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Gender, Science Self-efficacy and Science Related Career Aspirations among Ordinary Level Students in Uganda: A Case of Wakiso District

Moses Musisi, Grace Kibanja, Callist Tumwebaze*

School of Psychology, Makerere University, Kampala, Uganda

Abstract The study examined the gender difference in science self-efficacy and science related career aspirations and the relationship between science self-efficacy and science related career aspirations among ordinary level students in Wakiso district. A cross sectional research design was employed to collect data from 242 ordinary level students using a self-administered questionnaire. Simple random sampling technique was used to select the respondents. Data analysis was done using SPSS version 22 and the hypotheses were tested using the t-test and multiple linear regression techniques. Results revealed that overall, there existed no gender difference in science self-efficacy ($t = 1.20$, $p = .23$). However, considering its dimensions, there was a significant gender difference in Physics self-efficacy ($t = 1.94$, $p = .05$) but no significant gender difference in Biology self-efficacy ($t = 0.44$, $p = .66$), Chemistry self-efficacy ($t = 1.23$, $p = .22$) and laboratory self-efficacy ($t = 0.53$, $p = .60$). There was also no gender difference in overall science related career aspirations ($t = 1.72$, $p = .09$) but on analysing its dimensions, there was a significant gender difference in science educational aspirations ($t = 2.01$, $p < .05$) and no significant gender difference in science occupational aspirations ($t = 0.73$, $p = .47$). Results also revealed a significant positive relationship between science self-efficacy and science related career aspirations ($r = .72$, $p < .01$). The findings imply that male and female students differ in their confidence to accomplish academic tasks in Physics but their confidence to accomplish academic tasks in Biology, Chemistry or the Laboratory does not. It was concluded that an increase in science self-efficacy increases the likelihood of a student aspiring for a science related career. It was recommended that attempts to reduce the gender difference in science educational aspirations should focus on improving science self-efficacy. Educationists are therefore required to help students build their science self-efficacy through embedding science awareness into science lessons and mentoring; all of which could help learners gain confidence that they can successfully accomplish academic tasks in sciences and in the long run this could boost their science career aspirations.

Keywords Science, Self-efficacy, Gender, Career aspirations

1. Introduction

Career aspirations form the basis over which individuals develop decisions and preferences for their future occupational routes (Bandura, Barbaranelli, Caprara, & Patorelli, 2001). According to Gray and O'brein (2007), career aspiration is the desire for continuing education or career achievement within a specialised field. Research has shown that career aspirations have been related not only to individual factors such as one's gender but also a number of other factors including parental and peer attitudes, motivation, ethnicity, social economic status, self-efficacy, etc (Dewitt & Archer, 2015; Kuppan, Foong & Yeung, 2011; Macphee, Farro & Canetto, 2013; Obura & Ajowi, 2012).

Science self-efficacy is the belief in one's own capability to do sciences and execute skills and knowledge needed to manage science content and processes (Miller, 2006). Kemeza (2014) asserted that self-efficacy affects students' choice of subjects at advanced level. Kennedy (1996) also observed that science self-efficacy may affect science learning, choosing science, quantity of energy exercised and also diligence in science. Self-efficacy may explain course selection patterns at advanced level which eventually leads to few girls taking up science combinations (Loius & Mistele, 2012). Bandura, (1997) further asserts that efficacy beliefs will comparatively outline the trajectory that one's life takes. Therefore, students with low levels of self-efficacy in sciences are likely to avoid them while those with high efficacy levels will go for them. Although this is so, other researchers argue that science related career aspirations are influenced by the gender of the student (American Association of University Women, 2010; Mung'ara, 2012).

* Corresponding author:
tumwebc@tcd.ie (Callist Tumwebaze)
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According to Archer, Osborne, Dewitt, Dillon, Wong and Willis (2013), students have high science career aspirations at 10 years with little gender differences and by 14 years, most students' science career aspirations are fixed. They noted that students who aspire for science-related careers at age 14 are almost three and a half times more likely to end up getting a degree in the physical sciences or engineering than students without these expectations. However, Schreiner (2006) observed that by 14 years, the attitudes of girls were significantly more negative towards sciences as compared to the boys particularly in physical sciences. According to Archer et al (2013), from year nine, girls underestimate their science and math abilities despite the fact that there are no gender differences in performance and this trend may persevere into high school. Similarly, Usher and Chen (2013) found that high school girls notched lower compared to boys on self-efficacy in Biology and Physics, regardless of their achievement levels. Consequently, there are few girls taking on sciences at advanced level yet the type of subject combination offered at this level and students' performance in them can affect their career choices and this may eventually lead to low representation of females in science related fields.

According to American Association of University Women (AAUW, 2010), less than 20 percent of females are scientists, engineers or technologists in United States. Similarly, in Uganda, the government realised that sciences are the engine for development in the 21st century and made them compulsory at ordinary level but very few girls take them up at advanced level. The compulsory science subjects taught in Uganda are Biology, Chemistry and Physics. However, according to Uganda National Examinations Board (UNEB, 2016), few female students offer science-related subjects compared to males. For example, out of the 12,039 students who offered chemistry in 2015, only 3,586 students were girls representing about 30 percent and of the 16,824 students who offered physics, only 3,456 were girls representing about 21 percent (UNEB, 2016).

