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Relationship between Students' Perception of a Constructivist Learning Environment and Motivation towards Biology in Siaya County, Kenya

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Abstract

The study investigated the relationship between students' perception of a constructivist learning environment and motivation towards Biology among form two secondary school students in high and low achieving schools. Correlational survey design was used and a sample of 815 students from co-educational schools was selected using multi-stage cluster sampling. The instruments used in the study were: Student Perception Questionnaire (SPQ), Student Motivation Questionnaire (SMQ) and Student Interview Guide (SIG). Data were analyzed using Pearson Correlation Analyses and Multiple Regression Analyses. The interview data were used to explain the quantitative data. The results indicate that the perception of the constructivist learning environment explained 10.5% of the variance in motivation collective dimensions among students in the high achieving schools. On the other hand, the constructivist learning environment explained 3.2% of the variance in motivation collective dimensions of the students in the low achieving schools. Implications are discussed.

Keywords: Perception, Constructivist learning environment, Motivation.

Introduction

One of the goals of science education is to enhance all students' scientific literacy; that is to help students grasp essential science concepts, to understand the nature of science, to realize the relevance of science and technology in their lives and to willingly continue their science study in school or beyond school (AAAS, 1993). The achievement of this goal is only realizable within the environment where learning takes place. Despite the fact that learning environment has been a subtle concept, tremendous progress has been made in conceptualizing, assessing and researching it .It is currently conceptualized as the social, psychological and pedagogical context in which learning takes place and which impacts on cognitive and affective variables (Fraser, 1998; Fraser, 2001). According to Fout and Myers (1998), the classroom environment is a place where learners and teachers interact with each other and use a variety of tools and information resources in their pursuit of learning activities. It is therefore imperative to focus on creating a positive learning environment as a means to achieving scientific literacy.

According to Ozkal, Tekkaya and Cakiroglu (2009), the classroom has become an important place for educational research because most learning takes place there. This psychosocial environment has been researched extensively in the last three decades in the developed countries with results providing consistent and convincing evidence that the quality of the classroom environment is a significant determinant and predictor of student learning, cognitive outcomes, and motivation (Arisoy, Cakiroglu & Sungur, 2007; Mucherah, 2008; Igwebuike & Oriaifo, 2012). Results of several studies on the relationship between students' perceptions of their learning environment and their affective outcomes indicate a strong association (Wolf & Fraser, 2008; Igwebuike & Oriaifo, 2012). Badmus (1987) suggests the existence of a quasi-functional relationship between learning outcomes and the curriculum, learning environment and student characteristics.

Constructivist Learning Environment

According to Kim (2005), the constructivist theory of learning holds that learning is an active process of developing meaning based on individual personal experiences; knowledge is constructed out of sensual and perceptive experiences of the learner; knowledge is the personal understanding of the outside world through personal experience; learning creates knowledge in the context of a situational reality. According to Driver (1989) the constructivist position changes the philosophical view of the learner to a purposive and responsible individual, learning changes to construction of meaning, teaching changes to negotiation of meanings, and the teacher changes to a facilitator, guide and a cognitive 'coach' of the learning process. According to Moustafa, Ben-Zvi-Assaraf and Eshach(2013), scholars have argued that the constructivist learning environment can be used as a lever for increasing student motivation for science learning. The findings of a study by Aubusson and Watson (2003) indicated the existence of a nexus between a constructivist-based pedagogic environment and student's motivation.

The constructivist theory of learning has several implications for science learning. According to Tam (2000), the constructivist learning environment should provide for interaction between the learners and learners, and learners and the teacher. The collaboration and cooperation among the learners should enhance interaction. The learning environment should be interactive to promote higher level learning and social presence and to help develop personal meaning (Heinich et al, 2001). Collaboration also creates learning communities to negotiate and co-construct meaning (Neo & Neo, 2009). Secondly, the learning environment should be an active process. Keeping learners active doing meaningful activities results in high level processing which facilitates the creation of personalized learning. Asking the learners to apply the information in practical situations makes the learning active and facilitates personal interpretation and relevance (Elliomi & Anderson, 2001). Thirdly, According to Murphy and Cifuentes (cited in Elliomi & Anderson, 2001), the constructivist

