



Research Article

Reflective teaching strategy on students achievement and interest in basic technology

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ABSTRACT

The design for this study was quasi experimental, specifically the non-randomized control group pretest post-test design involving two groups – the control group and experimental group was used in this study. 6125 (JSS III) students who are offering Basic Technology in Minna Educational zone formed the population of this study. 241 Junior Secondary three (JSS III) students of two co-educational schools offering Basic Technology were sampled. The two-co-educational secondary schools were randomly drawn using balloting from four co-educational schools offering Basic Technology in Minna educational zone. Two intact classes were used for the study. In each of the sampled schools, all the JSS III students in the intact class randomly selected belonged to one group either the experimental (RTS) or control (TAT) group and thus received the same treatment. Basic Technology Achievement Test (BTAT) and the Basic Technology Interest Inventory (BTII), were developed and validated. An internal reliability consistency of BTAT was found to be 0.75 using Kuder Richardson formula $20(K - R20)$ and that of BTII was 0.85 using Cronbach Alpha. The BTAT and BTII were administered as pretest to the two groups. Mean and standard deviation was used to analyzed research questions; while analysis of covariance (ANCOVA) was used in testing the hypotheses at 0.05 level of significance. The result of the analyses indicated that the effect of reflective teaching strategy on students' achievement and interest in Basic Technology was significant and gender was not a significant factor on students' academic achievement and interest in Basic Technology among others.

Keywords: *Reflective teaching strategy, Achievement, interest, Assessment, Teacher*

1. INTRODUCTION

Science education of today is relied upon to create an experimentally proficient populace that can work in a logical and technology evolving society. The much want technology of our nation can be accomplished when understudies obtain the basic information in science before living school. The information on science is utilized in the creation of materials that decreases pressure; ensure individuals just as makes life simpler. It is subsequently a fundamental factor for monetary improvement of a nation (Olagunju, Adesoji, Iroegbu, and Ige 2013). It is accordingly infers that for any significant national development and advancement to be accomplished, science must be given satisfactory consideration (Nwagbo, 2012; Opara, 2014). Basic science involves the pre-essential, essential, and post essential science. That is the first 9 years in quite a while in Nigeria. (The initial 6 years is called basic science and technology while the most recent three years is called basic science). This is one of the center subjects offered at the degrees of Nigerian education framework. It is a significant subject that has positive effect on human's life and nation's economy. Basic science is officially called coordinated science. Rudraiah (2015) expressed that the basic science is the foundation of applied science or establishment on which all old and current technology depends.

Basic science is a piece of science that depicts the most basic items, powers, relations among them and laws administering them, to such an extent that all other wonder might be on a fundamental level got from them following the rationale of logical reductionism. It prompts mechanical advances and financial advantages that offer extraordinary chances to meet the basic human needs, lessen destitution, secure nature and improve the personal satisfaction. Basic science is the stage for information premise improvement. The improvement of basic science in Nigeria start from presidential activity targeting accomplishing national economy and human

turn of events, in commitment to the acknowledgment of vision which target Nigeria positioning among the 20 biggest economies in year 2020 (Obiageli, 2016). Some portion of the methodologies received to improve the headway of basic science in Nigeria is the presentation of 9-3-4 arrangement of education through the National Policy on Education. Obiageli (2016) at an initial service of the 22nd yearly gathering workshop of Nigeria Institute of Science technology held at Abuja proclaimed that the Government because of advancing science and technology education at the grass root ought to leave on basic science and different activity to engage the adolescent through science and technology education. Since every one of these understudies are shown basic science at the key level or basic level, this is an open door for teachers to teach and understudies to gain proficiency with the logical methods of getting things done. Basic science empowers understudy to build up a comprehension of utilization of logical information to ordinary exercises. It causes adolescent to exceed expectations in the field identified with applied science and helps efficient advancement in technology. Science as an order encapsulates ideas from such different trains as: Biology, Physics, Chemistry, solely with separate from wellbeing science, Mathematics, Geography, Agriculture and Technology. This infers subject unites in general, ideas of all science in the everyday issues, vitality and condition. All ideas from these regions of specialization are fitting to furnishing students at junior auxiliary level with the utilitarian information and aptitude required to meet the yearnings of the general public. On the off chance that this is to occur, the science must be instructed by capable teachers who are educated about the whole subject united to make an entirety. Analysts have recognized some likely explanations of horrible showing in basic science. This range from understudies' factor like helpless mentality to science, absence of enthusiasm for science (Adepitan, 2010), helpless arithmetic or science foundation (Ogunleye, 2013), Government factors in the zones of strategy making, infrastructural arrangement and government assistance (Ogunleye, 2013) and teaching techniques utilized (Adepitan, 2012; Kalijah, 2017; Bhatti et al., 2018; Laraib et al., 2020).

