EFFECTS OF TWO MODES OF CONCEPT MAPPING ON STUDENTS' INTEREST AND ENGAGEMENT IN ECONOMICS IN SECONDARY SCHOOLS IN NSUKKA EDUCATION ZONE

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Abstract
The increased use of computers for curriculum delivery has also offered many innovative instructional strategies that utilize computer tools and software. Concept mapping is one of the strategies that employs computer tool for effective instructional delivery. The purpose of this study, therefore, was to investigate effects of two modes of concept mapping (Manual Concept Mapping (MCM) and Computer Concept Mapping (CCM)) on students' interest and engagement in Economics in secondary schools in Nsukka Education Zone. Two research questions and two hypotheses guided the study. The study adopted a quasi-experimental pretest – posttest design. The sample consisted of 198 SS2 Economics students in Nsukka Education Zone, Enugu state. Economics Interest Inventory (EII) and Economics Engagement Scale (EES) were used for data collection. EII and EES yielded internal consistency reliability indices of 0.76 and 0.73 respectively using Cronbach Alpha. The data collected were analyzed using mean and standard deviation to answer the research questions and ANCOVA to test the null hypotheses at 0.05 level of significance. The results showed that CCM significantly enhanced students' interest in Economics more than MCM. The findings also showed an insignificant slight difference in the mean engagement scores of CCM and MCM groups in favour of CCM. The researchers recommended, among other things, that teachers should utilize CCM as a teaching strategy to help increase students' interest and engagement in Economics.

Introduction
New and innovative teaching methods, strategies and instructional techniques in the classrooms have been changing. The change is partly influenced by technological advancements, the diffusion of personal computers, productivity software, multimedia and network resources, learning theories, instructional, and pedagogical developments in recent times (Aremu & Fasan, 2011; Mahmood & Mirza, 2012). As new technology and computer tools and software are launched, educators will have the opportunity to integrate these new tools with different teaching and learning strategies to enhance instruction. One of such strategies is concept mapping tools.

Concept mapping is a teaching and learning strategy that allows a learner to learn and understand the relationships between ideas or concepts by creating a visual chart/diagram of the connections. Concept maps were developed in 1972 in the course of Novak's research program at Cornell where he sought to follow and understand changes in children's knowledge of science (Hsu & Chang, 2011). It is a technique that gives learners the opportunity to externalize their thoughts in a visual/graphic form. Asiksoy (2019) noted that concept mapping is a graphical presentation of the relations between the concepts using link words. Johnston (2013) observed that concept map is a powerful learning strategy that is graphic in nature and makes the learner to think about the relationships between terms and that latter aspect makes concept mapping especially suited to the study of Economics.

By drawing a concept map of a lesson or a chapter in a textbook, a learner can identify the key concepts and show the relationships between them. This helps him/her to understand more clearly the meaning of the material. Inspiration (2013) noted that concept mapping as a teaching-learning technique visually illustrates the relationships between concepts and ideas. Concept maps allow learners to: find out the connections between ideas they already have; connect new ideas to knowledge that they already have which helps to organize knowledge or ideas; and organize ideas in a logical but not rigid structure that allows future information or viewpoints to be included which can help them absorb and adapt to new information and ideas (Johnston, 2013).

Concept mapping could be created on physical paper (i.e. Manual Concept Mapping) or by the use of computer (i.e. Computer Concept Mapping). Manual Concept Mapping (MCM) is constructing concept maps with pen and paper. It is generating concept maps manually without any computer application or software. Correcting and modifying pen and paper concept maps could be very frustrating. The generation of linking features in concept mapping produces complex and intricate arrays that require constant evaluation and revision and use of pen and paper to construct concept maps can inhibit this generation (Riley & Ahlberg, 2004). With the processes involved in constructing concepts maps, students are bound to alter, erase, revise, change, add or modify their maps to accommodate new knowledge or organize information properly. This process of map modification may prove difficult, messy and cumbersome. The implication of this is that learners may need more support in creating concept maps, building relationships among concepts, and encouragement to modify and revise their maps. Thus, the need for Computer Concept Mapping (CCM). Computer concept mapping is a teaching-learning tool that has emerged as a result of computer technology advancement in education.