learning environment should make the learners to construct their own knowledge rather than mere acceptance of that given by the instructor. Knowledge construction is facilitated by good interaction since the students have to take the initiative to learn and interact with other students and the instructor because the learning agenda is controlled by the student. Fourthly, the constructivist learning environment should encourage the learners to use meta-cognitive skills. This can be done by self-check questions and exercises with feedback throughout the lesson to allow them to use meta-cognitive skills to adjust their learning approach (Elloumi & Anderson, 2001). Fifthly, the constructivist learning environment should encourage the application of knowledge in different and real life situations. Simulation of real life cases should be part of lessons and students should be given time to complete assignments and projects that use real life applications and knowledge. This leads to development of meaning and contextualization of information (Smart & Cappel, 2006). Sixthly, the constructivist learning environment should motivate the students to use their knowledge to solve problems that are meaningful and realistically complex. The problems provide the context for the learners to apply their knowledge and take ownership of their learning. Good problems should stimulate the exploration and reflection necessary for knowledge construction (Tam, 2000). Lastly the constructivist learning environment should give the learners the time and opportunity to reflect on their learning process.

Motivation to Learn Science

One of the contemporary challenges in science education is the declining interest and in science and science related careers arising from the experiences in the kind of learning environment in which learners are exposed to (UNESCO, 2010). It has been observed by many researchers that of all the personal and psychological variables that have attracted studies in science education, motivation seems to be gaining popularity and leading other affective variables (Palmer, 2005; Tuan, Chin & Shieh, 2005; Tella, 2007; Akbas & Kaan, 2007). According to Pintrich, Marx and Boyle (1993), motivation to learn is of interest in science education because of the relationship between motivation, cognitive engagement and conceptual change. Nelson and Debacker (2000) argue that conceptual change is a difficult task due to the requirement that new information be engaged at a sufficiently deep level to recognize conflicts between existing understanding and new information. Evidence suggests that decisions to engage in effortful learning may be affected by individual students' motivation including their goals for engaging in an activity, their beliefs about their abilities and the nature of the task, and their valuing of the task (Nolen & Haladyna, 1990; Greene & Miller, 1996).

According to Cavas (2011), motivation to learn science promotes student construction of their conceptual understanding of science. It is a variable that promotes both new learning and performance of previously learnt skills, strategies and behaviors. According to Lee and Brophy (1996), students who are motivated to learn science display a high quality of task engagement in science classrooms. In terms of behavioral engagement, they pay attention to lessons and are actively involved in classroom activities. These students also activate cognitive and meta-cognitive strategies to the goal of understanding science in specific task situations. According to Mills (1991), the teaching strategy that a teacher adopts is a strong factor that affects students' motivation towards learning. This would therefore mean that cognitive engagement in science requires individual student motivation, including their goals for engaging in an activity. This is likely to translate into high achievement in science.

Statement of the Problem and Purpose of the Study

Learning environment research has produced many promising findings that could lead to improvement of the cognitive and affective outcomes of science learning. However there is a dearth of literature as regards the relationship between the perception of the constructivist learning environment and motivation from the point of view of students especially in the domain of biology and in Kenya to be specific. The purpose of this study was therefore to investigate the relationship between the students 'perception of a biology constructivist learning environment and motivation. The specific question of the study was: What is the relationship between students' perception of the constructivist learning environment and motivation towards Biology in high and low achieving schools?

Theoretical Framework

The study was based on Moos theory of learning environments. According to Moos (2002), each human learning environment is defined in terms of three dimensions as the relationship, personal growth and system maintenance and change dimensions. The relationship dimension is concerned with the extent to which people are involved in the setting, support and help each other and express themselves spontaneously, freely and openly. A favorable relationship domain is characterized by open communication, student involvement and teacher support. The personal growth dimension is concerned with the achievement of the aims of education, clarity about learning objectives, relevant learning content and constructive criticism. The system maintenance and system change is concerned with the extent to which the environment is orderly and clear in its expectations, maintains control and responds to change. In this study, the relationship dimension was determined by the extent to which the learning environment enhances personal relevance and uncertainty; personal growth dimension was measured by the extent to which the environment allows for critical voice and shared control and system maintenance and change was determined by the extent to which the environment allows for student negotiation.

