



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2020; 6(1): 229-234  
www.allresearchjournal.com  
Received: 25-11-2019  
Accepted: 27-12-2019

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## **Advance organisers, students' achievement and retention of educational technology concepts at the University of Calabar**

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### **Abstract**

This study examined the effects of expository and graphic organizers on students' achievement and retention of educational technology concepts. Three research questions and three hypotheses guided the study. The research design used for the study was the pre-test post-test groups design. The population comprised all the 112 year 3 students in the Department of Curriculum and Teaching, Faculty of Education, University of Calabar during the 2018/2019 academic session. The sample was constituted of all the 112 students in their intact class using the census technique. The instrument used for the study was the Educational Technology Achievement Test. A test-re-test method was used to determine the reliability of the instrument and an index of 0.80 was obtained using Kuder Richardson Four Formulae. Data collected were analysed using Mean, Standard Deviation and Analysis of Covariance. All hypotheses were tested at 0.05 level of significance. The results indicated that students taught using graphics advance organizers performed and retained significantly better educational technology concepts than those taught using expository organizers. The findings of this study also indicated that cognitive ability of students had no effects on the achievement of educational technology students when taught using expository and graphics organizers. It was concluded that graphic advance organizers significantly enhance students' achievement and retention, and both advance organizers enhanced performance of students with different ability levels.

**Keywords:** Advance organiser, students achievement and retention, educational technology, concepts

### **Introduction**

Educational technology as a subject of special concern in teacher education demands an extra care and attention. It thus, represents the foundation stone for subsequent instruction in teacher training. A solid foundation in educational technology would equip millions of our teacher trainees for successful teacher education careers thereby indirectly contributing to the much needed scientific and technological advancement of the Nigerian society (National policy on Education, FGN 2013). However, the teaching and learning of educational technology can be both inspirational and frustrating. Students who enjoy learning the course get to rethink and pull together what they know in new and coherent ways. They enjoy the opportunity to create new demonstrations, invest new derivatives and solve interesting problems of teaching and learning.

Educational technology occupies a special position in teacher education curriculum due to its importance in everyday life and the development of science and technology. In Nigeria, the teaching and learning of educational technology in teacher education is made compulsory due to its importance. This has made Government to expend huge resources both financial and materials towards the teaching and learning of the course. Despite government huge efforts to provide a situation for effective and proper teaching and learning of educational technology, the performance of students in the course continues to be poor (Adebola 2001)<sup>[1]</sup>. Many researchers have attributed this to insufficient manpower, lack of equipment, poor attitude of students and poor understanding of the concepts involve due to their difficult nature. In order to address the poor performance of students, there is the need for functional teaching of the course. Adebola (2011)<sup>[1]</sup> opined that one of the variables that could make the teaching of educational

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One instructional strategy, which probably has the potential to offer opportunity to address the problems of effective teaching and learning of educational technology, is the advance organizer as advocated by the learning theory of Ausubel (1962) <sup>[6]</sup>. Advance Organizer provides bridges or links for binding together both existing and new knowledge. Advance Organizer, according to Woolfolk (2001), is a statement of inclusive concepts to introduce and sum up material that follows. Ausubel (1962) <sup>[6]</sup> defined advance organizer as a cognitive instructional strategy used to promote the learning and retention of new information. Anderson (2004) <sup>[8]</sup> pointed that, it is a method of bridging and linking old information with something new".

Advance organizer as a concept was developed and systematically studied by David Ausubel who was greatly influenced by the teaching of Jean Piaget (Geier, 1999). He had postulated that when instructional "Organizer" is introduced in advance of the actual learning material, there is an increase in achievement representational and combinational processes that occur during the reception of information (Adebola, 2011) <sup>[1]</sup>. David Ausubel determined through extensive research that "the most" dependable way of facilitating retention is to introduce appropriate sub-summers prior to the actual representation of the learning task. The introduced sub-summers was tacked Advance organizers.

