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Spicing Up Basic Science Instruction with Storyline Strategy; What Is Students' Achievement?

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Abstract

This study determined the effect of storyline strategy on primary school pupils' achievement in Basic Science with moderating effect of English Language proficiency of pupils. This study is the pre-test, post-test control group. It is a 2 x 2 quasi experimental study in which intact classes were used. This implies that the design included two treatment groups of the storyline and conventional teaching methods and pupils English proficiency at two level of high and low. Four schools were purposively selected from the public school in Ijebu-Ode Local government of Ogun State, Nigeria, West Africa. Two schools each served as the experimental group of 62 pupils and

the other two schools of 58 pupils served as the control group. Three instruments were used for this study. These are; Teaching guides for the experimental and the control group-Teacher Story line guide (TSG) and Teacher conventional method guide (TCG). Basic Science Achievement test (BSAT), English Language Proficiency Test (ELPT). The major findings in this study were discussed to details Mean while, Storyline strategy has been recommended for Basic Science lessons in Nigeria.

Key Words: Spicing up, Basic Science, Storyline strategy, Teaching Strategy, Experimental group, Conventional group, Control group, Quasi Experimental, Achievement, Method

Introduction

Teachers are the people who give direction and advice to the learners. Their behaviour, communication skills, conceptual clarity and psychological equanimity have direct bearing on the character and personality of the student Mirajud Din (2006). They are the key factors in educational development Alebiosu (2008). Teachers that exhibit enthusiasm can lead to students who are more likely to be engaged, interested, energetic, and curious about learning the subject matter. Recent research has found a correlation between teacher enthusiasm and students' intrinsic motivation to learn and vitality in the classroom. Patrick, Hisley & Kemper (2000).

Education requires a well organized curriculum and conducive environment along with experienced teachers while the teacher's attitude, experience and teaching method play vital roles in the teaching learning process. Effective teaching requires effort that will satisfy and sharpen the inquisitive capacity of the students. In addition participatory methodology that will ignite their positive attitude must be employed. For teaching to produce the expected learning outcome, a good method must be adopted by the teacher. The teacher has many options when choosing a style to teach while students have different ways of observing and processing information and as well as assimilation of knowledge. Hence, teachers need techniques which cater for multiple learning styles to help student retain information and strengthen understanding. A variety of strategies and methods need to be put in place to ensure that all students have equal opportunities to learn.

At the primary school level, the importance of the curriculum for the integrated subjects like Basic Science, Social Studies, Creative Art, and Agricultural Science is emphasized. The Nigeria primary school curriculum made adequate provisions for this and teachers are daily being sensitized on

the important of the integrated curriculum and ways to teach the subjects. Concept and topics that cut across the subjects which are environmentally based, glued and interwoven are taught in specialized fashion through innovation and activity – based teaching strategies.

Basic Science is activity packed; hence the teaching is activity oriented. The methods of teaching are strongly backed by the theory of constructivism. Constructivism transforms the learner from a passive recipient of information to an active participant in the learning process De Vries (2002). The approach triggers the innate curiosity of children about the world and how things come to be. This is particularly advantageous in the task of elementary science teaching and learning essentially being an integrated subject and that it is linked with real life experiences. The constructivist teacher provides tools such as problem – solving and inquiry – based learning activities for students to learn. In the light of this, variety of constructivist approaches to teaching science abound.

Such approaches include the strategies of Cooperative learning Lefrancios (1994) & Wendy (2005) Discovery learning, Jonassen (2000), Inquiry Brooks & Brooks (1993); Haury (1993); Boylan (2002), problem Solving Watts & West (1992), Games & Story line Jonassen & Harnandz-Ferrano (2002); Afuwape (2002)? and the Open-ended field or Laboratory exercises Olanrewaju (1994) & Alebiosu, (1999). These and other strategies had been developed and refined over the years. Such is the Storyline method that emerged and originally called Topic work, gradually metamorphosed into what is now widely regarded as the STORY LINE.

The main emphasis in the storyline approach was to find a method which would arouse the pupils' interest in leaning, and connect classroom education with real life outside. In short the teaching method should emphasize that learning is the goal, not the teaching and learning in individual – Cope (1987). Children learn best by being interested fully in their work, by seeing themselves, doing by themselves and puzzling themselves Ajiboye & Ajitoni (2008).

