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Learner Attitude towards Chemistry, Study Skills and Examination Preparedness: A Case of a Public School in Eastern, Kenya

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Abstract This study intended to test if there was significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between boys and girls, between boarders and day scholars and between low and high achievers. Two hundred and eleven (211) subjects participated. A questionnaire was designed to measure preparedness in chemistry in relation to attitude towards chemistry, study skills, and exam preparedness. To address the hypotheses, frequency distributions and other descriptive statistics including means, standard deviations and percentages were used. Independent sample t-tests were performed to address the first and the second hypotheses to determine whether differences between variables existed. The results indicate that there is homogeneity of variance amongst attitude towards chemistry, study skills and exam preparedness. The findings also inform that preparedness in chemistry in terms of attitude towards chemistry, study skills, and exam preparedness is the same in both boys and girls but boys lagged slightly below girls in attitude towards chemistry. There was no significant difference in chemistry preparedness between genders in relation to these variables. Borders and day scholars have similar preparedness in chemistry in terms of attitude, study skills and exam preparedness. The results further show that day scholars have a slightly higher preparedness in chemistry than the boarders. Higher achievers have more positive attitude towards chemistry, better study skills and higher exam preparedness.

Keywords: *learner, attitude, chemistry, study skills, examination preparedness*

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1. Introduction

Attitudes, as constructs of affective domain, have been in the research forum for several years (Aiken & Aiken, 1969; Koballa & Crawley, 1985; Koballa, 1988). Attitudes have determined the power to predict future behaviors like subject and career preferences of learners (Koballa, 1988; Osborne, Simon & Collins, 2003), and the relationship existing between attitude and academic achievement (Schibeci, 1984; Shrigley, 1990; Weinburgh, 1995; Osborne & Collins, 2000). In their meta-analysis of attitude related factors that predict future behaviors, Glasman and Albarracín (2006) concluded that there is a correlation between attitudes and future behaviors; that is, attitudes are a potential for predicting future preferences, especially if there is a direct interaction between participants and the attitude object (i.e. objects that related to attitude like science lessons). Actually, studies that examined the correlation between attitude and academic achievement did not provide consistent results. Schibeci (1984), for instance, found a strong relationship between attitude and achievement. Shrigley (1990), on the other hand, argued that there is only moderate relationship between attitudes toward science and science achievement. Add some more studies please.

The attitude literature has concentrated on a range of aspects (Osborne et al., 2003) such as defining attitude and making a distinction among similar terms (Koballa, 1988), defining attitude objects (Spall, Dickson & Boyes, 2004), and developing attitude constructs (Kind, Jones & Barmby, 2007).

Besides defining attitudes and dimensions of attitude, the literature deals widely with the factors affecting attitude toward science. Grade levels (Hofstein, Ben-Zvi, Samuel & Tamir, 1977; Yager & Yager, 1985; Simpson & Oliver, 1990; Francis & Greer, 1999; George, 2006; Barmby et al., 2008), gender (Hofstein et al., 1977; Harvey & Stables, 1986; Francis & Greer, 1999; Barmby et al., 2008), achievement (Weinburgh, 1995; Salta & Tzougraki, 2004) are some of the most investigated factors affecting secondary school students' attitudes toward science.

Study skills are those skills which are required for understanding and retrieving information; particular they are the link between comprehension and memorization (Al- Hilawani & Sartawi, 1997). Hoover (1989) has listed specific competencies of study skills including acquiring information, recording information, recording appropriate

responses to the presented information, locating the required information, organizing and managing activities efficiently, synthesizing information to create meaningful patterns of responses, and memorizing and retrieving information on demand.

Literature boasts of studies suggesting benefits of utilizing effective study skills. Al-Hilawani and Sartawi (1997) report students with improved GPA had adequate study skills, and students who are academically unsuccessful, sparingly use study skills than high achieving students. Hoover (1989) indicates that good study skills and habits are the tools that assist students during the learning process in order to acquire and retain new information and are essential for students' successful academic performance. Jones, Slate and Kyle (1992) reported that high achieving students have better study skills than low achieving students in areas of time management, study techniques and attitudes toward learning.

