TEACHERS' EPISTEMIC BELIEFS FOR PEDAGOGY OF COMPETENCY BASED CURRICULUM IN KENYA: ANALYSIS OF DEWEY'S THEORY OF KNOWLEDGE

By

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DECLARATION

Declaration by Student

This is to declare that this thesis is my original work and has not been submitted for examination in any university. No part of this thesis may be reproduced without prior or express written consent of the author and/or Moi University.

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DEDICATION

This thesis is dedicated to my loving wife Caroline Wanjiru Kariuki and beloved children George, Stanley, Pauline and Milka who have stood by me throughout this journey.

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ABSTRACT

The study examined teachers' epistemic beliefs for pedagogy of Competency-Based Curriculum (CBC) in Kenya. Studies on personal epistemology have established that teachers' epistemic beliefs are enacted in classroom pedagogical practices. Pedagogical studies in Kenya have neglected teachers' epistemic beliefs in classroom instructional practices. The purpose of the study was to investigate the requisite epistemic beliefs for teachers in Kenya to enact pedagogies appropriate for CBC. The objectives of the study included: To examine the theory of knowledge underpinning CBC in Kenya; to logically derive teachers' epistemic beliefs from theory of knowledge underpinning CBC in Kenya, and to analyze how concept of Pedagogical Content Knowledge can guide teachers in enacting epistemic beliefs for pedagogy of CBC in Kenya. Philosophical research design was employed for analytical, critical, and normative review of Kenya's education policy on CBC reform. The study argument had three major conclusions namely, that pragmatic social constructionism is the theory of knowledge underpinning CBC in Kenya, that there are necessary teachers' epistemic beliefs which are logical derivatives from the theory of pragmatic social constructionism and, that the concept of pedagogical content knowledge is necessary for pedagogical reasoning in the alignment of the teachers' epistemic beliefs with CBC in Kenya. There still remains longitudinal research to monitor student-teachers' development of epistemic beliefs in the teacher education program in Kenya. It is imperative to monitor teachers' epistemic beliefs in the in-service Continuous Professional Development (CPD) of practicing teachers in Kenya.

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ABBREVIATIONS/ACRONYMS

BA:	Bachelor of Art
BECF:	Basic Education Curriculum Framework
BED:	Bachelor of Education
BSC:	Bachelor of Science
CBC:	Competency Based Curriculum
CEQ:	Course Experience Questionnaire
CPD:	Continuous Professional Development
CSL:	Community Service Learning
EAC:	East Africa Community
EBQ:	Epistemological Belief Questionnaire
ESQAC:	Education Standards & Quality Assurance
GCM:	Generative Curriculum Model
GOK:	Government of Kenya
IBL:	Inquiry Based Learning
ICDTA:	Institute for Capacity Development of Teachers in Africa
INSET:	In-Service Education & Training
KBE:	Knowledge Based Economy
KICD:	Kenya Institute of Curriculum Development
KNEC:	Kenya National Examination Council

KQF:	Kenya Qualification Framework
NESSP:	National Education Sector Strategic Plan Ii
NRC:	National Research Council
NTDPF:	National Teacher Development Policy Framework
PCIs:	Pertinent Contemporary Issues
PCK:	Pedagogical Content Knowledge
SEQUIP:	Secondary Education Quality Improvement Project
SMASSE:	Strengthening of Mathematics & Science at Secondary Education

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

This chapter discusses the background to the study, the problem statement, the objectives of the study, the study research questions, the purpose of the study, the significance of the study, the study assumptions, the scope and limitations of the study and the definition of terms employed in this study.

1.2 Background to the Study

The frontier of modern research on pedagogy is represented by the research program under the appellation personal epistemology. Coined by Imre Lakatos, research program denotes a constellation of researchers unified by methodological paradigm (Fenstermacher, 1994). The research program of personal epistemology examines epistemic beliefs. 'Epistemic beliefs are personal beliefs about knowledge and the acquisition of knowledge.' They are subjective theories which direct and control actions of an individual (Paechter, *et al.,* 2013). Epistemic beliefs are also called epistemological beliefs, personal epistemologies, epistemic cognition or epistemological resources (Gu, 2016; Green & Hood, 2016; Er, 2013).

Epistemology and pedagogy are intertwined in the research program of personal epistemology (Hofer, & Pintrich, 2001; Littledyke, 1996). Epistemology 'exerts a profound influence over curriculum, teaching, and the purpose of schooling' (Cimpean, 2008, p. 18). Epistemology is the philosophical theory of knowledge which investigates 'the standards to which genuine knowledge should conform' (Koulaidis, 1987, p. 44). It is the normative philosophical theory on nature and validity of knowledge. It includes justification of true beliefs (Williams, 2013; Cimpean, 2008). Fenstermacher (1994) defines epistemology as a branch of philosophy concerned with the nature and scope of

knowledge, it analyses presuppositions, validity, and the general reliability of the claims to knowledge. Epistemology addresses questions such as: What is the nature of knowledge? How do humans know? What are the sources of knowledge? Are there different types of knowledge? How can knowledge be justified? What is the truth? (Cimpean, 2008). In education, epistemology is used to analyze how objects of knowledge feature in the school curriculum. Secondly, to analyze how knowledge is conceptualized in education (Radford, 2015).

Personal epistemology is predominantly an area of descriptive research whose focus is epistemic beliefs espoused by teachers and students (Sitoe 2006; Hofer, 2001; Hofer & Pintrich, 1997; Schommer–Aikins, 2002). Epistemic beliefs are guiding principles which teachers cognitively espouse as true, and upon which they rely for performing classroom pedagogical tasks (Hofer, & Pintrich, 1997).

The descriptive research program of personal epistemology is contrasted with normative philosophical epistemology. The later investigates nature, scope, validity and criteria of knowledge and, condition for possibility of knowledge. Descriptive studies suspend judgment on validity of teachers' epistemic beliefs but in philosophical epistemology the epistemic beliefs are subject to criticism on basis of established normative criteria of validating knowledge (Koulaidis, 1987).

The instrument that is mainly employed in descriptive research on epistemic beliefs is Schommer's (1990) Epistemological Belief Questionnaire (EBQ). It is a questionnaire of 63 items with five-factor format. EBQ allows researchers to identify, describe, classify and analyze epistemic beliefs espoused by individual teachers. The principal theory in personal epistemology states that epistemic beliefs espoused by classroom

teachers are enacted in classroom instructional practices (Gu, 2016; Lee et als., 2013; Hofer, 2001; Littledyke, 1996).

In the context of teaching and learning epistemic beliefs are relevant in understanding educational strategies of both teachers and learners. Epistemic beliefs affect individuals' higher order thinking and problem-solving approaches, levels of understanding, the strategies used in study, and the time and effort spent on learning (Er, 2013). These descriptors of individual cognitive operations are similar to descriptors expected of teacher implementers of CBC in the Basic Education Curriculum Framework (GoK, 2017b). Teachers' epistemic beliefs relate to a teacher's subjective views about the nature of knowledge, how knowledge is acquired and modes of knowing. Epistemic beliefs espoused by classroom teachers are enacted in the classroom instructional practices (Gu, 2016; Huling, 2014; Hofer & Pintntrich, 1997). Studies indicate that beliefs held by individual teachers concerning the nature of knowledge and learning, affect how new knowledge is processed and interpreted. This resonates with the skills proposed in Kenya's Sessional Paper no 14 of 2012 for the CBC (Gok, 2012). Awareness of teachers' epistemic beliefs in Kenya is crucial for they are the lenses through which teachers interpret and implement the CBC.

Curriculum implementation fails where teachers' beliefs are not aligned to the epistemology of the curriculum (Burkhardt, Frase, & Ridgeways, 1986). This is because teachers' beliefs are strong indicators and predictors of classroom instructional practices (Khader, 2012). Classroom teaching and learning activities are what ultimately affect learner's acquisition and use of knowledge, skills, and attitudes. The Kenya Sessional Paper no 14 of 2012 notes that 'the hardest element to change and the major challenge' facing teachers in Kenya, is how to change classroom instructional practices (GoK, 2012).

The real challenge is not acquiring and developing new epistemic beliefs, but rooting out and escaping captivity of old ones (Khader, 2012). Teachers' epistemic beliefs are solid, resistant to change and work as watchdogs against new knowledge. They also work as barriers to the change of teaching practices (Pajares, 1992; Fullan & Stegelbauer, 1991). We argue that the major challenge facing teachers in Kenya in light of CBC is how to root out and escape from old epistemological beliefs. Epistemological beliefs espoused by teachers affect their perception of learning and teaching (Er, 2013). However, teachers may change their beliefs but classroom practice may not change. Research has reported inconsistency and conflict between teachers' espoused beliefs and their actual classroom practice. This is attributed to lack of administrative support, the school culture, crowded classes, lack of professional development of teachers or teacher' lack of experience (Khader, 2012). Teachers are unwilling to change a practice on the basis of an admonition that begins with the phrase: 'Research says ....' They may challenge the premises that underlie these external mandates, but they may be unwilling to do so with their own practices (Fenstermacher & Richardson, 1993).

Fyall (2012) observed that teacher graduates join the teaching profession with strongly held beliefs that are difficult to alter. Such beliefs are constructed based on observational apprenticeship during the teacher education program. During the teacher education program pre-service teachers can be awakened to critical self-reflection as a condition of possibility of reconstructing espoused beliefs (Fyall, 2012). Teacher implementers of CBC in Kenya are required to undergo training and one expected learning outcome is that they become self-reflective and self-improving (GoK, 2017b). However, the intended self-reflection is not associated with espoused epistemic beliefs. Critical self-reflection can be triggered by cognitive dissonance provoked by conflicts in the beliefs that are dogmatically espoused. This is the condition for possibility of

appropriate pedagogical reform. The purpose of including epistemic beliefs in teacher education is meant to 'produce teachers with a self-critical perspective capable of making philosophical and pedagogical changes' (Fyall, 2012, p. 8).

Epistemological beliefs espoused by pre-service teacher candidates should constantly be reviewed and taken into account when developing curriculum in the teacher education program (Er, 2013). Epistemic beliefs espoused by Kenyan teachers should be analyzed to ascertain their adequacy for enactment of pedagogy aligned with CBC. It is not known what kind of epistemic beliefs participant teachers espoused during the KICD piloting of CBC in Kenya (KICD, 2018). It is therefore not known whether teachers have developed epistemic beliefs aligned to epistemology of CBC in Kenya.

Er (2013) argued that pre-service teacher candidates should have their epistemological beliefs identified at the very beginning of their training and the results should be factored in the design and planning of the teacher education program. Unfortunately, epistemological beliefs of teacher candidates at teacher education programs are generally overlooked. Students should be encouraged to reflect upon their epistemological beliefs openly if their beliefs about teaching and learning are to be reformed (Er, 2013). Pajares (1999) observed that often teacher candidates miss opportunities to share their beliefs with teacher educators. This is unfortunate because epistemological beliefs have significant impact on classroom teaching and learning outcomes (Er, 2013).

Epistemological beliefs of the pre-service teacher candidates are difficult to reform even in supportive environments that use constructivist epistemology (Er, 2013). However, 'if teaching programs, and particularly teacher training programs, could include different activities that show students different ways of reaching knowledge

and learning how to learn, it may be possible to develop the desired epistemological beliefs' (Er, 2013, p. 209).

William (2013) relied on Schommer (1994) in identifying four dimensions of epistemological beliefs in a continuum that ranges from naïve to sophisticated level. These are:

i. Structure of knowledge-(ranging from isolated bits to integrated concepts)
ii. Stability of knowledge - (ranging from certain to evolving)
iii. Speed of learning - (ranging from quick or not at all to gradual)
iv. Ability to learn - (ranging from fixed at birth to improvable).

Hofer & Pintrich (2001) illustrated how epistemological beliefs develop from naïve to sophisticated level. Epistemic beliefs studied under longitudinal studies were found to change. For instance, from belief that learning depends on innate ability to the belief that learning depends on individual effort; and that learning does not occur suddenly but rather it is a process which takes time (Kelly, 2013).

Teacher' classroom pedagogical approach is determined by the level of development in the continuum of epistemological beliefs. Teachers with 'developed epistemological beliefs promote strong acts of constructivism in their students' (Kelly, 2013, p. 32.) They help students to build personal meaning. Sophisticated teachers' epistemic beliefs are enacted in constructivist pedagogical approaches. Constructivist teachers use students' interests by helping learners to make connections to previous learning experiences. Constructivist teachers introduce real life problems in the learning experiences of the students. Students are encouraged to collaboratively consider different types of evidence. Students engage at higher order thinking in learning rather than focusing on reproducing knowledge. Teachers with less sophisticated

epistemological beliefs promote surface approaches to teaching and learning activities (Kelly, 2013). Surface approaches use direct instruction based on the process-product paradigm of industrial age schooling (Darling-Hammond, 1992; Hussu, 1995).

Chai (2010) summarized findings on personal epistemology and concluded that teachers' beliefs affect classroom practice and how teachers teach. Kelly (2013) explored the relationship between the teachers' beliefs and their approaches to teaching. She found out that science teachers' epistemological beliefs in their domain knowledge were consistent with their teaching practices (Kelly, 2013). She categorized science teachers as either positivists or constructivists based on their epistemic beliefs. Positivist science teachers have an empiricist approach and they do not avail students with alternative understanding of scientific concepts. Positivism is based on the theory of knowledge called empiricism. It relies on sense experience as the only legitimate source of acquiring knowledge and promotes behaviorist pedagogy. The positivist-empiricist believers hold that learners are blank slates receptive of gradual accumulation of bits of sequenced learning (Darling-Hammond, 1992). Consequently, under empirical epistemology teaching is focused on stimulus-response as control of learning (Cimpean, 2008).

Constructivist science teachers have a richer set of teaching strategies to draw upon. They facilitate learners' conceptual comprehension. It is not known whether in Kenya teachers' epistemological beliefs are interrogated during Continuous Professional Development (CPD) in the Strengthening of Mathematics and Science at Secondary Education (SMASSE). There is no study on whether science teachers in Kenya hold a constructivist or positivist view of science.

The shift in modern pedagogies is towards a constructivist approach away from positivist paradigm. The former engages learners at deep learning while the latter engages learners at surface learning. The latter was appropriate for the industrial age where schools were modeled on systems approach of the industrial assembly line. The curriculum and strategies of teaching and learning were uniform for all learners. The set curriculum was to be mastered by each learner who was subjected to standardized high stake examination. The learner was fitted in a process-product system, and pedagogy was linear transmission of content. Teacher' role was to cover the curriculum and manage the class discipline. The learners interests, experiences, challenges were glossed over (Hussu, 1995).

