Utilization of Ordinal Logistic Regression to Predict the Efect of Selected Variables Affecting Students Achievement

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Abstract -The difficulty that leads to failure of students to attain a good higher performance in Nigeria University lately can't be overstressed. Regardless of the benefit connected to student's performance, academic analysts have shown in their different papers that there is a decline in understudies' achievement. Explores had additionally demonstrated that there are great deal of components dependable for this pattern. Utilizing the information gotten from a questionnaire from understudies of Federal University of Lafia. Sex, Communication skills, Guidance, Proximity of student to school, Learning facilities, Pear group, Lack of learning materials and Family stress of understudies are inspected to the components that seem contribute to understudies' execution. Ordinal Logistic Regression (Proportional chance Model) is utilized to show the information and the output uncover that sex, communication, proximity to school, Peer group, Learning Facilities of understudies isn't a determinant component of last review (grade)that understudies may accomplished at graduation. This paper finds that there is break even chance for both male and female understudies to graduate from University with best class of degree. Hence, it in addition settled that the elevated chance of graduating with best Class of degree is gotten by understudies' who are giving proper guidance. Most of these students are giving a well proper care both academically, and financially which contribute to their high performances in their various departments. It has also seen that the model for family stress has the elevated clarification for the variations in the CGPA (last grade of scholars). Hence apolicy should be recommended to encourage students with various understanding of different disciplines to study at their own course of interest and government's strategy on schooling ought to be centered on the two sexual orientations rather than exceptional consideration generally given to female understudies.

I. INTRODUCTION

Tertiary institution like Universities, Colleges of Education and Polytechnic has no value without students. Students are the foremost important component in any instructive establishment. The economic and social improvement of a nation is linked straightforwardly to scholar's academic performance. The academic achievement of scholars contributes a part within the production of excellent graduates who will later become great pioneers within the future. The performances of students are influenced due to economic, mental, social, family, neutral and individual factors. These outlined variables unequivocally influence the understudies academic achievement, but these components changes from one individual to another and from province to province. From a few long time back in Nigeria, both proficient and instructive rate have move forward and most of the schools in Nigeria are trying to uplift their instructive level and generate well taught, competitive and gifted individuals, thereby meeting the dynamic growing economic needs.

Student's performance is the measurement of how well the students perform in a given academic year. (Mustaq & Khan, 2012) utilized GPA to estimate the execution of understudies since the fundamental thought is on the scholar's academic achievement for the particular semester. (Harb& El-Shaarawi, 2006) found that the foremost critical figure with solid impact on students' achievement is student's competence in English. In the event that the understudies have solid communication abilities and have solid feelings on English, it increment the achievement of the scholars. The execution of the understudy is influenced by communication abilities; Communication can be conceivably seen as a variable which may be emphatically related to achievement of the scholars in learning environment. A major event of this study from past studies is that it centers on a specific territory Abdullah(2011).Dana Burde & Linden L. L. (2009). Observe that most student demonstrate exceptionally touchy to changes within distances to the closest school. They also added the enrollment falls by 16 rate point for each

mile the scholars must travel to school and test scores drop by 0.19 standard deviation.

This paper happens to predict the effect of a few variables influencing scholar's academic achievement and way of tending to them so that the scholarly achievement can be move forward taking into thought the students of Federal University Lafia.

These variables or components to be predict are students' Sex, Communication skills, Guidance, Proximity of student to school, Learning facilities, Pear group, Lack of learning materials and Family stress have caused students poor performance. Many researchers have tried to look at few of these factors in their own locality or region. Harb El-Shaarawi (2006) found that the foremost vital components with solid impact on students' achievement is student's competence in English. In that the understudies have solid communication abilities and have solid feelings on English, it raises the achievements of the students. Students experience high failure rate due to the influence of these factors, low pass rate of students which later imposed a tremendous expense for the local area as far as the negligible number of understudies graduating and the decreased admission of anticipated scholars as a result of insufficiency of space. As a result of these factors that lead to high failure rate, the numbers of students retaking a particular course tend to be very high.

