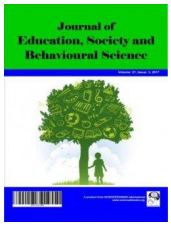

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Motivation to Learn Biology: Gender and School Type Differences in Co-Educational Schools in Siaya County, Kenya

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Aims: The purpose of the study was to investigate gender and school type differences in motivational orientations among grade 10 students in co-educational schools of Siaya County, Kenya.
Study Design: The study adopted a concurrent mixed methods design.
Place and Duration of Study: The study was carried out in Siaya County, Kenya during the second term of the year 2018 in June.
Methodology: The sample consisted of 680 students (380 boys, 300 girls) from a population of 6800 students (3800 boys, 3000 girls) using multi-stage cluster sampling and simple random sampling. The study used Biology Motivation Questionnaire (BMQ) adopted and modified to suit the study from Tuan, Chin and Shieh (2005) and Biology Interview Guide (BIG). To test gender and school type differences in motivation, independent sample t-tests were used. The hypotheses were accepted at a significance level of α=0.05.
Results: The findings indicate statistically significant gender differences in Self-efficacy (SE), Active Learning strategies (ALS) and Learning Environment Stimulation (LES) in favour of boys.

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There were gender differences in Performance Goal (PG) and Achievement Goal (AG) in favour of girls; there were no significant gender differences in Biology Learning Value (BLV). The findings indicated statistically significant school type differences in SE, ALS, and LES in favour of High Performing Schools (HPS). There were also statistically significant school type differences in PG and AG in favour of Low Performing Schools (LPS). There were no statistically significant school type differences with regard to BLV.

Conclusion: It is concluded that gender and school type differences exist with regard to motivational orientations and beliefs. Implications for practice are highlighted.

Keywords: Gender; school type; motivation; learn; biology.

1. INTRODUCTION

It has been observed by Scholars [1-6] that of all the personal and psychological variables that have attracted studies in science education, motivation seems to be gaining popularity and leading other variables. This is due to the fact that motivation mediates learning, conceptual change and achievement Palmer [1]. Generally, motivation is conceptualized as an internal state that arouses, directs and maintains behaviour [7-12].

Despite the general conception, motivation remains vast and encompasses different theories that attempt to enrich our understanding. According to the behaviourist theory, external rewards and punishments are keys in determining a students' motivation [10]. Advocates of the behaviourist perspective emphasise that the use of incentives add interest and excitement to the class and direct attention towards appropriate behaviour and away from inappropriate behaviour [13]. The humanistic theories stress students' capacity for personal growth, freedom to choose destiny and positive qualities. This perspective is closely associated with Maslow's theory that certain needs must be met before higher needs can be satisfied. According to Maslow, individual's needs must be satisfied in the sequence of psychological, safety, love and belongingness, esteem and self-actualisation [14]. Self-actualisation, the most elusive of Maslow's needs, is the motivation to develop one's full potential as a human being. However, not everyone agrees with this theory since for some students cognitive needs might be more fundamental than needs for esteem. Other students might meet their cognitive needs without experiencing love and belongingness [10,12].

According to cognitive theorists, students' thoughts guide their motivation. They argue that students should be given more opportunities and responsibility for controlling their achievement outcomes [15]. The cognitive perspective stresses the importance of goal setting, planning and monitoring progress towards a goal [10]. It also stresses that people with internal motivation are able to deal effectively with their environment, to master their world and to process information efficiently. The social theorists argue that students' need for affiliation or relatedness is reflected in their motivation to spend time with peers, close friendships, attachments to parents and their desire to have a positive relationship with their teachers [10]. In a study, it was found that a key factor in students' motivation and achievement was whether they had a positive relationship with the teacher [16]. According to Nelson and Debacker [17], educators who explicitly help students to understand the utility and attainment value of studying science may assist them in internalising values that will support them as students.

