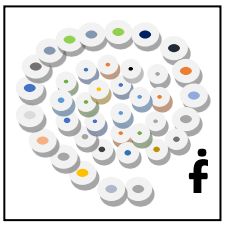

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Statistical theories and methods: a panacea for identifying the cause of low political participation among statisticians towards enhanced national development

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Abstract

The desire of every citizen of a nation is to have overall development. This can only be achieved through implementation of government policies and programmes which are off-shoot of research results. In most cases, persons found on the corridors of power neglect results of this research which is the bedrock of development. This paper made use of statistical theories and methods to ascertain if the claim in some quarters that the poor performance of statistics students in political and social sciences related courses is the cause of the political apathy among statisticians which has paved the way for people who have no regard or importance of research which is the walk path to sustainable development to dominate the political space. An analysis of variance for categorical data (catanova) was used in carrying out the test. The statistical findings were based on the result of GST211 (politics, peace studies and conflict resolution) course of students of department of statistics, computer science and agricultural economics of the Federal University of Lafia, Nasarawa state, Nigeria. It was discovered that students of the department of statistics performed worst among the three departments that took the course thereby justifying the claim that poor performance in political and social science related courses is the cause of political apathy among statisticians. The researchers therefore recommend for aggressive enlightenment by lecturers of the department of statistics among their students on the need to develop high interest in political and social science related courses so as to increase political participation of statisticians in order to bring more statistician to the corridor of power for the implementation of the research results rather than turning out research results that are never implemented.

Keywords: politics; apathy; catanova; performance.

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1 Introduction

The aim of any research is to solve a particular problem either for an individual or for a group of people. This therefore means that any research that fails to meet a need is useless. This is the case in most African countries particularly Nigeria. Statisticians and scientist in general are on the field labouring to find solution to many problems of Nigeria, but this usually ends on the shelves of politicians without implementation. Research is the process of arriving at dependable solutions to problem through the planned and systematic collection, analysis and interpretation of data (Chikwe C.K. et al. 2015). After all these processes of getting research results, they are not implemented. This then brings to the fore the question "does it mean that statisticians are not worthy or capable of occupying these political positions"? If they are qualified, then what is the major cause of statisticians not vying for these political offices where they can better be in position to implement the results of this research rather than turning out results that are never implemented? In an attempt to answer these questions, some persons linked the cause of this political apathy among statisticians to poor performance in political related courses taken during their undergraduate studies due to lack of interest and the fact that it is not calculation in nature. In an attempt to ascertain if this claim is true or false, the researchers made use of result of the course G.S. T. 211 (politics, peace studies and conflict resolution) of students of department of statistics, computer science and agricultural economics of the Federal University of Lafia, Nasarawa state, Nigeria for the year 2019/2020 session.

1.1 Aims and objectives of the study

1. To ascertain if performance is dependent on departments
2. To justify the claim that political apathy among statistician is linked to undergraduate programme

1.2 Nature and scope of study

There are 21 departments within the faculties of science, computing and agricultural sciences out of which statistics being the main department of interest was selected from the faculty of science and then, computer science was selected from the faculty of computing and lastly, agricultural economics was taken from the faculty of agricultural sciences. At the end of the examination, successful candidates are classified into five groups – Distinction(A), Good (B), Credit (C), Fair (D) and Pass (E). Similarly, unsuccessful candidates are awarded (F). All findings are based on the analysis of this examination results from the selected departments from the various faculties .

2 Literature review

According to Yusufu A.Y, political apathy manifested itself in the country between 1999 and 2011 in the following forms: one, the decline to register; two, the refusal to vote; three, failure to protest against rigging and four, failure to assist the security agents with useful information. It was discovered that bad governance was responsible for political apathy.

In order to understand political apathy, justice must be done to the term " Democracy" and its link with political apathy. Democracy is popularly conceived as government of the people, for the people and by the people (Hassan, 2003). According to Mikailu and Yaqub (Mikailu and Yaqub, 2003), "Democratic politics is always everywhere built on certain minimum principles. These principles include participation and inclusiveness, responsiveness and accountability, transparency and good governance, regular, free and fair elections, freedom and respect for human rights and the observance of rule of law. Where these principles are in general observed, one can pronounce a government constituted in such a policy as democratic. Thus, from the above, one can see that a democratic government ensures participation and inclusiveness and is also responsive and accountable to its people. Otherwise, there will be apathy in the political system. What then is political apathy? For the purpose of this article, political apathy is the deficiency of love and devotion to a state. It is the

indifference on the part of citizens of any state as regards their attitudes towards political activities such as elections, public opinions, and civic responsibilities. Political apathy is therefore absence of interest in, or concern about, socio-political life. Thus, an apathetic person lacks interest in the social and political affairs of his country. The relationship between the Nigerian government and the people between 1999 and 2011 is a continuation of what started at independence in 1960. It was based on the understanding that the government would provide security, justice, liberty and welfare for the people. On the other hand, people would be obedient and discharge their political, economic, social and other responsibilities.

