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EFFECTS OF FLIPPED CLASSROOM AND PEER TEACHING LEARNING STRATEGIES ON UPPER BASIC TWO STUDENTS' INTEREST IN BASIC SCIENCE

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ABSTRACT

This study investigates the impact of Flipped Classroom and Peer-Teaching strategies on the interest of Upper Basic Two students' in Basic Science within Plateau State, Nigeria. Guided by two research questions and two hypotheses, the research employed a quasi-experimental non-equivalent control group design. A sample of 397 students was drawn from a total population of approximately 182,400 Upper Basic Two students in state government-owned schools, using a simple random sampling technique (balloting with replacement). Two schools were randomly assigned to either the Flipped Classroom or Peer-Teaching groups. Each group was exposed to its respective teaching strategy. The instrument used for data collection was the Students Interest in Basic Science Scale (SIIBS). Mean and standard deviation were employed to address the research questions, while hypotheses were tested at a 0.05 level of significance using ANCOVA. The findings revealed that the Flipped Classroom learning strategy significantly enhanced students' interest in Basic Science compared to the Peer-Teaching strategy. Consequently, it is recommended that the Flipped Classroom learning strategy be adopted for effective handling of Upper Basic II students. This study contributes to the understanding of impactful teaching methodologies in enhancing student interest and engagement in Basic Science education.

Keywords: Flipped classroom learning strategy, Peer-teachingurategy, Interest and Basic Science

INTRODUCTION

In Nigeria's educational landscape, the significance of basic science at the Upper Basic level stands as a linchpin for scientific and technological progress, as emphasized by Ekwueme and Meremikwu (2013). It's widely acknowledged that a nation's scientific and technological advancement hinges upon a solid foundation in school science. However, despite its pivotal role, the performance of students in basic science, notably evident in the Junior Secondary School Certificate (JSSC) examination results, has fallen short of expectations. This discrepancy has spurred concerns among various stakeholders including parents, educators, and students themselves.

In response to this challenge, the Nigerian government and educational planners have taken numerous steps to address the issue of low performance in basic science. Policies emphasizing enhanced school supervision, incentives for science teachers, and encouraging continuous professional development through conferences and seminars have been implemented. Regrettably, these efforts have yielded minimal results, prompting a closer examination of potential underlying factors. One critical aspect that may significantly contribute to this underperformance is the level of students' interest in the subject. As highlighted by Obudo (2012) interest acts as a compelling force that drives a child's response to a stimulus. The correlation between interest and academic performance is evident; students tend to excel when they find a subject intriguing and engaging.

Gender differences also play a role, with Ekwueme and Meremikwu (2013) noting that girls, despite often outperforming boys, tend to lose interest in science at the primary school level. This finding underscores the necessity for educators to focus on nurturing and sustaining interest in basic science, recognizing its pivotal role as the bedrock of science education. In pursuit of strategies to bolster students' interest in basic science, the utilization of effective learning methodologies becomes imperative. Among these methodologies, the flipped classroom and peer teaching have

garnered attention. Research studies, such as Mason (2020) and Binola (2012) have indicated that the flipped classroom approach enhances students' engagement by enabling personalized learning experiences and fostering greater autonomy in the learning process. This increased control often sparks heightened interest among students, leading to deeper engagement with the subject matter.

Similarly, peer teaching, as explained by Roscoe and Chi (2017) and Topping (2017) not only reinforces learning, but also significantly enhances students' motivation and confidence in their abilities. The collaborative and social learning experiences facilitated by peer teaching not only aid in consolidating knowledge but also contribute to sustained interest and active participation in learning, as noted by Falchikov and Goldfinch (2017) and Sidelinger and Booth-Butterfield (2010). These learning strategies offer promising avenues to address the challenge of low interest in basic science among Upper Basic Two students in Nigeria. By leveraging methodologies that encourage active engagement, collaboration, and personalized learning experiences, educators aim to revitalize interest, ultimately fostering a deeper appreciation and understanding of basic science among students.

Purpose of the Study

The general purpose of the study is to find out the effects of Flipped classroom and Peer-teaching strategies on students' interest in Basic Science. Specifically the study intended to determine the:

1. Difference between the mean interest score of students taught Basic science using Flipped classroom learning strategy and those taught using Peer-teaching strategy.
2. Influence of gender on students' interest in Basic Science under Flipped classroom and Peer-teaching strategies.

Research Questions

The following research questions were made to guide the study.