Computer Concept Mapping (CCM) is a technique for organizing and representing knowledge by visualizing relationships among concepts in a computer environment or using computer software or tools. Computer concept mapping allows easy change, revision, modification and corrections without going through the hurdles of erasing, cancelling or outright condemnation of the already mapped work. This buttresses the point made by Wang (2019) that with computer or digital assistance, the revision of the concept map will be easy for students to build and draw. It is a teaching-learning approach that promotes meaningful learning (Douma, Ligierko & Romano, 2009) and also helps develop students' thinking skills (Ajaja, 2013).

Using CCM in the classroom is one of the ways teachers can actually go beyond simple knowledge dispensation. According to Hsu and Chang (2011), computer concept mapping as a graphical, visual and spatial creative computer tool guides designers to their own problem-solving paths. Some of the computer tools or software for concept mapping include CMAP®, Inspiration®, Smart Draw® and Concept Map EDitor® among others. CMAP software was used in this study. This is because it is very easy to use and convenient for the level of SSII students to be used in this study.

Many researchers have carried out various studies on efficacy of Concept Maps on students' learning and other related factors. For instance, Mashhadi, Ahmadi, and Rajabi (2021) reported that Computer Concept Mapping instruction brought about significantly better writing performance. Asiksoy (2019) found out that teaching in the Computer-based Concept Mapping environment provides meaningful learning by correcting the misconceptions of the students in sustainability of concept. Chang, Yeh, and Shih (2016) reported that the Computer-based Concept Mapping group students scored higher than the non concept mapping group students on the cognition, understanding and higher order thinking subtests in Physics. Hsu and Chang (2011) reported that students' computer-based concept mapping performance is directly related to their video production performance and can effectively predict their creative

performance. Bala (2011) reported that concept-mapping instructional strategy group significantly performed better in trigonometry than the control group that were exposed to the lecture method. Arruarte, Elorriaga, Calvo, Larranaga and Rueda (2012) found out that computer concept mapping using Concept Map EDitor is a good support for education in multilingual settings.

Findings from these studies proved the efficacy of concept-mapping in enhancing students' achievement in different areas even though most of the works are foreign. The ones carried out in Nigeria are mainly manual concept mapping done mainly in sciences and other school subjects but not in Economics. Most of the studies are also on achievement. Literature is deficient on students' interest and engagement in Economics using computer or manual concept mapping. Hence, the current study compared the effects of computer and manual concept mapping on students' interest and engagement in Economics.

Economics is a subject that has relevance to everyday life. It is a subject that has to do with the study of possible outcomes of human choices and conducts. It deals with the welfare of people. In this view, Vasiliki, Martha, and Konstantina-Maria (2015) noted that Economics is a social science that studies how individuals, governments, firms and nations make choices on allocating scarce resources to satisfy their unlimited wants. It is a social science that deals with the behaviour of people as they cope with the fundamental problem of scarcity.

In Nigeria, Economics is taught in senior secondary school using Economics senior secondary school curriculum. According to the Nigerian Educational Research and Development Council (NERDC) (2008) the guiding principle of the Economics curriculum is the need to equip graduates of senior secondary school with the basic knowledge and skills that will enable them to better appreciate the nature of economic problems in any society and adequately prepare them for the challenges in the Nigerian economy. Economics is useful in modern day life as life itself is full of economic activities on daily basis. It is a subject that enables the receivers to make wise decisions and choices to better their lots in face of limited means and competing ends. With a clear understanding of Economics, one comes to term with the fact that costs are measured in terms of foregone alternatives and then might have a very different view of some common choices. Yusuf (2012) noted that Economics gives one facts and shows what may be expected to be the outcome of certain lines of conduct and helps one to decide which of several alternatives to choose