1.1 Objectives

The main objectives are to
i. To determine the effect of explanatory component with the response variable using ordinal fit logistic regression model.
ii. To compute the odd ratio to which the variables have impact on the academic achievements of scholars.

II. METHODOLOGY

2.1 Research design

Trochim (2006) view that "the research design refers to the overall plan of action that researcher chooses to restore the different components of the study in a consistent and logical way, thereby, ensuring to effectively address the research problem; it constitutes the strategy for the collection, measurement, and analysis of data. Note that the research problem determines the type of design you should use, not the other way round. Thus, qualitative method appears to be vital. Omari (2010) expressed that, "qualitative strategy is expected to behavior and depictions which involves additional expressive statistics which looking for profound and clean portrayals of the setting and events.

2.2 Study sample and sampling procedure

Sampling refers to demonstration, procedure, system of choosing an appropriate littler length of populace of a consultant a part of a populace to decide parameters or qualities of the entire population, a decisive number of scholars had been selected through the usage of purposive examining. The analyst make utilized of simple random sampling for the classification to determine the respondents a few of the understudies.

2.3 Data collection methods

The information collected was essential with the help of well plan questionnaire. A subset of about 386 taken from a group of students of various departments. The survey managed with understudy profile based on the factors listed above. A simple question was design for the student to answer so that to get a reliable responds from students.

2.4 Data analysis techniques

Mhehe GL(2002), clarified that raw fact analysis includes arranging what an individual have watched, heard and read, to understand and gained information. Athanas(2004) characterized information investigation as an orderly procedure including working with information, sorting out and breaking them into sensible units. It is likewise worried about incorporating information, looking through examples, finding what is significant, what is to be realized and choosing what to tell others. For the reason of this work this investigate will make utilize of ordinal regression analysis in which the outline factors learning materials, communication, proximity of students to school, family stress, peer group and proper guidance were assigned as autonomous components.

2.5 Logistic regression model

Logistic regression may be a measurable model (or logit model) that in it essential frame is utilize a calculated work to model binary subordinate variable. To fit a binary logistic relapse model, a set of relapse coefficient that foresees the likelihood of the result of intrigued are evaluated. The same calculated model can be composed in numerous

ways. The common linear logistic regression model for this work is characterized as $\log\left(\frac{\pi_i}{1-\pi_I}\right) = loglt(CGPA) = \beta_{I0} + \beta_1\text{Sex} + \beta_2\text{Communication}$

$+ \quad \beta_3\text{Proximity of student to school} + \beta_4\text{Family Stress} + \quad \beta_5\text{Pear Group} + \beta_6\text{Learning facilities} + \beta_7\text{Guidance} + \beta_8\text{Learning materials}$

(1) the model above moreover can be revised in terms of the likelihood of a positive reaction:

$$cGPA = \frac{exp(\beta_{I0} + \beta_1\text{Sex} + \beta_2\text{Communication} + \beta_3\text{Proximity of student to school} + \beta_4\text{Family Stress} + \beta_5\text{Pear Group}) \quad \beta_6\text{Learning facilities} + \beta_7\text{Guidance} + \beta_8\text{Learning materials}}{1 + exp(\beta_{I0} + \beta_1\text{Sex} + \beta_2\text{Communication} + \beta_3\text{Proximity of student to school} + \beta_4\text{Family Stress} + \beta_5\text{Pear Group}) \quad \beta_6\text{Learning facilities} + \beta_7\text{Guidance} + \beta_8\text{Learning materials}}$$

(2) The quality of the identical signal is referred to as a LOGIT. It's the log of chance that occasion takes place.