Storyline is not only a theory, it is above all a teaching method, or more correctly, how a teacher should approach subjects during teaching. The development of the storyline method is based on experience from teachers who actively used the method Egan (1988) alluded that storyline method is also based on the theory that we can more easily learn a subject if it is put forward as a story. According to the researcher, the story is a vehicle to put

incidents together. The stories are coherently and logically constructed to be meaningful and relevant to the content. Shedding more light on the method, Letschert (1992) asserted that there are no never-ending stories, except on television. Stories have the limitation of their own boundaries. The limitation of boundaries in this method is extended to the teaching of science where stories may not depict many concepts. In consequence, teachers should take caution when using the method.

Parent have always used story-telling extensively and through the years people have told stories about things that through that way we can remember the events. The storyline method builds on this premise. In employing the method, there is a very rigid planning structure, which the teacher knows but the pupils do not.

Each topic is made out of chapters that are linked together by the teacher. The teacher asks questions to lead the story on; but also participates in the pupils activities as an organizer and a helper. When a teacher uses the storyline method, it is necessary to make the beginning interesting and exciting so the pupils are willing to continue. One major principal of the method is that each pupil is made to feel that he or she is a part of the story. When the teacher starts the story, the pupils develop it by themselves and feel that the story is theirs, although the teachers know all the time the trend of the story because he/she controls the topic without the pupils knowing. The teacher knows what he/she wants to do and what the purpose is. In the storyline method, there is the need to develop the framework as securely as possible to give teacher the maximum confidence.

Effective storyline approach in the class would require that pupils acquire basic principle of English Language since it is the major medium of communication and expression in the class and also most of the textbooks for other subjects are written in English Language Obianika (1981). In view of this, students who are unable to acquire some given minimum level of English Language proficiency may have difficulty in understanding the nature and process of storyline strategy as it involves asking and answering questions where English language is the medium of communication.

A learning environment that allows active participation of students in learning process makes it possible for the student to have control over their learning and this leads to improvement in students learning and retention Johnson, Johnson & Stane (2000), Springer, Stanne & Donovan (1999)?

The dilemma of an expanding curriculum, a fragmented school day and abstract classroom experience that do not reflect life outside school walls are issue of concern to all educators. Teachers and learner feel that as life become more fragmented every day, the bulk of work becomes overwhelming. There is too much to accomplish and too little time to get it done in the classroom. At the elementary/primary school level, subjects gets divided into “*morning*” and “*afternoon*” time slots, leading kids to perceive that mathematics and some subjects are studied in morning while others like social studies are better study after lunch. In addition some school subjects seemed to be too wide to be learned or even unbearable. These are pointers to the fact that primary school subject are seems as abstract and not applicable to real life situations.

Specifically this study sought to determine the effect of storyline strategy on primary school pupils’ achievement in Basic Science. The moderating effect of English Language proficiency of pupils was also examined.

Research hypotheses

Based on the stated problem, the study tested the following hypotheses.

1. There is no significant main effect of treatment on Basic science achievement of pupils taught with storyline method and the conventional teaching method.
2. There is no significant main effect of English Language proficiency level on Posttest academic achievement of pupils taught with storyline method and the conventional teaching method.
3. There is no significant interaction effect of treatment and English Language proficiency level on Pupil’s academic achievement in Basic science at the posttest level.

Methodology

Research design

This study is the pre-test, post-test control group design. It is a 2 X 2 quasi experimental study in which intact classes were used. This implied that the design included two treatment groups of the storyline and conventional teaching methods and pupils English proficiency at two level of high and low.

Population

The population for this study consisted of all the primary five pupils of public primary school in Ijebu-ode Local Government Area of Ogun State. There are thirty nine (39) public primary schools in Ijebu-Ode Local Government.

Sample and sampling procedure

Four schools were purposively selected from the public school in Ijebu Ode Local government. The research ensured that the selected school are of equal status being guided by the year of establishment of the school, school location (rural/urban) and school mix (co-educational or single sex), school population and teacher availability. To ensure that the sample do not interact with one another four were used. Two schools each served as the experimental group of 62 pupils and the other two schools of 58 pupils served as the control group.