Advance organizers are excellent ways to activate and build schema prior to the actual learning of new material by students. According to, Wachanga, Arimba and Mbugua (2013) <sup>[12]</sup>, based on the initial response to the material presented in the organizer, teachers can modify their lesson plans and materials to better fit the prior knowledge of their students. In addition, they can efficiently structure their time and the critical points that need to be covered, while simplifying complicated text (Bransford 2004) <sup>[8]</sup>. This enhances the development of higher order thinking in the students by helping them to relate concepts previously learned to the new material by enabling them to quickly organize their thoughts.

Advance organizers can present themselves in a plethora of ways. They could be expository, skimming, narrative and graphics. This study examined the relative effects of expository and graphics organizers on mathematics students achievement and retention. Graphic organizer is a visual and graphic display that depicts the relationships between fact, terms, and/or ideas within a learning task. Graphics organizers are also sometimes referred to as knowledge maps, concept map, story maps, cognitive organizers, advance organizers or concept diagrams (Atomatofa, 2013) <sup>[5]</sup>. According to Anders, Bos and Filip, (1984) <sup>[2]</sup>, graphics advance organizers provide a visual holistic representation of facts and concepts and their relation with an organized form. Graphic organizers allow, and often require, the student to sort information and classify them as essential or non-essential, structure information and concepts; identify relationships between concepts and organize communication about an issue or problem.

Expository advance organizer is a description of a new concept to be presented, highlighting important content. They can be used in learning situations that begin with an introduction and present information in a linear sequence. Advance organizers, according to Mayer (1979) <sup>[10]</sup>, have positive but conditional effects on learning. Mayer further

suggests that the most effective advance organizers are those that allow the students to generate all or most of the logical relationships in the material to be learnt and are used in situations in which the learner would not spontaneously use them. The use of advance organizers request the learner to generate the logical relationships in the material to be learnt. This involves the learners reason or cognitive ability. This study is also interested in how advance organizers would affect the achievement of students with high, average and low cognitive abilities.

A large number of studies have been conducted on the effects of advance organizers in learning and learner's performance. These studies have produced conflicting conclusions while inconsistent results have also been reported in literature on the effects of advance organizers. This uncovered the need for this study on advance organizers.

### Statement of the Problem

Evidence of poor performance and declining enrolment into education related careers point to the fact that most desired technological, scientific and engineering application of education cannot be sustained. The problem has been a course of worry. The implications of this fact is that teaching of educational technology does not seem to lead to student's understanding of concepts, functionality and application of its ideas, hence no learning.

The ugly situation has stimulated the search for an approach for teaching of the course that aims at understanding rather than memorizing facts. Can the use of Advance organizers in teaching results to students understanding of educational technology concepts, functionality and application of its ideas?

### Purpose of the Study

The purpose of this study is to determine the effects of advance Organizer on the achievement and retention of Education students in Cross River State, Nigeria. The study sought to achieve the following objectives:

- 1) Investigate the difference between the mean achievement scores of students taught using expository advance organizer and those taught using graphic organizer.
- 2) Determine the difference between the mean retention scores of students taught using expository advance organizer and those taught using graphics organizer.
- 3) Assess the mean achievement scores of education students taught using expository and graphic advance organizers based on their cognitive ability levels.

### Research Questions

1. What is the difference between the mean achievement scores of students taught using expository advance organizer and those taught using graphic advance organizer.
2. What difference exists between the mean retention scores of education students taught using expository advance organizer and those using graphics advance organizer?
3. What is the difference between the mean achievement scores of education students taught using expository and graphic organizers based on their cognitive ability levels?

## Research Hypotheses

The following hypotheses were postulated and tested:

1. There is no significant difference between the mean achievement scores of students taught using expository advance organizer and those taught using graphics advance organizer.
2. There is no significant difference between the mean retention score of education students taught using expository advance organizer and those taught using graphic advance organizer.
3. There is no significance difference between the mean achievement scores of education students taught using expository and graphic advance organizers based on their cognitive ability levels.

## Research Methods

The design for the study was a quasi-experimental design using a non-randomized pre-test and post-test group. One group was exposed to graphic advance organizer while the other was exposed to expository advance organizer.

The population of the study consisted of all education students in the third year of the four year education programme at the University of Calabar, Calabar during the 2018/2019 academic session. The size of the population was 112. The sample consisted of all the 112 third year education students. The group was split into using odd and even numbers and were randomly assigned to experimental groups 1 and 2.

