

Interest And  
Achievements In  
Natural Science  
Subjects Students In  
Secondary School In  
Western Uganda

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**ABSTRACT**

Interest in natural science subjects remains an important issue because it is related to achievement and the intention to pursue studies or careers in science-related areas. This study envisioned to determine the correlation between interest in natural science subjects and achievement among secondary school students in western Uganda using a correlational research design. The target population was 1350 senior four students in 350 schools. A random sample of 405 respondents was used for the study. Data was collected using Interest Inventories and Natural Science Achievement Test. Descriptive statistics, t-test, and Pearson's Correlation Coefficient  $r$  were employed in data analysis. According to the results achievement increased with the increase in interest of learners in natural sciences. There was no substantial gender difference in achievement and interest in natural science. Based on the conclusions of the study, professional career counselling should be provided at the secondary school level to increase the learners' interests in a natural science subjects. The government should continue its efforts and policy to improve gender equity in science subjects.

**Keywords:** Interests, Achievement, Sciences, Uganda

**1. BACKGROUND**

There is a worldwide worry due to scarceness of people having the required skills needed for sustainable knowledge economy. This has led to cut throat competition to find people with the right and required skills especially in science, technology, engineering, and mathematics (Beechler & Woodward, 2009; Carter, 2011; Kabunga, Habiba, & Mnjokava, 2016). For instance in the United States of America, it is now a matter of priority to guarantee adequate graduates who possess required skills in natural sciences (Chen & Soldner, 2013). Natural sciences are the engine for improved quality of life, economic growth and development and social development (Jugessur, 2008). They are also seen as means of solving problems facing humanity in the 21<sup>st</sup> century worldwide. Thus young people in secondary schools need to be equipped with the required skills and competencies desired to confront the 21<sup>st</sup> century global challenges, to be educators, researchers and innovators. The biggest obstacle hindering the achievement of this aim is the scarcity of people within interests in natural sciences. There is need to note that, interest determines learners' future occupations (Hasni & Potvin, 2015).

Several definitions of the concept of interest exist in literature. Most of these definitions denote cognitive, emotional and other characteristics (Schiefele, 2009). Krapp (2007) describes the concept of interest as a more or less durable precise association between an object and a person. Numerous studies have opined that interest is a vital factor in learners' aspiration to and eventually a choice of a science related occupations (Beggs et al., 2008; Kuechler et al., 2009; Hall et al., 2011). In the words of Krapp (2007) "one cannot simply have an interest: one must be interested in something". However, according to Osborne et al., (2003) pure science appears to be 'a love-hate subject that elicits strong feelings in learners and developing interest in the subject, therefore,

appears to be a real challenge as much as it is a challenging research subject. Variables such as the family background, socioeconomic characteristics, age, teacher, teaching methods are important predictors of interest (Krapp & Prenzel, 2011; Hofer, 2012; Hasni & Potvin, 2015). Additionally, personal characteristics including level of education age and gender are strongly associated with interest (Potvin & Hasni, 2014).

Studies show that there is a reciprocal relationship between interest and achievements (Ainley, 2012). According to Bolarin (1988), interest in more than a discipline is the key to education successes. Mabula (2012), found that students' performance in science subjects was affected by among others decline in interest of students toward science subjects. Bolarin (1988) observed that learners will learn better in subjects if they have some degrees of likeness for such subjects. This implies that learners will fail to learn if they do not like the subjects. Thomas (2013), in his study of the educational interest, found that students with educational interest have grade point averages in specific related courses than with low-interest scores. A review of literature reveals that the concept of interest has been studied in fields like psychology, and sociology (Krapp & Prenzel, 2011). The current study primarily examines natural science subjects within the field of education which has received little attention, especially in Uganda.

Voluminous studies on learners' interest in sciences have been carried out especially in the United States of America and Europe (Crisp, Nora & Taggart, 2009) but few in Africa. The East African region that has abundant resources including oil deposits, Coal, gold, iron, natural gas, petroleum, uranium, diamonds, sugar, salt, cobalt, uranium, copper, bauxite, silver, and cocoa beans, woods and tropical fruits and others has inadequate output of scientific specialists needed for maximum exploitation and use of such resources. Paradigm Shift in strategy is needed to bridge the gap through improving interest in in natural science subjects. The kind of industrialization envisioned by the government of Uganda will require a vast skilled workforce with a solid background in natural science subjects. To meet this goal, Uganda must prepare at least as twice as many graduates with a natural science background. The Government of Uganda and its partners have tried to improve the teaching of natural sciences especially at secondary school levels (Kabunga, Habiba, & Mnjokava, 2016). For instance providing chemicals and science textbooks and laboratory equipment, building new and renovating old laboratories, giving an extra incentive to science and mathematics teachers and computer science and ICT skills (The Ministry of Education and Sports, 2008). Whatever the gains made, lack of interest in natural science subjects may cripple the development of the critical required skills and competencies.

