Effects of Code-Switching Instructional Strategy on the Academic Achievement of Basic Science Pupils in Ijebu-Ode Metropolis Junior Secondary Schools

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Abstract

Different personality types of learners come into classrooms differently prepared with unique characteristics. These learners differ in their physique, psychology, ability to comprehend easily and even composure. The difference becomes accentuated when considering academic achievement. This puts teachers on their toes struggling with various strategies to nullify these observed differences. This study was based on these and noted that an instructional strategy could be used to level certain differences by incorporating code-switching. The pre-test, post-test control group, non-randomized quasi-experimental design was used with 2 x 2-factorial matrix. The population comprised all the JSII students in all the Junior Secondary Schools in Ijebu-Ode metropolis while a sample of 150 was used from purposively selected three Schools. Three null hypotheses were tested at .05 alpha level. One instrument was used, Basic Science Achievement Test ($r = .85$). Data collected were analyzed using, Analysis of Covariance and Estimated Marginal Means Result showed there was a significant main effect of treatment on the academic achievement of students in Basic Science ($F_{(1,144)} = 16.406$, $p < .05 = .001$), no significant main effect of gender on the academic achievement of students ($F_{(1,144)} = .006$; $p > .05 = .939$) and no significant interaction effect of treatment and gender on students' academic achievement ($F_{(1,144)} = .803$; $p > .05 = .372$). It is concluded that code-switching strategy can boost academic achievement in Basic Science. The recommendation was that teachers should improve on their content delivery through the use of the strategy to enhance achievement.

Keyword: Code-switching, Instructional strategy, Academic achievement, Basic science, Junior secondary

INTRODUCTION

Academic activity in the classroom is basically a communication process between the teacher and the learners. The extent of comprehension on the part of the learners largely depends on the language employed in the communication process. In Junior Secondary Schools the use of English language among students is poor due to their environment and location, this might constitute a limitation in the teaching and learning of science at that level. Science is taught as Basic Science and is compulsory for all students. To be able to proceed to the Science class at the Senior Secondary, students are expected to score at least a credit pass in the Basic Education Certificate Examination (BECE). Inability of the students to understand academic content due to communication disruption, might lead to a fall in the number of learners moving on to

Senior Secondary Science class. Also, the attitude of learners and their academic achievement in the subject may be affected as a consequence. To prevent this, the Basic Science instructor may employ various methods to help the students, one of which may be to integrate the mother tongue or native language into the current teaching approaches to aid and enhance student comprehension. The use of mother or local language in the process of classroom instruction together with the English language could be in the form of code mixing, code switching or a combination of the two. Concurring to this assertion, Tabaro and Twahirwa (2018), noted that while teaching and learning any subject be it science or language in multilingual communities, it is common to observe various language usage patterns such as code-switching and code-mixing. In this study, language code-switching only is used as an instructional strategy to seek its effect on the academic achievement of Basic Science pupils in Ijebu-Ode metropolis Junior Secondary Schools in which English language is code-switched with Yoruba language.

Schools are established by the government and private individuals for the main purpose of educating through the acquisition of skills, and other knowledge types so that the attendees will be able to live a useful life and contribute meaningfully to the growth of the society in which they find themselves. To determine the level of success of learners, their academic achievements are considered. Therefore to a very large extent academic achievement becomes an important yardstick for measuring the level of success attained and the effectiveness of any classroom instruction. It represents the performance outcomes that indicate the extent to which a person has accomplished tasks that are the target of activities in a given classroom (Steinmayr et al, 2025). According to Zheng and Mustappha (2022), the study of academic achievement of students is an effective way to promote the quality of higher education process. This could be interpreted to mean that the quality of education at the higher level is dependent on the achievement of learners at the lower levels such as in the Secondary Schools. So

when learners in the Secondary Schools achieve poorly, it affects not only the quality but also the quantity of students progressing into the higher levels. What is observed in the higher institutions in Nigeria today is a vivid empirical expression of what obtains at the lower levels of education, that is, decadence in academic achievement. This is one of the major thrusts that led to the choice of this study to seek for ways to salvage academic achievement in the lower prongs of education using instructional strategies incorporating code-switching. The effect of the strategy employed might be obscured by certain factors inherent in the learners and if not built into the design ab initio will create discordant outcomes. One of such is gender which in this study acts as an intervening variable.

