

# Active Review Strategy and Students' Attitude to Basic Science in Oyo State

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## **Abstract**

*This study examined the effects of Active Review (ARIS) Instructional strategy on students' attitude to Basic Science in Oyo State. The study adopted a pretest-posttest, control group, quasi experimental design. Oyo central senatorial district was purposively selected due to the observed low performance of students in Basic Science in the area. Six Junior Secondary Schools (JSS) were randomly selected from the district, while nine intact classes of JSS II student participants were randomly assigned as follows: ARIS (131), and control (131) groups. The Three instruments used were Basic Science Attitude Scale ( $r = 0.86$ ), and instructional guides for ARIS (Scott's  $\pi = 0.74$ ), and conventional ( $\pi = 0.78$ ) strategies. Three null hypotheses were tested at 0.05 level of significance. Data were analysed using Analysis of Covariance. Treatment had a significant main effect on achievement attitude ( $F_{(1, 262)} = 13.30; \eta^2 = 0.07$ ). Students in the ARIS ( $\bar{x}=51.11$ ) had better attitude ( $\bar{x}=53.64$ ) than those control ( $\bar{x}= 45.28$ ). The two-way interaction effect of treatment and gender, were not significant. Also, the three-way interaction effect of treatment and gender was not significant. Active review strategy enhanced student's attitude to Basic Science in Oyo State. Therefore, this strategy should be adopted in teaching Basic Science to junior secondary schools students.*

*Keywords:* Active review instructional strategy, Students' attitude, gender Basic Science.

## **Introduction**

The relevance of Basic Science to technological development in Nigeria is very vital and the knowledge of the concepts in the subject is a pivotal to the scientific academic careers of students. The Federal

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Government of Nigeria in its quest for scientific formulated goals in the National Policy on Education (NPE, 2014) which reflected among others, the acquisition of appropriate skills and the development of mental, physical and social abilities as well as competencies required for the individual to live, in and contribute to the development of the society. Education stakeholders have expressed anxiety over low educational achievement levels, but the root causes have not been identified, including student, teacher, or environmental variables. Numerous reasons could contribute to low accomplishment in scientific classes, including bad teaching techniques, students' lack of interest, an unfavorable learning environment, a lack of textual resources, and poor study habits (Oyasola & Adegoke 2022)

Previous study asserted that only negligible sample of students made it to offer science courses at senior secondary schools and higher levels due to their recurrent mass failure in the junior secondary School Certificate Examination (JSSCE) (Awopeju & Afolabi, 2016). Consequently, students' poor performance as revealed by chief examiner reports, might be because students develop negative attitude towards the science subject. Attitude is an emotional state of individual towards an object or situation. Previous study stated that attitude is the extent (degree) at which learners' likes' science (Bai et al., 2022). Also, attitude is an inclination to reason, sense, and perform decidedly or contrarily in the direction of objects in our present environment. They then conclude the following as some of the reasons responsible for poor performance of students in various examinations; mass promotion of students from one class to another; lackadaisical attitude of students to both internal and external examinations; inability of senior secondary students to read or write; shortage of qualified teachers in schools due to poor remunerations and parents not being responsible for examination fee of their student. Also, Oni (2024) remarked that acquisition of knowledge in the subjects is one of the means by which the nation hopes to attain the Millennium Development Goals (MDGs) by 2015 and the important targets of the National Economic Empowerment and Development Strategies (NEEDS) (NERDC 2012). In one word, Basic Science and Technology is supported to contribute to the

achievement of the national education goals by providing the required technical knowledge and vocational skills.

The content is drawn from NERDC (2017), Basic Science Curriculum was divided into four themes namely: You and Environment, Living and Non-living Things, Science and Development, and You and Energy. The Basic Science and Technology Curriculum (Revised, 2012) is a product of the restricting and integration of four Primary and Junior Secondary School (JSS) science curricula namely Basic Science, Basic Technology, Physical and Health Education, and Computer Studies/Information Communication Technology (ICT).

