

Improving the Teaching and Learning of Educational Technology Course Content Through the Use of Graphic Organizer

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Abstract

The study is a quasi-experimental involving the use of graphic organizer (concept mapping) and verbal communication presentation method in the teaching and learning of the course, educational technology. Forty-two (42) N.C.E. students of AIFCE, Owerri were randomly selected out of a total population of 154 students from School of Early Childhood and Primary Education Studies and School of General Education which served as the sample size for the study. The two treatment groups of A (concept mapping Group) (CMG) and Group B, verbal communication presentation method (VCPMG) comprising of equal male and female, of 21 students each were subjected to 90 minutes lectures of 2 days in a week. 50 objectives question items from 5 content areas were used for the study and the two hypotheses were tested using t-ratio (independent t-test of differences of mean) statistical tool. Findings revealed that the CMG performed better than the VCPMG and there was no significance gender difference among the CMG. It was recommended that lecturers be exposed on how to develop and utilize active learning instructional strategy especially, Concept mapping for increase in students' engagement and in learning.

Keywords: Teaching/learning, Educational Technology, Graphic Organizer.

INTRODUCTION

Over the years, the use of presentation method of teaching where verbal communication of ideas and knowledge dominate the classroom instructional delivery has been shown to be unproductive. Admittedly, too much telling places learners at the zone of passivity and also weakens the learner's natural urge to construct and discover knowledge through the use of his or her thinking abilities. Teacher-centric learning has been in use in the institutions of higher learning even in teacher education institutions. This seems to be contrary because, the paradigm shift expected in the teaching and learning in this 21st century should be championed by the teacher educators and the student-teachers. Unfortunately, one cannot give what he/she does not have because even the student teachers are not equipped with the expected. Gbamanja, (1991)

discussing the use of teacher centered in Science observes that the use of teacher centred method allows teachers to talk about Science while students need to learn about Science. Teacher centred teaching discuss what to teach and what the learners should know and not concerned to an extent, how to teach and how the learners can use what they have learnt to solve problems. It is an authoritative and coercive style of teaching that can disengage students and decrease motivation easily. Learners just receive information and teachers transmit knowledge.

Paradigmatic shift in the teaching and learning process actually is in the tools/strategies that are utilized in the instructional delivery to help learners to learn. The emphasis is on learning especially, how learners learn and how they can represent or utilize what they have learnt to solve problems and that is the reason why varied instructional strategies or what is referred to as Active Learning Instruction Strategies (ALIS) are emphasized. Active learning, according to Wiki Loves Africa retrieved August 2017, is a teaching method that strives to more directly involve students in the learning process which was introduced by the English scholar R.W Revens who lived between 1907 and 2003. The method was popularized in 1990s by its appearance on the Association for the Study of Higher Education (ASHE) report as recorded by Bonwell and Eison (1991). ASHE argued that for students to learn, they must do more than just listen. They must read, write, discuss or be engaged in solving problems. Graphic organizers are among such strategies that engage Learners/Students maximally. Graphic organizers, according to Lovitt (1994) in Polloway (2008), are diagrammatic illustrations used to organize and highlight content, information and or vocabulary. Wikipedia refers to it as concept maps, knowledge map, cognitive organizers, concept diagrams or advanced organizers. They are learning tools when they are integrated into classroom experiences; students are better able to understand new materials. Mcknight (2017) believes that Graphic organizers create strong visual pictures for students and support their ability to learn facts, information and terms. Students are literally able to see connections and relationships between facts, terms and ideas.

Gonzalez (2017) posits that graphic organizers are among the most powerful instructional tools and this tool helps meet the needs of all learners as it presents information in both text and graphic formats thereby making lesson accessible to more students. Maccini and Gagnon (2008) add that words and or phrases are used to connect the content information in a meaningful way to help student gather a clear understanding of the materials. Virtually, effective utilization of any graphic organizer depends on how knowledgeable the user is, in the development, application and utilization of this multi-faced strategy.