According to the social cognitive theory, students' motivation is directly linked to their ability to self-regulate their learning activities [17]. Generally; self-regulated learning describes how learners meta-cognitively, motivationally and behaviorally improve their own academic achievement. Meta-cognitively, self-regulated learners plan, organise, self-evaluate and self-monitor at various stages of the learning process. Motivationally, they perceive themselves as competent, self-efficacious, autonomous and value their academic pursuits. Behaviorally, they select, structure and sometimes even create environments that optimise learning [18]. The social cognitive framework assumes that motivation and learning strategies are not static traits of the learner but that motivation is a dynamic and contextually bound construct. At the same time, learning strategies can be learned and brought under control by the student [19]. It appears that the behaviourist theories emphasise the importance of extrinsic motivation in

achievement whereas the humanistic and cognitive approaches stress the importance of intrinsic motivation in achievement. The behavioural theory emphasizes environmental factors such as rewards and punishments; the humanistic theory stresses the capacity for personal growth, freedom to choose our destiny and our positive qualities; the cognitive theory focuses on the internal drive to achieve, attributions, beliefs and self-regulation; the social theory emphasises the need for affiliation to others. The social cognitive theory holds that motivation is fluid, changeable and related to the context of the learning environment.

A variety of constructs have been proposed that have the potential to inform motivation in school settings. Firstly, motivation has been described as self-efficacy; this refers to the belief in one's ability to perform effectively. It is concerned with a persons' belief that he/she can organise and execute courses of action required to deal with prospective situations that contain stressful elements [20]; secondly, motivation has been related to achievement goal. This implies an innate drive to accomplish something to satisfy intrinsic needs for improving their own competence [21]; Thirdly, Motivation has been associated with task value. This refers to whether one can perceive the value of the activity they engage in. In respect of science it relates to whether the students can perceive the value of science learning they engage in [22]; fourthly, motivation is related to the performance goal. This implies the desire to do better than others and to impress the teachers [23]; fifthly, motivation is related to active learning strategies. Students who are motivated employ a variety of strategies to construct new knowledge based on their previous understanding [2]. Lastly, Motivation is stimulated by the learning environment. The environment surrounding students such as curriculum, teachers, teaching and student interaction influences student motivation in science learning. The different motivational constructs have the potential to inform motivation in a Biology classroom setting.

2. LITERATURE REVIEW

Keraro, Wachanga and Orora [24] investigated the effects of using cooperative concept mapping approach (CCM) on secondary students' motivation towards Biology in Gucha District, Kenya. The study used a Solomon four- group design in which all the groups were taught the same Biology content but two groups were taught using the CCM approach. After four weeks all the groups post-tested using the student motivation questionnaire. The findings indicated that there were no statistically significant gender differences in motivation towards the learning of Biology among the students exposed to CCM. Cavas [6] investigated the factors affecting Turkish primary students' motivation towards science. The data were collected using Students' Motivation toward Science Learning Questionnaire. The findings indicated statistically significant gender differences in motivation towards science in favour of females. Shihusa and Keraro [25] investigated the effect of using advance organizers on students' motivation to learn Biology from an experimental perspective in Bureti District, Kenya. Data were collected using the Student Motivation Questionnaire (SMQ).The findings indicated that students taught using advance organizers had a higher level of motivation than those taught using conventional methods. The findings further indicated that following the intervention, there was a significant gender difference in motivation to learn Biology in favour of the males.

Meece, Glienke and Burg [26], carried out a review on gender differences in motivation using four contemporary theories of achievement motivation (attribution, expectancy value, and self-efficacy and achievement goal). Across all the four theories, the findings indicated that boys had a stronger ability and interest beliefs in mathematics and sciences, whereas girls had more confidence and interest in language, arts and writing. Yau [27], Investigated if there are different levels of intrinsic motivation towards study, curiosity, and external regulation among males and females among local university students in Hong Kong. The findings showed that their levels of intrinsic motivation towards study, curiosity and external regulation were not statistically different. Yong [28], Explored the motivational orientations of grade 11 science male and female students, selected from 9 government secondary schools of Brunei Darussalam. An instrument consisting of 7 constructs of motivational orientations was used in the study. The findings in terms of the gender indicated significant differences between male and female students' motivational profiles. The female students considered achieving good grades more important to them and were prepared to achieve that goal than their male

