

Determinants of students' academic achievement in agricultural sciences: A case study of secondary schools in Katsina State, Nigeria

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ABSTRACT

Education is viewed as a tool for change. Globally, efforts are geared toward enhancing the educational process of students' academic achievement in secondary schools. However, there is gap associated with differences in the students' attributes, and the desire for parents to provide better educational opportunities to their children. To achieve the goal of this research, students from Katsina State Science and Technical Education Board (STEB) were purposively selected for the study. Random sampling technique was used to select 300 students from six secondary schools. Primary data were collected using a structured questionnaire designed to address the specific objectives of the study. Cramer's V and stepwise regression model were used as tool of analyses to achieve the stated objectives of the study. Age of students was found statistically related to students' academic achievement using Cramer's V. The regression model has an R^2 (.915) implying that 92% of the total variations in students' academic achievement was accounted for by the independent variables. The F statistic was also reliably fit and statistically significant at $p \leq 0.001$ confidence level. Of the nineteen variables, nine were statistically significant and show effect on students' academic achievement. The significant variables that were positively related to academic achievement are: parent education, parent occupation, family feeding, provision of resource materials, visits to schools, provision of pocket money, and residential type. Family type and age category of parents had negative effects on students' academic achievement. We recommend for an intensified public enlightenment and awareness campaign on family planning and child spacing as well as dilution of family resources to counter the effect of family type being a risk factor.

Keywords: Education, students' academic achievement, family background variables, students' characteristics.

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INTRODUCTION

The importance of education for national development has placed secondary schools at the centre of the efforts of governments to increase the rate of literacy level in Nigeria. Students' success at this level depends on their academic achievement after taking the organized national examinations conducted by West African Examinations Council (WAEC) and National Examinations Council (NECO). The processes of globalization and technological revolution create greater demands for higher education provided in universities

and colleges. Secondary school students are the potential assets of these educational institutions. And only students with adequate academic skills and knowledge can score high enough to enter these high institutions. According to Akomolafe and Olorunfemi-Olabisi (2011) higher institutions are depending upon the potential academic skills and knowledge of secondary school students after their completion of secondary school education. Hence, stakeholders in education consider the students' academic achievement at this level

an important goal to produce the best quality candidates for the higher institutions.

Intelligence is not the only determinant of the academic performance of the student. Academic performance of a student is always associated with many components of learning environment. It is worth noting that students' academic achievement is affected by numerous factors including gender, age, students schooling, father/guardian social economic status, residential area of students, and school factors. Many studies about the factors contributing to students' academic achievement at different study levels were conducted. The most common study findings are the statistically significant effects of family background variables (Hanushek, 2003; Bratti and Staffolani, 2008). While, Considine and Zappala (2002) noticed that parent's social status positively affects the student test score in examination. Other studies have found parent's educational background, family income, self motivation of students, age of student and school, as important factors that have effect on student's academic achievement in different setting (Osonwa et al., 2013). However, it is not certain which of the family variables have the most determining effect on students' academic achievement.

In view of the above, the expansion of Nigerian universities in recent times has raised concerns regarding the quality of academic potentials of our secondary school students who are the potential target of these universities. However, recent results released both by WAEC and NECO show that many candidates felt to meet the entry requirement particularly for the science courses including agriculture (WAEC, 2014; NECO, 2014). More importantly, another reason stem out from the increasing gap in students social composition. The expansion in the number of students in secondary schools may increase in participation of students from the different socio-economic statuses in schools. Thus, some fraction of students may have to contend with social and economic challenges as opposed to others (Bratti and Staffolani, 2008). Since students come from a wide range of social backgrounds, these give them different life experiences, different educational opportunities, expectations, needs and varied academic potential which might have effect on their academic achievement (Telli et al., 2009). The sets of variables included as the determinants of students' academic achievement in this study include: family background variables such as household income and parental education; school factor, and students characteristics such as gender and age.