2.6 Ordinal logistic regression (OLR)

This arrangement is included at once with inside the manner the logits is specified. Sometimes the reaction can be any continuous variables, that is hard to measure, in order of its variety are split into J ordinal classes and have a related likelihood $\pi_1, \pi_2, \ldots \pi_j$. Das and Rahman, Ombui and Giehuhi, (2011).Total Logit Model: The total chances for the jth reaction class is express by a means of $\frac{\pi_1+\pi_2+\ldots+\pi_j}{\pi_{j+1}+\pi_{j+2}+\cdots+\pi_j}$

The total logit demonstrate is $log\left(\frac{\pi_1+\pi_2+\ldots\pi_j}{\pi_{j+1}+\pi_{j+2}+\cdots+\pi_j}\right) = \beta_{0j} + \beta_1\text{Sex} + \beta_2\text{Communication} + \beta_3\text{Proximity of student to school} + \beta_4\text{Family Stress} + \beta_5\text{Pear Group} + \beta_6\text{Learning facilities} + \beta_7\text{Guidance} + \beta_8\text{Learning materials}$

The chance proportion for each indicator is taken to regular throughout all reasonable collapsing of the results variable.

The corresponding chances model is based on the suspicion that the impacts of the covariates $x_{1,}x_{2,}\ldots,x_p$ are the same for all categories, on the logarithmic scale. Hence, within model, as it were caught term B_{0j} depends on the category j so that the model is $log\left(\frac{\pi_1+\pi_2+\ldots\pi_j}{\pi_{j+1}+\pi_{j+2}+\cdots+\pi_j}\right) = \beta_{0j} + \beta_1 x_1 + \cdots + \beta_p x_p$

2.7 Assumption of ordinal regression model
Parameter evaluation of the coefficients
The table of Parameter gauge tells us especially roughly the association among our informative factors and the result. The limit coefficients aren't

regularly explained separately, which simply constitute the intervention, especially the point (in terms of a logit) in which scholars are probably anticipated into the better categories. While we do now no longer normally must interpret the edge parameters immediately, it could be used to provide an explanation for how the version works (*in acquiringR^2*).

Measuring Strength of Association
Various R^2-like measurements may utilize to degree the quality of the association among the established variable and the indicator variables. They are not as beneficial as the R^2 statistic in regression, due to the fact that their translation isn't direct. Three as a rule utilize statistics are:

Cox and Snell R^2 $R_{CS}^2 = 1 - \left(\frac{L(B^{(0)})}{L(\widehat{B})}\right)^{\frac{2}{n}}$

Nagelkerke's R^2: $R_N^2 = \frac{R_{CS}^2}{1 - L(B^{(0)})^{\frac{2}{n}}}$

McFadden's R^2: $R_M^2 = 1 - \left(\frac{L(\hat{B})}{L(B^{(0)})}\right)$

Where $L(\hat{B})$ is the log-likelihood work for the demonstrate with the anticipated parameters and $L(B^{(0)})$ is the log-probability with simply the edge, and *n* is the assortment of cases (whole of all weights). What constitutes a "good" R^2 value esteem shift among one of a kind regions of application. While those facts may be suggestive on their own, they're maximum beneficial whilst evaluating competing model for the identical statistics. The demonstrate with the biggest R^2 measurement is "best".

III. DATA ANALYSIS

Table1: Chi-square test to find dependence

Factors	Pearson χ^2 Value	Df	P Value	Decision
Sex*CGPA	1.168	4	0.883	Sex is not subordinate on the last grade gotten at 0.05%level of significance.
Communication*CGPA	3.432	4	0.488	Communication is independent on the final grade 0.05%significancelevel.
Guidance*CGPA	16.922	4	0.002	Guidance is dependent on the CGPA 0.05%significancelevel.
Proximity to school*CGPA	6.500	8	0.591	Proximity to school is independent on the CGPA 0.05%significancelevel.
Family Stress	23.755	8	0.003	Family Stress is dependent on the final grade gotten at 0.05%level of significance.
Peer group	5.126	4	0.275	Peer Group depend on the final grade gotten at 0.05%significancelevel.
Learning facilities	2.656	4	0.617	Learning facilities does not depend on the final grade gotten at 0.05% significance level.
Learning Materials	13.513	4	0.009	Learning materials is dependent on the last grade gotten at 0.05%significancelevel.

