Location as a Factor in the Prediction of Psychomotor Performance in Automobile Engine using Computer Simulation

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Abstract
This study compared two groups of four technical college classes studying automobile engine. One group of two schools is located in rural area and the other group, also from two schools, is located in urban area. They learned automobile engine using computer simulation based on a dynamic, three-dimensional model of automobile engine. The study adopted a pretest, posttest, control group, quasi-experimental research design. There were three weeks (of 45 minutes each) of treatment for the study. Psychomotor rating scale was used to obtain data. The area of the study is Enugu State of Nigeria. 526 NTC 1 (average of 16-17 years old) students of Motor Vehicle Mechanics' Work formed the population of the study; while 106 students were sampled from 4 schools out of the 22 schools managed by Science Technical and Vocational Schools Management Board (STVSMB), Enugu. Arithmetic mean was utilised to answer the research question, while the hypothesis was tested using Analysis of Covariance (ANCOVA) tested at .05 level of significance. The study found that the effect of computer simulation teaching technique on students' psychomotor performance in automobile engine is greater in urban students than in rural students. It was also found that the difference was not significant. Based on the findings, one of the recommendations made is that since urban students performed better than the rural students, the rural students should be guided properly in order to maximize their academic potentialities.

INTRODUCTION
Rural area could be differentiated from the urban area using the characteristics put up by Rural Sociology and Educational Psychology (2001); while differentiating rural area from urban area stated that unlike the urban areas, most rural environment have direct contact with nature, agriculture is the fundamental occupation, the size of the community is very small and homogenous in social, racial and psychological trait. Rural society is simple unit-group society. Other differences include that the density of the population is lower, low degree of social differentiation, more rigid fewer economic, occupational and sociopolitical classes. Territorial, occupational and other forms of social mobility of the population are less intensive. They follow same occupation, stay in the same village. The mode of communication is simpler, face to face, informal, sincere relations.

Continuing, Rural Sociology and Educational Psychology (2001) stated that social solidarity or cohesiveness and unity are stronger/greater than urban. Common traits, similarity of experiences, common aims and purposes, common customs and traditions are the basis of unity in the rural area. There is strong sense of belonging and unity. Social pressure by community is strong. Conformity of norms is more by informal social pressure. Rural social life is relatively static and stable. Rural area has sacred (religious) culture. Choice of leadership is

more on the basis of known personal qualities of individual, due to greater face to face contacts and more intimate knowledge of individual. Most of the schools are natural outgrowth of rural social life. Standard of living, which is home conveniences, public utilities, educational, recreational, religious, medical, communication and other facilities for living is lower in rural areas.

Most of the characteristics of the rural communities are the reverse of the urban communities. Your Article Library (2015) noted down some characteristics of urban communities. They stated that in the same country and at the same period, the size of an urban community is much larger than that of a rural community. Density of population in urban areas is greater than in rural communities. So far as urban community is concerned, greater importance is attached to the individual than to the family. Nuclear families are more popular in urban areas. In case of urban community there is a preponderance of love marriages. Sons and daughters enjoy considerable freedom in choosing their life partners. In the urban areas, the major occupations are industrial, administrative and professional in nature. Divisions of labour and occupational specialization are very much common in towns/cities/metropolises. A town and a city house the richest as well as the poorest of people. In a city, the slums of the poor exist alongside the palatial bungalows of the rich, amidst the apartments of the middle class members. The most civilized modes of behaviour as well as the worst racketeering are found in the cities.

Other characteristics are that the cities symbolize cultural heterogeneity. The cities are characterized by diverse peoples, races and cultures. There is great variety in regard to the food habits, dress habits, living conditions, religious beliefs, cultural outlook, customs and traditions of the urbanites. Social distance is the result of anonymity and heterogeneity. Most of one's routine social contacts in a town or city are impersonal and segmental in character. In the urban community social responses are incomplete and half¬hearted. There is utter lack of personal involvement in the affairs of others. The circles of social contact are wider in the city than in the country. There is a wider area of interaction system per man and per aggregate. This makes city life more complex and varied. The city life is characterized by the predominance of secondary contacts, impersonal, casual and short-lived relations. In urban areas the social status of an individual is determined not by heredity or birth but by his merit, intelligence and perseverance.

Your Article Library (2015) went on to state that the urbanites attach supreme importance to their own welfare and happiness. They hesitate to think or act for the good of others. In urban community there is emphasis on rationality. People are inclined to reason and argue. Their relationship with others is governed, for the most part, by the consideration of gain or loss. Relationship takes place on a contractual basis. Once the contract is over, human relationship automatically comes to a close. By virtue of its size and population, the urban community cannot be a primary group. Here nobody knows anybody and nobody cares for anybody. The urbanites do not care for their neighbours and have nothing to do with their miseries or pleasures. The urban community is characterized by norm and social role conflict. Factors such as the size, density and heterogeneity of the population, extreme occupational specialisation and the class structure prevalent in the urban context lead to such a state of affairs. Rapid social and cultural change characterizes urban life. The importance attached to traditional or sacred elements has been relegated to the background. The benefits of urban life have effected changes in respect of norms, ideologies and behaviour patterns. The urban community is characterized by impersonal, mechanical and formal social contacts occurring among the people. Naturally they have a strong desire for developing genuine social relationships to

satisfy their hunger for emotional warmth and sense of security. They form associations, clubs, societies and other secondary groups. Social control in urban community is essentially formal in nature. Individual's behaviour is regulated by such agencies as police, jails and law courts. Urban areas provide impulses for modernization in society as a whole.

