

Effects of 7Es and 3Es Instructional Strategies on Secondary School Students' Retention in Biology in Jalingo Education Zone

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ABSTRACT: This study looked at the effects of using the 7Es and 3Es teaching strategies on biology students retention in secondary schools in Jalingo Education Zone. A quasi-experimental design was used in the investigation. The study's compass consisted of two research questions and one hypothesis. 224 of the 2,516 Secondary School II biology students who were enrolled in the program were chosen as the study sample. The instrument utilized was the Genetic Retention Test (GRT), which had a reliability index of 0.84 according to the Kuder-Richardson formula 20 (K-R20). The null hypotheses were examined using analysis of covariance at the 0.05 level of significance, while the research questions were examined using the mean and standard deviations. The findings showed, among other things, that students who learned genetics using the 7Es instructional strategy retained the material better than those who learned the same concept using the 3Es instructional strategy, and the null hypothesis indicated a significant difference between the two groups in favor of the 7Es. As a result, it is advised that biology instructors receive training on the 7Es teaching method.

Keyword: 7Es Instructional Strategy 3Es Instructional Strategy, Retention

INTRODUCTION

Science is an integral component of the educational system, with biology serving as a foundational subject. Biology is notably important since it concentrates on the examination of living creatures, encompassing their structure, function, growth, evolution, distribution, identification, and categorization (Joda, 2019). Biology is the scientific discipline that investigates life and the attributes of living creatures, encompassing their physical composition, behavior, distribution, origins, and interactions with their environment. Hillis et al. (2020) define biology as the scientific field that investigates life, employing a systematic methodology to analyze live creatures and their interactions with one another and their environment. Comprehending biology is crucial for tackling environmental challenges such as desertification, erosion, ecosystem protection, genetic manipulation, and pollution, among others. Studying biology provides students with essential information, skills, and attitudes to safeguard the environment, regulate population

- Perceiving biology as an exploration of the natural world.
- Analyzing the behaviors of living creatures in relation to their environs.
- Exhibiting proficiency in the use of scientific apparatus.
- Demonstrating exceptional proficiency and expertise in teaching secondary school biology.
- Fostering affirmative attitudes and beliefs regarding science and biology within society, while promoting an optimistic perspective on biology, science, and scientific pursuits.

Despite the significance of the subject, the results in biology from major certification bodies, such as the National

growth, combat illnesses, and improve food supply, as indicated by Cherono et al. (2021).

Furthermore, biology provides access to diverse job opportunities in sectors such as education, healthcare, agriculture, and environmental protection, among others. Considering the essential importance of biology in comprehending life, it is crucial for Nigerian students to engage in the study of biology during secondary education, which encompasses several purposes. The principal aims of biology education encompass:

- Equipping youth with a comprehensive grasp of the essential concepts and methodologies of biology.
- Cultivating informed, driven, proficient, and impactful biology instructors capable of instilling a respect and understanding of biological processes and concepts in pupils.
- Enhancing the confidence of biology instructors and their adaptation to the changing world of science and technology

Examination Council (NECO) and the West African Examination Council (WAEC) have been disappointing in Nigeria, as noted by Ali and Gasim (2018). The lack of satisfactory student performance in biology during secondary school exit examinations indicates that students are struggling to meet the educational goals for the subject, which may stem from poor knowledge retention.

Retention denotes the capacity to maintain or retrieve knowledge or experiences acquired over a prolonged duration. Adonu et al. (2021) define retention as the ability to

remember and the capability to recall and recognize previous experiences. Retention is considered correlated with academic performance, since it assesses the efficacy of knowledge memory and recall from learning. Retention is fundamentally the ability to absorb, retain, and subsequently recall information or knowledge gained via schooling. Retention of information over time can improve academic performance. Retention transpires when information is kept in memory, and the encoding method might influence the ease of subsequent retrieval. Consequently, the manner in which information is presented and encoded significantly influences retention. The attributes of learning materials, including their relevance, familiarity, clarity, and capacity to evoke imagery, can influence retention levels (Bichi, quoted in Maikano, 2016).

Consequently, selecting appropriate materials for instruction is crucial to enhance the memory of biological knowledge. Factors that induce confusion or obstruct comprehension of acquired knowledge can impede learning, whereas those that facilitate learning can improve retention. Consequently, instructors have to implement tactics that confront students' preconceptions and augment their comprehension of the subject to bolster retention. Employing appropriate pedagogical tactics is essential for students' memory of biological knowledge, irrespective of gender.

