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Relationship between Classroom Psychosocial Environment and Academic Performance in Chemistry in Keiyo Sub-county, Elgeyo-Marakwet County

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Abstract:
This study examined the relationship between classroom psychosocial environment and academic performance in chemistry. The study further investigated the perceptions by gender, class level and school type. Participants included 366 students in Form 2 and Form 4 from 10 secondary schools of different types in Keiyo sub-county. The classroom environment was assessed using the questionnaire. Average scores in chemistry were obtained from the students' progress records in the respective schools. The results obtained showed that students had fairly positive attitudes towards chemistry. They also perceived their chemistry classroom psychosocial environment positively. Pearson product moment correlation revealed that the students' perception of the classroom psychosocial environment was significantly associated with their attitudes and academic performance in chemistry the students' perceptions of the chemistry classroom psychosocial environment is related to academic performance. The students' perceptions of the chemistry classroom psychosocial environment was related to academic performance The classroom environment has been identified as a potent ingredient in student learning and luckily is under the control of the teachers and learners. Educators can therefore adjust aspects of the classroom environment that maximise student learning. Students should be encouraged to foster a cohesive, cooperative, and task oriented environments in their classrooms.
The results suggest that educators seeking to improve students' attitudes and academic performance in chemistry should endeavor to improve the classroom environment factors assessed by the WIHIC.

Keywords: *Relationship, classroom, psychosocial, environment, academic, performance, chemistry*

1. Introduction

A major focus of science instruction over the years has been on ways of enhancing the learning outcomes of students. Science can exert a dominant, if not decisive influence on the life of an individual as well on the developmental effort of a nation (Emovon, 1985). Rutter, Maughan, Mortimore, Ouston and Smith (1979) contend that by the time learners finish high school, they have spent as much 15,000 hours in school. Learners therefore spend much of their formative years in school and the experiences and perceptions they have about school and in particular the classroom environment are significant. Research on this field have however been centred in western and Asian countries (Koul & Fisher, 2003). Concerted efforts therefore need to be taken to reverse these trends. This can only be made possible through an understanding of the factors that are causal or predictive of the low achievement in chemistry. Chemistry teaching and learning can only be fruitful if the learner is willing to learn and if the teacher is motivated enough to teach using appropriate methods and resources.

Within the context of science education, chemistry has been identified as an important school subject and is touted as being instrumental in the scientific and technological development of a nation (Kenya National Examination Council [KNEC], 2014). Kenya's national goals of education capture the need to focus on the development of the requisite skills, attitudes and knowledge in the sciences necessary to promote technological and industrial development. This should be by deliberately imparting these values in the youth to match global trends (Kenya Institute of Education [KIE], 2002). A number of past studies have advocated for the establishment of conducive learning environments for students. Chemistry as a subject in school is seen as having a twofold benefit to the learner namely, enabling the learner to have an open scientific mind and to equip the learner with knowledge, skills and attitudes required for further education (KIE, 2002). Court (as cited in Alwy & Schech, 2004), points out that Kenya's education policy emphasizes academic achievement as the criterion for advancement within the system.

In Kenya's new development blue print dubbed vision 2030 (Ministry of Planning, 2007), Kenya intends to have international ranking for her learners achievement in mathematics, science and technology. The specific strategies to achieve these will involve reforming secondary school curricula, modernising teacher training and strengthening partnership with the private sector. Further in its science, technology and innovation policy framework, the government plans to devote more resources to scientific research, technical capabilities of the workforce and in raising the quality of teaching mathematics, science and technology in schools, polytechnics and

universities. The strongest move yet by the government and the Ministry of Education together with its partners towards achieving this end has been the massive in-service programme named Strengthening Mathematics and Science in Secondary Education (SMASSE) targeting about 20,000 mathematics and science teachers. The main aim of the programme has been to equip teachers with the requisite competencies to reshape student's attitudes towards science and mathematics by enhancing appropriate classroom practices. SMASSE baseline studies revealed largely negative or neutral attitudes towards teaching and learning of mathematics and sciences, poor teaching methods, poor content mastery by teachers and a lack of infrastructure, instructional materials and equipment to schools (Nui & Wahome, 2006). Past SMASSE impact assessment surveys of the in-service and training programme on classroom practices have indicated that teachers quality of teaching and the extent of student participation are better after undergoing SMASSE in-service and training (Muraya, 2008).Fewer if any studies have been conducted on the relationship between learning environment and learning outcomes in chemistry in Kenya.