counterparts. Sevinc, Ozmen and Yigit [29], investigated the relationship between motivational levels of Turkish primary school students and gender using a likert-type scale developed by Tuan, Chin and Shieh [2]. The findings indicated that the motivational level of female students was higher than that of male students. Koul, Roy and Lerdpornkulrat [30], investigated the relationship between students' perceptions of classroom learning environment and motivational achievement goal orientation towards Biology and Physics as well as the influence of gender. The findings indicated that females adopted significantly higher levels of mastery and performance approach goals towards Biology while males adopted significantly higher levels of performance avoidance goals towards both Biology and Physics. Positive associations emerged between gender and the adoption of specific performance goals, perceived the degree of competition in Biology and Physics classrooms. The research findings indicated that there was a significant gender difference in favour of the females on a number of domains of motivation. Ozbas [31], investigated high school students' intrinsic and extrinsic regulation when learning Biology and found that female students' intrinsic and extrinsic regulation was higher than those of male students.

2.1 Justification and Purpose of the Study

The enrolment of students in Biology in the Kenya Certificate of Secondary Education (KCSE) remains high compared to the other natural sciences [32,33]. However, the performance of students in the subject remains low [32,33]. Research in Biology education point to a nexus between motivation and achievement in Biology [34]. Reviewed literature indicates that research in gender differences in motivation is inconclusive, mixed and equivocal. Students' ability and school environment play a significant role in shaping gender role conceptions, beliefs and identities [26]. This is a cause for concern in the face of gender differences in pursuit of Science, Technology, Engineering and Mathematics (STEM) disciplines in favour of men [26,35]. This in itself creates the need to investigate the motivational orientations and beliefs of students at the level of secondary education where higher order reasoning problem solving strategies are developed. The school environment remains one of the major contexts in which motivational beliefs, goals and orientations are shaped since students spend most of their time in school during any of their schooling cycles. This corroborates the need to investigate the influence of the school type on motivation. The purpose of the study was therefore to investigate the status of secondary students' motivation to learn Biology from the perspective of gender and school type at grade 10 level in Siaya County, Kenya.

2.2 Theoretical Framework

The study was guided by Self-Determination Theory [36]. According to this theory, the levels of student motivation for academic performance vary in both strength (amount) and type (orientation) and both variations predict learning achievement [37]. Self-determined, intrinsic motivation emerges from the learners own needs and desires rather than from outside pressures. According to this theory, self-determined motivation powerfully predicts school related engagement and success [38]. Relative to the present study, not all learners (boys and girls) have intrinsic motivation for all biological tasks. The social contexts within the school environments and the classroom environments can either augment or diminish students' motivation through their perception of their teachers and fellow students [37]. A supportive school environment that enhances autonomy, competence and relatedness is a fertile ground for the development of motivation [39]. This study investigated how the different schools environments engender students' motivational orientations.

2.3 Objectives of the study

The following objectives guided the study

i) To determine gender differences in motivation to learn Biology
ii) To determine school type differences in motivation to learn Biology

2.4 Hypotheses of the Study

The following hypotheses were tested

i) There is no statistically significant gender difference in students motivation to learn Biology
ii) There is no statistically significant school type difference in students' motivation to learn Biology.

3. RESEARCH METHODOLOGY

3.1 Research Design

The study adopted a concurrent mixed methods design. A mixed methods design is useful in providing an in depth, condensed, detailed and specific understanding of the problem that cannot be done by either method [40,41,42]. Relative to the present study, this method was used to provide a better and deeper understanding of students' motivation to learn Biology from the perspective of gender and school type. A mixed method approach involves the use of quantitative and qualitative methods of data collection [40,41,42]. Relative to the present study, this design was valuable as data was collected using both questionnaires and interviews.

