

**INFLUENCE OF REFLECTIVE INQUIRY-BASED TEACHING ON
PUBLIC SECONDARY SCHOOL STUDENTS' PERFORMANCE IN
GEOGRAPHY MAP WORK IN KENYA**

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DECLARATION

This thesis is my original work and has not been submitted to any other award of a degree doctor of philosophy in any other university

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DEDICATION

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ABBREVIATION

AAG	Association of American Geographers
KCSE	Kenya Certificate of Secondary Education
KIE	Kenya Institute of Education
JAB	Joint Admissions Board
AERA	American Educational Research Association
ERO	Educational Review Office
NCME	National Council on Measurement in Education
APA	American Psychological Association

ABSTRACT

Instructional strategies/techniques, approaches, and methods, when used appropriately, are likely to significantly influence academic achievement at all levels of education. The purpose of this study was to investigate the influence of reflective inquiry-based teaching on public secondary school students' performance in geography map work in Kenya. The specific objectives of the study were to: (i) determine how teacher professional qualifications influence the utilization of reflective inquiry methods in the teaching of geography map work; (ii) investigate the effect of the reflective inquiry-based method on students' performance in secondary school geography map work; (iii) investigate the influence of students attitudes on learners' performance in secondary school geography map work, and (iv) establish how teacher attitude towards the use of reflective inquiry (action, engagement, exploration, explanation, elaboration, and evaluation) influences students' performance in secondary school geography map work. The study targeted both the teachers and Form 3 students in public secondary schools in Nyanza, Western and Rift Valley regions in Kenya. Quasi-experimental research design was used to guide this study. Data was collected using questionnaires, document analysis, interviews, observation, pre-test and post-test methods. During data collection, adequate steps were taken to preserve the integrity and identity of the participants including procuring consent to carry out the study. Data was analyzed using means, standard deviations, percentages, t-test and analysis of variance (ANOVA). The findings indicate that there is a significant difference in learner performance in geography map work ($t_{(236)} = 22$, $p < 0.05$) between students who are taught using reflective inquiry-based teaching method and those taught using traditional methods of teaching geography map work in public secondary schools. This implies that public secondary school students are likely to perform better in map work activities when taught using reflective inquiry-based method in addition to the traditional methods of teaching geography map work. The study also established that teacher qualifications positively influence students' performance ($F_{(3,115)} = 1.295$, $p=.828$) in geography map work. Findings also indicate that students have positive attitude towards map work activities ($F_{(2, 236)} = 132.38$, $p=1.26$) when taught using reflective inquiry in addition to the traditional methods of teaching geography. Against these findings, there is need to have teachers and instructional supervisors of geography trained in reflective inquiry-based teaching method and also have instructional materials that incorporate this method of teaching in schools. The findings are also likely to inform curriculum developers on use of reflective-inquiry-based teaching method in teaching school geography map work. Consequently, further research is recommended on reflective inquiry-based teaching to determine the steps on how it can be integrated in secondary school teaching system.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Map work, field work and quantitative methods form the practical component of geography in secondary schools in Kenya. Map work is key to the study of geography. Cartography forms part of the three traditions of the study of geography as stated by Haggett (1990). Haggett states further that geographers have evolved their own ways of viewing the world which can be summarized in the three methodological traditions.

These are the cartographic tradition, field work tradition and the holistic tradition.

He explains that cartographic tradition encompasses the way geographers record and represent the surface of the earth. The recording of started by the sketch map of early explorers, to the current concepts of modern map making and interpretation. The field work tradition reflects the interaction of geographers with their primary sources of empirical information. This includes the ways geographers gather quantitative data and gain qualitative insights. The holistic tradition captures the attempts of geographers to understand the totality of the earth surface. These three traditions blend to give us the general definition of geography, its nature and scope.

According to Bailey (1974) Geography is the science of present day distribution of phenomena of the surface of the earth. He notes that the discipline of geography is concerned with ideas and spatial relationship between surface phenomena. Geography, in secondary schools in Kenya, is recognized for it belongs to the sciences, arts and liberal studies. This is indicated by the clusters it belongs to for admissions in the universities

and other tertiary institutions (JAB, 2011). Geography is also used to admit students into science based courses as well as arts and liberal courses.

One of the important topics in geography required by many in society is map work. Map work plays a key role in showing the relation between phenomena on the earth's surface. Barley (1974) says that skills in map work are better developed through graphicacy, which is fundamentally the special communication that cannot be conveyed adequately by verbal or numerical means (Borchert 1987). Graphicacy in a larger measure is concerned about map work. Bailey (1974), while noting the importance of maps in the teaching of geography, cited five areas in learning of map work creates that is problematic to students. These areas are selectivity, map conventions, relief and contours, scale and the overhead view of map readings. The same problematic areas are highlighted by examiners in geography in the national examinations in Form Four in Kenya (KNEC, 2012). In addition, KNEC cites problems in cross sections, vertical exaggerations; calculation of areas, working out bearings, reading grid references, measuring distances, sketch drawing and plotting features, interpretation of both physical features using the key, identification of population distribution patterns, distinguishing and describing settlement features (KNEC, 2012). This has led to poor performance in the question on map work in Kenya Secondary Certificate Examination (KCSE) Geography paper. This may imply that there might be a problem in the teaching of skills in map work.

Skills in map work mean a wide range of competencies that geography students expected to develop and apply in different geographical issues. Skills are important in geography teaching and should be developed in an integrated way rather than in isolation (Cox, 2001). In developing skills in any aspect of geography, teachers should be able to identify

the basic and many activities that are involved in the teaching of a given skill. This demands a methodology that is likely to provide students enough opportunity to participate in their learning. The methodology that is also likely to enable students to construct and apply knowledge in geography map work. The methodology that is likely to provide such an opportunity is student-centred teaching methodologies that require them to do inquiry and reflections. Perhaps a combination of student reflections and inquiry is likely to engage them in developing knowledge and skills in geography. This method, herein referred to as reflective inquiry-based teaching, is likely to be appropriate because it focuses on students' reflections and inquiry through engagement, exploration, explanation, elaboration and evaluation of learning tasks (Henderson, 2001, Koballa and Chiapetta, 2006). The teaching of geography in Kenya has been through expository methods (Graves, 1999). These methods are teacher-centered rather than learner-centered. The expository methods lend themselves to rote learning, which is likely not to be useful in map work thus leading to low student achievement of learning outcomes. This is supported by the national geography examinations reports (KNEC, 2012).

In Kenya, geography is an optional subject at Forms Three and Four (KIE 2002), yet it appears popular among students in secondary schools as shown by the number of candidates enrolled every year in Kenya as shown in Table 1.

Table 1.1: Candidates Performance in Geography National Examinations, 2006-2014

Year	Total number of candidates	Geography candidates	Subject mean score out of 200 marks
2006	243,453	97,991	83.44
2007	276,239	103,288	93.62
2008	305,015	109,745	74.01
2009	337,404	112,446	75.73
2010	357,488	112,402	74.98
2011	411,783	121,402	83.30
2012	436,349	117,402	93.30
2013	446,696	110,307	84.82
2014	483,630	121,854	88.03

Source: KNEC K.C.S.E Examination Report, 2015

From Table 1.1, it can be seen that the number of students taking geography has been increasing (from 243, 453 in 2006 to 483,630 in 2014) while those enrolling for KSCE in geography has increased (from 97,991 in 2006 to 121,854 in 2014). This translates to about 25% of all the candidates who sit for the geography examination every year. From Table 1, it can also be seen that students' mean scores have been declining (from 93.62 to 74.01 out of a possible mark of 200). This indicates that students' performance in geography national examinations has been below the average mark of 100. In the examination reports (KNEC, 2015), it is argued that the geography subject could have

been performed well except for students' poor performance in map work. The examination reports on the performance of geography in KCSE suggest that candidates perform poorly in question 6 on map work which is compulsory, thus lowering the average mark in geography (KNEC, 2012). This suggestion has also been supported by KNEC (2015) reports which show that the mean mark for geography paper has been consistently below 50% over the years.

The analysis of students' performance in the national examinations in geography according to gender has also been done (KNEC, 2015). Students' performance in geography national examinations for the years 2011-2014 as per gender is shown in Table 1.2.

Table 1.2: Performance in Geography National Examinations by Gender (2011-2014)

Year	Gender	Number of candidates	Subject mean score (%)
2014	Male	72,553	46.29
	Female	49,607	44.02
2013	Male	66,292	44.71
	Female	44,058	38.08
2012	Male	71,610	48.82
	Female	46,101	43.09
2011	Male	87,604	37.42
	Female	32,489	34.55

Source: KNEC K.C.S.E Examination Report, 2015

From Table 1.2, the number of boys sitting for geography national examinations has reduced from 87,604 in 2011 to 72, 553 in 2014 while girls increased from 32,489 in 2011 to 49,607 in 2014. The boys performance in geography has ranged from 37.42% in 2011 to 46.29% in 2014. It is evident that male candidates have always been more than female candidates. From the mean scores, it can be seen that males' mean scores in geography have been higher than those of the females for the last four years, 2011-2014). This concurs with other studies that indicate that in Mathematics and Science boys perform better than girls (Twoli, 1986). Similarly, Sara, et al. (2010) analyzed gender differences in recent studies on students' performance in mathematics from 242 studies published between 1990 and 2007 representing the testing of 1,286,350. It was found that there is no difference between boys and girls performance in mathematics. It can also be argued that students' performance in geography may not be influenced by gender. There are no studies in Kenya that have been done to show why there is a disparity in students' performance in national geography examinations. Against this background, there was need to find out whether students studying geography in similar conditions achieve learning outcomes, regardless of gender.

There are many factors that are likely to be attributed to poor performance in geography. Some of the factors may include teaching methods, instructional materials, and inadequate coverage of the syllabus content; especially map work whose question items are poorly done in the national examinations (KNEC, 2012), learner attitude towards map work, and school environment (Roberts, 2006).

Generally, the geography syllabus in Kenya aims at strengthening student awareness about Kenya and the world, starting from the local area and equipping them with

information which they can use effectively in their lives. The geography syllabus has been designed to be taught from form 1 to form 4 (grades 9 to 12). The geography curriculum puts emphasis on concepts, skills, attitudes and values as they relate to the discipline of geography. The secondary school geography syllabus/curriculum in Kenya has 12 lessons of map work for Forms One, Two and Three, respectively.

The geography syllabus seems based on constructivist's approaches and is supposed to focus on students' active learning and inquiry. In this respect, the geography curriculum is aimed at educating students towards critical thinking and equipping them with geographical and spatial analysis skills thorough constructed knowledge. The broad and specific objectives of secondary school geography are geared towards making contributions to development of cognitive skills, sensory and psychomotor skills. From the general objectives and the specific objectives of each topic in the geography syllabus (KIE, 2002), it can be confidently stated that the geography curriculum is based on "process – model" teaching strategies and student activities involving life related problem – solving. In other words the syllabus developed in 2002 requires teaching strategies which make the students participate in the learning-teaching process in an active way inside and outside the classroom. As a student-centered programme, active participation by the students at every stage of the teaching/learning process is required. In view of the general objectives of geography (K.I.E 2002), it can be argued that geography teaching in secondary schools should have changed in terms of its purpose, scope, range of teaching, teaching methods and techniques. In addition, text book designs, teaching materials and assessment methods in geography ought to have changed.

In teaching geography using the traditional methods (lecture, discussions, group work, demonstrations and excursions, among others), it is assumed that students will exhibit the same reaction and behavior to the stimuli presented by the teacher. In the current syllabus (KIE, 2002), the learning process is envisaged in the interpretation, comprehension and construction of the information by the individual. Great importance is also given to field work. It is emphasized that students need to evaluate geographic phenomena in their local areas in order to improve their field study skills. Fieldwork may be conducted near or far, or even at the school garden. In addition, they can be conducted not only in natural environment but also in an industrial zone, factory, trade centre, village, housing estate or a tourism area.

In cases where it will not be possible to organize field trips, virtual trips via the internet in class and visual-auditory teaching tools (films and documentaries) are recommended. In the geography syllabus, it has been suggested that teachers may use static visual materials (photographs, maps, slides, profiles and diagrams, CD-ROMs and materials such as multimedia, hypermedia and the internet) in class as far as possibilities can allow in a given school.

KIE (2002) further suggests that persistent learning may be achieved as a result of applying learning by doing activities and developing course materials together with students. The geography syllabus supports and even necessitates the use of current instructional technologies in students' development of geographical skills, concepts, knowledge, values and attitudes required in society. Geographical skills consist of eight main groups: map skills, observation, skills, field study skills, geographical investigation

skills, skills to prepare and interpret tables, figures and diagrams, skills to perceive time, and skills to perceive change and continuity. To achieve the eight main groups of skills in geography, students ought to be actively involved in learning activities. By so doing, the students are likely to achieve the learning outcomes in secondary school geography.

In doing map work in Form Three, students are supposed to identify and describe (physical features on topographical maps, and human activities on topographical maps); enlarge and reduce parts of topographical maps; draw cross-sections from topographical maps; calculate and interpret vertical exaggeration and gradient; determine points of intervisibility (K.I.E, 2002). Map work is a skill-oriented and a practical part of geography course. This part of the geography syllabus is likely not to be well catered for when students are taught using the traditional methods of teaching geography. The learners are likely not to understand map work to the expected level. It has been argued that attitudes of learners towards a subject influence their performance in that subject (Ruba and Anderson, 1978). It has also been argued that teaching methods play a major role in student learning and performance in a given subject (Klopfer, 1978). Against this background, it can be argued that students' achievement in geography, especially map work, may be enhanced if a new student-centred teaching method is employed during learning sessions. Perhaps, one method that might bring change in student learning outcomes in map work in secondary schools is through a combination of reflective teaching and inquiry-based teaching methods.

Reflective teaching emphasizes an ethic of care, a constructivist approach to teaching and creative problem solving (Henderson 2001). Teaching using a constructivist approach

places emphasis on the concepts, student questions, active learning and cooperative learning and they interweave assessment with teaching (Abdi, 2014). Inquiry based teaching also uses a constructivist approach to teaching which enables a student to be actively involved in the learning process. Few schools used to research funding as the basis for their decision making about provisions for students. Teachers typically selected future teaching strategies from an existing repertoire of their own and colleagues' practice (Abdi, 2014). While there are merits to choosing known approaches, the risks are that this does not necessarily align well with the currently identified issues. Thinking about the possibilities that could lead to better for students should include looking at what other teachers and researchers have found to be effective. Reflective teaching and inquiry based teaching have been found to be effective in making learners acquire and construct knowledge (ERO, 2011).

