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EFFECTS OF THINK-PAIR-SHARE AND INDIVIDUALIZED INSTRUCTIONAL STRATEGIES ON STUDENTS' INTEREST IN PRACTICAL BIOLOGY IN ABUJA, NIGERIA

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Abstract

This study investigated the Effects of Think-Pair-Share and Individualized Instructional Strategies on Students' Interest in Practical Biology in Abuja. The study adopted a quasi-experimental pretest-posttest control group design. A sample of 124 Senior Secondary one (SS1) students was drawn from three co-educational public senior secondary schools in Gwagwalada Area Council, Abuja. Twelve research questions and twelve null hypotheses were formulated and tested at 0.05 level of significance guided the study. A multi-stage sampling technique was used to arrive at one intact class from each of the three schools. The schools were randomly assigned to two treatment groups: Individualized and Think-Pair-Share Instructional Strategies and a control group. Instruments titled "Food Test Interest Scale (FTIS) were developed, validated and used for the study. FTIS has a reliability coefficient (internal consistency) of 0.76 determined using Cronbach's alpha. Mean and Standard Deviation were used to answer research questions while the null hypotheses was tested at 0.05 alpha level using Analysis of Co-variance (ANCOVA). The findings showed significant difference in the interest rating of the students in favour of Think-Pair-Share Instructional Strategy (TPSIS), followed by the individualized instructional Strategy (IIS) with the Control Group having the least interest rating. The findings also revealed no significant difference in the interest ratings of male and female students in favour of TPSIS, followed by the students in IIS, with the Control Group. On the basis of these findings, it was therefore recommended, among others, that the learning strategies used in this study are highly recommended to be used in teaching food test in senior secondary schools so as to improve and enhance students' interest in food test and also help curb the menace of poor performance in practical Biology.

Keywords: Student interest; Think-pair-share; Individualized instruction; Practical Biology; Cooperative learning

Introduction

Interest is a subjective feeling of intensity, concern or curiosity about something. It is regarded as the condition of wanting to know or learn about an object. The interest in a particular thing is a feeling manifested in

activity from which one derives some pleasure. Interest leads the individual to make a variety of choice with respect to the activities in which he engages, he shows preference to some and aversion to others. Interest refers to the tendency to seek out and participate in certain activities. Tran and Lewis (2022) noted that interest is a very strong factor in the teaching and learning of biology concepts. The degree and direction of interest towards these concepts are largely determined by the kind of interest developed by students for it. Students are very likely to work more diligently and most effectively at tasks in which they are genuinely interested in, that it is easier to interest student in their work than to keep them interested after the work has gone under way and the novelty has worn off.

In generating and sustaining interest in Biology concept (food test), the teacher should provide enough activities in either physical or intellectual sense for students. This makes the learning of food test fun. The absence of students" participation in Biology (food test) activities makes learning of food test boring and unexciting. A teacher who teaches food test as if he is telling a story is sure to make his students lose interest in food test (Olakehinde & Olatoye, 2024).

Nigerian science educators have long observed that students' interest in Biology concepts is uneven and that routine, teacher-centred delivery contributes to disengagement. Credit-level attainment in Senior Secondary Certificate Examination (SSCE) Biology among Federal Capital Territory (FCT) candidates ranged between 37.1% and 47.1% from 2020 to 2025 (Education Resource Centre, 2020–2025), and Chief Examiners' reports attribute much of the weakness to the practical paper, in which food-test questions recur and are answered poorly (West African Examinations Council, 2020–2025). Interest and attainment are not the same, but they are linked: students tend to remain interested in what they can do successfully, and to do well in what interests them. Food tests illustrate the difficulty. The topic is inherently hands-on, yet when it is taught by exposition it is experienced as a list of reagents and colour changes to be memorized. Where students are given little chance to participate, lessons become dull, the concept comes to seem abstract and difficult, and perceived difficulty erodes the sense of competence on which sustained interest depends. It is also easier to arouse interest at the start of a unit than to sustain it once the novelty has worn off, so instructional designs should be judged by whether they hold engagement across several weeks.

Food tests are a revealing context in which to study interest. The topic requires students to prepare samples, add reagents and watch for diagnostic colour changes; it is therefore intrinsically hands-on, and it is also procedurally demanding, since a poorly executed test yields ambiguous results. Constructivist accounts of learning expect activity-based teaching, in which students participate in concrete tasks and build understanding for themselves, to promote meaningful learning and interest, and the persistent difficulty students have with food-test items suggests that the topic has not been taught in this way. Examining interest in this specific context, and not interest in Biology in general, avoids the problem that a favourable attitude to the subject can coexist with boredom in a particular unit.