The major challenge facing teachers in Kenya in light of CBC is how to acquire the necessary epistemic beliefs for enactment of appropriate learner centered pedagogical approaches which develop potential of each learner (GoK, 2017b; GoK, 2012). Kenyan teachers need to develop sophisticated epistemological beliefs to engender constructivist pedagogy of CBC.

Teachers in Kenya could change their classroom instructional practices if firstly they are aware of their epistemic beliefs. Epistemic beliefs espoused by teachers in Kenya are unknown. In particular it is unknown what specific epistemic beliefs are necessary for enactment of learner centered pedagogical approaches aligned with the CBC.

Beliefs are key components in the pedagogical reasoning of a teacher and they have 'considerable influence on the development of teacher's behavior' (Fyall, 2012, p. 10). Shulman (1978) developed the theory of 'pedagogical reasoning and action' as a means of aiding teachers to translate their content mastery into individual learner's context. Shulman's (1978) pedagogical reasoning theory is analyzed in this study for adaptation

by teachers in Kenya in linking epistemic beliefs with pedagogy for CBC. When epistemic beliefs are rationalized based on Shulman's theory, they become pedagogical beliefs which influence classroom instructional practices (Khader, 2012).

Empirical studies on how epistemological beliefs influence conceptions of teaching and learning among in-service teachers are on the rise (Lee, et al., 2013). This is evident for instance in the United States of America (Hofer & Pintrich 2002; Gu, 2016), Germany (Paechter et als, 2013), Turkey (Yildiran et als, 2011), Thailand (Trakulphadetkrai, 2012), and in China (Chai, 2010; Wang et als, 2013). In Africa there is Ghana (Manu, Osei-Bonsu & Atta, 2015), Tanzania (Musendekwa, 2015) and Mozambique (Sitoe, 2006). However, fewer studies have explored teachers' epistemic beliefs in Africa and, no study exists on epistemic beliefs of teachers in Kenya. It is imperative for education stakeholders in Kenya to understand how epistemic beliefs influence classroom teaching and learning outcomes especially in the light of implementing CBC.

In Kenya, Nasimiyu (2017) examined how pre-service secondary school teacher education program facilitate the acquisition of instructional beliefs for use of modern instructional technology. Her study did not employ EBQ and it did not relate to epistemology of CBC in Kenya. Instructional practices were not theorized in relation to teachers' epistemic beliefs. Khakasa (2009) examined proficiency in pedagogical content knowledge amongst secondary school mathematics teachers' interpretations of students' problem-solving strategies in Kenya. Khakasa (2009) used Shulman's (1987) theory to raise the question: How does the successful college student transform his/her expertise in the subject matter into a form that high school students can comprehend? How does learning for teaching occur?

According to Khakasa (2009) poor performance of students is a reflection of inappropriate teacher's knowledge for teaching. Khakasa (2009) holds that classroom instruction is driven by beliefs espoused by the teacher. Teachers' beliefs about subject-matter and, about teaching and learning, influence their instructional practice. Khakasa (2009, p. 49) described belief as 'internalized concepts based on the given information.' This definition does not capture the concept of teachers' epistemic beliefs as employed in the current study. Khakasa (2009) elaborates that pre-service teachers require 'additional knowledge for teaching mathematics.' This means that 'knowing mathematics for teaching is more than just knowing mathematics' (p. Khakasa, 2009, p. 54). Shulman (1987) declared that 'fluency in content knowledge is necessary but not sufficient for the knowledge of teaching' (Khakasa, 2009, p. 257). Khakasa (2009) fails to relate teachers' beliefs to the epistemology of the curriculum. In spite of using Shulman's theory of pedagogical content knowledge she does not relate it to Dewey's constructivist theory of pragmatic epistemology.

In spite of Otieno (2015) citing Hofer (2004) he nonetheless uses theory of Dweck's terminology of 'intelligence beliefs.' The two scholars Dweck and Hofer belong to the area of personal epistemology but employ different theoretical models. Conceptually 'intelligence belief' does not coincide with 'epistemic belief.' Intelligence beliefs are dyadic either fixed or malleable, secondly, they influence students' learning. In the current study teachers' epistemic beliefs are about teacher's views on nature and sources of knowledge, knowing process and learning. Teacher's epistemic beliefs are analyzed in terms of their influence on pedagogy. Teachers' epistemic beliefs are not intelligence beliefs.

Pedagogy should be aligned with the curriculum (Hayward et als, 2016). Education policy on CBC in Kenya advocates for Dewey's theory of social constructivism 'which

focuses on the need to adopt learner-centered approaches in curriculum design and delivery' (GoK, 2017b). This theory is advocated as a guide to appropriate pedagogical approach for CBC in Kenya (Gok, 2017b). In this study Dewey's theory of knowledge is analyzed to assess its relevance for pedagogy appropriate for CBC in Kenya. Dewey observed that (1990, p. 8)

> The modification going on in the method and curriculum of education is as much a product of the changed social situation, and as much an effort to meet the needs of the new society that is forming, as are changes in modes of industry and commerce.

Dewey (1990) advocated for learners to acquire knowledge by *doing* things in a social and co-operative way. The school is an embryonic community and learners should be aided to develop social power and insight so that they are imbued 'with the spirit of service.' This gives education social motive especially where practical activities are introduced at school to affiliate school work with life occupations. Dewey's idea of social service is relevant to justify the value of Community Service Learning (CSL) a pedagogical novelty in CBC in Kenya (Kabita and Li, 2017).

Dewey is credited for having articulated the fundamental tension in teacher education concerning the 'proper relationship' of theory and practice (Dewey 1916, p. 361). Ball & Bass (2000) believe that this tension persists into the 21st century. They pose the question: 'to what extent does teaching and learning to teach depend on the development of theoretical knowledge and knowledge of subject matter? On the other hand, to what extent does it rely on the development of pedagogical methods?' (Ball & Bass, 2000, p. 3). The answer is that it relies on both. Sessional Paper no 14 of 2012 raises concern on time allocation in teacher education between theory and practice (GoK, 2012). This concern is captured by Ball & Bass (2000, p. 3) in observing that 'policy makers debate whether teachers should major in education or in a discipline.'

Ball & Bass (2000) relied on Dewey to argue that teaching and learning activities are intimately tied into the discipline. For Dewey subjects taught at school are embodiments of mind, they are products of human curiosity, inquiry, and search for truth.

Studies on pedagogy based on personal epistemology established that teachers enact epistemic beliefs in their pedagogical approaches. This suggests that a teacher's theory of knowledge of subject matter informs how one chooses to teach it. However, according to Dewey (1990) teachers are supposed to formulate subject matter in response to experiences of the learners. Otherwise subject matter is taught according to the teacher's understanding which is the basis of content transmission and learners' surface learning (Chai, 2010; Kelly, 2012). It is therefore important to make explicit Dewey's theory of knowledge to see how it relates to the theory of knowledge of the CBC in Kenya.

Teacher education under CBC aim to equip teacher-candidates with the knowledge to identify and develop the educational abilities, interests, talents, and needs of the learner (GoK, 2012). Secondary school teachers in Kenya are required by Basic Education Curriculum Framework (BECF) (GoK, 2017, p. viii)

> to be flexible in adapting this new curriculum to meet the needs, talents and interests of every child…. This new curriculum shall ensure that all learning can be made contextually relevant for every learner's holistic growth and development so that they can…love learning' and become 'keen, focused and able to apply their learning in order to make constructive contributions as productive responsible citizens who cooperate with their peers around the world in their learning, through enhanced digital literacy and mastery.

Darling-Hammond (1992) argues that policy makers must drive reforms in education by shifting from designing control mechanisms to capacity building of both teachers and school. The schools must shift from 'delivering instructional services' via teachers who merely 'cover the curriculum.' Teachers should be equipped to 'enable diverse

learners to construct their own knowledge and develop talents in effective and powerful ways' (Darling-Hammond, 1992, p. 3).

This calls for learner-centered pedagogy (Tabulawa, 2013). Education must begin with psychological insight into the child's abilities, talents, capacities, interests, and habits. These powers of the child must be continually interpreted and translated into what they are capable of becoming in the way of social service. This social interpretation of powers of the child constitutes the sociological side of education (Dewey, 1916).

Dewey (1990, p. 71) offers a guide in the direction which teachers in Kenya should follow in search of a pedagogy that meets the above requirements (GoK, 2017). He stated that:

> A mind which is habituated to viewing subject-matter from the standpoint of the function of that subject-matter in connection with the mental signs of intellectual activity when exhibited in the … youth of sixteen would … be prepared to hear and extend students' thinking. To do this, teachers would need to be able to study subject matter in ways that took it back to its psychical roots.

Competency Based Curriculum (CBC) in Kenya

Curriculum is an educational instrument by which a country empowers its citizens with the necessary knowledge, skills, attitudes, and values to enable them become socially and economically engaged and empowered' (Kabita & Li, 2017, p. 5). The Kenya government is putting in place 'a new curriculum that is more attuned and responsive to the socio-economic reality of Kenya and its Vision 2030 challenges' (GoK, 2017a). CBC was adopted after the Kenya Institute Curriculum Development (KICD) undertook a needs assessment study in 2016. The study by KICD sought views from Kenyans and also got to learn from experiences of other countries. The CBC was therefore 'influenced by both national needs and international trends' or international best practices (Kabita & Li, 2017, p. 7). Kenyans expressed the general view that the

education system ‘emphasized acquisition of knowledge with no pedagogical emphasis on application.’ This also influenced the examinations, ‘which mainly tested memorization’ (Kabita & Li, 2017, p. 7).

It was evident that Kenya needed ‘a curriculum that empowers learners with 21st century skills to help them thrive rather than survive in this era’ (Kabati & Li 2017, p. 7). Based on these findings there was a need to adopt a competency-based approach (CBA) in pedagogy that would promote application rather than mere acquisition of knowledge.’ It is on this basis that KICD proposed CBC in education reforms under Vision 2030.

Competency is ‘the ability to apply learning resources and outcomes (knowledge, skills, values, and attitudes) adequately in a defined context (education, work, personal, or professional development)’ (Kabati & Li, 2017, p. 10). There are seven core competencies for learner’s acquisition and application under CBC these are (GoK, 2017b):

i. Communication and collaboration
ii. Self-efficacy
iii. Critical thinking and problem solving
iv. Creativity and imagination
v. Citizenship
vi. Digital literacy
vii. Learning to learn

The focus on competencies underscores emphasis on application than mere content acquisition of knowledge. Content is but a vehicle to facilitate development of skills and know-how in numeracy, literacy, communication, problem solving, critical

thinking. ‘More focus should be directed to competencies and less on content. The goal should be the appropriate application of knowledge, and not necessarily just its acquisition’ (GoK, 2017b, p.27).

A major reform in the new curriculum is the shift from ‘the current teacher-centered and content-centered’ (GoK, 2017a, p. vi) to a curriculum with emphasis on what ‘what learners are expected to do rather than … what they are expected to know’ (Kabati & Li, 2017). Such a curriculum is in principle learner-centered and adaptive to the changing needs of students, teachers and society. CBC aims to empower learners to ‘acquire and apply knowledge, skills, values, and attitudes to solve situations they encounter in everyday life’ (Kabati & Li, 2017, p. 10).

For realization of these competencies adoption of ‘the appropriate pedagogy, subjects, learning areas, curriculum designs, schemes of work, textbooks, lesson plans, and other learning-materials will be developed’ (Kabita & Li, 2017, p. 10). Similar implementation requirements are identified in Secondary Education Quality Improvement Project (SEQUIP) where it is stated that ‘implementation of the new Competency-based curriculum will require capacity building of teachers, development of new teaching materials and institution of new student assessment systems (GoK, 2017a).

CBC aims to make ‘learning meaningful and provide opportunities to apply the competencies to real life situations, while also empowering learners with skills for life-long learning (Kabita & Li, 2017, p. 10). Such opportunities include Community Service Learning (CSL) where learners are supposed to ‘apply their knowledge and skills in addressing real needs in the community.’ CSL helps learners to integrate school learning with community activities which provide opportunities to apply and learn from

life experiences. The aim of CSL is for learners to experiment with knowledge and skills in working on 'real problems in order to make their academic learning relevant' to the society (Kabita & Li, 2017). In Kenya CSL is compulsory for all learners and at senior school learners will be required to input 135 hours of community service (Kabita & Li, 2017, p. 13).

Dewey (1990) advocated for learners to acquire knowledge by 'doing things in a social and co-operative way' (Dewey, 1990, p. 17). The school is an embryonic community and learners should be aided to develop social power and insight so that they are imbued 'with the spirit of service' (Dewey, 1990, p. 29). This gives education social motive especially where practical activities are introduced at school to affiliate school work with life occupations. Dewey's idea of social service helps to justify the value of CSL under CBC.

Another significant paradigm shift in CBC is inclusion of Pertinent Contemporary Issues (PCIs) where subject matter learnt must integrate with current emerging issues. This makes subject matter learning dynamic and relevant to social, political and economic issues which concerns members of society. Such issues may include social cohesion, environmental care, drug abuse, HIV and AIDS. In order to mainstream the idea of PCIs, KICD is mandated to develop a matrix that outlines the content to be taught for each PCI (Kabita & Li, 2017). It is therefore necessary that pedagogical capacity building of teachers is imperative for implementing CBC in Kenya.

Education Policy on CBC in Kenya

In 2007 Kenya government launched Vision 2030 as a national development blueprint (Kabita & Li, 2017). The Kenya Vision 2030 is a long term development ideology with global and national aim. Globally the aim of the Vision is to make Kenya a competitive

and prosperous nation. Ideology of Kenya Vision 2030 wishes to position Kenya globally as a knowledge-based economy (KBE).

The term KBE has gained ascendancy in the 21st century economic discourse which links education to development (Godin, 2009, p. 300). In this new theory of development knowledge is considered as a key factor of production. Inclusion of knowledge amongst factors of production is predicated on the premise that a national economy is stronger when 'rooted in the production, distribution and use of knowledge' (Godin, 2009, p.280). Therefore KBE is a function of 'the production, distribution and use of knowledge.' KBE creates, adopts, and adapts information on production and distribution of goods and services. Knowledge in Kenya is viewed as the engine that drives rapid economic growth (GoK, 2007, article, 4.2). Globally it is believed that 'effective use of knowledge is becoming the most important factor for creating wealth and improving social welfare and for international competitiveness' (GoK, 2007, article, 4.2).

Nationally, the Kenya Vision 2030 aims at 'transforming Kenya into a newly industrializing middle income country providing a high quality life to all its citizens' (GoK, 200, p. ii). Human capital must be equipped with competencies and skills of generating useful knowledge for social, economic and political development (GoK, 2007, article, 2.6; GoK, 2015, p. vii; GoK, 2012, article, 7.1).