Several gender equity enhancement strategies including affirmative action education policy, interventions by several Non-Governmental Organisations like Female Education in Mathematics and Science in Africa (FEMSA), and Forum for African Women Educationists- Uganda (FAWE-U) have been implemented to increase participation of female students in sciences in Uganda. However, despite these interventions, the number of females represented in science related career fields in Uganda has remained low compared with their male counterparts (Uganda National Council for Science and Technology (UNCST, 2012).

2. Purpose

To examine the gender difference in science self-efficacy levels and science related career aspirations and how science self-efficacy levels relate to science related career aspirations among ordinary level students in Wakiso district.

2.1. Hypotheses

The study hypotheses were sub divided into sub-hypotheses for the self-efficacy and science related career aspirations to account for the specific domains of those variables. This was because many self-efficacy theorists (Bandura, 1997; Pajares, 1997; Usher & Pajares, 2008) have emphasized that self-efficacy is domain specific hence it should be tailored to a specific domain or subject of interest otherwise its predictive power will be weakened if it is assessed at broad or general levels. For this reason, science self-efficacy was analyzed in its various facets depending on the science subjects and curriculum at ordinary level, that is, Biology, Chemistry, Physics and Laboratory work. Similarly science related career aspirations were also analyzed in its dimensions, that is, science educational aspirations and science occupational aspirations. Sub-hypotheses were therefore designed to this effect. The study was guided by the following hypotheses and their sub-hypotheses:

1. There is a significant gender difference in science self-efficacy levels among ordinary level students.
   - 1 a). There is a significant gender difference in Physics self-efficacy levels among ordinary level students.
   - 1 b). There is a significant gender difference in Chemistry self-efficacy levels among ordinary level students.
   - 1 c). There is a significant gender difference in Biology self-efficacy levels among ordinary level students.
   - 1 d). There is a significant gender difference in laboratory self-efficacy levels among ordinary level students.
2. There is a significant gender difference in science related career aspirations among ordinary level students.
   - 2 a). There is a significant gender difference in science educational aspirations among ordinary level students.
   - 2 b). There is a significant gender difference in science occupational aspirations among ordinary level students.
3. Science self-efficacy levels are significantly related to science related career aspirations among ordinary level students.
4. Science self-efficacy levels moderate the gender difference in science related career aspirations among ordinary level students.
   - 4 a). Physics self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students.
   - 4 b). Chemistry self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students.
   - 4 c). Biology self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students.
   - 4 d). Laboratory self-efficacy levels significantly

moderate the gender difference in science related career aspirations among ordinary level students.

3. Method

3.1. Participants and Procedure

The study population was 642 senior four students from 8 schools in Wakiso district that were selected for this study by use of a stratified random sampling technique. The classification of schools into strata depended on the type of school, that is, three single sex girls, two single sex boys and three mixed sex school. From each of the strata for mixed sex schools and single sex girls, three schools were chosen using simple random sampling together with the only two schools in the single sex boys' strata making a total of eight schools. Senior four students were chosen because it is at the end of this class where transition in one's career plans occurs. It is therefore hoped that they are mature enough to give more realistic responses.

Basing on Krejcie and Morgan's (1970) table for sample size determination, a sample size of at least 240 respondents was sufficient for the study. Simple random sampling technique was used to select 35 respondents from each of the eight schools in order to account for any incompletely filled questionnaires and in the analysis, the questionnaires which had complete information were from 242 respondents (119 males and 123 females). This was achieved using a lottery method where pieces of paper labelled with numbers from 1 up to 35 were shuffled in a basket and in each school, the lucky students who picked these numbers were included in the study. This sampling technique was deemed appropriate because all the participants had equal chances of participation since they all had the information necessary for the study.

3.2. Instrument and Measures

The data collection instrument was a structured self-administered questionnaire. The questionnaire consisted of three sections A, B and C. Section A covered items on background information, section B covered items on science self-efficacy and section C covered items on science related career aspirations.

Background information included gender, age, type of the school, parents' occupation and education level. Science self-efficacy was measured using the science self-efficacy questionnaire by Smist (1993) from which 26 items out of 27 items were considered appropriate, that is, 6 items for biology self-efficacy, 6 items for chemistry self-efficacy, 5 items for physics self-efficacy and 9 items for laboratory self-efficacy. The Cronbach's alpha coefficient for the science self-efficacy questionnaire was 0.862 for biology self-efficacy; 0.837 for chemistry self-efficacy; 0.850 for physics self-efficacy; and 0.764 for laboratory self-efficacy (Miller, 2006). Science related career aspirations were measured by the science aspirations questionnaire by Chandrasena (2013) which is originally derived from Yeung and McInerney (2005) school aspirations scale that consists of 7 items, that is, 4 for science educational and 3 for science occupational aspirations. The Cronbach's alpha coefficient for science aspiration questionnaire was 0.90 for science educational aspirations and 0.90 for science occupational aspirations (Chandrasena, Craven, Tracey & Dillon, 2014).

