A CAUSAL MODEL OF TEACHERS' ATTRIBUTES AS CORRELATES OF STUDENTS' PERFORMANCE IN MOCK GEOGRAPHY EXAMINATION IN SENIOR SECONDARY SCHOOLS IN BAUCHI METROPOLIS, BAUCHI STATE, NIGERIA

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Abstract
The study was precipitated by the secondary school students' poor performance in geography in school-based and external examinations in Bauchi State. The study developed a causal model of teachers' attributes as correlates of students' performance in mock geography examination in senior secondary schools in Bauchi Metropolis, Nigeria. One research question and five hypotheses were formulated for the study. The study adopted ex-post facto and correlational research designs. The population of the study consisted of all the SSIII geography students and their teachers in public senior secondary schools in Bauchi metropolis of Bauchi State, Nigeria. The population of the study consisted 4, 438 SSIII geography students and 55 teachers in public senior secondary schools in Bauchi metropolis. A sample of 475 geography students and 40 geography teachers were drawn using the stratified sampling technique. The instrument used for data collection was a Geography Teachers' Attribute Questionnaire (GTAQ). The data collected were analyzed using path analysis method. The findings of the study revealed that there was no significant difference between the default and saturated model of teachers' attributes in the mock geography examination in senior secondary schools in Bauchi Metropolis. It was also found that teachers' attributes had 58.87% direct effect and 41.13% indirect effect on the students' performance in the mock geography examination. The study recommended that stakeholders in Education; the Bauchi State Ministry of Education and Teachers Service Commission (TSC), Bauchi State should adopt quality assurance in the employment and recruitment of geography teachers and should provide in-service training for the teachers.
Key words: Causal Model, Mock-Geography examination and SSIII Students

Introduction

Geography is a subject that is concerned with the earth surface and the way in which the human race lives and uses the earth. Geography is relevant in creating awareness about what happens in man's environment and many of current world issues at global and locally boils down to geography. For instance, the issues of global warming as it affects countries and regions, food and energy security, degradation of land and soils from overuse and misuse and the impact of economic change on places among others, all are the concerns of geography. It is a living-breathing subject that is constantly adapting itself to change and it is a multifaceted subject that unifies the school curriculum. Thus, students who offer geography and obtain credit pass at the Senior Secondary Certificate Examination (SSCE) have the opportunity to gain admission into tertiary institutions to study professional courses in the Natural, Environmental and Social Sciences, Humanities and the Arts.

Despite the importance and relevance of geography, there is poor/dwindling performance of secondary school students in the subject in both internal and external examinations whereby very few students score credits in geography which is worrisome to educationists, stakeholders, parents and the general public. The study of geography in senior secondary schools is not limited to only understanding and locating places on maps. It involves understanding the cultural differences that exist in the world and using the knowledge of geography to bring unity amongst people. The use of graphs and models in teaching and learning of geography in senior secondary makes the subject fascinating. Diagrams and games when adapted in teaching geography enhance the learning of geography because they constitute graphical languages in teaching that provide convenient and powerful way to explaining relationships.

Also, the use of models is significant in geography teaching in the sense that, it explains abstractions of the reality of real-life problems in geography for easy understanding of relationships/causal links among variables in a system (Anikweze, 2011). Studies (Amosun & Oderinde, 2008; Anikweze, 2010; Ugodulunwa & Wakjissa, 2015) have revealed that senior secondary school students' performance in geography is poor in both internal and external examinations. Many factors have been found to be the attributes to students' poor performance in geography which are summed as school-related variables, students-related variables and teacher–related variables. For instance, (Anikweze, 2011; Okafor, 2015 & Adeyemi 2014) found that school environment, parents, geography teachers and students' attitude towards

geography are the factors responsible for students' poor performance in geography in both internal and external examinations.

The teacher variables that correlate with performance of students in geography include teacher qualifications, teacher self-concept, teaching experience, and teaching strategies, which play vital roles in improving performance of students in secondary school geography. Teachers play a vital role in the teaching and learning of geography and should employ authentic instructional and assessment techniques that will equip students to be efficient in geographical observations. For instance, inside the classroom, teachers should make use of the globe, charts and models to make geography knowledge relevant to real life experiences and make geography instruction more effective in the post COVID 19 era. Suffice it to say that the real geography exists outside the classroom through field trip/excursion and laboratory and garden visits among others to further concretise on what they have learnt inside the classroom. Students should be made to observe geographical facts like clouds, hills/mountains, temperature, wind direction and velocity and pressure among others. These will get them more involved outside the classroom in the post COVID 19 era. Also, achieving quality in geography instructional process will depend to a large extent on the teacher variables; teacher qualifications, teacher self-concept, teaching experience, and teaching strategies which constitute the attributes to students' performance in geography.