1. What is the difference between the mean interest scores of students under Flipped classroom learning strategy and those under Peer-teaching strategy?
2. What is the influence of gender on students' interest in Basic Science?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance

1. There is no significant difference in the mean interest scores of students under Flipped classroom learning strategy and those under Peer-teaching strategy.
2. Gender does not have significant influence on students' mean interest score under Flipped classroom and Peer-teaching strategies.

Research Method

This study utilized a quasi-experimental research design, specifically employing the non-equivalent control group design. The study was conducted in Jos North Local Government Areas of Plateau State. These areas was selected due to the researchers familiarity, enabling effective monitoring and supervision of the experiment. The population of the study comprised all Upper Basic two students in state-owned secondary schools in Plateau State during the 2012/2013 academic session which was 32,850. Upper Basic two students were chosen due to the topic's inclusion in their curriculum, recognized as a challenging concept for both teachers and students. Sampling involved a simple random technique to select four schools from the chosen local government areas. Two schools were assigned to the Flipped Classroom group, while the remaining two were allocated to the peer teaching group. The sample consisted of 397 students (105 males and 292 females) drawn randomly from eight intact classes. The research instrument comprised two sections, A and B. Section A gathered demographic data, while Section B contained 25 items assessing students' interest in basic science. The Students' Interest in Basic Science' Scale (SIIBS) served as the data collection tool. Prior to implementation, the instrument underwent validation by

three experts - two in science education and one in measurement and evaluation from University of Jos. Experts' feedback was incorporated to refine the instrument. A reliability coefficient (Cronbach's alpha) of 0.82 was established for the SIIBS. The procedure involved training regular teachers in utilizing the prepared lesson notes. Pre-tests were administered to students before treatment and post-tests after treatment to ascertain the impact of the Flipped Classroom and Competitive groups. Mean and standard deviation were employed to address research questions, while ANCOVA was used to test hypotheses at a 0.05 level of significance using scores obtained from pre-test and post-tests. The analysis aimed to determine the effect of the teaching methodologies on students' interest in basic science.

Results

Research Question 1:

What is the effect of Flipped classroom and Peer-teaching strategies on student's interest i Basic Science?

Table 1: Mean and Standard deviation of interest scores of students under Flipped classroom and Peer-teaching strategies

Variable learning strategies	N	Pre-test X	Pre-test SD	Post-test X	Post-test SD	Mean gain
Flipped classroom	197	54.87	15.46	67.58	12.68	12.71
Peer-teaching strategy	200	51.36	26.25	58.45	17.07	7.09

The Flipped classroom learning strategy had a more positive influence on the subjects in that they obtained a high mean interest score of 67, 58 compared to their counterparts in the peer-teaching group with a mean interest score of 58.45.

Research Question 2

What is the influence of gender on students' interest in Basic Science?

Table 2: Mean and Standard Deviation of Interest Scores of Male and Female Students Taught Basic Science Under Flipped Classroom and Peer-teaching Strategies.

Learning Mode	Gender	N	Pre-test x	Pre-test SD	Post-test x	Post-test SD	Mean gain x
Flipped classroom	Male	105	54.44	15.12	57.67	17.20	3.32
	Female	92	55.37	15.92	59.34	16.97	3.97
Peer-teaching strategy	Male	105	52.69	15.99	67.09	12.93	14.40
	Female	92	49.88	16.50	68.11	12.45	18.23

In table 2 above, the female students in the 2 groups had higher interest mean gain scores (3.97 and 18.23) respectively than their male counterparts (3.32 and 14.40). This shows that the female students taught basic science under both Flipped classroom and Peer-teachingstrategies seemed to have higher interest than their male counterparts.

Hypothesis 1

There is no significant difference between the mean interest scores of students under Flipped classroom learning strategy and those under Peer-teaching strategy.

Table 3: Analysis of Covariance (ANCOVA) of students' Interest in Basic Science

Source	Type III of Squares	Sum df	Mean Square	F	Sig
Corrected model	**8461.992**	**4**	**2115.498**	**9.328**	**.000**
Intercept	**126752.456**	**1**	**12675.456**	**558.901**	**.000**
Pretest interest	**4.691**	**1**	**4.691**	**.021**	**.886**

GROUP	**8125.753**	**1**	**8125.753**	**35.830**	**.000**
Gender	**179.193**	**1**	**179.193**	**.790**	**.375**
GROUP gender	**9.924**	**1**	**9.924**	**.044**	**.834**
Error	**88901.192**	**392**	**226.789**		
Total	**1675325.000**	**397**			
Corrected total	**97363.184**	**396**			

Result on Table 3 shows a significant difference on the interest of students with flipped classroom learning strategy is higher than those taught under peer-teaching strategy at 0.05 alpha level. This is from the fact that f(1,392) = 9.924 and P = 0.00 < a = 0.05. The null hypothesis is rejected indicating that flipped classroom learning strategy has more positive effect on students' interest in basic science than the peer teaching strategy.