Kenya Vision 2030 intends Kenya to be 'a knowledge-led economy wherein, the creation, adaptation and use of knowledge will be among the most critical factors of rapid economic growth' (GoK, 2007 article, 2.6). This is dynamic conceptualization of knowledge in terms of its usefulness as a tool for application in improving the economy. This dynamic view of knowledge is further evident in the belief that 'new knowledge

plays a central role in wealth creation, social welfare and international competitiveness' (GoK, 2007).

The idea of 'new knowledge' suggests a progressive process of continuous learning and application of what is learnt in productive activities. Kenya Vision 2030 further identifies four elements for 'effective exploitation of knowledge' three of which focuses on use of new knowledge. These include:

i. Efficient use of the existing knowledge and creation of new knowledge
ii. An educated skilled population that create, share and use knowledge well
iii. Effective innovation that taps into the 'growing stock of global knowledge, assimilate and adapt it to local needs, while creating new knowledge and technologies as appropriate' (GoK, 2007, article, 2.6)

The country needs coherent strategies that 'build the capabilities to create access and use knowledge' (GoK, 2007, article, 2.6). Teachers are producers or generators of knowledge (Fenstermacher, 1994). If KBE in Kenya is driven by creation of 'new knowledge' then Dewey's (1990) idea of 'New Education' is relevant in describing CBC as curriculum for knowledge creation.

Educational reforms under CBC in Kenya are driven by Vision 2030 (Kabita & Li, 2017). The reforms are within the global narrative of KBE. It is expected that 'implementing Vision 2030 will require more knowledge-based skills' from the labor force (GoK, 2007, p.100). Education is charged with responsibility of 'creating a knowledge-based society' in Kenya (GoK, 2007, p.93). Sessional Paper no 14 of 2012 states that 'At the heart of Vision 2030 is a curriculum which will provide knowledge, skills, competences and values to enable learners to move seamlessly from the education system into the world of work' (Gok, 2012, article, 6.3). KICD adopted 'a

competency-based curriculum approach' in education reforms under Vision 2030 (Kabita & Li 2017).

In Kenya the education sector is charged with responsibility of 'improving the national pool of skills and talents through training that is relevant to the needs of the economy' (GoK, 2007, article, 2.6). The sector is expected to 'provide a globally competitive quality education, training and research.' Kenyan workers are to be 'constantly subjected to retraining' for sustainable productivity (GoK, 2007, article, 2.8). In vision 2030 teachers are recognized as key players in provision of quality education to the Kenyan learner (GoK, 2012, article, 10.32). However, 'modernising teacher training' is a priority if the 'reformed secondary school curricula' is to be effectively implemented (GoK, 2007, p. xi). The theory of knowledge presupposed by Vision 2030 needs to be analyzed so that its pedagogical implication is clarified in the educational reform under CBC. This will help to clarify the need for 'modernizing teacher training' in pedagogical approaches relevant for implementation of CBC for knowledge production.

1.3 Statement of the Problem

Curriculum reform in Kenya should be undertaken intertwined with pedagogical reforms. The Kenya policy documents on education reforms towards CBC observed that the major and hardest challenge facing the teaching profession is how to change teachers' pedagogical practices towards learner centeredness as required under CBC. Teacher education program at the universities in Kenya was criticized for failure to keep abreast with recent pedagogical innovations. Teachers in Kenya are required to approach subject matter of teaching from the perspective of learners' experiences and not from the perspective of a subject specialist.

Studies in personal epistemology reveal that teachers' epistemic beliefs influence their pedagogical practice. Pedagogical reform fundamentally demands changing teachers' epistemic beliefs. Awareness of teachers' epistemic beliefs is paramount as a precondition to possibility of changing the default pedagogy. Pedagogical studies in Kenya have failed to interrogate teachers' epistemic beliefs as the anchorage of pedagogical reforms in response to CBC. Furthermore, the theory of knowledge underpinning CBC in Kenya is unexplored and this presents a challenge on what to stipulate as relevant teachers' epistemic beliefs for enactment in pedagogy appropriate for CBC. It is therefore, not yet known what repertoire of epistemic beliefs teachers in Kenya should espouse for them to practice pedagogy as advocated for in education policy on CBC in Kenya.

Whereas proficiency in subject matter is necessary for classroom teacher, it is not sufficient for formulating subject matter for learners' application in solving problems as CBC demands. The main challenge for the teacher practitioner in Kenya under CBC is not mastery of content as such but rather how to ensure effective pedagogical interaction with learners' experiences, needs, and capacities in the achievement of the intended learning outcomes.

1.4 Research Objectives

The study was based on the following research objectives

i. To examine the theory of knowledge underpinning CBC in Kenya in light of Dewey's theory of knowledge
ii. To logically derive teachers' epistemic beliefs from theory of knowledge underpinning CBC

iii. To analyze how the concept of PCK can lead teachers in Kenya to enact epistemic beliefs in pedagogy aligned with CBC.

1.5 Research Questions

The study was based on the following research questions:

i. What is the theory of knowledge underpinning CBC in Kenya in light of Dewey's theory of knowledge?
ii. Based on the theory of knowledge of CBC what epistemic beliefs can logically be derived for espousal by teachers in Kenya?
iii. How can the concept of PCK lead teachers in Kenya to enact epistemic beliefs in pedagogy aligned with CBC?

1.6 Purpose of the Study

The purpose of this study was to examine theory of knowledge undergirding CBC as means to logically deriving teachers' epistemic beliefs for enactment of pedagogy aligned with CBC.

This study was triggered by policy documents on educational reform in Kenya which emanated from ideology of Kenya Vision 2030. The Vision 2030 intends Kenya to become a KBE. The intended educational reform is biased towards implementing a curriculum that equips learners with competences relevant for Vision 2030. Since Vision 2030 requires knowledge-based competencies, CBC has bias towards knowledge construction, application and continued improvement.

1.7 Justification of the Study

The study addressed pedagogical concerns raised by the educational reform policy documents on CBC in Kenya, namely, how to find learner centered pedagogical approaches aligned with CBC in Kenya. The study also responded to the knowledge

gap pertaining to teachers' epistemic beliefs for CBC in Kenya. There is no study in Kenya that has examined epistemology of CBC as basis of proposing learner centered pedagogical reforms. No study in Kenya has used theory of personal epistemology to examine teachers' epistemic beliefs for CBC in Kenya. Studies on pedagogy in Kenya have not related PCK to enactment of teachers' epistemic beliefs in pedagogy for CBC.

1.8 Significance of the Study

This study contributes to future policy formulation on teachers' CPD particularly as anticipated in National Education Sector Strategic Plan II (GoK, 2015), Sessional Paper no 14 of 2012 (GoK, 2012), Basic Education Curriculum Framework (GoK, 2017b) and Secondary Education Quality Improvement Project (GoK, 2017a) for pedagogical professional training of teachers in Kenya. Under National Teacher Development Policy Framework (NTDPF) all teacher development activities will be directed, coordinated, supported and monitored in the pursuit of improved pedagogy. This study contributes to pedagogical knowledge for use by NTDPF.

Findings of the study are useful to the Institute for Capacity Development of Teachers in Africa (ICDTA) which is charged with responsibility of building teachers' capacities to cope with the pedagogy related challenges in the delivery of curriculum (GoK, 2015). The study contributes on how to evaluate teachers' pedagogy based on the Education Standards and Quality Assurance Council (ESQAC).

The study contributes in pedagogical knowledge required for teacher education in professional development of teachers both for in-service and pre-service training. In particular the study has demonstrated how content knowledge should be integrated with pedagogy under PCK. The study has aligned teachers' pedagogy to aspirations of the Kenya Vision 2030 which require modernization of teacher education in terms of

appropriate pedagogical approaches in the shift to ‘competency-based approaches of teaching’ (GoK, 2007).

The study contributes to pedagogical knowledge for improving pre-service teacher education. It contributes to improving the quality of teacher educators at universities in Kenya by recommending inclusion of EBQ in teacher education program and research on teachers’ epistemic beliefs.

The study improves the curriculum of pre-service teacher education particularly in general theory of pedagogy which will have to be logically linked to the epistemological framework of CBC. The concept of classroom pedagogy will be transformed into the more robust concept of domain PCK.

In-service Continuing Professional Development (CPD) of classroom teachers will be enhanced by helping them examine and transform their epistemic beliefs in improving classroom pedagogical as required under learning outcomes of training of implementers of CBC (GoK, 2017b). Pre-service teacher-education program at university will have to draw attention to epistemic beliefs, their formation and influence on teaching practice in classroom behavior of pre-service teachers.

The study contributes in realization of Vision 2030 as intended in Sessional Paper no.14 of 2012 (GoK, 2012) on secondary school reforms on CBC by generating pedagogical knowledge aligned to competencies of 21st century in Kenya.

1.8 Scope and Study Limitation

The scope of the study was on how to derive epistemic beliefs for teachers in Kenya from epistemology of CBC. The study was theoretical philosophical research. It was a critical analysis deducing teachers’ epistemic beliefs from theory of knowledge underpinning CBC in Kenya. This study was desk-top library-based philosophical

research on pedagogical reforms aligned with CBC as required by education policy in Kenya namely: Basic Education Curriculum Framework (GoK, 2017b), The Kenya Vision 2030 (GoK, 2007), Sessional Paper No. 14 of 2012 (GoK, 2012), National Education Sector Strategic Plan II (GoK, 2015), A Policy Framework for Education Training and Research (GoK, 2005), Secondary Education Quality Improvement Project Vulnerable and Marginalized Groups Framework (GoK, 2017a), KICD Research Report and Draft Framework for Teacher Education in Kenya (GoK, 2016). The significant limitation of the study was lack of empirical data from the field to triangulate the findings.

1.9 Assumption of the Study

The study was based on the following assumptions:

i. That pedagogy of CBC is enacted based on teacher's epistemic beliefs derived from epistemology of CBC
ii. That CBC and its pedagogy are integrally concomitant
iii. That CBC reform fails without concomitant pedagogical reform
iv. That the unique professional expertise of a teacher under CBC lies in the competency of how to integrate curricular subject matter with pedagogy (PCK)

1.10 Theoretical Framework

Dewey's social constructivist learning theory is heavily advocated in Basic Education Curriculum Framework (GoK, 2017b). In the CBC blueprint namely Basic Education Curriculum Framework by KICD, Dewey and his theory of social constructivism are in the lead in the list of other constructivists theorists including, 'Vygotsky, Piaget, Brunner, and more recently Gardner and Hattie' (GoK, 2017b, p. 15). Constructivism is described in terms of the learner building 'a personal interpretation of the world based

on experiences and interactions, and learning is a process of constructing knowledge rather than acquiring or communicating it' (GoK, 2017b, p.15).

This study integrated Dewey's learning theory of social constructivism (Dewey, 1916; Dewey, 1931) and theory of personal epistemology (Hofer & Pintrich, 2002) and Schulman's (1987) PCK. Dewey's pragmatic social constructivism blends theory and practice as two sides of a coin. Pragmatic theory of knowledge integrates knowing with doing, curriculum and pedagogy. Knowledge is an instrument, a resource in thinking how to deal with a problematic experience. In pedagogy Dewey's theory of knowledge states that knowledge is acquired when learners are engaged in experiential learning (Dewey, 1938). Learning is performing practical activities guided by intelligent thinking. Learners demonstrated knowledge acquired in the intelligent application in new situations. Learners learn when they demonstrate capacity to use knowledge in further learning. Teachers should transform the content knowledge in a subject matter into the experience of the learner. All learning must start from a real life problematic case which excites desire to find workable solutions. Learning is based on experience of a problem which challenges learners to begin thinking about possible solutions. It is problem based or inquiry based pedagogy (Dewey, 1910; 1916). According to Basic Education Curriculum Framework inquiry based learning approaches are employed throughout the learning experiences as advocated by John Dewey's social constructivist theory which emphasizes that the learner should be given the opportunity to learn through participation in hands-on activities (GoK, 2017b, p. 39).

Cimpean (2008) argued that Dewey is integrationist in his theories of curriculum, teaching and purpose of schooling. Dewey integrates philosophy with modern scientific logic of experimentation (Dewey, 1948). Cimpean (2008) affirmed that the process of education emphasizes the role of the student, learner's freedom, interests, desires, and

instincts. He further states that, from a pedagogical perspective, the teacher is an authority regarding the transmission of culture, also referred to as the wisdom of the race.

Dewey's theory of knowledge may be further elaborated by relating it to teacher's epistemic beliefs in the theory of personal epistemology by Hofer & Pintrich (2002) and Littledyke (1996). Theory of Personal Epistemology argues that teachers enact espoused epistemic belief in their pedagogy. Epistemic beliefs mirror a teacher's personal theory of knowledge. Dewey's pragmatism is evident in the teacher's personal epistemology because classroom instructional activity mirrors epistemic beliefs cognitively espoused by the teacher. Pedagogy is the practice and epistemic beliefs are the theory, the two mirror each other. The theory of personal epistemology is pragmatic.

The concept of epistemic belief is therefore useful in making it explicit that a teachers' personal theory of knowledge is pragmatic in its pedagogical enactment. In this linkage of theory to practice, Dewey heralded the theory of personal epistemology.

The unique professional expertise of a classroom teacher was particularized by Lee Shulman (1987) who coined the term Pedagogical Content Knowledge (PCK). This concept illustrates the essence of a teacher's professionalism. It is the competence in transforming subject matter for learner's comprehension. A teacher differs from domain specific experts in that a teacher must know a subject matter in terms of how to represent it for comprehension of any learner. That is a teacher's professional knowledge lies in integrating subject-matter with a domain specific pedagogy. This means that a teacher knows a subject matter in terms of its teachability. Shulman's concept of pedagogical content knowledge is a novelty as a nomenclature but it reiterates what Dewey already

defended: that a teacher is not a subject expert but an expert in rendering subject matter in terms of experience of the learner.

Hence Dewey was a protagonist of learner centered pedagogy (GoK, 2017b), something he likened to a Copernican shift in astronomy (Dewey, 1990). Dewey argued the learner must be the center around which everything else revolves in education. Education must start with the learner and proceed in terms of how to bring the learner to become a robust bearer of ideals and aspirations of the society. Education is the bridge that links the learner to the society. Education has the two pillars, the psychological and the sociological (Dewey, 1897). Whereas curriculum is selected content from accumulated social capital of society the selection must be tempered by psychological reality of the learner. What to teach (curriculum) must be constrained by how to teach (pedagogy). How to teach is activity based on the concrete contextual particularities of the given learner or class of learner. The pedagogical fallacy of one size fits all is debunked by ontological truth that there exists no learner in general. Each learner is a particular psychological and sociological situated individual. Pedagogical competence is teachers' professional unique expertise of how to psychologize curriculum content in the experience of a concrete individual learner (Dewey, 1990). The psycholozing competency is the pedagogical content knowledge in a given subject matter.