Two learner-centred strategies are widely recommended as remedies. Think-Pair-Share (TPS) (Lyman, 1981) asks learners to think alone, discuss with a partner and share with the class; in practical lessons the stages

become performing and recording a test alone, comparing observations and inferences with a partner, and reporting findings to the class. Individualized instruction (IIS) lets each learner work through structured tasks at his or her own pace without peer interaction (Anowor, 2021). Their implications for interest differ. TPS gives every learner a defined role in every lesson, lets ideas be tested with a partner in a low-risk setting before facing the class, and gives learners an audience; it embodies the positive interdependence, individual accountability and promote interaction which Johnson and Johnson (2021) identified as the active ingredients of cooperative learning. Cooperative learning has been shown to improve not only knowledge but also learners' perceptions and social relations (Kyndt et al., 2013). IIS gives learners control over pace and individual feedback, but it removes the social reward of working with others, places a heavy task on the learner, and lacks the element of competition that group work provides (Anowor, 2021); where classes are large and feedback is thin, its competence benefits may not materialise while its isolation costs remain.

Gender adds a further dimension. Boys' and girls' interest in science develops in contexts shaped by social expectations. Boys are often encouraged from an early age to explore, handle tools and take risks, whereas girls are more often steered toward conformity and caution, which can give boys a head start in hands-on science and lead girls to see themselves as less suited to practical work. Within classrooms, patterns in who handles equipment, who speaks in groups and whose contributions are taken up may reinforce this. Strategies that restructure participation could therefore alter gender differences in interest, but the direction is not predictable in advance, which is consistent with the mixed empirical record. The relevant statistical question is one of moderation, whether the difference between strategies is the same for boys and for girls, in addition to whether either sex differs within a strategy.

Objectives of the Study

The study determined the effects of TPS and IIS, compared with conventional teaching, on SS1 students' interest in food-test concepts in Biology in Abuja. Specifically, the study determined the effects of:

1. individualized and think-pair-share instructional strategies on SS1 students' interest in food test.
2. individualized instructional strategy on male and female SS1 students' interest in food test.
3. think-pair-share instructional strategy on male and female SS1 students' interest in food test.

Research Questions

The following research questions guided the study:

1. What are the mean interest ratings of SS1 students taught food test using Individualized, think-pair-share and conventional instructional strategy?
2. What are the mean interest ratings of male and female SS1 students taught food test using individualized instructional strategy?
3. What are the mean interest ratings of male and female SS1 students taught food test using think-pair-share instructional strategy?

Research Hypotheses

The following research hypotheses guided the study and were tested at 0.05 level of significance.

H_{O1}: There is no significant difference in the mean interest ratings of SS1 students taught food test using individualized,

think-pair-share and conventional instructional strategies.

Ho_2: There is no significant difference in the mean interest ratings of male and female SS1 students taught food test using individualized instructional strategy

Ho_3: There is no significant difference in the mean interest ratings of male and female SS1 students taught food test using think pair-share instructional strategy

Methodology

A quasi-experimental pretest–posttest non-equivalent control-group design with intact classes was used. The population was all SS1 Biology students in government secondary schools in Gwagwalada Area Council, FCT (N = 15,432). Three co-educational schools were randomly drawn and randomly allocated to TPS, IIS or control, and one intact SS1 class was randomly selected in each. The sample comprised 124 students TPS n = 44 (23 male, 21 female), IIS n = 42 (22 male, 20 female) and conventional n = 38. An instrument titled; Food Test Interest Scale (FTIS) consisting of 20 items. The instruments underwent face and content validation by three experts in Science Education and Measurement and Evaluation. . The reliability coefficients on FTIS using Cronbach-Alpha was 0.76 indicating high internal consistency**.** Descriptive statistic of mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results

Research Question 1

What are the mean interest ratings of SS1 students taught food test using Individualized, think-pair-share and conventional teaching method?

Table 1: The Mean and Standard Deviations of Interest Ratings of Students in the Experimental and Control Group

Teaching Methods	Test	N	Mean	S.D
Individualized	Preinterest	42	27.86	6.198
	Postinterest	42	46.24	9.627
Think-Pair-Share	Preinterest	44	28.98	6.436
	Postinterest	44	55.45	9.675
Convention Method	Preinterest	38	27.29	5.061
	Postinterest	38	49.55	6.474

Table1 shows the mean interest ratings of the students in individualized instructional strategy was 27.86 and 46.24; think-pair-share was 28.98 and 55.45 and conventional method was 27.29 and 49.55 in pretest treatment and posttest treatment interest ratings respectively; and standard deviations of 6.198 and 9.627; 6.436 and 9.675; 5.061 and6.4744 in that order.