The Basic Science and Technology Curriculum (Revised 2012) is expected to enable the learners: develop interest in science and technology; acquire basic knowledge and skills in science and technology; apply scientific and technological knowledge and skills to meet contemporary societal needs; take advantage of the numerous career opportunities provided by science and technology; become prepared for further studies in science and technology; avoid drug abuse and related vices; and be safety and security conscious. The thematic approach to content organization was adopted in order to achieve a holistic presentation of scientific and technological concepts and skills to learners. The basic science sub-themes that were used for this study are: Learning about the environment (Living and non-living things, chemicals), You and Energy (work, energy and power, and types of energy), Science and Development (Crude oil and Petrochemicals)

Instead of experiencing good outcomes in Basic Science, both in achievement and attitude, the result from different scientific researches on science have not been encouraging. Afuwape and Olatoye (2014) recommended effective treatment of students' attitude towards Integrated Science the positive attitude of students towards Integrated Science would in turn improve their achievement. Similarly, Afuwape and Olatoye (2014) advocated enriched mastery and methodology in order to improve students' outcome in Integrated Science.

Attitudes are acquired through learning and can be changed through persuasion using variety of techniques. Previous study

reported that teacher's attitude towards science has strong relationship with students science achievement as well as the students' attitude towards science (Hobbs et al., 2013), while other study asserted that one of the important factors in science teaching is the attitude which determines behavior (Baker et al., 2020). While it was of the opinion that a person with good scientific attitude is free from superstition (Chang & Tsai, 2022), unverified assumptions and many times from popular opinion that has no empirical basis and this in collaboration with study state that a person with scientific attitude is not necessarily a scientist but he or she consciously or unconsciously thinks, acts and demonstrates traits that are common to scientist (Kibirige & Teffo, 2014).

Literatures has also indicated that teachers attitude have exerted some influence on the academic achievement of students. For instance, Yara (2019) reported that teacher's attitude towards science has strong relationship with students' science achievement as well as the students' attitude towards science while instead of experiencing good outcomes in basic science through attitude, the result from different scientific researches on science has not been encouraging. The poor performance of students in basic science was not only attributed to attitude but also inappropriate methods of teaching mainly used by basic science teachers to teach the subject (Aboobaker, 2020). Among the strategies that have been explored in previous researches are; Critical exploration strategy (Al Mamun et al., 2022), Puzzled Based Critical Thinking g Motivation Strategies (Agarwal et al., 2020). In spite of all these strategies, students still experienced high rate of poor performance in the basic science especially, in the public examination such as junior secondary school certificate examinations conducted by state examination body and National Examination Council (NECO).

Adodo (2015), and Yara (2019) asserted that teacher's and student's attitude toward teaching and learning respectively go side by side to record achievement in science.

Traditional teacher-centered methods are focused on rote learning and memorization of facts. Students need acquisition and understanding of scientific knowledge and teachers are the instruments by which this knowledge is communicated and these

standards of behavior are enforced. In a conventional lecture setting, students would need to sit quietly in their places and listen to one student after another recite his or her lesson, until each has been called upon. The teacher's primary activity is assigning and listening to these recitations; students study and memorise the assignment at home. A test or oral examinations might be given at the end of instructional process. In addition it is over-emphasis on verbal answers, reliance and rote memorization (memorisation with no effect at understanding the meaning), and disconnected, unrelated assignment, it is also an extremely inefficient use of students' and teachers' time.

This conventional approach also insisted that all students be taught the same materials at the same point; students that do not learn quickly enough fail, rather than being allowed to succeed at their natural speeds. Traditional education is associated with much stronger element of coercion than seems acceptable now in most cultures. It has sometimes included; the use of corporal punishment to maintain classrooms discipline or punish errors; inculcating the dominant religion and languages; separating students according to gender, race, and social class, as well as teaching different subjects to girls and boys. In terms of curriculum, there was and still is a high level of attention paid to time-honored academic knowledge. Students are less attentive, more likely to skip class, and less engaged (Christopher 2013).

Active review strategy is the magic balm that can alleviate exam woes and stress. It offers students opportunity to gain through understanding of the materials. One of the active instructional strategies that has caught the attention of researchers is the Active Review Strategy. Active review strategy is a well-designed review strategy that helps students organize the materials to be studied. Studies show, that, perhaps emphasis should be on total study time but not on the way students study (Ade-Ojo et al., 2022; Rahimi & Yadollahi, 2017). One way to reach more students in a review strategy would be to present the material in a different form than it was presented in class. If PowerPoint was the main form of presentation for example, then you should distribute or use overhead transparencies or handout or other graphic representation. Students

could be encouraged to create their own concepts maps, or outlines that, will group and organize the materials in their minds cooperatively and showing active learning. One group was provided with basic questions and answers, on review strategy, the other in addition to time allotted for questions reviewed exam content in an outlined form. All the major concepts were discussed, and then time was allowed for questions; results showed that, the students who attended the second type of review strategy out performed those in the former. Previous study noted that, students who attended one or more review classes earned higher grades than those that did not (Piotrowska et al., 2022).