Methodology

Research Design

The study adopted a correlational survey design. This is because the study sought to describe the existing degree of correlation between perception of constructivist learning environment and motivation towards Biology using correlation coefficients. The study also described the Constructivist learning environment as perceived by the students without manipulating the learning environment (Cohen, Manion & Morrison, 2000; Nworgu, 2006; Fraenkel & Wallen, 2008). A

survey has the potential of providing a lot of useful information about the subjects of the study (Fraenkel & Wallen, 2008). For example, how they perceive the Biology constructivist learning environment and its association with motivation towards the subject. A survey is also more economical because it makes possible for many subjects to be studied at the same time (Mugenda & Mugenda, 1999; Mitchel & Jolley, 2004; Fraenkel & Wallen, 2008). In this study the data were collected from high and low achieving form two students of Siaya County in co-educational secondary schools within a reasonably short time.

Sample Size and Sampling Techniques

The sample size comprised of 815 (399 High achieving, 416 low achieving) form 2 students in co-educational public secondary schools. This represented 10.31% of the population. For descriptive studies, 10% of the population is enough to provide a representative sample when the target population is in thousands (Gay, 1987; Mugenda & Mugenda, 1999; Kasomo, 2007). This provided a reasonable and representative sample of the population. Table 1 shows the sample characteristics by school type.

Table 1: Sample Characteristics by School Type and Gender.

Category	Population	Sample	Percentage
High Achieving Schools	3900	399	10.23
Low Achieving Schools	4000	416	10.40
overall	7900	815	10.31

A list of 50 high achieving and 50 low achieving co-educational secondary schools in Biology from 2010- 2012 in national examinations in Siaya County were used as the sampling frame. Multistage cluster sampling was used to randomly select clusters of 18(9 from each category) form two classes from the high and low achieving 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 (Gall, Borg & Gall, 2003). 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.

Instrumentation

The study used three instruments namely Students Perception Questionnaire (SPQ), Student Motivation Questionnaire (SMQ) and Students Interview Guide (SIG).

Student Perception Questionnaire

The Student Perception Questionnaire (SPQ) was adopted from Johnson and McClure (2004) and modified to suit the study by the researcher. It is a five point response scale of Almost always, Often, Sometimes, Less often, and almost never. The instrument consists of two forms that are 'actual' and 'preferred' forms. However the study used the preferred form which assesses students' preference for constructivist learning environment.

The instrument has 20 items, with 5 scales (4 items on each scale). The scales are Personal relevance, uncertainty, critical voice, shared control, and student negotiation. The scale on personal relevance is concerned with the extent to which the teachers relate science to out of school experiences. Uncertainty is concerned with the extent to which opportunities are provided for students to experience scientific knowledge as provisional or tentative, involving human experience and values. Critical voice is concerned with the extent to which a school climate has been established in which students feel it is beneficial to question the teachers' pedagogical plans and methods to express concerns about any impediments to their learning. Shared control is the extent to which students are invited to share with the teacher in the control of the learning environment. Finally, Student negotiation is concerned with the extent to which opportunities exist for students to explain and justify to other students their newly developing ideas.

Student Motivation Questionnaire

The Student Motivation Questionnaire (SMQ) was adopted from Tuan, Chin and Shieh (2005) and modified to suit the study by the researchers. 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 instrument was modified to specifically measure motivation towards Biology. This instrument has 6 scales: self-efficacy with 7 items related to students' 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 SMQ. 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.

Student Interview Guide

Student Interview Guide (SIG) was developed by the researchers and used to triangulate data collected from the other two instruments i.e. SPQ and SMQ. The questions were generated from each of the subscales of the instruments.

SPQ had 5 questions; SMQ had 6 questions giving a total of 11 questions. For each class of students where questionnaires were administered, 2 boys and 2 girls were randomly selected to be participants in the interview.