Other scholars (Sandoval & Reiser 2004, Stofflett 1998) have also indicated that inquiry-based learning produces better results in sciences than when traditional methods are used. Studies have not been done applying any of these methods in geography and specifically to map work. Against this background, it was imperative to combine reflective and inquiry teaching to form a hybrid teaching method, herein referred to as reflective inquiry teaching method in the teaching of map work in secondary schools. It was envisaged that students are likely to benefit from reflective inquiry-based teaching in secondary school geography map work. Use of a more practical and student friendly teaching methods such as reflective inquiry-based instruction, in addition to the tradition methods, was likely to enhance students' performance in map work activities in school.

Reflective inquiry-based teaching method was likely to have an effect in student learning achievement in geography. This method was likely to be good for map work exercises because it focuses on reflections on student engagement, exploration, explanation, elaboration, and evaluation. Thus students are involved in reflections on and in action as they conduct map work activities (Lampard and Balderstone, 2000). It was assumed that each of the seven components of reflective inquiry-based teaching method involve many learning activities which were likely to enable learners, regardless of gender, to grasp well skills being taught.

Research studies have shown that reflective teaching (Mtitu, 2014) and inquiry-based teaching (Robert, 2006) enhance students' performance in the sciences. Students learning geography as a science are likely to benefit from reflective and inquiry-based teaching. However, it appears that there are no studies in Kenya to show how reflective teaching and also inquiry-based teaching impact on student learning in geography. In addition, there is no documentation of student outcomes in geography based on a new hybrid teaching method that combines both reflective and inquiry-based approaches. In relation to this, there was need to combine the key elements of reflective teaching and inquiry-based teaching to form a hybrid teaching method, herein, referred to as reflective inquiry-based teaching method. In this study, reflective inquiry-based teaching was used, in addition to traditional teaching methods, to determine whether secondary school students' learning outcomes in map work are enhanced, regardless of gender.

1.2 Statement of the Problem

Geography, as a subject, has laudable purposes and relevance in society. Geography is recognized as one of the subjects in secondary school education and occupies a central position between the liberal arts, social and natural sciences. The importance of geography in the present age of globalization, characterized by Information Technology (IT), cannot be underestimated. In Kenya, many students appear not to achieve the expected learning outcomes in geography, in particular map work, as shown in Table 1 (KNEC, 2012). This poor performance may be attributed to many factors among them being lack of materials, quality of instruction, and inadequacy of teachers map work teaching skills. Against this background, there was need to search for a new teaching method that was likely to enhance students' performance in map work. The new teaching method that was hoped to benefit student learning in map work was reflective inquiry-based teaching method. Since there are no studies conducted involving the use of reflective inquiry-based teaching in geography in Kenya, this study investigated the influence of reflective inquiry-based instruction on learner achievement in geography map work in public secondary schools in nine (9) selected counties in Kenya.

1.3 Purpose of the Study

The purpose of this study was to investigate the influence of reflective inquiry-based teaching method on secondary school students' academic achievements in geography map work in nine (9) selected counties in Kenya. Specifically, the investigation included the combined influence of reflective in and on action in relation to engagement, exploration, explanation, elaboration, and evaluation, and teacher/students attitudes on

student's performance in geography map work in sampled public secondary schools in Kenya.

1.4 Objectives of the Study

This study was guided by the following objectives:

1. To determine whether teacher professional qualification level is a factor in the utilization of reflective inquiry methods in the teaching of geography map work.
2. To investigate the effect of the reflective inquiry-based method on students' performance in secondary school geography map work.
3. To investigate the impact of teacher/students attitudes on students' performance in secondary school geography map work.
4. To determine how teacher attitude towards the use of reflective inquiry (action, engagement, exploration, explanation, elaboration, and evaluation) influences students' performance in secondary school geography map work.

1.5 Research Questions

1. How does teacher professional qualification level affect the utilization of reflective inquiry-based methods in the teaching of secondary school geography map work?
2. What is the effect of reflective inquiry-based method of teaching on students' performance in secondary school geography map work?
3. How does the students' gender influence geography map work performance when reflective inquiry teaching method is used?

4. How does the use of reflective inquiry-based teaching method influence students' attitude towards the learning of secondary school geography map work?
5. How does teacher attitude towards the use of reflective inquiry-based method (action, engagement, exploration, explanation, elaboration, and evaluation) in teaching influence students' performance in secondary school geography map work?

1.6 Null Hypothesis

- Ho₁ Teacher professional qualification level is not a factor in the use of reflective inquiry-based teaching method to influence students' geography map work mean scores.
- Ho₂ There is no significant difference in the mean geography map work scores when students taught using reflective inquiry-based method are classified by gender.
- Ho₃ There is no statistically significant difference in mean geography map work scores when students are taught using reflective inquiry-based or traditional methods.
- Ho₄ Reflective inquiry-based method has no significant effect on students' attitudes towards the learning of geography map work.

1.7 Significance of the Study

This study may be of benefit to the teachers who might use the results to improve their teaching. It might also be of use to the Quality Assurance and Standard officers in their daily advice on the teaching of map work. The study may contribute the knowledge bank in the area of instruction in map work.

This study's problem was to find out whether training in an environment that emphasized reflective inquiry based teaching as the desired method, led to the acquisition of more positive attitudes concerning map work and classroom application of the reflective inquiry based teaching approach than those teachers who were not trained in the reflective inquiry based teaching methods. Therefore the findings of this study may be significant because they were able to show that an environment that emphasized the reflective inquiry teaching method enhanced students' interest in map work.

Teachers who used the reflective inquiry based teaching method were found to exhibit more interest in map work than teachers who did not use these methods. This indicated that changes are needed in the existing teacher training programs to incorporate reflective inquiry based teaching methods.

The results show that the acquisition of positive map work attitude by the teacher was related to his or her classroom performance, such evidence may guide geography teacher educator in pointing out what changes they need to initiate in their existing training programs so as to cater for individual differences among trainees. The findings of the studies may also help geography curriculum planners in terms of the facilities they need to have in the classroom that would promote teacher interest in the teaching of map work.

Incorporation of reflective inquiry as the desired methods of teaching and identification of teachers and school factors necessary for development of interest in map work and consideration of such factors when planning both teacher education programs and the secondary school geography curriculum would lead to improved geography education in Kenya.

1.8 Limitation of the Study

The study investigated the effects of reflective inquiry-based instruction on learner's achievement in map work in secondary schools in Kenya. There are other factors or variables such as instructional materials, school environment, school culture, instructional supervision, students' self-directed learning, and other teaching methods, which might impact on learner's performance that are not related to the purpose of the study. The researcher had no control over student class attendance. Student school attendance became an impediment during the study because some of the sampled students who attended classes were not available to do the tests or fill the questionnaire due to various individual reasons.

1.9 Delimitation of the Study

The study was carried out in nine (9) counties focusing on six (6) public county and twelve (12) district schools in Kenya. This comprised six (6) boys, six (6) mixed, and six (6) girls' schools. The study focused on four hundred and fifty (450) Form 3 geography students and eighteen (18) teachers of geography in the sampled schools. This study was restricted mainly to secondary schools geography map work. The study used questionnaires, interview schedules, observation schedules, and achievement tests to

investigate the influence of reflective inquiry-based teaching method on student achievement in geography map work in sampled secondary schools in 9 counties in Kenya.

1.10 Basic Assumptions

In pursuing this study it is assumed that all teachers of geography are academically and professionally qualified to teach map work. It was also assumed that teachers in the study schools were competent in using the reflective inquiry-base instruction after undergoing training on the same. In addition, sampled schools were assumed to be representative of the schools in the nine counties in order for the results to be generalized. It was also assumed that students in sampled schools and the teachers of geography together with the school principals were to volunteer to participant in the student and be in a position to provide honesty responses to all items presented to them.

1.11 Organisation of the Study

The final report of this study is organized in five distinct chapters. The first chapter called Introduction is composed of the background of the study, statement of the problem, purpose of the study objectives of the study, research questions, hypothesis, limitations, delimitations, and significance of the study, basic assumptions and definition of operational terms used in the study.

The second chapters consist of a review of related literature, a literature which provided a frame work within which data obtained would be contextualized. The review included work on reflective teaching, reflective based teaching, skills developed through teaching

geography. Secondary schools map work skills and assessment of student geography map work were also included. A theoretical frame work was developed along side conceptual frame work.

Chapter three covers research methodology which includes the design, target population, sample and sampling procedure, research instruments including their validity and reliability, data collection procedure and methods of data analysis. Chapter 4 deals with presentation, interpretation and discussion of findings. These discussions are presented based on key thematic areas defined by objectives, research questions and hypothesis. Specifically the work has been arranged in the following order introduction, effect of reflective enquiry- based teaching on participant geography map work achievement effects of reflecting inquiry-based teaching on student attitude towards geography map work. This is followed by chapter 5 which involves conclusions and recommendations.

1.12 Definition of Operational Terms

The following operational definition of terms in this study:

- Achievement** Refers to a measure of performance as indicated by the scores on the test instruments of this study.
- Attitude** Refers to feeling, opinion, and belief in and about appreciations which individuals have formed as a result of interacting directly or indirectly with various aspects of map work and which exert a directive influence on their behaviors toward map work skills.
- Teacher** Refer to trained qualified personnel's in secondary schools charged with the responsibility of teaching geography map work.
- Traditional method** Refers to the method of teaching that is teacher centered whose main characteristics involve informal lecturing, explaining, illustrating, giving examples and assignments.
- Reflective teaching** Is a systematic process of collecting, recording and analyzing teachers' thoughts and observations as well as those of the students and then going on to making changes for students' improvements.

- Reflective inquiry** Refers to a method that applies reflective action upon inquiry based teaching simultaneously in a teaching session.
- Inquiry method** Is an approach to geography teaching that gives priority to discovery, group work, self-instruction, co-operation and initiation from students. This method requires the teacher to be a skillful organizer, an expert guide, a careful planner and a provider of materials.
- Inquiry** Is a way of seeking information, knowledge or truth through questioning. It is basically for learners to acquire new information and data and turn it into useful knowledge.
- Student** In this study student refers to the learner taking geography in form three and four.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

In this chapter the literature on studies related to reflective teaching in geography and other subjects is reviewed. The literature is analyzed under the following themes: Reflective teaching, inquiry based teaching and reflective inquiry based teaching. Other areas dealt with in this chapter include: skills developed through geography and how assessment of geography map work is done. In addition, theoretical and conceptual frameworks are highlighted.

2.2 Reflective Teaching

Dewey (1933) contrasted routine action with reflective action. According to Dewey, routine action is guided by factors such as tradition habit and authority and by institutional definitions and expectations. By implication it is relative static and is thus unresponsive to changing practices and circumstances. Reflective action on the other hand involves a willingness to engage in a constant self-appraisal and development. Among other things it implies flexibility, rigorous analysis and social awareness. Dewey's reflective action when developed and applied to teaching is both challenging and exciting. Pollard, et al., (2002), reviewed the implications of Dewey's notion of reflective action and came up with seven characteristics of reflective teaching.

These seven characteristics are concern with aims and consequences as well as means and technical efficiency, applied in cyclical or spiraling processes, competence in

methods of evidence based classroom enquiry, attitudes of open mindedness, responsibility and whole heartedness, teacher judgment informed by evidence based inquiry and insight from other research, collaboration and dialogue with colleagues, and enables teachers to creatively mediate externally developed frameworks for teaching and learning.

Shapiro and Reiff (1993) define reflective teaching as a means of looking at what you do in your classroom, thinking about what you do in the classroom, thinking about why you do it and thinking about if it works. Reflective teaching then is a process of self-observation and self-evaluation. By collecting information about what goes on in the classroom and by analyzing and evaluating this information, we identify and explore our own practices and underlying beliefs. This may then lead to changes in our teaching. Reflective teaching implies a more systematic process of collecting, recording and analyzing our thoughts and observation as well as those of our students and then going on to making changes. If a lesson went well, we can describe it and think about why it was successful. If the students did not understand a language point we introduced, we need to think about what we did and why it might have been unclear. If students are misbehaving, what were they doing, when and why? You may begin a process of reflection in response to a particular problem that has arisen with one of your classes or simply as a way of find out more about your teaching. For example how you deal with incidents of misbehavior or how you can encourage your students to speak more English in your class. The first step in reflective teaching is to gather information about what happens in class.

One way of doing this is through writing a Teacher diary. That is done after the lesson, in a note book of what happened. The teacher may also describe their own reaction and feelings and those they observe on the parts of the student. This way, teachers are likely to begin to pose questions about what has been observed. It can also be done through peer observation, recording lessons through audio. Audio recording can be useful for considering aspects of teacher talk, say, how much you talked, what was talked about, clarity of instructions and explanation, how much time is allocated to student talk, and responses to student talk. Video recording can also be useful in showing you aspects of your own behavior, like where you stand, who you speak to, how you come across to the students etc. through student feedback, you can also ask your students what they think about what goes on in your classroom, their opinions and perceptions can add a different and valuable perspective. This can be done with different questionnaires or leaning diaries, for example.

Secondly, once there is some information recorded of what goes on in the classroom, what does the geography teacher do? The answer is think, talk, read and ask. Lois, et al., (2000) concludes that reflective teaching is a cyclical process because, once implementation of changes start, the reflective and evaluative cycle begins again. The geography teacher has to consider questions on what, why, and how effective students responses to the teaching and how it can be improved. As a result of this reflection, the geography teacher may decide to do something in a different way or may just decide that what was done is the best way. This way, geography teachers are likely to undergo effective professional development.

Richards (2008), while talking about how reflection takes place, stated that there are many different approaches that can be employed if one wants to become a critically reflective teacher, including observation of one self and others, team teaching and exploring ones view of teaching through writing. Reflective teaching involves three part process of the event, reflection of events and review and response to the event.

The event is the starting point of an actual teaching episode such as a lesson or other instructional activity in geography map work. While the focus of critical reflection is the teachers own teaching, self-reflection can also be stimulated by observation of other persons teaching. It is in this regard that team teaching should be made inclusive in the teaching of geography (Robinson, et al., 1984). It can be argued that teachers who involve team teaching in their classes are likely to be more effective than those who teach on their own. Through team teaching, teachers provide constructive and positive feedback to colleagues with an aim of enhancing achievement of learning outcomes.