Despite the importance of Economics for all round development of students, students' achievement in the subject is poor. For example, the West African Examination Council Chief Examiner's Reports (2017 through 2019) revealed a continuous decline or drop in students' achievement. The report showed that the performance of candidates dropped significantly when compared to those of the previous years. Various factors have been adduced for students' poor achievement of students in Economics such as the use of teaching strategies that do not promote students' interest and engagement. Some studies have linked students' poor achievement to lack of interest and engagement in the teaching and learning process (Nji, 2023; Eneogu, 2017; Adejoh, 2019 Alikemuo, 2014).

Interest is a feeling of curiosity or concern about something that makes the attention turn towards it. Interest is a construct that could be used to determine the feelings and/or emotions of people over an event, object, activity or a phenomenon (Ejimonye, 2015). Ekweoba and Nji (2015) defined interest as the eagerness, willingness, attention and intellectual curiosity shown by students towards learning. Students with little interest to learn have less capacity to attend, find meaning, and identify their own questions (Renninger, 2012). If interested in any subject, students tend to ask and seek answers to feed their curiosity. Students' interest in Economics seems not to be encouraging. The researchers' observations showed that many students from Nsukka Education Zone were getting away from choosing Economics as a school subject. Most of these students cited that Economics has high level of

abstraction and that they preferred electives with no mathematical or graphical contents. Therefore, finding engaging teaching and learning strategies that will stimulate their interest and help reduce the level of abstractness of Economics is paramount. This is because students' interest seems to be enhanced if they are actively engaged.

Student engagement involves the active participation of the learner in the teaching and learning process. Engagement, according to Sumarno and Shodikin (2018) is defined as a reflection of a person's active involvement in a task or activity cognitively, emotionally and behaviourally. Nji (2023) defined student engagement as the extent to which students participate optimally in-class activities. In this study, engagement is seen as students' level of physical, mental and social involvement in learning process. Engagement in Economics entails students' level of participation in Economics classes. It shows how students are integrated in the teaching and learning of Economics subject. With the traditional lecture method used by most Economics teachers in Nsukka Education Zone, students are less engaged or involved in Economics classes. They are passive and just succumb to note coping and rote learning. This lack of engagement in Economics classes undoubtedly showcases in their achievement in the subject.

There have been some research reports on students' engagement. Studies have shown that students' engagement could be linked to an increase in behaviour, affective and cognitive engagement, academic satisfaction, and social skills, and reduced dropout (Martin & Bolliger, 2018; Fineley, 2014). Eneogu, Ezegbe, Ugwuanyi, Ejimonye, Idika, and Obiorah (2019) identified that students were more engaged in Team Accelerated Instruction when applied to the teaching of Quantitative Economics. Also, Dean and Jolly (2013), observed that students can actively be involved in classroom activity and be precisely disengaged due to the nature of learning opportunities. The learning opportunities provided in this study are Computer Concept Mapping (CCM) and Manual Concept Mapping (MCM). The researchers suspected that concept mapping involving students' participation in their learning could enhance students' interest and engagement. This study, therefore, investigated the effects of these two modes of concept mapping on students' interest and engagement in Economics in senior secondary schools in Nsukka Education Zone.

Research Questions

1. What are the effects of CCM and MCM on students' mean interest scores in Economics?
2. What are the effects of CCM and MCM on students' mean engagement scores in Economics?

Hypotheses

Ho_1: There is no significant difference in the mean interest scores of students taught Economics using CCM and those taught using MCM.

Ho_2: There is no significant difference in the mean engagement scores of students taught Economics using CCM and those taught using MCM.