Content and construct validity of the questionnaire were determined by expert judgement from other competent researchers (Amin, 2005). They helped in checking for the question wordings and statement of the items; and modifying some items to fit the context of the respondents.

Despite the fact that questionnaire sections for science self-efficacy and science related career aspirations were all standardised, a pre-test was carried out to determine their suitability in the Ugandan context. The questionnaire was pretested using a sample of 20 senior four students from one secondary school in Wakiso. A reliability analysis was run to establish the Cronbach alpha coefficient of the scales and the sub-scales and the results are shown in Table 1.

Table 1. Coefficients of the scales and the sub-scales

Variable items	Reliability coefficients (α)	Number of items
Biology self-efficacy	.82	6
Chemistry self-efficacy	.85	6
Physics self-efficacy	.75	5
Laboratory skills self-efficacy	.83	9
Overall Science self-efficacy scale	.91	26
Science educational aspirations	.75	4
Science occupational aspirations	.76	3
Overall Science aspirations questionnaire	.79	7

According to Amin (2005), tools are regarded reliable measures of the study variables if they show the Cronbach alpha coefficient of .70 and above. Therefore, the Cronbach alpha values in Table 1 show that all the scales and the sub-scales were reliable enough to be used in the study. The school involved in the pre-test group was not included in the final study.

3.3. Data Analysis

The questionnaires were crosschecked for any errors like omissions and those with omissions were left out since they would affect the final results. After coding, data were analysed using the Statistical Package for Social Sciences (SPSS). Gender differences in self-efficacy were tested using the independent samples t-test whereas the interactions between gender, self-efficacy and science related career aspirations were tested using a multiple linear regression test.

4. Results

Findings are presented beginning with the means and standard deviations in the study variables as reflected in

Table 2 below:

Table 2. Means and Standard Deviations of the Scores of Study Variables

Variable	Gender	N	Minimum score	Maximum score	Mean	Standard deviation
Total science self-efficacy	Male	119	37	130	81.59	17.22
	Female	123	26	126	78.62	21.43
Total science related career aspirations	Male	119	9	42	29.38	7.86
	Female	123	7	42	27.63	7.95

Results in Table 2 show that the science self-efficacy levels of males (mean = 81.59) were higher than those of females (mean = 78.62). This implies that males reported more confidence that they accomplish academic tasks in sciences than females. Results also show that the science related career aspirations of males (mean = 29.38) were higher than those of females (mean =27.63). This implies that females aspire less for careers related to science as compared to their male counterparts.

4.1. Advanced Data Analysis Results

The gender difference in science self-efficacy levels was analysed using the independent samples t-test and results are shown in Table 3 below.

Table 3. T-test Results Gender and Self-Efficacy

	Group Statistics			Independent Samples Test		
	Gender	N	Mean	T	Df	Sig. (2-tailed)
Biology Self-efficacy	Male	119	18.26	.44	240	.66
	Female	123	17.94			
Chemistry Self-efficacy	Male	119	18.43	1.23	240	.22
	Female	123	17.47			
Physics Self-efficacy	Male	119	16.81	1.94	240	.05
	Female	123	15.68			
Laboratory Self-efficacy	Male	119	28.09	.53	240	.60
	Female	123	27.52			
Total science self-efficacy	Male	119	81.59	1.20	240	.23
	Female	123	78.62			

Results in Table 3 show that generally, there exists no gender difference in science self-efficacy levels (t = 1.20, p = .23). However, results show that there is a significant gender difference in only one out of the four science self-efficacy facets, that is, Physics self-efficacy (t = 1.94, p = .05) and that males exhibit higher levels of Physics self-efficacy with a mean of 16.81 as compared to females with a mean of 15.68. This implies that male students have more confidence in their capabilities to accomplish Physics academic tasks than female students do. No significant gender differences were found in other facets of science self-efficacy, that is, Biology self-efficacy (t= .44, p = .66), Chemistry self-efficacy (t= 1.23, p = .22) and laboratory self-efficacy (t = .53, p = .60) although generally, males exhibit high levels of science self-efficacy in all the domains.

The gender difference in science related career aspirations was analysed using a multiple linear regression test and results are shown in Table 4 below:

Table 4. Hierarchical Multiple Linear Regression Results for Gender and Science Related Career Aspirations with Science Self-Efficacy as a Moderator

		Unstandardized Coefficients		Standardized Coefficients			ANOVA[d]		Model Summary	
Model		B	Std. E	Beta	T	Sig.	F	P	R^2	AdjR^2
1	(Constant)	.33	.20		1.63	.11	2.94	.09[a]	.01	.01
	Gender	-.22	.13	-.11	-1.72	.09				
2	(Constant)	-2.90	.24		-11.90	.00	55.72	.00[b]	.54	.53
	Gender	-.08	.09	-.04	-.95	.35				
	Biology self-efficacy	.05	.01	.21	3.90	.00				
	Chemistry self-efficacy	.04	.01	.25	4.07	.00				
	Physics self-efficacy	.06	.01	.29	5.21	.00				
	Laboratory self-efficacy	.02	.01	.17	3.10	.00				
	Total science self-efficacy	.29	.02	.72	16.03	.00				