Gender in this study served as a moderator variable that sought to streamline the achievement of students based on whether one is a male or female. All other factors remaining constant in their influence, gender is a significant learning factor that is capable of determining the general direction of any academic programme. It even determines the type of student who chooses science and technology versus arts and social science. Giving credence to this assumption, Delaney and Deveruex (2021) observed that particularly, boys are over-represented in Science, Technology, Engineering and Mathematics (STEM), economics, and many other technical fields and girls are over-represented in nursing, teaching, and many less technical areas. In line with this view, Okoronka (2014) noted that males and females show great differences in their interest and career choice which may be attributed to the psychological differences and cultural influences. Outside the academic circles, gender influences what roles individuals play in society and even strongly determines what portion of inheritance goes to who based on gender. The English language that is adopted as our lingua franca and the main language of instruction streamlined the gender phenomenon into "him or her, he or she and his or hers" indicating a dichotomy in the way each individual is identified. Several definitions of gender so far proffered align with what each writer has in mind to suit the given context. Gender is a specially

constructed phenomenon that is brought about as society ascribes different roles, duties, behaviours, and mannerisms to the two sexes, (Mangvwat 2006, in Nnamani & Oyibe, 2016, Okeke, 2015 in Abuh 2021).

In terms of academic achievement, researchers have shown that there is no consistency in academic achievement based on gender due to the inconclusive reported findings. For instance studies pointed out no significant gender difference in students' academic achievement. Ajai and Imoko (2015) in Tsaousis and Alghamdi (2022) found that male and female students did not significantly differ in achievement and retention in scores in mathematics. Also, Ugwuadu's (2013) finding showed that there was no significant difference between male and female students' achievement in mathematics and science subjects irrespective of the gender (sex) of the teachers. On the other hand, other studies have reported significant differences, with the boys or the girls performing better. This view is also shared by Nnamani & Oyibe (2016). For example Lakin's, (2013) and Abuh's (2021) findings revealed that male students achieve higher than female folks in Science, Technology and Engineering in a meta-analytic study, Voyer and Voyer (2014) found that females appear to have higher school grades in language-based subjects and STEM subjects than males.

The phenomenon of code-switching has been a significant topic of theoretical and practical investigations in content delivery and knowledge acquisition in schools. English is a common language of instruction in educational systems around the world and constitutes a barrier to comprehension in most classrooms. Code-switching is the practice of alternating between two or more languages during a conversation and can have a positive impact on academic achievement particularly for bilingual students. When used strategically, code-switching can enhance understanding, engagement and ultimately improve academic achievement in the content areas, hence breaking the barrier created by the use of the English language alone. Al-Adanani and Elyas (2016) citing McDonough (2012) assert that code-switching is an achievement strategy in which learners can rely on when compensating for their language

incompetence. In the same vein Sert (2006) in Al-Adnani and Elyas (2016) suggested that a bridge from known to unknown is constructed in order to transfer the new content and meaning is made clear in this way. Habintwali et al (2024) citing Modupeola (2013) wrote that code-switching also makes classroom instruction easier for teachers, as they do not need to invest as much time clarifying concepts or simplifying explanations to resolve potential confusion.

They also observed that in some African bilingual and multilingual communities where learners speak more than one native language, teachers switch and mix codes to help learners understand the lesson. This is more so in Nigerian schools especially in Federal institutions where three native languages students can be found in the same class. It is therefore uncommon to have an English classroom where the teaching and learning process are conducted exclusively in a single language (Nita, 2015 in Habintwali *et al* 2024). Code-switching of the English language and other mother tongues spoken by both teachers and learners are common. Simasiku, Kasanda and Smit (2015). In their remark Simasiku *et al* (2015) observed that in many instances when learners find it difficult to understand content and are also not able to express themselves adequately through English during lessons, they either fall back on rote learning or become silent. They noted that in such situations, code-switching has been demonstrated to be an effective teaching and learning technique in schools that use a second language as a medium of instruction as in the study area to boost academic achievement. Dumatog and Dekker (2003) state that if learners do not understand the medium of instruction, a language they understand must be used transitionally until a new medium of instruction can be used with comprehension in the classroom.