Instrumentation

Three instruments were used for this study. These are;

- i. Teaching guides for the experimental and the control group-Teacher Story line guide (TSG) and Teacher conventional method guide (TCG).
- ii. Basic Science Achievement Test (BSAT)
- iii. English Language Proficiency Test (ELPT)

Teaching guides for the groups (TSG & TCG)

The teaching guided consists of specific instructions, activities and roles of the teacher in the experimental and control groups. There are two forms. These are;

- a) The Teacher Storyline Guided (TSC) was used for the experimental group. The six essential principal guiding the use of the storyline are highlighted in form of a chart. These are storyline- topic, key questions, class organization/setting, activities, resources and product. These principles were further fragmented into eight steps in the process of the instruction. The strategy was adapted from Bell (1992). The research employed this guide for the experimental group.

- b) The Teacher Conventional Method Guide (TCG) is the second teaching guide. The guide described the teacher's typical role in a primary school's science classroom. The researcher used a research assistant to teach the control group using the TCG.

Basic Science Achievement Test (BSAT)

This consists of 30 multiple choice test items in Basic Science with four options per item. The BSAT was constructed and validated by the research for the purpose of the study. The test covered six major topics selected from selected from the primary five Basic Science Curriculum/Syllabus. BSAT was constructed following the due process of test construction, involving the use of a test blue print, subjecting the items to experts' scrutiny and ensuring that the items satisfy appropriate discrimination and difficulty levels.

Table 1: Table of Specification for Multiple Choice Items in Basic Science Achievement Test

S/N	Content	Knowledge	Understanding	Application	Total
1	Respiratory System	2	1	1	4
2	Water	2	2	1	5
3	Grouping/Ordering	2	2	2	6
4	Observing Common Animal	1	1	2	4
5	Health and Safety	2	3	2	7
6	Modeling	1	1	2	4
	Total	10	10	10	30

Validity and reliability of BSAT

The face and content validity were determined through the expert opinion of five primary school Teachers. The items were adjudged adequate for administration, the final set of items were trial tested on some primary school pupils different from the selected school for the main study. From the responses of the pupils, discrimination and difficulty indices were used to remove some of the items.

Thirty (30) items were finally selected for the purpose of the study. The thirty items were re-administered to the same set of pupils after two weeks. From

the responses of the pupils, a kinder Richardson 21 statistical tool was used and a test re-test reliability co-efficient of 0.73 was established from the test.

English language proficiency (ELPT)

A 30- items proficiency test (ELPT) was used for this study. This instrument used English Language past question that were constructed and validated by the Ministry of Education. This was administered at two different occasions during the experiment.

Procedure for data collection

The score of pupils in the first, second and third term English Language Proficiency Course were collected from the school and averaged. This was done at this commencement of study for the purpose of grouping the pupils the pupils to high and low English Language proficiency category. After three (3) weeks of the commencement of the experiment the ELPT was administered. The research trained research assistants for the exercise. The assistant used the teacher conventional method guide (TCG) to teach the control group while the Research personally used the teacher guide (TSG) to teach the experimental group.

The experiment was divided into four phases but the training exercise took a few days before the commencement of the experiment whose first phase involved collection of English Language scores and administration of the Basic Science Achievement Test (BSAT). The BSAT was administered in the first phase as the pre-test and this was the first week and English Language score to group the pupils to high and low category.

The second phase was the treatment phase in which the topics selected for the study were taught and it lasted for six weeks (week 2 to week 7) the school Basic Science scheme was consulted hence, the arrangement below was followed.

Week 2 -	Respiratory System
Week 3 -	Water
Week 4 -	Grouping/Ordering of object
Week 5 -	Observing Common Animals
Week 6 -	Health and Safety
Week 7 -	Modelling

On the eight week, the BSAT was administered again but now as the post test the test items in the post test were the same as in the pretest, but certain steps were taken to give a vague impression that the test items differed- such include changing the colour of the paper and re-arranging the item numbers.

The sets of the English Language proficiency test (ELPT) was arranged at three different convenient occasions spread across the period of the exercise i.e. the 1st day of the pre-test phase (week 1) the week which was in the 2nd phase and the week 8 which was in the 3rd phase. The fourth phase of the exercise involved the administration of the posttest instrument on the 10th week as delayed post test. This was to examine the retention of the pupils.

The procedure is schematically illustrated below.