3.2 Population

In this study, the population comprised of 6800 (3800 boys and 3000 girls) grade 10 students in district co-educational public secondary schools in Siaya County. These are distributed in 130 secondary schools. Fifty schools were identified as high performing and 50 as low performing. They all take Biology as a compulsory subject up to form two. Form two students were the respondents in this study since this is the point where students opt to pursue Biology in the future or not [43]. At this stage they have also covered reasonable content to enable them make choices. Motivational level was therefore pertinent at this stage. Students in coeducational public secondary schools were sampled because gender differences in motivation were part of the objectives of this study.

3.3 Sample Size and Sampling Techniques

The sample size comprised of 680 (380 boys and 300 girls) grade 10 students in coeducational public secondary schools. This represented 10% of the population. For studies requiring a description of variables of a population, 10% of the population is enough to provide a representative sample when the target population is in thousands [40,44]. This provided a reasonable and representative sample of the population. Table 1 shows the sample characteristics by school type and gender.

A list of 50 high performing and 50 low performing co-educational secondary schools in Biology from 2010- 2015 in Siaya County were used as the sampling frame. Multistage cluster sampling was used to randomly select clusters of 18(9 from each category) grade 10 classes from the high and low performing co-educational secondary schools in Siaya County. In schools that had more than one stream, simple random sampling was used to select the stream that participated in the study. Cluster sampling is more feasible in selecting groups of individuals rather than individuals from a defined population [45]. Questionnaires were administered to every student in the 18 classrooms. In the second stage of multistage cluster sampling, four students, 2 boys and 2 girls were randomly selected from each of the 18 classrooms for an interview. The interview sample, therefore, included 72 students.

3.4 Data Collection Instruments

This study used two instruments of data collection namely: Biology Motivation Questionnaire (BMQ) and Biology Interview Guide (BIG).

3.4.1 Student motivation questionnaire

The Biology Motivation Questionnaire (BMQ) was adopted from Tuan, Chin and Shieh [2] and modified to suit the study by the researcher. This instrument was originally developed to measure motivation towards science in general and consisted of 35 items in the five-point likert type of scale. The Cronbach alpha for the entire questionnaire was 0.89. The instrument was modified to specifically measure motivation towards Biology. This instrument had 6 scales: self-efficacy with 7 items related to students'

Table 1. Sample characteristics by school type and gender

Category	Population	Sample	Percentage
High performing schools	3900	390	10.00
Low performing schools	2900	290	10.00
Boys	3800	380	10.00
Girls	3000	300	10.00
Overall	6800	680	10.00

beliefs about their own ability to perform well in Biology learning tasks: Biology Learning Value with 8 items related to the value of Biology in daily life: Active Learning Strategies with 5 items related to students' active participation in using a variety of strategies to construct new knowledge based on their previous understanding: Performance goal with 4 items related to students' competition with other students and their desire to get attention from the teacher: Achievement Goal with 5 items related to students satisfaction as they increase their competence and achievement during Biology learning: and Learning environment Stimulation with 6 items related to learning environment factors that affect students' motivation in Biology learning.

There were no right and wrong answers in BMQ. The likert style items were specifically concerned with various aspects of Motivations of students towards Biology. The students were required to indicate whether they strongly Agree, Agree, Undecided, Disagree or Strongly Disagree with the statements.

3.4.2 Biology interview guide

Biology Interview Guide (BIG) was developed by the researcher and used to triangulate data collected from Biology Motivation Questionnaire (BMQ). The questions were generated from each of the subscales of BMQ and had 6 questions. For each class of students where questionnaires were administered, 2 boys and 2 girls were randomly selected to be participants in the interview.

3.5 Validity and Reliability of Instruments

The instruments BMQ and BIG were subjected to validation before piloting. After piloting of the instruments in a school with the same characteristics as the sample, the results were subjected to reliability tests. To achieve construct and content validities of BMQ and BIG, the instruments were presented to experts in science education in the school of education for examination and recommendation. This allowed for the checking of the appropriateness of the language used so that students were able to comprehend them. It also allowed for the rewording of items perceived to be ambiguous and checking of the items to ensure they measured what they purported to measure.