Several empirical studies have been conducted in Nigeria and elsewhere on the effect of code-switching on academic achievement or its relationship with academic achievement. Simasiku *et al* (2015) carried out a study to investigate whether the use of mother tongue in English-medium classroom enhanced learners' academic achievement using 12

teachers in 12 schools in the Caprivi Education Region in Namibia. The study found that teachers perceived code-switching as enhancing academic achievement. Santos (2021) undertook an assessment of code-switching and its impact on students' academic performance and found that code-switching was most of the time utilized and students' level of academic performance was satisfactory. Ali *et al* (2023) in their own study in Punjab, Pakistan on the effects of code-switching on bilingual students' success in mathematics and language education, found a positive correlation between code-switching and bilingual students' mathematics and language performance. In Nigeria, Okeke *et al* (2025) investigated the effect of code-mixing and code-switching on academic achievement in mathematics among Secondary school students in Oyo metropolis, Oyo State. Results showed that there was a significant relationship between code-switching strategy and academic achievement in mathematics. In another study conducted by Adesokan (2021) in Katsina another part of Nigeria, using pre-NCE students, showed that students performed better when their lecturers alternate between official of instruction and their first language. However profound these findings might be in favour of code-switching, there are still dissenting opinions in its use in classroom instructions. For example even in the same study conducted by Simasiku et al (2015) some participants were against the use of code-switching arguing that there were many languages spoken in the Caprivi Region and questioned as to which language could be used in mixed mother tongue classrooms and reiterated that the use of Code Switching would hinder communication in the classrooms. Another teacher participant in the sample argued that learners might carry over code-switching into their writing, and that code-switching would lead to poor English proficiency, poor expression and poor command of the English language both spoken and written. These observations are very cogent and germane which calls for a very careful use of the strategy.

Statement of the Problem

Academic activity in the classroom is basically a communication process between the teacher and the learners. The extent of comprehension on the part of the learners largely depends on the language employed in the communication process. At the junior secondary level where the use of English language among students is poor as a result of their environment and location, this might constitute a hindrance in the teaching and learning of Science at that level. Inability of the students to understand academic content due to communication disruption, might lead to a fall in the number of learners moving on to Senior Secondary Science class. Also, as the attitude of learners and their academic achievement in the subject may be affected as consequence, the Basic Science teacher in a bid to forestall this applies different strategies to assist the learners. One of these may be the fusion of the mother or native tongue into the existing instructional strategies to assist and improve the understanding of the learners. Therefore this study investigated the effect of code-switching instructional strategy on the academic achievement of Basic Science students in Ijebu-Ode metropolis Junior Secondary Schools

Purpose of the study

The general purpose of this study was to examine the effect of code-switching instructional strategy on the academic achievement of Basic Science students in Ijebu-Ode metropolis Junior Secondary Schools. Specifically, the study sought to investigate:

1. The main effect of treatment on the academic achievement of students in Junior Secondary Basic Science.
2. The main effect of gender on the academic achievement of students in Basic Science
3. The interaction effect of treatment and gender on the academic achievement of students in Basic Science

Hypothesis

The following null hypotheses were tested at a 0.05 alpha level of significance:

H_{01}: There is no significant main effect of treatment on the academic

achievement of students in Basic Science

H02: There is no significant main effect of gender on the academic achievement of students in Basic Science

H03: There is no significant interaction effect of treatment and gender on the academic achievement of students in Basic Science

MATERIALS AND METHODS

Design of the study

The pre-test, post-test control group, non-randomized quasi-experimental design was used for this study with 2 x 2 factorial matrix.