1.1. Statement of the Problem

In Kenya's secondary school curriculum, chemistry is only compulsory for students in Form 1 and Form 2, yet at Form 3 and Form 4 many students still opt to pursue it. This is in spite of the fact that chemistry has consistently ranked lowest in the national examinations among the three sciences (KNEC, 2014). The teaching of chemistry in Kenya is in line with the objectives of secondary education which include the imparting of the necessary skills, attitudes and knowledge for the development of the self and the nation, promotion of positive environmental and health practices, the development of ability for enquiry, critical thinking and rational judgement and to build a foundation for technological and industrial development (KIE, 2002).

Despite the importance of chemistry to mankind and the educators' efforts to improve its teaching and learning, the achievement of students in the subject in the country remains low. The national mean marks in chemistry in the years 2011, 2012 and 2013 were 23.65%, 27.93% and 24.5% respectively (KNEC, 2014). Achievement with respect to gender also varied with boys outperforming girls in the three years considered. The performance of chemistry in Keiyo sub-county mirrors the national trends with low performance being observed (Keiyo sub-county education day planning committee, 2014). Among the factors that have been identified as contributing to the observed low performance are poor methods of instructions, learners' largely negative or neutral attitudes towards the subject, inadequacy of laboratory experiences and a poor science background of learners (Nui & Wahome, 2006). In spite of all the efforts being put to improve the learning outcomes in science and chemistry in particular, a lot remains to be done as reflected by the dismal results at the national examination year after year. It is therefore important and necessary to continuously review factors that cause or predict negative attitudes and low academic performance in chemistry. In this study, there was need to establish the relationship between Classroom Psychosocial Environment and Academic Performance in Chemistry

2. Literature Review

Walberg, (1991) defines classroom psychosocial environment as "the climate or atmosphere of the class as a social group that potentially influences what students learn" (p. 255). Wilson (1996) defines it as the space or place where learners and teachers interact with each other and use a variety of tools and information in their pursuit of learning activities. Importantly, it excludes the physical learning environment in terms of classroom furniture, displays, lighting, air quality and technology. The concept of environment, as applied to educational settings, refers to the atmosphere, ambience, tone, or climate that pervades the particular setting (Dorman, 2002). Accordingly, research in this field has focussed historically on the psychosocial dimensions of the environment; those aspects of the environment that focus on human behaviour in origin or outcome (Boy & Pine, 1988). Rutter, Maughan, Mortimore, Ouston and Smith (1979), contend that students spend up to 15,000 hours at school by the time they finish high school. Students therefore have a large stake in what happens to them at school and their reactions to, and perceptions of, their classroom experiences are significant.

Classroom psychosocial environment is somewhat a difficult concept to describe but since the 1960s, considerable interest has been shown internationally in the conceptualisation, measurement and investigations of perceptions of psychological characteristics of the learning environment of classrooms at the elementary, secondary and higher education levels by studies mainly in Western and Asian countries (Fraser, 1994).

Perceptions of the classroom environment have consistently been shown to be associated with students' learning outcomes. Haertel, Walberg and Haertel (1981) in a meta-analysis of previous research examined 734 correlations from 12 studies on 823 classrooms in eight subject areas found significant correlations between classroom environment and learning outcomes. The outcomes include cognitive, affective and behavioural dimensions. Specifically the outcomes were positively associated with cohesiveness, satisfaction, task difficulty, formality, goal orientation, democracy and environment. They were negatively associated with friction, cliqueness, apathy, disorganisation and favouritism.

Baek and Choi (2002) in Korea found academic achievement in English to be positively related to the classroom environment dimensions of involvement, task orientation, affiliation, competition, order and organisation, rule clarity and teacher control. Their study used a revised version of the CES questionnaire that was then translated to Korean. A study by Rivera and Ganaden (2000) in the Philippines found the LES environment scales of students' interest, teacher support, student participation, teacher encouragement, fairness and clarity of rule and tasks in the classroom and classroom ventilation to be positively related to achievement in chemistry. Although different research variables and different instruments have been used to study environment-achievement associations in different subjects, evidence support the potency of the environment in helping to predict achievement outcomes.

Wahyudi and Treagust (2004) examined the associations between learning environments and students' outcomes in science classes in Indonesian lower secondary schools. Learning environment perceptions were gathered using a modified version of the WIHIC

questionnaire from 1400 students. Performance was reflected by scores in the national examinations. The study found that revealed significant associations between achievement in science and the learning environment dimensions of student cohesiveness, task orientation, and cooperation. The study especially singled out cooperation as being a strong predictor of students' cognitive achievement.

Chionh and Fraser (2009) investigate the relationship between classroom environment and achievement, attitudes and self-esteem in geography and mathematics. Student cohesiveness and task orientation was found to be related with scores in geography, while student cohesiveness, task orientation and equity were found to be related to achievement in mathematics. Classroom environment perceptions was collected using the WIHIC questionnaire while results in the Singapore-Cambridge General Certificate of Education ordinary Level Examination was to rate achievement in mathematics and geography.