DiVesta and Moreno (1993) viewed study skills as a compensation for cognitive limitations in the information processing system and reported that there was a significant correlation between GPA and comprehension monitoring activities, which in turn was an indication that students with high GPA practice self awareness, purposeful planning and self-adjustment activities more than students with low GPA. Studies self-regulated learning examines this process in terms of teachable cognitive skills where students learn to think about the way they learn (Paris & Winograd, 2001).

While positive study behaviors are important to student achievement, knowledge of the actual study behaviors and techniques utilized is rather limited (Elliot et al, 2002). Scholars do however agree that students typically utilize a variety of studying techniques (Allgood et al, 2000), while the actual techniques utilized are rarely documented (King 1992; Stanley et al., 1999; Van Meter et al, 1994; Wood et al. 1999).

Self-regulated learners' proactive qualities and self-motivating abilities help to distinguish them from their peers. Research shows that self-regulated students are more engaged in their learning. These learners commonly seat themselves toward the front of the classroom (Labuhn, Zimmerman, & Hasselhorn, 2010), voluntarily offer answers to questions (Elstad & Turmo, 2010), and seek out additional resources when needed to master content (Clarebout, Horz, & Schnotz, 2010). Most importantly, self-regulated learners also manipulate their learning environments to meet their needs (Kolovelonis, Goudas, & Dermitzaki, 2011).

For example, researchers have found that self-regulated learners are more likely to seek out advice (Clarebout et al., 2010) and information (De Bruin et al., 2011) and pursue positive learning climates (Labuhn et al., 2010), than their peers who display less self-regulation in the classroom. Due to their resourcefulness and engagement, it is not then surprising that findings from recent studies suggest that self-regulated learners also perform better on academic tests and measures of student performance and achievement (Schunk & Zimmerman, 2007; Zimmerman, 2008).

To promote SRL in classrooms, teachers must teach students the self-regulated processes that facilitate learning. These processes often include: goal setting (Winne & Hadwin, 1998; Wolters, 1998), planning (Zimmerman, 2004; Zimmerman & Risemberg, 1997), self-motivation (Corno, 1993; Wolters, 2003; Zimmerman, 2004), attention control (Harnishferger, 1995; Kuhl, 1985; Winne, 1995), flexible use of learning strategies (van de Broek, Lorch, Linderholm, & Gustafson, 2001; Winne, 1995), self-monitoring (Butler & Winne, 1995; Carver & Scheier, 1990), appropriate help-seeking (Butler, 1998; Ryan, Pintrich, & Midgley, 2001), and self-evaluation (Schraw & Moshman, 1995).

Creating SRL environments for the complex and diverse range of backgrounds, skill sets, and personalities that many students encompass poses challenges to the most experienced teachers too. Fortunately, a great deal of literature showcases a variety of effective instructional strategies for encouraging self-regulation in the classroom (Andreassen & Braten, 2011; Boekaerts & Corno, 2005; Cleary & Zimmerman, 2004; De Corte, Mason, Depaepe, & Verschaffel, 2011; Dignath & Buettner, 2008; Graham, Harris & Mason, 2004; Souvignier & Mokhlesgerami, 2006; Stoeger & Ziegler, 2011; Tonks & Taboada, 2011). Some of these strategies include direct instruction and modeling, guided and independent practice, social support and feedback, and reflective practice.

2. Method

This study tested three null hypotheses:

a. HO: There is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between boys and girls.

b. HO: There is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between boarders and day scholars.

c. HO: There is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between low and high achievers.