Curriculum is delivered via pedagogy which is based on learners' experience. CBC in Kenya is supposed go hand in hand with pedagogical reform. This new curriculum presupposes a theory of knowledge that shifts from a purely academic or what Dewey termed spectator theory of knowledge. Learners are expected to acquire competences instead of filling their heads with scraps of disjointed bits of information which they

reproduce in examinations. The new curriculum presupposes pedagogy of teaching how to construct and use knowledge in real life situations (Kabita & Li, 2017). This suggests Dewey's theory of knowledge as a resource for social use in solving problems.

1.11 Conceptual Framework

Conceptual framework of this study was based on modification of Littledyke's diagram which illustrates the relation between national ideology, epistemology and pedagogy. Vision 2030 is the national ideology or social philosophy which influenced epistemology and pedagogy of CBC in Kenya. Littledyke (1996) argued that curriculum is derived from the national ideology and that both have logical relation with epistemology and pedagogy. Theory of knowledge (epistemology) of curriculum and pedagogy are intertwined with logical reciprocity.

On the next page is Littledykes (1996, p. 121) diagram illustrating the interplay of ideology, epistemology and pedagogy in the curriculum of science education

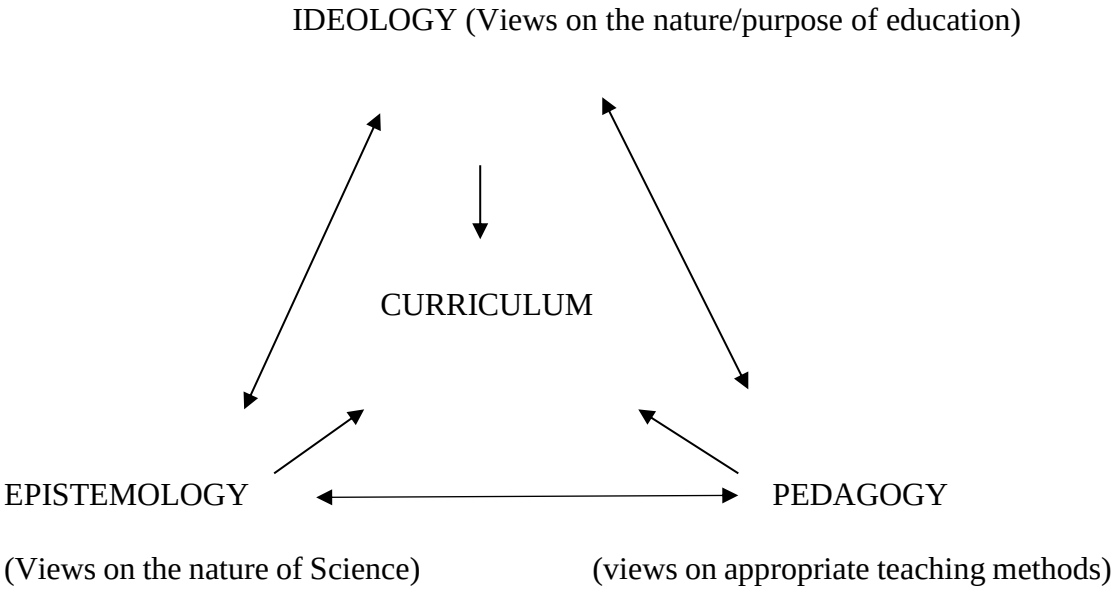

Figure 1: Littledyke's (1996) diagram illustrating the interplay of ideology, epistemology and pedagogy in the curriculum of science education

Epistemology or theory of knowledge of a curriculum has integral pedagogy. The epistemology of curriculum is anchorage of teachers' epistemic beliefs to be enacted in classroom pedagogy.

Teachers' epistemic beliefs mirror conceptualization of the curriculum content. Teacher's classroom pedagogical approaches are intended for learners' interaction with the curriculum. They are the teaching and learning activities employed in the classroom. How teachers facilitate learners' interaction with the content (subject matter) should be evaluated in terms of ideals of the CBC. Pedagogical content knowledge is the teacher's dispositional knowledge of how to facilitate the interplay between CBC content knowledge and the experiences of the particular learner. Teachers' continuous professional development must focus on how to account for every learner's abilities, interests, experience, and challenges in the engagement with the curriculum.

On the next page is diagram illustrating the conceptual framework of this study, it is an adaptation and modification of Littledyke's (1996) diagram.

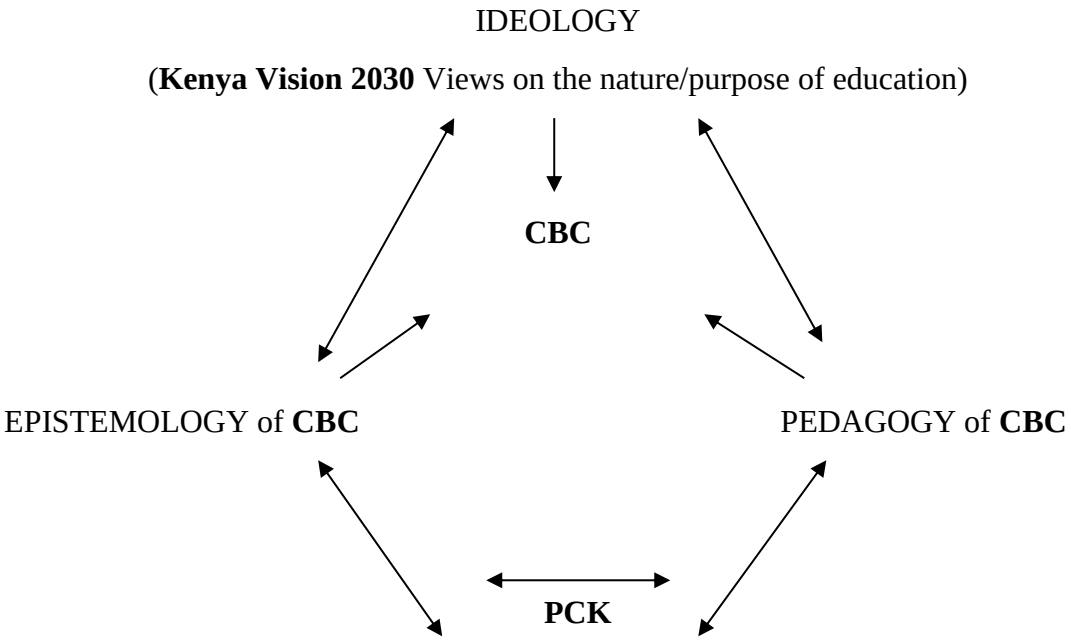

Figure 2: Conceptual diagram on the interplay between ideology of the Kenya Vision 2030, CBC, CBC epistemology and CBC pedagogy, and PCK

Ideology of the Kenya Vision 2030 required CBC as its educational means of achieving KBE. EPISTEMOLOGY of CBC is concomitant with PEDAGOGY of CBC. Teachers' epistemic beliefs are derived from EPISTEMOLOGY of CBC and those teachers' epistemic beliefs are enacted as PCK which integrates EPISTEMOLOGY of CBC and PEDAGOGY of CBC.

Pedagogy acquires broader meaning under the Kenya Vision 2030. It is the normative social vision that guides teachers' epistemic beliefs and classroom instructional methods (Bennaars, 1998). The above diagram illustrates how ideology, curriculum, epistemology, and pedagogy are interrelated in CBC. These four terms account for the *why, what* and *how* of education reform. Ideology of Vision 2030 is the reason why education reform is necessary; it is the rationale or justification of curriculum reform. CBC is the what or content of curricular subject matter. Pedagogy is the *how* to enact CBC. It is the process of how teachers are to strategically approach CBC in learning

activities. Role of classroom teacher is to interpret, transform and translate CBC in the context of learner's experience, perspective, ability and reality of PCI in KBE. Pedagogy is not a mere method of teaching; it includes the wider social vision of the ideology of Vision 2030. Epistemology of CBC is the source from which teachers formulate epistemic beliefs for enactment of the appropriate CBC pedagogy. Personal epistemology is teachers' theoretical understanding of the CBC epistemology. It should correspond with the epistemology of the CBC. Personal epistemology espoused by a teacher is the theory of knowledge that informs how subject matter of teaching is understood from the perspective of trained CBC teacher. It is the theory that organizes teacher's espousal of CBC epistemic beliefs. PCK is the integration of teachers' personal epistemology of the CBC with their enactment in teaching and learning activities responsive to learner's context, abilities, challenges, strengths, interests, talents, and needs in light of PCI emerging from KBE.

1.12 Operation Definition of Terms

CBC Epistemology: theory of knowledge underlying CBC

CBC Pedagogy: pedagogy concomitant in CBC

Competency Based Curriculum: A curriculum that aims to equip learner with dispositions on how to acquire, construct and apply knowledge, skills, attitudes and values in successful completion of tasks and solving problems in real life situations of KBE.

Pedagogical Content Knowledge: Teacher's unique professional expertise of formulating CBC subject matter in response to learners experience, ability, interests, needs, challenges, and context in light of KBE under the Kenya Vision 2030.

Pedagogy: The enactment of epistemic beliefs in classroom teaching of a given subject matter for specific learners under CBC

Teacher: A professionally trained and certified classroom teacher with expertise of integrating pedagogy with specific subject matter under PCK.

Teachers' epistemic beliefs: The principles, theory, perspectives, and ideas that individual teacher's espouse concerning the nature of knowledge, sources of knowledge, and process of knowing and learning derived from epistemology of CBC.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The aim of literature review is to acquaint researchers with relevant background of the area of study, and to name what the field lacks, and to attempt to bridge the knowledge-gap (Gale, 2006). This literature review has the focus on Dewey's theory of pragmatism in pedagogy, teachers' epistemic beliefs in personal epistemology, and pedagogy and pedagogical content knowledge. The literature review was to find out whether studies have analyzed CBC in terms of its theory of knowledge and whether epistemic beliefs of classroom teachers are derived from theory of knowledge of CBC. Lastly, the literature review wanted to establish whether studies have looked at how the concept of pedagogical content knowledge can aid teachers' pedagogical reasoning in enacting epistemic beliefs.

2.2 Dewey's Pragmatism in Pedagogy

CBC is about a constructivist approach to teaching in order to enable learners to create and use knowledge in practical experience of critical thinking and problem solving. Dewey's social constructivist theory is one of the six constructivist learning theories included in Kenya education policy on *Basic Education Curriculum Framework* (GoK, 2017b). Dewey described is learning theory as pragmatic (Dewey, 1931; Dewey, 1916)

Pragmatism was introduced by Charles Sander Peirce and it was advocated for by William James but was applied in education by John Dewey (White, 2002). Dewey labored in the field of education by applying pragmatic philosophy and he merited the appellation 'Educator of Pragmatism' (White, 2002). Rorty (1998) believed that while Peirce remained Kantian, Dewey along with William James were the real pragmatists. Dewey viewed the natural scientist as the moral hero (Dewey, 1948). The reason for

that view was based on the technological civilization and social hope which application of scientific knowledge produced. Dewey wrote in the social hope of consequence of the pragmatic use of scientific experimental logic (Dewey, 1948).

Dewey analyzed theories of knowledge in chapter twenty-five of his magnum opus *Democracy and education; an introduction to the philosophy of education* (Dewey, 1916). Dewey stated that epistemic schools or theories of knowledge sponsor educational methods of teaching. This is the belief that epistemology is intertwined inextricably with pedagogy (Littledyke, 1997). Dewey (1916) integrates empiricism, rationalism and scientific method to advocate for pragmatic theory of knowledge. Dewey's pragmatic theory of knowledge is evident in all of works (Dewey, 1910; 1916; 1931; 1933; 1948, 1990).

Dewey's pragmatism is against neurotic Cartesian preoccupation with certainty. His theory of pragmatism holds that there is no essence of knowledge, morality or truth. Pragmatism is anti-essentialism, a traditional philosophical interest on permanence of reality, knowledge and values. Pragmatism as conceptualized by Dewey rejects the notion of a-historical reason, abstract and speculative consciousness. Reason operates in, with and from practical experience thus Cartesian, Kantian and Hegelian reason are mythical and superfluous (Dewey, 1948)

Dewey's pragmatism makes no distinction between what ought to be and what is the case, it denies metaphysical difference between facts and values, science and morality. The same method of scientific logic of experimentation is reliable in the study of morality and science (Dewey, 1931; 1948). Cimpean (2008) in identifying the concept of experience as basic in Dewey's ontology goes on to assert that 'values originate in experience and are constantly reconstructed by inquiry' (Cimpean, 2008, p. 200).

Pragmatism assumes that 'the pattern of all inquiry' whether in science or morality is 'deliberation concerning the relative attractions of various concrete alternatives' (Rorty, 1998, p. 339). The theory of knowledge of pragmatism rejects metaphors of vision, correspondence, picture theory and representation. Dewey dismissed all these as 'spectator theory of knowledge' (Rorty, 1998, p. 340).

The starting point of understanding pragmatism is in its rejection of Cartesian epistemology. Pragmatism of Dewey rejected the mind–body dualism of Descartes. This led to three characteristics of pragmatism:

i. It developed a functional view of thought, relating cognition to the purposive life of the organism, responding to problems set by its environment.
ii. In rejecting Cartesian certainty, pragmatism proposes a fallibilistic view of knowledge as a provisional scheme of hypotheses, resting upon probable reasoning and pointed toward the future, remaining ever subject to the test of further experience.
iii. While surrendering Cartesian individualism, pragmatists offer in its place a social conception of science as the effort, not of a single inquirer, but of an open-ended community of investigators to learn from experience in a systematic way. The consequences of these anti-Cartesian positions are far-reaching. Once certainty and individualism are surrendered as epistemic ideals and science reinterpreted as the continuous learning effort of an ideal community, stability is to be sought in the intellectual method.

Pedagogical implications of Dewey's pragmatism are that skills and knowledge that teacher-candidates learn should integrate subject matter with instructional practices (Hyslop-Margison & Strobe, 2008). This resonates with education reform in Kenya

influenced by ideology of Kenya's Vision 2030 (GoK, 2007). Teachers using pragmatic constructivist theory of Dewey should design instructional activities that engage students in 'complex and ill-structured problem solving within authentic contexts and in learning by applying concepts and principles to new and challenging situations' (Hyslop-Margison & Strobe, 2008, p. 84). This is because for Dewey (1948) knowledge is justified in its practical use. Learning environment should 'afford the application of different knowledge and dispositions in order to accomplish a particular goal or solve a particular problem' (Cimpean, 2008, p. 84).

Dewey's constructivist theory of knowledge is not about providing social knowledge and cultural tools rather it is about permitting students to pursue independent objectives based on their 'own experiences, interests and concerns.' Dewey's constructivism views the teacher as 'a classroom facilitator whose role is to help students, as autonomous agents, design their own learning experiences in response to personal priorities and objectives' (Cimpean, 2008, p. 82).