Stakeholders in Kenya's education system attach immense importance to academic performance. This is mainly because good performance guarantees one's progression into tertiary institutions and competitive career opportunities. Although Kenya's education curriculum emphasizes wholesome education, academic achievement remains the main criterion for admission into tertiary institutions.

2.1. Theoretical Framework

The study was guided by the field theory advanced by Kurt Lewin. Lewin's field theory attempts to approach the problem of the relationship between psychological processes and environmental characteristics in a "total way" perhaps influenced by his earlier training in the phenomenological orientation of the Gestalt school (Bonnes & Secchiaroli, 1995). Lewin postulates that every psychological event depends upon the state of the person and the environment. The famous equation of the Lewinian theory B = f (P, E) points out the environment (E) interacts with personal characteristics (P) as to determine behaviour (B).

Lewin defines an individual's whole situation as their life space (LS), which he explains as the total psychological reality that determines the behaviour of the individual (Mishra, 2008). Behaviour is therefore a function of the life space expressed mathematically as B = f(LS). Lewin, though affirming the importance of considering the physical characteristics of the environment however incorporates them in the psychological realm as these characteristics are perceived subjectively. This puts into perspective other underlying factors such as needs. Lewin also views the person as being differentiated from his psychological environment. This can be illustrated as follows.

Mishra (2008), states that Lewin's theory divides the psychological environment into different regions some with permeable boundaries which enable individuals to influence and be influenced by others. This theory was applied in this study to explain the relationship between the psychosocial environment, attitudes and academic performance in chemistry. The independent variable, the classroom psychosocial environment comprised the interaction between students and students and the teacher in the classroom, whereas attitudes and academic performance was the resultant behaviour.

3. Research Methodology

A quantitative method was employed in this study. The quantitative approach involves the collection of numerical data in order to explain or predict phenomena. In this study, the use of questionnaires and record analysis was used to source for numerical data. Quantitative research is advantageous in that it is suitable for testing hypothesis and minimising research bias. This study adopted a multi-strategy approach whereby both causal-comparative and correlational designs were used. Causal-comparative design attempts to establish a cause for or consequences of differences between groups. The independent variable is not under the control of the researcher (Fraenkel & Wallen, 2009). This design was used to examine the influence of class level, school type, and gender on chemistry students' perception of psychosocial environment in their classrooms. Correlational design attempts to determine relationships between two or more variables. It is suitable in collecting more than one type of information from the sample when the intention is to describe and compare them (Fraenkel & Wallen, 2009). The methods are non-experimental because they deal with relationships among non-manipulated variables to analyse their relationships (Best & Kahn, 1993).

The study was carried out in Keiyo sub-county. Keiyo sub-county is part of Elgeyo-Marakwet County and is located east of Eldoret which is the regional hub. The geographical location of the study was chosen because the academic performance in chemistry was observed to be low (Keiyo Sub-county Education Day Planning Committee, 2014). It also has the characteristics desired for the study, namely, different school types, and students of different gender. Further, no study on learning environments has been done in the sub-county.

The research population comprised all Form 2 and Form 4 chemistry students in all the secondary schools in Keiyo sub-county. The sub-county has 21 secondary schools. There are three girls' only schools and three boys' only schools. The rest are co-educational. The research population was approximately 3,500 students.

Multi-stage sampling was used to select the various units that participated in the study. First, stratified random sampling was employed to select the schools in the different categories namely, boys' only schools, girls' only schools and co-educational schools. Two co-educational schools were in the process of phasing out students of one gender while one other had no students at Form 4 level. These three schools were therefore omitted from the sampling frame. In the schools chosen, two class levels, Form 2 and Form 4 were purposively selected to take part in the study. This consideration provided for the study of the influence of class level on the students' perceptions of the psychosocial environment in a chemistry classroom. The two class levels represented lower and upper forms respectively. Students in each of the selected level have been in school longer and so have experienced the variables being examined longer. In schools with more than one stream per form, at least one stream was randomly selected. In single sex schools, participating students in each class were randomly selected while disproportionate stratified random sampling was used to select students in

coeducational schools to ensure all groups were equitably represented. Krejcie and Morgan (1970) sample size table was used to determine the sample size. The composition of the participants is shown in the Table 1.