Three researcher-made instruments were used for the study. These were Educational Technology Achievement Test (ETAT), Educational Technology Retention Test (ETRT) and Cognitive Ability Test (CAT). Educational Technology Achievement Test (EAT) was a forty multiple choice items from the course outline for educational technology. Each item had four (4) options A, B, C and D with only one correct answer. The post-test of students and ETRT were reshuffled version of the pre-test. The Cognitive Ability Test (CAT) was used to measure the ability level of the students. The test result was used to categorise the students into high, average and low cognitive ability levels using quartile. The content consisted of middle basic questions in educational technology. It comprised of two sections. Section A, personal data of the respondents and section B, forty multiple-choice items. Each item had four options with only one correct answer.

The instruments were face and content validated by three experienced educational technology teachers and two experts in test, measurement and evaluation. These evaluators were requested to vet the items for clarity of words, plausibility of the distractors, appropriateness to the level of the students and adequacy in addressing the objectives and the problems of the study. Their comments and corrections were incorporated into the final form of the instruments. In order to test the reliability of the instruments, the instruments were administered on a sample of 20 students who had carry over on the course the previous year AND not selected to participate in the study but had similar qualities as those in the study. The reliability of the instruments was found using test-retest method. The reliability coefficients ( $r$ ) of the instruments were obtained using Pearson Product Moment. Reliabilities of 0.81 and 0.78 were obtained for ETAT and ETAT respectively, indicating that the instruments were reliable.

The five educational technology teachers were used as research assistants. They were trained and were provided with detailed instructions and lesson packages on selected concepts of educational technology. The two groups of students were administered the pre-test and cognitive ability test before treatment started. The experimental group 1 was taught with graphic advance organizer while Group 2 was taught using expository advance organizer. The two groups were taught the selected concepts for two weeks. Post-test was administered to the two groups after treatment. Two weeks after post-test, retention test was administered. The scripts were marked and awarded one mark for each correct option and zero mark for a wrong option.

The data collected were analyzed using adjusted mean, standard deviation and Analysis of Covariance (ANCOVA). All the hypotheses were tested at 0.05 level of significance.

## Results

The data collected for the study are presented based on the research questions and hypotheses of the study.

### Research Question One

What is the difference between the mean achievement scores of students taught using expository advance organizer and those taught using graphic organizer.

**Table 1:** Mean and Standard Deviation of Students' Pre-test and Post-test Scores of Students Taught Using Graphic and Expository Advance Organizers.

Advance Organizer	N	Pre-test		Post-test		Mean Gain
		X	SD	X	SD	
Graphic	58	12.84	1.78	23.12	2.36	10.28
Expository	54	11.85	1.89	21.24	2.02	9.39

As shown in Table 1, the mean achievement scores of students' pre-test and post-test scores taught graphic advance organizer is 12.84 and 23.12 respectively while that of the students taught using expository advance organizer is 11.85 and 21.24 respectively. The mean scores of the two groups increased from pre-test to post-test, showing that all the advance organizers were effective in teaching the concept. Comparing the mean gain scores 10.28 and 9.39 of students taught using graphic advance organizer and Expository advance organizer respectively indicates that the use of graphic advance organizer was more effective than expository advance organizer.

### Research Question Two

What difference exists between the mean retention scores of education students taught using expository advance organizer and those using graphic advance Organizers?

**Table 2:** Mean and Standard Deviation of Students' Post-test and Retention Scores of Students Taught Using Graphic and Expository. Advance Organizers.

Advance Organizer	N	Post-test		Retention		Mean Gain
		X	SD	X	SD	
Graphic	58	23.12	2.36	22.24	0.94	-0.88
Expository	54	21.24	2.02	19.07	1.48	-2.17

As shown in Table 2, the mean achievement scores of students' post-test and retention scores taught graphic advance organizer is 23.12 and 22.24 respectively while that of the students taught using expository advance organizer is

21.24 and 19.07 respectively. The mean scores of the two groups decreased from post-test to retention showing that all the advance organizers aided in the retention of some concepts. Comparing the mean gain scores -0.88 and -2.17 of students taught using graphic advance organizer and Expository advance organizer respectively indicates that the use of graphics advance organizer aided more in the retention of concepts than expository advance organizer.