Many studies related to interest have been conducted over the years, addressing various aspects of interest in pure sciences (Krapp & Prenzel, 2011; Potvin & Hasni, 2014; Renninger & Hidi, 2011). A review of these studies, however, show that while progressive knowledge has been built about interest, further research is still needed, particularly in different cultural and educational contexts since interest seems to depend on these contexts (Ainley & Ainley, 2011; Wang & Berlin, 2010). Krapp and Prenzel (2011) observed that reports of correlations between achievement and interest are largely inconclusive. Besides, there is a need to for research

and develop instruments that are culturally sensitive and take into account several interest-related components (Lamb, Annetta, Meldrum & Vallett, 2012). Using survey-based quantitative data, this study was conducted to bridge the gap. Interest is required for achievement to occur and to prove this assumption the following hypotheses were tested;

**Ho<sub>1</sub>:** There is no statistically significant correlation between interests in natural science subjects and achievement among secondary schools in Western Uganda

**Ho<sub>2</sub>:** There is no statistically significant association between male and female on interest in natural science subjects and achievement among secondary schools in Western Uganda.

## 2. METHODS

This study used a correlational research design. Data for this study was collected on the interest variable and achievement variable. The association between the two variables was investigated to determine the strength of their relationship and the coefficients of determination existing between the two.

### 2.1 PARTICIPANTS

The target population was 1350 form six students in 350 secondary schools in western Uganda. 30% of the target population was considered appropriate to determine the sample size of 405. To ensure representativeness, proportionate stratified sampling was used to obtain the sample size taking into account the male and female respondents. Thus 220 males and 185 females were selected randomly for the study as shown in Table 1.

*Table 1: Gender of the Respondents*

Gender	Frequency (n)	Percentage
Male	220	54
Female	185	46
Total	405	100

Table 1 shows that more than half (54%) of the sample respondents were male while the female respondents constituted 46%. Results show that the number of male respondents was 8% bigger than that of the female respondents. This difference notwithstanding, the size of both female and male respondents was good enough for the study to capture gender-balanced experiences of career info and career choices in western Uganda.

### 2.2 INSTRUMENTS

Two instruments namely, adopted Science Interest Inventory and achievement tests were used to collect data for the study. The validity of the tools was determined through pretesting. Reliability and the internal consistency for tools were measured using Cronbach's alpha coefficient. The researcher recorded a Cronbach alpha score of 0.70 and 0.79 for adopted Science Interest Inventory and achievement tests respectively.

**2.3 PROCEDURE**

Instruments were administered to respondents at pre-arranged times in their respective schools. Administrators including headteachers or deputies were contacted through phone calls, emails and letters. Respondents were contacted physically through administrators of the schools. Afterwards, the survey questionnaires were distributed to the respondents who filled the questions.

**2.4 ETHICAL CONSIDERATIONS**

Permission to collect data was acquired from the Uganda National Council for Science and Technology and ethical approval from the National HIV/AIDS Research Committee. It was a voluntary participation by the respondents and were guaranteed of confidentiality. Respondents anonymously completed the questionnaires within the time allotted to the researcher.

**3. DATA ANALYSIS**

All statistical analyses were performed using R (R Core Team, 2015) with statistical significance set at  $p < 0.05$ . The Shapiro–Wilk test results showed that the respondents' scores were normally distributed. Data analysis was done using descriptive statistics, t-test and Pearson's Correlation Co-efficient  $r$ . All hypotheses were tested at the  $\alpha = .05$  significance level.

**3.1 RESULTS**

The analysis in this theme addresses the first objective that was designed to establish the association between interest in natural science subjects and achievement. To investigate this relationship, it was hypothesized that there is no statistically significant correlation between interest in natural science subjects and achievement. To investigate the hypothesis, Pearson's product-moment correlation was conducted between scores on the interest in natural science subjects and scores on the achievement. The statistical hypothesis was tested at the significance level of 0.05. The results are shown in Table 2.

*Table 2: Pearson's product-moment correlation between natural sciences and achievement*

Pure science subjects		Interest in sciences
Biology	Pearson's $r$	.170*
	Sig. (2-tailed)	.008
	N	269
Chemistry	Pearson's $r$	.280*
	Sig. (2-tailed)	.000
	N	405
Physics	Pearson's $r$	.240*
	Sig. (2-tailed)	.006
	N	138

\* Pearson's ( $r$ ) is significant at  $p < .05$

The Pearson's product-moment correlation (*r*) values for natural sciences and interest are .170 for Biology, .280 for Chemistry and .240 for Physics. An overview of the information derived from Table 2 is that when correlated at  $p < .05$  there is a positive significant correlation between interest in natural science subjects and achievement among secondary school students in western Uganda. With the p-value being less than the alpha value (0.05), the null hypothesis that there is no statistically significant relationship between interest in natural sciences and achievement among secondary school students in western Uganda was invalid and hence rejected. It can be inferred that the higher the levels of interest of individual students in natural science subjects the higher the achievement in those subjects.