Researchers (Pearl, 2015; Tein & MacKinnon, 2013) indicate that the concept of causation has always been an extremely critical issue in social and behavioral sciences. A causal model is an abstract model that describes the causal mechanisms of a system. Models express more than correlation because correlation does not imply causation. Pearl (2015) and Adegoke (2013) posit that causal model is an ordered triple (U, V and E). The U stand for a set of Exogenous variables whose values are determined by factors outside the model, the V represent a set of Endogenous variables whose values are determined by factors within the model while the E refers to a set of structural equation that expresses the value of each endogenous variables as function of other variables in the U and V in the model. Causal modeling or Path Analysis (PA) hypothesizes causal relationships among variables and tests the unobserved (latent) indicators by many observed indicators that are measured using pictorial form.

A causal diagram as a graphical tool describes and enables visualization of causal relationship between variables in the causal model. Kothari (2012),

Adegoke (2014) and Streiner (2015) adduced that a typical causal diagram comprises a set of variables defined as being within the scope of the model and variables in the diagram that are connected to each other by an arrow showing the causal influence. The arrowhead delineates the direction of the causal relationships.

The Bauchi State Ministry of Education introduced a centralized mock examination for the SS3 students to serve as predictor of performance in SSCE external examinations. The mock geography examination results are used to further teach students on areas of difficulties. Usually, the mock examinations help to measure students' level of understanding of concepts taught in the senior secondary education curriculum and to develop test-taking skills in the students that will familiarize them for the task ahead in the external examinations (Okey, Charles-Ogan, & Ochuba, 2015). However, available statistics reveals that students' performance in the mock geography examinations in the study area is poor hence the need to investigate to develop a model of effects of teacher-related variables on students' performance that could be used in solving the problem of poor performance in geography in the study area. Therefore, the broad question for the study is, what is the most meaningful causal model of the teacher variables.

Five research questions guided the study

1. What are the default model and the saturated model of the variables affecting performance of students in the mock geography examination in senior secondary schools in Bauchi metropolis of Bauchi State?

2. What is the causal link of performance of students in mock geography examination in Senior Secondary schools in Bauchi metropolis in relation to teachers' teaching strategies?

3. What is the causal link studnets' performance in the mock geography examination in Senior Secondary schools in Bauchi metropolis in relation to teacher qualifications?

4. What is the direct and indirect effect of teacher teaching experience on students' performance in the mock geography examination in Bauchi metropolis?

5. What is the causal link of students' performance in mock geography examination in relation to teachers' self-concept in Senior Secondary schools in Bauchi metropolis?

The following hypotheses were formulated for the study

Ho[1]. There is no significant difference between the default model and the saturated model of the variables affecting performance of students in the mock geography examination in senior secondary schools in Bauchi metropolis of Bauchi State.

Ho[2]. Performance of students in mock geography examination in Senior Secondary schools in Bauchi metropolis of Bauchi State has no causal link with the geography teachers' teaching strategies.

Ho[3]. Teacher qualifications have no significant causal link with performance of students in mock geography examination in Senior Secondary schools in Bauchi metropolis of Bauchi State?

Ho[4]. Teaching experience does not directly and indirectly affect the performance of students in mock geography examination in Bauchi metropolis of Bauchi State?

Ho[5]. Teachers' self-concept has no significant causal link with the performance of students in mock geography examination in Senior Secondary schools in Bauchi metropolis of Bauchi State?
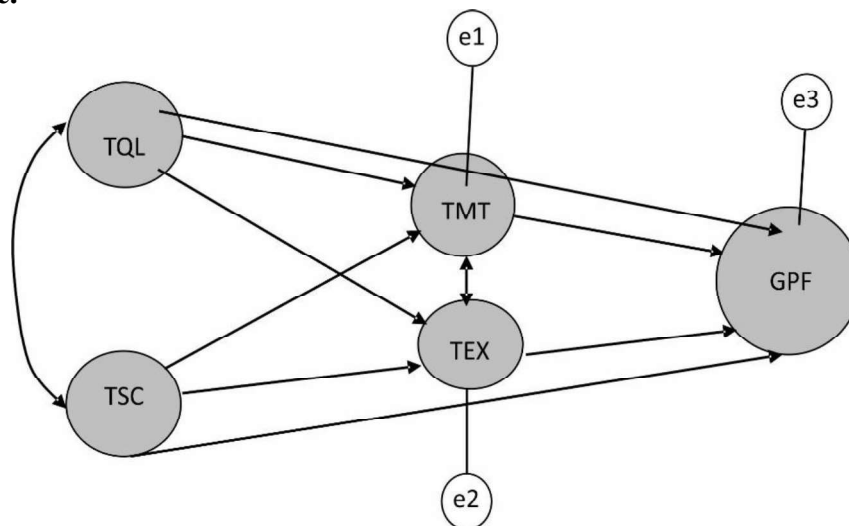
Method
The causal comparative (ex-post facto) and correlational research designs were adopted for the study. The choice of causal comparative research design was because the independent (exogenous) variables tend to affect the dependent (endogenous) variables. The population of the study consisted of all the geography teachers and SSS III geography students in Public Senior Secondary Schools in Bauchi metropolis of Bauchi State who participated in the 2018/2019 academic session with a total of 55 geography teachers and 4,438 geography students. The sample of the study consisted of 520 research participants; 45 (82%) geography teachers and, 475 (11%) SS III geography students selected from the senior secondary schools in Bauchi metropolis of Bauchi State through proportionate stratified sampling technique.