2.1. The Sample

The respondents were secondary school students from all classes (form 1 to form 4) from a public school in Kenya whose student population is 689 students. Since the sample was obtained from already existing groups, the sampling design qualified to be stratified sampling. Through purposive sampling, it was ensured that the strata (all classes) were adequately represented in the sample. The valid sample size was composed of 211 subjects of which 111 were boys and 100 were girls. Of all the respondents in the sample, 56 were in form one, 51 in form two, 54 in form three and 50 in form four. Majority (173 students) aged between 15 and 18 years and few aged below 15 (14 students) and above 18 (24 students) years.

2.2. The Instrument

For the purpose of this survey, a questionnaire was designed to measure preparedness in chemistry in relation to attitude towards chemistry, study skills, and exam preparedness. The first part of the questionnaire was designed to get demographic information from the students. This part of the questionnaire garnered students'

information on gender, being a boarder or a day-scholar and students' score in the previous term's chemistry exam. The second part of the questionnaire consisted of 12 items to assess students' attitude towards chemistry, 19 items to dig up information on study skills, and 12 items to assess exam preparedness.

Each respondent was instructed to read the statements in part one and put a tick in the brackets against the most appropriate answer to the question asked. In a four likert scale; 1- Disagree, 2- Tend to Disagree, 3- Tend to Agree, and 4- Agree, the respondents were asked to put a tick in the box matching best matching his/her opinion in the four columns.

The total number of items used in the questionnaire was 47 and were in two categories, 30 positively stated statements and 17 negatively stated statements, all used to draw information from the respondents. The negatively stated statements were recorded, hence, given values 4, 3, 2, and 1 instead of 1, 2, 3 and 4 before performing treatments with SPSS apart from obtaining the frequency tables.

Using the 47 items, the questionnaire's reliability was found to be .901 with a Cronbach's test against an alpha value of .05, implying that the probability of not committing type 1 error was 95 per cent.

2.3. Data Analysis

All analyses were performed using the Statistical Package for Social Science (SPSS). To address the hypotheses, frequency distributions and other descriptive statistics including means, standard deviations and percentages were used. Descriptive statistics describe basic feature of the data under study in simple summaries (Vogt et al., 2014). Independent sample t-tests were performed to data used to address the first and the second hypotheses because there was need to determine whether differences between variables existed. Independent sample t-test compares means' differences between two independent samples (Bui, 2009). For the third hypothesis, Pearson product Moment Correlation Coefficients was determined to test relationships between variables.

3. Results and Discussion

HO: There is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between boys and girls.

To test the attitude towards chemistry, study skills and exam preparedness as aspects of 'preparedness in chemistry', students responded to statements in a likert scale format which had a 4-point rating scale labeled; 1-disagree, 2-tend to disagree, 3-tend to agree and 4-agree. Independent samples t-test was done to determine whether there is a significant difference between boys' and girls' preparedness in chemistry in relation to attitude towards chemistry, study skills, and exam preparedness. The results were as shown in Table 1 and Table 2 and summarized in Table 3.

Table 1.

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
ATTITUDE TOWARDS CHEMISTRY	Male	111	3.5627	.50930	.04834
	Female	100	3.5893	.46577	.04658
STUDYSKILLS	Male	111	3.1396	.46378	.04402
	Female	100	3.1144	.44541	.04454
EXAM PREPAREDNESS	Male	111	3.4392	.55595	.05277
	Female	100	3.3991	.54647	.05465

Table 2.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Attitude Towards Chemistry	Equal variances assumed	1.079	.300	-.395	209	.694	-.02661	.06744	-.15957	.10634
	Equal variances not assumed			-.396	208.950	.692	-.02661	.06713	-.15895	.10572
Study Skills	Equal variances assumed	.285	.594	.400	209	.689	.02512	.06276	-.09860	.14883
	Equal variances not assumed			.401	208.135	.689	.02512	.06262	-.09834	.14857
Exam Preparedness	Equal variances assumed	.297	.586	.527	209	.598	.04010	.07603	-.10979	.18999
	Equal variances not assumed			.528	207.404	.598	.04010	.07597	-.10967	.18986

Table 3.