Still, several other factors might have raised concerns regarding the talent pool in the area of agricultural sciences. Katsina state being an agrarian society is increasingly depending on the ability to develop human resources capable of dealing with current economic, scientific, technological and environmental challenges (Ibrahim and Bin Jamil, 2012). Therefore, concerns regarding the supply of such human resources stem from

the decreasing number of qualified candidates to gain admission into the field of agriculture and agricultural related fields (WAEC, 2012; WAEC, 2013). While, students' academic achievements in the national examinations have improved in 2013, notably there remains a significant gap in the relative levels of students' achievement. This gap is associated with different attitudes and levels of parental involvement broadly conceived (Ibrahim and Bin Jamil, 2012).

Similarly, under representation of secondary school agricultural sciences in most of the researches conducted provide a basis for concern (Oribhabor and Okodugha, 2010). This is fundamental to argue that academic achievement of students in agricultural sciences can be affected by students' home background factors at anytime. Unfortunately, there is no clear enough evidence of such information in Katsina State particularly when the current information on students' academic achievement is disaggregated into secondary schools, tertiary institutions and even among science subjects. The extents to which students' home background factors affect their academic achievement in agricultural sciences and in Katsina State remain to be clarified. Therefore, the aim of this study was to assess the determinants of students' academic achievement in order to establish information for better understanding and decision-making with the aim of improving secondary school students' academic achievement not only in agricultural sciences, but also in other subject areas with similar conditions.

Justification of the study

Education for all as contained in the NPE depends on the conducive learning environment of the learner. This is because failure rate in education is costly to all stakeholders in education. It increases the cost of training students as well as reducing admission opportunities for secondary school graduates seeking higher education. The study provides existing positions of the current students' home background factors with the most determining effect on their academic achievement in Katsina State. With this information, government and parents can know more of the existing factors which promote academic achievement of students and with particular regard to informing the development of policy intended to close disparity to some extent in students' academic achievement.

Objectives of the study

1. Examine the relationships between age, gender and school factors with students' academic achievement.
2. Determine the students' home background factors with most determining effect on their academic achievement.

Hypothesis of the study

Students' home background factors do not have significant effect on their academic achievement.

Theoretical orientation

Merton (1968) proposed the self-fulfilling prophecy and later this concept was applied in education (Rosenthal and Bandura, 1978). The proposition was that when parents expected their children to do well they interacted with them in ways that led to their expectations being fulfilled. Since then research has consistently explored parents' expectations, aspirations and involvement as significant for students' outcomes which have been largely ignored. For example, while parents clearly guide their children properly, they will install self-expectations. Yet, these various perceptions have been little explored, and where they have, at most, expectations of two parties have been included (Benner and Mistry, 2007). The aim of this research was to explore the determinants of students' academic achievement with respect to home background variables, students' characteristics and school factor. The interactions of these independent variables are likely to determine students' academic achievement in schools.

However, it is more likely students will have self-determination based on the interactions and aspirations of their parents. When individuals have a strong belief in their ability to achieve a particular goal they are more likely to design steps towards achieving the goal so ultimately success will be attained. This can be realized when parents play their roles of making their children understand themselves and belief in family norms and values. This self-belief is a powerful motivator for students' understanding of their parents' expectations regarding schooling (Tavani and Losh, 2003). Urdan and Schoenfelder (2006) assert that parents who provided their children with nurturing support were having an important influence on their motivation and achievement. According to Rubie-Davies (2007), students' self, school and parent factors can influence students' attitudes to school and possibly motivation to learn. It is therefore not certain which of these variables most determine students' academic achievement in a school setting.

METHODOLOGY

This study was conducted in Katsina State, Nigeria in schools under the Katsina State Science and Technical Education Board (STEB). This was justified because agricultural sciences were taken as compulsory subject, and the students were boarders, hence easier to be accessed. The study was an ex post facto research design and adopted a cross sectional survey. Changes in the family everyday life and state of economy among families justify the choice of the design. The target sample size was drawn from the study population. A multi-stage sampling procedure was adopted in selecting the respondents. Two schools were selected from each of

the three senatorial zones of Katsina State. One year group was again selected from each of the schools through a random sampling. Then students were randomly selected to yield a sample frame of three hundred (300) respondents.

The primary data was generated from the respondents through a structured questionnaire. During the survey, the questionnaire was administered to the respondents by the researcher with the assistance of all the form masters as research assistants. The questionnaire covered aspects of students' home background. Other information collected includes, personal information of students such as age and gender as well as name and school location. Another primary source of data collected was students' academic records provided by the examination officers of each school. These records comprised both combinations of continuous assessments and terminal examinations for three years. The results were computed into average scores for all the respondents.