Most sessions are passive question and answer sessions that look backward at content deficits rather than advancing student learning. Piotrowska et al.(2022) noted that, students who attended one or more review classes earned higher grades than those that did not. This result was not surprising, but the authors were able to determine those higher grades that need less attention. Therefore, this study determines the effects of Active Review strategy on students' attitude to Basic Science. The moderating effects of parent educational background and gender of students were also examined.

### **Purpose of the Study**

The purpose of this study is to examine the effects of active review strategy on student's attitude to basic science in Oyo State. Specifically, the purpose of this study is to:

1. examine the effect of treatment on students attitude to Basic Science;
2. investigate the effect of gender on students Attitude to Basic Science;
3. examine the effect of treatment and gender on students attitude to Basic Science.

### **Research Questions**

To guide the study, three research questions were posed and answered

1. What are the effects of treatment on students' attitude to Basic Science?

2. What the effect of gender on students' attitude to Basic Science?
3. Does effect of treatment and gender influence student's attitude to Basic Science?

### **Hypotheses**

The following null hypotheses were tested at 0.05 level of significance.

- H<sub>01</sub>: There is no significant main effect of treatment on students' attitude to Basic Science.
- H<sub>02</sub>: There is no significant main effect of gender on students' attitude to Basic Science.
- H<sub>03</sub>: There is no significant interaction effect of treatment and gender on students attitude to Basic Science.

### **Methodology**

The study adopted a pretest, posttest, control group, quasi-experimental research design. The participants were chosen from Oyo Central Senatorial District of Oyo state. Three (3) Local Governments Areas (LGAs) were randomly selected from Oyo central senatorial district. The three Local Governments were, Atiba, Oyo East and Oyo West with 15, 10 and 16 public schools respectively. Three (3) schools were randomly selected from each local government area making a total of six (6) schools and JSS II Basic Science students of intact class were used. The participants for the study consisted of 262 (131 male and 131 female). The teachers of selected classes (3) teachers per each local government were also used for the study. The six schools were distantly located from each other to avoid interaction taking place between or among students from the selected schools of the study. The treatment was randomly assigned to the three schools, one school for Active Review Strategy, and one school for Conventional Strategy in each Local Government Area of the study.

The criteria for the selection of schools based on:

- i. The school is a public co-educational secondary school.
- ii. The JSS 2 students in the school have completed the JSS 1 Basic Science Curriculum at the time of data collection.

- iii. The school must have produced candidates for public examinations like JSSCE for not less than 5 years.
- iv. Willingness of the required members of staff to participate in the study.

The choice of JSS II Basic science students was based on exposure to introductory aspects of living and non-living things, chemicals, work, and power and types of energy in (JSS II) Basic science subject and JSS 1 Basic science which act as pre-requisites for the study of the chosen concepts. The students were likely to be more receptive to the teaching strategy as they were not under the pressure of preparing for external examination. The teaching of the concepts was appropriate to the scheme of work at this stage of their spiral curriculum. Three instruments used in this study include:

- A. Students Basic Science Attitude Scale (SBSAS)
- B. Instructional guide on Active Review in Basic Science (IGARBS).
- C. Instructional Guide on Conventional Strategy in Basic Science (IGACSBS).

The SBSAS aimed at investigating or testing the affective domain of the students based on their attitude towards Basic Science. The instrument was developed by the researcher. It was divided into two (2) sections. **Section A** was demographic. It sought information on the name of the school, name of student, class of student, sex, Parent Educational Background, and time allowed for the test. **Section B** was assessing students' attitude toward Basic Science. It comprised of 4 likert-type of 20 items, 10 positive and 10 negative. The scoring of SBSAS was as follows: Strongly Agree (SA) -4 marks; Agree (A) -3marks; Disagree (DA) -2marks and Strongly Disagree (SD) - 1 mark. The face and content validity of the instrument was censured by two experts in the field of Basic Science in the Department of Science Education, Faculty of Education, Emmanuel Alayande University of Education.