Population

The population for this study was all the students in all the Junior Secondary Schools in Ijebu-Ode Local Government metropolis of Ogun State. Specifically, Junior Secondary II Students were focused on.

Sample and Sampling Technique

The sample for this study comprised one hundred and fifty Junior Secondary two (JSII) Chemistry students from three purposively selected schools in Ijebu-Ode metropolis.

Instruments

The main instrument used for this study was the Basic Science Achievement Test (BSAT) which was designed by the researchers. The BSAT which was a 30-item multiple-choice objective-type test was drawn from JSII Scheme of Work. The topic for the test was electrolysis covering definition, ionic theory, electrolytes, non-electrolytes, preferential discharge of ions, and electrolysis of common electrolytes,

E.M.F of cells and laws of electrolysis which have not been treated by any of the sampled schools. All the questions were in the multiple-choice format with four options lettered A-D and were dichotomously scored in which a correct answer attracted one mark while an incorrect answer attracted zero. The instrument was refined through appropriate validation by the JS II Basic Science teachers and Colleagues in Evaluation. The validated instrument was then administered to a school that did not partake in the study. The result was used for the determination of the index of reliability using Kuder-Richardson-20 technique. An estimate of 0.85 was obtained.

Data Analysis

The data collected were Analysis of Covariance (ANCOVA) and Estimated Marginal Means (EMM) in order to show how the two groups performed. ANCOVA was used to compare the means of the two groups in the BSAT while statistically controlling for the effects of a continuous covariate (Pre-test). Also as the researchers were not able to randomly assign participants to groups, ANCOVA helped to adjust potential pre-existing differences between the groups.

RESULTS AND DISCUSSION

Test of Hypotheses: Main effect of treatment on academic achievement

Hypothesis 1: There is no significant main effect of treatment on the academic achievement of students in Junior Secondary Basic Science. To test this hypothesis, Analysis of Covariance (ANCOVA) was carried out and the result is presented in Table 1.

Table 1. Summary of 2 x 2 Analysis of Covariance of Posttest achievement scores according to Treatment, Gender. Tests of Between-Subjects Effects.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	276.578[a]	4	69.145	5.469	.000	.132
Intercept	2046.045	1	2046.045	161.819	.000	.529
Pretest	124.851	1	124.851	9.874	.002	.064
Treatment	207.440	1	207.440	16.406	.000	.102
Gender	.075	1	.075	.006	.939	.000
Treat * Gender	10.159	1	10.159	.803	.372	006
Error	1820.737	144	12.644			
Total	55129.000	149				
Corrected Total	2097.315	148				

a. R Squared = .132 (Adjusted R Squared = .108)

The data on Table 1 show that there was a significant main effect of treatment (Code-switching) on the academic achievement of students in Junior Secondary Basic Science. $(F_{(1,144)}$ = 16.406, $p < .05 = .001$). Based on this finding, hypothesis 1a was rejected. In order to show how each group performed, Estimated Marginal Means (EMM) was carried out and the result is presented in Tables 2a and b.

Table 2(a). Dependent Variable: Grand Mean Estimated Marginal Means Post Achievement.

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
18.516[a]	.309	17.905	19.126

a. Covariates appearing in the model are evaluated at the following values: PreAch = 13.5302.

Table 2(b). Dependent Variable: Posttest Achievement.

Treatment	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental Group	19.795[a]	.502	16.243	18.229
Control Group	17.236[a]	.372	19.061	20.529

a. Covariates appearing in the model are evaluated at the following values: PreAch = 13.5302.

From the data in the EMM, Table 2(a), the grand mean is 13.53 for academic achievement. The data in Table 2(b) revealed that the experimental group had a mean score of 19.795, while the Control group (Conventional Teaching Strategy) had an adjusted mean of 17.236. This indicates that the experimental group performed better than the Control group indicating that the treatment was more effective than the control group.