The data collected were compiled and coded in the Microsoft Excel spreadsheet and analyzed using Statistical Package for Social Science (SPSS). Cramer's V was done to determining relationship between students' characteristics and academic achievement. While, stepwise regression analysis was performed to determine the home background variables with most determining effect on students' academic achievement. The regression was used to analyze the full sample data generated from the students and used for the identification of significant effect of the predictor variables on the response variable and to test the stated hypothesis (i) of the study. The model was specified as follows:

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + \dots + b_nx_n + e \quad (1)$$

$$Saa = b_0 + b_1x_1(pe) + b_2x_2(po) + b_3x_3(ff) + b_4x_4(hc) + \dots + b_{19}x_{19}(sa) + e \dots \quad (2)$$

Where:

Y = response variable/students' academic achievement (Saa)

a = constant

b₀ = regression coefficients

x_n = independent or predictor variables

Where:

x₁ = Parents' educational level (pe)

x₂ = Parents' occupation (po)

x₃ = Family feeding (ff)

x₄ = Family health care (hc)

x₅ = Dependency ratio (dr)

x₆ = Perceived religious involvement (ri)

x₇ = Family type (ft)

x₈ = Family size (fs)

x₉ = Siblings order (so)

x₁₀ = Age category of parents (ac)

x₁₁ = Provision of resource materials (rm)

x₁₂ = Parent visits to schools (vs)

x₁₃ = Provision of pocket money (pm)

x₁₄ = Cosmopolitaness (cs)

x₁₅ = Extra lessons (el)

x₁₆ = Place of residence (pr)

x₁₇ = Area of residence (ar)

x₁₈ = Residential type (rt)

x₁₉ = Social amenities (sa)

e = error term

RESULTS AND DISCUSSION

Relationship with age, schools, gender and students' academic achievement

Measure of association with the age of respondents,

Table 1. Cramer's V measure of relationship between nominal variables involving age, schools, and gender (N = 300).

Cross tabulation	Cramer's V	Sign.
Age × Scores	0.382	.036*
Schools × Scores	0.372	.185 ^{NS}
Gender × Scores	0.387	.202 ^{NS}

NS (P ≥ 0.05) = not significant; * significant at (P ≤ 0.05).

Table 2. Stepwise regression analysis showing students' home background factors with most determining effects on their academic achievement in agricultural science subjects (N = 300).

Model	Beta	SE	R	t	Sign.
Constant	40.353	2.034	-	19.839	.000
1. Parents visit to school(x ₁₂)	3.113	.450	.376	6.910	.000
2. Family type(x ₇)	-2.083	.427	-.363	-4.874	.000
3. Parents' occupation(x ₂)	1.482	.431	.275	3.442	.000
4. Provision of resource materials(x ₁₁)	.718	.108	.235	6.627	.001
5. Family feeding(x ₃)	.716	.231	.215	3.369	.000
6. Parents' education(x ₁)	.605	.142	.198	4.266	.001
7. Age category of parents(x ₁₀)	-.195	.092	-.194	2.119	.008
8. Residential type(x ₁₈)	.165	.073	.131	2.248	.025
9. Provision of pocket money(x ₁₃)	.001	.000	.123	2.674	.035

R² = .918 Adjusted R² = .915 model was statistically significant at p ≤ 0.001.

academic achievement, schools and academic achievement, gender, and academic achievement shows positive and significant association using Cramer's V (Table 1). A positive and significant association was observed between age and students' academic achievement (0.382, P ≤ 0.36). Respondents' academic achievement was however independent of schools and gender as shown by the statistically insignificant relationship (p ≥ 0.185 and P ≥ 0.202, respectively) of Cramer's V.