		Unstandardized Coefficients		Standardized Coefficients			ANOVA[d]		Model Summary	
Model		B	Std. E	Beta	T	Sig.	F	P	R^2	AdjR^2
3	(Constant)	-2.95	.25		-11.90	.00	31.92	.00[c]	.55	.54
	Gender x Biology self-efficacy	-.03	.06	-.03	-.57	.57				
	Gender x Chemistry self-efficacy	.05	.06	.05	.80	.43				
	Gender x Physics self-efficacy	-.13	.06	-.12	-2.25	.03				
	Gender x Laboratory self-efficacy	.05	.06	.04	.79	.43				
	Gender x total science self-efficacy	-.29	.37	-.04	-.78	.44				

	Change Statistics				
Model	R Square Change	F Change	df1	df2	Sig. F Change
1	.01	2.94	1	240	.09
2	.53	68.10	4	236	.00
3	.01	1.54	4	232	.19

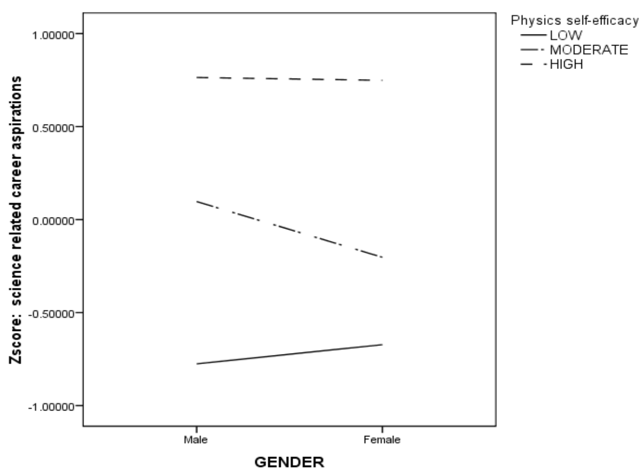
a. Dependent Variable: science related career aspirations

In model 1, only gender was included in the regression analysis. The results show that gender was negatively but not significantly related to science related career aspirations (β = -.11, p = .09).

In model 2, gender, science self-efficacy and its dimensions were included in the regression analysis and results show that science self-efficacy and all its four dimensions were significantly related to science related career aspirations, that is, science self-efficacy (β = .72, p = < .01), Biology self-efficacy (β = .21, p = < .01), Chemistry self-efficacy (β = .25, p = < .01), Physics self-efficacy (β = .29, p < .01) and laboratory self-efficacy (β = .17, p < .01). This implies that science self-efficacy is a predictor of science related career aspirations.

In model 3, all variables and the interaction of gender and all the dimensions of science self-efficacy were included in the analysis and results show that the interaction of gender and overall science self-efficacy together with its dimensions of Biology, Chemistry and Laboratory self-efficacy were not significantly related to science related career aspirations, that is, gender x science self-efficacy(β = -.04, p = .44), gender x Biology self-efficacy (β = -.03, p = .57), gender x Chemistry self-efficacy (β = .05, p = .43) and gender x laboratory self-efficacy (β = .04, p = .43). This implies that a decrease or an increase in science self-efficacy and its dimensions of Biology, Chemistry and Laboratory does not strengthen or weaken the difference in science related career aspirations; hence they do not moderate the gender difference in science related career aspirations. On the other hand, results also show that the interaction between gender and physics self-efficacy was significantly negatively related to science related career aspirations, that is, gender x Physics self-efficacy (β = -.12, p = .03). This implies that as physics self-efficacy levels increase, the gender difference in science related career aspirations weakens and as Physics self-efficacy levels decrease, the gender difference in science related career aspirations increases with the aspirations of females lowering more than those of males; hence Physics self-efficacy negatively moderates the gender difference in science related career aspirations.

Therefore, for students having lower levels of Physics self-efficacy, there is bigger gender difference in their science related career aspirations while for students with high levels of Physics self-efficacy, there is a small gender difference in their science related career aspirations as shown in Figure 1 below:



Males' dummy code-0, females dummy code- 1

Figure 1. A graph showing the gender differences in science related career aspirations with levels of Physics self-efficacy as a moderator

Results in Table 4 also generally reveal that in model 2, gender and all the four dimensions of science self-efficacy significantly accounted for 54% of the variance in science related career aspirations (R^2 = .54, p < .01). However, in model 3, on inclusion of the interaction of gender and science self-efficacy dimensions, the variance in science related career aspirations accounted for increased to 55%

(R^2 = .55, p = .19). This was only a slight increment of 1% in R^2 hence it did not attain significance (R^2 change = .01, p = .19). This implies that when considered broadly, science self-efficacy does not significantly moderate the gender difference in science related career aspirations. Therefore, the alternative hypothesis that science self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students together with the sub-hypotheses that Biology self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students, Chemistry self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students and Laboratory self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students were rejected but the sub-hypothesis that Physics self-efficacy levels significantly moderate the gender difference in science related career aspirations among ordinary level students was retained.

