The Effects of Advance Graphic Organizers Strategy Intervention on Motivation to Learn Science in Primary Six Students with Learning Disabilities

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Abstract

The objective of this study was to investigate the effects of Advance Graphic Organizers Strategy Intervention on motivation to learn Science in primary six students with learning disabilities . 60 students participated in the present study. Each student participant met the following established criteria to be included in the study: (a) a diagnosis of LD by teacher's references, and learning disabilities screening test (Kamel,1990) (b) an IQ score on the Mental Abilities Test (Mosa, 1989) between 90 and 118 ,(c) Neurological scanning results indicated that they were neurologically deficient (d) absence of any other disabling condition. The sample was randomly divided into two groups; experimental (n= 30 boys) and control (n= 30 boys).The effects of implementing the advance graphic organizers strategy on students' academic motivation were assessed using a repeated-measures design, pre- post- and follow-up testing. ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in academic motivation showed that the (F) value was (521.447) and it was significant value at the level (0.01). Scheffe test for multi-comparisons in academic motivation scale showed that there were statistical differences between pre and post measures in favor of post test, and between pre and follow up measures in favor of follow up testing , but no statistical differences between post and follow up testing.

Keywords: Advance Graphic Organizers, Motivation to Learn Science, Primary Six Students with Learning Disabilities

Introduction

An advance organizer is a kind of cognitive bridge, which teachers use to help learners make a link between what they know and what is to be learnt . A graphic organizer can be defined as a visual and graphic display that depicts the relationships between facts, terms, and ideas within a learning task. Graphic organizers are also referred to as knowledge maps, concept maps, story maps, cognitive organizers, advance organizers, or concept diagrams (Adel Abdulla , 2010). Graphic organizers have multiple benefits. These benefits include helping learners grasp the material by assisting in seeing the relationships between ideas, concepts, or authors. Graphic organizers also assist in memory recall. Finally, graphic organizers encourage the use of developing higher-level thinking skills by assisting students to synthesize and integrate information, ideas, and concepts. Ellis and Howard (2007) stated that graphic organizers are effective across subject areas because they provide visual cues designed to assist students in their understanding of information by organizing information. According to Yin, Vanides, Ruiz-Primo Ayala, and Shavelson (2005), graphic organizers allow students a means of creating connections by visually showing relationships among concepts.

Science and Graphic Organizers

FN Keraro(2005) investigated the effects of using advance organizers on students\' achievement in biology. The sample comprised of 166 form three students in Bureti District, Kenya. Data was collected by use of a Biology Achievement Test (BAT). A t-test and One-Way ANOVA statistical techniques were used to analyse the data. Results were accepted at an alpha level of 0.05. The findings indicate that students taught using advance organizers achieved significantly higher than those taught using conventional teaching methods.

Hudson & Fred(2009) investigated the effect of using advance organizers on students' motivation to learn biology. The research design used was quasi-experimental design where the non-randomized Solomon Four group was adopted. The focus was on the topic pollution.

The sample comprised of 166 form three (third grade in the secondary school cycle) students in Bureti District, Kenya. Data was collected by using Students' Motivation Questionnaire (SMQ). A t-test, one-way ANOVA and ANCOVA statistical techniques were used to analyze the data. The findings indicate that students taught using advance organizers had a higher level of motivation than those taught using conventional teaching methods. The findings further indicate that following the intervention, male students had a significantly higher level of motivation than their female counterparts.

Hendron (2014) reported that students who use graphic presentations perform better in tests that require higher cognitive skills, due to the way the organizers provide scaffolding of new ideas with pre-existing schema. Onwioduokit and Akinbobola (2005), and Oloyede (2011) also demonstrated that pictorial organizer was most facilitating, followed by written organizer and non-organizer was least in enhancing student's achievements.

Theodore Njeribe Ekenobi1 and A.A.O Mumuni (2015) adopted a re-test, pre-test control group, quasi-experimental design in a 3x2 factorial matrix to investigate the efficacy of advance organizers strategies on chemistry students' cognitive achievements in redox reaction concept. A total of two hundred and twenty (220) senior secondary two (SS2) chemistry students (118 males and 102 females) purposively selected from three out of six public co-educational senior secondary schools that met sampling criteria in Obio/Akpor education zone, Rivers State, Nigeria constituted three non-equivalent intact classes that participate in the study. A Redox Reaction Concept Achievement Test (RRCAT) instrument with Kuder-Richardson's reliability co-efficient of 0.90 was used to obtain data. Descriptive statistics (mean, standard deviation and percentages) and inferential statistics (ANCOVA and Scheffe's post hoc analysis) were used for data analysis at 0.05 alpha level. The findings established that graphics advance organizers strategy consistently produced the highest levels of achievement gain and was therefore found to be most efficacious in promoting meaningful understanding and enhancing higher cognitive achievements in redox reaction concept at all levels of the cognitive domain among the three strategies compared. Gender did not significantly influence the achievement of students in redox reaction concept.