	Male		Female			
	Mean	Standard Deviation	Mean	Standard Deviation	t(df)	Sig
Attitude towards chemistry	3.5627	.50930	3.5893	.46577	.395(209)	.694
Study skills	3.1396	.46378	3.1144	.44541	.400(209)	.689
Exam preparation	3.4392	.55595	3.3991	.54647	. 527(209)	.598

In Table 2, the Levene's test for equality of variances has Sig values of .300 for 'attitude towards chemistry', .594 for 'study skills' and .586 for 'exam preparedness' which are greater than .05 (alpha value). The null hypotheses for testing for homogeneity, 'there is homogeneity of variance' are therefore accepted. This confirms that sample groups were obtained from populations which have equal variances (Quinn & Keogh, 2002).

Table 3 above shows that the p-values for the three aspects of chemistry preparedness are above the alpha value which is .05 (P=.694, P=.689, P=.598), meaning the null hypothesis 'there is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between boys and girls' is accepted. In other words, boys' preparedness in chemistry in terms of attitude towards chemistry, study skills, and exam preparedness is the same as that of girls. The mean for the attitude towards chemistry is slightly higher in girls than in boys. But this difference is not statistically significant.

The findings are in harmony with those of Satta and Tzouglaki (2004) whose study found no differences between boys' and girls' attitude towards chemistry, but differs in the sense Satta and Tzouglaki (2004) observed a tendency of girls to be more negative than boys.

The findings contradict those of many studies done in the recent past (Nyamba & Mwajombe, 2012; Can, 2012; Cheung, 2007). Although many studies agree that gender is a factor that influences attitude towards chemistry (Nyamba and Mwajombe 2012; Can, 2012; Cheung, 2012), their findings vary in that some studies find girls to have a more positive attitude (Cheung 2007). Other studies find girls to lag slightly behind boys in attitude towards chemistry (Nyamba & Mwajombe, 2012) but this survey found out that boys lag slightly below girls in attitude towards chemistry. Cheung (2007) in a study on the interactive effect between grade level and gender discovered that males reported greater liking for chemistry theory lessons than their female counterparts. In a study on *Gender Disparities in Self-concept, Attitude and Perception in Physics and Chemistry*, male students had a more positive attitude towards Physics than the female students though the differences were not statistically significant and mean attitude scores of both groups show that these students had positive attitude toward Physics and Chemistry (Inzahuli, Role & Makewa, 2012).

Table 4.

Group Statistics					
	Residence	N	Mean	Std. Deviation	Std. Error Mean
Attitude towards Chemistry	Day scholar	140	3.5855	.46190	.03904
	Boarder	71	3.5554	.53916	.06399
Study Skills	Day scholar	140	3.1307	.46227	.03907
	Boarder	71	3.1216	.44121	.05236
Exam Preparedness	Day scholar	140	3.4160	.56967	.04815
	Boarder	71	3.4284	.51453	.06106

Table 5.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Attitude Towards Chemistry	Equal variances assumed	.134	.715	.422	209	.673	.03008	.07127	-.11041	.17057
	Equal variances not assumed			.401	123.210	.689	.03008	.07495	-.11829	.17844
Study Skills	Equal variances assumed	.092	.762	.138	209	.890	.00917	.06634	-.12161	.13995
	Equal variances not assumed			.140	146.734	.889	.00917	.06533	-.11994	.13828
Exam Preparedness	Equal variances assumed	.001	.970	-.154	209	.878	-.01239	.08040	-.17088	.14611
	Equal variances not assumed			-.159	154.095	.874	-.01239	.07776	-.16600	.14123

Can (2012) did a similar study to that of Cheung (2007), but realized that female students expressed a higher liking for chemistry lessons than male students. In both cases, these studies had similar findings, that both boys' and

girls' attitude towards chemistry is slightly average, this survey's finding concurs with their findings. The trend in attitude towards chemistry in relation to gender varies with factors that can be determined in another study.