This study sought to find out if these characteristics affect psychomotor performance of the students in urban areas significantly when compared with their counterparts in the rural areas in Enugu State. Psychomotor performance is used to assess the attainment of the objective in psychomotor domain. Psychomotor domain requires the use of performance test. Okoro (2002) stated that performance tests involve actual practical activities and the use of tools and equipment by students to demonstrate their levels of skill in the operation of machinery and equipment and in construction and repair of goods. A psychomotor skill test typically is a paper and pencil test that looks at how rapidly and well the person integrates motor and cognitive processes. Psychomotor skill test can also be done outside paper and pencil provided it integrates motor and cognitive processes (Johnson, 2015). Motor process in this study is the course of action (that is assessment) taken outside a paper, rather on the material (automotive part/s) itself.

Population size is used, in this study, to distinguish the rural area from the urban area. In Nigeria, a rural area is defined as an area having a population of less than 20,000 persons and urban area having a population of 20,000 and above persons (National Population Commission, 2003). Communities where the technical colleges are situated are used as areas defined above. Therefore, according to the population census results of 1991, any community in Enugu State having a population of less than 20, 000 persons are here referred to as rural area and the areas with 20,000 persons and above is here referred to as urban areas. Also schools located in the rural areas are here referred to as rural schools and schools located in the urban areas are here referred to as urban schools. The results of the 1991 population census were used because the results of the 2006 census do not contain community level data. The experiment in this study sought to find out if there would be positive effect when teaching automobile technology to urban students as against the rural students in technical colleges in Enugu State. Computer simulation teaching technique was used to teach the students.

Computer simulation teaching technique is taken here to refer to classes using computer simulation as a replacement for or supplement to conventional classroom instruction in order to teach students. Conventional teaching method on the other hand is taken here to refer to classes using traditional methods of instruction, that is, non-computer-based methods, to teach students. The basic replacement in this study is in the learning resources, that is teaching materials. Kalekar (2015) stated that learning resources are texts, videos, software, and other materials that teachers use to assist students to meet the expectations for learning. Computer simulation teaching technique in this study used system model (simulation video and Lotus Engine Simulation) as a replacement to physical model and charts respectively. In Enugu State technical colleges, teachers use traditional methods of teaching. They use physical model to teach for psychomotor performance. This traditional method has not improved the academic performances of the students substantially. Therefore, the need to try out any other alternative; one of which is computer simulation teaching technique as one of computer assisted instruction.

In order to achieve the aforementioned, a research question and a hypothesis were used. The research question asked is what are the psychomotor performance scores of urban and rural

students of Motor Vehicle Mechanics' Work taught using the computer simulation teaching technique? The null hypothesis was that there is no significant difference between the mean psychomotor performance test scores for urban and rural students taught using computer simulation teaching technique.

METHODS

In this study, a quasi-experimental research design of pre test and post test model was used. This study was carried out on 49 NTC 1 students in second term of 2014/2015 academic session. The study involved two groups of subjects. They are the urban and the rural students. The groups were taught using computer simulation teaching technique. Only the scores of students who participated in pretest, treatment, and post test were taken to analyse the data; therefore the urban group consists of 20 students and that of the rural group was 14 students. The study was conducted in Enugu State, Nigeria. Psychomotor rating scale was used to assess the psychomotor performance of the students in the study.

The study was conducted during the school lesson period. It followed the classes' time table of Motor Vehicle Mechanics' Work. The regular school Motor Vehicle Mechanics' Work teachers were used in the study. Pretest was administered to both groups before the commencement of the lessons. During the lessons, computer simulation teaching technique lesson plan was used to teach the students. The regular Motor Vehicle Mechanics' Work teachers who were involved in the study were trained on how to teach the selected topics using computer simulation. This was done before the pretests. After the training and pretests, then the treatment (that is actual teaching) commenced. Each lesson lasted for a period of 45 minutes, two periods in a week and the lessons were a period of three weeks. A total of six lesson periods were therefore involved in the study. At the end of the lessons, post tests were administered to both groups. The data collected from the pretest and post test were used for further analysis. The analysis determined if there were significant differences in the psychomotor performances between the two groups.

Results: The results are presented according to the research question and hypothesis that guided the study.

RESEARCH QUESTION

What are the mean psychomotor performance scores of urban and rural students of Motor Vehicle Mechanics' Work taught using computer simulation teaching technique?

The answer to this research question is provided in table 1.

