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EFFECTS OF INSTRUCTIONAL STRATEGIES AND STUDENTS' VARIABLES ON THEIR COGNITION OF WORLD ECONOMIC MELTDOWN

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Abstract

The study investigated the effects of instructional strategies (concept mapping, demonstration and guided discovery) on chemistry students' cognition of world economic meltdown among senior secondary three students in Itu Local Government Area of Akwa Ibom State. It also studied the influence of students' cognitive styles and gender on students' achievement on the concept. Three research questions and three hypotheses guided the study. The study was quasi-experimental research using a pretest-posttest non-randomized design. It was conducted in six public secondary schools selected using purposive sampling technique. A sample size of 300 SS3 chemistry students were used from a population of 1,150 chemistry students. World Economic Meltdown Achievement Test (WEMAT) was a researcher-made instrument while Cognitive Style Measuring Instrument (CSMI) adapted from Uzzi (1999) were the two instruments used for gathering data for the study with reliability indexes of 0.78 and 0.73 respectively. Data obtained were analysed using ANCOVA for the hypotheses at $P < 0.05$. Findings showed significant differences in the effect of instructional strategies on students' achievement on world economic meltdown. Cognitive styles of students and gender significantly influenced students' achievement. Based on the findings, it was recommended among others, that concept mapping strategy should be used in teaching the concept of world economic meltdown.

Introduction

World economic meltdown has dominated the headlines in recent times and is receiving attention from scientists and policy makers worldwide. There is much to gain by educating the students about the effects of world economic meltdown on the environment and on education in particular. World economic meltdown has been poorly understood or not understood at all by most students. This may be due to the instructional strategies adopted by the teachers in lesson delivery. In addition, students related variables such as cognitive style, gender and students ideas of the concept may affect understanding (Abalor, 2010). In an effort to meaningfully teach the concept of world economic meltdown, the adoption of instructional strategies such as concept mapping, demonstration and guided discovery become viable alternatives that can facilitate proper conceptualization of world economic meltdown.

Concept mapping is an instructional strategy that present key concepts as knowledge maps that act as scaffolds to facilitate learning. Novak and Canas (2006) described concept maps as graphical tools for organizing and representing knowledge in enclosed circles, arrows and box-types to enhance selection, summary and develop construct of the concept. According to Olaniran (2004) and Omoifo (2005), concept mapping technique, is highly efficient in bringing about meaningful learning outcomes that characterizes crosslinks between concepts for different domains knowledge with potentials for developing skills for inferring, classification and hierarchical structure taking advantage of students'

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prior knowledge (Inomesia and Unuero 2003). Guided discovery is an inquiry-based indirect learning strategy that can start with demonstration in which learners are quizzed in a manner that stimulate thinking out principles based on what they have observed. It aids participants learn to recognize a problem, characterize what the solution would look like, search for relevant information, develop solution strategy and execute the chosen strategy (Borthick and Jones, 2000). Demonstration method is a teaching strategy in the laboratory that involves experimentation. It can be carried out by the teacher for students to observe/participate or by a student for both the teacher and other students to observe. With prior knowledge (Dick 2004) reported that providing students with a combination of behavioural objectives on topics that are taught in chemistry, classroom interaction will be enhanced leading to students better performance. Cognition is the action of acquiring knowledge through thought, experience or the senses (Hornby 2000). Cognitive style can be construed as the way an individual processes and structures information whereby objective stimuli is interpreted into meaningful schema. Ridding and Cheema (1991) opined that cognitive styles is subsumed in the overall personality and cognitive dimension of an individual which influences attitudes, values and social interaction. One dimension of cognitive style includes field-dependence. Field independence that identifies an individual's perceptive behaviour while distinguishing objects and figures from the content field in which they are set. A field – independent learner would locate the figure without wasting time no matter how discreet, whereas the field-dependent learner would take a longer time in locating the figure (Witkin and Goodenough 1981). Okwo and Tartiyus (2004) found that analytical ability, sharp perceptual focus and greater intellectual curiosity have direct influence on students' achievement because cognitive styles are related to the form which cognitive activities are performed rather than to their content.

The major goal for EFA (2000) was that education should be accessible to all irrespective of gender. However, when academic achievement of boys and girls in science subjects were compared, some showed significant difference (Olatoye and Afuwaye 2004) while others showed no significant differences in the academic achievement of boys and girls in science (Agommoh and Nzewi 2003).

