EFFECTS OF CONSTRUCTIVIST TEACHING APPROACH ON STUDENTS’ ACHIEVEMENT AND ATTITUDE TOWARDS SECONDARY SCHOOL CHEMISTRY IN BARINGO NORTH DISTRICT, KENYA

RICHARD CHEROP KIBOS

A Thesis Submitted to the Board of Postgraduate Studies in Partial Fulfillment of the Requirements for the Award of Degree of Master of Education (Science Education) of Egerton University

EGERTON UNIVERSITY

SEPTEMBER, 2015
DECLARATION AND RECOMMENDATION

Declaration

This is my original work and has not been presented for an award of a Certificate, Diploma or Degree in part or as a whole in this or any other University.

Signature_________________________________          Date___________________

Richard Cherop Kibos
Reg. No. EM14/1177/04

Recommendation

This work has been submitted for examination with our approval as University supervisors.

Signature___________________________ Date______________________

Prof. S.W. Wachanga
Department of Curriculum Instructions and Education Management, Faculty of Education and Community Studies, Egerton University

Signature___________________________Date________________

Prof. J. Changeiywo
Department of Curriculum Instructions and Education Management, Faculty of Education and Community Studies, Egerton University
DEDICATION

This thesis is dedicated to my dear wife Emily, my daughters Betty, Caroline, Gladys and sons Kelvin and Caleb. They became patient and steadily encouraged me throughout the years of study. This also extends to my sister Benedine, brother Reuben and my parents.
ACKNOWLEDGEMENT

I would like to express my deepest gratitude to my supervisors Prof. S. W. Wachanga and Prof. J. Changeiywo for their guidance, tireless effort and concern throughout the study. I also thank Mr. Ogola for his invaluable guidance, the entire Faculty of Education and Community Studies and my fellow masters students for their assistance and constructive criticism during the research. I would like also to extend my thanks to the principals and teachers in the schools of study who assisted me in the research not forgetting friends who provided suggestions and advice where necessary. Finally, I thank my parents and children for their support, patience and encouragement.
ABSTRACT

Chemistry teaching and learning is important in any society because it is one of the key subject in the socio-economic development of the society. It is offered in the secondary school curriculum and examined at Kenya Certificate of Secondary Education (KCSE) Examinations. It helps learners to acquire knowledge of facts, principles and events of nature, enabling them to live intelligent and efficient lives in the modern society. Despite its usefulness, the students’ performance in Chemistry in National Examinations has been poor thus affecting their enrollment in chemistry related courses in colleges and universities. The teaching approach used by a teacher may affect the students’ performance in the subject. The constructivist teaching approach may help improve students’ performance in Chemistry, but its usefulness is not known. Therefore this study sort to investigate the effect of the constructivist teaching-learning approach on students’ achievement and attitude in the learning of Chemistry. Quasi-experimental research which involved Solomon-Four Non-Equivalent Control Group Design was employed. The population of the study was Form Two learners in Baringo North District. The sample size was 160 Form Two students out of a total population of 1260 from four District co-educational public boarding schools purposively sampled. The four schools were randomly assigned to treatment and control groups. The instruments used in the study were Chemistry Achievement Test (CAT) and Students’ Attitude Scales (SAS). Pilot test was done in a school within the Baringo North District but a different division from the schools under study to ascertain the instruments’ validity and reliability. To maintain validity, three experts from the Department of Curriculum Instruction and Education Management validated the instruments. The Cronbach’s coefficient alpha method was used to estimate the reliability coefficient of SAS and the reliability coefficient of the CAT was calculated using Kuder-Richardson formula \(21(KR-21)\). The reliabilities of SAS and CAT were found to be 0.7591 and 0.7823 respectively which were above the threshold value of 0.7 recommended for the research. The students took a pre-test then a post-test after the treatment followed by post group discussions. The collected data were analyzed using descriptive and inferential statistics. Quantitative data were subjected to t-test, ANOVA and ANCOVA at coefficient alpha \(\alpha\) equal to 0.05 level of significance with the help SPSS computer package. Results of the study showed that the constructivist teaching–learning approach is highly effective on enhancing students’ chemistry achievement but no significant difference was found in their attitudes towards chemistry. The results of this study may be beneficial to curriculum developers, teacher trainers and chemistry teachers in improving the teaching-learning process in Chemistry.
# TABLE OF CONTENT

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION AND RECOMMENDATION</td>
<td>ii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
<tr>
<td>ABBREVIATIONS AND ACRONYMS</td>
<td>xiii</td>
</tr>
<tr>
<td>CHAPTER ONE</td>
<td>1</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Background Information</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Statement of the Problem</td>
<td>4</td>
</tr>
<tr>
<td>1.3 The Purpose of the Study</td>
<td>4</td>
</tr>
<tr>
<td>1.4 The Objectives of the Study</td>
<td>4</td>
</tr>
<tr>
<td>1.5 Hypotheses of the Study</td>
<td>5</td>
</tr>
<tr>
<td>1.6 Significance of the Study</td>
<td>5</td>
</tr>
<tr>
<td>1.7 Scope of the Study</td>
<td>6</td>
</tr>
<tr>
<td>1.8 Assumptions of the Study</td>
<td>6</td>
</tr>
<tr>
<td>1.9 Limitations of the Study</td>
<td>6</td>
</tr>
<tr>
<td>1.10 Definitions of Terms</td>
<td>6</td>
</tr>
<tr>
<td>CHAPTER TWO</td>
<td>8</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td>8</td>
</tr>
</tbody>
</table>
2.1 Introduction