The second stage in reflection is examination of an experience which is an account of what happened without explanation or evaluation. Several different procedures are available during the recollection including written, description of an event, a video or audio recording of an event or the use of check list or the coding systems to capture details of an event. The final stage of reflection, involves an objective description of the event, where the participant returns to the event and reviews it. The event is now processed at a deeper level. Questions are asked about the experience. Richards (2008) concludes that a reflective approach to teaching involves changes in the way teachers

perceive teaching and their roles in the process of teaching. Reflections in geography are likely result in better learning and performance of students in map work.

Mathews and Herbert (2004) state that teachers who explore their own teaching through critical teaching develop changes in attitudes and awareness, which they believe can benefit their professional growth as teachers, as well as improve the kind of support they provide to their students. Like other forms of self-enquiry, reflective teaching is not without risks. Since, journal writing self-reporting or making recording of lessons can be time consuming. Teachers engage in reflective analysis of their own teaching report that it's a valuable tool for self-evaluation and professional growth.

According to Anderson (2002), reflective teaching suggests that experience alone is insufficient for professional; growth, but experience coupled with reflection can be a powerful impetus for teacher development. Moon (2005) argues that reflection is a form of mental processing used to fulfill a purpose or to achieve some anticipated outcome. Reflection is applied to gain a better understanding or relatively complicated or unstructured ideas and is largely based on the reprocessing of knowledge understanding and possible emotions that we already possess. Moon argues, further, that reflection is deliberate, purposeful, structured, change oriented, learning focused and about linking theory practice in a professional setting.

2.3 Inquiry Based Teaching

In inquiry based instruction students become engaged in many of the activities and thinking processes that scientist use to produce new knowledge science educators encourage teachers to replace traditional teacher-centred instruction at practices, such as

emphasis on text books, lectures and scientific facts with inquiry-oriented approaches that (a) engage students interests in geography, (b) provide opportunities for students to use appropriate laboratory techniques to collect evidence, (c) require students to solve problems using logic and evidence and (d) encourage students to conduct further study to develop more elaborate explanations and (e) emphasize the importance of writing scientific explanations on the basis of evidence(Secker, 2002).

Sandoval and Reiser (2004) pointed out in order to build the inquiry-based classroom environment must construct a community of practice like the scientists work. In authentic inquiry-based activities the students take action as scientists did, experiencing the process of knowing and the justification of knowledge. Mascazine (2012) described the implementation of inquiry based teaching in the classroom as involving five major steps of engagement, exploration, explanation, elaboration and evaluation. Engagement builds curiosity and provides direction for the remainder of the lesson. During this stage, the question for investigation is developed, prior knowledge is activated and procedures, rules and safety precautions are outlined.

In exploration, students manipulate materials, make discoveries and share their findings with classmate and teachers. The teacher's role is to provide, scaffolding by observing, questioning and guiding. Exploration provides concrete experience from which student learning and knowledge can build. Mascazine (2012) continues in their description of the component of inquiry based by stating that Explanation; is stage where students share their discoveries and explanations. After the student sharing, teachers introduce relevant concepts principals and on theories. Students are encouraged to make connections to their

experiences during the exploration face. Together students and teachers utilize the concept and the experiences to describe and explain the phenomenal and answer the initial question.

Elaboration stage allows students to create connections between new concepts, principals, theories and real world experiences by applying them to a new situation. This application of this new knowledge provides an opportunity for students to move beyond memorization to deeper understanding of what they have learned. Small group and class discussion continue to play a vital role in the learning process by allowing students to share and defend their understanding and explanations.

In the evaluation stage, teachers have an opportunity to assess student knowledge and provide feedback on performance. Informal assessment and feedback maybe provided throughout the inquired learning process to reassure encourage or direct students. Formal assessments such as tests or projects provide the teacher with feedback and allow them to determine how much the students have learned from the activity. Students should also be encouraged to utilize self-assessment throughout the learning process (Mascazine, 2012).

Inquiry based learning is most effective when a small number of students work in a collaborative environment, exchange ideas and ask interrelated questions. Although challenging for high enrollment classes, it possible if teachers are trained well in advance to lead small sections or groups of students tackling a specific task Llewelly (2005).

Mullei (1985) set out to find out whether training in an environment that emphasizes inquiry as the desired method leads to acquisition of more positive attitudes concerning science and classroom application of the inquiry teaching approach by teachers than

training in an environment that stresses non inquiry as a desired method. This showed that an environment that emphasizes does in fact lead to enhanced interest in science. The teachers trained in inquiry exhibited more interest in science than those trained in non-inquiry methods. The performance in sciences was better for the students who were taught using the inquiry methods than those who were taught using the non-inquiry methods.

Twoli (1986) studied the ways in which cultural, educational and social forces in a developing country operate to differentially shape the achievement levels, attitudes and science related experiences of boys and girls towards science. It was noted in this study that girls had more positive attitude and performed better in biology than boys. On the contrary boys had positive attitudes in physics and chemistry and performed better in these subjects than girls.

Most interestingly and useful to the current study is Twoli (1986) way of justifying the exclusion of some variables like home environment, peer influence, teacher characteristics, motivational orientation of the students, ability of students and prior experiences or knowledge of students. Akimfoff (1996) discussed some problems of measuring and analyzing home factors in developing countries such as polar distribution of occupation and income. In the developing countries people may be doing similar jobs but because of lack of a grading system they earn differently, hence different incomes. Developing countries also have a large peasant population and kinship resources which cannot be quantified or accounted for.

Lois, Diane and Joan (2000) note that effective inquiry is a complex process involving individuals attempting to convert information and data into useful knowledge. This involves several factors namely; a context for questions, a framework for questions, a focus for questions, and different levels of questions. Map work should blend well with such an approach by its focus on asking questions to make senses of presented phenomena.

2.4 Skills Developed Through the Teaching of Geography

Mehemet (2009), while evaluating the changes to the secondary school geography curriculum in Turkey, identified the following skills that are developed through the learning of geography. They included finding, using and structuring information instead of appreciating information, general skills that are covered by geography teaching like critical thinking, creative thinking, research and inquiry, problem solving using information technology. They also identified geographic skills namely: Map skills, observational skills, field study skills, geographic investigative skills, skills to prepare and interpret tables, figures and diagrams, skills to perceive time, skills to use evidence and skills to perceive change and continuity.

Mehemet (2009) further state that the knowledge students gain through learning geography in school can be used by them for solving real life problems and be applied in practice. Apart from the skills, the Turkish geography curriculum also has concepts. Concept analysis and concept maps were emphasizing. Another important component of this syllabus is values and attitudes. This syllabus aims to realize values such as

tolerance, adopting a scientific approach, love, respect, sensitivity, patriotism, peace, aesthetics and responsibility in addition to learning concepts and skills.

It is noted that the evaluation particularly of principle components of the course is almost similar to the set out objectives Kenya secondary school geography syllabus whose components are clearly spelt out (KIE, 2002). KNEC (2002), examines the students based on the topics found in the syllabus. Some topics like map work are made compulsory in the examination.

Robert (2006) compared the achievement of pre-service teacher education students enrolled in Inquiry-based earth science courses and those enrolled in traditionally –based earth science courses in knowledge, comprehension and application proficiencies. The students were tested at the beginning of the semester(pre-test) and again at the end of the semester (post-test). A sample of students participated in post-test interview sessions designed to examine in depth their knowledge, comprehension and application proficiencies with regard to atmospheric science content. Classroom observation data related to the behavior of both students and instructions were collected and later coded and analyzed using a letter observation instrument.

Analysis of the pre-test/post-test revealed that students in the traditional course demonstrated gains in knowledge and comprehension that resulted in statistically significant improvements on the overall post-test scores. Students in the inquiry based courses accomplished some improvements in knowledge comprehension and application competencies that did not result in statistically significant improvements on the overall post test scores.

Analysis of data suggested that the traditional course was more effective in preparing pre-service teachers to teach content consistent with the Michigan curriculum framework. The interpretation of the classroom observations and the interview sessions revealed that the inquiry-based courses were not fully consistent with national and state standards, included activities that did not adequately use investigative procedures and lacked several major content areas outlined by the Michigan curriculum framework which the pre-test/post-test was based.

In Roberts (2006) study the Michigan curriculum framework (syllabus) was rewritten (module) developed on inquiry-based course and only inquiry-based instruction was applied. In the case of this study, a module was developed, and the reflective inquiry-based instruction applied in conjunction with the traditional method for the experimental group. The control group used the Kenya geography syllabus as it is and only applied the traditional method.

2.5 Secondary School Map Work Skills

All maps are concerned with two fundamental elements of reality; location and attributes at locations (Walford, 1976). Locations are simply positions in two dimensional space such as places with coordinates (x, y). Attributes at locations are some qualities or magnitudes such as language or temperatures. All sorts of topological and geometrical properties of relationships can be identified and derived such as distance, adjacency, insidedness, patterns, and networks. A map is therefore a very powerful tool in the learning and teaching of geography.

In the study of topographical maps it is necessary to examine the methods of representing relief and drainage in order to obtain some idea of the physical features depicted. Knowledge of various methods of representing relief and ability to visualize a three dimensional figure of what they represent is necessary. Especially important is the ability to read contours namely lines on the map made up of all points which in actual country are the same height above sea level (Stofflett, 1998). These difficulties have been mentioned in reports of KNEC on the performance of geography in national examinations.

A thorough grounding in some of the elementary principles of physical geography is indispensable, if full advantage is to be derived from analysis of physical features shown on the topographical map. Various symbols known as conventional signs are used by the cartographer to represent natural features such as marshes and cliffs, manmade features such as roads, railways and buildings. It is necessary to know them and explain their presence, which can often be done by a consideration of the influence of physical features.

Much of the study of topographical maps should be devoted to interpretation of landforms and their influence on human geography such as the distribution and characteristics of settlements and development of communications. Joffe (1998) noted that it is not enough to tell students about map reading skills, considerable practice in specific reading skills is necessary. He further stated that maps, charts, and tables are pictures that give information. Sometimes they compare things, sometimes they how things change according to time or seasons or area. Maps usually show shapes, distances

and locations. Charts graphs and tables usually compare quantities or qualities or indicate the way things change over a period.

Joffe (1998) proposes that to be successful in reading maps, charts, graphs and tables the one should follow four steps, read the titles and sub titles because they will often tell you the purpose of the graphic material and may provide a clue to its main idea. The next step is to read the key and/or legend and the scale, when it is on the map. The student should also read the information shown along the scale and the bottom of graphs and charts and tables if any. This helps to understand what quantities and qualities are being presented or what comparisons are being made. On maps notice how the different parts of the map are related to each other. Finally the student should determine the purpose of reading the map, chart, graph and table.

Bygott (1984) emphasizes the importance of a knowledge of physical geography as a basis for map reading. Bygot notes that the relief of an area is important to its physical geography and this helps to explain much of human geography. Contours show the position of mountains and hills, their general outline, and their height. A knowledge of the lie of the land helps us to understand the direction and character of drainage, and to appreciate modifications in climate especially rainfall and temperature conditions. Various features of relief have profound effects on man; the shape of the ground, the direction of the valley, the shelter of a cliff, these and many others may decide whether man's settlement is exposed or sheltered, swampy or dry, protected or liable to attack, difficult to approach or accessible to neighboring communities and so on. To appreciate these features one must be able to read contours and to say with certainty what features

they represent. Certain features are common to mountainous and hilly areas and can be identified on the map by the shape and trend of contours.

2.6 Assessment of Students Geography Map Work

Assessment of students' achievement is a fundamental part of education. Assessment is important in monitoring progress and providing feedback on the effectiveness of teaching and learning. It is also important for understanding strength and weaknesses learning process. Assessment is also used for summative purposes, that is, to give a final judgment of achievement. Terminal examinations are the main form of external assessment in schools and colleges. However, using work completed by students during their course and also assessment at their center has long been recognized as being valuable too. Using coursework for assessment purposes improves the relationship between how students learn and we assess them. Centre based assessment is different and in many ways better form of assessment than the terminal examination, because it can be formative as well as summative (Hopkins, 1990).

Sanathirajah (1971) noted that the purpose of evaluation is to collect evidence on improving teaching and learning. The judgment aspect of testing which has been producing undesirable side effects is viewed as having a minimal role in classroom evaluation. He further says teachers must develop some kind of curriculum design in order to find a better balance between student-oriented and subject oriented approach. This design helps to find a better balance between the learner, the nature of learning process, and the nature of geography. He continues to state that appropriate materials from many sources should be gathered and used. The materials should be analyzed in

order to increase geographic understanding. The teacher should provide the environment for the inquiry in order for learners to arrive at generalizations and conclusions.

If teaching of geography is considered a cycle which is repeated across group of students, assessment supplies the teacher with some of the necessary information to determine where improvement is necessary. For example, evaluation can provide information for clarifying selecting and appraising educational objectives. Pre-test before the program and summative evaluation at the end, may supply information useful in assessing the relevance of the program or to determine the attainability of educational goals. Assessment is also considered a method of acquiring and processing the evidence required to improve a variety of specific and general areas of teaching and learning.

The assessment in map work can be best explained through the role of evaluation in the teaching and learning process as summarized by Sanitharajah (1971) in Table 2.

Table 2.1: Role of Evaluation in Geography Teaching

Area	Decisions to be made	Evidence required	Evaluation needed
The learner	Readiness (orientation, preparatory learning needed) Point of entry	Diagnosis of skills Attitudes Interests Cognitive style	Records of previous achievements Diagnostic test of present skills, interest Placement tests Aptitude tests
Instructional process	Structure and organization of learning experiences and tasks Feedback on progress of learner Alternative materials or approaches	Analysis of content and its organization into units Teaching techniques Interaction of teaching techniques and learners	Formative evaluation: Test to determine what has been learned Task analysis Diagnostic test for what needs to be learned Prescript of alternative materials or approaches
Objectives	Content or skill to be learned Extent of attainment of learning Effectiveness of instructional techniques Changes to be made	Analysis of Learning outcomes (knowledge intellectual skills) Content (appropriate for development of required skills)	Summative evaluation; Sample of attainment of various categorical of objectives Analysis and diagnosis of extent of attainment of intended objectives Diagnosis and analysis of each learner's attainment

Source: Senathirjah (1971)

Table 2.1 shows that one of the roles of evaluation in geography is to inform teachers and students about achievement of objectives and appropriateness of teaching methods used. Evaluation is thus used as a diagnostic tool to identify weakness of methodology, and student learning styles. Evaluation may also be used in a summative way to help advice the community on the abilities of geography students for the job market.