Gatumu (2016) set that intelligent teaching has to do with purposeful examination of how we teach and learn. It fits in the interpretive perspective on teaching and learning, a move towards basic thinking about the manner in which we teach and learn. It is a sort of teaching system which must be seen in wording what you can accomplish for yourself and your understudies to find out profitability in your teaching and understudies' learning. In this degree intelligent teaching is a call to let you join hypothesis and practice to keep up and continue your teaching calling. Intelligent teaching implies taking a gander at what you do in the study hall and giving it a significance of appending the why question to what you experience. Your reviewed encounters as a teacher are investigated and assessed to let you satisfy your strategic vision in the teaching calling. Gatumu (2016) view intelligent teaching as cyclic procedure by which teacher deciphers his/her homeroom practice. Intelligent teaching empower teacher to from the known to the obscure by utilizing reviewed encounters in a basic way. XU Qing (2018) place that intelligent teaching isn't an imaginative in teaching. It has its root in crafted by educational scholar and specialists. The ideas has been around for over 50 years. Intelligent teaching is without a doubt a legitimate methods towards powerful teaching rehearses. Intelligent teaching is a way to deal with teaching and to teacher education which is base on the suspicion that teachers can improve their comprehension of teaching and the nature of their own teaching by thinking about basically their teaching encounters.

Different teaching and learning approaches in Basic Science and Technology have been investigated and were found useful but students' poor achievement in Basic Technology still persisted. For instance, Onwubiko (2011) applied the Student Centered Teaching Approach while Akudolu (2013) and Anekwe (2016) applied the Computer Assisted Instruction and Constructivist Based Instructional Model respectively. The findings of their studies proved to have significant effects on students' achievement in Basic Technology. Despite their findings, students have not improved in their Basic Technology achievement. Offorma (2010) observed that class one Junior Secondary School (JSSI) students are very enthusiastic about Basic Technology and the enthusiasm lingers on and starts to dwindle from Junior Secondary class three (JSS III). Akudolu (2013) made a similar observation that the exodus of students from Basic Technology class occurs mostly in the Junior Secondary School (JSS) after the students have learnt basic technology for at most three years.

Interest has been defined by Anderson et al. (2008) as "the capacity to evoke an emotional response". It is this emotional response that sustains the quests for learning. Olikeze (2009) defined interest as "a persisting tendency to pay attention and enjoy some activities; or content is of interest if it's pleasing and engages one's

attention". Anderson et al (2008) added that "interest increases attention which, in turn increases learning." However to test the statement, they conducted a series of experiments and found out that even when the factor of attention was removed, that interest was enough to promote learning. They also found out that as regards to language learning, interest has a profound positive effect on the learning of sentences and the students' reading time.

2. LITERATURE REVIEW

2.1 STATEMENT OF THE PROBLEM

Students' poor achievement in Basic Technology over the years in both external and internal examinations in the Junior and Senior Secondary Schools has attracted a lot of concern.

Based on the observed poor achievement, a number of methods of teaching designed to stimulate students' interest and learning of Basic Technology had been suggested and tried out by researchers in Nigeria. Despite these useful strategies, students' have not yet improved in their academic achievement. Since the teachers have made use of different instructional methods without the students improving in the academic achievement, perhaps an assessment technique like reflective teaching strategy could be of help. Reflective teaching strategy encourages students' active participation in their own learning and motivates students learning. Students' participation includes contributing during discussions, initiating ideas, clarifying points among students, students paying individual attention to their fellow students, asking and answering questions. All these will be done under the supervision and direction of the teacher.