BMQ and BIG were pilot-tested in a Form two class similar in characteristics to the schools in the sample but not taking part in the study. Rewording of BIG items was done based on the findings from piloting. The Cronbach's Correlation Coefficient alpha (α) formula was used to test for the reliabilities of BMQ. A reliability coefficient of 0.7 and above was acceptable [45,46,47]. After piloting the reliability coefficient was determined to be 0.875. This level of reliability coupled with the validation ensured that the instrument was tailor made for the Kenyan context.

3.6 Data Collection Procedures

The researcher sought for research permit from the County Education office. The researcher then requested an introductory letter authorizing the researcher to visit the schools involved in the study and to inform the head teachers of the intended study. On entry to the schools, the researcher sought an audience with the Heads of science department who in turn arranged for a meeting with the Biology teachers concerned. Appointments were thereafter made for the administration of instruments. The BMQ and BIG were administered on the same day.

3.7 Methods of Data Analysis

Both quantitative and qualitative methods were used in data analysis. The data collected using questionnaires were grouped, organised and categorized according to specific objective of the study. The qualitative data were also coded manually and organised under different variables of the study.

The quantitative data generated from BMQ were computed according to the scales of each instrument. The scores for each respondent per scale were computed by taking the mean of the items that make up the scale, summations were thereafter made to find the overall score for each student. BMQ data were analysed by both descriptive and inferential statistics. The qualitative data collected using BIG was grouped according to their similarity in content then organised in relation to research objectives. The analysis was done by establishing the thematic categories. The qualitative data was used to confirm or disconfirm the quantitative findings. Descriptive statistics were used to summarise quantitative data. Inferential statistics were used to analyse quantitative data and test the research

hypotheses. The hypotheses were accepted at a significance level of α=0.05.

4. RESULTS

4.1 Gender Differences in Motivation to Learn Biology

To test the hypothesis that 'there are no statistically significant gender differences in students motivation to learn Biology' descriptive statistics are first presented, thereafter results of independent sample t-tests on gender differences in motivational variables are presented. Table 2 shows the descriptive statistics for gender and school type from student motivation questionnaire variables.

Table 2 indicates that the mean scores of boys and girls from High performing schools on the subscales of self efficacy, active learning strategies, Biology learning value and learning environment stimulation are higher than those from the low performing schools. On the other hand, the boys and girls from low performing schools had high motivational scores on performance and achievement goals compared to those from High performing schools. The results from the table indicate that the boys and girls from high performing schools have favourable motivational beliefs which could be contributing to their high performance. On the other hand, the boys and girls from the low performing schools have unfavourable motivational beliefs which could be contributing to their dismal performance. Table 3 shows the independent sample t-test on the scores of BMQ between boys and girls in low and high performing schools.

Table 3 shows that there are statistically significant gender differences in self-efficacy, active learning strategies and learning environment stimulation in favour of boys. At the same time, there are statistically significant gender differences in performance goal and

Table 2. Descriptive statistics for BMQ subscales in HPS and LPS

Boys, N= 380; Girls, N = 300		High performing schools		Low performing schools	
SMQ scales	**Gender**	**Mean**	**SD**	**Mean**	**SD**
Self-efficacy	Boys	4.241	.294	3.506	.245
	Girls	4.021	.375	3.520	.331
Active learning	Boys	4.182	.342	3.568	.298
strategies	Girls	3.958	.298	3.602	.323
Biology learning	Boys	3.910	.346	3.614	.353
value	Girls	3.813	.388	3.634	.345
Performance goal	Boys	2.347	.335	4.042	.352
	Girls	3.157	.648	4.053	.364
Achievement goal	Boys	2.417	.404	3.990	.253
	Girls	3.238	.637	4.015	.347
Learning environment	Boys	3.581	.357	2.975	.296
stimulation	Girls	3.562	.388	2.958	.327

Table 3. Independent sample t-test of BMQ by gender

Group 1- Boys, N =380; Group 2- Girls, N =300						
SMQ scales	**Group**	**Mean**	**SD**	**t-value**	**df**	**P-value**
Self-efficacy	1	3.881	.457	3.851	813	.000*
	2	3.760	.427			
Active learning strategies	1	3.882	.444	3.869	813	.000*
	2	3.766	.392			
Biology learning value	1	3.763	.378	1.726	813	.085
	2	3.717	.368			
Performance goal	1	3.176	.898	-8.045	813	.000*
	2	3.639	.682			
Achievement goal	1	3.187	.857	-8.634	813	.000*
	2	3.656	.634			
Learning environment	1	3.285	.447	3.027	813	.003*
stimulation	2	3.190	.436			

**P< .05*

achievement goal in favour of girls. There were no significant gender differences in Biology learning value.