The second objective of the study sought to examine the influence of gender on interest in natural science subjects and achievement among secondary school students in western Uganda. To confirm this significant gender difference, an independent sample t-test was conducted. The analysis compared the male and female respondents' Science Interest Inventory mean scores and scores the results are as shown in Table 2.

Table 2: Independent t-test for Science Interest Inventory Scores (N =405)

		T	Df		Sig Difference	Std Error Difference	95% Confidence Interval Difference	
							Lower	Upper
Science Interest Inventory	EV assumed	.170	402	.868 <sup>ns</sup>	.22	1.282	-2.304	2.738
	EV not assumed	.177	401.30	.864 <sup>ns</sup>	.22	1.238	2.216	2.651

EV= Equal Variance

<sup>ns</sup> = Not significant at  $p < .05$

Results in Table 2 indicate that Science Interest Inventory has t-test of .170 and .177, the probability value is  $p = .868$  and  $.864$ , meaning that  $p > .05$ . These probability values are not statistically significant. The results imply that there is no statistically significant difference in Science Interest Inventory scores among secondary school students. Based on these results the hypothesis that there is no statistically significant relationship between male and female in interest in natural science subjects and achievement among secondary schools in Western Uganda was accepted. The findings show that it is now apparent that girls are challenging sex-role stereotypes in science and agitating for gender equity in science subjects and science-related careers. Also, the results indicate that although the gender gap still exists, the country is making significant strides in reducing gender inequality in science subjects.

### 3.2 DISCUSSION

The first objective of this study was to assess whether there is a statistically significant relationship between interest in natural sciences and achievement among secondary school students in western Uganda. The results showed that the higher the levels of interest of individual students in natural science subjects the higher the achievement in those subjects. This is in agreement with many studies which have identified personal interest

as a key factor in students' aspiration to choose of a science-related degree or occupation (Beggs et al., 2008; Hall et al., 2011; Kuechler et al., 2009). According to Mabula (2012), students' performance in science subjects is determined by among others the level of interest of students toward science subjects. Bolarin (1988) observed that learners will learn better in subjects if they have some degrees of interest in such subjects. This implies that learners will fail to learn little if they do not have an interest in the subjects. Students who demonstrate active interest in their work tend to display characteristics such as increased attention, greater concentration, pleasant feelings of applied effort, and increased willingness to learn (Ainley, 1998).

The second objective of the study sought to examine the influence of gender on interest in natural science subjects and achievement among secondary school students in western Uganda. Results revealed that there is no statistically significant relationship between male and female in interest in natural science subjects and achievement. The gender-related phenomenon in sciences and the under-representation of females has been widely discussed in the literature (Adamuti-Trache, 2008; Brotman, 2008). However, a review of this literature reveals that there are conflicting findings of gender differences in students' interest in science subjects. These results are favourably consistent with those obtained in other studies (Karaarslan & Sungur, 2011; Mustafa, 2012). These studies show that no gender differences in students' interest in science learning. Also in line with current results, Brickhouse *et al.* (2000) found that girls' attraction to sciences at age fourteen was related to their confidence in their ability to perform in science.

Contrary to the current results, studies have explained the low participation of girls in science and they reveal that secondary school students perceive some subjects to be difficult and gendered, with girls appearing to favour subjects which involve identifiable personal interactions (Freeman, 2004; Bystidzienski & Bird, 2006). Other studies indicate that gender was the most important factor in subject choice (Cleaves, 2005; Miller *et al.*, 2006). Similarly, a study examining the science-related interests and out-of-school experiences of students in Greece (Christidou, 2006) found significant gender differences between the interests of boys and girls.

#### **4. CONCLUSION AND RECOMMENDATIONS**

While massive resources have been allocated by the government of Uganda and its partners to improve the teaching of natural science subjects, many students have not enrolled in such subjects. This may be due to the fact that little attention has been paid to the interests of learners. The findings indicate that there is a significant positive association between students' interest in natural sciences and achievement. This implies that interest greatly influences learners' interest scientific disciplines. Hence interest cannot be underlined because it is central to learners' enrollments in science-related subjects and programs. The findings also show that it is now apparent that girls in Uganda are challenging sex-role stereotypes in science and agitating for gender equity in science subjects and science-related careers. Also, the results indicate that although the gender gap still exists, the country is making significant strides in reducing gender inequality in science subjects.

Professional career counselling should be provided at the secondary school level to increase the learners' interests in a natural science subjects. This can also help learners connect their future career decisions to their educational decisions. Professional counselling programs can assist learners to make a smooth transition into higher institutions of learning. The government should continue its efforts and policy to improve gender equity in science subjects.

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