The Cronbach Alpha formula procedure was applied to find the reliability co-efficient. The instrument was trial tested on some students which were out of the study area in a separate school to

determine the reliability co-efficient of the instrument. The reliability (Cronbach Alpha Co-efficient of 0.86 was obtained and it was considered high enough for the instrument to be used for this study. Data collected were analyzed using descriptive statistics (mean and standard deviation), the inferential Statistics used was Analysis of Covariance (ANCOVA) using the pre-test scores as covariate. Estimated Marginal Mean (EMM) was used to find out the magnitude of the difference in the various groups where there is significance effect. To determine the actual source of the significant differences;

## Results

### Descriptive Statistics

**Table 1: Summary of Descriptive Statistics Associated with Treatment**

	Attitude Scores	
	ARS	MCS
No of cases	131	131
Pre-test mean	44.04	41.29
Pre-test S.D	1.85	2.12
Post-test mean	51.11	45.28
Post-test S.D	1.89	2.17
Mean Grain	7.07	3.99

- **ARS** – Active Review Session
- **MCS** –Modified Conventional Strategy
- **S.D** – Standard Deviation

The summary of the descriptive statistics associated with the treatment of the students' attitude scores is presented in Table 1. The results depicted that the post test scores improved for Active review strategy in Attitude to scores with 7.07. In case of Modified Conventional Strategy, the post test scores improve with scores 3.99.

**Descriptive statistics Associated with Gender**

**Table 2: Summary of Descriptive statistics Associated with Gender**

	Attitude Scores	
	Male	Female
No of cases	164	223
Pre-test mean	43.19	44.58
Pre-test S.D	21.06	17.15
Post-test mean	49.37	50.60
Post-test S.D	2.11	1.95
<b>Mean Grain</b>	<b>6.18</b>	<b>6.02</b>

Table 2 displays the descriptive statistics of the student’s attitude scores associated with gender. The results indicated that there were improvements in mean attitude scores of both male (6.18 and female 6.02). The mean show greater improvement in mean attitudinal scores by 6.18 (pretest mean = 43.19, post test mean = 49.37) and female attitudinal scores improve by 6.02 (pretest mean = 44.58, post test mean = 50.60).

**Testing the Null Hypothesis**

**H<sub>01</sub>: There is no significant main effect of Treatment on Students’ attitude towards Basic Science**

**Table 3. ANCOVA of Post-test Attitude scores of students by treatment and Gender.**

Source	Sum of Squares	DF	Mean Square	F	Sig.	Eta Square
Main Effect:	9164.051	16	572.75	10.539	.000	.339
Pretest Attitude to Basic Science	3746.660	1	3746.660	77.561	.000	.173
Treatment groups 2-way	1284.342	1	1284.342	13.294	.000*	.067
Interactions:	21.901	1	21.901	.453	.501	.013
Treatment group	230.636	2	115.318	1.194	.313	.003
Treatment group x Gender	55.935	1	55.935	.579	.561	.008
Gender	141.910	2	70.955	1.469	.232	
Gender						.005

3-way Interaction:	82.360	4	20.592	.426	.790
Treatment	x	9164.051	256	35.797	
Gender		17873.204	254	70.366	
Explained		27037.254	262		
Residual					
Total					

\*Significant at  $P < 0.05$

Table 3 shows the ANCOVA of post-test attitude scores of students by treatment and gender. The results revealed that there was significant effect of treatment on student's attitude towards. Basic Science ( $F(1,254) = 13.294$ ;  $P < .05$ ;  $\eta^2 = 0.067$ ). On this basis, hypothesis 1 was rejected. This means that the difference between the attitudes score of students exposed to treatment group was significant.

**Table 4: Estimated Marginal Means of Attitude score of students According to treatment group.**

	Mean	Std. Error	Upper Bound	Lower Bound
Active Reviews	51.11	1.89	52.13	50.09
Modified Conventional	45.28	2.17	46.52	44.04

The estimated marginal means of attitude score of students according to treatment group is as shown in Table 4. The results revealed that students in the Practice-Invention group had the highest adjusted posttest mean Attitude scores ( $\bar{x} = 53.64$ ) followed by Active Review ( $\bar{x} = 51.11$ ) while students in the modified Conventional Strategy group had the least adjusted mean Attitude scores ( $\bar{X} = 45.28$ ).