The results indicate that the boys and girls all have some level of self-efficacy but the boys persevere until they understand Biology concepts. Probably, the boys attribute failure to lack of effort or task difficulty. The girls, on the other hand, give up at some point in time probably due to constraints of time scope or content of what is to be learnt. This situation has been described as learned helplessness [26] and is caused by the individuals' underestimation of their performances. The following excerpt from a girl and a boy emphasises and confirms this point.

Boy: *When I meet Biology content that is difficult, I struggle with it on my own and also consult my classmates and teacher if there is a need.*

Girl: *When I meet concepts of biology that are difficult to understand, I struggle with it but when it takes too much of my time then I move on to other concepts"*

The following were some of the responses by a girl and a boy as regards their motivational orientations and beliefs as regards value of learning Biology, performance and achievement goals which confirm the quantitative findings.

Boy: *I take part in biology lessons to have an understanding of biology. It is useful to me as an individual.*

Girl: *I work hard in biology lessons so that I can get a good grade, a good grade encourages me. If you don't get a good grade you can't get a good future.*

Boy: *I feel most satisfied when am able to solve a difficult problem in Biology.*

Girl: *I feel most satisfied I get a good score in a biology test and when other students accept my ideas".*

4.2 School Type Differences in Motivation to learn Biology

To test the second hypothesis that 'there are no statistically significant school type differences in students' motivation to learn Biology' independent sample t-tests on school type differences on motivational variables are done. Finally a two-way ANOVA was conducted to understand if there is an interaction between gender and school type on the motivational variables as dependent variables.

Table 4 shows the independent sample t-test of BMQ scores by school type.

Table 4 shows that there is no statistically significant difference between the high and low performing schools with regard to Biology learning value. There are statistically significant school type differences in self-efficacy, active learning strategies and learning environment stimulation between low performing and High performing schools in favour of High performing schools. There were statistically significant differences in performance goal and achievement goal in favour of low performing schools.

The results indicate that the students from High performing schools believe that they have the competence to accomplish tasks related to Biology; they use a variety of strategies to construct knowledge based on previous understanding and find the learning environment components like the teacher, the curriculum and pedagogy stimulating them to learn Biology. On the other hand, the students from low performing schools set goals for learning Biology devoted to competing with other students and attracting the teachers' attention. They also feel satisfaction from increasing competence and achievement during Biology learning.

The excerpts below show the views of students from the school types of their motivational strategies.

HPS_1 *"when learning new Biology concepts, I try very much to compare what I learnt earlier with what I am learning at the moment. I find this helping me to understand Biology well."*

LPS_1 *"when I meet new ideas, I try to understand as it is. Sometimes the new idea is not related to past knowledge. There are times when I give up".*

The analysis from the interview data indicates that the students from high performing schools have high levels of self-efficacy since they can persist in attempts to understand in the face of the encounter of difficult concepts. The following excerpt summarises and confirms the motivational views of students for participating in Biology lessons.