**Table 3:** Mean and Standard Deviation of Students' Pre-test and Post-test Scores of Students Taught Using Graphic and Expository Advance Organizer.

Advance Organizer	Cognitive Ability Levels	N	Pre-test		Post-test		Mean Gain
			$\bar{X}$	SD	$\bar{X}$	SD	
Graphic	High	27	13.11	1.91	23.78	3.19	10.67
	Average	21	12.90	1.58	22.67	0.86	9.77
	Low	10	12.00	1.70	22.30	1.25	10.30
Expository	High	22	12.05	1.68	21.77	1.31	9.72
	Average	19	11.84	1.61	21.32	1.06	9.48
	Low	13	11.54	2.60	20.23	3.42	8.69

As shown in Table 3, the mean achievement scores of students' pre-test scores using taught graphic advance organizer having high, average and low ability level is 13.11, 12.90 and 12.00 respectively while their post-test scores is 23.78, 22.67 and 22.30 respectively. The mean achievement scores of students' pre-test scores taught using expository advance organizer having high, average and low ability level is 12.05, 11.84 and 11.54 respectively while their post-test scores is 21.77, 21.32 and 20.23 respectively. The mean scores of the two groups increased from pre-test to post-test, showing that all the advance organizers were effective in teaching the concepts. Comparing the mean gain scores of high, average and low students 10.67, 9.77 and 10.30 respectively taught using graphic advance organizer indicates that those of high ability gain most, followed by low and average were the least. Comparing the mean gain scores of high, average and low students 9.72, 9.48 and 8.69 respectively taught using expository advance organizer indicates that those of high ability gain most, followed by average and low were the least.

**Testing hypotheses: Hypothesis One**

There is no significant difference between the mean achievement scores of students taught using expository advance Organizer and those taught using graphic advance organizer.

**Table 4:** Analysis of Covariance of Students Post-test Scores Based on Advance Organizer Using Pre-test as Covariate.

Source of Variation	SS	df	MS	F <sub>cal</sub>	P-value <sub>cal</sub>
Pre-test	105.31	1	105.31	24.46*	.00
Advance Organizer	56.24	1	56.24	13.06*	.00
Residual	469.30	109	4.31		
Total	630.86	111	5.68		

\* = Significant at.05 level of significance

As shown in Table 4, the analysis of pre-test scores of the two groups of students is significant since the calculated P-value (.00) is less than the alpha level (.05), indicating that the groups were not comparable. The comparability of the groups is however addressed by analysis of covariance that would regress the pre-test and post-test scores of the

**Research Question Three**

What is the difference between the mean achievement scores of education students taught using expository and graphics advance organizers based on their cognitive ability levels?

The table also showed that the calculated P-value (.00) of advance organizer is less than the alpha level (.05). Therefore, the null hypothesis is rejected. This implies that there exists significant difference between the mean achievement scores of students taught using expository advance Organizer and those taught using graphic advance organizer.

**Hypothesis Two**

There is no significant difference between the mean retention score of education students taught using expository advance organizer and those taught using graphic advance organizer.

**Table 5:** Analysis of Covariance of Students Retention Scores Based on Advance Organizer Using Post-test as Covariate.

Source of Variation	SS	df	MS	F <sub>cal</sub>	P-value <sub>cal</sub>
Post-test	123.26	1	123.26	94.22	.00
Advance Organizer	180.99	1	180.99	138.35	.00
Residual	142.60	109	1.31		
Total	446.86	111	4.03		

\* = Significant at.05 level of significance

As shown in Table 5, the analysis of post-test scores of the two groups of students is significant since the calculated P-value (.00) is less than the alpha level (.05), indicating the groups were not comparable. The comparability of the groups is however addressed by analysis of covariance that would regress the post-test and retention scores of the students. The table also showed that the calculated P-value (.00) of advance organizer is less than the alpha level (.05). Therefore, the null hypothesis is rejected. This implies that there exists significant difference between the mean retention score of education students taught using expository advance organizer and those taught using graphic advance organizers.