- | | | |
|----------------------------------|---|-------------------------------------|
| Phase 1: Week 1 | - | Administration of pretest. |
| Phase 2: Week 2 to Week 7 | - | Treatment |
| Phase 3: Week 8 | - | Administration of posttest |
| Phase 4: Week 10 | - | Administration of delayed posttest. |

Procedure for data analysis

The data collected from the study was analyzed using the descriptive statistic which involved simple percentage computation of the means of the pre test, post test and the delayed post test, the standard deviation and the variance for the dependent variable. The inferential statistic of an ANOVA was used to test for possible difference in the achievement of pupils in science with respect to the treatment condition this tested the hypotheses generated for the study.

Results of Findings

The results of this study were obtained using descriptive statistics and Analysis of Covariance (ANCOVA) with pre-test score as covariates.

Table 1: Descriptive Statistics of the post Academic Achievement Mean Scores and standard Deviation According to Treatment and English Proficiency Level Dependent Variable: Post Achievement

		Pretest	Posttest	Pretest	Posttest
Group	N = 120	Mean		S. D	
<i>Treatment</i>					
1. TSG	62	14.19	21.16	5.797	5.932
2. TCS	58	15.00	16.45	5.725	5.465
<i>EPL</i>					
1. High	83	17.67	21.61	21.61	4.775
2. Low	37	7.65	12.76	3.335	4.206

**Significant at .05 level of significant*

In table1, it is revealed that students in the Teacher Story-line Guide (TSG) group had the higher posttest mean score than their colleagues in the Teacher Conventional method Guide (TCG) group. Student with high English proficiency level in TSG group had the higher mean score of 21.61 than their colleagues in the TCG group with 16.45; student with low English proficiency level in TSG also had higher means score of 21.16 than their colleagues in TCG group whose mean score is 12.76. At the TSG and TCG groups, students with high English proficiency level had the higher mean; scores than their colleagues with English proficiency level. However, on the whole the mean scores (21.16) of students in the TSG group is higher than the means scores (16.45) of students in the TCG group.

Test of hypotheses involving main and interaction effects of treatment and English proficiency level on students’ posttest academic achievement in basic science:

Table 2: summary of Analysis of Covariance of Students’ Posttest Academic Achievement Score According to treatments and English Proficiency Level

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected model	4017.849 ^a	4	1004.462	232.647	.000
Intercept	185.2081	1	185.208	42.897	.000
<i>PREACHMT</i>	1252.413	1	1252.413	290.075	.000
<i>METHOD</i>	716.351	1	716.351	165.916	.000
<i>EPL</i>	3.450	1	3.450	.799	.373

<i>treatment * EPL</i>	3.629	1	3.629	.841	.361
<i>Errol</i>	496.517	115	4.318		
<i>Total</i>	47304.000	120			
<i>Corrected Total</i>	4514.367	119			

*Significant at .05 level of significant

a. R squared = .890 (Adjusted R square = .886)

Hypothesis 1: *There is no significant main effect of treatment on basic science achievement of pupils taught with storyline method and the conventional teaching method at the post test level.*

Table 2 reveals that the treatment had significant effect on students' post test academic achievement score in Basic Science ($F(1, 119) = 0.000, p < 0.05$) statistically significant on students' post test achievement in basic science. That is, the posttest academic achievement score of the students exposed to the different treatment conditions were significantly different. Hence, the null hypothesis (H_0) was rejected.

In other to determine the magnitude of the mean achievement score of pupils exposed to the treatment conditions, the result of the multiple classification analysis (MCA) presented in table 4.3 was used

Table 3: Multiple classification analysis of students' achievement according to treatment & English language proficiency

	Grand mean = 18.817				
Variable + Category Treatment	N	Unadjusted deviation	Eta	Adjusted for Independent Covariate	Beta
TSG	62	2.05		3.28	
TCG	58	-3.28	0.59	-2.04	0.77
English Language Proficiency					
High	83	-0.88		0.26	
Low	37	-0.72	0.07	1.34	0.26
Multiple R Squared					
Multiple R					

The result of the MCA revealed that, with a grand mean of 18.917 the pupils exposed to storyline strategy had the higher adjusted post test mean achievement scores of 22.917 ($18.917 + 3.28$) than colleague in the

conventional method group whose adjusted post test mean achievement score is 16.877 (18.917 – 2.04)

The result in the table further showed that while treatment alone counted for 59% (0.77^2) of the variation jointly counted for 89% (0.943^2) of the variance observed in the pupils' achievement scores.