		School Category			
Gender	**Class Level**	**Boys' Only School**	**Girls only Schools**	**Co-educational Schools**	**Total**
Boys	Form 2	39	-	43	82
	Form 4	58	-	50	108
Girls	Form 2	-	43	56	99
	Form 4	-	43	34	77
Total		**97**	**86**	**183**	**366**

Table 1: Composition of sampled students

A research permit was obtained from the National Commission for Science, Technology and Innovation to enable the researcher to collect data from various participants. Further clearance to conduct research in the sub-county was sought from the county commissioner and the county director of education, Elgeyo-Marakwet County and the respective head teachers and chemistry teachers in the various schools. Two data collection instruments were used to source data. The WIHIC questionnaire was used to obtain data on the perception of students of their psychosocial environment in a chemistry classroom.

The Statistical Package for the Social Sciences (Version17) was used to analyse the students' responses. Pearson product moment correlation was used to determine relationships between the factors in the WIHIC scale and academic performance and attitudes towards chemistry. A t-test for independent samples was used to compare the differences in the students' perception of the classroom psychosocial environment by gender and class level. Differences in the perceptions of students in different school types for WIHIC factors was analysed using one way ANOVA. Statistical inference was carried out at 0.05 level of significance.

4. Results

The participants were asked to respond to items in the WIHIC which measured their perception of the chemistry classroom psychosocial environment. An average score in chemistry was calculated from scores of three preceding terms. These were obtained from the respective schools' progress records and served as a measure of academic performance in chemistry. The responses to the WIHIC items were scored and correlated with standardized chemistry scores using Pearson product moment correlation. The results of the correlation are reported in Table 2.

Measure	**1**	**2**
1. Perceptions of Classroom Psychosocial Environment	-	.16**
2. Standardised Chemistry Scores	.16**	-
M	3.78	0
SD	0.47	1

Table 2: Simple Correlation between Perceptions of the Chemistry Classroom Psychosocial Environment and Academic Performance in Chemistry
$^{**}p \leq 0.001$

The result of simple correlation analysis showed that perceptions of the classroom psychosocial environment are positively and significantly related with academic performance in chemistry, r (364) = .155, p = .003. Further analysis was conducted to explore the relationship between the various WIHIC scales and academic performance. The results are displayed in Table 3.

WIHIC Scale	**Average Score in Chemistry**
Student Cohesiveness	.12*
Teacher Support	.15**
Involvement	.13*
Investigation	.15**
Task Orientation	.06
Cooperation	.04
Equity	.12*

Table 3: Simple Correlation (r) between WIHIC Scales and Academic Performance in Chemistry
$^{*}p \leq .05$, $^{**}p \leq 0.001$

The results of simple correlation analysis show that 5 out of the 7 correlations are statistically significant. Results show that Student Cohesiveness, Teacher Support, Involvement, Investigation and Equity are significantly and positively correlated with the students' academic performance in chemistry. Task orientation and cooperation were found not to be correlated with academic performance in chemistry.

Pearson product moment correlation revealed that students' perceptions of the chemistry classroom psychosocial environment is related to academic performance. Specifically, student cohesiveness, teacher support, involvement in class tasks, investigation skills and equity in the classroom were found to be related academic performance in chemistry. Only task orientation and cooperation did not correlate with academic performance. These findings largely replicate research in various subject areas which have shown significant associations between learning environment factors and academic performance. These include Wayhudi and Treagust (2004), who found out that student cohesiveness was positively and significantly related to academic achievement in science, Chionh and Fraser (2009) who established a link between student cohesiveness, task orientation, and equity on academic performance in mathematics, and Baek and Choi (2002) who found student involvement, teachers control and task orientation to related academic performance in English. Similarly, Ganaden and Rivera (2000) found association between teacher support and academic achievement in chemistry. Notable in this study is the lack of a relationship between task orientation and cooperation with academic performance. In the Kenyan education set up, teachers are particularly keen and strict on completion of tasks and failure by students to complete them is severely punished (Human Rights Watch, 1999). Students may therefore be mechanically solving tasks without really bothering to understand them in order to meet deadlines. This may explain the lack of association between task orientation and academic performance. The non-significant relationship between cooperation and academic performance may be attributed to the competitive nature of most classrooms. Students therefore find it a contradiction to cooperate and compete at the same time.

5. Conclusion

The students' perceptions of the chemistry classroom psychosocial environment was related to academic performance The classroom environment has been identified as a potent ingredient in student learning and luckily is under the control of the teachers and learners. Educators can therefore adjust aspects of the classroom environment that maximise student learning.

6. Recommendation

Based on the findings of this study, the following recommendations are made.

1. Students should be encouraged to foster a cohesive, cooperative, and task oriented environments in their classrooms.
2. School administrators should strive to make available suitable learning facilities and to ensure that the work environment is motivating for teachers to carry out their duties.

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