5. Discussion

5.1. Gender and Self-Efficacy

Results revealed no gender difference in general science self-efficacy. However, only one significant gender difference was found in the dimension of Physics self-efficacy and no gender differences were found in the Biology self-efficacy, Chemistry self-efficacy and Laboratory self-efficacy.

5.2. Gender Difference in Physics Self-Efficacy

The study results reveal that there exists a significant gender difference in Physics self-efficacy levels with male students having higher self-efficacy than females. This implies that males had more confidence that they can undertake academic tasks in Physics as compared to their female counterparts. This shows that females underestimate their abilities in Physics which may account for the gender disparity in engineering and other physical science related courses.

This may be due to a widely held view that studying Physics leads to an engineering destination and coupled with this, some individuals think of an engineer as a dirty mechanic under a car or an electrician up an electric pole yet in some cultures, unlike males, it is a taboo for a female to climb a tree. This presents a negative view about studying Physics to females who fear that they may be viewed as less feminine or even masculine. That, coupled with lack of enough exposure to female role models in Physical sciences, inadequate career guidance, together with the fact that most Physics literature is credited to males, denies females positive vicarious experiences in Physics yet several researchers (Usher & Pajares, 2009; Zeldin & Pajares, 2000) have shown that these experiences are more essential in the development of self-efficacy in females than males hence this may explain why Physics self-efficacy is lower in females as compared to their male counterparts.

The results of the study are consistent with those of Chandresea (2013) and Kuppan et al (2011) who separately studied secondary students and found out that females had significantly lower Physics self-efficacy than males. Similarly, Archer et al (2013) found out that by year nine, there existed differences in self-efficacy between boys and girls in Physics. The application of mathematical calculations and abstract concepts makes Physics appear hard which may lower girls' Physics self-efficacy (Chandresea, 2013). In another study, Sharma and Lindstorm (2011) also found out that gender significantly affected students' Physics Self-efficacy among first year college physics students with males being more efficacious. They noted that this may be due to the "male over confidence syndrome" since males with no prior formal Physics instruction surprisingly reported the highest self-efficacy than even those who had formal Physics instruction. But Usher et al (2009) argue otherwise that for curriculum areas that are seen as masculine and more particularly Physics, it is instead the gender stereotypic perceptions that lead to males over estimating and girls under estimating their capabilities and even worse these stereotypic perceptions may be further magnified as children grow up and climb the academic ladder.

Contrary to the results of this study, Stephen (2008) found no gender difference in Physics self-efficacy among 12^{th} graders in India. He argued that due to the conservative culture where women are traditionally discouraged from pursing sciences, girls who offer sciences take it upon them to perform better on science tests and be more confident in their science and math abilities hence they hold the belief that to be successful in this male dominated field, they need to work harder than boys which leads them into investing greater effort in science classes than males and this raises their self-efficacy. However, the research was carried out among high school learners who had already specialised in sciences and as noted by Pajares (2006), girls who choose to take up sciences hold high self-efficacy in them while this research was carried out among ordinary level students who had not yet specialised in a particular field.

5.3. Gender Difference in Biology, Chemistry and Laboratory Self-Efficacy

The study results showed that there is no significant gender difference in Biology, Chemistry or Laboratory self-efficacy levels. This implies that male and female students do not differ in their confidence that they can accomplish academic tasks in Biology, Chemistry and Laboratory work.

It should be noted that from nursery school, children are taught that a female in a laboratory coat is a nurse who is very caring, at the same time a male in the same attire is a doctor and that both careers are prestigious. Despite this being short of the precise description of the two outlooks, this inspires both male and female learners to develop a positive attitude towards careers in the medical field. As the learners climb the academic ladder to secondary school, they realise that to achieve a career in a medical field requires them to study Biology and Chemistry which are both practical subjects hence the power of these social persuasions helps learners, regardless of gender, to develop resilience in the face of obstacles in these subjects that helps them to develop their confidence in them and this may explain why there is no gender difference in biological sciences.

The study results are in agreement with results of a study by Yazachew (2013) which revealed that there existed no differences between male and female self-efficacy levels in analytical Chemistry. Bandura, et al, (2001) noted that of recent, parents have become aware and appreciate the relevance of female participation in Science, Technology and Mathematics (STEM) and have made their children aware as well. With much emphasis directed to females, children have been persuaded that they are capable of accomplishing tasks in STEM fields and as a result they have invested quite a lot of energy in STEM paying little attention to their incompetence even in the face of obstacles. The much attention given to females has boosted females' science efficacy levels than those of males that by now the efficacy levels of females which were thought to be lower are not much different from those of males.

Various other studies at various education levels have also found results that are in line with those of this study, that is, Karaarslan and Sungur (2011) and Ucak and Bag (2012) at elementary level; Goulao (2014), Minnigerode (2012) and Sungur and Kiran (2012) at middle school; Dullas (2005) and Usher et al (2013) at high school, have all found no gender difference in self-efficacy levels. Macphee et al (2013) argued that it is mentoring that has bridged the gender gap in science self-efficacy. They followed up the impact of a mentoring program intervention on academic self-efficacy in STEM among students and found out that at admission, there existed gender differences in self-efficacy with females perceiving themselves weaker despite having the same academic potentials as males but after the mentoring intervention, the academic self-efficacy of the females was no different from that of males.