Objective

The objective of this study was to investigate the effects of Advance Graphic Organizers Strategy Intervention on motivation to learn Science in primary six students with learning disabilities .

To achieve the stated objective, the following research questions were raised:

1-Are there differences in post-test scores mean between control and experimental groups on Academic Motivation test?

2- If the program is effective in academic motivation of experimental group, is this effect still evident a month later?

Methods

Participants

60 students participated in the present study. Each student participant met the following established criteria to be included in the study: (a) a diagnosis of LD by teacher's references, and learning disabilities screening test (Kamel,1990) (b) an IQ score on the Mental Abilities Test (Mosa, 1989) between 90 and 118 ,(c) Neurological scanning results indicated that they were neurologically deficient (d) absence of any other disabling condition. The

sample was randomly divided into two groups; experimental (n= 30 boys) and control (n= 30 boys)

The two groups were matched on age, IQ, academic achievement in social studies, self efficacy, and academic motivation. Table 1.shows means, standard deviations, t- value, and significance level for experimental and control groups on age (by month), IQ , and academic motivation (pre-test).

Table 1. *means, standard deviations, t- value , and significance level for experimental and control groups on age (by month),IQ and academic motivation (pre-test).*

Variable	Group	N	M	SD	T	Sig.
Age	Experimental	30	143.24	1.98	-.121	Not Sig.
	Control	30	143.41	2.01		
IQ	Experimental	30	112.34	3.45	-.221	Not Sig.
	Control	30	112.89	3.24		
Academic	Experimental	30	35.27	2.00	-.442	Not Sig.
Motivation	Control	30	35.85	2.52		

Table 1. shows that al t- values did not reach significance level . This indicated that the two groups did not differ in age (by month),IQ and academic motivation (pre-test).

Instrument

Intrinsic and Extrinsic Motivational Orientations Scale(Mourad Ali Eissa ,2012) : The Intrinsic and Extrinsic Motivational Orientations Scale consists of six subscales; three for Intrinsic Motivation (Challenge , Curiosity, Independent Mastery) , and three for Extrinsic Motivation (Easy Work, Pleasing Teacher , and Dependence on Teacher). a three point Likert scale (agree=3, Uncertain= 2 , and Disagree=1) was used . Reliability coefficients were computed for the full scale (Intrinsic and Extrinsic Motivational Orientations Scale) and subscales. These results were -91 for Intrinsic and Extrinsic Motivational Orientations Scale, .91 for challenge , -73 for curiosity , and -80 For Independent Mastery, 0.82 for easy work , 0.76 for pleasing teacher, and 0.86 for dependence on teacher .

Procedures

Screening : Six year primary students who participated met the following established criteria to be included in the study: (a) a diagnosis of LD by teacher's references, and learning disabilities screening test (Kamel,1990) (b) an IQ score on the Mental Abilities Test (Mosa, 1989) between 90 and 118 ,(c) Neurological scanning results indicated that they were neurologically deficient (d) absence of any other disabling condition.

Pre-intervention testing : All the sixty students in grade six completed Intrinsic and Extrinsic Motivational Orientations Scale, which assesses students' intrinsic and extrinsic motivational orientations. Thus data was reported for the students who completed the study.

General Instructional Procedures: Instruction was delivered to the six year Science teacher. Before the study started, instructors participated in 10 hours of training to learn how to implement the advance graphic organizers strategy. The teacher was provided with a notebook that contained detailed directions for implementing all activities and lessons. The teacher received training and role-played implementing the strategy until she was able to do so to criterion. To help ensure complete implementation, she was provided with a checklist for each lesson. As she taught a lesson, each step was checked as it was completed.

The teacher, however, had the flexibility to respond to individual student needs, backing up and repeating a step, if necessary, or reordering steps. Students received 3 training

sessions a week, lasting between 40 and 45 min. Instruction took place in the regular classroom in order to naturalize the situation.