Kelly (2013) traces constructivism to 18th century philosopher-scientist Giambattista Vico who regarded knowledge as something created by the human mind; his slogan was 'the human mind can only know what the human mind has made.' Dewey's constructionism is from a pragmatic viewpoint which is influenced by experimental logic of methods of science. Dewey (1916) believed that 'there is no such a thing as genuine knowledge and fruitful understanding except as the offspring of doing.' For Dewey (1916) knowing is inseparable from doing thus he rejected intellectual knowledge which 'isolate intellect from activity.' Men have to do something when they wish to find out something. Labor becomes intellectually fruitful in the laboratory method of experimentation. Labor becomes 'intellectually fruitful and not merely

externally productive.' Thus Dewey's constructionism is not purely mental – 'just inside the head' it is rather a conjoint activity of 'doing and knowing.'

2.3 General Pedagogy in the 21st Century

The Sessional Paper no 14 of 2012 is a policy document that highlights pedagogical challenges towards CBC in Kenya. It is observed in this policy that teacher education in Kenya has 'not kept pace with developments that have occurred throughout most developed countries' (GoK, 2012, article, 9.7). Such developments include pedagogical studies.

Bennaars (1998) lamented that the term pedagogy is not 'part of the teacher's vocabulary in most parts of Africa' (Bennars, 1998, p. 2). Pedagogy is equivocated with teaching methodology used in a given subject in the classroom. Bennaars (1998) advocated for a broader concept of pedagogy. Bennaars (1998) described pedagogy as 'a theoretical position, a normative stance or a social vision of teaching' (Bennaars, 1998, p. 2). 'Pedagogy is a more complex and extensive term than 'teaching' it is vision of teaching (Bennaars, 1998, p. 4). To propose some pedagogy is to propose a political *vision*. In this perspective, we cannot talk about teaching practice without talking about politics' (Bennaars, 1998, p. 6). Bennars (1998) cautioned that 'there will inevitably be *the struggle for Pedagogies*.' He further argued that: 'Given the various theoretical, including political positions, and the numerous social visions, there are bound to be a number of conflicting pedagogies, each of which will seek to struggle for recognition or acceptance' (Bennaars, 1998, p. 6). For Bennaars (1998) pedagogy includes normative social vision (Bennars, 1998, p. v). Pedagogy comprises both educator's sense of direction and the corresponding curriculum.

Concept of 'struggle of pedagogy' guided this study to recognize that the research for CBC is a struggle. The pedagogical conclusion of this study is a social vision for it will be developed from the analysis of the Kenya government policy on CBC and the Kenya Vision 2030. The chief policy is the Kenya Vision 2030 from which CBC education policies arose. It would be pedagogy responsive to Kenyan education reform and will include not merely pedagogic skills but will carry *'a vision of teaching'* CBC. Like Bennaars (1998) cautioned pedagogical proposal is not easily accepted but it must undergo struggle for acceptance. We agree with Bennaars (1998) that teaching without pedagogical social vision is to engage in 'a mechanical exercise, a task of operant conditioning, or the equivalent thereof.' However, teaching inspired by a pedagogical vision is transformed into a meaningful endeavor of transforming subject matter into learner's experiences and social context.

This study endeavors to propose pedagogy for CBC anchored on the social vision of the Kenya Vision 2030.

Freire in his seminal work *pedagogy of the oppressed* (1970) has influenced discourse on pedagogy. Freire viewed knowledge as continually created and recreated as people reflect on the world. Knowledge is not fixed permanently in abstract properties of objects (Williams, 2013, p. 37). Rather knowledge is a process where gaining of existing knowledge and producing new knowledge are 'two moments in the same cycle.' Freire's theory corroborates Dewey's theory of experiential learning (Dewey, 1938). In his new theory of experience Dewey defined education as continuous reconstruction of experience that increases capacity for intelligent handling of subsequent experience (Dewey, 1916; 1938). Both Freire and Dewey underscore constructivist learning theory which accords with CBC in Kenya.

Pina (2013) re-examined critical pedagogy in terms of how it can be inclusive and transformative for the student. Critical pedagogy is teaching for critical consciousness it challenges both students and teachers to engage in a joint re-envision of the surrounding world and how it informs them. Teachers and students under critical pedagogy work together in an attempt to uncover and 'interrogate the hidden narratives that shape their lives and perspectives' (Pina, 2013, p. 1). Such 'hidden narratives' in this study are called unexamined teachers' epistemic beliefs. Pina (2013) contrasts critical pedagogy with passive transfer of dogmatic knowledge from the expert teacher to the receptacle-student. Critical pedagogy involves learners as agents who are active participants in learning so that they transform themselves and the world. Students criticize both the external world as well as interior self-examination of their own beliefs. Critical pedagogy aims at two-fold transformation namely of the world and of individuals. Teachers' epistemic beliefs are mental thoughts about knowledge and knowing often implicitly espoused they require explicit critical examination.

Pragmatic pedagogy agrees with critical pedagogy in that both thinking begins with experience of problems in the society and both reject objectifying students as passive recipients of knowledge. Both reject learning for its own sake. In both critical pedagogy and pragmatic pedagogy, knowledge is constructed by learners in co-joint endeavor as means to bring moral change in the society. This requires CBC competency in communication and collaboration in the context of learning how to learn continuously.

Fullan & Langworth (2014) advocated for a new pedagogy in the 21st century to meet two global challenges namely of school systems learning from each other, and of teachers learning quickly from their peers across the globe. These are the huge pedagogical potential benefits of globalization which could accelerate improvements in education outcomes. The learning outcome would transcend the traditional expectations

like literacy and numeracy to include outcomes such as problem-solving, collaboration, creativity, thinking in different ways, and building effective relationships and teams. These outcomes are similar to education outcomes expected in Kenya policy on CBC in article 1.3 of Sessional Paper 14 of 2012 (GoK, 2012).

Tabulawa (2013) criticized the contemporary pedagogical reforms in sub-Saharan Africa as driven by economic and political rationales imposed by Western interests to 'globalise a liberal democratic ethos' (Tabulawa, 2013, p. 17). This unstated rationale for the 'constructivist learner-centred pedagogy might in fact be contributing to the failure of pedagogical reform in sub-Saharan Africa.' This foreign rationale promotes a technical view of teaching abstracted from existential realities of educational context in Africa. That learner-centered pedagogy as purported improves students' performance is an assumption that is unexamined. This is because student performance is relative. For instance, in Sub-Saharan Africa it refers to 'student performance in tests and examinations' (Tabulawa, 2013, p. 18). Tabulawa (2013) cautions that pedagogical innovations 'whose utility in this regard is not obvious to teachers and students are unlikely to be embraced. In the educational context of Sub-Saharan Africa teachers and students 'are most likely to evaluate the utility value of a pedagogical innovation in terms of whether it is likely to enhance students' performance in tests and examinations, not in terms of whether it is likely to produce students with the character traits preferred for contemporary political life and the economy' (Tabulawa, 2013, p. 18).

The criticism of learner centered pedagogy as Western imposition on Africa is untenable in this study because pedagogy of CBC is investigated from epistemology of CBC which is a curriculum designed after a study by KICD (KICD, 2018; GoK, 2016). CBC and its pedagogy are afrocentric not Eurocentric (Gok, 1998).

Tabulawa's criticism of foreign pedagogical reforms in Sub-Saharan Africa is not wholly unfounded. For instance, the reforms in Kenya education under Sessional Paper no 14 of 2012 (GoK, 2012, article, 1.3) have a striking resemblance to a passage in the World Bank (1999). The Sessional Paper article 1.3 states that the Ideology of the Kenya Vision 2030 places great emphasis on the development of a middle-income country in which all citizens will have embraced the following (GoK, 2012, article, 1.3):

> entrepreneurship, be able to engage in lifelong learning, perform more non-routine tasks, be capable of more complex problem-solving, be able to take more decisions, understand more about what they are working on, require less supervision, assume more responsibility and as vital tools towards these ends, have better reading, quantitative reasoning and expository skills.

According to Tabulawa (2013) the World Bank (1999) report stated that Tomorrow's workers will need to be able:

> to engage in lifelong education, learn new things quickly, perform more non-routine tasks and more complex problem-solving, take more decisions, understand more about what they are working on, require less supervision, assume more responsibility, and – as vital tools to these ends – have better reading, quantitative, reasoning, and expository skills

Similar ideas are captured by (Darling-Hammond, 1992, p.3) who wrote that

> There is little room in today's society for those who cannot manage complexity, find and use resources, and continually learn new technologies, approaches, and occupations. In contrast to low-skilled work on assembly lines, which was designed from above and implemented with routine procedures from below, tomorrow's work sites will require employees to frame problems, design their own tasks, plan, construct, evaluate outcomes, and cooperate in finding novel solutions to problems (Drucker, 1986). Increasing social complexity also demands citizens who can understand and evaluate multidimensional problems and alternatives and who can manage ever more demanding social systems.

Tabulawa (2013) opines that contrary to propagation of paedocentricism or learner-centered pedagogy as educationally effective it is in reality not successful in African context. This pedagogy is more ideological than educational. It is 'a view about the world, about the kind of people and society (they) want to create through education. However, this political/ideological nature of the pedagogy is often not recognized because it is often presented as if it were value-free and merely technical. Tabulawa's criticism of this Western pedagogical hegemony goes on to explain that the 'ideology of technical rationality' of this pedagogy disguises it as 'value neutrality.' This is in order to present a global 'one-size-fits-all pedagogical approach that works with equal effectiveness irrespective of context' (Tabulawa, 2013, p. 22).

This could explain why Sessional Paper no 14 of 2012 verbatim reproduces the wording of World Bank strategy as cited above. The West via its supranational aid agencies want to spread through learner-centered education character traits or attributes such as 'creativity, versatility, innovativeness, critical thinking, problem solving, tolerance of divergent views and independence of thought.' Tabulawa (2013) is emphatic that constructivist and learner-centered approaches are seen as the appropriate approaches to deliver these character traits. For instance, quality teaching is defined as teaching that adopts constructivist approaches that privilege active, inquiry-based learning and student-centered teaching.

The association of these attributes with learner-centered pedagogy gained ascendance after 1989 the fall of Berlin wall. All these are 'habits of thought' 'in line with the individualistic Western culture and are deemed necessary for an individual to survive in a pluralistic, liberal democratic, capitalist society. Thus learner-centeredness is associated with capitalistic rugged individualism as educational means to spread Westernization as a global phenomenon in the periphery states that need foreign aid

from Western metropolitans. Education is political and moral tools used as ‘core states’ to propagate their ideology in ‘periphery states’ via education aids as ‘intellectual socialization’ (Tabulawa, 2013, p. 24).

The authoritarian climate of classrooms of Third World schools is seen as antithetical to development of liberal democracy. Thus learner-centered is offered as a better pedagogical alternative. It is portrayed as more democratic than authoritarian teacher-centered pedagogy. Tabulawa (2013) cited Ginsburg (1992) to assert that logically pedagogical choice is a political instrument after all because education is a political activity. To make curricular choices, such as adopting a particular pedagogy, is to engage in a political activity. This idea was underscored by Bennaars (1998). The way teachers organize their classrooms and the way they relate to and interact with their students is a form of political engagement in power relations.

The shift from knowledge reproduction to knowledge production is exemplified by Tabulawa (2012) in the argument that during industrial age the workers were ‘hired from the neck down’ meaning they were not supposed to ‘demonstrate initiative, innovativeness and creativity.’ They were to follow directions in a hierarchically organized work environment. Decisions were centralized and there was a clear ‘dichotomy between conception and execution.’ These forms of production are being challenged in the ‘new’ economy which requires employees who can ‘think creatively, adapt flexibly to the new demands, identify as well as solve problems, and create more complex products in collaboration with others. This paradigm shift in the ‘new’ kind of worker has major implications for the nature of schools and schooling, as well as for the society.

It is the task of education to deliver this kind of learner/worker who has ability to solve problems, think critically and apply new skills and techniques to different situations (Tabulawa, 2013). For this reason, there are specifically targeted areas of reform in education. To that end 'constructivist, learner-centered pedagogy has emerged as the preferred pedagogy for the production of the self-programmed learner/worker. Tabulawa (2013) is instrumental in explaining why Kenya Vision 2030 is being 'globally competitive and prosperous nation.' He writes that the 'dominant view is that only nations with education systems that are attuned to the changed patterns of production are the ones that are mostly likely to survive in a global marketplace characterized by hyper-competition' (p. 36). For this reason, 'nations all over the world are restructuring their education systems in an effort to improve their economic competitiveness.' Global competitiveness means that 'economies require a well-qualified population and that they require workers with flexible, generic and constantly up-gradable skills that are self-programmable workers' (Tabulawa, 2013, p.35).

Tabulawa (2013) relates new learner/worker with knowledge-economy in that due to the rapid changes in the world of work. Technological changes have led to unpredictability, uncertainty and constant change in the labor market, skills can no-longer be fixed for a particular job. This suggests that knowledge stability in the 21st century is illusory. William (2013) pointed out that epistemic beliefs may be analyzed in terms of perception of stability of knowledge. Knowledge is evolving in perpetual flux, a situation captured by Dewey's view that 'knowledge is no longer an immobile solid; it has been liquefied. It is actively moving in all the currents of the society (Dewey, 1990, p. 25). The best workers, 'like the best learners are those whose understanding transcends situationally gained skills' (Tabulawa, 2013, p. 35). Knowledge has become ephemeral and due to this 'constant state of flux workers are

forever learning.' In which case the traditional one-off training is no longer adequate instead, lifelong learning has gained currency.

Nsamenang and Tchombe (2016) criticized formal education in Africa for alienating learners in its Western bias in curriculum and pedagogy. To address this problem education in Africa must tap into African indigenous cultural heritage to derive culturally influenced learning styles and culturally appropriate instructional processes. This may include use of African roles of parents, siblings, the peer group, grandparents and elders. The concept of peer group resonates with peeragogy. African indigenous pedagogy is credited with participative learning. Children are regarded as social partners in educational processes. African education is portrayed as based on problem-solving and use of social relationships to influence cognitive performance. In general, the proposal is for Generative Curriculum Model whose main thrust is to incorporate 'local knowledge into pedagogic processes.' This generative model of curriculum is a perspective that views 'teaching and learning' from a perspective which 'respects the fact that each student comes to school with varied interests, skills and knowledge of the world' (Nsamenang and Tchombe, 2016, p. 14). Within this 'generative curriculum' students are expected to consult with holders of indigenous knowledge in their communities, and bring that information into the school curriculum. This model shifts away from search for a universal educational approach to celebration of diversity in educational ideas and practices.