Validity and Reliability of Instruments

The instruments SPQ, SMQ, and SIG 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 SPQ, SMQ, and SIG, the instruments were presented to experts in science education in the faculty 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.

The SPQ, SMQ, and SIG 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 SIG 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 SPQ and SMQ. Cronbach's correlation coefficient alpha is considered appropriate for both essay and structured questions, especially where the items are of varying difficulty (Ary et al., 1972; Ebel, 1972). A reliability coefficient of 0.7 and above was acceptable (Ebel, 1972; Ogunniyi, 1992; Gall et al, 2003). SPQ had a reliability coefficient of 0.855 and SMQ had a reliability coefficient of 0.875.

Results and Discussion

To answer the research question on whether there is a relationship between students' perception of Biology constructivist learning environment and motivation in the high and low achieving schools, descriptive statistics are presented first, followed by Pearson Correlation Analyses between SPQ variables and motivational variables. Multiple Regression Analyses are finally conducted to find out whether preferences for constructivist learning environment variables contribute to variance in motivation. Assumptions of normality, homoscedasticity, linearity and independence were met prior to multiple regression analysis. To detect multicollinearity among the independent variables, correlation matrices, Tolerance and Variance Inflation factor were used.

Table 2 shows the descriptive statistics of motivational subscales among the low achieving schools and high achieving schools.

Table 2: Descriptive statistics of SMQ among HAS and LAS

	High Achieving Schools		**Low Achieving Schools**	
SMQ Sub-scales	**Mean**	***SD***	**Mean**	***SD***
Self-Efficacy	4.152	.346	3.520	.287
Active Learning Strategies	4.092	.374	3.584	.310
Biology Learning Value	3.868	.366	3.623	.350
Performance Goal	2.674	.628	4.047	.308
Achievement Goal	2.748	.651	4.002	.299
Learning Environment Stimulation	3.533	.374	2.967	.310

Table 2 indicates that students from the high achieving schools have high scores on self-efficacy, active learning strategies, Biology learning value and learning environment stimulation than low achieving schools. On the other hand students from low achieving schools have high scores on performance goal and achievement goal than those from high achieving schools.

The results suggest the students from high achieving schools have confidence in their ability to organize and execute a course of action to solve a biological problem or accomplish a task. They also embrace active learning strategies where they can monitor, control and regulate aspects of their cognition. Due the effort they expend in learning, they have value for Biology learning and this makes it naturally for them to find the learning environment stimulating. The low achieving schools on the hand have learners who are more focused on demonstrating their competence on tasks and demonstrating their ability to get good grades or good grades than their peers. Table 3 shows the perceptions of a constructivist learning environment by school type and scales of SPQ.

Table 3: Perceptions of Constructivist Learning Environments

Group 1= High Achieving Schools, N = 399; Group 2 = Low Achieving Schools, N = 416

Variable	SPQ Scales	Group	Mean	SD	*t*-value	df	*p*-value
School Type	Personal Relevance	1	3.830	0.528	10.362	813	.000*
		2	4.164	0.375			
School Type	Uncertainty	1	3.765	0.523	11.881	813	.000*
		2	4.151	0.393			
School Type	Critical Voice	1	3.680	0.639	13.936	813	.000*
		2	4.212	0.422			
School Type	Shared Control	1	3.917	0.441	10.304	813	.000*
		2	4.203	0.343			
School Type	Student Negotiation	1	3.859	0.487	10.364	813	.000*
		2	4.189	0.410			

*$p < 0.05$

Table 3 indicates that the preference levels for Biology constructivist learning environment are higher among the low achieving schools than the high achieving schools for all the scales of SPQ as depicted by the mean scores. At the

same time, there existed a statistically significant difference between the low achieving schools and high achieving schools in favor of the low achieving schools at an alpha level of 0.05.

Table 4 shows the inter-correlations between Student Perception Questionnaire (SPQ) and Student Motivation Questionnaire (SMQ) variables among the high achieving schools.