Similarly, the p values for the study skills (p=.689) and exam preparedness (p=.598) were average and above, indicating that, there is no significance in chemistry preparedness between genders in relation to these variables.

HO: There is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between boarders and day scholars. The results for the independent t-test are in the Table 4 and Table 5 and summarized in Table 6.

The Levenes sig values as indicated in Table 5 are .715 for 'attitude towards chemistry', .762 for 'study skills', and .970 'for exam preparedness' all of which are greater than the critical value of .05. The implication is that there is homogeneity of variance.

Table 6.

	Day scholar		Boarder			
	Mean	Standard Deviation	Mean	Standard Deviation	t(df)	Sig
Attitude towards chemistry	3.5855	.46190	3.5554	.53916	.422(209)	.673
Study skills	3.1307	.46226	3.1216	.44121	.138(209)	.890
Exam preparation	3.4160	.56967	3.4284	.51453	.-154(209)	.878

In Table 6, all the p-values (P=.673, P=890, P=878) are greater than .05 hence the null hypothesis is accepted. Borders and day scholars have similar preparedness in chemistry in terms of attitude, study skills and exam preparedness. However, the day scholars have a slightly higher preparedness in chemistry (μ=3.5855) than the boarders (μ=3.5554). Previously in this study, it has been revealed that the students have a notable problem with consulting their teachers. While the boarders spend most of their time with the teachers and other supportive staff, they may lack as much encouragement at school as the day-scholars get from home. As Azubuike (2011) found out in a study on factors that influence attitude towards vocational subjects, parents and guardians play a vital role in determining students' attitude towards a subject.

HO: There is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between low and high achievers.

In this survey, achievement was determined using the students' score in end term one chemistry tests.

Table 7 and Table 8 give the results of the t-tests on the basis of achievement.

Table 7.

Group Statistics					
	End-term one Chemistry score	N	Mean	Std. Deviation	Std. Error Mean
Attitude towards chemistry	34 and below	33	3.1671	.66960	.11656
	65-79	46	3.6957	.39056	.05758
Study skills	34 and below	33	2.7358	.58180	.10128
	65-79	46	3.3357	.30370	.04478
Exam preparedness	34 and below	33	2.8232	.69026	.12016
	65-79	46	3.6522	.39996	.05897

3.1. T Test

Table 8.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Attitude towards chemistry	Equal variances assumed	16.410	.000	-4.414	77	.000	-.52853	.11973	-.76695	-.29010
	Equal variances not assumed			-4.065	47.514	.000	-.52853	.13001	-.79000	-.26705
Study skills	Equal variances assumed	16.336	.000	-5.962	77	.000	-.59997	.10063	-.80035	-.39959
	Equal variances not assumed			-5.418	44.524	.000	-.59997	.11074	-.82307	-.37687
Exam preparedness	Equal variances assumed	8.527	.005	-6.730	77	.000	-.82894	.12317	-1.07420	-.58368
	Equal variances not assumed			-6.193	47.320	.000	-.82894	.13385	-1.09816	-.55972

The p values for the Lavene's test for homogeneity (Table 8) equal to .000 which is less than .05, hence, the null hypothesis 'there is homogeneity of variances' is rejected. The sig values for the dimensions in question are P=.000 for attitude towards chemistry, P=.000 for study skills and P= .000 for exam preparedness. The null hypothesis 'there is no significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between low and high achievers' is rejected. This means that the high achievers have different levels of preparedness for chemistry from the low achievers.

Table 7, suggests that the means for higher achievers are higher than for low achievers in the three dimensions. Higher achievers have more positive attitude towards chemistry (μ=3.6957) interpreting to high rating while the low achievers have positive attitude that rates average (μ=3.1641). Higher achievers recorded to practice better study skills as evidenced by average mean rating of (μ=3.3357) than low achievers (μ=2.7358). Similarly, higher achievers exhibit higher exam preparedness as indicated by the high mean rating of (μ=3.6522) than low achievers (μ=2.8232).