The two instruments used for data collection were the Mock Geography Teachers' Attributes Questionnaire (MOGTAQ), while the Mock Geography Examination Records (MGER) was used to collect record of performance in the mock examination. The reliability of internal consistency of the Mock Geography Teacher Attributes Questionnaire (MOGTAQ) yielded a coefficient of 0.79. Path Analysis technique was employed for data analysis for answering the research question and testing of the five hypotheses with Statistical Packages for Social Sciences (SPSS) Analysis of Moment Structures (AMOS) version 22.

Results
Figure 1: Hypothesized Causal Model of Teachers Attributes as Correlates Students' Performance in Geography Examination in Bauchi State.

key
TQL = Teaching qualification.
TMT = Teaching methods.
TSC = Teachers self-concept.
TEX = Teaching Experience.
e1, e 2 and e3 = error variables
GPF = Geography Performance

Figure 2: Meaningful Path Model (Saturated Model) of Teachers' Attributes as Correlates Students' Performance in Senior Secondary Schools in Bauchi Metropolis of Bauchi State.
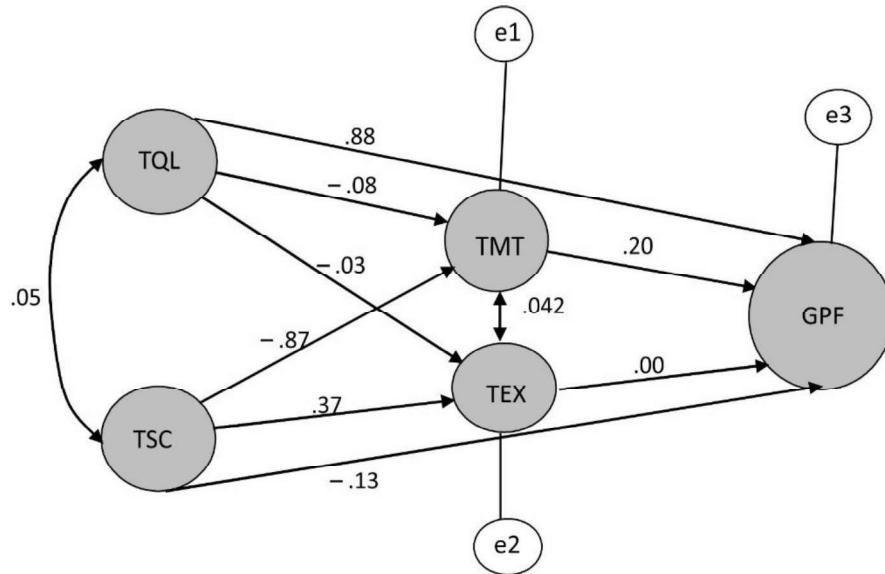
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Table 1: Summary of Model of Fit Index

Model	CMIN	NFI	GFI	CFI	RMSEA
Default Model	9.613	.900	.996	.909	.031
Saturated Model	0.000	1.000	1.000	1.000	.037

Key:
CMIN: Chi-square Goodness- of- Fit Index
NFI: Normal Fit Index
GFI: Goodness-of-Fit Index
CFI: Comparative Fit Index
RMSEA: Root Mean Square Error Approximation.

The results in Table 1 shows that the Chi-square goodness of-Fit index (CMIN) value obtained from the default model was 9.613 and the value of CMIN saturated model was 0.000. Since the chi-square value 9.613 and p = .100 and where the $p > 0.05$ is not significant (Moss, 2015).