2.7 Attitudes towards Use of Reflective Inquiry-based Teaching in Map Work

Learning

Gerber (2001) studied the attitudes to geography held by members of the community at large. He focused on perception on the role of geography in contributing on social goals related to lifelong learning and leaving. The results of the study indicated the importance of geography to Australian society in terms of knowledge skills, and variance and values. The study recommended that the education sectors should make geography at large to live up to the importance the society ascribes to it.

On attitudes of students towards learning, Lilian (2014) said that attitudes of teachers involved the following teaching competence; knowledge content and presentation, relationship with students (having students' interest at heart). The teacher attitudes also include respect to teaching and learning. All these three aspects created an improvement in learners' academic achievement. Ismail (2013) in his research on how attitudes impact learning of ICT similarly emphasized that attitudes play an important role and highlighted the reciprocity between learning and attitudes. Attitudes appear to affect learning, and in turn the learning process and end results of it, affecting attitudes of learners. This was also echoed by Kim, Jain and Broussant (2010). It would be found interesting to see how these processes would affect student learning in map work.

Attitudes and retentional knowledge is important in the academic achievement of learners (Karacalli, 2014). In a quasi – experimental design using the project based learning, Karacalli (2014) discovered that there were significant effects from being different groups for the attitude of the students. The students who had positive attitudes towards

the science subject performed better than those who had negative attitudes. Students, who had similar achievement and possess more positive attitudes towards reading and had higher levels of self-esteem, performed better in reading achievements (Theodore and Kanuika, 2013).

2.8 Theoretical Framework

This study is based on the constructivist theory. Since geography as a discipline and in particular map work students need to have knowledge and reflect on it in an active manner. They should also collaborate with each of the key elements in constructivism, in reflective inquiry-based learning which is important in the study of geography. Cognitive constructivist's theory as provided by Piaget (1967) specifically informed the study in terms of learners being actively engaged in their learning in order to construct and retain knowledge. The key principles of the Piagetian constructivism theory are that learning is an active social and developmental process. Map work being a skill-oriented activity, Piaget's theory encourages practice which assists in achievement of learning outcomes that the study focused on.

Dewey (1933) believed that traditional education, as practiced in his native America, was rigid, static and inadequate for the rapidly developing society and economy of the time. He advocated child-centred learning and stressed the importance of each individual lived experience as a starting point for learning. Map work can provide immense opportunity for student-centred learning in geography. In accordance to Dewey's argument, one should move from routine action to reflective action, which characterized by ongoing self-appraisal and development. Dewey believed that reflection begins in a state of doubts

or perplexity which for teachers is most likely to account when working with new unfamiliar learners. When one is faced with difficulties and uncertainties in practice, when things don't go according to plan or don't fit with the theory, one may feel powerless and unable to resolve the situation. For, Dewey, these are key moments for learning; one can reflect on these problems to solve the perplexity and learn from it.

Schon (1983) developed the notions of reflection in action and reflection on action. Reflection in action refers to thinking on your feet and happens while teaching. Reflection on action refers to reflecting after you have taught. This implies that after you have completed teaching a lesson, you can reflect on, analyze and evaluate the learning and teaching. This action informs the teacher's subsequent planning and preparation leading to a cycle of continuing improvement. These ideas were incorporated in the design of data collection instruments.

Theory is only of any use when it is applied and developed in practice. The real teaching environment is where theory is applied, tested and evaluated. Theory is never used rigidly, nor does it provide all the answers to the problems teachers encounter. It is however starting point for developing teaching and learning in practice. Reflection in and on action allows teachers to continually improve their practice and even to the development of practice based theory (Schon, 1983).

Klob (1984) developed a four stage experiential learning theory which shows a four stage cycle of activity. These four elements are: concrete experience, reflection, abstract conceptualization and active experimentation. The teacher can begin the cycle at any point, but must follow each step in order. Consider for example a trainee teacher may use

inquiry- based teaching in a session (concrete experience). The inquiry-based teaching is partially successful. The teacher reflects on the use of these teaching methods and considers how it could be improved and made more effective (reflection). The teacher then reads up on the use of inquiry based teaching and talks to more experienced colleagues and as result formulates an improved version of the activity (abstract conceptualization). The next time she plans to use inquiry based teaching she incorporates her new ideas into the planning (active experimentation). This leads to a new concrete experience and the repetition of the cycle.

Gibbs (1988) adds feeling to Klob's model, noting that a teacher may experience a wide range of feelings during and after teaching. These may be feelings such as elation, confusion, anger, helplessness and blaming the learner. Gibbs' model provides key points in development of elaboration especially description, evolution analysis and action. It is important for the teacher to recognize and reflect on these emotions. In geography teaching and learning, students try to make sense of symbols used in map work while the teacher guides the effort. While this happens both the teacher may experience feelings of success, defeat, helplessness and failure. It was hoped that this study on reflective inquiry based teaching would provide further observations in geography teaching and learning particularly in map work.

2.9 Conceptual Framework

Conceptual framework is very important in that it visualizes the study in terms of variables, literature review, informs the study on the theoretical framework and finally indicates the stakeholders or participants in the study. In developing this conceptual

framework, the study used the items above to arrive. The items were arranged in a diagram form that shows all the variables or participants in the study. For any learning achievement to be successful, we must consider all the independent variables, the moderating variables and the dependent variables.

In this study there are many indicators for variables of each type as shown in Figure 1.

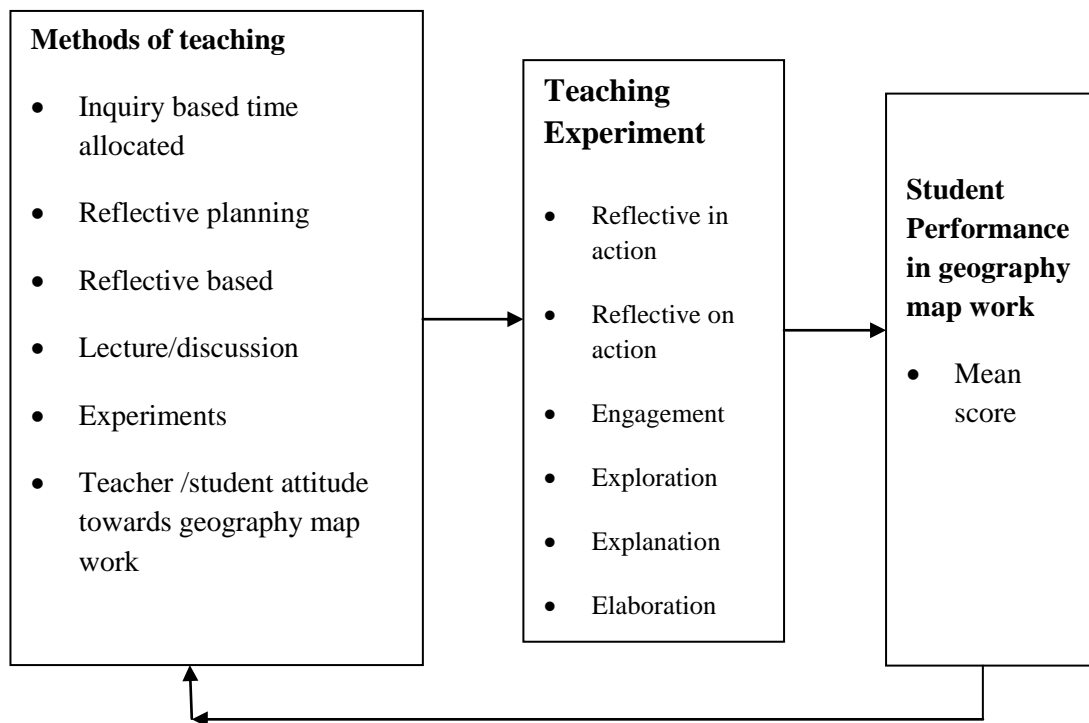


Figure 1: Conceptual Framework Showing Interaction of Study Variables

In this study the main independent variable is the method of teaching map work while the dependent variable is student performance in map work as measured by student scores in a map work tests. In this study two tests were used, a pretest and a post test. Students and teacher characteristics were considered as moderating variables. Teacher characteristics included academic qualifications, experience, attitudes and gender. Student characteristics on the other hand included gender and attitude towards map work.

2.10 Summary of the Gaps in the Review of Literature

From the review of the empirical studies, it was evident that reflective and inquiry teaching methods have been treated separately in relation to student performance in science and mathematics. Little information is available on how these teaching methods impact on student achievement in geography. Studies that have been done on performance of boys and girls in sciences show that there is no difference in performance by gender. However, the Kenya National Examinations Council Reports indicate that girls mean scores in geography examinations are below those of boys. In addition, more boys have been choosing to study geography compared to the number of girls who do so. Studies that focus on student attitudes towards learning in science subjects indicate that girls have positive attitudes towards the natural sciences like biology while boys have a positive attitude towards physical sciences (chemistry and physics). There are hardly any studies on student attitudes towards learning geography and in particular map work in Kenya. In addition, there are no studies that have been done to indicate the relationship between teacher qualification and learner achievement in geography in Kenya. It can also be argued that the available literature has not focused on teacher attitudes towards learning of geography map work and how they influence student achievement of learning outcomes in geography.

The Kenya National Examinations Council Report (2015) indicates that students have continued to perform minimally in the area of map work. The literature shows that teachers have continued to teach geography using the traditional methods such lecture, demonstration, and case studies which are more teacher-centred than learner-centred.

Against this background, there was need to investigate whether teacher characteristics influence the minimal performance of students in geography map work. Consequently, there was need to find out whether new teaching methods like reflective inquiry-based teaching could enhance the performance of students in map work.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section covers the research design, target population, sample size and sampling procedure, instruments, validity, reliability, data collection procedures and data analysis procedures.

3.2 The Research Design

The study adopted a quasi- experimental research design. This design was best suited for this study because to determine the effect of a teaching method on students' performance in a subject, one needs a control and experimental groups for comparison (Baybee et. al., 2006). In the control group, students were taught map work and map work skills using the traditional method of teaching geography. In the experimental groups, students were taught the same content using the traditional method and reflective inquiry-based teaching method. The quasi-experimental researcher undertakes this study with groups that are intact, that is to say the groups have been constituted by means rather than random selections (Best and Kahn, 2011). This study therefore used quasi-experimental design leaving geography classes intact as most schools desired.

3.3 Target Population

This study targeted all Form three students in public secondary schools in Kenya. It also involved all geography teachers teaching Form Three students in Kenyan public secondary schools. In Kenya, schools are categorized as national, county

and District in addition to being categorized as boys or girls or mixed or boarding or day school. The number of public secondary schools in Kenya by categories as per 2013 data is shown in Table 2.

Table 3.1: Categories of Public Secondary Schools in Kenya

School category	Boys	Girls	Mixed	Total
National	65	50	0	115
County	280	300	203	793
District	130	279	2552	2961
Total	485	629	2755	3869

Source: Ministry of Education, 2013

From the Table3.1, it is apparent that most secondary schools are categorized as county or district, and that there were no mixed national schools. Further the majority of schools (97%) are categorized as district schools or county schools. District schools are mainly day schools and mixed.

3.4 Sample Size and Sampling Procedures

3.4.1 Sample Size

The sample size is important in getting the best information for the lowest cost. The sample size also determines how much the data collection process will cost in terms of time and labour. A sample size that is too large is a waste of resources. A sample size

that is too small is a waste of effort since it will not be large enough to detect the significant effect (difference).

The sample size is depended on three factors: alpha level, power and effects size between the two groups. According to Cohen (1999), the table for determining sample sizes given the alpha level of 0.05. The power level of 0.08 and the effects size equaling 0.2, 0.5 or 0.8 depends on one's expectation. Using a two tailed test gave a sample size of two groups of thirty. The sample was selected through random sampling.

In this study, compiling both Cohen's method and Williams (1978) method of determining sample sizes of getting two groups of schools and using simple random sampling, the following formula was be applied: $n = \frac{(z^2\beta^2)}{d^2}$, where z is the standard score corresponding to specified probability of risk, d is specified deviation, and β is the standard deviation of the population. In this study, two groups of schools, for experiment and control samples, were selected through stratified random sampling. The dependent variable in this study was the performance in terms of marks. In this study, tolerance was taken as 0.2 deviation between the sample mean and population mean taking a risk of 0.05, and using the performance marks in the past studies (in Nigeria) that reported a standard deviation for the population of the approximate 0.6 for a risk of 0.05, the z-value is 1.96. Using these figures and a population of 3,869 schools, the sample size was calculated as follows:

$$n = \frac{(z^2\beta^2)}{d^2} \text{ If } \beta = 0.6, d = 0.2, z = 1.96, \alpha = 0.05, N = 3,869$$

$$\text{Then, } n = \frac{(z \beta)^2}{d^2} = \frac{(1.96)^2 (0.6)^2}{(0.2)^2} = 34.5 \approx 35$$

This means that there should be 35 schools (control and experimental groups). Using the adjusted formula by Williams (1978), and since $N= 3869$ and sampling was done without replacement, the sample size was calculated as follows: $n' = \frac{n}{1+n/N} = (35/ 1 +35/3869) = 34.69$. Therefore, the actual sample size is 35. For manageable experimental and control groups, 50 % of the sample size was taken giving a total number of schools participating in the study as 18. The sample represented county schools and district schools according to gender.

3.4.2 Sampling Procedures

Stratified random sampling was used to sample nine (9) counties and the county and district schools in terms of their category and gender. This was to ensure a representative sample of public secondary schools in Kenya that teach geography at Form Three, since geography is an elective subject (KIE, 2002). Eighteen schools were sampled from nine counties out of the forty seven counties, according to school category and gender. This ensured that a representative sample of county and district schools were randomly selected based on whether they are boys' or girls' or mixed schools. Thus schools in each of the nine (9) counties were selected through a stratified random sampling procedure. Table 3.1 shows how the schools were sampled.