Table 4. Independent sample t-tests of BMQ scores by school type

HPS- 1, N = 399; LPS – 2, N = 416						
SMQ sub-scales	**Group**	**Mean**	**SD**	**t-value**	**df**	**P-value**
Self-efficacy	1	4.152	.346	28.405	813	.000*
	2	3.520	.287			
Active Learning Strategies	1	4.092	.374	21.152	813	.000*
	2	3.584	.310			
Biology Learning Value	1	3.868	.366	9.782	813	.070
	2	3.823	.349			
Performance Goal	1	2.674	.627	-39.904	813	.000*
	2	4.047	.307			
Achievement Goal	1	2.748	.651	-35.535	813	.000*
	2	4.001	.299			
Learning Environment	1	3.533	.374	23.528	813	.000*
Stimulation	2	2.967	.310			

** P < .05*

HPS_2 *"I participate in Biology lessons because I want to understand Biology concepts and apply them in my everyday life. I want to have a better understanding of various things about human life. I feel most happy when I am able to understand a concept in Biology that was not easy to understand".*

LPS_2 *"I participate in Biology lessons because I want to get a good grade in Biology so that I may get to college. Without a good grade, you cannot make it. I feel most happy when I get a good grade in Biology because everybody will be happy with me like my teacher and parents".*

It was also necessary to carry out a two-way ANOVA to determine if there is an interaction between gender and school type on the motivational variables. Table 5 shows the results of two-way ANOVA of the output.

The results of two-way ANOVAs on motivational variables confirm the results of independent sample t-tests by gender and school type. The interaction effects of gender and school type on motivational variables were statistically significant for self-efficacy, active learning strategies, performance goal, achievement goal and learning environment stimulation ($P< .05$). The interaction effect on Biology learning value was not statistically significant.

Table 5. Two-way ANOVA summary for BMQ, by school type and gender

SMQ-subscales	**Variables**	**Mean^2**	**F**	**p-value**	**Partial eta^2**
Self-efficacy	Gender	1.776	18.639	.000	.022
	School	73.859	775.171	.000	.489
	Gender *School	3.124	32.782	.000	.039
Active learning strategies	Gender	1.811	16.22	.000	.020
	School	46.780	418.415	.000	.340
	Gender * School	3.280	29.383	.000	.035
Biology learning value	Gender	.258	2.031	.155	.002
	School	11.015	86.569	.090	.096
	Gender * School	.625	4.911	.067	.056
Performance goal	Gender	33.437	203.756	.000	.201
	School	333.623	2033.011	.000	.715
	Gender * School	31.696	193.146	.000	.192
Achievement goal	Gender	35.560	205.071	.000	.202
	School	274.562	1578.944	.000	.661
	Gender * School	31.527	181.307	.000	.183
Learning environment stimulation	Gender	.932	8.015	.005	.010
	School	61.252	526.614	.000	.394
	Gender * School	.522	4.487	.034	.006

P < .05

The results from table 5 imply that gender and school type are factors which affect the beliefs that students hold about their competence in Biology learning tasks, the students use active learning strategies, students goal for performing Biology related tasks, students goals for increase in competence and finally whether the learning environment stimulating them to learn Biology.

5. DISCUSSION

From the analysis on **"gender differences"** the findings of this study have indicated that there are gender differences in self-efficacy, active learning strategies and learning environment stimulation in favour of boys. This finding is in conformity with the finding of Nelson and Debacker [17] which reported that boys had higher scores on self-efficacy whereas girls had higher scores on performance goal (pleasing the teacher). The boys are generally driven by the desire to have a conceptual understanding of Biology concepts. The boys are most satisfied when they are able to conceptualise a difficult concept in Biology. This indicates that they are more focused on learning, understanding and developing competence in biology learning environment. The implication is that they have a drive to master the task at hand or improve intellectually [48] instead of self-presentation compared to others [26,49].On the other hand, the girls are more driven by the desire to get good grades. The girls are generally most fulfilled when they attain good grades in Biology. This indicates they are focused on demonstrating and validating their competence. The girls have surface-level learning strategies. They are more concerned about self-presentation compared to others [49]. These findings contradict the findings of Cavas [6] and Webb-williams [50] who found out gender differences in these variables in favour of girls in primary school pupils. This finding departs from the studies by Cavas and Webb-Williams for two reasons: One, the studies were carried out among primary school students and secondly they were based on science in general as opposed to this study that was specific to Biology. In a seminal review of 'gender and motivation' by Meece, Glienke and Burg [26] it was documented that there is a reversal of motivational orientations and beliefs as grade level increases and learning environment of elementary classrooms favour girls more than boys. The study has also indicated that there are gender differences in performance goal and achievement goal in favour of females. This confirms the findings of Koul, Roy and Lerdpornkulrat [30] who found out that female have high performance goals towards Biology whereas boys had performance avoidance goals. Yong [28] and Nelson and Debacker [17] found out that females have high achievement and performance goals than males. This study has also indicated statistically non-significant differences between girls and boys on the variable of Biology learning value. This finding confirms the study by Nelson and Debacker [17].