Concept map according to inspiration software retrieved 2017, is a type of graphic organizer used to help students organize and represent knowledge or a subject. Wiki free encyclopedia recorded that it emerged from Cornell University in 1970 by Joseph D. Novak as a means of representing the emerging science knowledge to student. Novak in his book, “learning how to learn,” states that a meaningful learning involves the assimilation of new concepts and proposition into the existing cognitive structures. Wiki defines concept map as a diagram that depicts suggested relationships between concepts and, the techniques in visualizing the relationships among different concepts is called “concept mapping”. In representing or developing concept map, circles or boxes are used while words and phrases are used to link the concepts. Such words and phrases explain the connection between the ideas. These visual symbols help students organize and structure their thought, connecting prior knowledge for further understanding of the information and also to discover new relationships.

Izuagba, Afurobi and Ifegbo (2016) aver that concept maps are used to develop logical thinking, creative and critical thinking and study skills in students. Wolfinger (2006) agrees that

when used in assessing or pre assessing, it has an advantage over popular methods of pre-assessment techniques like pre-test, interviews or group discussion because concept map provide a written record of the students' idea. Concept map has been proved effective in teaching English, Mathematics, Social Studies, and Science respectively. Udeani (2000) carried out a survey to explore the knowledge and use of concept mapping instructional strategy by science teachers in the classroom using 71 science teachers and 25 – itemed unstructured questionnaire. 86% of the teachers indicated that they are aware of the strategy and 89% accepted that they have never used concept maps and reasons were lack of knowledge, lack of basic skills required in using and accessing concept maps. 11% that utilized the strategy indicated extensive gain to students, meaningful understanding of the difficult concepts in science when their students were exposed to the strategy. Ezeudu (1995) maintained that quasi-experimental design involved concept map to determine student's achievement, interest and retention in organic chemistry using a sample size of 411 students selected through multistage sampling techniques from Nsukka education zone of Enugu state. ANCOVA result indicated that students exposed to concept mapping performed better than those taught with conventional method and gender was consistently insignificant. Eze (1992) used advanced organizer on students' achievement, interest and retention in integrated science on 356 JSS students randomly selected from intact class drawn from five secondary schools in Isiuzo L.G.A. of Enugu State. It was found out the advanced organizers had significance effect on the students mean achievement score. Gustello, Beasley and Sintara (2000) assessed the effects of concept mapping on a science unit with low achieving seventh graders in Urban Brooklyn, New York. At pre-tests, the two group, concept mapping and read and discuss group score similarly. At post-test the result showed a statistically mean effect favouring the graphic organizer group indicating that instructional technique using graphic representations are more effective than traditional methods.

Peppell (2005) cited in Gallavan and Kottler (2001) agrees that students become more motivated, demonstrated faster short term recall, and show greater long-term achievement when organizers are used effectively in social studies content. Polloway (2008) supports that graphic organizers in social studies empower students to become critical, analytical, independent and strategic learners.

Theoretical Basics of Graphic Organizers

Graphic organizers interpret text and visual images and these attributes enable it to cater for individual differences, age, ability and learning profiles of learners. Dual Coding theory, Schema theory, Multiple Intelligence and more especially learning movement of constructivism lend credence to this strategy. Furthermore, David Ausubel's advanced organizers model also contribute to the theoretical frame work of the study. Paivio (1986) dual code theory of memory avers that the memory consists of two separate but interrelated system for processing information: thus: - processing non-verbal image and the other is specialized in dealing with language. The visual system processes and stores images in form of imagens while the verbal store linguistic information in form of logogens. Learning becomes active and effective when visual and verbal sytems of processing and storing information are connected and utilized. Ezebiro and Ezekoka (2011) corroborate that the use of illustrations either in colour, simple line, shape or shade enhance comprehension, retention and recall of learned materials while Knowlton (1966) has since agreed that in using illustrations, greater effectiveness are achieved when compared to using written word only.