Some studies have been conducted in the area of gender – related differences in the academic achievement and interest of students in the different learning method. It was discovered that in some cases (Anekwe, 2016; Akudolu, 2013), there is no gender difference in students academic achievement and interest while in some, gender difference abound. The contradictory results/reports in academic achievement and interest due to gender has led to the need to find out the influence of RTS on students' achievement and interest, by gender, in Basic Technology.

2.2 PURPOSE OF THE STUDY

Compare the mean achievement scores of Junior Secondary three (JSS III) students exposed to reflective teaching strategy (experimental) and traditional teaching strategy (control) techniques on a Basic Technology Achievement Test (BTAT).

Compare the mean interest scores of students exposed to reflective teaching strategy and traditional teaching strategy in Basic Technology Interest Inventory (BTII).

2.3 RESEARCH QUESTIONS

The following four research questions were posed to guide the research.

To what extent would any of the two assessment techniques, to reflective teaching strategy and traditional teaching strategy enable students to have higher academic achievement as indicated by their mean scores in Basic Technology Achievement Test (BTAT)?

Which group of students, those assessed with to reflective teaching strategy or those assessed with traditional teaching strategy showed greater interest in Basic Technology as indicated by their mean scores in Basic Technology Interest Inventory (BTII)?

2.4 HYPOTHESES

Based on the research questions, the following null hypotheses are put forward in this study to be tested at $p < 0.05$ level of significance.

H01: There is no significant difference in the BTAT scores of students exposed to reflective teaching strategy and those exposed to traditional teaching strategy.

H02: There is no significant difference in mean interest scores of students exposed to reflective teaching strategy and those exposed to traditional teaching strategy as determined by the use of BTII.

3. METHODOLOGY

The design is a quasi-experimental design. Specifically the design used is the non-randomized control-group pretest-post-test-design involving two groups - the experimental group and the control group. This study was conducted in Minna educational zone. The target population comprised of all the Junior Secondary School class three (JSS III) students doing Basic Technology in all the state owned co-educational secondary schools in Minna educational zone. Two out of the four co-educational schools doing Basic Technology in the area of the study were randomly sampled using balloting. Using co-educational schools will enable the researcher obtain a true record of gender interaction. Two instruments were used for data collection in this study, which are; Basic Technology Achievement Test (BTAT) for JSS III and Basic Technology Interest Inventory (BTII) for JSS III. The instrument was validated by two experts in Industrial and Technology Education Department, Federal University of Technology, Minna.

The reliability of internal consistency of BTAT was determined using the Kuder Richardson Formula 2o (K-R2o) technique. The procedure helped to establish the internal consistency of the BTAT items. The researcher administered the BTAT to 65 JSS III Basic Technology students of Government Secondary School, Bida. These students' scores were used to compute the coefficient of internal consistency of BTAT. Establishing this form of reliability for the BTAT was considered necessary since items were aggregated into a composite score for each individual. This practice presupposed that the items are homogenous. The reliability index of $r = 0.75$ was obtained for the BTAT and 0.85 for BTII.

The two instruments for collection in this study (BTAT and BTII) were administered to the students before the experimental treatment. Students' scores in this first administration served as the pretest of the study. After this, the treatment and control condition commenced. The teaching period of the research lasted for one month of twelve lesson periods.

The research questions were answered using mean and standard deviation. The hypotheses were tested at 0.05 level of significance Analysis of Covariance (ANCOVA).

4. RESULTS

4.1 RESEARCH QUESTION L

To what level would any of the two assessment techniques, to reflective teaching strategy and traditional teaching strategy enable students to have higher academic achievement as indicated by their mean scores in Basic Technology Achievement Test (BTAT)?

Table 1: Means and Standard deviation of Pre-test and Post-test scores of students in BTAT by treatment and gender

		Gender			Gender		
		Pretest			Posttest		
Treatment		Male	Female	overall Mean	Male	Female	overall Mean
Experimental (RTS)	Mean	41.69	45.83	43.76	59.67	63.48	61.58
	SD	14.98	14.07	14.52	12.07	12.50	12.28
	N	58	65	123	58	65	123
Control (TTS)	Mean	43.33	46.97	45.15	46.61	49.73	48.17
	SD	13.96	13.32	13.64	12.79	8.90	10.85
	N	43	75	118	43	75	118

The overall mean post-test score of the students taught using Reflective Teaching Strategy (RTS) was 61.58 with standard deviation (SD) of 12.28. The group taught using Traditional Teaching Strategy (TTS) had an overall

mean post-test score of 48.17 with SD of 10.85. The difference between the experimental group and control group was 13.41. This suggested that students assessed with RTS have higher academic achievement than students assessed using TTS.