Inconsistent with the study results, Kothari and Patra (2016) also argued that the gender differences in self-efficacy arise due to negative gender stereotypes being very powerful and result in female capabilities being undermined compared to those of males; yet individuals are much likely to be successful if they attempt tasks in which they believe they are good at. This was further supported by Chavez, Beltran, Guerrero, Enriquez, & Reyes (2014) who also pointed out that it is the socialisation process that gives males and females a different perception of the appropriate tasks, activities and occupations appropriate for each gender which accounts for the gender disparity in science self-efficacy. Therefore, the society perception that sciences are a male domain results into females redirecting their energies to the non-science traditional domains and losing confidence that they can perform science academic tasks as much as males. However, all these studies were among college students who had already specialised in either arts or sciences yet this study was in ordinary secondary level with students who had not yet specialised.

Distinctively, the study results by Webb-Williams (2014) and Zuraidah (2010) point to a different bearing. They separately found gender differences in self-efficacy but noted that it is the females who possessed higher levels of self-efficacy than males. However, all these studies were carried out at primary level and as Britner and Pajares (2006) found out, at primary level, sciences are taught with language than laboratory or practical oriented methods yet girls have a greater faculty of language than boys do; hence boys are out performed making girls feel more efficacious.

5.4. Gender and Science Related Career Aspirations

Overall, the study results show no significant gender difference in science related career aspirations. However, a significant gender difference in the science educational aspirations dimension was found whereas there was no gender difference in the occupational aspirations dimension.

5.5. Gender Difference in Science Educational Aspirations

The study results show that there was a significant gender difference in science educational aspirations among ordinary level students with females having lower aspirations compared to males. This implies that female students aspire less to continue studying sciences beyond the compulsory level up the academic ladder compared to their male peers. This may explain why female enrolment in sciences has remained low at advanced level and beyond despite their being compulsory at ordinary level.

This may be attributed to lack of fundamental curriculum reforms in science content rendering it less appealing to females. This is largely due to a general held view of the science masculine outlook and negative gender biased stereotypes coupled with limited mentoring and academic guidance to the learners. More to that, apart from raising the entry cut off points for science combinations as compared to those of arts, schools go ahead to separate these points by gender where they are somehow lower for females compared to their male peers. This does not only give an impression that sciences are for the brainy, but also gives an impression that females are less capable in sciences compared to males. This negative exposure may create a hysteria of female inferiority versus male superiority in sciences and eventually negative stereotypes in sciences against females develop which may lower females' interest and aspirations to continue studying sciences up the academic ladder beyond the compulsory level.

The study results are in line with study findings by the Institute of Physics (IOP, 2014) which found out that there existed a significant gender difference in students' educational aspirations. They found gender as one of the major demographic factors that correlated with the likelihood of a young person choosing a physics course beyond the compulsory level. It was noted that very few females wish to take up sciences particularly Physics. They in fact observed that one female student dropped physics in year 13 since continuing with it would have made her the only girl in the Physics class. Moreover, after an intervention program called Physics busking, only one girl was able to change her mind from aspiring being an English teacher to wishing to take Physics at advanced level and study science at the university.

In a related study, Schoon, Ross, & Martin, (2007) found out that there existed a persistent gender imbalance in terms of educational attainment and occupational attainment with more boys than girls aspiring for a career in Science and Technology. They attributed this to the family backgrounds lacking professional females to inspire the young females since women who aspire for STEM-related careers are more likely to have come from families with a professional rather than non-skilled background compared to men and still the association between early aspiration and later career attainment was stronger for women than men. Therefore, if a female is not inspired to take up a STEM career early in life, they are less likely to aspire for them later in life while men are likely to be drifted into STEM without being guided by earlier aspirations for the domain. Furthermore, they noted that school environment is also central to the development of STEM aspiration hence teachers have a vital role to recognise and encourage science and math related aptitude in their female pupils' while taking into account that differential attainment, treatment and placement in science and math of girls and boys may reinforce stereotypic views and negative self-concepts that may push females away from studying sciences.

Similarly, when Aschbacher, Li, & Roth, (2010), in a longitudinal study, followed 33 students to high school, results revealed that gender plays a significant role sometimes interacting with social economic status and ethnicity in students' educational aspirations and persistence in the science pipeline since it affects the development of students' identities, participation and career goals in science for example girls who often express a strong desire to help others may be more likely than boys to enrol in health sciences through high school. Similarly, Archer et al (2013) also found that gender, social class and ethnicity patterned the likelihood of a student expressing science aspirations. They noted that women remain underrepresented in physical sciences at post science compulsory level in what is referred to as "leaky pipeline" where girls participate in progressively lower numbers as they move along the science educational qualification and career ladder. They found that one contributing factor is the widely held view that science careers are predominantly a male domain that even parents who were supportive of their daughters' science aspirations recognised that girls probably have to work twice as hard as boys to succeed in a male dominated field such as science especially Physical sciences. Thus, by year nine, girls who aspire for sciences are very much minority compared to their counterpart peers and described as odd; hence such girls may require considerable resilience to maintain their aspirations over time.