Statement of the Problem

World economic meltdown exist in a macrocosm posing a challenge in cognition to inexperienced minds at the secondary school level mainly because of semantic and financial principles involved in its elucidation which may appear obscure to the learners. These constraints no doubt, can be surmounted by presenting the phenomenon in a microcosm. Bruner (1960) opined that any concept could be taught a learner at any age. This applies to world economic meltdown implying that the depth of this phenomenon as a subject matter could be matched with the level of cognitive development and ability of the learner. It is therefore imperative that there be essence in presenting this phenomenon in a microcosm through various strategies to enhance its understanding by students.

This study determined to what extent instructional strategies of concept mapping, demonstration and guided discovery, cognitive style and gender as variables affect students' achievement in the era of world economic meltdown.

Research Questions

Three research questions guided the study.

1. What are the effects of instructional strategies (concept mapping, demonstration and guided discovery) on chemistry students' achievement in world economic meltdown?
2. How does students' cognitive style influence their achievement in world economic meltdown?
3. How does gender influence students' achievement when taught world economic meltdown using concept mapping, demonstration and guided discovery strategies?

Research Hypotheses

The following hypotheses guided the study

1. There is no significant effect of concept mapping, demonstrate and guided discovery on chemistry students' achievement in world economic meltdown.
2. There is no significant influence of students' cognitive styles (field independent and field dependent) on their achievement in chemistry.
3. There is no significant difference in the influence of gender on the achievement of students when taught world economic meltdown by concept mapping, demonstration and guided discovery.

Population of study

The population was made up of all the chemistry students in the 10 public secondary schools in Itu LGA of Akwa Ibom State.

Sample and Sampling technique

Three hundred (300) students were used as sample size for the study. Purposive sampling technique was used in selecting intact class subjects from the population.

Instrumentation

Two instruments used in the study were;

World Economic Meltdown Achievement Test (WEMAT) and
Cognitive Style Measuring Instrument (CSMI)

WEMAT was researcher made and contained 20-multiple choice questions that examined different concepts of world economic meltdown that were of interest to this study namely, economic recession, lowering interest rates, and effects of world economic meltdown on education. The instrument was administered on the three groups used in the study. The Cognitive Style Measuring Instrument (CSMI) was designed to reflect the different levels of the cognitive objectives adapted from that of Uzzi (1999) and it contained twelve (12) items. Each item contained response that were either field dependent or field independent. Responses of students with maximum of either styles indicated the cognitive style of the student.

Validation of Instruments

The two instruments WEMAT and CSMI were validated by two professionals in chemistry education and two lecturers of science education in measurement and evaluation for the construct, content and face validity.

Reliability of the Instruments

The two instruments' reliability were determined after administering the instruments to a group of fifty (50) students selected for the purpose who had been taught the concept. WEMAT had a reliability index of 0.78 which was arrived at using split-half approach. CSMI had a reliability index of 0.73 arrived using the test-retest method. After one week the same instrument (CSMI) was re-administered to the same group of students. The WEMAT contained 20-multiple choice test items. Each correct option attracted two (2) points. The CSMI had twelve (12) items with two options for each item reflecting the field-dependent and field-independent. The cognitive style with the highest response indicated the type of cognitive style the student, would most likely be.

Research Procedure

The study was conducted within the first term of 2008/09 school year in six secondary schools. Subjects in each school were divided into three (3) groups. Pretest was administered to each of the three groups before actual teaching with the treatment packages. There were three (3) treatment sessions for each of the three groups. The teaching packages had similar objectives, content and evaluation to reflect the three instructional strategies. One group was taught by concept mapping strategy while the other two were taught with demonstration and guided discovery respectively on world economic meltdown. The posttest took place after the treatment session. The two instruments were administered to each group on the same days in all schools chosen for the study.

Research Design

The design used in the study was a quasi-experimental pretest-posttest non-randomized group design with intact class.

The CSMI was administered first, the WEMAT and each instrument was collected after completion of response. This was to guard against information in WEMAT influencing responses in CSMI. Items in posttest were the same as in pretest but were reshuffled. Scripts were collected and marked at the end of the exercise.

Data Analysis

Data collected were analysed using (ANCOVA) with pretest scores as covariates.

Results

The covariance analysis was used to test the first hypothesis and the results are presented in Table 1.

Table 1: Result of covariance analysis showing students' achievement classified by treatment.

Source of variation	Sum of square	df	Mean square	F _{cal}	Sig. of F	Decision at P<0.05
Pretest (Covariate)	12.240	1	12.240	1.483	0.223	
Main effects (Treatment)	1431.610	2	715.804	86.697	0.000	
Explained Residual	1443.849	3	481.282	58.292	0.000	*Significant
Total	2443.878	296	8.255			
	3887.719	299	13.001			

Table 1 shows that the compute F-value (F_{cal}) was 86.69, significant at P<0.05. This imply that treatment contributed significantly to students' achievement hence, null hypothesis one was rejected. This meant that there was a significant effect of instructional strategies on chemistry students' achievement on world economic meltdown.