Table 1: Mean Scores of Pre-test and Post-test Psychomotor Performance scores of Urban and Rural Students of MVMW taught using Computer Simulation Teaching Techniques

Location	N	Pre-test $\bar{X}$	Post-test $\bar{X}$	Mean Gain
Urban	20	28.55	43.75	15.20
Rural	14	28.17	40.10	11.93

Table 1 shows that urban students taught MVMW with CST technique had a mean score of 28.55 in the pre-test and a mean score of 43.75 in the post-test; making a pre-test, post-test mean gain in the urban students taught using CST technique to be 15.20. Meanwhile, rural students taught MVMW using CST technique had a mean score of 28.17 in the pre-test and a

post-test mean of 40.10 with a pre-test, post-test mean gain of 11.93. With these results urban students taught MVMW using CST technique had mean scores greater than rural students in the MVMW psychomotor performance test; thus, there is a higher effect attributable to location on the psychomotor performance of students taught MVMW using CST technique in favour of the urban students.

Null Hypothesis
There is no significant difference between the mean psychomotor performance test scores for urban and rural students taught using computer simulation teaching technique. The data analysed for this hypothesis is presented in Table 2.

Table 2: Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Locations with respect to their Mean Scores on the MVMW Psychomotor Performance Test

Source of Variation	Type III Sum of Squares	Df	Mean Squares	F	Significance of F
Corrected Model	109.921[a]	1	109.921	2.591	.117
Intercept	42508.827	1	42508.827	1.002E3	.000
Location	109.921	1	109.921	2.591	.117
Error	1357.676	32	42.427		
Total	46133.760	34			
Corrected Total	1467.597	33			

a. R Squared = .075 (Adjusted R Squared = .046)
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The data presented in Table 2 shows that F calculated value for location is 2.591 with significance of F at .117 which is greater than 0.05. Therefore, the null hypothesis of no significant difference between the effect of location (urban and rural) on students' psychomotor performance in MVMW is accepted at 0.05 level of significance. Hence, there was no significant difference between urban and rural students in respect to their mean scores on the MVMW Psychomotor Performance Test.

DISCUSSION
The findings as presented in table 1 shows those urban students performed better than rural students in psychomotor performance scores of MVMW using computer simulation. This is in consonance with the results of Owoeye & Yaya (2011) and Bulala, Ramatlala & Johnson (2014). They found that urban students performed better than the rural students. Owoeye & Yaya (2011) suggested that urban students better performance could be attributed to the fact that urban schools are better staffed - teachers with the highest training are posted to largest cities, and even more noticeably to the capital, with better facilities, so students are exposed to good study habits, and highly motivated to study with conducive learning environment; hence these factors encourage the students from urban schools to perform better than those from rural schools. Rural schools are characterised by teachers who accepted their appointment because either; there was no better appointment available, or it was regarded as a quick set up on to promotional ladder. Most rural-based schools which lack enough qualified teachers are poorly equipped and lack basic amenities and all these serve as inhibiting factors of good academic performance.

Most rural students trek a long distance to school, they become exhausted every day when they get to school and when they returned. Most rural schools' environments are very large and have very few students, who are required to keep the environments clean by manual labours

that are enormous for them. Most of these students become truants in order to avoid these manual labours. Bulala, Ramatlala & Johnson (2014) added that provision of education in rural areas is normally fraught with the following difficulties and problems; qualified teachers refuse appointment in isolated villages; villagers refuse to send their children to schools because they are dependent on them for help; parents hesitate to entrust their daughters to male teachers; lack of roads or satisfactory means of communication makes it difficult to get books and teaching materials to the school which place difficulties in the way of organizing school transport among others. A lot of coaching of urban students is done to prepare students for public examinations thus promoting the spirit of competition and rivalry which may be public examinations thus promoting the spirit of competition and rivalry which may be lacking in the rural pupils, probably owing to limitations in exposure and experience.

Analysis of covariance explained hypothesis 4 in table 10. It revealed that the calculated F-value for the psychomotor performance of urban students over rural students stood at 2.591 with a significant of F at .117 which is greater than 0.05. Hence, the null hypothesis of no significant difference between the effects of location treatment on students' psychomotor performance in MVMW was upheld at 0.05 level of significance. With this result, there was no significant difference between the mean psychomotor performance scores of urban and rural students taught Motor Vehicle Mechanics' Work using computer simulation teaching technique. This result showed that the effectiveness of computer simulation teaching technique on students' psychomotor performance in MVMW does not depend on the level of location. Hence, there were no differential effects of treatment over level of location (urban and rural) which implies that conventional teaching method is more effective in improving students' psychomotor performance in MVMW regardless of location levels.

CONCLUSION

Based on the analysis of data, it is concluded that urban students performed better than the rural students when computer simulation was used to teach them automobile engine. The study also revealed no significant difference in the psychomotor performance of the urban and rural students. These results therefore showed that there is characteristics in urban students that made them perform better than their equals from the rural areas.

RECOMMENDATIONS

Based on the findings of this study, rural students should be guided properly in order to maximize their academic potentialities. Government should provide educational equipment and facilities; such as mowers, good roads and transport system, to rural students, which would help them perform as better as the urban students. The community should assist the government by providing taxis and buses to facilitate movement of teachers and students to their school. Adequate incentives should be provided to rural area teachers to encourage them to put in their best to remain in their duty stations.

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