Consistent with the study results, Koul, Lerdpornkulrat, & Chantara, (2011), while investigating career aspirations, motivation towards Biology and Physics and the influence of gender, attributed the gender differences that existed in Biology and Physics career aspirations to motivational goals. They noted that males are performance-goal-oriented; thus are motivated to impress others, for self -enhancement, to gain public recognition and a sense of superiority. Thus, to fulfil this ego, they tend to inflate and report high science career aspirations but the females are instrumental-goal-oriented; thus motivated to value studying science for self-improvement and academic and career progress hence tend to report lower science career aspirations as their motivational goals are more self-centred.

Contrary to the results of the study, Uka (2015) and Bora (2016) found out that males were not significantly different from females in educational aspirations. Bora (2016) argued that the improved levels of mothers' education has been vital in shaping career development of female children in that they have either acted as role models or as key socialisers to their daughters. This has raised their educational aspirations in many fields such that by now there is a slight increase in aspirations towards pure science and health professions among girls than boys; hence bridging the gender gap in science aspirations. However, the above results were from the western world where improvement of female education started long ago unlike the Ugandan context where the current research was carried out since the levels of education of mothers in Uganda is low given the fact that gender equality in education was given more priority recently when the parents of the study respondents were most likely to be no longer of school going age.

5.6. Gender Difference in Science Occupational Aspirations

The study results revealed that there was no significant gender difference in science occupational aspirations among ordinary level students. This implies that male and female students equally wished to have occupations that are related to science.

This may be attributed to various interventions from both government and various Non-Governmental Organisations that have aided students to appreciate the importance and advantages of being in a science career which raises their science occupational aspirations. Besides, science occupations are generally more paying and their demand is high on the job market as compared to humanities. Therefore, many adolescents wish to reap from such benefits and opportunities; hence, regardless of gender or academic ability to pass sciences, they equally aspire for science related occupations.

The results are consistent with other previous researches which found that the predictive strength of gender on science occupational aspirations was non-significant (Chandresena, 2013; Bora, 2016; Sterritt, 2016; & Uka, 2015). These studies may represent the current trend which could indicate the success of several interventions and strategies that have been put up to bridge the gender gap in science occupational aspirations by removing multiple barriers women faced including; society's continued stigmatisation of women in science fields and limited exposure of females to specific field role models. The increase in female role models in sciences has raised females' aspirations to work in science related occupations as it was found out that females who interact in a meaningful way with at least one role model possess higher aspirations in science careers than those who had less meaningful or no role modelling at all (Rudroff, 2007).

Contrary to the results of this study, Patton and Creed (2007) found out that occupational aspiration discrepancies differed across gender with males more likely to choose professional occupations than females. Similarly, Frostick, Phillips, Renton, & Moore (2015) and Riegle-Crumb, Moore, & Ramos-Wada (2010) reported that males had significantly higher occupational aspirations than females. The latter reported that gender differences in enjoyment coupled with self-concept are crucial in differential development of future interests which interests are a trajectory to future career aspirations. Therefore, females' low science enjoyment leads to low future science interests which drifts into their low science occupational aspirations and still gender differences in self-efficacy or self-concept get translated into gender differences in science career aspirations.

In another study, Kothari et al (2016) also reported gender difference in occupational aspirations which is inconsistent with this study results. They noted that for many science occupational fields like engineering, society has created an environment of dominant masculinity where female students may feel that being an engineer for example makes one unfeminine and hence sexually unattractive in the heterosexual world, that is, a female fears being perceived to be adopting a masculine identity that is associated with science occupations which is even magnified by the absence of role models. However, the respondents for this research were from a working class yet this study respondents were students.

5.7. Science Self-Efficacy and Science Related Career Aspirations

Results of the study showed a significant positive relationship between science self-efficacy and science related career aspirations. This implies that the more students feel that they have the capability to accomplish academic tasks in sciences, the more likely they aspire for careers related to science.

The results are in agreement with those of a study by Loius et al (2012) who found that math and science self-efficacy impacts career choices in math and science. Herrera, Hurtado, & Chang, 2011) also observed that students' commitment to science or the value they place on making a theoretical contribution to science influences students' STEM career aspirations hence students with high academic self-efficacy are more likely to retain their STEM career interests. Therefore, psychological factors like self-efficacy that influence individual actions are very important considerations in seeking to understand career development.

In a related study, Kuppan et al (2011) studied the factors affecting senior ones' career aspiration in Physics and found that self-efficacy plays a prominent role in shaping students' Physics career aspirations. They noted that students who feel that they have the ability to do well in Physics have a tendency to aspire for Physics related careers in future hence it was reported that it is the low sense of competence in Physics that has contributed to the persistent underrepresentation of women in Physics related careers. It is, therefore, worthwhile that teachers consider restructuring the science learning experiences so as to enhance students' self-efficacy in specific science domains (Chandresena, 2013) so that more students may aspire for science careers.