Methods

This study adopted a quasi-experimental design. Specifically, a pretest - posttest quasi experimental design was used. The experimental and control groups were taught with Computer Concept Mapping (CCM) and Manual Concept Mapping (MCM) respectively. The study was carried out in Nsukka Education Zone of Enugu State. The population of this study comprised of 4,592 SS2 students from the 58 public senior secondary schools in Nsukka Education Zone. The sample of this study consisted of 198 SS2 Economics students from two co-educational secondary schools in Nsukka Education Zone. The schools were purposively sampled from the public secondary schools in Nsukka education zone based on the availability and usability of computers in the schools.

The instruments for data collection were Economics Interest Inventory (EII) and Economics Engagement Scale (EES) developed by the researchers. The EII is a 30-item rating scale bordering on students' interest on labour market unit covering demand and supply of labour, wage and wage determination, trade union and unemployment topics. The EES is a 20-item rating scale with statements of students' engagement. Both EII and EES are a four-point rating scale with response options of Strongly Agree – SA (4points), Agree –A (3points), Disagree – D (2points) and Strongly Disagree – SD (1point).The instruments EII and EES were face validated by three experts from University of Nigeria, Nsukka. Their modifications and corrections were duly effected in the final draft of the instruments. EII and EES yielded internal consistency reliability indices of 0.76 and 0.73 respectively, using Cronbach Alpha. As a result of the high reliability indices, the instruments were considered suitable and reliable for the study. Computer Concept Mapping Lesson Plans (CCMLPs) and Manual Concept Mapping Lesson Plans (MCMLPs) on labour market covering demand and supply of labour, wage and wage determination, trade union and unemployment were developed by the researchers and were used in teaching the CCM and MCM groups respectively.

The two groups: experimental and control were made to cover same learning contents using CCM and MCM respectively. EII and EES were administered before and after the experiment. Data collected were analyzed using mean and standard deviation to answer the research questions and Analysis of Covariance (ANCOVA) to test the null hypotheses at 0.05 level of significance.

Results

Research Question 1: What are the effects of CCM and MCM on students' mean interest scores in Economics?

Table 1: Effects of CCM and MCM on Students' Mean Interest Scores in Economics

Mode	N	Pretest		Posttest		Mean Gain
		Mean	SD	Mean	SD	
CCM	101	2.29	0.42	3.20	0.44	0.91
MCM	97	2.28	0.48	2..90	0.32	0.62

The data in **Table 1** showed that both CCM and MCM groups were originally at almost the same level of interest with pretest mean interest scores of 2.29 (0.42) for the CCM group and 2.28 (0.48) for the MCM group. For the posttest, the CCM group obtained a higher mean interest score of 3.20(0.44) than the MCM group which obtained a mean interest score of 2.90 (0.32). The mean gain scores for the CCM and MCM groups were 0.91 and 0.62 respectively. This indicates that CCM enhanced students' interest in Labour Market unit of Economics more than MCM.

Ho_1: There is no significant difference in the mean interest scores of students taught Economics using CCM and those taught using MCM.

Table 2: Summary of ANCOVA for Students' Mean Interest Scores in Economics

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	4.907[a]	2	2.453	16.252	.000	
Intercept	76.830	1	76.830	508.936	.000	
PreInterest	.318	1	.318	2.105	.148	
Mode	**4.618**	**1**	**4.618**	**30.589**	**.000**	**S**
Error	29.438	195	.151			
Total	1877.896	198				
Corrected Total	34.344	197				

S= Significant (p<0.05)

Table 2 shows that F value of 30.589 has a probability value of 0.000. Since this value is less than 0.05 level of significance at which the hypothesis was tested, the null hypothesis is rejected. Therefore, there is a significant difference in the mean interest scores of students taught Economics using CCM and those taught using MCM in favour of CCM.

Research Question 2: What are the effects of CCM and MCM on students' mean engagement scores in Economics?