Table 2: Path Coefficients (Regression Weights of Default Model)

			Estimate	S.E.	C.R.	P	Label
T.SELFCON	<---	Teachers Qualification	-.049	.011	-4.429	***	NS
T.EXP	<---	Teachers Qualification	-.002	.002	-.934	.350	NS
T.EXP	<---	Teachers' self-concept	.046	.007	6.603	***	Sig
T.METH	<---	Teachers' self-concept	.456	.023	-.613	***	Sig
T.METH	<---	Teachers' Qualification	-.024	.007	-3.307	***	Sig
Performance	<---	Teachers Qualification	.340	.035	.665	**	Sig
Performance	<---	Teaching Methods	.240	.000	1.00	.001	Sig
Performance	<---	Teachers'self-concept	-.512	.141	-3.621	***	Sig
Performance	<---	Teaching experience	.108	.589	.184	.***	Sig

Note: S.E. is Standardized Estimates, C.R is Critical Ratio, Probability Label * is significant at 0.05, ** is significant at 0.01 and *** is highly significant. Sig = Significant, Ns =Not significant

The results in Table 2 showed the path coefficient regression weight of the relationship between teaching method and students' performance in mock geography as.240 with Pvalue as 0.001. Where the $P < 0.05$ is significant (Moss, 2015)

Also, the results in Table 2 showed the path coefficient or regression weight of the relationship between teaching qualification and students' performance in mock geography as.340 with P value as ** (which signifies significant at 0.001). Where the $P > 0.05$ is significant (Streiner, 2015).

The results also indicated the path coefficient or regression weight of the relationship between Teachers' self-concept and students performance in mock geography as -.512 with Pvalue as *** (signifies highly significant). Where the $P > 0.05$ is significant (Streiner, 2015).

Table 3: Direct and Indirect Effects of Teacher-related Variables on Performance

S/N	Path	Direct Effect	P. Value	Interpretation	Indirect Effect	P. Value	Interpretation
1	T. Qualification to performance	0.003	-.000	significant	0.036	0.120	Not significant

Table 3 shows the direct and indirect effects of teaching experience variables affecting senior secondary school students in mock geography examination with their corresponding *P*values to test their significance to students' performance in mock geography examination. Direct effect had 0.003 with *P* value of -.000 (significant) and indirect effect had 0.036 with *P*value of -.120 (not significant).

Figure 3: The Decomposed Causal Model of Teachers attributes as Correlates of Students' Performance in Mock Geography Examination in Senior Secondary School in Bauchi metropolis, Bauchi State.
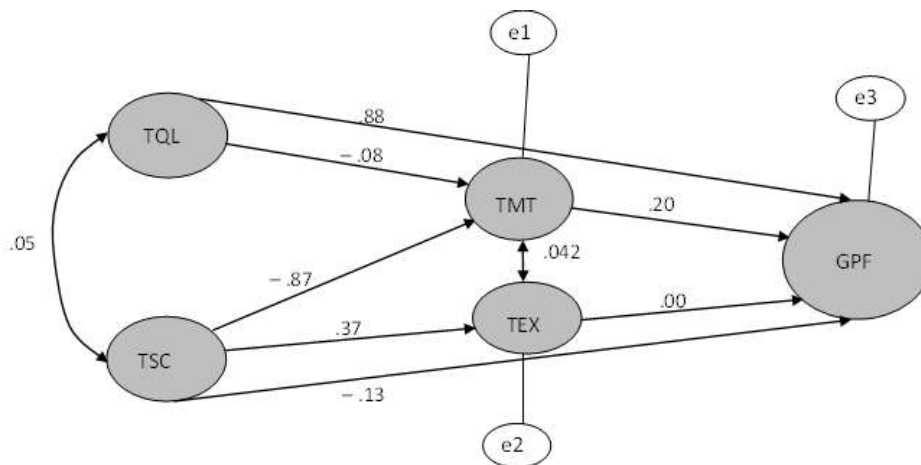
Key

TQL = Teaching qualification.
TMT = Teaching methods.
TSC = Teachers' self-concept.
TEX = Teaching Experience.
e1, e 2 and e3 = error variables.
GPF = Geography Performance.

The path from teacher qualifications was decomposed using Okham's Razor principles based on the fact that the regression or weight path coefficient with

*P*value is greater than .005. Hence, the path was erased, this mean that teachers' qualification has no significant relationship with students' performance in mock geography examination in senior secondary schools in Bauchi Metropolis Bauchi State.

Discussion
The findings from the research questions showed the criteria for the model of fit indices; the chi-square test of goodness of fit (CMIN), Goodness of Fit Index (GFI), Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). The developed meaningful causal model consists of nine paths shown by leading arrows from the two exogenous variables and three endogenous variables to performance. The variables that which the arrows pointed at are referred to as endogenous variables where their variability's are determined within the model. The variables with double headed arrows pointed at them are referred to as exogenous variables where their variabilities are determined outside the model. Besides each arrow is the path coefficient of each path. The error variable arrows only pointed at the endogenous variables.