Table 4: HAS Correlation Matrix between SPQ and SMQ variables

	High Achieving Schools, N = 399				
Variables	**PR**	**U**	**CV**	**SC**	**SN**
Self-Efficacy	.141**	.224**	.107*	.223**	.145**
Active Learning Strategies	.194**	.236**	.170**	.196**	.152**
Biology Learning Value	.010	.025	.027	.106*	.051
Performance Goal	-.258	-.355	-.311	-.314	-.269
Achievement Goal	-.245	-.364	-.328	-.293	-.245
Learning Environment Stimulation	.211*	.184*	.133*	.162**	.104*

** Correlation significant α =0.01 (2- tailed), *Correlation significant α = 0.05 level (2-tailed)

PR= Personal Relevance, **U** = Uncertainty, **CV** = Critical Voice, **SC**= Shared Control, **SN**= Student Negotiation

Table 4 indicates that the correlations between constructivist learning environment variables and self-efficacy and active learning strategies are all positively statistically significant. Correlations between SPQ variables and Biology learning value are all non-significant except for that with shared control which is statistically significant (p <.05). The correlations between performance goal and achievement goal were negative and not statistically significant. The correlations between SPQ-Preferred subscales and learning environment stimulation are all statistically significant.

The positive correlation statistics indicate that the relationship between self-efficacy, active learning strategies and learning environment stimulation with constructive learning environment variables in high achieving schools are correlated. It implies that when these motivational variables increase, the constructivist learning environment variables also increase. On the other hand, the negative correlations indicate that high scores on one variable are associated with low scores on the other variable. For instance when the constructivist learning environment variables increase, the motivational variables decrease and vice versa.

Table 5 shows the inter-correlations between the SPQ subscales and the SMQ subscales among the low achieving schools.

Table 5: LAS Correlation Matrix between SPQ and SMQ variables

	Low Achieving Schools, N = 416				
Variables	**PR**	**U**	**CV**	**SC**	**SN**
Self-Efficacy	-.018	.021	-.023	.360	-.008
Active Learning Strategies	-0.164**	-.161**	-.147**	-.112*	-.163**
Biology Learning Value	-.249**	-.212**	-.204**	-.218**	-.213**
Performance Goal	.191	.028	.088	-.018	-.006
Achievement Goal	.072	.037	.024	-.020	-.029
Learning Environment Stimulation	.126**	.184**	.153**	.101*	.097*

** Correlation significant α =0.01 (2- tailed), *Correlation significant α = 0.05 level (2-tailed)

SPQ Subscales: **PR**= Personal Relevance, **U** = Uncertainty, **CV**= Critical voice, **SC**= Shared Control, **SN**= Student Negotiation

Table 5 shows that correlations between SPQ variables and self-efficacy were not statistically significant and negative. The correlations between SPQ variables and active learning strategies and Biology learning value were all negatively statistically significant. The SPQ variables and learning environment stimulation variable correlations were the only ones that were positively statistically significant. Some of the correlations of performance goal and achievement goal with SPQ variables (personal relevance, uncertainty, critical voice) were positive but not statistically significant. The correlations of performance goal and achievement goal with shared control and student negotiation were negative. These findings can be explained using the mean scores of students in both constructivist learning environment subscales and motivational variables. The students from low achieving schools generally had high scores of SPQ and low scores on self-efficacy, active learning strategies and Biology learning value subscales of SMQ. This led to negative correlations.

It was also necessary to carry out multiple regression analyses on the predictors and collective dimensions of the dependent variable (student total score on SMQ) from high achieving and low achieving schools. The results are shown in table 6.