From Table 1: Sex of student, communication, proximity to school, peer group and learning facilities does not rely on the CGPA (last grade) of students therefore they shows a negative impact on the student's academic performance while proper guidance, family stress and learning materials depends on the CGPA (final grade) of scholar subsequently they appear a positive effect on the scholar's academic achievement.

Table2: Degree of determination

Model	NagelkerkeR^2	CoxandSnellR^2	McFaddenR^2
Sex*Last Grade	0.000	0.000	0.000
Communication *Last Grade	0.000	0.000	0.000
Guidance*Last Grade	0.027	0.020	0.013
Proximity to school*Last Grade	0.001	0.001	0.001
Family stress*Last Grade	0.037	0.042	0.018
Peer Group*Last Grade	0.00	0.001	0.00
Learning Facilities*Last Grade	0.000	0.000	0.000
Learning Materials*Last Grade	0.022	0.025	0.010

From Table 2: The R^2 show up exceptionally small, when comparing values with other measurement, this value is the best reachable. Whereas sex of scholars, Proximity to school, family stress, peer group and learning facilities is not clarify on any extent of the affiliation among scholars in their achievement (final review of scholars), family stress has the elevated clarification for the varieties within the CGPA (last review of scholars).

What contribute a "good" R^2 esteem shifts completely different ranges of application. Whereas insight can be suggestive on their claim, they are strongly valuable when we compare them with competing models for the same information. The model with the largest R^2 statistic is "best" agreeing to this degree. Pseudo R^2 isn't as valuable as the R^2 measurements in regression, since their straightforward.

Table3:Test of parallel lines

`	Model	-2LogLikelihood	Chi-Square	df	Sig.
Sex*Final Grade	Null Hypothesis	31.135			
	General	29.923	1.212	3	0.750
Communication *Final Grade	Null Hypothesis	25.526			
	General	20.398	5.128	3	0.163
Guidance*Final Grade	Null Hypothesis	32.802			
	General	1.550	31.252	3	0.000
Proximity to school*Final Grade	Null Hypothesis	43.572			
	General	36.091	7.482	6	0.279
Family stress*Final Grade	Null Hypothesis	39.441			
	General	33.652	5.789	6	0.447
Peer Group*Final Grade	Null Hypothesis	34.058			
	General	29.395	4.663	3	0.198
Learning Facilities*Final Grade	Null Hypothesis	31.566			
	General	28.438	3.127	3	0.372
Learning Materials*Final Grade	Null Hypothesis	32.348			
	General	0.000	32.348	3	0.000

From Table 3: the suspicion of relative chances is rejected for demonstrate of Final review on Sex, communication, proximity to school, family stress, peer group and learning facilities. This implies that the common demonstrate gives an altogether unmistakable sense to the information than demonstrate with a partitioned set of coefficients for each edge. This presumption is be that as it may not be rejected for other components. This implies that the ordinal relapse model of Last review on Guidance and learning materials provide a result that's not essential distinctive fit to the information than demonstrate with a isolated set of coefficients for each edge.

IV. DISCUSSION

From the results, it provide the gauges of male scholars coefficient to be -0.008, taking its exponent to discover the OR with female scholars as the base: exp(-0.008) = 0.9920. to discover the complementary OR with male as the base, we either rearrange sign of the coefficient recently taking the exp(0.008) = 1.0080 or we discover $\frac{1}{OR\ for\ female} = \frac{1}{0.9920} = 1.0080$

The P-value of sex (0.967) demonstrates that gender of scholars isn't a noteworthy supporter to the CGPA achieved by the scholars. In spite of the fact the chances proportion (Male/Female) is somewhat elevated than that for (Female/Male), both are roughly equal i.e. the chances of male scholars accomplishing a higher last review are roughly the chances for female scholars'

The chances proportion for those that can communicate easily is 0.097 taking the exponent to find the OR for those that cannot communicate smoothly as the bottom: exp(0.097) = 1.1019 to discover the complementary OR with those that communicate smoothly as the base , we invert the sign of the coefficient some time recently before taking the exp(-0.097) = 0.9076 the P-value of communication (0.863) shows that communication of understudies isn't a significant donor to the CGPA achieved by the understudies. It also appear that the chances for a graduating understudy whose communication is fluidly and needed to graduate with Last review is around 0.91 more likely compared to those whose communication is less have an odd proportion of around 1.11.