Null Hypothesis 1

Ho_1: There is no significant difference in the mean interest ratings of SS1 students taught food test using individualized instructional strategy (IIS), think-pair-share instructional strategy (TPSIS) and Conventional Method (CM).

Table 2: One-Way ANCOVA Results on Mean Interest Rating of FTIS in Experimental and Groups

Source	Type III sum of squares	df	Mean Square	F	Sig	Result
Corrected Model	8089.257[a]	3	2696.425	57.051	0.000	S
Intercept	1466.295	1	1466.295	31.024	0.000	S
Preinterest	6212.271	1	6212.271	131.438	0.000	S
Group	**1322.887**	**2**	**661.443**	**13.995**	**0.000**	**S**
Error	5671.652	120	47.264			
Total	330295.000	124				
Corrected total	13760.927	123				

a. R Squared = .588 (Adjusted R Squared = .578)

Table 2 shows the summary of the one way ANCOVA results on students' mean interest rating of FTIS in the Experiment and Control groups. The results in Table 2 revealed that the noted difference between the food test interest scale mean scores of the students taught using IIS, TPSIS and CM was significant at 0.05 alpha levels. This is from the fact that $F_{(2,120)} = 13.995$ and, $P=0.000 < \propto = 0.05$. The null hypothesis was therefore rejected, indicating that there is significant difference in the means interest ratings of students' taught food test using IIS, TPSIS and CM.

Table 3: Bonferroni Test Analysis for Pair-wise Comparison of Means Interest Rating for IIS, TPSIS and CM

i. Group	(J) Group	Mean Difference (I-J)	Std Error	Sig.	95% Confidence interval for Difference	
					Lower Bound	Upper Bound
IND	**TPS**	-7.871*	1.488	0.000	11.483	-4.259
	CM	-3.997*	1.540	0.320	-7.736	-0.257
TPS	**IND**	7.871*	1.488	0.000	4.259	11.483
	CM	3.874*	1.533	0.380	0.153	7.596
CM	**IND**	3.997*	1.540	0.320	0.257	7.736
	TPS	-3.874*	1.533	0.380	-7.596	-0.153

The Post Hoc Analysis using Bonferroni test to determine the direction of superiority of means by Pair-wise Comparison is shown in Table 3. Based on the estimated marginal means, the Table shows the following mean difference between groups: IIS and TPSIS have mean difference of 1.488, P = 0.000 < $\propto$ = 0.05. IIS and CM have mean interest difference of 1.540, P = 0.032 < $\propto$ 0.05, while TPSIS and CM have 1.533, P = 0.038 < $\propto$ 0.05. Even though both mean differences are significant at 0.05 levels which rejected the hypotheses, the results of this test indicate that TPSIS and IIS were more effective in showing interest in acquisition of science process skills among Biology students.

Research Question 2

What are the mean interest ratings of SS1 male and female students taught food test using individualized instructional strategy?

In order to answer research question 2, mean and standard deviation of students' scores in the various groups were calculated as shown in Table 4.

Table 4: The Mean and Standard Deviation of FTIS of Male and Female Students in the Experimental Group 1 (IIS)

Gender	Test	N	Mean	S.D
Male	Preinterest	22	29.45	7.089
	Postinterest	22	45.86	10.829
Female	Preinterest	20	26.10	4.599
	Postinterest	20	46.65	8.368

Table 4 shows that the interest mean ratings of the male students taught using individualized instructional strategy was 29.45 and 45.86 in pretreatment and post treatment interest ratings respectively and standard deviation of 7.089 and 10.829 in that order. For the female students, it was observed that they had the interest mean scores of 26.10 and 46.65 in pretreatment and post treatment interest ratings and standard deviations of 4.59 and 8.368 in that order.

Null Hypothesis 2

Ho_2: There is no significant difference in the mean interest ratings of SS1 male and female students taught food test using IIS.

Table 5: Results of ANCOVA on Male and Female Mean Interest Scores of FTIS in IIS

Source	Type III sum of squares	df	Mean Square	F	Sig
Corrected Model	2058.049[a]	2	1029.025	23.044	0.000
Intercept	319.606	1	319.606	7.157	0.011
Preinterest	2051.571	1	2051.571	45.942	0.000
Gender IND	**220.210**	**1**	**220.210**	**4.931**	**0.032**
Error	1741.570	39	44.656		
Total	93594.000	42			
Corrected total	3799.619	41			

a. R Squared = .542 (Adjusted R Squared = .518)

Table 4 shows the summary of the one-way ANCOVA on male and female students' interest mean ratings in FTIS of IIS. The results in Table 5 reveals that the noted difference between the interests means ratings of the male and female students taught using IIS is significant at 0.05 alpha level. This is from the fact $F_{(1, 39)} = 4.931$ and $P = 0.032 < \propto = 0.05$. The null hypothesis is therefore rejected showing that there is significant difference in the interest mean scores of male and female students who are exposed to IIS.