Gender pertains to the distinctions between men and women in social contexts: the capabilities attributed to males and the permissions or prohibitions imposed on women. Consequently, gender is a social construct that categorizes and divides individuals according to their biological requirements and conventional responsibilities (Egara and Mosimege, 2023). The word gender is utilized to analyze the societal roles of men and women. Individuals in society depend on their memory and performance, which are frequently influenced by the educational techniques employed. Consequently, it is essential to acknowledge that performance and memory retention are critical educational elements that may be affected by instructional methods.

The substandard quality of scientific instruction in Nigerian schools is mostly attributable to the presence of untrained educators, as noted by Danjuma and Bajon (2022). Their contention was that the absence of appropriate pedagogical practices among these instructors significantly contributes to pupils' underachievement and poor retention in biology. The difficulties faced in teaching science subjects, especially biology, as noted by (Oduol, 2018; Jepketer, 2017) is the ineffective teaching approaches. The upshot is diminished retention rates in students' outcomes, both in internal and external evaluations. This indicates that a comprehensive grasp of biological ideas may not be attained without utilizing an appropriate pedagogical approach.

Therefore, the researcher deemed it pertinent to investigate the effects of the 7Es and 3Es teaching strategies

on the secondary school students retention in biology in jalingo education Zone Taraba State

Problem of the study

The consistent low scores of students in biology, possibly due to inadequate knowledge retention, represent a significant issue that demands immediate and thorough resolution. The reports from the West African Examination Council (WAEC) from 2013 to 2018 consistently highlighted the dismal performance of biology students resulting from poor knowledge retention as noted by (Chukwu and Dike, 2019). Therefore, the purpose of this study was to determine whether the 7Es and 3Es instructional methodologies could be employed to address the issue of students' low retention in biology classes at secondary schools in Jalingo Education zone

Purpose of the Study

This study's primary goal was to find out how secondary school biology students in Jalingo Education Zone retained biology concept after using the 7Es and 3Es instructional strategies. In particular, the research discovered:

1. The retention ability of students taught genetics using the 7Es instructional strategy and those taught using the 3Es instructional strategy.

Research Questions

The following research questions guided the study:

- 1 What's the mean retention score of students' taught genetics utilizing the 7Es educational approach likened to their counterparts tutored the same utilizing the 3Es educational design?

Hypotheses

H0₁: There is no significant difference in the mean retention score of Students taught genetics using the 7Es instructional strategy, and their counterparts taught the same concepts using the 3Es instructional strategy.

Methodology

The pretest, posttest, and post post-test non-equivalent control group quasi-experimental research design was employed for this study. Since this study uses intact classes that were specifically chosen to prevent disruption of regular class lessons, the quasi-experimental design was thought to be appropriate

The population of the study was 2515 Secondary School II Biology students and a multi-stage sampling procedure comprising several distinct stages was employed by the researcher. Purposive sampling was employed for the deliberate selection of two public secondary schools from the pool of selected secondary schools and two intact classes, with 121 male and 103 female students apiece, were chosen by lucky dip from each of the sampled schools using simple random sampling.

The Genetic Retention Test (GRT), made up of 40 items with 5 options to choose from was used to data collection for this investigation. The GRT was validated by three experts all from the faculty of Education Taraba State University Jalingo and a reliability coefficient of 0.84 was determined using the Kuder-Richardson formula 20 (K-R20). The collected data were analyzed using the mean and standard deviation in order to answer the research question and ANCOVA was used to test the null hypothesis at 0.05 level of significance. The sampled schools comprised of

Table 1: Mean retention score of students taught genetics using the 7Es instructional strategy compared to their counterparts taught using 3Es instructional strategy.

Group	N	Posttest		Post-posttest		Mean Gain
		Mean	Std. Dev	Mean	Std. Dev	
7Es Instruction	105	25.53	2.275	29.23	2.877	3.70
3Es Instruction	119	20.45	1.899	21.50	1.561	1.05
Mean Differences		5.08		7.73		2.65

Table above compares the mean retention scores and standard deviations of students taught genetics using the 7Es and 3Es instructional strategies. The results show that Students in the 7Es Instruction group had higher mean retention scores in both posttest (25.53) and post-posttest (29.23) compared to the 3Es Instruction group (20.45 and 21.50, respectively) and The standard deviations for the 7Es Instruction group were slightly higher in posttest (2.275) but lower in post-posttest (1.899) compared to the 3Es Instruction

experimental group A and B, where group A were taught Genetics using the 7Es instructional strategy and the group B taught same concept using 3Es instructional strategy.