Table 6: Multiple Regression Analyses on SMQ and SPQ by school type

	Model 1-HAS, N = 399			Model 2-LAS, N = 416		
	R^2	F	p	R^2	F	p
	.105	9.252	0.000	.032	2.700	.020
Variable	Beta	t	p	Beta	t	p
Personal Relevance	.176	2.146	.032	.014	.191	.848
Uncertainty	.118	1.425	.155	.004	.057	.955
Critical Voice	.349	3.991	.000	-.054	-.889	.375
Shared Control	.020	.320	.749	.183	1.573	.006
Student Negotiation	-.013	-.185	.853	-.104	-1.608	.109

Predictors: Personal relevance, uncertainty, critical voice, shared control and student negotiation

Dependent variable: Score on SMQ

Table 6 indicates that the first multiple regression model with all the five predictors explained 10.5% of the variance in motivational score in high achieving schools (R^2 = .105), F (5,393) = 9.252, $p < 0.05$. The two variables that were positively and statistically significant are personal relevance (ß = .176, t = .2.146, $p > .05$) and critical voice (ß = .349, t = 3.991, $p > .05$). The rest of the variables were not statistically significant with the motivation of students from high achieving schools. The second multiple regression model with the five predictors produced 3.2% of the variance in the motivational score of students from low achieving schools (R^2 = .032), F (5,410) = 2.700, $p < 0.05$. It is only shared control that was positively statistically significant (ß = .183, t = 1.573, $p > .05$). The rest of the variables were not statistically significant.

The statistically significant regression effect shows that the prediction of the independent variables is accomplished better than can be done by chance. The results indicate that the constructivist learning environment variables are better predictors of motivation of students in high achieving schools compared to that of the low achieving schools. The students from high achieving schools naturally perceive their actual learning more favorably than those from low achieving schools and even their perceptions of the constructivist learning environment are lower than the perceptions of low achieving students. On the other hand, the high achieving students are more naturally motivated to learn Biology.

The students from high achieving schools have high levels of self-efficacy since they are able to persist in attempts to understand in the face of encounter of difficult concepts. On the other hand, the students from the low achieving schools can easily give up when they come across concepts that are difficult. Two students from HAS and LAS had the following to say when asked about their strategies for learning Biology.

"HAS: 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 well

LAS: when I meet new ideas, I try to understand as it is. Sometimes the new idea is not related to the past knowledge".

The indication is that the high achieving students have embraced the active learning strategies. They are able to construct new knowledge based on their previous understanding. They are able to use previous knowledge to create links with the current concepts being brought in the learning environment. On the other hand, the low achieving students do not show strong inclination to relate the previous knowledge with the current.

The high achieving students are driven by the desire to have a conceptual understanding of Biology concepts. The high achieving students are most satisfied when they are able to conceptualize 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 instead of self-presentation compared to others (Kaplan & Maehr, 2007). On the other hand, the low achieving students 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 (Anderman & Anderman, 2010). The students from HAS and LAS had the following to say about the nature of the learning environment.

"HAS: 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

LAS: 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".

The findings from this study indicated that when high achieving students perceive the Biology learning environment as providing for personal relevance, and critical voice, they tended to have high overall motivational score. On the other hand, when the environment provided for shared control among the low achieving students, they tended to have high overall motivational scores. These findings can be interpreted from the nature of high achieving students and low achieving students. The high achieving students usually have a high level of motivation and usually are independent (Martinez & Snider, 2006). Due to this, they are likely to be comfortable with situations that enhance independence as opposed to negotiation characteristic of constructivist learning environment. They are also likely to view the learning environment as positive and offering challenges and opportunities for personal development.

The low achieving students on the other hand are naturally less motivated and dependent on the extrinsic factors of the learning environment for their achievement. Due to this, they are likely to attribute extrinsic factors of the learning environment as responsible for their performance or non-performance. The findings of this study are in agreement with the results from the study of Arisoy (2007) who found out strong associations between constructivist environment variables and motivation.

Conclusion

There is a significant relationship between the constructivist learning environment and motivation of students from high and low achieving schools. On the other hand, when the learning environment provided for critical voice and shared control among the high achieving and low achieving students respectively, they tended to have high motivation. It is concluded that constructivist learning environment can enhance the motivation of students in high and low achieving schools.

Recommendation

There is need for teachers to continuously structure the learning environment to conform to the constructivist pedagogy since this is likely to enhance the motivation of the learners towards learning biology. The constructs of critical voice and shared control were found to be strongest predictors of motivation. This is not to say that these variables cause

motivation, however it suggests that an environment that provides for these contributes strongly to motivation of students.

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