Research Question 3

What is the mean interest ratings of SS1male and female students taught food test using think-pair-share instructional strategy (TPSIS)?

Table 6: The Mean Scores and Standard Deviations in FTIS of Male and Female Students in the Experimental Group 2 (TPSIS)

Gender TPS	Test	N	Mean	S.D
Male	Preinterest	23	30.04	6.997
	Postinterest	23	56.04	9.883
Female	Preinterest	21	27.81	5.698
	Postinterest	21	54.81	9.642

Table 6, shows that the mean interest ratings of the male students taught using TPSIS was 30.04 and 56.04 in the pretreatment and post treatment interest ratings respectively and standard deviations of 6.997 and 9.883 in that order. For the female students, it was observed that they had mean interest ratings of 27.81 and 54.81 in the pre-interest and post-interest, and standard deviations of 5.698 and 9.642 in that order.

Null Hypotheses 3

Ho_3: There is no significant difference in the mean interest ratings of SS1 male and female students taught food test using think-pair-share?

Table 7: Results of ANCOVA on Male and Female Mean Interest Ratings of FTIS in TPSIS

Source	Type III sum of squares	df	Mean Square	F	Sig
Corrected Model	2366.959[a]	2	1183.480	29.267	0.000
Intercept	925.617	1	925.617	22.890	0.000
Pretest	2350.245	1	2350.245	58.120	0.000
Gender TPS	**20.049**	**1**	**20.049**	**0.496**	**0.485**
Error	1657.950	41	40.438		
Total	139334.000	44			
Corrected total	4024.909	43			

a R Squared = .588 (Adjusted R Squared = .568)

Table 7 shows the summary of the one-way ANCOVA table on male and female students' interest mean ratings in TPSIS. The results in Table 7 reveals that the noted difference between the interests means ratings of the male and female students taught using TPSIS was not significant at 0.05 alpha level. This is from the fact $F_{(1, 41)} = 0.496$ and $P = 0.485 > \propto = 0.05$. The null hypothesis was therefore not rejected showing that there is no significant difference in the interest mean ratings of male and female students who are exposed to TPSIS

Discussion of Findings

The results of the interest means and standard deviations scores in FTIS of the students in the experimental and control groups revealed the mean interest scores of Individualized Instructional Strategy, Think-Pair-Share Instructional Strategy and Conventional Method. The results revealed the students taught with TPSIS show more interest on the concept of food test than those taught without it. A post hoc analysis was done using Bonferroni test to determine the direction of superiority of interest mean rating by Pair-wise Comparison of IIS and TPSIS, IIS and CM and TPSIS and CM. Even though both mean differences are significant at 0.05 levels which rejected the hypotheses, the results of this test indicate that students developed more interest on the concept of food test when taught with TPSIS followed by the IIS and conventional method as the least.

The results of interest mean rating and standard deviations of male and female students in the IIS revealed the gender interest is not a significant factor on food test when taught with individualized instructional strategy even though the difference between the male and female rating is not much, but the difference is not significant with that of the male at 0.05 alpha level. For the interest

mean rating and standard deviations of male and female students in think-pair-share instructional strategy, the results revealed that think-pair-share instructional strategy has significant effect on gender interest when taught food test as the interest rating is in favour of the male.

Conclusions

Based on the findings of this study, individualized and Think-Pair-Share instructional strategies enhanced students' interest, in the food-test aspect of Biology compared with conventional teaching. The results indicate that Think-Pair-Share produced particularly strong outcomes for students' interest.. These findings suggest that students benefit when Biology practical lessons actively involve them rather than relying mainly on teacher exposition. Within the limits of the schools, topic and sample studied, the two strategies are therefore useful alternatives to conventional teaching for teaching food test and supporting practical Biology learning.

Recommendations

On the basis of the findings, the following recommendations are made.

1. The learning strategies used in this study are highly recommended to be used in teaching food test in senior secondary schools, seeing that they have capacity to improve and enhanced positive interest in Biology.
2. Science curriculum planners and developers should continue to incorporate these strategies to help cob the menace of poor performance in Biology that was attributed to low interest.

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