**Hypothesis Three**

There is no significance difference between the mean achievement scores of education students taught using expository and graphic advance organizers based on their cognitive ability levels.

**Table 6:** Analysis of Covariance of Students Post-test Scores Based on Ability Level Using Pretest as Covariate.

Source of Variation	SS	df	MS	F <sub>cal</sub>	P-value <sub>cal</sub>
Pre-test	105.31	1	105.31	25.19*	.00
Advance Organizer	56.24	1	56.24	13.45*	.00
Ability	26.41	2	13.21	3.16 <sup>NS</sup>	.05
Advance Organizer* Ability	3.88	2	1.94	0.46 <sup>NS</sup>	.63
Residual	439.02	105	4.18		
Total	630.86	111	5.68		

\* = Significant at.05 level of significance

NS = Not Significant at.05 level of significance

As shown in Table 6, the analysis of the pre-test scores of the two groups of students is significant since the calculated P-value (.00) is less than the alpha level (.05), indicating that the groups were not comparable. The comparability of the groups is however addressed by analysis of covariance that would regress the pre-test and post-test scores of the students. The table also showed that the calculated P-value (.05) of Ability level is equal to the alpha level (.05). Therefore, the null hypothesis is retained. This implies that there exists no significance difference between the mean achievement scores of education students taught using expository and graphic advance organizers based on their cognitive ability.

### Discussion of Findings

The findings on the difference between the mean achievement scores of students taught using graphic advance organizer and expository advance organizer indicated a significant difference. Those taught using graphic advance organizer achieved better than those taught using expository advance organizer. This might have been due to graphic organizers providing stability and clarity of the ideas. It could also be attributed to graphic advance organizer being able to make students remember more conceptual ideas and were able to relate to prior knowledge. The findings is in agreement with that of Zaini, Mokhtar and Nawawi (2010) [13], who found that graphic organizers had effect on the improvement of students' comprehension, performance and motivation in learning. The findings is also in agreement with Owolabi and Adaramati (2015) [11], who found that the experimental groups taught using graphic advance organizer performed better than the control group taught using conventional teaching approach.

The findings on the difference between the mean retention scores of students taught using graphic advance organizer and expository advance organizer indicated a significant difference. Those taught using graphic advance organizer achieved better than those taught using expository advance organizer. This might be due to the fact that graphic organizers involve the translating of words expressed in linear form into visual structures. Graphic advance organizer help students in developing structures for understanding concepts since it could sometimes involve in translation of expressions in line to graphical structures. This results to making students in remembering more of conceptual ideas and relate them to prior knowledge. The findings is in line with that of Bamidele, (2010) [7], who concluded similar importance of using concept mapping as advance organizer which enhanced recall and retention among chemistry students. The findings is also in line with that of Atomatofa (2013) [5], who found that there were significant differences in the attainment and retention of concepts of gravity by students in favour of the advanced organizer group.

The findings on the difference between the mean achievement scores of students with high, average and low ability level taught using graphic advance organizer and expository advance organizer indicated no significant difference. This could be attributed to the advance organizers enhancing the cognitive ability of students. The findings is also in line with that of Adesina, Okewole and Bodunrin (2014) [4], who concluded that advance organizer often have at least small facilitative effects for learners in most learning situations especially when it involves entire new learning

### Conclusion

Based on the findings, it could be concluded that the use of graphic advance organizer had a significant positive impact on students' achievement and retention when compared to expository advance organizer. It is therefore concluded that graphic and expository advance organizers are effective instruments to develop the students' cognitive ability.

### Recommendations

Based on the findings of the study, the following recommendations are made;

1. Advance organizers should be used by the educational technology teacher to provide for a good link between the new concept and the previous knowledge acquired by the students.
2. Expository and graphics organizers should be incorporated into educational technology curriculum by curriculum planners to enhance teachers' innovations and creativity in teacher education programmes.
3. Seminar/workshops should be organized by Deans of Faculties of Education to acquaint educational technology teachers with the use of graphic and expository advance organizers in teaching educational technology concepts.

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