Schema theory according to Anderson in Slavin (2006:174) holds that we gain access to information held in our semantic long-term memory by mentally following paths. In developing concept maps, main ideas are identified first followed by sub concepts that will branch out to show how the main idea can be broken down and also the use of words and phrases are used to connect the ideas helping students organize and structure their thoughts for better understanding of the information so as to link the prior knowledge to construct new relationships and knowledge. Gustello, Beasley and Sintara (2000) accept that graphic organizers make it easier to link new information to existing knowledge and help students build the schema they need to understand new concepts. Furthermore, Gardner's (1983) theory of Multiple Intelligence, postulates that students learn better and internalize information faster and meaningful when more than one learning modality is employed in an instructional strategy. Gardner's visual spatial modalities are involved using concept map and it help students internalize what they are learning. Visual spatial intelligence according to Santrock (2004) has to do with the ability to think in images and pictures to visualize accurately and abstractly.

Constructivists generally see learning as a process of prior knowledge for construction of new knowledge. They are of the view that learner's active role in learning helps in learners building their own understanding of learned materials. Slavin (2006) opines that constructivism draws heavily on the work of Piaget and Vygotsky. Constructivism discovered "Active Learning Instructional strategies (ALIS) where teachers help students to discover their own meaning instead of lecturing and dominating the instructional activities. Graphic organizers direct students learning and enable students acquire knowledge which will become meaningful and memorable. Concept map enables conceptualization and retention of learnt materials. There is creativity and flexibility in the learning that emanate from concept mapping instructional strategy.

Advanced organizer is a method developed by David Ausubel (1963). Joyce, Weil and Calhoun (2000) posit that in advance organizer, an initial statement about a subject to be learnt is provided and such initial statement provides a structure for the new information and relates it to information students already possess. Advance organizers are used to activate prior knowledge that is used to link the new knowledge. Concept mapping is a powerful thinking tools that are used to visually represent ideas for better comprehension and retention of learned materials. It can be used to introduce a topic, teach a topic or assess learning. The use of graphic organizers in Educational Technology will maximize students' engagement and increase learning.

Statement of the Problem

The urge to replace traditional approach to teaching and learning in order to ensure learner autonomy, learner engagement and learning maximization contributed to the emergence of Active Learning Instructional Strategies (ALIS). ALIS are expected to enable learners collaborate, interact, communicate, reflect and construct knowledge. Educational technology, a course that has to do specifically with the design, development, utilization, management and evaluation of the education and the instructional system is multidisciplinary and multidimensional in approach and therefore the need for varied instructional strategies in the teaching and learning of the course. Unfortunately, it has been observed that in the College (Alvan Ikoku Federal College of Education, Owerri) where team teaching instructional strategy is utilized, some of these powerful instructional tools are not emphasized because lecturing method which has been declared unproductive is used on the increase. The major problem of this

study is to establish the fact that active learning will take place using Graphic Organizer like concept mapping in delivering Educational technology course contents.

Purpose of the Study

The main purpose is to determine the effect of the use of concept map instructional strategy, a graphic organizer tool in teaching and learning of EDU 212, Educational Technology. Specifically, the study will determine if there is any significant difference between the mean performance of students of Educational technology of Alvan Iko Federal College of Education who were taught some Educational Technology concepts using concept mapping and those taught with the normal presentation method of verbal communication and removing gender disparity in academic performance among these learners when exposed to the use of concept mapping instructional strategy.

Hypotheses

Two hypotheses guided the study:

- There is no significant difference in the performance of students taught Educational technology contents with concept mapping and those taught with presentation method of verbal communication.
- The performances of males and female educational technology students taught with concept mapping instructional strategy did not differ significantly.

METHOD

Design

A quasi-experimental pre-test, post-test treatment group involving equal number of students of year 2 NCE offering educational technology EDU 212 was the design of the study. The students were randomly selected from the (96) students of department of Early Childhood and Primary Education Studies and (63) Special Needs students of School of General Education respectively. The two groups comprised of 21 equal males and females' students totaling 42 students from the 159 student's population. 50 itemed objective questions constructed from the contents: Concept and Domains of education Technology, System Approach to Instructional design, Categories, retrieval, storage and administration of Instructional materials, classroom Communication process and Entre-educate, approach to family life and population education respectively and were subjected to reliability and validity-testing, were used at pre-test and post-test. The test items validity was satisfied by 2 Educational Technology lecturers and 2 measurement and evaluation majors. The items were found to have satisfied parallel form reliability co-efficient of 0.83. the pre-test and post-test were scored over hundred percent with 2 marks for each corrected answers. Group A, the concept mapping treatment group was tagged experimental group while Group B presentation method of verbal communication group was tagged control group. The course contents were delivered in 90 minutes' duration lesson of 2 times a week and lasted for 6 weeks. After the treatments, there was post-test using the validated 50 objectives test items and the hypotheses were tested using t-ratio (independent t-test of difference of means).