Mung'ara (2012) found a direct relationship between science self-efficacy and science career aspirations. Similarly, Backer and Haulualina (2012) found out that women who choose to study engineering felt high confidence in their abilities to succeed in engineering projects. Minnigerode (2012) followed students STEM career goals for one year and found out that students who had higher self-efficacy did not change their goal to study STEM and those who by the end of the year still had interest in pursuing STEM had higher self-efficacy than those who by the end of the year showed no interest in STEM. Therefore, self-efficacy does not only predict STEM career aspirations but also predicts maintenance of STEM career goals as it is the goals we set that sustain and maintain behaviour that shape our career aspirations.

Contrary to the results of the study, Kurczewska and Bialek, (2014) investigated whether the interplay between self-efficacy and entrepreneurial intentions were gender dependent and they found out that self-efficacy is not a major factor in shaping entrepreneurial intentions.

6. Conclusions

Results of the study indicate that students' physics self-efficacy differed by gender with males being more efficacious than females. Therefore, male students express more confidence that they can accomplish academic tasks in physics as compared to their female counterparts. Hence, whether a student has low or high physics self-efficacy will depend on the student's gender. Furthermore, the study results indicate the male and female students did not significantly differ in their confidence to accomplish academic tasks in Biology, Chemistry and Laboratory skills. Therefore, having high or low Biology, Chemistry or Laboratory self-efficacy does not depend upon the gender of a student.

Results of the study also reveal that male and female students differed in their science educational aspirations where female students aspired less to continue studying sciences beyond the senior four compulsory level than male students. This suggests that whether a student has high or low science educational aspirations will depend on that student's gender. However, results also show that there existed no difference between male and females' aspirations to venture into science related occupations which suggests that both male and female students wish to have science related occupations despite females finding studying sciences rather difficult. For example, a student wishing to be a doctor but finds studying Chemistry hard hence does not wish to continue studying it.

According to the results of the study, science self-efficacy positively and significantly influences students' science related career aspirations. Therefore, a student with higher levels of science self-efficacy will aspire more for science related careers as compared to those with lower levels of science self-efficacy.

7. Recommendations

There exist gender differences in science educational aspirations. Therefore, teachers are urged to ensure that when teaching, science lessons are motivating and girls participate fully as equally as boys. There should also be training in self-efficacy for girls. This may enhance girl aspirations to continue studying sciences up the academic ladder.

Students' science career aspirations are dependent on their levels of self-efficacy. Therefore, science educators need to measure students' self-efficacy regularly so as to identify those with low levels of self-efficacy and intervene to enhance it, for example, through verbal persuasion, peer or role modelling, mentoring among others. Moreover, teachers should also analyse their learners' goals and talk to them about these goals. Once students' self-efficacy is enhanced, their goals will be streamlined towards sciences and they will look at science as a potential option for their future hence aspire more for careers related to science.

Science self-efficacy affects science related career aspirations. Therefore, intervention programs that can boost students' self-efficacy in sciences should start early right from primary school so as to broaden learners' science related career aspirations early in life. Since literature has shown that learners' career aspirations develop as early as nine years while still in primary school and by 14 years they are relatively fixed, focusing efforts and interventions in secondary school may be a little too late.

Awareness about science careers should be embedded within science lessons by science teachers. Thus, what is learnt in class should be thoroughly connected to numerous real life science careers and day to day science applications as this will open up a students' mind to the various opportunities in science that might boost the aspirations for science career in both male and female students.

The brainy image of sciences should be broken by educational institutions through relaxing the entry restrictions to science subjects after senior four as most educational institutions place very high and tight cut off points on taking science subjects as compared to other arts subjects which makes sciences look as if they are for only the genius. Students end up developing a negative attitude that sciences are not for them since they are not among the best in class. Hence, instead of focusing on their weaknesses to eliminate them and improve, they just give up on sciences. Therefore, it is important to portray to students that sciences are inclusive and can be offered by anyone regardless of their gender or age or performance. Thus, if students invest more energy in sciences, their science self-efficacy will rise and consequently their aspirations for science related careers.

Students' gender has an effect on their Physics self-efficacy. It is, therefore, recommended that educators expose students to female role models in physical sciences and also take them to study tours in manufacturing industries as this may help break the notion that physical science is a male domain. This could be coupled with mentoring interventions and follow up whose verbal persuasion helps to enhance females' efficacy in Physics. When females' self-efficacy increases, they will aspire more for careers in physical sciences and generally all science fields which may eliminate the gender difference in aspiration and occupational representation in sciences.

Policy makers, in particular the Ministry of Education and Sports, should find ways of diversifying science options that students can choose from after senior four since there are currently fewer options for learners to continue studying sciences after senior four outside the usual traditional Biology, Chemistry or Physics subject combinations at advanced level. Therefore, more science career pathways like technical or vocational and more nursing options should be availed and promoted among students so that after this level they are not lost from the science pipeline which all requires policy and curriculum review.

The Ministry of Education and partner NGO's together with educational institutions should invest resources into sensitisation programs to widen young peoples' views of where sciences can lead them to hence break the notion that studying sciences will lead one to only work in science fields. Educators, therefore, need to highlight the wide value of studying sciences in the 21st century and further emphasize how attaining a qualification in sciences can be of great value in propelling an individual into a wide variety of careers and make it clearly understood that sciences keep one's options open as this may help to keep many students in the science pipeline.

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