Hypothesis two was tested at P< 0.05 using the results of ANCOVA in Table 2.

Table 2: Covariance analysis showing students' achievement by cognitive styles

Source of variation	Sum of square	df	Mean square	F _{cal}	Sig. of F	Decision at P<0.05
Pretest (Covariate)	12.240	1	12.240	0.984	0.321	
Main effects (cognitive style)	182.800	1	182.800	14.702	0.000	
Explained	195.041	2	97.520	7.843	0.000	*Significant
Residual	3692.677	297	12.433			
Total	3887.719	299	13.002			

As shown in Table 2, the result indicate 0.000 significance of F which is less than 0.05. This means that the calculated F value of 14.702 is significant at 0.05 level indicating that cognitive style contributed significantly to chemistry students' achievement. This implied that cognitive style had significant influence on chemistry students' achievement on world economic meltdown.

Hypothesis three was tested at $P < 0.05$ using the result of ANCOVA in Table 3

Table 3: Covariance analysis showing students' achievement in world economic meltdown classified by treatment and gender.

Source of variation	Sum of square	df	Mean square	F _{cal}	Sig. of F	Decision at P<0.05
Pretest (Covariate)	12.240	1	12.240	1.768	0.184	
Main effects	1732.423	3	577.464	83.442	0.000	
Instructional strategy	1431.608	2	715.804	103.430	0.000	
Gender	300.814	1	399.814	43.466	0.000	
2-way interactions	115.325	2	57.662	8.331	0.000	*Significant
Gender X strategy						
Explained	1859.990	6	309.997	44.793	0.000	
Residual	2027.719	293	6.920			
Total	3887.719	299	13.002			

The result of the analysis in Table 3 showed that for 2-way interaction of gender and instructional strategy, the F_{cal} was 8.331 ($P < 0.05$). This implies that gender and instructional strategy contributed significantly to students' achievement. The result further implies that there is a significant indifference in the influence of gender on students' achievement when taught world economic meltdown using concept mapping, demonstration and guided discovery strategies.

Discussion of Findings

The findings of this study showed that there is a significant effect of instructional strategies on students achievement when taught world economic meltdown with concept mapping having the most facilitative effect. This corroborates Olaniran (2004) and Omoifo (2005) that concept mapping technique is highly efficient and brings about meaningful learning outcome that characterizes crosslinks between concepts for different domains of knowledge when presented as graphical tools for organizing and presenting knowledge to enhance selection and skill development (Inomesia and Unuero, 2003). Concept

mapping strategy presented a unique quality of stimulating students' interest in the desire to make sense of scientific information they acquired by selecting and organizing relevant information through cross links of different sub-concepts.

Guided discovery and demonstration were not very effective for the teaching of world economic meltdown because for guided discovery, more of the learner's preparedness is required for participation in the learning activity. However, learners that were involved in this study demonstrated little preparedness to learning by discovery. The demonstration method was more teacher-activity based as students' were inadequate and lacking information involving world economic meltdown. The study showed a significant influence of students' cognitive styles on their achievement in world economic meltdown with the field-independent cognitive styles outperforming the field-dependent ones. This is in agreement with Koleoso (1998); Okwo and Tartiyus (2004) who found that analytical ability, sharp perceptual focus and greater intellectual curiosity have direct influence on students' achievement because cognitive styles are related to the form which cognitive activities are performed rather than to their content. The findings also showed that the influence of gender on achievement in world economic meltdown was statistically significant. The higher mean for females may be due to some positive traits like rational logic critical and analytical minds the females may have brought to bear during the study period which are essential ingredients that facilitate high academic achievement. The males also possessed identified attributes that enhance achievement. This finding corroborates Olatoye and Afuwaye (2004) who observed that when academic achievement of boys and girls are compared, they show a significant difference.

Conclusion

The study established that concept mapping strategy as the most facilitative in the teaching and learning of world economic meltdown just as there existed significant influences of cognitive style and gender on concepts that relate with world economic meltdown on their achievement.

Recommendations

1. Concept mapping instructional strategy should be used in teaching world economic meltdown to chemistry students for better conceptualization.
2. Teachers should try to appreciate and understand students' cognitive styles and adopt teaching strategies that will favour each cognitive style domain.
3. Teaching should be done without gender-bias as both sexes could be exposed to meaningfully participate in the learning process

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