Table 4; Result of ANCOVA on male and female students' interest scores in basic science.

Source	**Type III**	**Sum of squares**	**Df**	**Mean square**	**f**	**Sig**	**Result**
Corrected model	4.26	2	2.13		0.04	0.95	NS
Intercept	2370.81	1	50.04	0.00	S		
Pre-interest	0.42	1	0.00	0.92	NS		
Gender	3.94	1	0.08	0.77	NS		
Error	1089.57		47.37				
Total	180540.00						
Corrected Total	1093.84						

Table 4 shows the summary of the one-way ANCOVA table on male and female students' interest scores in Basic science. The result reveals that the noted difference between the mean interest scores of male and female students taught with flipped classroom and peer teaching is not significant at 0.05 alpha level. This is from the fact that F(1, 23) = 0.08 and p = 0.77 > a = 0.05. The null hypothesis were therefore not rejected indicating gender discernment hence significant influence on stable mean interest score under flipped classroom and peer teaching.

DISCUSSION

The result on table 1 showed that Flipped classroom learning strategy had effect on students' interest in Basic Science. The group exposed to Flipped classroom learning strategy had mean gain score of 12.71 which is higher than the 7.09 for the peer-teaching group. Hence the Flipped classroom learning strategy appeared to have facilitated the development of interest in Basic Science among the students more than the Peer-teaching strategy. However, result in Table 3 indicates that the difference in mean interest score was significant. The null hypothesis (Ho,) which stated that there is no significant difference in the mean interest scores of students taught Basic science under Flipped classroom learning strategy and those taught under Peer-teaching strategy is rejected, implying that there was a significant difference in the mean interest scores of students taught Basic Science under Flipped classroom learning strategy and those taught under Peer-teaching strategy. This finding is contrary to the findings of Lawrence (2004) who stated that Peer-teaching increases interest. In the same vein, the result of this study did not agree with the view of Fasli and Kopoules (2005) which revealed that Peer-teaching strategy provides incentives for students to develop interest in science.

The findings of the study in Table 2 showed that male students under Flipped classroom learning strategy had interest mean gain score of 3.32 while the female students had interest mean gain score of 3,97, For the competitive group, the male students had an interest mean gain score of 14.40 while the females had an interest mean gain score of 18.23. This showed that female students

under Flipped classroom and Peer-teachingstrategies seemed to have higher interest than their male counterparts. However, data in Table 3 indicate that the gender differences are not significant, since the calculated probability of 0.38 is greater than the 0.05 level of significance. This implies that the gender gap is reducing. This is in line with the view of Martins (2008) who submitted that differences between boys and girls in the area of interest in science are now very small.

The findings of the study also showed that the reduction in gender gap is due to the teachers' effort presenting well-designed tasks to the students which in turn challenged the female students to do their best through the use of Flipped classroom and Peer-teaching strategies thus reducing the gender gap. This Indicates that the use of the learning strategies under study, did not only reduce the gender gap but also transformed the gap in favour of the female gender. This is not surprising because Nworgu (2004) observed that exposing students to appropriate activities reduces gender gap in science. From the fore going, it could be deduced from the findings of the study that female students developed a seemingly higher interest because the classroom was student friendly and their little effort and successes were acknowledged. It could also be attributed to the fact that their views were recognized and respected which have boosted and developed their confidence in their ability to develop and apply Flipped classroom and Peer-teaching strategies in the learning of Basic Science, hence the gender influence on the interest of male and female basic science students taught using the two strategies was not significant.

CONCLUSION

Based on the findings of the study, the researchers drew the following conclusions.

1) The use of Flipped classroom learning strategy in learning Basic Science concepts leads to increase in students interest in Basic Science more than the use of Peer-teaching strategy.

2) Although differences seem to exist in the mean interest scores of male and female students, gender is not a significant factor affecting students' interest in Basic Science when taught under Flipped classroom and Peer-teaching strategies

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were proffered:

1. Basic Science teachers should endeavour to develop and adopt Flipped classroom learning strategy as it would enhance overall interest of students in science.
2. Regular sensitization workshops should be organized to retrain Basic Science teachers on the development and use of Flipped classroom learning strategy.
3. The use of Flipped classroom learning strategy should be encouraged during pre-service teacher training programmes.
4. Government in conjunction with other professional bodies, like STAN, should sponsor further research on the use of Flipped classroom learning strategy.

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