Table 3.2: Sampled Public Secondary Schools in the Study

Region	Counties	Boys Schools	Mixed Schools	Girls Schools	Total of schools
Nyanza	3	2	2	2	6
Western	3	2	2	2	6
Rift Valley	3	2	2	2	6
Total	9	6	6	6	18

Table 3.2 shows that 3 counties were randomly selected in each of the three regions, giving a total of 9 counties in the study. It can also be seen that 2 boys, 2 girls and 2 mixed schools were randomly sampled in each county. This gave a total of 18 public secondary schools (6 boys, 6 girls, and 6 mixed), with an average population of 500 geography students, selected to participate in the study. Each category of the sampled schools was represented in the control and experimental group of schools. They were nine control schools and nine experimental schools in the study.

All Form Three students taking geography in the sampled schools participated in the study either as control group or experimental group. The control and experimental groups of schools were selected through a random sampling procedure. Eighty five (85) teachers of geography were also sampled through simple random or purposeful sampling depending on whether they were teaching Form Threes at the time or were geography teachers in the school. Those geography teachers who were not in the participating schools were randomly sampled. The Control Group was taught using traditional methods

of teaching only while the experimental group was taught using reflective inquiry-based teaching method in addition to the traditional methods of teaching map work in geography. All participating schools used common schemes of work prepared by teachers and researcher in workshop arranged by the researcher.

3.5 Research Instruments

The following instruments were used in the study: interview schedules for individuals and focus groups, observation schedule for both teachers and students in class, questionnaires for teachers and pupils, document analysis guide and test. These instruments were developed based on the research objectives to ensure validity of the information required in the study.

3.5.1 Interview Schedule

Interview schedules were developed to collect information about reflective inquiry based teaching during the training workshop of teachers. They were used both for individual and focused interviews. They yielded results to show the understanding of reflective inquiry based teaching method and its application to map work. The interview schedule had ten items.

3.5.2 Document Analysis Guide

Document analysis guide was developed based on the research objectives to analyze schemes of work, lesson plan and progress records of teachers in the participating schools. The analysis of documents enabled the researcher to find out whether the students in the participating school were at the same level in terms of knowledge in map

work. It also helped in determining whether the teaching of map work is being done at the same period of the year. Document analysis guide was applied on school records on student's performance in geography at school or national examinations and KNEC examination reports.

3.5.3 Observation Schedule

This was developed to be used in the classroom to see the implementation of reflective inquiry based teaching this enables the researcher to confirm whether the teachers understood the way reflective inquiry based teaching takes place. This was also to confirm the participation of students in the learning of map work through reflective inquiry teaching method. Observation schedules prepared by the researcher based on the research objectives/questions/hypotheses.

3.5.4 Questionnaire for Teachers

Questionnaire for teachers had a wide range of questions starting with bio data ,the characteristics of the school ,teachers attitude towards reflective inquiry teaching and the general teaching of geography and in particular map work. The questionnaire had fifty items. Its main objective was to find out the attitude of the teachers in the application of reflective inquiry based teaching .The attitude about any teaching method, will affect his her effectiveness in using the method.

3.5.5 Questionnaire for Students

The main purpose of this questionnaire was to find out how learners value geography map work. It was also to find out the attitude of the students towards map work after

having been taught using reflective inquiry based teaching. Specifically, it assisted in finding out whether the students have changed their attitude after learning through reflective inquiry based teaching.

3.5.6 Pretest and Post Test

These tests were developed by the teachers and the researcher. The tests had two parts and marking schemes were also developed by both the researcher and the teachers. The tests were developed based on the commonly prepared scheme of work and following a table of specification. The items focused on topographical map work skills that were taught during the study period.

3.5.7 Pilot Study

In the process of developing the instruments and making sure that they are right for being used, to collect data, a pilot study was carried out in four secondary schools not participating in the study. The purpose of the pilot study was to ensure that items used in data collection were validity and reliable. While most of the items were retained, some of them were deleted or rephrased or added. In addition, the scores from the pilot study were used in finding indices for validity and reliability of instruments.

3.5.8 Instrument Validity

Validity is the most important consideration in developing and evaluating measuring instruments. Historically, validity was defined as the extent to which an instrument measured what it claimed to measure. The focus of recent views of validity is not on the instrument itself but on the interpretation and meaning of the scores derived from the

instrument. The most recent standards for educational and psychological Testing (1999), prepared by the American Educational Research Association (AERA), National Council on Measurement in Education (NCME), and the American Psychological Association (APA) defines validity as “the degree to which evidence and theory support the interpretations of test scores entailed by proposed use of tests”. Measuring instruments yield scores; but the important thing is the interpretation we make of the scores, which may or may not be valid.

Evidence based on test content involves the test’s content and its relationship to the construct it is intended to measure. The standards define content-related evidence as “The degree to which the sample of items, tasks, or questions on a test is representative of some defined universe or domain of content”. That is, the researcher must seek evidence that the test to be used represents a balanced and adequate sampling of all the relevant knowledge, skills, and dimensions making up the content domain. This type of evidence is especially important in evaluating achievement tests. Brennan (2001) writes that “in educational achievement tests, content-related validity evidence is absolutely essential. If the content can’t be defended, little else matters”. Validity of an achievement test, for instance, would look at the material covered, the wording of the questions, and the adequacy of the sample of items to measure the achievement in question.

To ensure validity in the map work tests the topics covered in map work formed the content domain and each topic considered for its importance to the national KCSE examination. Evidence based on content was mainly the result of a logical examination by relevant subject specialists or analysis that checked that the instruments adequately

represented the content and objectives making up the domain. Brennan (2001) says that "for test users, the single best thing to do in advancing proper score use and interpretation is to take the test, at least, study content".

Although content related-related validity evidence is especially important for achievement test, it is also a concern for other typed of measuring instruments such as personality and aptitude measures. An instrument for measuring attitudes would be examines to make sure that it contains, in sufficient number, a balanced set of positive and negative statements about capital punishment.

Validity coefficients indicate whether the test will be useful as a predictor or as a substitute measure. If it has been shown that a test has a high correlation with a future criterion, then that test can later be used to predict that criterion. Criterion-related validity evidence is especially important for scholars tic aptitude tests because they are generally used to predict future academic performance. The three types of validity overlap (Tuchman, 1994). A measure of one type will do for all the three. For the pretest and posttest the coefficient of correlation between test scores (validity coefficient) was calculated. The validity coefficient (r) was 0.75 and 0.80 for pre-test and post-test respectively. For the other instruments: document analysis observation & interview schedules and teachers and students questionnaires, a logical analysis of each of the documents showed a balanced representation of the items in each.

3.5.9 Instrument Reliability

Reliability refers to a measures consistency in producing similar results on different but comparable occasions. It should yield consistent reputable results (Coolican, 1994). A pilot study was carried on in four secondary schools and the results were tested for reliability. The instruments were cleaned of the irrelevant items. The tests were administered during the pilot and scores obtained. Using the test scores, ccoefficients of reliability were calculated using the following formulae:

$$r = \text{variance of the true scores} / \text{variance of the observed scores}$$

The results indicated that coefficients of reliability for the pretest and the post-test were 0.81 and 0.84, respectively, showing that the tests were reliable.

3.6 Data Collection Procedure

Relevant authority was sought from NACOSTI before commencement of the study, and from the relevant principals around the time of the study. Data was collected from geography teachers and students. The teachers who participated in this study were trained on the purpose, principle and procedures governing the group learning and the use of reflective inquiry based instruction. A common scheme of work was developed during the training and a sample lesson plan discussed. The manuals for training and the module were given to them to use while teaching. They were requested to refer to the training manual and the module from time to time in addition they were requested to use both the module reflective inquiry based instruction and the traditional method in the experimental group and use the traditional method only in the control group. At the beginning of the

research, the teachers were asked to prepare the students for this exercise, and after the students were prepared the pretest was given and scored.

Questionnaires were administered to the geography teachers, and students. The questionnaires contained factual items and an attitude scale for teachers and students. Observation of selected lessons was carried out by the researcher to authenticate and triangulate participants' responses on other instruments. The observations were in both control and experimental groups. There were six observations in each class over a period of three months. Focused group interview(s) for teachers were conducted during the training sessions before the commencement of the study .selected teachers were interviewed individually during the experiment. Focused interviews for students were carried out immediately after the posttests results. Document analysis was done on the previous class tests, lesson plans, schemes of work and performance records. They were done in order to confirm, the confidence level of the teachers in the preparation of these documents. This enabled the researcher and the teachers to develop the common schemes of work, the pretests and post tests and lesson plans.

3.7 Methods of Data Analysis

Descriptive and inferential statistics were used to analyze quantitative data collected in this study. The data analysis techniques used included computation of means, percentages, standard deviations, variances and Analysis of variance (ANOVA). The multiple classification analysis technique was employed to find out how the two groups performed. All the hypotheses were tested at a significance level of $\alpha = 0.05$. Qualitative data collected through interviews were transcribed and coded based on major themes

identified through review of literature. The theme areas were then summarized interpreted and discussed in accordance with the qualitative data analysis steps as specified in Miles and Huberman (1994). Data was analyzed using SPSS computer software version 20.

3.8 Ethical Considerations

Ethics refers to the appropriateness of the researcher's behavior in relation to the rights, integrity and privacy of the participants in his/her study. In this study the researcher ensured that no one was harmed or suffered adverse consequences from the research activities. This was ensured first by obtaining consent from the National Commission of Science, Technology and Innovation to conduct educational research. The participants were also requested to partake in the study and were assured of their confidentiality when answering questions as their names were not to be recorded anywhere. The researcher also assured the subjects of the sole use of the data and information obtained from them for the purpose of the study and not any other purpose outside the study.

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND DISCUSSION OF FINDINGS

4.1 Introduction

In this chapter the outcomes of the study on reflective inquiry-based teaching are presented, interpreted and discussed. The findings are organized thematically with all data from different instruments and sources being classified and presented under their respective thematic subsections. These subsections include: Demographic characteristics of the participants, Effect of Reflective Inquiry on Participants' Geography map work achievement, effects of Reflective inquiry on student attitudes towards geography map work, effect of gender on students' achievement when reflective inquiry is used in teaching geography map work, and effects of teachers attitude towards the use of reflective inquiry on geography map work performance.

4.2 Rate of Return of Instruments

The rate of return for the teachers questionnaire was 85% and the rate of return for the student tests and questionnaire were 95% respectively. Eighty five of the questionnaires were filled and returned by the geography teachers. Those that were not returned were due to communication problems. The student questionnaires had a ninety five percent return rate since they were collected at the time of administration of the post test. Those student questionnaires that were not returned were as a result of absenteeism. The rate of return of instrument was high enough to guarantee the reliability of the research outcomes.

4.3 Demographic of Participant Characteristics

The demographic characteristics determined in this study gender, level of education, teaching experience and managerial experience, among other. The purpose of obtaining this data was to ensure and demonstrate the credibility of data sources. The detailed outcomes are reported in the following sections:

4.3.1 Distribution of Participants by Gender

Data was collected on the gender characteristics of the participants. The outcomes are presented in Table 4.1.

Table 4.1: Classification of Participants' by Gender

Gender	Students		Teachers	
	Frequency	Percent (%)	Frequency	Percent (%)
Male	114	47.9	42	58.3
Female	124	52.1	30	41.7
Total	238	100.0	72	100.0

From Table 4.1, it can be noted that the majority (58%) of teachers in the study were male while the female students were 52% compared to 48% male students. This shows that there were slightly more female students than the males. The numbers seen in this analysis therefore reflects the general status in the schools. The classification of participants by gender helped not only to demonstrate inclusiveness in this study but also in the cross tabulation analysis which helped to determine whether student gender

influenced performance in geography map work where reflective inquiry was applied as a teaching method.

4.3.2 Sampled Teachers' Nationality, Professional Qualifications and Teaching

Experience

The researcher also collected data on the teachers' nationality and level of qualification of the geography teachers. Data collected showed almost all (92%) geography teachers were Kenyan. On teachers professional qualifications the results are summarized in Table 4.2.

Table 4.2: Sampled Teachers Professional Qualification Level

Qualification	Frequency	Percent
Diploma	18	25.0
B. Ed (Sc)	8	11.1
B. Ed (Arts)	11	15.3
B.A	16	22.2
M. Ed	5	6.9
M.A	10	13.9
MSc	4	5.6
Total	72	100.0

It was found that a slight majority (58%) of geography teachers is professionally trained, and half almost half of these were diploma holders. The remaining 42% were untrained teachers. It is also notable that 26.4 % of the geography teachers had postgraduate qualifications. This shows the importance of the initial training given to all participating teachers before the start of the study. This made the teachers competent to handle the map work topics in the study. They were therefore expected to effectively use reflective inquiry method to teach map work in geography. As indicated by Llewelly, D., (2005), teacher ability and instructional prowess is determined to a large extent by their professional qualifications. This phenomenon emerged clearly from the findings of this study. The findings were also complemented by data on the teaching experience of teacher participants involved in this study as presented in Table 4.3.

Table 4.3: Teaching Experience of Sampled Geography Teachers

Teaching experience (years)	Frequency	Percent (%)
0-5	37	51.4
6-10	10	13.9
11-20	1	1.4
21-30	24	33.3
Total	72	100.0

Table 4.3 indicates that a slight majority (51%) of the geography teachers had an experience of up to five years, meaning they were hired last few years. One third of the teachers in the study had a teaching experience of over twenty years. This could reflect

the hiring policy of the main teacher recruiting body, TSC. Accordingly, it was apparent that they understood well how to use reflective inquiry method in teaching geography map work at the secondary school level.

4.4 Reflective inquiry and Participants' Geography Map Work Achievement

The researcher analyzed the results from 238 participants in the experimental and control groups that sat the Geography map work Achievement Test. Means and standard deviation obtained for the experimental and control groups are presented in Table 4.4

Table 4.4: Students' Mean Scores in Map Work Pretest and Posttest (N = 238)

Groups	Frequency	Pretest		Posttest		Change
		Mean	SD	Mean	SD	
		(%)		(%)		
Experimental	119	32	4.4	42	3.2	11
Control	119	31	4.4	31	4.6	1

Table 4.4 shows the experimental and control groups' mean scores and standard deviations on the pretest and posttest. The experimental group had a pretest mean score of 32 percent and a posttest mean score of 42 percent respectively. On the other hand, the control group had a mean score of 31 percent on the pretest and a 31 percent on the posttest. The changes in the mean scores are possibly indicative of an improvement in student achievement after using reflective inquiry method to teach geography map work. This is in line with other studies carried out in sciences on inquiry teaching and students

performance (Tambyah, 2006, Roberts, 2006). The knowledge differs slightly because the studies were done using teacher trainees at university colleges. The reflective inquiry based teaching method as applied to teaching in secondary schools in Kenya made teachers to be enthusiastic in the teaching.