**Main effect of Gender**

**H<sub>02</sub>: There is no significant main effect of Gender on Students’ Attitude towards Basic Science.**

It was obtained from Table 4.4 that the effect of gender on participant attitude towards basic science was not significant. (F (1,254) =.453; P > 0.05  $\eta^2$  =.001).

**Table 5: Estimated Marginal means of post test attitude score by Gender**

	Mean	Std. Error	Upper Bound	Lower Bound
Male	13.75	0.70	14.68	12.82
Female	14.48	0.64	15.36	13.60

Table 5 indicated the estimated marginal means of post-test attitude score by gender. The results depicted that the female students had higher mean  $\bar{X}$ = 14.48 while the male students had a lower mean of  $\bar{X}$ = 13.75, but the difference was not significant.

**H<sub>03</sub>: There is no significant interaction effect of Treatment and Gender on Students’ Attitude to Basic Science.**

The results from Table 4 showed that there was no significant interaction effect of treatment and gender on students’ attitude to Basic Science (F<sub>1,254</sub> = .579; P<.05,  $\eta^2$  = 0.003). This means that there is a significant interaction effect of treatment and gender on students’ attitude to Basic Science among participants Hence H<sub>05</sub> was not rejected.

**Discussion of Findings**

The result obtained in this study showed that, there was a significant main effect of treatment on student’s attitude to Basic Science. Practice-invention was more effective that the active review and the modified conventional strategy. The effectiveness of Practice-invention over both active review and modified convention strategies may be as a result of the fact that the students were giving opportunity

to practice using non-routine method and re-discover new concepts by manipulating apparatus through appropriate heuristic approach. The finding of this study is in agreement with the submission of Gazi et al., (2010) and Aremu and Sangodoyin (2010) who found that students with student centered strategy performed better than those with conventional lecture strategy. The Active Review Strategy was found to be more effective than conventional strategy, this may be as a result of the fact that the teacher monitor the students' progress in active review, provides support, feedback and scores are awarded to each group which can serve as reinforcement to them thus change the attitude towards Basic Science. This is in line with the study of Duron et al., (2016), and Gurung (2015). However, this finding is opposed to Brenda (2013) who argued that the conventional lecture method could not be totally ignored. Practice invention shows best positive attitude/favorable attitude which lead to significant/higher attitude in science. The strategy affects, to a large extent, attitude of students in science (Adetunji, 2010; Abram, 2014) while, The result supports the work of Abram (2014) found attitudes tended to vary significantly in relation to research strategy used. Teachers that, are undertaking student centered strategy tended to be more positive about their student's attitude towards the subject (80.6% positive). Attitude towards science varied in relation to specific subjects taught. Those teaching science and technology were more positive about attitude towards the subject.

### **Conclusion**

The right selection and appropriate use of instructional strategies may result into favorable attitude on the part of the learners. The study had shown that Active review teaching strategy was more effective in improving the students' attitude, to Basic science than conventional teaching strategy. The study found that active review strategy was more effective than the conventional lecture strategy in teaching the selected concepts in Basic science. However, Active review strategy can be used to foster the learning of selected concepts in Basic science irrespective of gender and parent educational background.

Effort should be geared to make students respond like Female low parental educational background students who are ideal critical

thinkers that are habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal.

### **Recommendations**

Based on the findings of this study, the following recommendations are hereby made:

- a. In order to improve students' performance in Basic science, Active review strategy is recommended to secondary school Basic science teachers for the teaching of Basic science.
- b. Teachers should facilitate the use of Active review strategy in schools to enhance positive attitude of students towards Basic science.
- c. Students should be allowed to use their skills with all instructional resources in Basic science classroom instruction in order for students to yield positive attitude towards Basic science.
- d. There is need for training of pre-service Basic science teachers on the effective use of Active review strategy for effective teaching and learning.
- e. Government and professional bodies such as Science Teachers Association of Nigeria, National Teachers' Institute, Nigerian Union of Teachers, etc. should organize in-service and re-training programmed for teachers on the effective use of Active review strategy in the teaching of Basic Science.
- f. Government should intensify the development of a manual for each of the strategy and the need to train teachers on it through the ministry of education.
- g. Active review is effective strategies in enhancing students attitude , irrespective of their parent educational background and gender

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