3 Methodological framework

The methodological framework for this study is a two-way analysis of variance for categorical data (CATANOVA).

A two-way CATANOVA with chi-square tests for interaction

Consider a two-way experimental situation with a k-dimensional vector of responses { (n_{ijk}) K, i=1,2,…I, j=1,2,…,J} recorded in frequencies in the $(ij)^{th}$ plot. We assume a multinomial probability model, namely

$\Pr(\{n_{ijk}\}k/\{\pi_{ijk}\}\ k,n_{ij}) = nij\ !/\ \prod_k\{nijk!\}$ $(\pi ijk)\prod_k(n^{ijk}$
$nijk = 0,1,\ldots,n_{ij}$
$0 \leq \pi_{ijk} \leq 1$
$Nij = \sum_k nijk$ is held fixed

Nijk, $ni^{/}\ j^{/}\ k$ are independent $\forall\ i \neq i^{/}$

The hypothesis to be tested are:
HR: $\prod ijk == \prod jk$, there is no row effect
HC: : $\prod ijk == \prod ik$, there is no column effect
HRC: : $\prod ijk == \prod k$, there is no row x column interaction
The expectation of the sample estimate of : $\prod ijk$ is given by the linear model
$E(\prod^{\wedge} ijk)$ $\boldsymbol{\mu}k + Tik + Bjk + \boldsymbol{\lambda}ijk,$

where $\boldsymbol{\mu}k$, Bjk and $\boldsymbol{\lambda}ijk$ assume their usual meaning of constant, row effect, column effect and interaction respectively. The hypothesis, HR, HC, and HRC will be seen to be respectively equivalent to
Hi: Tik = 0 ∀i, HB: Bjk = 0 ∀j and $\boldsymbol{\lambda}ijk = 0$ ∀i,j.

The parameters : $\prod ijk$ may be considered fixed or random with probability density h($\prod ijk$), over [0,1] depending on whether I and J are random or not , C.H. Scheffe (1959). Specially,
g($\prod ijk$) if I and J are random, o≤ $\prod ijk \leq 1$
h($\prod ijk$) = g ($\prod jk$) if I is fixed and J random $0 \leq \prod jk \leq 1$
g($\prod ik$) if I is random and J fixed, $0 \leq : \prod ik \leq 1$.

We shall now consider the sum of squares (SS) for {nijk }k. This may be obtained, I.B. Onukogu [1982] also Anderson [1958], as the trace of the sample variance- covariance matrix. That is
$SS(nijk) = \Sigma_k$ var (nijk)

Upon further simplification, we have that

TSS = n - $\sum_k$ n2..k/n , as the total sum of squares
BRSS = n - $\sum_{ik}$ n2i.k/ni , as the between row sum of squares
BCSS = n - $\sum_{jk}$ n2.jk/nj , as the between column sum of squares
WUSS = n - $\sum_{ijk}$ n2ijk/nij, as the within unit sum of squares ,

where
N = $\sum_i$ ni = $\sum_j$ nj $\sum_{ij}$ nij
RSS = TSS – BRSS = $\sum_k$ n2i.k/ni - $\sum_k$ n2..k/n
CSS = TSS – BCSS = = n - $\sum_{jk}$ n2.jk/nj - $\sum_k$ n2..k/n
NSS = BRSS + BCSS – TSS – WUSS
= n - $\sum_{ijk}$ n2ijk/nij - $\sum_{ik}$ n2i.k/ni - $\sum_{jk}$ n2.jk/nj + $\sum_k$ n2..k/n.

We may reject HR, HC and HRC respectively at specified ά-level of error if
$\chi^2_R \geq \chi^2_{(\acute{\alpha})}$ (I-1)(J-1)(K-1)
where
χ^2_R = (K-1)(n-1)RSS/ TSS
χ^2_C = (K-1)(n-1)css/TSS
χ^2_{NT} = (K-1)(n-1)NSS/TSS

3.1 Materials and methods

Below is the data layout for a two – way analysis of variance for categorical data (CATANOVA).

Table 1: Data layout for two way CATANAVO

	DEPARTMENTS	COMPUTER SCIENCE							AGRIC ECONOMICS							STATISTICS						
i	responses	A	B	C	D	E	F	T	A	B	C	D	E	F	T	A	B	C	D	E	F	T
	Males	n_{111}	n_{112}	n_{113}	n_{114}	n_{115}	n_{116}	$n_{11.}$	n_{12}	n_1	n_1	n_1	n_1	n_1	n_1	n_{131}	n_{132}	n_{133}	n_{134}	n_{135}	n_{136}	$n_{13.}$
	Females	n211	n212	n213	n214	n215	n216	n21	n21	n22	n23	n24	n25	n26	n2	n23	n232	n233	n234	n235	n236	n23.
	n.jk	n.11	n.12	n.13	n.14	n.15	n.16	n.1	n.2	n.	n.	n.1	n.	n.	n.	n.3	n.32	n.33	n.34	n.35	n.36	n.3.