The age of respondents was observed to be an important factor for their academic achievement. Students do well in examinations when they are appropriately placed in their respective classes or academic level, otherwise they may lack basic skills for effective study or to be impaired by age related deficits (Newman-Ford et al., 2009). The reason for insignificant Cramer's V of schools may be because the students were borders. While, there is no association with gender and students' academic achievement because students' performances did not discriminate gender. According to Newman-Ford et al. (2009) gender had no or only minor impact on students' academic achievement. However, on the contrary it is worth noting that differences exist between male and female students depending on the subject matter (Haist et al., 2000; Arigbabu and Mji, 2004; Erinosh, 2005; Bilesanmi-Awoderu, 2006; Kolawole, 2008).

Study findings on stepwise regression analysis of students' home background factors with most determining effect on their academic achievement in agricultural science subjects

The study objective 2 of this research was to use stepwise regression analysis to select a good set of predictors from the students' home background factors with the most important effect on their academic achievement in agricultural science subjects. Study findings produced by SPSS software show the strong order of effects of the independent variables on students' academic achievement (Table 2). Of all the nineteen variables included in the model, only nine had significant and determining effects. The model was statistically significant at p ≤ 0.001 and accounted for approximately 92% of the variance of the academic achievement (R² = .918; Adjusted R² = .915). The constant coefficient was equal to 40.353. The standardized coefficients, standard errors, partial correlation (r) and t-statistics as produced by the SPSS software are also presented in Table 2.

Parent visits to schools

Study findings in Table 3 show that parent visits to school (x₁₂) (3.113.) at p ≥ 0.000 was the strongest determining home background factor with predictive capacity to

Table 3. Regression analysis of parents visits to schools.

Model	Variable	Beta	SE	R	t	Sign
	Constant	40.353	2.034	-	19.839	.000
1.	Parents visits to school	3.113	.450	.376	6.910	.000

Table 4. Regression analysis of family type.

Model	Variable	Beta	SE	R	t	Sign
	Constant	40.353	2.034	-	19.839	.000
2.	Family type	-2.083	.427	-.363	-4.874	.000

Table 5. Regression analysis of parents' occupation.

Model	Variable	Beta	SE	R	t	Sign
	Constant	40.353	2.034	-	19.839	.000
3.	Parents' occupation	1.482	.431	.275	3.442	.000

improve students' academic achievement. The study result implies that parents predisposition to education of their children through visit to school was the most important indicator of students' academic achievement. Supporting this finding, Yan and Lin (2002) stated that greater parent's involvements in their children's learning process influence high academic achievement.

Family type

The second home background variable with the most determining effect on students' academic achievement was family type (x_7) (-2.083) at $p \geq .000$. Table 4 indicated that family type had negative effect on students' academic achievement. In this case, increased level of family type did not increase students' academic achievement but rather decreased it. This shows that children, who came from families with large magnitude of increase rate of household size, had low academic achievement. Parents with increased number of household size have many family challenges such as time, family welfare and investment on education of their children which were limited. Study findings reported by Chawla (2012) affirmed this study result and show that students' academic achievement significantly correlate with factors of family type. Libiensi and Gutierrez (2008) on the other hand state that identifying such factors of the family type will help parents to utilize limited resources of the family including financial resources and time more effectively. This study finding identifies family type as a risk factor on students' academic achievement which might result in students more particularly from less privileged families drop out from schools or put on continuous academic stresses in schools.

Parents' occupation

Study findings on parent's occupation (x_2) (1.482) at $p \geq .000$ in Table 5 have shown that parent's occupation was the third most determining factor which predicts effect on students' academic achievement. It is argued that occupation determines the income earnings of parents which in turn are use for family welfare and pay educational expenses of the children. Ermisch and Francesconi (2001) and Grawe and Mulligan (2002) agreed and supported this finding and conclude that economic resources and potentials of parents correlate significantly with children's schooling process, and their academic achievement. They concluded that children who come from families with prestigious occupations had more resources and their parents can afford to pay for extra lessons and other auxiliary educational services. Furthermore, such parents can mold the behavior of their children using pecuniary incentives to motivate their academic motives (Weinberg, 2001; Alderman et al., 2001; Gordon et al., 2004). Therefore, it implies that parents with better occupations had better chances to influence their children's academic achievement.

Provision of resource materials

The study findings further indicate that Provision of resource materials (x_{11}) (.718) at $p \geq .001$ (Table 6) had positively predicted effect on students' academic achievement and being the fourth strongest determining home background factor. According to Jeynes (2002) parents negatively influence academic achievement of their children by denying them the provision and access to various educational materials and resources which

Table 6. Regression analysis of provision of resource materials.