The main effect of Gender on academic achievement

Hypothesis 2: There is no significant main effect of gender on the academic achievement of students in Junior Secondary Basic Science. The data in Table 1 revealed that there is no significant main effect of gender on the academic achievement of students in Junior Secondary Basic Science. $(F_{(1,144)} = .006; p > .05 = .939)$. Based on this result, hypothesis 2 was not rejected. Estimated Marginal Means, (Table 2) was determined to examine the differences in the posttest means of the two categories of gender, Table 3.

Table 3. Dependent Variable: Estimates Posttest Achievement.

Sex of Students	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Male	18.540[a]	477	17.597	19.482
Female	18.491[a]	.399	17.703	19.280

a. Covariates appearing in the model are evaluated at the following values: PreAch = 13.5302.

From the data in the EMM, Table 2(a), the grand mean is 18.516 for academic achievement. The data in Table 3 revealed that the males had a mean score of 18.540 and the females had an adjusted mean of 18.491. With this result, the males had a little better posttest academic achievement score with a difference of 0.05 but from ANCOVA this was not significant. This indicates that there was no significant difference in the academic achievement of students across gender and so hypothesis 2 was not rejected.

Interaction effect of treatment and gender on the academic achievement of students

Hypothesis 3(a): The hypothesis states that there is no significant interaction effect of treatment and gender on the academic achievement of students in Junior Secondary Basic Science. From the ANCOVA Summary, Table 1, it could be seen that there was no significant interaction effect of treatment and gender on the academic achievement of students in Junior Secondary Basic Science. ($F_{(1,144)}$ = .803; p > .05 = .372). Based on this result, hypothesis 3 was not rejected. This means that the interaction effect of treatment and gender did not produce any remarkable changes in the academic achievement of students in Junior Secondary Basic Science.

DISCUSSION OF FINDINGS

This study sought to find out if an effect could be found on the academic achievement when code-switching instructional strategy is used in teaching Basic Science. In this study three null hypotheses were stated. In the first hypothesis, it was sought to determine the effect of code-switching which is the treatment on academic achievement of student in Basic Science. Results of analysis showed that treatment had main effect on academic achievement indicating that code-switching influenced the academic of students positively. This finding is corroborated by the works of Simasiku et al (2015), Adesokan (2021), Santos (2021), Ali et al (2023) and Okeke et al (2025). However, Simasiku et al (2015) reported that some participants in their study were against the use of code-switching arguing that there were many languages spoken in the Caprivi Region and questioned as to which language could be used in mixed mother tongue classrooms and reiterated that the use of Code Switching would hinder communication in the classrooms.

For the second hypothesis, which sought for the effect of gender on academic achievement, it was found that there was no significant difference in the academic achievement of students in Basic Science based on gender. So there was no significant main effect of gender on achievement. This implies that there was no difference in the achievement of male and female Basic Science students. This result agrees with the findings of Ugwuadu's (2013), Ajai and Imoko (2015) in Tsaousis and Alghamdi (2022), but disagrees with those of other studies that reported significant differences, with the boys or the girls performing better Lakin (2013) in Nnamani & Oyibe (2016) and Abuh (2021) findings revealed that male students achieve higher than female folks in Science, Technology and Engineering. In a meta-analytic study, Voyer and Voyer (2014) found that females appear to have higher school grades in language-based subjects and STEM subjects than males. The third hypothesis in which there was interaction between treatment and gender, no significant difference was observed as there was no interaction effect. This outcome could be as a result of the gender factor masking the influence of treatment which singularly positively influenced achievement.

CONCLUSION

From the result of the study, it is concluded that code-switching instructional strategy could be very effective in teaching Junior Secondary School subjects and not only Basic Science since it is not gender bias. Also interacting treatment with gender did not produce any effect on academic achievement which the strategy further indicating that the strategy could not be made labile in a mixed-gender classroom.

RECOMMENDATION

The following recommendations were proffered in line with the results of this study.

The posting of teachers should be made in such a way that they have the advantage of both the first and second languages so that they will be in a better position to apply the strategy.