The findings are similar to those of other studies done in the recent past (Hofstein & Naaman, 2011; Aydeniz & Kaya, 2012). These studies indicate that students, who score low in science, have negative attitude towards it. The study associated the negative attitude in low performers with low self-esteem and lack of self efficacy.

HO: Attitude towards chemistry, study skills, and exam preparedness as aspects of chemistry preparedness are not correlated.

The Pearson product moment correlation coefficient was determined to measure the degree of relationship between variables. Table 9 gives information on levels of relationship between attitude towards chemistry, study skills and exam preparedness as measures of preparedness in chemistry.

Table 9.

Correlations				
		ATTITUDE TOWARDS CHEMISTRY	STUDYSKILLS	EXAM PREPAREDNESS
ATTITUDE TOWARDS CHEMISTRY	Pearson Correlation	1	.596**	.526**
	Sig. (2-tailed)		.000	.000
	N	211	211	211
STUDYSKILLS	Pearson Correlation	.596**	1	.740**
	Sig. (2-tailed)	.000		.000
	N	211	211	211
EXAM PREPAREDNESS	Pearson Correlation	.526**	.740**	1
	Sig. (2-tailed)	.000	.000	
	N	211	211	211
**. Correlation is significant at the 0.01 level (2-tailed).				

All the P-values are less than .005 (sig=.000) implying that the null hypothesis 'attitude towards chemistry, study skills, and exam preparedness as aspects of chemistry preparedness are not correlated' ought to be rejected. There is a moderate positive relationship between attitude towards chemistry and study skills (Pearson r=.596). Similarly, attitude towards chemistry has a moderately positive relationship with exam preparedness (Pearson r=.526). The relationship between study skills and exam preparedness is strongly positive (.740). The way a student studies determines how prepared the student is towards exams, so that the more and better the study skills, the more the student is prepared to tackle exams.

4. Conclusions and Recommendations

This study intended to test if there was significant difference in chemistry preparedness in terms of attitude towards chemistry, study skills and exam preparedness between boys and girls, between boarders and day scholars and between low and high achievers. It also aimed at testing the relationship between the students' attitude, study skills and exam preparedness in chemistry. Two hundred and eleven (211) subjects participated. A questionnaire was designed to measure preparedness in chemistry in relation to attitude towards chemistry, study skills, and exam preparedness. To address the hypotheses, frequency distributions and other descriptive statistics including means, standard deviations and percentages were used. Independent sample t-tests were performed to address the first and the second hypotheses to determine whether differences between variables existed. The findings also inform that preparedness in chemistry in terms of attitude towards chemistry, study skills, and exam preparedness is the same in both boys and girls but boys lagged slightly below girls in attitude towards chemistry. There was no significant difference in chemistry preparedness between genders in relation to these variables. Borders and day scholars have similar preparedness in chemistry in terms of attitude, study skills and exam preparedness. The results further show that day scholars have a slightly higher preparedness in chemistry than the boarders. Higher achievers have more positive attitude towards chemistry, better study skills and higher exam preparedness. The three variables are correlated.

Being ready to learn is an essential ingredient. It can help students develop better learning habits and strengthen their study skills, apply learning strategies to enhance academic outcomes, monitor their learning process, and evaluate their academic concerns. This, therefore, suggests that teachers should familiarize with the factors that influencing the learner's ability to prepare to learn and the strategies they can use to identify and promote self-regulated learning in their classrooms. In addition to self-regulation, motivation can have a long-lasting impact on students' academic outcomes.

4.1. Recommendations for Further Studies

1. A replica of the study can be carried out in schools in different area for comparative purposes. For example to compare rural and urban, boys' and girls' in single sex schools.

2. A study can be carried to determine causes of poor performance if students have positive attitude towards a subject.

3. A study on the relationship between job aspirations and attitude towards chemistry can also be done.

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