Model	Variable	Beta	SE	R	t	Sign
	Constant	40.353	2.034	-	19.839	.000
4.	Provision of resource materials	.718	.108	.235	6.627	.001

Table 7. Regression analysis of family feeding.

Model	Variable	Beta	SE	R	T	Sign
	Constant	40.353	2.034	-	19.839	.000
5.	Family feeding	.716	.231	.215	3.369	.000

Table 8. Regression analysis of parents' educational level.

Model	Variable	Beta	SE	R	T	Sign
	Constant	40.353	2.034	-	19.839	.000
6.	Parents' education	.605	.142	.198	4.266	.001

create distress and discomfort both at home and in school. Therefore, parents who provide resource materials to their children increased their academic achievement. The study finding underscored the need for parents providing required learning materials such as school uniform, books, writing materials, computers and other basic provisions to improve academic chances of their children as asserted by Jeynes (2002).

Family feeding

Still, family feeding (x_3) (.716) at $p \geq 000$ in Table 7 was statistically significant at $p \leq 0.001$ and positively related to academic achievement. The study finding shows that academic achievement of students increased with better family feeding. Learners who are well nourished are healthy, safe and protective (Abdullahi, 2011). This study result is in agreement with the findings by Gordon et al. (2004) who mentioned that adequate family feeding correlate with children's academic achievement since it will develop their mental alertness and motivate their concentration to school's activities and achieve better academic grades.

Parents' educational level

Parent's educational level (x_1) (.605) at $p \geq 001$ (Table 8) had positively predicted academic achievement of students. Education had an important effect and an influential determinant of social status of parents which presumably influence the educational outcomes of their children. For example, Campbell et al. (2000) mention that students whose parents had less educational level

obtained lower grades than those whose parents had higher levels of education. Moreover, parents' educational level not only impact student attitudes toward learning but also encourages their aspirations as supported by Abdullahi (2011). Eccles (2007) concludes that parents' educational levels were linked to child's developing academic achievement oriented attitudes and success. It can be said that parents with higher levels of education positively influence the educational outcomes of their children since they will be seen as good role models by their children.

Age category of parents

Age category of parents (x_{10}) (-.195) at $p \geq 008$ (Table 9) was having negative effect which implied that children whose father-mothers' age were small and moderate had higher academic scores. While, children with fathers-mothers' were having advanced age gaps had lower academic achievement scores. It means that as age gap between parents increases academic achievement decreases by -.195. It implies also that parents with more advanced age gap, though had better experience, but other parents with smaller age gap are more active, understanding, committed and enthusiastic to provide better educational guidance and opportunities to their children, thereby creating academic disparity in schools, as earlier upheld by Chawla (2012).

Residential type

Table 10 shows residential type (x_{18}) (.165) at $p \geq 025$ was positively related to academic achievement. This

Table 9. Regression analysis of age category of parents.

Model	Variable	Beta	SE	R	t	Sign
7.	Constant	40.353	2.034	-	19.839	.000
	Age category of parents	-.195	.092	-.194	2.119	.008

Table 10. Regression analysis of residential type.

Model	Variable	Beta	SE	R	T	Sign
8.	Constant	40.353	2.034	-	19.839	.000
	Residential type	.165	.073	.131	2.248	.025

Table 11. Regression analysis of provision of pocket money.

Model	Variable	Beta	SE	R	t	Sign
9.	Constant	40.353	2.034	-	19.839	.000
	Provision of pocket money	.001	.000	.123	2.674	.035

finding agrees with that of Ajila and Olutola (2007) who stated that the home of students affects their academic chances since it is the first place of socializing an individual's life. Therefore, it can be concluded that if the home environment affects child's reaction to life situations then, his/her level of academic achievement are also affected.

Provision of pocket money

Furthermore, study results show that provision of pocket money (x_{13}) .001 was statistically significant at $p \geq 0.035$. Provision of pocket money had positive effect on students' academic achievement (Table 11). This implies that students used pocket money given by to them by their parents to meet their basic necessities and other luxury services in school which promote their academic motives.