Hypothesis 2: *There is no significant main effect of English proficiency level on post test academic achievement of pupils taught with storyline method and the conventional teaching method.*

Table 2 also reveals that English that English proficiency level of pupils does not have Significant effect on students' post test academic achievement score in Basic Science ($F(1,119) = 0.373, p < 0.05$, statistically). This is a pointer to the fact that there was no significant main effect of English proficiency on pupils' posttest achievement in Basic science. That is, the post test academic achievement scores of the pupils exposed to the deferent treatment conditions were not significantly different. Hence, the null hypothesis (H_02) was not rejected.

The result of the MCA however revealed that ELP alone accounted for just 7% of the variance observed in pupils achievement scores.

Hypothesis 3: *There is no significant interaction effect of treatment and English proficiency level on pupils' academic achievement in Basic science at the post test level.*

Result of the 2-way interaction effect in table 2 reveals that there was no significant interaction effect of treatment and English proficiency level on students' academic achievement in basic science at the post test level ($F(1,119) = .361, p < 0.05$, not statistically significant). Hence, null hypothesis 3 was not rejected.

Discussion, conclusion and recommendations

Discussion of the main effects

This study was conducted to examine the effects of storyline teaching strategy on pupils' academic achievement in primary school Basic Science.

Results from table 1 indicate that the storyline teaching strategy and conventional lecture method had different effects on the academic achievement of pupils at the post test level. There was significant difference in academic achievement of the pupils in the two treatment groups with storyline teaching strategy promoting pupils understanding of Basic Science

concept taught evidenced by higher improvement in their academic achievement more than the conventional lecture/teaching method.

The result is in line with the findings of de Vries, (2002) Jonassen, (2000), Brook & Brooks, (1993), Jonassen & Harmardz – Ferraro, (2002); Afuwape M.O (2002), Olanrewaju, 1994 & Alebiosu, (1999), e.t.c, who reported in their different studies that problem solving and inquiry based learning activities which storyline teaching strategy is an example facilitated pupils learning more than conventional lecture method.

Another object of this study was to investigate the influence of English language proficiency for learning Basic Science on pupils' academic achievement at the posttest level. Result in table 2 indicates that there was difference in the post academic achievement mean score of low high English proficiency pupils. This implied that English language might influence the academic achievement of pupils in Basic Science.

Interaction effects of the variable on dependent measures

It was shown in table 1 and 3 that there were no significant interaction effects of treatment and English language proficiency on pupils' academic achievement in Basic Science. This is a pointer to the fact that English language, as a single factor, did not contributed significantly to the differences in posttest means scores of pupils, suggesting that the effective use of storyline teaching strategy was not associated with English language proficiency of pupils.

Conclusions

Based upon the findings of this study the following were drawn.

1. There were significant main effect of treatment on the dependent measures post test mean score in academic achievement in both the experimental and control group were different from one another. The differences between the storyline teaching strategy and conventional lecture method statistically significant. This suggested the effectiveness of storyline teaching strategy on pupils academic achievement in Basic Science over the conventional lecture method.
2. There were no significant main effects of English language proficiency on pupils' achievement in Basic Science.

Implications and recommendations:

The findings of this study have very important contribution and implication for the education practices in Nigeria. This study revealed that pupils in the storyline teaching strategy had higher posttest mean score than the pupils in conventional method group, storyline teaching strategy was found to be more effective in enhancing pupils' academic achievement in Basic Science. This is because storyline teaching strategy allows the full participation of the pupils from the beginning to the end of the lesson/class which was not possible in conventional lecture method. Generally, storyline teaching strategy promotes pupils academic achievement.

It was found out that treatment did not interact with English Language proficiency of pupils. Also a single factor, English Language proficiency did not contribute significantly to the difference in post test means scores of subject. This implied that the effective use of storyline strategy was not associated with English language proficiency.

Further, on order to make the strategy effective, the teachers need training on the storyline teaching strategy, principles, techniques and rules. This strategy necessitates significant role change for teachers, so they need support and guidance as they implement the skills until they become a comfortable part of the teachers' repertoire.

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