The chances proportion for proper guidance in the case of yes is (-0.917) taking the exponent to find the OR for those that are not been appropriately guided as the bottom: exp(-0.917) = 0.3997 to discover the complementary OR with those that are properly guided as the base, we switch the sign of the coefficient some time recently taking the type exp(0.097) = 2.5018 demonstrates the chance for a graduating student who have been given a proper guide, graduating with Best Grade is 2.5018 more likely compared to a understudy who have not been given a proper guide. This implies that the chances for a no to proper guidance student graduating with First Class is 2.5018 with P-value (0.001) which indicate that guidance of student is a significant factor that contribute to the CGPA of students.

The odds ratio (0-20minuites/30-50 minutes = 0.8772) indicates the odds for a graduating students whose distance from home to school is 30 - 50 minute finishing with Best class of degree is 0.8772 more likely compared to a understudy whose distance from home to school is 0 – 20 minutes). This means that the odds for distance of 0 -20 minutes student finishing with Best Class is 1.1399 (0.8772⁻¹) more likely compared to a scholars whose distance is between 30 -50 minutes. Also, the odds for the distance of 0 -20 minute scholars graduating with Best Class of degree is 1.003 (0.9970⁻¹) more likely compared to a student whose distance is 1 hour and above while it is 1.1366 more likely for a student whose distance is 1 hour and above compared to a student whose distance is 30 -50 minute.

The Chances proportion for peer group those that their friends contribute to their academic performance is -0.098 taking the exponent to find the OR for those that their friends contribute negatively to their academic performance as the bottom: exp (-0.098) = 0.9067 to discover the complementary OR with those that their friends contribute to their academic performance as the base , we invert the sign of the coefficient some time recently taking the exp(0.098) = 1.103 the P-value of communication (0.668) indicates that peer group of scholars is not a critical donor to the CGPA achieved by the scholars. It also show that the chances for a graduating scholar whose friends contribute to their academic performance and wanted to graduate with Best Class of degree is roughly 1.103 more likely compared to those whose friends contribute negative to their academic performance have an odd ratio of approximately 0.9067.

CONCLUSION

Models of Sex, Proximity to school, family stress, peer group and learning facilities does not provide way better expectations than in the event that we fair speculated base on the minimal probabilities for the result categories. The presumption of corresponding chances is only denied for sex, communication, Proximity to school, family stress, peer group and learning facilities among all the factors considered. Hence, for sex, communication, proximity to school, family stress, peer group, and learning facilities. The common model provide a critical distinctive fit to the information than demonstrate with a isolated set of coefficients for each edge. All these pointers uncover that sex, communication, proximity to school, family stress, peer group, and learning facilities of understudies isn't a determinant component of CGPA that understudies may accomplished at the end. Neither male nor female under studies accomplish higher Last Grade than another. The chance for a scholar that have been given a proper guidance graduating with best class of degree is around 2.5018timesmorelikelycompared to does that have not been given a proper guide. The odds for distance of students from 0 -20 minute scholars graduating with best class of degree is more than three times compared to a scholar whose distance is 30 – 50 minute and the above.

RECOMMENDATION

In the light of the above, the following recommendation are made
i. Government should build an intensive and conducive learning environment to develop the mindset of students towards their academic.
ii. Government should also provide a lot of learning materials and tools to enhance the education of student in Nigeria.
iii. Parents should also be caution and guide their children so that they can attain the highest CGPA in school.

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