4.2 RESEARCH QUESTION 2

Which group of students, those assessed with to reflective teaching strategy or those assessed with traditional teaching strategy showed greater interest in Basic Technology as indicated by their mean scores in Basic Technology Interest Inventory (BTII)?

Table 2: Mean and Standard Deviation (SD) of Pre and Post-test scores of students in BTII by treatment and gender

Treatment		Gender			Gender		
		Pretest	Pretest	overall Mean	Posttest	Posttest	overall Mean
		Male	Female		Male	Female	
Experimental (RTS)	Mean	45.36	48.92	47.14	56.28	73.06	64.67
	SD	12.60	11.76	12.18	11.11	16.71	13.91
	N	58	65	123	58	65	123
Control TTS	Mean	46.23	49.35	47.79	49.19	50.53	49.86
	SD	13.40	11.71	12.55	11.87	10.26	11.06
	N	43	75	118	43	75	118

Table 2 showed that the students assessed using RTS recorded higher overall mean interest score of 64.67 with a standard deviation (SD) of 13.91 while students taught using TTS had a less overall mean interest score of 49.86 and a SD of 11.07. It seemed that the experimental group (RTS) showed more interest in Basic Technology than the control group (TTS) as indicated in their overall mean interest score in BTII.

4.3 HYPOTHESIS 1

H01: There is no significant difference in the BTAT scores of students exposed to reflective teaching strategy and those exposed to traditional teaching strategy.

Table 3: Analysis of Covariance (ANCOVA) of students' overall Post Achievement mean scores in BTAT (Assessment Technique and Gender)

Source of variation	Sum of squares	Df	Mean square	F calculated	Sig. of F	F table
Corrected model	28633.34	4	7158.34	125.71	.00	
Intercept	16343.68	1	16343.68	287.02	.00	
Pretest	17603.35	1	17603.35	309.14	.00	
Sex	65.80	1	65.80	1.16	.28	3.96
Treatment	11720.53	1	11720.53	205.83	.00	3.96
Sex x treatment	2.01	1	2.01	.04	.85	3.96
Error	13438.59	236	56.74			
Total	778375.00	241				
Corrected Total	42071.93	240				

The F calculated for assessment techniques in BTAT was 205.83 at the 0.05 level of significance and 236 degree of freedom (df) while the F critical value was 3.96. Since F calculated (205.83) was greater than f critical (3.96), the decision was to reject the null hypothesis. This implies that there is a significant ($P < 0.05$) difference between the two assessment techniques (RTS and TTS) as measured by the students' mean BTAT scores using Analysis of Covariance (ANCOVA). This appears equally to suggest that the early observed difference between the means of the two groups was not attributed to chance error but due to the treatment.

4.4 HYPOTHESIS 2

H03: There is no significant difference in mean interest scores of students exposed to reflective teaching strategy and those exposed to traditional teaching strategy as determined by the use of BTII.

Table 4: Analysis of Covariance (ANCOVA) of students' Overall Post-Interest mean scores in BTII (Assessment Techniques and Gender)

Source of variation	Sum of squares	Df	Mean square	F calculated	Sig. of F	F table
Corrected model	35421.46	4	8855.36	5.44	.00	
Intercept	12070.25	1	12070.25	7.41	.01	
Pretest	12996.91	1	12996.91	7.98	.01	
Sex	2820.71	1	2820.71	1.73	.19	3.96
Treatment	13343.06	1	13343.06	8.19	.01	3.96
Sex x treatment	3323.81	1	3323.81	2.04	.15	3.96
Error	384387.61	236	1628.76			
Total	1223588.00	241				
Corrected Total	419809.06	240				

The F calculated for assessment technique was 8.19 against the critical value of 3.96 at the 0.05 level of significance, 1 df for numerator and 236 df for denominator. Since the calculated value exceeded the critical value, the null hypothesis of no significant difference in the mean interest scores is rejected. It is therefore inferred that the effect of reflective teaching strategy on students' interest in Basic Technology is significant.