Table 3: Effects of CCM and MCM on Students' Mean Engagement Scores in Economics

Mode	N	Pretest		Posttest		Mean Gain
		Mean	SD	Mean	SD	
CCM	101	2.29	0.36	2.69	0.39	0.40
MCM	97	2.30	0.41	2.67	0.40	0.37

The data on **Table 3** showed that both CCM and MCM groups were originally at almost the same level of engagement with pretest mean engagement scores of 2.29 (0.36) for the CCM group and 2.30 (0.41) for the MCM group. For the posttest, the CCM group obtained a slightly higher mean engagement score of 2.69(0.39) than the MCM group that obtained a mean engagement score of 2.67 (0.40). The mean gain scores for the CCM and MCM groups were 0.40 and 0.37 respectively. This implies that CCM slightly enhanced students' engagement in Labour Market unit of Economics more than MCM.

Ho_2: There is no significant difference in the mean engagement scores of students taught Economics using CCM and those taught using MCM.

Table 4: Summary of ANCOVA for Students' Mean Engagement Scores in Economics

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	.236	2	.118	.760	.469	
Intercept	33.435	1	33.435	215.660	.000	
PreEng	.213	1	.213	1.374	.243	
Mode	**.025**	**1**	**.025**	**.160**	**.689**	**NS**
Error	30.232	195	.155			
Total	1456.813	198				
Corrected Total	30.468	197				

NS = Not Significant (p>0.05)

The result in **Table 4** showed that F value of 0.160 has a probability value of 0.689. Since this probability value is greater than 0.05 level of significance at which the hypothesis was tested, the null hypothesis is upheld. Therefore, there is no significant difference in the mean engagement scores of students taught Economics using CCM and those taught using MCM.

Discussions

The result of this study showed a significant difference in mean interest scores of students taught Economics with CCM and those taught with MCM in favour of CCM group. This finding may be explained by the use of computers by CCM group. Since today's learners are digital learners, any atom of technology integration in teaching them may get their attention in the teaching and learning activities. This could have got them excited, stimulating their interest. Furthermore, the fact that CCM allows easy change, revision, modification and corrections without going through the hurdles of erasing, cancelling or outright condemnation of the already mapped work as the case with MCM could have contributed to the observed findings. The stress-free environment experienced by the CCM group might have boosted their interest more in the learning process. The finding is in line with the observation of Hsu and Chang (2011) who noted that computer concept mapping not only represents knowledge but also facilitates the process and makes it flexible and interesting.

The findings of the study further showed an insignificant difference in the mean engagement scores of students taught Economics with CCM and those taught with MCM. This finding can be explained by the fact that concept mapping is a technique that gives learners the opportunity to externalize their thoughts in a visual/graphic form. The process of this externalization could be very engaging for students. It is a very engaging strategy irrespective of the mode. In concept mapping, students are actively engaged and occupied in constructing knowledge and making their own meaning by drawing concepts and the relationships or connections among them. This is in line with the findings of Asiksoy (2019) who reported that teaching in the Computer-based Concept Mapping environment provides meaningful learning by correcting the misconceptions of the students in sustainability of concept.

Conclusion

From the findings of this study, the researchers conclude that CCM is a suitable strategy that can be used to promote students' interest and engagement in Economics. CCM is a strategy that is capable of satisfying today's technology-driven learners. For students' engagement, both CCM and MCM can be effectively utilized. This is because, irrespective of its mode, concept mapping could be seen as a deep learning strategy that actively engages the learner to clearly relate and distinguish among concepts for meaningful learning.

Recommendations

Based on the findings of this study, the researchers recommend the following:

1) Teachers should utilize CCM as a teaching strategy to help increase students' interest and engagement in Economics.
2) Government and school administrations should organize seminars and workshops for teachers to sensitize and train them on the use of CCM.
3) Government, school administrations, school-community groups and other well-meaning individuals should provide sufficient power supply and computers that will make the use of CCM thrive in secondary schools.

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