The independent samples t-tests were computed to determine the significance of the difference in the post test and pretest means for the experimental and control groups. Table 4.5 shows the details.

Table 4.5: Comparison of Student’s Performance in map Work Pre-test and Posttest

Groups	Means score		t
	Pretest (X)	Posttest (X)	
Experimental	32	43	22.45
Control	31	32	1.7
t	1.76	22	

All values were significant, df = 236 at $p < 0.05$

The researcher sought to find out whether there is any significant difference between geography map work pretest mean scores of students taught by reflective inquiry and those taught using other teaching methods. Thus, there was no significant difference between the geography map work mean scores of students taught by reflective inquiry and those by other teaching methods in the pretest. This could be explained by the fact

that at time of testing both the control and experimental groups had not been exposed to instruction by teachers using reflective inquiry.

After teaching the experimental group topics in map work using reflective inquiry, the difference between the mean scores of the experimental and control groups were subjected to the t-test for significance. Thus, the difference between the mean scores of students taught by Reflective inquiry and those by other teaching methods was significant.

The researcher also tested the finding to establish whether there was a significant difference between the posttest and pretest mean scores of students taught by Reflective inquiry. The computed t value (22.45) was greater than the critical t-value (1.960) at 0.05 level of significance and 238 degrees of freedom. It therefore implies that there is a significant difference between the posttest and pretest mean score of participants taught by reflective inquiry.

Finally, the researcher tested to find out whether a difference existed between the posttest and pretest mean scores of students taught by other teaching methods. The calculated t value (1.74) was less than the critical t value (1.960) at 0.05 level of significance and 238 degrees of freedom. There was no significant difference between the posttest and pretest scores of students taught by Traditional methods.

The primary implication of the stated interactions is that reflective inquiry was effective in improving achievement in Geography map work. This is because there is a significant difference between the posttest and the pretest scores of the participants in the experimental group. There was also a significant difference between the posttest scores of

the experimental and control groups. There is no doubt that the treatment was responsible for the differences in the scores. Thus reflective inquiry enables students share their areas of strength and also develop their weak areas. This improves the students' understanding of the subject matter and that is why participants in the experimental group perform better than those in the control group.

The above findings are in line with Springer's, Stanne's and Donovan's (1999), study that was concerned with investigating the effects of small-group learning on undergraduates in science, engineering and technology, using cooperative teaching/learning methods.

4.3 Effects of Reflective inquiry on Student Attitudes towards Geography Map

Work

An analysis of the Likert scale items on the Attitudes towards Geography map work was done for participants in the control and experimental groups. This was done for both the pretest and posttest. Participants had indicated on a five – point Likert scale, the extent of agreement or disagreement with the listed items. The total score for each respondent was determined by adding the points scored in all the items. Table 4.6 shows the results obtained.

Table 4.6: Students' Attitude towards Map Work Pretest Scores

Groups	Mean Score	Below/Above 66	Implication
Experimental	44	below	Negative attitude
Control	45	below	Negative attitude

Table 4.6 shows that the mean score attitudes of participants in the experimental group was 44 and that for the control group was 45. Both groups had mean scores below the neutral score (66). This implies that the participants in both the experimental and control groups had a negative attitude towards Geography map work at the time of the pretest. At this juncture the participants in the experimental group had not yet been exposed to the treatment. So their mean attitude towards Geography map work score was similar to that for participants in the control group. Table 4.7 shows students' attitude towards the post-test results.

Table 4.7: Students' Attitude towards Map Work Posttest Scores

Group	Mean Score	Below/Above 66	Implication
Experimental	96	above	Positive attitude
Control	49	Below	Negative attitude

As depicted in Table 4.7, the experimental group had a mean score of 96 out of a possible 115 while the control group had a mean score of 49 out of 112 in the posttest. The results reveal that the experimental group score on the attitude scale was higher than

the 66 while that for the control group was lower. This implies that the attitude of the students towards the study of geography map work turned positive after the teacher used reflective inquiry is effective in teaching the subject and changing the attitude of students positively towards the learning of geography map work. Hence in accordance with the views espoused by Llewelly, D., (2005), it is clear that method of teaching coupled with the teacher's skill level have a significant effect on student interest and attitude towards a subject and learning generally.

The research further computed the ANOVA test to find out whether there was a significant difference between the mean attitude scores obtained by the participants. Table 4.8 shows the outcome of the test.

Table 4.8: ANOVA Results for Students' Attitude towards Map Work Pretest

Scores

Scores	Sum of Squares	df	Mean Squares	F	P
Between groups	5605	1	3899.62	-0.59	1.26
Within groups	14490	237	1067.50		
Total	20,095	238			

A test of significance for the pretest scores F (-0.59) and p value F (91.26) were derived using ANOVA as shown in Table 4.8. From Table 4.8, the analysis of variance results ($F_{(1, 237)} = -.059, P = 1.26$) indicate that there was no significant difference between the mean attitude towards geography map work scores of participants at the pretest stage. Perhaps this is due to having none of the groups exposed to treatment (reflective inquiry-

based teaching). Another analysis of variance was done whether there was a difference in students' attitude towards map work posttest results. The results are presented in Table 4.9.

Table 4.9: ANOVA Results for Students' Attitude towards Map Work Posttest Scores

Scores	Sum of Squares	df	Mean squares	F	p
Between groups	5605	2	3899.62	132.38	1.26
Within groups	14490	236	1067.5		
Total	20,095	238			

The results in Table 4.9 show that, F (132.28) is greater than the P value F (1.26). This implies that there was a significant difference between the mean attitude towards geography map work when participants taught by Reflective inquiry and those taught by traditional/other methods. Accordingly it is agreeable that method of teaching if innovatively utilized can lead to significant improvement not only in student attitude but also improvement in their achievement (Schon, 1983; Williams, 1994); Yore, 2001).

4.4 Effects of reflective inquiry on Students Achievement in Map work by Gender

Data were collected from the form three students regarding their attitude towards learning geography map work. They were given a list of attitude-related items to respond to before and after instruction using reflective inquiry. Although the control group did the two tests, they were not exposed to teaching using reflective inquiry. Their scores

were cross tabulated with gender. The pretest and posttest results are reported in Table 4.10.

Table 4.10: Influence of Reflective Inquiry on Student Achievement in Map Work by Gender

Gender	Reflective inquiry group mean scores	Traditional methods group mean scores
Boys	57.1	34.7
Girls	43.9	25.3

Table 4.10 indicates that boys in the Reflective inquiry group performed better than their counterparts in the traditional/other learning group. The boys in the Reflective inquiry group also performed better than girls in the same group. It is interesting to note that girls in the Reflective inquiry group performed better than both boys and girls in the traditional learning group. This implies that girls can also perform better than boys can when taught by Reflective inquiry but not by traditional methods (Robinson, Sale, Joel, & Morrison, 1984).

To test the hypothesis of whether there was a significant difference between the mean scores of girls and boys on the posttest Geography map work achievement test, a test was performed on the Reflective inquiry group data, and results tabulated as shown in Table 4.11.

Table 4.11: T-test Results for Students' Posttest Mean Scores by Gender

Gender	Mean scores of posttest experimental group
Boys	57.2
Girls	44.1
t	15.69

Table 4.11 indicates the computed t value for the posttest Geography map work achievement test for the Reflective inquiry group. A comparison between the mean scores of boys and girls yielded a t value of 15.70. The obtained value was higher than the table t-value (1.645) at 0.05 significance level, with 238 degrees of freedom. The researcher therefore rejected the null hypothesis. There was thus a statistically a significant difference between the mean geography map work scores when students were categorized by gender. The boys appeared to perform better. Apparently, the findings of this study confirmed the outcomes reported by the Kenya National Examinations Council - KNEC (2014) report which indicated that boy's performed generally better than girls on the Geography map work examinations. However, the KNEC did not clarify whether this phenomenon had to do with the methods used in teaching the subject.

The ANOVA test was carried out on the data to test whether there was a significant difference between teacher professional qualification levels and their students' Geography map work Mean Scores depicted in Table 4.12.

Table 4.12: Teacher Qualification Levels and Students' Map Work Mean Scores

Scores	Sum of Squares	df	Mean Squares	F	P
Between groups	80.096	3	26.698	1.295	.828
Within groups	5140.573	115	90.185		
Total	5220.679	118			

The researcher wanted to know whether the teacher qualification level enhanced the ways they used reflective inquiry, and in turn influenced the performance of students in geography map work. The results ANOVA results are presented in Table 4.11. Since $F(1.296)$ is greater than the p value $F(0.828)$ there is a significant difference between the Geography map work mean scores of the various groups that sat the tests and were isolated on the basis of their teachers' qualifications. Teacher qualifications have for many years been associated with student performance levels. Many studies, among them Schon, (1983); Lilian, (2014); Sandoval, & Reiser, (2004); Lewelly, (2005) positively associated these variables. Accordingly, the findings in this study are believable and in consonance with existing understanding on this phenomenon. It nevertheless must be emphasized that the mechanism in which this relationship is actualized is better understood through an experimental study demonstrating the scenario more directly as revealed in this study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter summarizes the study findings and conclusions on the influence of reflective inquiry on secondary school students' performance in map work. The chapter also presents recommendations for practical action by teachers and policy makers. Finally, the researcher proposes areas for further research in related areas that emerged and are pertinent to the implementation of the secondary school geography curriculum.

5.1 Summary of the Study

The use of reflective inquiry in teaching has been widely studied in relation to other subjects both in the primary and secondary school curriculum. However, the limited evidence of research on the use of this method in teaching practical aspects of the secondary school geography curriculum prompted this study. Accordingly, the purpose of this study was to investigate the effect of reflective inquiry-based teaching on public secondary school students' performance in geography map work in Kenya. The objectives of the study were: determine whether teacher professional qualification level is a factor in the utilization of reflective inquiry methods in the teaching of geography map work; investigate the effect of the reflective inquiry method on students' performance in secondary school geography map work; investigate the impact of teacher/students attitudes on students'

performance in secondary school geography map work; and determine how teacher attitude towards the use of reflective inquiry (action, engagement, exploration, explanation, elaboration, and evaluation) influences students' performance in secondary school geography map work.

This study targeted both the geography teachers and Form 3 students in secondary school in Kenya. The descriptive survey and quasi experimental research designs were used to guide this study. Two questionnaires, a document analysis guide, interview guide, observation guide and pre-test and post-test items were developed and administered. Adequate steps were taken to preserve the integrity and identity of the participants including procuring consent to carry out the study.

5.3 Summary of Findings

This study sought to answer five questions to enable the research determine the effect of reflective inquiry as a teaching method on students' performance in secondary school geography map work.

The first question sought to ascertain whether teacher professional qualification level affect in the utilization of reflective inquiry methods in the teaching of secondary school geography map work. Findings revealed that most of the geography teachers were highly educated and experienced as they had qualifications ranging from diploma in education to masters degree level. The diplomas were nevertheless fewer. More than 70% of the teachers had teaching experience ranging from 5 years to more than 20 years.

In the second research question, the researcher investigated the effect of reflective inquiry method of teaching on students' performance in secondary school geography map work. The findings succinctly revealed that there is a statistically significant difference in mean geography map work scores when students are taught using reflective inquiry than the traditional method. The t-test revealed that the control group which was taught using traditional methods did not record any significant difference in the mean scores on the pre-test and post-test. On the other hand, the results for the experimental group revealed a significant difference in the mean scores on the geography map work results.

The third research question sought to determine how students' gender influenced geography map work performance when reflective inquiry teaching method is used. It was found that irrespective of gender the results on the pretest and posttest improved for both the boys and girls in the experimental group. It was nevertheless not clear why the performance for girls in both cases was lower compared to boys.

The fourth question investigated how the use of reflective inquiry teaching method influenced students' attitude towards the learning of secondary school geography map work. The results revealed positive correlation between the use of reflective inquiry teaching method and the student performance on the geography map work test where the student attitude was determined to be favorable/positive. This shows the students who were taught using reflective inquiry method developed positive attitudes towards the learning of map work.

The fifth question determined how teacher attitude towards the use of reflective inquiry (action, engagement, exploration, explanation, elaboration, and evaluation)

in teaching influenced students' performance in secondary school geography map work. Results indicated that in cases where teacher attitude was positive towards using reflective inquiry methods, consequent improved student performance was realized in secondary school geography map work.

Generally, these findings indicate that there is a significant relationship between reflective inquiry-based teaching in public secondary schools and students' performance in geography map work. Remarkable improvement in performance was observed in classes where reflective inquiry-based teaching was experienced. The findings indicate further that students and teachers found the lessons enjoyable and with more activities whenever reflective inquiry-based teaching was used. The study also revealed that classroom explanation and elaboration worked best when it was followed by practical involvement by students in different activities in map work. The study nevertheless found that effective use of the reflective inquiry-based teaching required more time.

5.4 Conclusions

Based on the findings of this study, the researcher made the following conclusions regarding the effect of reflective inquiry on student performance in geography map work:

First, the researcher concluded that there is a positive correlation between teacher professional qualifications and experience on one hand and effectiveness of teaching geography map work on the other hand. Student performance is higher with better qualified and experienced teachers.

Secondly, the researcher concluded that the reflective inquiry method of teaching is effective in teaching geography map work at the secondary school level. This conclusion is based on the pretest and posttest results obtained on the geography map work.

Thirdly, the researcher concluded that gender is not a significant factor in the student achievement when reflective inquiry method is used to teach secondary school geography map work. This conclusion is based on the findings that revealed marked improvement for both the girls and boys on the geography test following teaching using this method.

The researcher concluded further that both the student and teacher attitude towards the use of reflective inquiry method in teaching geography map work leads to improved achievement in the subject. Accordingly, the research concluded that reflective inquiry-based teaching improves public secondary school students' performance in geography map work.

5.5 Recommendations

Based on the findings of this study the researcher made the following recommendations:

5.5.1 Policy Recommendations

There is need for the Ministry of Education Science and Technology to develop a subject-based continuing and in-service training programmes to effectively and regularly update teachers on teaching methodology.

The Kenya Institute of curriculum development needs to liaise with the Ministry of Education Science and Technology to develop methodology guides to enhance

application of different and appropriate teaching methods for the different topics in geography and other disciplines.

