among the groups. The Scheffe post hoc analysis was also used.

RESULTS

HO 1: There is no significant main effect of treatment on pupils' achievement in social studies.

Table 1 reveals that there is a significant main effect of treatment on pupils achievement in social studies ($F_{(2,227)} = 112.20$; $P < 0.05$). This implies that the posttest scores of pupils in social studies differ significantly across the two experimental and control groups. Therefore, HO1a is rejected. MCA in Table 2 shows the magnitude of pupils' mean achievement score in each of the treatment groups and control.

Table 2 shows that pupils in the experimental group 1 exposed to social studies concepts through Three Dimensional Puzzle-based instructional strategy obtained the highest adjusted mean score of 13.10, while those in experimental group 2 exposed to social studies concepts through paper and pencil puzzle-based strategy had adjusted mean score 8.84. The control group obtained the lowest adjusted mean score 5.88. This implies that the group 1 (Three Dimensional puzzle-based instructional strategy) is significantly different from group 2 (paper and pencil puzzle-based strategy) and conventional teaching method group. To trace the source of significant effect of the treatment, Table 3 shows the pairwise component among the three groups - three

Table 1. Summary of 3x2x2 ANCOVA of the post-test achievement scores of pupils according to treatment, gender and school location.

Source	Sum of square	Df	Mean square	F	Sig.
Corrected model (explained)	5431.974	12	452.665	64.103	0.000*
Covariate (pretest)	0.145	1	0.145	0.020	0.886
Main effects					
Treatment group	1584.613	2	792.306	112.201	0.000*
School location	1571.366	1	1571.366	222.526	0.000*
Gender	11.092	1	11.092	1.571	0.211
2-way Interactions					
Treatment x school location	1155.162	2	577.581	81.793	0.000*
Treatment x gender	13.270	2	6.635	0.940	0.392
Location x gender	4.452	1	4.452	0.630	0.428
3-way Interactions					
Treatment x school location x gender	25.590	2	7.061	1.812	0.166
Error (Residual)	1602.959	227			
Total	7034.933	239			

* Significant at P<0.05

Table 2. Multiple classification analysis (MCA) of achievement scores of pupils according to treatment, gender and school location.

Variable + Category	N	Unadjusted variation	Eta	Adjusted for independent + covariates deviation	Beta
Treatment groups					
Three Dimensional Puzzle	80	3.70		3.83	
Paper and Pencil Puzzle	80	-1.28	0.49	-.43	0.55
Control	80	-2.42		-3.39	
Location					
Urban	120	3.21		2.82	
Rural	120	-3.21	0.59	-2.82	0.52
Gender					
Male	113	0.03		0.18	
Female	127	-0.03	0.01	-0.16	0.03

Grand Mean = 9.27; Multiple R-squared = 0.605; Multiple R = 0.778.

dimensional puzzle-based strategy, paper and pencil puzzle-based method and conventional teaching method.

Table 3 shows that group 1 (three dimensional puzzle group) $\bar{x} = 13.10$ differs significantly from group 2 (paper and pencil puzzle group) $\bar{x} = 8.84$. Also, the three dimensional puzzle group $\bar{x} = 13.10$ differs significantly from control group $\bar{x} = 5.88$. This means that there are significant differences between each of the three possible pairs of groups in the study. They all therefore

contributed to the observed significant effect of treatment in pupils' achievement in Social Studies.

HO₂: There is no significant main effect of gender on pupils' academic achievement in Social Studies.

From Table 1, it was observed that there is no significant main effect of gender on the variation in achievement scores of pupils in Social Studies ($F_{(1,227)} = 1.571; P > 0.05$), hence hypothesis 2a is not rejected.

Table 2 shows that male obtained higher mean score of

Table 3. Summary of the Scheffe Post-Hoc Analysis on Post-Test Mean Scores of Pupils' achievement in Social Studies according to treatment groups.

Treatment	Mean	No	Three dimensional puzzle	Paper and pencil puzzle	Conventional method (control)
Three dimensional puzzle (Group 1)	13.10	80		*	*
Paper and pencil puzzle(Group 2)	8.84	80	*		*
Conventional method (Control)	5.88	80	*	*	

* Pairs of groups significantly different at $p < 0.05$.

$\bar{x} = 9.45$ than their female counterparts $\bar{x} = 9.11$.

HO₃: There is no significant main effect of school location on pupils' academic achievement in Social Studies.

From Table 1, the summary of ANCOVA as shown indicates that school location has a significant main effect on variation in pupils achievement scores ($F_{(1,227)} = 1.571$; $P < 0.05$). Hence hypothesis 3a is therefore rejected.

HO₄: There is no significant interaction effect of treatment and gender on pupils' academic achievement in Social Studies.

Table 1 reveals that there is no significant interaction effect of treatment and gender on pupils' achievement score ($F_{(2,227)} = 0.940$; $P > 0.05$). Thus, hypothesis 4 is not rejected.

DISCUSSION

Results of this study show that treatment significantly affected pupils post achievement mean scores. The treatment brought an outstanding performance of pupils' achievement in social studies in the TDP group followed by PPP experimental group with least performance in control group. This study is in agreement with the findings of Aremu and Ayelagbe (1997), Idowu and Ige (2007), Anamy and Mary (2006), and Gardner (2006) which show that puzzles are more effective than the conventional teaching methods. The results also revealed that gender had no significant main effect on pupils' achievement in Social Studies. This finding supports the assertion and conclusion of Oyebade (2003), Amosun (2002), Adu (2002), Ajiboye (1996) and Akinbote (1999) who in their various studies confirmed that gender as a single factor had no significant effect on students' learning outcomes. The results also negate the finding of Akinola (1993) that girls performed less in environmental concept than boys.

The findings of the study showed that school location had significant effect on pupils' achievement in Social Studies. The results showed that students in urban school performed better than their counterparts in rural school across the three treatment groups. This result is in

line with the findings of Falade (2007) and Akintunde and Akinola (2006) that location produced significant different in students' learning outcomes. The result is however negating the findings of Olanipekun (2002) that location had no significant effect on pupils' achievement in social studies. These findings might not be unconnected with the fact that urban schools are more equipped with facilities and resources that can facilitate effective teaching and learning than their counterparts in rural schools (Olagunju, 2000). The study showed that the interaction effect of treatment and gender on students' achievement was not significant. This study is in agreement with the findings of Ajiboye (1996) and Ayelagbe (1998) that there was no significant interaction effect of treatment and gender on students' academic achievement in social studies.

Conclusion

Based on the findings of this study, it is concluded that the three dimensional puzzle-based strategy followed by paper and pencil puzzle-based instructional strategy were found to be more effective in enhancing cognitive achievement of the learners than the conventional classroom method of teaching. Pupils' achievement in and attitude to social studies can better be improved and enhanced through technological-based instructions. The study showed that learner-centred and active participation approach should be highly encouraged by social studies teachers.

RECOMMENDATIONS

It is recommended that government at all levels, societies and non-governmental parastatals should commission the designing, production and publication of different types puzzles especially three dimensional as well as paper and pencil puzzles for the teaching of social studies. They should take it upon themselves to educate teachers on their use both inside and outside the classrooms. Furthermore, social studies curriculum should be reviewed to incorporate the use of three dimensional and paper-pencil puzzle-based instructional strategies to the teaching of social studies in primary

schools. Also, seminars, workshops, symposia and conferences should be organized at national and local level for teachers and student-teachers in order to expose them to the skill and competencies required in using the two puzzle-based instructional strategies (three dimensional and paper and pencil puzzle-based instructional strategies).

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