Therefore, only these nine variables discussed above did significantly have determining effect on students' academic achievement in Katsina State. Thus, parent visits to school (x_{12}), family type (x_7), parent's occupation (x_2), provision of resource materials (x_{11}), family feeding (x_3), parent's education (x_1), age category of parents (x_{10}), residential type (x_{18}), and provision of pocket money (x_{13}), had emerged as the most effective and strongest determinants of home background factors on students' academic achievement in agricultural science subjects respectively. These nine variables are hypothesized to have explained the contributions of other variables that were included in the model but did not show effect on students' academic achievement.

The implications of these findings indicate that, if parents wish to increase the academic achievement of

their children significantly, the first factor to consider is parents' visits to school. All aspects relating to parents' visits such as discussions, children having fun with parents during visits, gifts, etc, significantly motivate students to study hard. This is followed subsequently by increasing other factors that have shown positive effect on students' academic achievement with the exception of family type being a risk factor and age category of parents that inversely affect students' academic achievement.

These study results were consistent with the theoretical framework of this study which viewed the home as the major factor and conceptually associated with social indicators and educational motives of the children (Chen, 2009). Other authors (Oribhabor and Okodugha, 2010; Ibrahim and Bin Jamil, 2012) affirmed that children required being motivated to inspire their discipline, concentration and their academic motives to excel in school. Broussard and Garrison (2004) report that motivation is highly related to academic achievement and concluded that learners required motivation from their home to progress.

Hypothesis testing

The study results of stepwise regression show that the model was statistically significant at $p \geq 0.001$ and the home background factors of students accounted for 92% of the variance of the academic achievement. Nine students' home background variables were statistically significant as most determining factors having effects on their academic achievement. The null hypothesis which states that students' home background factors do not have significant effects on their academic achievement is

rejected.

CONCLUSIONS

Age of students was an important factor for their academic achievement, and that students did well in examinations when they were appropriately placed in their respective classes. The study findings show that students' home background variables such as parents' visit to schools, provision of pocket money, parents' education, parents' occupation, residential type and family feeding positively enhanced students' academic achievement. Overall, these were important in predicting effects on students' academic achievement positively. Therefore, better parenting and strengthened capacity in family welfare through these factors will increase students' academic confidence, greater academic motives and high level of academic achievement.

Inversely, family type was identified as a risk factor and that large dependency ratio pose a great concern in the quest for good learning environment both at home and school. Out of these concerns are likely that children from large families may end up as school dropouts, having behavioural problems and deviants in the society. However, it is important to note that what matter most in a family welfare is the equitable dilution of the family resources and time devoted for family welfare and the educational needs of the children. It is expected that parent with more efficient dilution of family resources and time will provide their children better education.

The study results on stepwise regression further conclude that measures of parental predisposition to education such as visits to school, provision of resource materials and provision of pocket money and socio-economic factors of parents such as parents' occupation, parents' education and family feeding positively accounted for more of the variation in students' academic achievement than measures of other family factors. It is essentially worth noting that students who did well in schools came from families that provide support and enrichment environment for learning both at home and school.

RECOMMENDATIONS

1. The study has identified family type as a risk factor. We fear that household size of the families will likely continue in the increase due to perceived religious ideology and standing traditional polygamy of the people. We therefore recommend for an intensified public education through enlightenment and awareness campaigns on family planning and child spacing as well as dilution of family resources.
2. It is important to recommend that parents should feature prominently in future educational reforms. This is

intended to increase more support to education. Any future educational initiatives should therefore give regard to the role of family in education rather than focusing on increased expenditure alone.

3. Since age is an important factor in determining academic excellence, both parents and school administrators should ensure that their children are enlisted and appropriately placed in the right class or academic level in order to promote academic excellence.
4. School administrators must ensure that libraries in their schools are adequately equipped with learning materials to assist students whose parents could not be able to provide them with adequate learning materials.
5. Parents should form a forum of leaders and mentors as parents. Under this forum they can mentor other parents to help them support their children's learning particularly through Parent Teachers' Association (PTA).

Suggestion for further research

Effect of career agriculture choice determination on secondary school students' academic achievement is hereby advocated for future research.

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