5.5.2 Recommendations for Practice

It is recommended further that the continuous training in reflective inquiry-based teaching and research in related teacher instructional practices be mainstreamed in the teaching of not only map work but geography as a whole.

Geography teachers need to target the improvement of performance in geography by using the reflective inquiry method to teach map work and other practical aspects of geography such as project and excursions.

5.5.3 Recommendations for Further Research

The study revealed that reflective inquiry method generally required more time to be effective. Accordingly, there is need to study the dynamics and effectiveness of time utilization in teaching using the reflective inquiry method, given the limited time available for the teaching of geography at three periods of 40 minutes per week.

The study also revealed that girls generally performed slightly lower than boys despite the significant improvement on the use of reflective inquiry method in teaching geography map work. Consequently, there is need to investigate other possible factors responsible for this variation. The researcher recommended further that that there is need for further research on reflective inquiry-based teaching to determine the steps how it can be integrated in other subjects.

Lastly, there is need to carry out further analysis to determine whether different outcomes can be realized if reflective inquiry method is used alongside other methods to teach secondary school geography map work.

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APPENDICES

Appendix 1: The Module

Teaching of Geography Map work

A. Depicting of physical features using contours.

In order for you to depict the physical features the learners need to have an understanding of physical geography. The features to be depicted by using contours include landforms - mountain, hills, plateaus, plains and valleys- the features are drainage patterns and soil types.

B. Map work Skills

These skills include cross section, calculation of distances and areas, orientating a map, directions, inter-visibility, scaling, and map drawing.

C. Map Reading

This involves depicting human activities like settlements, roads, railways, agricultural, industrial activities and their relationships to the land form and among themselves.

Appendix 2: Sample of National Examinations Questions on Map Work

Question 6

Study the map of SILALONI (1:50,000) provided and answer the questions that follow.

- a.
 - (i) Convert the ratio scale of the map extract into statement scale.
 - (ii) Give the six grid reference of the point where the power line crosses the samburu-silaloni dry-weather road.
 - (iii) Give three types of natural vegetation shown in the area covered by the map.
- b.
 - (i) Identify two sources of water in the area covered by the map.
 - (ii) Use evidence from the map, suggest four functions of tsangatsini township.
- c. Using a vertical scale of 1 cm to represent 20 m
 - (i) Draw a cross section from grid reference 400915 to 500915.
 - (ii) on the cross section mark and name the following
 - A river
 - A road
 - A quarry
 - (iii) Calculate the vertical exaggeration of the section you have drawn.
- d. Students at Silaloni school (grid square 3199) carried a field study on soil around their school.
 - (i) Give four reasons why a reconnaissance was necessary for the field study.
 - (ii) Name two types of soil they recollected.

2007

Question 6

Study the map of taiata hills (1:50,000) sheet 189/4 provided and answer the following questions.

- a. (i) What is the bearing of the peak of mwatunga hill in grid square 3214 from the water tank in grid square 2619.
- (ii) What is the length in kilometers of the section of the mwatate-voi railway line in the south-eastern part of the map?
- b. Draw a rectangle measuring 16cm by 12 cm to represent the area enclosed by the Eastings 24 and 40 and Northing 20 and 30.

On the rectangle, mark and name the following features,

- Mganage hills
 - A rock out crop
 - All weather road bound out surface river ruhia
 - Ronge forest
- c. Using evidence from the map, explain three factors that may have favoured the establishment of the Teita Sisal Estates in the southern part of the area covered by the map.
- d. (i) describe the distribution of settlements in the area covered by the map
- (ii) Citing evidence from the map, give two economic activities carried out in the area covered by the map other than sisal farming.

The question required candidates to read and interpret the map of Taita Hills. The map reading skills tested were;

- Working out bearings
- Reading grid reference
- Measuring distances
- Sketch drawing and plotting features
- Interpretation of features both physical and human using the key.
- Ability to distinguish the settlement features and describe them.

Advice to teachers

Teachers should ensure that they revise map work often throughout the four year period. The more students are exposed to map work exercise, in class, the more confident they will become and eventually acquire the skill to enable them perform better in the final examination.

The difference between population, settlement patterns and distribution of settlements in map reading among other map reading skills should be thoroughly taught and clarified for candidates to be able to understand and differentiate their meanings.

2010

Question 6

- c. (i) Explain three factors which have influenced the distribution of settlement in the area covered by the map.

Weaknesses

Many candidates only mentioned the factors that influenced distribution of settlements without mentioning the distribution.

Advice to teachers

This was a question that tested the skills of identifying distribution of population on a map. Teachers should ensure that they teach the candidates these skills of identifying distribution patterns and be able to explain the factors that affect them.

Question 7a

The map below shows some vegetation regions in the world. Use it to answer question A and B.

- a. (i) name the temperate grasslands marked D,E and F
- b. Describe the characteristic of the natural vegetations found in the shaded region marked D

Weaknesses

Many candidates were not able to name the temperate grasslands marked on the map and could not be identify the vegetation marked G on the map.

Advice to teachers

This was a question that tested the skills of identifying types and distribution of grasslands in the world. Teachers should ensure that they teach the candidates using maps for the candidates to be able to locate the different types of vegetations.

Appendix 3: Secondary School Map Work Syllabus in Kenya

Map in form one

Definition of pictures, plans and maps

Distinction between pictures, plans and maps

Types of maps

- (a) Atlas maps
- (b) Topographical maps
- (c) Sketch maps

Uses of maps

Marginal information

Map scales

- (a) Types of scales
- (b) Conversion of scales
- (c) Sizes of scales

Uses of scales

- (a) Estimation and measurement of distances
- (b) Calculation of areas of regular and irregular shapes

Map work in form two

Direction and Bearing

- (a) Distinction between direction and bearing
- (b) Tradition and modern methods of showing direction
- (c) Calculation of bearing
- (d) Location of places using

- (e) Direction, bearing and distance
- (f) Place names
- (g) Latitude and longitudes
- (h) Grid reference system

Methods of representing relief on topographical maps

Map work in form three

Interpretation of physical and human activities on topographical maps

- (a) Landforms
- (b) Vegetation
- (c) Drainage
- (d) Economic activities
- (e) Settlement

Enlargement and reduction of maps

Drawing of cross-sections

Calculation and interpretation of:

- (a) Vertical exaggeration
- (b) Gradient
- (c) Intervisibility

Appendix 4: Classroom Observation Schedule

Criteria	Scale. 0	1	2	3	4	Criteria score
1. material and activities of interest	Students are hard	Students generally not interested	Students mildly interested	Students generally interested	Students very interested	
2. material and activities which provoke thinking questioning and discussion	No thinking, questioning or discussion	Few students questions, little discussion.	50% of students stimulated to think, question, discuss.	Most students provoked to think, question and discuss.	All students provoked to think, question and discuss.	
3. provision within the tester for a variety of levels and	Only one level path of investigation	Only one level of investigation.	Some lesson variety 50% of the time.	Many students investigate a level one discretion.	All students able to pursue investigation at a level and discretion.	
4. content fits intellectual level of the learner	Content appropriate to none of the students	Content appropriate for few students.	Content appropriate for 50% of students.	Content appropriate for many students.	Content appropriate for all students.	
<u>the lesson</u> 5. lesson involves fundamental concept of the discipline	Contents or ideas, trivial not tied to developing meaningful understanding	Idea of lesson slightly tied to developing meaningful understanding	Concept or idea of lesson of secondary significance.	Idea of the lesson generally tied to key concepts of discipline.	Key concept or concepts of the discipline.	
6. reading does not impede lesson success	Amount of reading prohibitive to conducting lesson.	Many students hampered by reading difficulty	50% of students hampered by reading difficulty.	Many students generally not hampered by reading difficulties.	No student hampered by reading difficulty.	

7. visual aid used as effective supplements	Visual aids used as substitutes for investigative experience	Visual aid eventually institute investigative experience.	Aids used but somewhat ineffective.	Visual aids generally effectively used as supplements.	Used effectively as supplements.	
Student	Observation and data collection done by teacher	A few students involve in observing and collecting data.	Alf of the class involved in observing, collecting data.	More than half of the class involved in observing and data collection.	All the students are involved in making observations and collecting data.	
9. students terminating and testing hypothesis models or predictions	Only teachers terminates hypothesis and test ideas	A few students formulated and attempted testing ideas.	Students terminate and attempt to test ideas 50% of the time.	More than half of the class make predictions and attempt testing ideas.	All students attempt formulating hypothesis testing them.	
10. students analyzing, interpreting and evaluating data	Teacher in analyzer and interpreter of data	A few students involved in analyzing and interpreting data.	50% of students involved in analyzing and interpreting data.	Students generally analyze and interpret data.	All students involved in analyzing and interpreting data.	
11. class conclusion based on evidence	Conclusions based on teach authority	Conclusions based on evidence occasionally.	Conclusions based on evidence and some teacher's authority.	Conclusions generally based on evidence.	All conclusion based on evidence taken from investigations from students.	
<u>Teacher behavior</u> 12. Is fellow investigator	Teacher does all investigations	Some students involved in investigation	50 % of students are involved in investigations.	Many students involved in investigations.	All students conducting investigations.	

13. Acts as classroom secretary when data needs to be organized.	Teacher does not organize data.	Teacher occasionally organizes data.	Teacher is guide and organizer of data 50% of the time.	Teacher is generally organizer of data and guide to students	Teacher guide and organizer of data.	
14. Concepts introduced after direct experience.	Concept introduced before tried experience	Concept introduced after little direct experience.	Concept introduced after some direct experiences.	Concept introduced generally following direct expenses.	Concept introduced only following direct experience.	
15. Opportunities for extending concept processing provided.	Concept introduced but not referred to again.	Occasional reference to introduced concept.	Numerous examples are mentioned and discussed.	An additional lesson involves the concept to reinforce meaning.	Additional lesson involve concept to enlarge, refine and reinforce.	
16. Calmly handles classroom interruptions	Teacher always yells to class to reprimand	Rarely addresses offending students personally.	50% of the offending students.	Usually addresses offending students personally.	All the time personally addresses the offending students.	
17. Appears confident, calm, friendly.	No	Rarely understanding or patient.	Confident, calm and friendly 50% of the time.	Generally confident, calm and friendly.	Totally confident calm with a good sense of humor.	
Questioning techniques 18. majority of teachers questions are divergent	Only one answer to teachers question	One or two answer to teachers' question.	Many possible answers to teachers question.	Teacher questions discussed many possible answer proposed.	Question discussed many answers and questions advised.	
19. convergent questions used effectively	Used to demand answer to	Occasionally used to help students to	Used to help students analyze	Generally used to help students analyze	Used to help students analyze a situation as	

	question asked	analyze a situation.	situations 50% of the time.	situations or correct errors.	correct as error or clean out.	
20. Questions are phrased directly and simply.	Questions are unclear	A few students bother to answer.	50% of class responses.	Class generally responses.	All students listening and responding.	
21. Individuals called upon after questions asked.	Teacher calls on individuals to answer.	Teacher calls on class to answer.	Teacher calls on group to answer.	Teacher asks majority of class questions first.	Question is asked first to entire class to stimulate thinking then an individual is called to answer.	
22. allows time for students response	No.	Occasionally.	50% of time.	Generally allows time.	Yes.	
23. Accept student answer on opinion.	No.	Occasionally.	50% of time.	Generally accepts students answer.	Accepts students answer as information and allows discussion of an answer.	
24. Responds to questions by providing additional ideas, information or clues to external student thinking.	No.	Occasionally.	50% of time	Generally responds with further questions and suggestions to continue thinking.	Always poses further questions and suggest possible push of investigations.	
25. Teacher and students enjoyed the lesson.	No.	Some students enjoyed the lesson	50% of the students.	Students generally enjoyed the lesson.	All the students and teacher.	

Appendix 5: Student Questionnaire

We are interested in how you feel about geography and geography map work. Answer the question as honestly as possible. The first section requires you to give some personal and general information. Answer the question by ticking in the appropriate box or feeling in the spaces provided. The next sections have statement where you are to decide carefully whether you agree or uncertain/ not sure with each statement.

Put a tick in the box bellow agree if you agree with the statement. Then put a tick in the box below disagree if you disagree with the statement. Put a tick below uncertain/not sure if you are not decided about the statement. Please mark each statement and tick only in one box for each statement.

If you make a mistake, put a cross through the marked box and then tick in the correct box.

Section one: personal or general information.

1. Your full
2. You sex Boy Girl
3. Name of school _____
4. Type of school Boys Girls Mixed
National County District
5. K.C.P.E Results; use latter grades A, B, C, D, E for each subject
Mathematics English Social Studies
Kiswahili Science

6. Who of the following has influenced you most in education

Family member Friends Teachers

Section two: feeling about the learning of map work in Geography

		agree	disagree	uncertain
1	The most enjoyable part of my life is the time I spent in school			
2	I enjoy everything about school			
3	I agree with people who say school days are the happiest days			
4	I always look forward to a geography lesson			
5	I always look forward to a map work lesson			
6	I do not enjoy geography, if I would avoid it, I could.			
7	I do not enjoy map work, if I would avoid it I could			
8	Geography confuses me with many big words and facts that I cannot understand.			
9	Map work confuses me with many calculations and drawing			
10	Geography is very interesting and fun			
11	Map work is very interesting and fun			
12	I do not hope to make use of what we are learning			

	in geography			
13	I do not hope to make use of what we are learning in map work			
14	The geography we are doing helps me to understand more about the world we live in			
15	The map work we are doing helps me to understand more about the world we live in			
16	Doing geography is not going to help me get a job			
17	Doing map work is not going to help me get a job			
18	Geography make me think hard and therefore helps to improve my thinking			
19	Map work make me think hard and therefore helps to improve my thinking			
20	No more geography in my life after form four			
21	You are good enough to settle for a science oriented job (engineering and surveying)			
22	You are good enough to study geography at the university.			

Appendix 6: Teacher Questionnaire

I am interested in getting information about geography teachers especially those teaching map works in form 1, 2 and 3. In cases where there are two teachers or more in geography, it would be advisable to consult each other before responding to some points of this questionnaire. I would also expect you to consult some literature like the KNEC syllabus, time table.

Respond by ticking in the boxes or writing in the spaces.

Part one

Bio data, Background and professional information.