4.5 DISCUSSION OF RESULTS

The study has revealed that students taught using RTS achieved significantly better than students taught using Traditional method. The higher achievement of students taught using RTS could be attributed to the fact that the students were involved in their own learning starting from setting of criteria to assessment of their fellow students' work. This could excite them and boost their enthusiasm to learn Basic Technology. Oboh (2008) noted that peer assessment encourages creativity on the part of the students, promotes students' independence and limits teacher's interference on students' output. The students' achievement in peer assessment could be explained on the basis of expectations from fellow students, coupled with the fact that a student's achievement will be made known to other students.

The above finding appears to be consistent with that of Anekwe (2016) and Akudolu (2013). They observed that students' achievement in Basic Technology were statistically significant using the Constructive Based Instructional Model (CBIM) and Computer Assisted Learning (CAL) respectively. The works of Agbaegbu (2011), Ifeakor (2012) and Anaekwe (2016), were also consistent with the above finding. They studied on the effects of peer assessment techniques on students' cognitive achievement in their different subject areas and found out that the students' cognitive achievement using RTS was statistically significant. However, the finding of this study with respect to cognitive achievement in Basic Technology contradicts those of onwubiko (2011) in which they reported that the teaching approaches he studied using Basic Technology, were not statistically significant to the conventional teaching method. Peer assessment exposes students to the skills of critical reflection and analysis and increases students' confidence in their ability to perform according to special criteria, as well as their awareness of the quality of their work.

The study has revealed that students taught using Reflective teaching strategy (RTS) showed significant interest in Basic Technology than those taught using Traditional Teaching Strategy. The finding of this study in respect to students' interest with regards to assessment techniques agrees with that of Agbaegbu (2011), who observed that the mean interest score of students in the peer assessment group was greater than the mean interest score of students in the teacher assessment group. Also in agreement with the findings of this study in respect to students' interest in Basic Technology is the finding of Anekwe (2016) on the Effects of Constructivist –Based Instructional Model (CBIM) on students' Interest and Achievement in Basic Technology. He observed that

students taught with CBIM (experimental) showed greater interest in Basic Technology than those taught with TCM (control). This means that modes of assessment and instruction have significant effect on the interest rating of students. Akudolu (2013) observed on the contrary in his finding, that mode of instruction had no significant effect on the interest rating of the student.

On the combined effect of Reflective teaching strategy on students' interest in Basic Technology, there was no significant effect. This conformed with Agbaegbu (2011) who found the combined effects on RTS and gender on students' interest towards Geography not significant. This meant that the efficacy of RTS on students' interest was consistent.

From the findings of this study, it could be deduced that with an innovative assessment technique like RTS in which male and female students have shown equal interest, they could equally attend to high standard in Basic Technology achievement.

5. CONCLUSION

The study had shown that RTS has significant effect on students' cognitive achievement and interest in Basic Technology. The RTS enabled students to learn more Basic Technology grammar than their counterparts who were taught using the TAT. The RTS appeared to be more efficacious than TAT in engendering the aforementioned criterion measure.

The influence of gender on cognitive achievement in Basic Technology was not significant though the female students tended to exhibit superior achievement over their male counterparts. The study indicated no significant gender influence on interest in Basic Technology but the female students tended to show more interest towards the subjects.

The combined effects of RTS and gender on students' cognitive achievement and interest were not significant. Both male and female students demonstrated equal level of achievement and interest in the RTS.

5.1 RECOMMENDATIONS

Innovations like RTS demand well-trained personnel and make training and retraining of staff imperative. Heads of teacher training tertiary institutions should include RTS as one of the methods of evaluation and should impart the usage to the student teachers.

There should be no discrimination or gender factor in any teaching and learning situation. Both the male and female learners should be made to see themselves as co-learners and discrimination against sex must be sincerely avoided.

The Ministry of Education in Nigeria should organize seminars, workshops and conferences for Basic Technology teachers on how to use RTS in teaching and evaluating students of Basic Technology. The same ministry of education should consider adopting RTS for the purposes of promoting gender equality in Basic Technology classroom.

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