Transformational education in Africa taps into local knowledge and practice. The aim is to tap into usable local knowledge and techniques. The learning process is supposed to organize contents around 'significant themes and questions that set the students into a deep inquiry and discovery mode.' The generative curriculum positions teaching as 'both a science and an art' which takes into account 'the importance of the relationships

and sense of community that should be cultivated between teachers, students, parents, and the family, such that they become a community of learners, par excellence.

The generative model integrates both curriculum and pedagogy. Its pedagogical side is termed ‘generative inquiry’ based on ‘underlying belief in children as learners whose natural curiosity leads them to explore their world in a meaningful way.’ The pedagogy of generative curriculum is derived from indigenous African pedagogies which organize learning in a participatory process through “hands-on” and “work-play” activities, with little to no explicit didactic support. The assumption in generative pedagogy is that children’s innate capacity predisposes them as agents of their own learning. It is based on the belief that children can both learn and share their knowledge in multiple ways and that everyone has areas of strength that educational effort can capitalize.

Both teachers and students are viewed as learners. Teachers develop a broad repertoire of teaching strategies that enable children to approach learning in different ways. There is a continuous interplay between content learning and process learning. The two components enhance each other for instance learners apply the processes of reading, writing, speaking, listening, art, music, drama, and mathematics to gain meaning and understanding from the content areas of social studies and science, with children’s Literature playing an important part in linking these processes and content. In this way, content is learned through process and process through content.

The generative pedagogy begins from interest of learners which ‘remain at the center of teaching and learning.’ In the pursuit of interests of learners ‘new knowledge is generated and new curricular content is created collaboratively.’ In that case ‘learning becomes dynamic, as one avenue of interest leads to another. As themes and topics are

initiated and actively pursued, connections and relationships are made. Working with contents in this way allows for authentic learning and provides teachers with opportunities to be learners, too. Teachers become learners who teach and the learners become knowledge generators with teachers as facilitators. Generative curriculum fosters not only lifelong learning but also lifetime generation of knowledge. Generative models expect teaching-learning transactions to proceed in ways that renew knowledge in shared processes. It provides rich opportunities for inquiry-based learning. The learner takes ownership by pursuing their interests and in so doing discover and develop their potentials, passions and talents.

Learners are lifelong and deep learners, and critical thinkers, they are able to make significant contributions whose meaningfulness they can demonstrate in their eco-cultures that are part of a complex and changing world.

Neel (2008) argued for the integration of Western epistemology with local epistemology of the Haida community in the area of pedagogy of mathematics. This was in an attempt to improve mathematics of aboriginal communities which use alien constructs without incorporating mathematical concepts within the cultural experience of the people. This is captured by Vygotsky's concept of the zone of proximal development which describes 'the teachable range between the student's current knowledge and the knowledge that the student is expected to acquire' (Neel, 2008, p.27). Teachers may not assume that students are tabula rasa rather students already have 'knowledge' which has to be reconstructed as the basis of engaging with the new experience. Teachers are supposed to consciously reflect on their epistemic beliefs and their influence on their pedagogical approaches. This is the essence of pedagogical content knowledge which makes content knowledge integral with pedagogy in response to the learners' context.

The notions of epistemic belief and pedagogical content knowledge are not present in the study by Neel (2008). But the belief that teaching should exploit local epistemology to influence pedagogy for improvement of performance of students is in line with the impulse of the basic premise of personal epistemology, namely, that teacher's epistemic beliefs are enacted in classroom pedagogical approaches.

Neel (2008) summarized Dewey's pedagogical theory as integrating two poles, namely, psychology and sociology. Psychological pole of education recognizes that a child is born with natural instincts, natural capacities, desires and needs. Sociological pole is what society wants the child to achieve in activities of reading, writing, or practical skills. The two poles according to Dewey require balancing otherwise the process is not worthy of the title education (Dewey, 1916). The mismatch between the two polarities constitutes mis-educative experience (Dewey, 1938). Education is a social process and knowledge is constructed in the context of community or social life (Dewey, 1916).

Neel (2008) contrasts traditional indigenous epistemology with modern Western epistemology. The former seeks for integration with all life forms, spiritual, natural, and human domain. But modern epistemology promotes rationalist and dualistic knowledge production that analyzes and objectifies in a linear form.

Neel (2008) coins the term ethno-mathematics which he regards as 'the pedagogy of understanding content knowledge within a cultural context' (Neel, 2008, p.42). Ethno-mathematics identifies 'the diverse ways in which cultural groups quantify, compare, classify, measure, and explain day-to-day phenomena in their own environment.' Ethno-mathematics unlike school mathematics is 'both context-relevant and problem-specific thus provides the necessary linkages between the everyday cultural practices of mathematics and the teaching of school mathematics.' Ethno-mathematics is a

framework to deconstruct how Eurocentric or western discourse has impeded others to see and represent reality. Ethno-mathematics has three elements: culture and context, pedagogy and content knowledge (Neel, 2008, p.23). Ethno-mathematics is how to connect school mathematics to cultural practices. This ethno-mathematics concept is a salient feature of the essence of pedagogical content knowledge.

Knight (2016) studied how learning analytics is related to epistemology, pedagogy and assessment. Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environment in which they occur. Knight (2016) explains the fundamental relevance of epistemology in education. For instance, he poses: 'How do we, as educators, researchers, and assessors, know when a student knows something? Understanding what it means to 'know' something, and what that knowledge is, how it manifests itself, its structure, its warrant or justification-all these are epistemological concerns. 'It is uncontroversial and pre-philosophically accepted that education aims at the imparting of knowledge. Students are educated in part so that they may know things' (Knight, 2016, p. 8). Dewey's perspicuity revealed that philosophical problems arise from the fundamental assumptions in social practices including education (Dewey, 1916). Philosophical questions are about what is taken for granted akin to the above epistemological questions raised by Knight (2016).

Karimi (2014) carried out a study to find out the levels and types of didactic competencies among teaching staff in universities in Kenya. The study sampled university teaching staff from three public universities in Kenya (Nairobi, K.U and JKUAT). The study focused on three competency areas curriculum, pedagogy and quality assurance. Her findings revealed that pedagogical attributes were highly regarded as compared to curriculum development. She observed that education has

experienced a pedagogical shift in the 21st century precisely from teacher-centered to student-centered. This observation to what Otieno (2015) observed in Kenya. In addition, constructivism has gained ascendance which focuses on meaningfulness of learning for the learner. Constructivism requires learners to incorporate new understanding and knowledge into old understanding and knowledge (Karimi, 2014). Dewey referred to this as reconstruction of experience by enlarging it with new experience in continuous learning. Karimi identifies changes in 21st pedagogy including consideration of the context of practice and redefinition of the role for both teachers and students. Karimi (2014) highlights the idea on 'context of practice' which is an element emphasized in the policy on (NESSP) National Education Sector Plan (GoK, 2015). NESSP requires teachers to attain 'knowledge and contextual understanding of teaching subjects.' The point by Karimi (2014) on redefining roles of teachers and students is consistent with Fullan and Langworth (2014) in elaborating on collaborative learning between teachers and students. It engenders deep learning as a distinctive attribute of new pedagogies of the 21st century. Karimi states that the role of teachers has shifted to that of creating support to the student in their learning process. Learning environment is oriented towards deep learning approaches.

Williams (2013) states that teachers are often engaged in mulling over the value of transmitting knowledge and covering material superficially as opposed to engaging in in-depth inquiry in a few topics. Williams (2013) cited Lyon (1990) who illustrated how a teacher joins the students in encountering and interpreting experience in a co-joint activity of constructing meaning and potentially new knowledge. This approach requires a teacher to examine her beliefs about knowledge, her discipline and how she assesses students.

Karimi (2014) asserts that ‘many universities have shifted from passive learning, which relates to surface learning approaches, to active, engaging students in deep approaches to learning.’ It is not clear whether universities in Kenya have made this shift since the studies cited by Karimi are non Kenyan. The said shift is characterized in independent, creative and critical thinking learners. The learning outcomes are dependent on students’ effort and activities which they direct and are responsible for.

According to Karimi (2014) universities in Kenya require teaching staff to research, publish, attend conferences and take up ad-hoc duties while neglecting the need for training in pedagogy. The importance of teaching competencies among teachers is often downplayed as compared to that of research competencies in Kenya. There is skewed training in subject area and research skills to the neglect of competencies in teaching (Karimi 2014). This observation is witness to deficiency in pedagogical content knowledge in Kenya university teaching. Teachers spend most time teaching yet they are expected to develop their teaching competencies on their own or through older teaching staff.

Karimi (2014) provides steps of didactic teaching, pedagogy as methodology of teaching namely ‘plan-do-check cycle.’ Design what to teach, teach it and reflect on what was done. These are the three stages of didactic competencies. Without referring to pedagogical content knowledge Karimi cited Shulman to assert that curriculum is prior to pedagogy. Pedagogy ‘relates to content delivery.’ The attributes of pedagogy as the doing competencies in the classroom includes ‘classroom management, assessment, context, environment, nature of discipline and socioculturalism.’ Karimi (2014) asserted Kenya should ‘recognize pedagogical knowledge as a significant qualification to the teaching profession’ (Karimi, 2014, p. 30). Karimi (2014) fails to clarify the difference between pedagogical knowledge and pedagogical content

knowledge. Karimi (2014) observed that little is known of the attention given to didactic competencies among teaching staff of universities in Kenya. Her study focused on finding the types and needs of didactic competencies among university teaching staff in Kenya.

The pedagogical shift that Karimi (2014) pointed out towards learner-centeredness is consistent with CBC but she fails to make that observation. She fails to relate her study to education reforms in Kenya under Vision 2030 and Sessional Paper no 14 of 2012.

Mwangi (2015) did a descriptive study on factors influencing students' achievements at Kirinyaga technical university. One of the research objectives was on the extent to which pedagogy influences students' achievements in technical education programs. Pedagogy in that study is defined as the 'art of teaching which encompasses all to do with classroom, teaching and management' (Mwangi, 2015, p. 5). Mwangi (2015) cited Kiio (2010) to assert that in Kenya teachers rely more on expository methods rather than heuristic methods. In citing Mwai (2007) Mwangi (2015) stated that teaching methods impact on the students' ability to comprehend ideas presented. However, Mwangi (2015) does not seem to identify any specific pedagogical theory. Mwangi cites Adikinyi (2007) to among other things assert that time is a factor that influences whether a learner -centered method is employed. The study recommended the use of a variety of pedagogy like discussion, demonstrations and the curious term 'automated approaches' to capture the attention of each student. The study by Mwangi (2015) is on students undertaking technical studies; she has no pedagogical theory nor are beliefs of students analyzed whether of intelligence like what Otieno (2015) did or teachers' epistemic beliefs in this study. Mwangi's study reveals a knowledge gap where studies in Kenya on learners' achievement are yet to use the theoretical framework of personal epistemology which looks at epistemic beliefs of teachers.

Koulaidis (1987) researched on Philosophy of science in relation to curricular and pedagogical issues: a study of science teachers' opinions and their implications. He asserted that on the basis of analysis of his data findings a tentative conclusion is that there are two relatively autonomous regions of 'educational theory' as held by teachers, namely, epistemological and pedagogical views on one hand, and on the other ontological and curricular views. His study focused on science teachers' beliefs 'about issues concerning the philosophical-epistemological basis of science teaching and its relation to certain curricular and pedagogical issues' (Koulaidis, 1987, p. 13). Koulaidis (1987) distinguishes between content as 'what' is taught and pedagogy as 'how' the content is taught. This distinction is also found in the conceptual framework of this study which adopted Littledyke's theory (1996).

In line with personal epistemology but without making any allusions to it Koulaidis (1987) cited Robinson (1969) to argue that teachers' 'conception of the "nature of science" is an important force in shaping classroom behavior.' The term 'conceptions of" is akin to epistemic belief of a teacher. The nature of science is domain specific or 'knowledge content.' In other words, teachers' epistemic belief on nature of science shapes classroom behavior.

The following illustration demonstrates the philosophical-epistemological analysis of science-teaching: To the question 'what is a gene?' Does the teacher's explanation reflect the construct 'gene' or does his language reify the construct and make it into an entity? Is gene given instrumental or existential status? (Koulaidis, 1987, p. 14). Koulaidis (1987) credits Robinson for pioneering philosophical-epistemological considerations in science teaching. However, it is Scheffler (1973) that Koulaidis believes that arguments were strongest. For Scheffler (1973) the educator plays the role of transmitting or perpetuating what is available in a given tradition but educator is in

a position not only of ‘constantly representing and advancing specialized exemplifications of thought, but also of explaining and interpreting such exemplifications to the novice.’ Koulaidis (1987) commented that it is ‘in this transitional role that philosophy of science is of primary importance’ (Koulaidis, 1987, p. 15).

Koulaisdis (1987) in the above citation reiterates the essence of the concept of pedagogical content knowledge in terms of what a teacher should do in teaching-learning activities. Teachers should move from where the ‘novice’ or student is so that using that as a point of reference constantly represents, explains and interprets specialized thoughts of experts. In other words, a teacher should not approach content from experts’ perspective but must ‘constantly’ be in a position to relate it to students’ circumstances. In other words, pedagogy is always local.

In using various instruments to collect teachers’ opinion about science Koulaidis (1987) compares them to a number of philosophical stances however no one stance is considered as ‘correct.’ He explains that in identifying teachers’ positions it is necessary to withhold judgment about their validity. This is the nature of descriptive study as used in personal epistemology where administration of epistemological questionnaires is the rule. Koulaidis (1987) argued that in curricular innovations designers and developers of curriculum should know the dispositions of teachers because the experts at the center of curricular innovations fail in ‘some occasions to take into account teachers’ views. Koulaidis (1987) opines that ‘an instrument capable of recording aspects of teachers’ views could be of help in removing this sort of tension.’ This suggestion is useful in Kenya particularly where the instrument of EBQ is not known nor used in eliciting teachers’ epistemic beliefs particularly in times of piloting or implementing new curriculum.

Koulaidis (1987) views instruction in the classroom as theory about 'the most effective way of achieving knowledge or skills' (Koulaidis, 1987, p. 36). This definition he believes has a 'normative-prescriptive' character. This is contrasted with learning theories which are descriptive and explanatory rather than prescriptive. The preoccupation of instruction as how one wishes to teach can best be learned. This is of immediate relevance to classroom teachers; it is practice-oriented. Koulaidis (1987) cites Barnes to identify four dimensions of theory of learning:

i. Predispositions
ii. The way knowledge is presented to the learners
iii. The sequence of knowledge
iv. Pacing of rewards and punishments in the process of learning and teaching.

Koulaidis (1987) defines classroom activities as 'those elements of classroom interaction systems which are instrumental in transmission-interpretation of knowledge' (Koulaidis, 1987, p.39).