Design and Analysis

The effects of implementing the advance graphic organizers strategy on students' academic motivation were assessed using a repeated-measures design, pre- post- and follow-up testing.

Results

Table 2. shows data on ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in academic motivation . The table shows that the (F) value was (521.447) and it was significant value at the level (0.01).

Table 2. *ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in academic motivation*

Source	**Type 111 Sum of squares**	**df**	**Mean square**	**F**	**Sig.**
Pre	229.992	1	229.992		
Group	24640.438	1	24640.438	521.447	0.01
Error	2693. 474	57	47.254		
Total	29974.733	59			

Table 3. shows T. test results for the differences in post- test mean scores between experimental and control groups in academic motivation. The table shows that (t) vale was (23.166). This value is significant at the level (0.01) in the favor of experimental group. The table also shows that there are differences in post- test mean scores between experimental and control groups in academic motivation in the favor of experimental group.

Table 3. *T. test results for the differences in post- test mean scores between experimental and control groups in academic motivation*

Group	**N**	**Mean**	**Std. deviation**	**T**	**Sig.**
Experimental	30	83.000	2.04	24.161	0.01
Control	30	38.533	4.22		

Table 4. shows data on repeated measures analysis for academic motivation. The table shows that there are statistical differences between measures (pre- post- follow up) at the level (0.01).

Table 4. *Repeated measures analysis for academic motivation*

Source	**Type 111 sum of squares**	**df**	**Mean square**	**F**	**Sig.**
Between groups	35224.022	1	5224.022	590.551	0.01
Error 1	2984.556	58	51.458		
Between Measures	23157.378	2	11578.689	497.742	0.01
MeasuresxGroups	19331.511	2	9665.756	415.509	0.01
Error 2	2698.444	116	23.262		

Table 5. shows data on Scheffe test for multi-comparisons in academic motivation scale. The table shows that there are statistical differences between pre and post measures in

favor of post test, and between pre and follow up measures in favor of follow up testing , but no statistical differences between post and follow up testing.

Table 5. *Scheffe test for multi-comparisons in academic motivation*

Measure	**Pre** **M= 35.27**	**Post** **M= 83.00**	**Follow up** **M= 82.50**
Pre	--	--	--
Post	48.26*	--	--
Follow up	46.76*	1. 500	--

Discussion

The objective of this study was to investigate the effects of Advance Graphic Organizers Strategy Intervention on motivation to learn Science in primary six students with learning disabilities . The findings of this study have shown that advance organizers enhance learners' motivation to learn. The use of advance organizers in this study, therefore, enabled learners to be active cognitively and hence was motivated to learn.

Experimental group gained better scores in academic motivation tests than did control groups in post-tests though there were no statistical differences between the two groups in pre- test. This is due to the program which met the experimental group's needs and interests. On the contrary, the control group was left to be taught in a traditional way. This goes in line with Mourad Ali's(2012) adopted perspective which indicates that traditional methods used in our schools do not direct students as individual toward tasks and materials, and do not challenge their abilities. This may lead students to hate all subjects and the school in general. On the contrary, when teachers adopt a technique that suits students interests and challenges their abilities with its various modalities, those students had a lot of gains. The results also go in the same line as Bouyaoude and Attieh's (2008) who showed that students who used advance organizers performed better than those that did not use advance organizers at knowledge, comprehension and application levels respectively. Onwioduokit and Akinbobola (2005) and Oloyede (2011) demonstrated that pictorial organizer was most facilitating, followed by written organizer and non- organizer was least in facilitating student's achievements. Based on the findings of this study, it was concluded that graphics advance organizers strategy was most efficacious in enhancing students' Science.

Limitations and future research

Although the results of this study showed the effectiveness of the adopted strategy , it had some limitations. The study was implemented to boys only . Gender difference in motivation to learn Science is important. So, future research should study gender difference in motivation to learn Science. Another limitation was that this study did not investigate teacher characteristics as Proko, Tuncer & Chuda (2007) also posit that teacher characteristics have a significant role on students' attitude towards Science.

Implication

The findings of this study have indicated that the use of advance organizer teaching strategy results in higher students' motivation in Science. Thus the strategy should be incorporated into the teaching of Science at primary school level. This in turn would improve students' motivation to learn Science. Curriculum developers in their efforts to improve the effectiveness of Science teachers should encourage the use of advance organizers.

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