From the analysis on **"School type differences"** this study has revealed school type differences with regard to self-efficacy, active learning strategies and learning environment stimulation in favour of the High performing schools. On the other hand, there were school type differences with regard to performance goal and achievement goal. There was no statistically significant difference between the high and low performing schools with regard to Biology learning value. Nelson and Debacker [17] found out that high performing students had higher scores than low performing students on the motivational variables of perceived ability (self-efficacy). These findings can be interpreted with regard to the nature of high performing students with regard to motivation. They have a high self-efficacy that drives them to persist at tasks in the face of challenges. This makes them to be cognitively engaged at a sufficiently deeper level. They will use active learning strategies like relating new learning to previous experiences and negotiating meanings with other students. In such a situation, they are likely to perceive the learning environment as stimulating. They embrace the active learning strategies and are able to construct new biological knowledge based on their previous understanding [51]. They are able to use previous biological knowledge to create links with the current Biology concepts they encounter in the learning environment. They use cognitive and meta-cognitive strategies to integrate personal knowledge with scientific knowledge through conceptual change. The students from high performing schools are interested in the practical relevance of the subject. They also apply scientific knowledge to make sense of the world around them [52,53]. In so doing, the students in high performing schools are able to discover the relevance of biological knowledge. The students from high performing schools are driven by the desire to have a conceptual understanding of Biology concepts. They are most satisfied when they are able to conceptualise a difficult concept in Biology. This indicates that they expend more effort on

learning, understanding and developing competence in Biology as a domain of learning. The implication is that they have a drive to master the task at hand instead of self-presentation compared to others [49].

On the other hand, the students from the low performing schools can easily give up when they come across concepts that are difficult. This was confirmed by Bandura [20] who posited that low achievement lowers students' self-efficacy. The students in low performing schools do not show strong inclination to relate the previous biological knowledge with the current knowledge they are encountering in the learning environment. They display a low quality of task engagement in the Biology classrooms. According to Lee and Brophy [52] such students content themselves with strategies for meeting accountability pressures with the least possible effort. The students in low performing schools are driven by the desire to get good grades. They are most fulfilled when they attain good grades in Biology. This indicates they are focused on demonstrating and validating their competence. They are more concerned about self-presentation compared to others [49]. These students also have high performance and achievement goals. These motivational constructs are concerned with attempting to accomplish a task in order to satisfy the innate needs of recognition and increasing competence and achievement respectively [2]. These motivational orientations have been described as unfavourable and do not contribute to high achievement.

6. CONCLUSIONS AND IMPLICATIONS

This study has the following conclusion and implications for practice and further research:

- The study concludes that gender and school type differences exist with regard to motivational orientations and beliefs.
- In the light of convincing evidence that motivation is a precursor to science performance and gender and school type differences in achievement, there is need to maintain the motivational beliefs of the boys and high performing schools (self-efficacy, active learning strategies and learning environment stimulation) while working on the unfavorable motivational beliefs of girls and low performing schools.
- The school type and gender differences in motivation are suggestive of interventions to increase the motivation of students who are low performing to enable them to excel in their study of Biology. The easiest and the most practical place to start is for teachers to restructure the learning environment to conform to the learners preferences.
- The state department of secondary education and the institute for curriculum development could use these findings to come up with strategies to bridge gender and school type differences in motivational orientations to learn Biology. One way is to make the school environment and learning environment as similar as possible in terms of physical endowments.
- A further study could be done to establish the factors that contribute to gender and school type differences in motivational orientations.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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