The output from AMOS indicated that the developed model was good as it fit with the observed data. The Normal Fit Index (NFI) value of the default model was .900 and the value of NFI saturated model is 1.000. Moss (2015) a model is said to be good if the NFI is greater than 0.90. The default model was good since the NFI value (0.997) was greater than 0.90. The Goodness of Fit Index (GFI) value of default model was .996 and the saturated model was 1.000. A GFI value greater than 0.09 shows good model of fit (Moss, 2015). Since, the GFI of the default model was 1.000. This implies that the model was good. The Comparative Fit Index (CFI) of default model was 0.909 and the saturated model was 1.000. An acceptable model of fit is one that has CFI value greater than 0.90, hence, the default model was good and acceptable. The Root Mean Square Error of Approximation (RMSEA) value of default model was 0.031 and saturated model was 0.037. Since good model has RMSEA value less than 0.05 (Moss, 2015), the RMSEA value of the default model was 0.031. This indicates that the model was meaningful and good. Hence, there is no significant difference between the default model and the saturated model.

The result implies that the developed causal model to the theory and practice of education is that the performance of students in mock geography examination is multifaceted and teachers' attributes have causal link either directly or indirectly. This conformed to the study of Anikweze (2011) that the

performance of students in geography is attributed to multiple teachers-related factors/variables. This indicated that the developed causal model of teachers'' related variables are significantly related to students' performance in mock geography examination in Bauchi metropolis of Bauchi State.

The finding from testing hypothesis two showed that teaching methods attribute has a strong causal link with the performance of student in geography mock examination. From the regression weight, the path coefficient of .240 and a P. value of .001, which is less than .005 value. This means that the endogenous variables teaching method has strong relationships with students' academic performance in mock geography examination. Hence, there is a need to train teachers with variety of classroom pedagogies to facilitate teaching and learning of geography in senior secondary schools in metropolis of Bauchi State.

Findings from testing hypothesis three revealed that the teachers' qualification, with a corresponding path coefficient estimate of .0340 and probability value of ** indicated a significant path ($P<0.05$). This means that teachers' qualification correlates with students' performance in mock geography examination. This conformed with the finding of Amosun and Oderinde, (2008) that teachers qualification correlates students' performance in geography in Ogun State. The implication is that stakeholders in education should ensure that qualified teachers are recruited to teach geography in secondary schools in metropolis of Bauchi State.

Testing hypothesis four revealed that the teachers' self-concept with a corresponding path coefficient estimate of -.512 and probability value of *** indicated a significant path ($P<0.05$). This means that a geography teacher who is confident of his self-concept will give the students the required teaching methods in geography. Furthermore, testing hypothesis five showed that geography teachers teaching experience has direct effect on students' performance in mock geography examination. The finding also revealed that the indirect effect was not significant meaning that there is no indirect link or correlation between geography teachers teaching experience to performance.

Conclusion
The developed meaningful path model of teachers' attributes as correlates of students' performance in geography mock examination in senior secondary schools in Bauchi metropolis of Bauchi State was good. Furthermore, teachers' related variables which include teacher qualifications, teaching

methods, teaching experiences, and teachers' self-concept were found to correlate with students' performance in mock geography examination in senior secondary schools in Bauchi metropolis of Bauchi State. This implies that teachers must ensure that quality teachers are needed with appropriate instructional strategies. Geography teachers should be trained, motivated and good learning environment should be provided to facilitate teaching of Geography in senior secondary schools in Bauchi metropolis of Bauchi State.

Recommendations

1. Considering the importance of teacher-related variables, each of the variables; teaching experience, teaching methods, teachers' qualification and teachers' self-concept should be put into consideration by the Bauchi State Ministry of Education when employing teachers. This is because the teacher variables have been discovered to account for variabilities in students' mock Geography performance.

2. The teachers should develop good interpersonal relationship with the students, inspire and spur students to improve their performance in both internal and external examinations in Bauchi metropolis of Bauchi State.

3. Geography teachers should use the school environment and other instructional materials for effective Geography teaching and learning process and engage in fieldtrips and excursions to expose students to real life situation for quality Geography learning.

4. The Bauchi State Government through her State Ministry of Education, Teacher Service Commission, school administrators, researchers, teachers and stakeholders in education should develop causal model of factors affecting students' performance using teacher and students' attributes as correlates of students' performance in Mock Geography Examination.

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