Koulaidis (1987) contrasts two types of teacher namely, the transmissive and the interpretational teacher. The former believes knowledge exists in the form of public disciplines. Other traits of transmission include that a teacher values the performance of pupils in terms of criteria laid down within the discipline, perceives teacher's task to be evaluation of learners' performance and perceives learner as an uninformed acolyte for whom, access to knowledge will be difficult. These are characterizations of the teacher of the positivist pedagogy (Kelly, 2012). Transmissive teachers believe that teaching is about presenting clear explanations to which pupils should carefully attend, instead of investigating problems of their own. The emphasis on reconstruction of scientific knowledge within a carefully guided path suggests that the teachers lean

towards the transmission model. It appears that transmission teachers teach from the perspective of the experts since he views students as an acolyte for whom access to knowledge will be difficult. Kouladis (1987) is unaware of Shulman's pedagogical content knowledge particularly because his study was in 1987 while Shulman's theory came up in 1986.

Interpretation teacher believes that knowledge exists in the knower's ability to organize thought and action. It considers both teacher and learner as the source of the criteria of performance. It stresses that the teacher's task is to set up a dialogue through which the learner can reshape knowledge. This is akin to Dewey's notion of reconstructing experience (Dewey, 1916). Koulaidis (1987) elaborates that if a teacher believes that the pupils' investigations and active discussions are of primary importance such a teacher is interpretational. The term 'teachers think the pupil', shows that teaching is a thinking practice. The two approaches on teachers' activities are 'in relation to the way knowledge is conceived' however they also contrast between teacher and pupil-centered. The instructional activities of classroom teachers are viewed by Koulaidis (1987) in terms of 'the way knowledge is conceived' which is an epistemic view of content knowledge. Inadvertently Koulaidis (1987) seems to corroborate the theory of personal epistemology that epistemic beliefs influence teacher classroom instructional activities.

Williams (2013) research raised the question: What patterns can be seen in undergraduate pre-service teachers' epistemological and pedagogical development while tutoring in a university-based reading setting. Another question was: How does intervention affect the instructional literacy practices of undergraduate pre-service teachers as they experience epistemological growth? This study seemed to assume that undergraduate pre-service students experience development in both epistemological

and pedagogical development particularly under interventions by the university lecturers. The study collected data by interviews and observations. The data was analyzed based on Shulman's (1987) model of pedagogical reasoning and action. The study revealed changes in the initial ideas about literacy instruction, guided questioning helped pre-service students develop and grow epistemologically and pedagogically. She recommends that teacher education programs train pre-service teachers so that as novice teachers they may enter classrooms prepared to teach reading.

2.4 Pedagogical Content Knowledge

Cochran (1991) stated that 'early history' of teacher education was 'primarily focused on teacher's knowledge of subject matter content' (Cochran, 1991, p.4) as separate from general pedagogical methods. However, recent studies have made it clear that 'both teacher's pedagogical knowledge and teachers' subject matter knowledge are crucial to good teaching and student understanding' (Cochran, 1991, p. 4). This separation of subject matter and pedagogy is evident in policy documents on teacher education in Kenya for instance in Sessional Paper No. 14 of 2012 (GoK, 2012).

According to Shulman (1986, 1987) teacher's expertise should be 'described and evaluated in terms of pedagogical content knowledge.' Pedagogical content knowledge is a new concept which 'represents a new, broader perspective in our understanding of teaching and learning.' (Cochran, 1991, p. 5). PCK is 'a type of knowledge unique to teachers' and it is the essence of teaching. It is about the manner in which teachers 'relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge (what they know about what they teach), in the school context, for teaching of specific students.'

It is knowledge of how to integrate or synthesis pedagogical knowledge with subject matter. It is teachers' expertise on how to represent topics in the subject area in 'the most useful forms' of examples, explanations and demonstrations. Including use of analogies, metaphors in a word it is the manner of 'representing and formulating the subject that makes it comprehensible to others' (Cochran, 1991, p. 5). Teacher may have mastery of subject content but that is not sufficient for him/her to make it comprehensible to others in their situatedness. Teachers with pedagogical content knowledge should anticipate learners' difficulties by understanding what makes the learning of specific concepts easy or difficult. She should be aware of her learners' preconception and misconceptions which individual and diverse students bring with them in the learning activity.

Khakasa (2009) used Shulman's (1987) question to focus on the problem of teachers' pedagogical content knowledge for teaching in Kenya: 'How does the successful college student transform his/her expertise in the subject matter into a form that high school students can comprehend? … How does learning for teaching occur?' Khakasa (2009) suggests that 'poor performance of students may be a reflection of inappropriate teacher's knowledge for teaching.' For instance, teaching mathematics requires more than the ability to do mathematics in the school curriculum. That is teaching mathematics is not just 'standing at the board and solving mathematics questions in front of students, it entails additional mathematical knowledge competencies and skills to engage students in the art of problem solving' (Khakasa, 2009, p. 57). Khakasa (2009) corroborates Dewey's idea that a teacher's expertise in subject matter is different from that of a subject expert or specialist.

Khakasa (2009) observed that pre-service teachers take the same course as other mathematics major students and the focus is on mastery of subject matter content.

However, Khakasa (2009) elaborates that pre-service teachers require ‘additional knowledge for teaching mathematics.’ This means that ‘knowing mathematics for teaching is more than just knowing mathematics’ (Khakasa, 2009, p. 54). More emphatic was Shulman (1987) who declared that ‘fluency in content knowledge is necessary but not sufficient for the knowledge of teaching’ (Khakasa, 2009, p. 257). Khakasa (2009) concludes that teachers need the ability to transform subject matter content in a form that is comprehensible to learners. This requires three things: deep knowledge of content, knowledge of students and teacher’s flexibility. Khakasa (2009) recommends that pre-service training be redesigned to include exposure of the mathematics content that they are being prepared to teach. This is because advanced mathematical knowledge taught to pre-service teachers had no link or direct application to the mathematics curriculum of secondary school they are expected to teach (Khakasa, 2009, p. 224).

Khakasa (2009) is the most accomplished Kenyan scholar in using the concept of pedagogical content knowledge particularly in the domain of teaching mathematics. She demonstrates how pedagogical content knowledge is relevant in pre-service training of mathematics teachers. Interestingly she relates teachers’ beliefs and their influence on instructional behavior. Similar to this study Khakasa (2009) holds that classroom instruction is driven by beliefs held by the teacher. Teachers’ beliefs about subject-matter and about teaching and learning influence their instructional practice (Khakasa, 2009, p. 48). Beliefs are described as ‘internalized concepts based on the given information’ (Khakasa, 2009, p. 49). Unexamined beliefs leave teachers under influence of ‘primitive beliefs to guide them through instruction. ‘It is therefore important to understand teachers’ existing beliefs. This is because students’ attitude reflects the teacher's attitude which in turn is manifestation of the teacher's belief about

teaching. However mere knowledge of a teacher's belief does explain how they can be influenced through ‘a focused education program’ (Khakasa, 2009, p. 50). This is the gap that the study done by Khakasa (2009) sought to address. Her study was predicated on the assumption that appropriate information about pedagogical content knowledge could change teachers’ beliefs on teaching and learning of mathematics. However, Khakasa (2009) fails to demonstrate in-depth awareness of study in the area of personal epistemology. She does not include the use of an epistemological belief questionnaire as an instrument to elicit and discover beliefs held by teachers. Neither does she use the concept ‘epistemic belief.’ However, she believes that knowledge of pedagogical content can influence teachers to change their beliefs about teaching and learning of mathematics. This study assumes that epistemic beliefs should be derived from an explicit theory of knowledge of curriculum. That teacher’s epistemic beliefs are enacted in instructional behavior. This study analyzes the concept of pedagogical content knowledge in terms of how it could guide teachers’ enactment of epistemic beliefs in pedagogy appropriate for CBC. Khakasa’s (2009) study is domain specific; it is focused on the teaching of mathematics at secondary school but this study is domain general; it focuses on epistemic beliefs for pedagogy of competence based curriculum of knowledge production.

Khakasa (2009) is also relevant in this study when she advocates a constructivist approach to teaching instead of a behavioristic approach which is overly rationalistic, scientistic and managerial (Khakasa, 2009, p. 41). This criticism is similar to Bennaars (1998) criticism of descriptive and narrow definition of pedagogy.

Inyega & Inyega (2017), doctoral dissertation by Khakasa (2009) and M.A thesis by Machina (2012) are studies on pedagogical content knowledge they examine teaching of science, mathematics and chemistry respectively. The three studies were domain

specific namely in science, mathematics and chemistry however this study is domain general since it deals with teachers' epistemic beliefs in general as they relate to pedagogy of CBC. This study attempts to link epistemic beliefs and pedagogy via the concept of pedagogical content knowledge.

Ngware et al., (2011) observed that lack of an adequate pool of teacher mathematics content and pedagogical content knowledge seemed to be a major factor in influencing how much mathematics students learnt. The study assessed teacher mathematical knowledge and learner achievement in class six in 72 primary schools spread across six districts in Kenya (Ngware et al., 2012, p. 13). The study analyzed data on teachers' mathematical pedagogical knowledge (Ngware et al., 2011, p. 15). However, the study seems to separate teachers' content mastery of mathematics and pedagogical knowledge (Ngware et al., 2011, p. 23) that is 'teacher pedagogical and content knowledge' are not integrated (Ngware et al., 2011, p. 37). Some policy implications of the study by Nware et al., (2011): Teachers with low subject competency develop lessons at 'low level cognitive tasks' (Ngware et al., 2011, p.38). Low performing schools require teachers to undertake 'more pedagogical skill-upgrading' in order to use 'more learner-centered approaches' (Ngware et al., 2011, p.39). Evidentially Ngware et al., (2011) kept teacher content knowledge and pedagogical knowledge separate.

2.5 Pedagogical Reasoning and Action

Shulman (1987) introduced the theory of pedagogical reasoning and action. He identified the transformation process that an individual teacher performs in developing the ability to reason in pedagogy. Shulman (1987) identified six activities of what he termed Pedagogical Reasoning and Action. These include:

i. Comprehension (the power of understanding subject matter)
ii. Transformation (the process of reconfiguring subject matter knowledge for teaching, preparation, representation, selection, adaptation, and tailoring are the five sub-processes involved)
iii. Instruction (the aspect of active teaching discovery and inquiry)
iv. Evaluation (the assessing of student and teacher accomplishments)
v. Reflection (the critical analysis of one's teaching performance)
vi. New comprehension (the process of understanding new subject matter.

In Shulman's pedagogical reasoning, activity (5) on Reflection as the critical analysis of one's teaching performance may be elaborated using the concept of reflective practitioner (Fenstermacher, 1994). Reflective practice is a teacher's pedagogical reflection or critical thinking in the practical action in teaching. Teaching is 'reflective practice,' so that the teacher is 'reflective practitioner.' The concepts of reflective thinking, reflective practitioner or reflective practice as used by Donald Schon (1983) are derivatives from Dewey (1910) who defined reflective thinking as 'active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the conclusion to which it tends' (Dewey, 1910, p. 6). Reflective thinking is closely related to critical thinking which is 'the careful, deliberate determination of whether we should accept, reject, or suspend judgment about a claim – and of the degree of confidence with which we accept or reject it' (Moore & Parker, 2000, p. 4). This definition of reflective thinking suggests epistemological critique of beliefs or knowledge claims. On the vital importance of the 'ability to think critically' (Moore & Parker 2000) argue that the way we conduct our lives depends on what we believe to be true –on what claims we accept. Critical thinking and reflection demands careful evaluation of claims. It is second order activity of reason

which turns available epistemic beliefs and knowledge into matters of reflection to establish their warranty or justification. This is how philosophical epistemology differs from personal epistemology the former is critical reflection while the latter is empirical descriptive, the former is normative and prescriptive the latter is report of observable beliefs.

On transformation Shulman (1987) elaborated that it requires some combination and ordering of the following:

i. Preparation (of given materials including the process of critical interpretation.
ii. Representation of ideas in form of new analogies, metaphors
iii. Instruction selection from an array of methods and models
iv. Adaptation of these representations to the general characteristics of the learners being taught
v. Tailoring the adaptation to the specific students in the classroom.

These forms of transformation are aspects of the process of moving from personal comprehension to preparing for the comprehension of others. This is the essence of pedagogical reasoning, of teaching as thinking, and of planning-the performance of teaching. These elaborations help elaborate the concept of pedagogical content knowledge.

2.6 Teachers' Epistemic Beliefs in Personal Epistemology

Beliefs are most commonly associated with religious convictions that a person holds dearly. Religious change of beliefs is conversion but Dewey uses the analogy of the Copernican revolution as analogy to the radical change in teacher's belief from traditional to modern pedagogy (Dewey, 1990). The attempt to change cherished beliefs can be an arduous task because of the 'nature and manner in which they were

developed' (Cajigal, 2010, p. 62). Sessional Paper no 14 of 2012 on CBC change in Kenya observed that 'the hardest element to change and a major challenge facing teaching profession' in Kenya is how to change 'instructional practices towards greater collaborative relationships between teachers and learners' (GoK, 2012, article, 9.6).

'Teachers possess various beliefs that influence their actions and decisions regarding the teaching-learning process' (Cajigal, 2010, p. 62). Content of teachers' beliefs in education may be about students, subject matter (content knowledge), other teachers, the principal, and their roles and responsibilities in the school. How does Cajital's (2010) definition of belief compare with that of Williams (2013)? The later cited Hofer (2001) to define epistemic beliefs as beliefs 'about the definition of knowledge, how knowledge is constructed, how knowledge is evaluated, where knowledge resides, and how knowing occurs.' Cajigal (2010) cites Richardson (2003) to state that beliefs 'are psychologically held understandings, premises or propositions about the world that are regarded as true.'

Cunningham, et al., (2005) asserted that cognition rests on a set of beliefs that guide us in making sense of the world, guide our desires, and shape our actions. Cajigal (2010) cites Pajares (1992) to illustrate how literature is replete with different usage of the term belief. For instance, belief may refer to judgments, opinions, ideology, conceptions, conceptual systems, preconceptions, dispositions, implicit theories, explicit theories, personal theories, mental processes, action strategies, rules of practice, practical principles, perspectives, and repertoire of understanding among other characterizations of belief. The term belief is problematic conceptually.

Personal epistemology is an area of descriptive research whose focus is epistemic beliefs espoused by teachers and students (Sitoe 2006; Hofer, 2002; Hofer & Pintrich,

1997; Schommer–Aikins, 2002). Personal epistemology examines an individual teacher's belief on the origin, nature, limits, methods, and justification of knowledge (Hofer, 2002). Epistemic beliefs are guiding principles which teachers cognitively hold to be true, and upon which they rely for performing their classroom pedagogical tasks (Hofer & Pintrich, 1997). In the studies on teacher's epistemic beliefs the basic principle is that there is a necessary relation between how teachers conceive, interpret, and perceive knowledge, and the manner in which they deliver their instructions, specifically how they formulate instructional decisions. Teachers' epistemic beliefs have necessary relation to their pedagogy.