Results

Research question 1: What is the mean retention score of students taught genetics using the 7Es instructional strategy compared to their counterparts taught using 3Es instructional strategy?

group (1.899 and 1.561, respectively). The mean gain score for the 7Es Instruction group (3.70) was higher than that of the 3Es Instruction group (1.05), indicating better retention of knowledge by students in the 7Es group.

Hypotheses One There's no meaningful difference in the mean retention score of scholars tutored genetics using the 7Es educational strategy, and their counterparts tutored the same generalities using the 3Es instructional strategy.

Table 2: One-way Analysis of Covariance of the Mean Retention Scores of 7Es Instructional Strategy and 3Es Instructional Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4016.372 ^a	2	2008.186	946.544	.000	.895
Intercept	66.320	1	66.320	31.260	.000	.124
Posttest	679.922	1	679.922	320.476	.000	.592
Group	268.906	1	268.906	126.747	.000	.364
Error	468.873	221	2.122			
Total	145939.000	224				
Corrected Total	4485.246	223				

Table 2 shows the results of a one-way ANCOVA (Analysis of Covariance) comparing the mean retention scores of students taught genetics using the 7Es instructional strategy and those taught using the 3Es instructional strategy. The results indicate that here is a significant difference in the mean retention scores between the two groups ($F(1, 221) = 126.747, p < 0.05$). The null hypothesis is rejected, indicating that the two groups differ significantly. The effect size (eta square = 0.364) is high, indicating that 36.4% of the

difference in the mean score is attributed to the instructional strategy used, and the posttest scores were used as a covariate to control for initial differences between the groups. The results suggest that the 7Es instructional strategy had a significantly positive impact on students' retention of genetics concepts compared to the 3Es instructional strategy. The high effect size indicates that the instructional strategy had a substantial influence on the outcome, accounting for 36.4% of the variance in retention scores.

Discussion of findings

Effect of Instructional Strategies (7Es and 3Es) on Students' Retention in Genetics

Students in the 7Es Instruction group demonstrated higher mean retention scores in both the posttest (25.53) and post-posttest (29.23) compared to the 3Es Instruction group (20.45 and 21.50, respectively). This suggests that students in the 7Es group retained more of the material taught in the genetics lessons than the 3Es group. This investigation is in unison with the exploration of Adam et al., (2022) and Abdullahi et al. (2021) who all affirmed that students instructed with 7Es instructional strategy had high retention ability. This suggests that the 7Es instructional strategy was more effective in promoting long-term retention of genetics concepts compared to the 3Es strategy. This finding has significant implications for the design of instructional materials and the training of teachers in the use of effective instructional strategies. It suggests that the 7Es instructional strategy, which is based on a more interactive and inquiry-based approach, is a more effective way to teach genetics to students and promote long-term retention of the material. In addition, the finding suggests that the 7Es instructional strategy may be a useful tool for reducing the achievement gap between different groups of students.

The finding shown indicated a significant difference in the mean retention scores of students taught genetics in favor of the 7Es instructional strategies more than the 3Es instructional strategies.

Conclusion

Based on the results of this research, it can be definitively stated that:

The 7Es teaching method is a more successful technique than the 3Es method for enhancing the academic retention of secondary school students in biology and also significantly improves students' ability to remember genetics concepts, suggesting it is an effective strategy for fostering a deep and lasting understanding and memory of biology concepts.

Recommendations

Based on the results of this research, the author has proposed several suggestions:

The Ministry of Education and school owners should ensure that Biology teachers receive training in contemporary, effective teaching techniques, particularly the 7Es strategy, by supporting them in attending workshops, seminars, and additional training sessions. This approach is expected to be beneficial in the modern era.

The research also indicates that the 7Es teaching strategy improves student retention in Biology, suggesting that Biology teachers should dedicate ample time to incorporating

the 7Es during lessons to help improve students' retention ability and better understand biological concepts.

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