DATA ANALYSIS AND RESULTS

Hypothesis 1: There is no significant difference in the performance of students taught Educational Technology with concept mapping (CMG) and those taught with presentation method of verbal, communication (PMVCS).

Table 1: Mean, standard deviation, and t-ratio of concept mapping and verbal communication Presentation method in pre-test and post-test

Test	Group	Mean	Standard Deviation	t –ratio	Significance level	Degree of freedom
Pre-test	CMG	48.62	11.20	0.13	0.05	82
	PMVE	48.75	11.73			
Post-test	CMG	68.00	11.79	5.86	0.05	82
	PMVE	42.40	9.52			

The critical value= 1.98 at 0.05 level of significance

In the table above, the two groups showed no significant difference at pre-test with mean of 48.62 and standard deviation of 11.20 for group A and for group B, a mean of 48.75 and standard deviation of 11.13 with a ratio of $t=0.13 < 1.98$ which is the critical value at 0.05 level of significance.

The result of the post-test however, indicated difference in the two groups cognitive level in favour of the group A. mean of 68.00 and standard deviation of 11.79 with t-test value of $t=5.8671$ as which is the critical value at 0,05 level of significance for those taught with concept mapping instructional strategy. Those exposed to presentation method of verbal communication had mean of 52.40 and standard deviation of 9.52 indicating better performance from the CMG and therefore hypothesis 1 was rejected.

Hypothesis 2 - The performances of male and female Educational Technology taught with concept mapping instructional strategy did not differ significantly.

Table 2: Mean, standard deviation, and t-ratio of the male and female students taught educational technology with concept mapping instructional strategy

Test	Group	Mean	Standard Deviation	t –ratio	Significance level	Degree of freedom
Pre-test	CMG Male	52.90	10.66	2.15	0.05	40
	CMG	45.67	10.65			
Post-test	CMG	68.19	11.25	0.0104.	0.05	40
	Female	67.81	11.93			

Critical value = c 2.02 at 0.05 level of significances

From the table above, there was significant difference at pre-test with means of 52.90 and SD of 10.66 as against female mean of 45.67 and SD of 10.65. However, at post-test, the significant difference was not reflected as indicated with t-ratio of $t=0.904 < 2.02$, which is the critical value at 0-05 level of significance as against t-ratio of $t=2.1572 > 2.02$ obtained at pre-test. The results lead

to the acceptance of the null hypothesis that stated no significance gender difference in the performance of students taught with concept mapping instructional strategy.

DISCUSSION

The study revealed that the use of concept mapping in educational technology course delivery have positive effect on the student-teachers' performance from the table above, result indicated a significance effect on the performance of student teachers taught with concept maps as against those taught with conventional approach showing that using graphic representation of concepts and ideas are more effective than traditional method. This corroborates with Ezendu (1995), Gustello et al. (2000) whose findings advance that concept map maximizes learning. Furthermore, in gender interaction effect, no significant effect was shown between male/female using concept map as reported by Ezendu (1995) in her studies also.

CONCLUSION

In conclusion, learning is maximized, engagement is higher and learners are motivated using Graphic organizer as the result indicated better performance from student-teachers exposed to the use of concept map against those taught with the normal conventional method and it depicts gender friendly instructional strategy hence both male and female achieved better learning using the strategy.

Recommendation

Based on the findings the following recommendations were made:

- Teacher educators should revitalize their teaching approaches and involve strategy-based instructional delivery like graphic organizer.
- There is need for the teacher education curriculum to emphasize on the use of active learning instructional strategies as against teaching method that has yielded little or no results over the years.
- Teacher educators should be taught how to develop, utilize and evaluate/assess learning using graphic organizers especially concept map for worthwhile results to be achieved when the strategy is employed.

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