Table 2: Two – way catanova test on performance of male and female students result of G.S. T. 211 (Politics,peace studies and conflict resolution) course of students of department of statistics, computer science and agricultural economics of the Federal University of Lafia, Nasarawa state, Nigeria for the year 2021. DEPARTMENTS

	Computer science							Agric. Econs							Statistics						T							
sex	A	B	C	D	E	F	ni1.	A	B	C	D	E	F	ni2.	A	B	C	D	E	F	ni3.	ni.k						ni..
male	139	62	58	10	55	83	407	71	75	45	24	36	52	303	107	52	53	5	45	75	337	317	189	156	39	136	210	1047
female	80	51	48	11	50	85	325	39	48	29	37	39	51	243	43	20	26	6	30	64	189	162	119	103	54	119	200	757
Total	219	113	106	21	105	168	732	110	123	74	61	75	103	546	150	72	79	11	75	139	526	479	308	259	93	255	410	1804

Total sum of squares (TSS) = n - $\sum_k n2..k/n$
= 1804 - (479^2 + 308^2 + 259^2 + 93^2 + 255^2 +410^2)/ 1804
= 1804 – 633160/1804
= 1804 – 350.9756
TSS = 1453.0244.

Between sex sum of squares (BSSS) = n - $\sum_{ik} n2i.k/n\,i$
= 1804 – (317^2 + 189^2 +156^2 +39^2 +136^2 +210^2)/1047 + (162^2 +119^2 +103^2 +54^2 +119^2 +200^2) / 757
= 1804 - (214.5778 + 142.7886)
= 1804 - 357.3664
BRSS = 1446.6336.

Between departments sum of squares(BDSS) = n - $\sum_{jk} n2.jk/nj$
= 1804 - (219^2 +113^2 + 106^2 + 21^2 +105^2 +168^2)/ 732 + (110^2 + 123^2 +74^2 +11^2 + 75^2 + 139^2)/526
= 1804 - (152.5355 + 96.4469 + 112.1521)
= 1804 - 361.1345
BDSS = 1442.8655.

Row sum of squares (RSS) = TSS – BDSS
= 1453.0244 – 1446.6336
= 6.3908
RSS = 6.3908.

Column sum of squares (CSS) = TSS – BDSS
= 1453.0244 - 1442.8655
= 10.1588.

Table 3: Catanova table

Source of variance	Degree of freedom	Sum of squares
Row or factor levels or sexes	1	6.3908
Departments	2	10.1588
Sex x departments	10	1.3334
Residual	1790	1435.1414
Total	1803	1453.0244

Ho: Performance is independent on the departments.
H1: Performance is dependent on the departments

The test statistic = χ^2_{cal} = k – 1(n-1)CSS/ TSS
= (6-1)1804 – 1) 10.1588/ 1453.0244
= 63.0282,
$\chi^2_{tab} = \chi^{2\,(0.05)}_{(J-1)(K-1)} = \chi^{2\,(0.05)}_{(3-1)(6-1)} = 18.307$.

Decision Rule: Reject Ho if χ^2_{cal} is greater than χ^2_{tab}
Conclusion:
Since $\chi^2_{cal = 63.0283} > \chi^2_{tab} = 18.307$, we reject Ho and conclude that performance depends on the departments.

To determine which of the departments perform best, we compute the proportions of students that passed and failed in each department as follows:

Proportion of pupils in computer science that passed is
$P_{\text{Computer science passed}}$ = nComp science pass/ Ncomp 0.77.

Proportion of students in computer science that failed is
$P_{\text{computer science failed}}$ = nComp Science failed/Ncomp = 168/732 = 0.23.

Proportion of students in Agric Economics that passed is
$P_{\text{Agric Econ passed}}$ = nAgric Econs passed/NAgric Econs = 443/546 = 0.81.

Proportion of students that failed in Agric Econs department is
$P_{\text{Agric Econ failed}}$ = nAgric Econs failed/NAgric Econs = 103/546 = 0.19.

Proportion of students in Statistics department that passed is
$P_{\text{Stat passed}}$ = nStatpassed/NStat = 387/526 = 0.74.

Proportion of students in Statistics department that failed is
$P_{\text{Statfailed}}$ = nStatfailed/NStat = 139/526 = 0.26.

The proportions of students that passed in each department in the decreasing order is as follows:
Agric Econs = 0.81.
Computer Science = 0.77.
Statistics = 0.74.

Similarly, the proportion of pupils that failed in each department in the increasing order is as follows:
Agric Econs = 0.19.
Computer Science = 0.23.
Statistics = 0.26.

4 Conclusion

From the foregoing, it shows that performance depends on the departments. This means that performance of any chosen student depends on which department the student comes from. From the result obtained, students from Agric Economics performed better than the other two departments with the department of statistics having the poorest. It goes to mean that the political apathy among statisticians which has lead to non active participation in political activities is linked to poor performance in political related courses taken during the school. Therefore, efforts should be made to identify the cause of this failure from this early stage.

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