2.2 Chemistry Education in Society

2.3 Development of Chemistry Education in Secondary Schools in Kenya

2.4 Chemistry Conception

2.5 Structure and Bonding Topic

2.6 Constructivism as a Learning Theory

2.7 Constructivist as a Learning Approach

2.8 Teaching Science using Constructivist Approach

2.8.1 Teacher Perspectives on a Constructivist Learning Approach

2.8.2 Criticisms of Constructivist Approach

2.9 Instructional Methods used in Teaching Chemistry in Kenya

2.9.1 Lecture Method

2.9.2 Discussion Method

2.9.3 Demonstration Method

2.9.4 Questioning Method

2.9.5 Class Experiment

2.9.6 Cooperative Learning Approach

2.9.7 Discovery Learning Approach

2.9.8 Guided Discovery Approach

2.10 Research in Chemistry Teaching Methods in Kenya

2.10.1 Students’ Achievements in Secondary School Chemistry

2.11 Students’ Attitude towards Chemistry

2.11.1 Importance of the Research on Attitudes towards Chemistry

2.11.2 How to Gather Information on Attitudes Towards Chemistry

2.12 Theoretical Framework

2.13 Conceptual Framework
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

5.2 Summary of the Findings

5.3 Conclusion

5.4 Implications of the Findings

5.5 Recommendations

5.5.1 Recommendations for Further Research

REFERENCES

APPENDICES:

Appendix A: CHEMISTRY ACHIEVEMENT TEST (CAT)

Appendix B: STUDENTS’ ATTITUDE SCALES (SAS)

Appendix C: CONSTRUCTIVIST TEACHING-LEARNING MODULE

Appendix D: CONSTRUCTIVIST CLASS ACTIVITIES

LIST OF TABLES

Table 1: Candidates’ National Overall Performance in Chemistry from the years 2000-2008

Table 2: Candidate’s Overall Performance in Chemistry from the year 2000-2007 in Baringo District
Table 3: Summary of Analytical Procedures for the Study ----------------------------- 32
Table 4: Summary of Data Analytical Procedures for the Study ---------------------- 34
Table 5: Pre-test Analysis by Teaching Approach ---------------------------------- 35
Table 6: CAT Post-test Mean Gain by Teaching Approach --------------------------- 36
Table 7: Comparison of Mean Gain of E_1 and C_1 Groups on CAT ------------------- 37
Table 8: Post-test Analysis Using ANOVA ------------------------------------------ 38
Table 9: One-way of Students’ Post-test CAT Mean Scores ------------------------- 38
Table 10: Multiple Comparison Test (Sceffes’ Post hoc) Analysis using ANCOVA--- 39
Table 11: The Adjusted Post-test Mean Scores Using K.C.P.E as Covariate--------- 39
Table 12: Test of Differences Using Analysis of Covariance (ANOVA)------------- 40
Table 13: Table of CAT Post-test Mean Scores Multiple Comparison
using ANCOVA--------------------------------------------------------------- 40
Table 14: Post-test and Mean Gain Analysis on SAS by Learning Approach------ 41
Table 15: A Comparison of Mean Gain of E_1 and C_1 groups on SAS --------------- 42
Table 16: Students’ SAS Post-test Mean Scores ---------------------------------- 43
Table 17: One-way ANOVA of Students’ Post-test SAS Mean Scores----------------- 43
Table 18: Multiple Comparison Test Sceffes’ (Post hoc) using ANOVA------------ 44
Table 19: The Adjusted SAS Post-test Mean scores ------------------------------- 44
Table 20: Test of Differences Using ANCOVA ------------------------------------- 45
Table 21: Multiple Comparison Test (Sceffes’ Post hoc) using ANCOVA---------- 45
Table 22: Comparison of the Combined Mean Scores of the Control and
Experimental Groups---------------------------------------------------------- 46

LIST OF FIGURES

Figure 1: Teaching Sequence of Constructivist Approach ------------------------- 26
Figure 2: Conceptual Framework for Determining the Effect of
Constructivist Learning Approach ----------------------------------------------- 29
Figure 3: Solomon Four Non-Equivalent Control Group Research Design
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT</td>
<td>Chemistry Achievement Test.</td>
</tr>
<tr>
<td>CDF</td>
<td>Constituency Development Fund</td>
</tr>
<tr>
<td>CTA</td>
<td>Constructivist Teaching Approach.</td>
</tr>
<tr>
<td>K.C.S.E</td>
<td>Kenya Certificate of Secondary Education</td>
</tr>
<tr>
<td>K.I.E</td>
<td>Kenya Institute of Education</td>
</tr>
<tr>
<td>KR-21</td>
<td>Kuder Richardson (21) formula for estimating the reliability of a test.</td>
</tr>
<tr>
<td>KNEC</td>
<td>Kenya National Examinations Council</td>
</tr>
<tr>
<td>SAS</td>
<td>Students’ Attitude Scales</td>
</tr>
<tr>
<td>SMASSE</td>
<td>Strengthening of Mathematics and Science in Secondary Education</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>8.4.4</td>
<td>A Kenyan Education system involving eight years of primary, four years of secondary and four years of university education. This is the current education system in Kenya.</td>
</tr>
</tbody>
</table>