1. Sex

Male Female

2. Nationality

Kenyan Expatriate

3. School

4. Professional Training

B.ed (sci) B.ed (Arts) PGDE M.ED

MSC M.A Dip. ED S1 UT

Any other, specify

5. a) Years of teaching experience

0-5 6-10 11-15 16-20 Above 20

b) Subject you teach in Form 1, 2 and 3

Form 1

Form 2

Form 3

Part 2

Types of instruction

Indicate how often you use the following in your instruction. Tick only one of the box for each type.

	Rarely or never	Often	Frequently
6. Text books	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Supplementary printed materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Small Group work (materials)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. audio visual material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. School radio programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Field trips or special projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Lecturing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Questioning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Discussions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 3

Using your own experiences asses your students in the following

Good

Average

Slow

15. Involvement in learning experience (asking and responding to questions, doing practical's on maps)

Good

Average

Slow

16. Mathematical abilities in computing areas, conversions of scales etc.

Good

Average

Slow

17. Response to homework

Good

Average

Slow

Part 4

Student assessment

In assessing your students work, please indicate how often you use the following types of appraisal. Tick only one of each box

Rarely/never

Sometimes

Frequently

18. Teacher made essay test

19. Teacher made objective test

20. Performance on homework

21. Performance on projects and term papers

Part 5

Teacher attitude scales

Below are ten statements on the teaching of geography map work. I am interested in obtaining information on how teachers regard the job of teaching geography map work. I would like you to indicate against each item the extent to which you agree or disagree with each statement. Please answer the question by ticking the appropriate box where;

SA – Strongly agree, A – Agree, UD/N – Undecided/Neutral, D – Disagree,

SD – Strongly disagree

22. It is interesting to teach geography

SA A UD/N D SD

23. It is interesting to teach map work

SA A UD/N D SD

24. Practical experience is not essential for the acquisition of map work skills

SA A UD/N D SD

25. A student may forget all he/she learned at school about facts and principles of map work, but the experience he/she gains in carrying out his/her own practical on maps will last him/her forever

SA A UD/N D SD

26. A teacher's time is better employed in giving lectures and demonstrations than in preparing students activities in map work.

SA A UD/N D SD

27. Teaching map work in geography is stimulating.

SA A UD/N D SD

28. Geography teaching and especially map work doesn't lead to a satisfying career.

SA A UD/N D SD

29. Geography teaching and especially map work should develop critical thinking abilities

SA A UD/N D SD

30. Extracurricular geography activities like field trips and clubs are useful in the learning of geography map work

SA A UD/N D SD

Part 6

School characteristic

31. Status of the school

Category of the school whether:

National County District Boys boarding

Boys day Girls boarding Girls day Mixed boarding

Mixed day

32. Geographical position/ location

Rural Urban

33. Learning and teaching resources in the schools

(a) Text books

- i) Each student has a text book
- ii) Two students share a text book
- iii) More than two students share a text book
- iv) There are no text books for students.

(b) Topographical maps during map work

- i) Each student has a map
- ii) Two students share a map
- iii) More than one students share a map
- iv) There are no maps available

(c) Geography rooms.

Is there a geography room Yes No

34. Teachers. Types of geography teacher

Full time Shot by one Short by more than one

35. Scheduled number of periods per term

Geography

Map work

36. Time lost (as periods) in a term considered time lost due to;

Public holidays

Mid-terms

Opening preparations

Closing school preparations

37. On average, how many times per term do your geography students write test

Once Twice Thrice Four or more

38. How much study times in hours per week are students given in;

Form one

Form two

Form three

39. Do you have any provision for remedial teaching or tutoring on map work?

Yes No

If yes, state the number of hours per week

Appendix 7: Interview Schedule

1. What were you feeling about teaching map work using reflective inquiry-based method?
2. How did your students respond to the reflective inquiry method?
3. What were the new aspects that you learned when using reflective inquiry method?
4. How was the students' performance in map work after using the reflective inquiry method?
5. Was there a difference in terms of preparation and presentation when using reflective inquiry based method from the traditional methods?
6. What would you consider as the strong points of using the reflective methods?
7. What do you consider as the weak points of the reflective inquiry method in teaching map work.
8. Do you think the slow learners/fast learners liked the reflective inquiry method in the learning of map work?
9. What were the challenges of using reflective inquiry in the teaching of map work?
10. How do you compare the reflective inquiry-based method with the traditional method in the teaching of geography map work?

Appendix 8: Document Analysis Guide

1. Type of document (check one)

Scheme of work

Lesson plan

2. Dates of documents

3. Author or creator of the documents

4. Who do you think the document was written for

5. What is the main topic of the document

6. List three things the author said that you think are important

7. What does the document tell you about the teachings of map work in Kenya at the time the document was written.

8. Is there any information you think conflicts with other things you have read about map work.

9. Write a question to the author

10. Does the document reveal the writer's attitude

11. Does the document provide any clue about the relationship between the writer and the audience.

12. List two things the document tells you about the teaching of map work at the time the document was written.

13. Indicate to the author the question that were left unanswered by the document.

Appendix 9: Pre-Test

1. Study the map of Kitale 1:50,000 (sheet 75/3) provided and answer the following questions:

- (a) (i) Identify the two human made features found at the grid square 2330
(ii) What is the altitude of the highest point in the area covered by the map?
(iii) Give three types of natural vegetation found in the area covered by the map.
- (b) (i) What is the bearing of the air photo principal point at grid square 3426 from the air photo principal point at grid square 2931?
(ii) Measure the distance of the dry weather road (c 640) from the junction at point Mh (345142) to the junction at point N(416201). Give your answer in Kilometres.
- (c) (i) Using a scale of 1 cm to represent 40 metres, draw a cross section from grid square reference 410180 to grid reference 500180.
(ii) On the cross-section, mark and name the following:
- A dry weather road
 - River Kaptarit
 - A ridge
- (iii) Calculate the vertical exaggeration (VE) of the section.
- (d) Citing evidence from the map, identify five social services offered in Kitale Municipality.

2. Study the map of Taita Hills (1:50,000) sheet 189/4 provided and answer the following questions

- (a) (i) What is the bearing of the peak of Mwatunga hill in grid square 3214 from water tank in grid square 2619?
(ii) What is the length in kilometres of the section of the Mwatate-voi railway line in the south –eastern part of the map?

(b) Draw a rectangle measuring 16 cm by 12 cm to represent the area enclosed by the Eastings 24 and 40 and Northings 20 and 30

On the rectangle, mark and name the following features;

- Mgange hills
- A rock out crop
- River Ruhia
- Ronge forest

(c) Using evidence from the map, explain three factors that may have favoured the establishment of the Teiata Sisal Estate in the southern part of the area covered by the map.

(d) (i) describe the distribution of settlements in the area covered by the map

(ii) Citing evidence from the map, two economic activities carried out in the area covered by the map other than sisal farming.

Appendix 10: Post-Test

1. Study the map of Meru (1:50,000 sheet 108/3) provided and answer the following questions;

(a) (i) What is the height of Njorivola hill at grid square 4117?

(ii) Measure the bearing of the peak of Kanjai hill from the peak of Keiru hill to the north east of the map extract,

(iii) Give two methods used in representing relief on the map extract.

(b) Citing evidence from the map, explain;

(i) Two factors that favour trading in the area covered by the map.

(ii) Two physical conditions that favour cattle rearing in the area covered in the map.

(c) The rectangle below represents the area in the map extract bounded by Eastings 35 and 40 and Northings 02 and 10.

Identify and name the features marked;

(i) **J**

(ii) **K**

(iii) **L**

(d) Students from the school at Nkunga (grid square 4412) carried out a field study at Thaie saw mills (grid square 4706)

(i) Measure the length of the road they followed from the junction at grid reference 442128 to the junction at Gitoro, grid reference 478069. Give your answer in kilometres.

(ii) Apart from forests, name two other types of natural vegetation they observed along the route

- (iii) State two methods they have used to collect data at the saw mill
- (iv) State three follow up activities they may have been involved in after the field study.

2. Study the map of Karatina 1:50,000 (sheet 121/3) provided and answer the following questions

- (a) (i) What is the four figure grid reference of the Technical Institute at Mathira?
(ii) What is the bearing of Mount Kenya Campus at grid reference 932568 from the cattle dip at reference 990529?
- (b) Draw a rectangle measuring 15 cm by 10 cm to represent the area enclosed by Eastings 90 and 100 and Northing 50 by 60
On the rectangle mark and name the following;
 - (i) Kirinyaga district;
 - (ii) All weather road bound surface;
 - (iii) Forest;
 - (iv) Coffee factory.
- (c) Describe the distribution of the natural vegetation in the area covered by the map?
- (d) Identify two social functions of Karatina town?
- (e) Citing evidence from the map, explain three factors that favour trading in the area covered by the map.

Appendix 11: Sample Lesson Plan of a Reflective Inquiry Based Teaching

Step one: Engagement

Reflection in action and on

action

Ask students, what is a map?

Select a few students to offer their definition.

Materials needed are a globe, several types of maps.

Step Two: Exploration

Reflection in action and on

action

Procedure

Demonstrate the drawing of a cross section. Then ask students to draw a cross section in groups of threes.

Step Three: Explanation

Reflection in action and on action

Have students share their results with others. This may be done as a whole class activity or in sub groups. They should create a summary of what transpired when drawing the cross section.

Discussion guiding questions

What were the most difficult aspects of drawing a cross section?

Did the drawing of cross sections produce the desired results?

What would you do differently in drawing cross section a second time?

What created the differences in the cross sections while all the specifications were similar?

Step Four: Elaboration**Reflection in action and on action**

The teacher will lead the discussion on why the cross section differed greatly.

Additionally, the teacher will go over the steps of cross section construction.

Step Five: Evaluation**Reflection in action and on action**

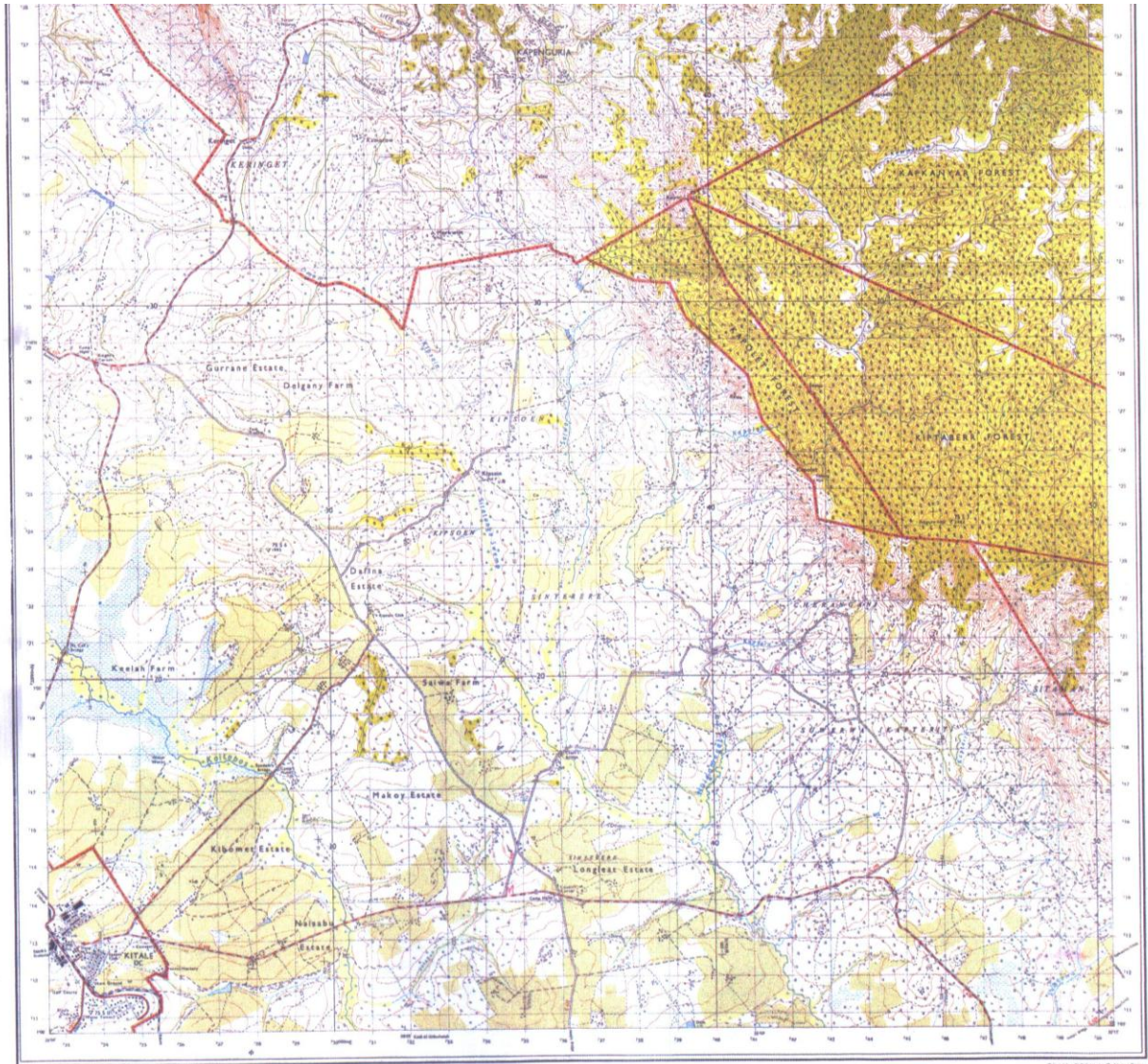
What was your gradient?

Was there an intervisibility?

What was the range of the contours?

What was the highest point of the cross section?

Appendix 12: Map of Kitale



SCALE 1:50,000

HEIGHTS IN METRES

ADJACENT SHEETS

WEST: 751, 752, 753
EAST: 754, 755, 756
SOUTH: 882, 883, 884

CONSTRUCTION	HEIGHTS IN METRES	SYMBOLS	EXPLANATION
ROADS	Contours	Water	Water
RAILWAYS	Spot heights	Marsh	Marsh
BRIDGES	Trigonometric stations	Swamp	Swamp
RAILWAY CROSSINGS	Benches	Wetland	Wetland
RAILWAY PROJECTIONS	Benches	Wetland	Wetland
RAILWAY PROJECTIONS	Benches	Wetland	Wetland

SYMBOLS

Water

Marsh

Swamp

Wetland

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Appendix 13: Map of Meru