In situations where many first languages are spoken the use of the strategy should be limited so as not to put some learners to disadvantage

REFERENCES

Abuh, Y. P. (2021). Influence of Gender on Students' Academic Achievement in Science and Technology Education When Taught Using Innovative Strategies. African Journal of Science, Technology and Mathematics Education 7(1): 14-20

Adesokan, R. T. (2021). Effect of code switching on pre-NCE students achievement in mathematics: a study of FCE, Katsina. *Sapientia Foundation Journal of Education, Sciences and Gender Studies*, 3(1) 407 – 412

Al-Adnani, A. L. & Elyas, T. (2016). The effect of teachers' code-switching on students' achievement speaking in the EEF context: Official Conference Proceeding, the *Europeans Conference on Language learning*.

Ali, M. S. B; Ihsan, M. & Sherazi, G. Z. (2023). Effect of Code Switching on Bilingual Students' Success in Mathematics and Language Education. *Global Language Review (GLR)*, 8(2), 80 – 88. https://doi.org/10.31703/glr.2023 (VIII-II).08.

Delaney, J. M. & Devereux, P. J. (2021). Gender and Educational Achievement: Stylized Facts and Causal Evidence. Discussion. Paper Series IZA DP No. 14074

Habintwali, A; Niyibizi, E. Kamanzi, A. K. (2024). Code-Switching in Practice: Prevalence in Classroom Interactions during English and Mathematics Lessons at Selected Secondary Schools in Muhanga District, Rwanda. *African Journal of Empirical Research*, 5 (3), 1091-1101

Nnamani, S.C. & Oyibe, O.A. (2016). Gender and academic achievement of secondary school students in social studies in Abakiliki urban of Ebonyi State. *British Journal of Education*, 4(8), 72 - 83

Okeke, G. C; Badmus, B. O; Adeleke A. M; Alabi, T. D & Sabitu, K. A. (2025).Exploring the effect of code-mixing and code switching on academic achievement in mathematics among secondary school students in Oyo metropolis, Oyo state, Nigeria. *Trends in Social Sciences and Humanities Research*, 3(1), 53-57

Okoronka, O. N. (2014). Effect of emotional pictures on students, concept attainment in primary Science. *Journal of Primary and Teachers' Education Association of Nigeria*. 9(2) 56-62.

Santos, J. M. B. (2021). The utilization of code switching and its impact on students' academic performance. *Cosmos Journal of Engineering & Technology*, 11(2), 48 - 56

Simasiku, L; Kasanda, C & Smit, T (2015). Can Code Switching Enhance Learners' Academic Achievement? *English Language Teaching*; 8(2); 70 – 77. A Publication of Canadian Centre of Science and Education.

Steinmayr, R. Meißner, A. Weidinger, A. F. & Wirthwein, L. (2025). Academic Achievement. DOI: 10.1093/obo/9780199756810-0108. https://www.oxfordbibliographies.com/display/document

Tabaro, C., & Twahirwa, J. B. (2018). Analysis of language of instruction-related challenges encountered by Rwandan primary school pupils and teachers at Cyuve School (G.S.CYUVE). *International Journal of Contemporary Applied Researches*, 5(2), 1–22. http://ijcar.net/assets/pdf/Vol5-No2-February2018/01.pdf

Tsaousis I and Alghamdi MH (2022) Examining academic performance across gender differently: Measurement invariance and latent mean differences using bias corrected bootstrap confidence intervals. Front. Psychol. 13:896638. doi: 10.3389/fpsyg.2022.896638

Ugwuadu, N. J. (2013). Effects of multiple intelligence based instructional approach on students' cognitive achievement and retention in learning introductory technology. An unpublished M.Ed thesis, University of Nigeria Nsukka.

Voyer, D. & Voyer, S. D. (2014). Gender differences in scholastic achievement: a meta-analysis. Psychol. Bull. 140, 1174–1204. doi: 10.1037/ a0036620

Zheng, Z. & Mustappha, S. M. (2022). A literature review on the academic achievement of college students. Journal of Education and Social Sciences, 20(1), 11 – 18.