The narrative of research on epistemic beliefs is traced from William Perry who researched on students' epistemological beliefs. Students initially view knowledge as simple, unchanging facts that are handed down by authority however with time this simplistic view of knowledge changes into view of knowledge as complex, tentative and based on reasoning and judgment (Hofer & Pintrich, 1997). Recently Schommer's (2002) work advanced this area of study by providing multidimensional conception of knowledge under five dimensions including, structure of knowledge, stability of knowledge, source of knowledge, speed of learning and ability to learn (Epler, 2011).

Scholars in personal epistemology use quantitative research design in the study of teachers' epistemic beliefs. This is evident for instance, in Ghana (Manu, Osei-Bonsu & Atta, 2015), China (Chai, 2010), Thailand (Trakulphadetkrai, 2012) and Tanzania Musendekwa (2015) and Turkey (Yildiran et als, 2011). According to Er (2013), Schommer's (1990) Epistemological Belief Questionnaire is the dominant instrument used. It is a questionnaire of 63 items with four-factor format. However, in Turkey (Yildiran et als, 2011) this Epistemological Belief Inventory was tested for validity and reliability in Turkey and it was modified to 35 items with three-factor format.

Quantitative method in the study of epistemic beliefs employs self-report data and there may be variance between what individual writes and what he does. To address this shortcoming mixed method is used to observe the individual in practice. Then epistemic beliefs are domain specific and contextual. A belief in mathematical knowledge may be different from another in English. Students of engineering may have different epistemic beliefs from those of arts and humanities. Thus interviews, questionnaires, self-report, think-aloud are various methods used (Gu, 2016).

Cajigal (2010) focused on 'how pre-service secondary science teachers envision their roles as classroom teachers who will be teaching global climate change to their students. Their personal repertoire of knowledge, skills, habits, and values about the issues and schooling guided the development of their beliefs' (Cajigal, 2010, p. 68). Cajigal (2010) used interpretive method interview-schedule, case study, informal conversation and group presentations to collect data regarding the question on what are the epistemological, pedagogical and curricular beliefs of pre-service secondary science teachers about climate change. Cajigal (2010) noted that traditionally epistemological beliefs are 'measured by standardized written instruments' however his study aimed to explain the 'possible relationship between the dimensions of personal epistemology, as proposed by Hofer and Pintrich (1997) and the pre-service teachers' beliefs as revealed from interview data, observations, and their written products.'

Cajigal (2010) in focusing his study on pre-service science teachers' beliefs he identified these beliefs by making 'reasonable inferences from their verbal expressions, predispositions to action, and written products.' In other words, beliefs are inferred from available data. This may include pre-service teachers' 'thinking, understanding, and ideas about the subject matter that they expressed and which were assumed to have

been drawn from their personal, social, and academic experiences' (Cajigal, 2010, p. 67).

However, Cajigal (2010) favors Richardson's (2003) view that teacher's beliefs are influenced by personal experiences, schooling, and experiences with formal and informal knowledge.' Cajigal (2010) defines epistemological beliefs as 'an individual's perspectives about knowledge and knowing.' Relying on Pajares (1992) Cajigal (2010) defines pedagogical beliefs as 'teacher's thoughts and notions of how instructions should occur, the role of the teacher, students, and the learning environment, and how knowledge should be cultivated in schools' (Cajigal, 2010, p. 193). Pedagogical Content Knowledge can then be inferred to be belief about how personal theory of knowledge and knowing, should guide thoughts about instruction in cultivating knowledge in schools.

Gu (2016) discussed the theoretical framework of epistemic beliefs beginning with Piaget, Perry, and Magold who he categorized under developmental approach. Under multidimensional approach he cites Schommer (1990), Schommer-Aikins (2004) and Hofer and Pintrich (1997) then under integrated approach of both developmental and multidimensional approaches he cites Greene et als (2008) and Hofer (2000).

Williams (2013) argued that teaching and learning processes are affected by various cognitive factors, such as epistemological beliefs and reflection. She identified three major groups within personal epistemology, namely:

i. Developmental perspective which is associated with Perry (1970) who established a structure in which individuals construe the nature and origins of knowledge, of value, and of responsibility in a sequential and logical process.

ii. System of personal beliefs associated with Schommer-Aikins (2002), they viewed individuals as having a set of beliefs that are independent of each other. Schommer's (1988) original work on epistemological beliefs analyzed students' approaches to learning as a function of their belief about knowledge.
iii. Epistemological theories associated with Hofer and Pintrich (1997) and epistemological resources associated with Hammer and Elby (2002). However, in addition to the three frameworks identified by Williams (2013), in the area of personal epistemology, a study on epistemic beliefs by Ziegler (2015) is a forth group called epistemic understanding, also associated with (Kuhn, 1999).

Developmental approach in the study of epistemological beliefs was started by Jean Piaget in his genetic epistemology, in the theory of cognitive development. That theory influenced Perry (1968, 1970) to undertake in-depth interviews on male university students thereby founding the field of personal epistemology. He developed students' intellectual development model based on four perspectives of knowledge and learning namely:

i. Dualism
ii. Multiplicity
iii. Relativism
iv. Commitment.

The shift from one perspective to another is marked by the change from belief that knowledge is simple and certain facts, to belief that knowledge is complex, tentative entity derived from reasoning and empirical evidence (Gu, 2016). This developmental approach assumed that epistemic beliefs develop from a naïve to a sophisticated level

through stages of qualitative differences. In general, this approach has three levels of epistemic beliefs, namely:

i. Absolutism/objectivism
ii. Multiplism/subjectivism
iii. Evaluativism/subjectivism

Under absolutist/objectivist epistemological perspective, epistemic beliefs are dualistic. Knowledge is viewed as either right or wrong. Knowledge is held with certainty. This is what pragmatists criticize as Cartesian neurosis or obsession with indubitable and absolute certitude knowledge. Multiplist/subjectivist epistemological attitude views knowledge as consisting of subjective uncertain opinions which can be equally right. This is the classic position associated with sophists in ancient Greek philosophy (Kariuki, 2002). Epistemological position of relativist/evaluativist considers knowledge as evolving and in constant need for evaluative judgment based on criteria such as critical thinking and evidence. Multidimensional approach began in the 1980s where students' epistemic beliefs began to be viewed as multidimensional rather than one-dimensional.

Schommer (1990) proposed a model of five independent dimensions in epistemic beliefs. She identified five dimensions of epistemic beliefs:

i. Structure
ii. Certainty
iii. Source of knowledge
iv. Control (innate or effort)
v. Speed of knowledge acquisition (suddenly or in time).

Each dimension can develop at its own rate since the dimensions are autonomous of each other. Schommer (1990) introduced a quantitative approach to the study of epistemic beliefs. He introduced the use of an epistemological belief questionnaire (EBQ) of 63 items to verify the five dimensions. The questionnaire was criticized for methodological problems like loadings, internal reliability and use of factor coefficients (Gu, 2016). Critics of Schommer included Hofer and Pintrich (1997), they argued that control and speed of knowledge acquisition refer to intelligence not to nature of knowledge and learning.

Hofer and Pintrich (1997) reduced the study on epistemic beliefs to two categories

i. Nature of knowledge
ii. Process of knowing.

Nature of knowledge has two dimensions

i. the certainty of knowledge (ranging from absolute to absolute to knowledge is tentative and evolving)
ii. the simplicity of knowledge (ranging from knowledge that exists in discrete facts to knowledge is highly interrelated concepts).

Under nature of knowing there are two dimensions

i. the source of knowledge (ranging from external authority to knowledge is constructed with interaction)
ii. the justification for knowing (ranging from relying on observation, expertise and authority, to applying rules of inquiry and personal evaluation and integration of expert's view) (Gu, 2016, p. 9).

Integrated approach has three dimensions to categorize individual epistemic beliefs.

i. Simple and certain knowledge (has two dimensions certainty of knowledge and simplicity of knowledge)
ii. Justification of knowing is namely by authority and by personal justification.

According to Green et al (2008) in ill-structured problem domains, students are expected to exhibit dogmatic or skeptic positions. But in a well –structured problem domain, students are expected to exhibit realistic positions. Realists believe knowledge is certain and simple and justification can rely on authority or own experience but there should not be disagreement about knowledge. Dogmatists and skeptics both concur knowledge is not simple and certain as if one might see a direct 'copy' of reality. Dogmatists rely on authority for justification but skeptics rely on personal experience. Rationalists believe knowledge is tentative and evolving and they base justification on both experience and reasoning, they rely on neither authority nor personal experience.

Sophisticated epistemic beliefs can positively influence student's learning strategies and outcomes. Epistemological belief questionnaire of Schommer (1994) has four epistemological factors namely:

i. Fixed ability
ii. Simple knowledge
iii. Quick learning
iv. Certain knowledge.

Studies revealed that if students believe in 'quick learning, simple knowledge, certain knowledge, and fixed ability' they have low academic performance (Gu, 2016). On argumentative reasoning research shows that individuals with evaluative belief balance objective and subjective views of knowledge they acknowledge that 'knowledge is

continually constructed and uncertain, but it can be critically evaluated based on criteria such as critical thinking and evidence' (Gu, 2016). This is Dewey's view of knowledge as tentative and constructed from continuous reconstruction of experience through reflective thinking. It seems pragmatic epistemology engenders evaluativist epistemic belief. Evaluativits have 'higher argumentative reasoning skills such as counterarguments and alternative theory generation' (Gu, 2016). They may be good debaters. For instance, Gu (2016) cited a study done by Mason & Scirica, (2006) where learners at the evaluativist level in eighth grade were found to produce higher quality arguments, counterarguments and rebuttals.

Online learning is also influenced by epistemic belief of a student. Student epistemic beliefs influence internet-based learning. Evaluativists students outperform absolutists on the strategy to integrate online information and are aware of information bias of a source. If a student believes that knowledge is evolving and tentative, that knowledge is justified by evidence such students are likely to evaluate knowledge as subject to change in future research, and can compare multiple sources and evidence (Gu, 2016).

Students who have epistemic beliefs that view knowledge as complex and highly interrelated tend to set higher standards in self-regulated learning. They aim at comprehension, elaboration and critical integration of information. This leads to higher performance. With such advanced/developed epistemic beliefs students have critical interpretation of knowledge and are competent in the cognitive process of recognizing, comparing, reasoning and judging between two competing views of certain knowledge. Students with immature epistemic beliefs about knowledge and knowing processes are less likely to attain conceptual change during the learning process. Students' epistemic beliefs affect various aspects of learning and they need to be assisted to 'develop optimal epistemological beliefs' (Gu, 2016).

Chai (2010) in his appendix puts an instrument of interview schedule on learning, teaching and epistemology. Fives (2004) has an appendix on pedagogical knowledge beliefs and pedagogical belief questionnaire. Manu (2015) has an appendix on epistemological questionnaires with questions on certainty/simplicity of knowledge, source of knowledge, justification for knowing, attainability of truth, and instructional practice. Manu's study was to create awareness and ignite discussion in academia for the educators to periodically monitor and evaluate epistemological beliefs of their student-teachers. Manu (2015) identified various variables that made teachers in Ghana not approximate their instructional practices to their self-reported epistemological beliefs. There are many aspects of epistemological beliefs to be known within Ghana's context but the same can be said of Kenya. There is a need to establish epistemological beliefs of teachers within a country's educational philosophy in Sub-Saharan Africa. Such information could help policy makers, curriculum designers and teacher educators to strategically use epistemological beliefs to influence other academic variables positively.

Manu (2015) hoped that his study may lead to the requirement of epistemological beliefs being consciously embedded in the teacher education programs in Ghana. He believed that the developers of professional programs for classroom teachers might be drawn to some of the dynamics between epistemologies and instructional practice of their teachers. His study he thought would add knowledge to how epistemological beliefs translate into instructional practice in school settings. This would help the teacher education program facilitate student-teacher developing epistemological beliefs for desired classroom results. He cited Brownlee (2003) to assert that epistemological beliefs serve as a lens through which teachers make instructional decisions. Epistemological beliefs espoused by teachers influence choice of instructional practice.

Williams (2013) cited Pajares (1992) to affirm that ‘many researchers agree that teachers’ epistemic and pedagogical beliefs usually relate to each other.’ Hofer and Pintrich (1997) are also cited to affirm the same that beliefs about teaching, learning, and knowledge are intertwined.

Hennessey (2007) researched on how to develop a sound psychometric measure of teacher epistemic beliefs. Her dissertation was in the area of educational psychology. She defined teacher epistemic beliefs as beliefs teachers have about the justification of knowledge and how those same beliefs are evidenced in their pedagogical practices. The findings of the study showed that pre-service enacted espoused epistemic beliefs. This finding is relevant because it buttresses the theoretical framework of the present study which assumes that epistemic beliefs held by teachers are enacted in their pedagogy. However, Hennessey is not concerned with pedagogical content knowledge but how to reliably measure the relation between epistemic beliefs and pedagogical practice of classroom teachers.

Hennessey (2007) obtains the concept of teacher epistemic beliefs as they are defined in the philosophical literature. This implies that study of teachers’ epistemic belief in philosophy is conceptual while in educational psychology is quantitative. She categorically points out that ‘beliefs are the primary topic in the discipline of epistemology’ (Hennessey, 2007, p.1). Hennessey (2007) cited (Pollock & Cruz, 1999) to define epistemology as ‘the study of the nature of knowledge and knowing’ (Hennessey, 2007, p. 1). Further she defines knowledge as justified true belief. Hennessey opines that epistemologists have two primary concerns in philosophical study of knowledge namely, the truth of knowledge and the justification of knowledge or ‘how knowledge is justified.’ She states that her study focused on the justification condition of knowledge. Justification is said to be ‘the actions a person takes or the

conditions they hold to show that they have a belief that is true' (Hennessey, 2007, p. 1).

Belief may be justified in philosophy under three epistemic frameworks namely foundationalism, coherentism and reliabilism. For Hennessey, the three epistemic frameworks match with corresponding pedagogical practices that teachers may employ in classrooms context.

Whereas philosophers use rational speculations in epistemology, educational psychologists investigate beliefs about knowledge held by individual teachers. Philosophers construct arguments about the normative nature of knowledge and the conditions of objective justification of knowledge however psychologists study epistemic beliefs as subjectively espoused by individual teachers. Individual teachers hold personal beliefs 'about knowledge itself, what knowledge is, and how it is justified' (Hennessey, 2007, p.2). These beliefs more often than not are implicit. Psychologists investigate epistemic beliefs in an area called 'personal epistemology.'

However, Hennessey (2007) cites Kitchener (2002) to clarify that 'personal epistemology' may also refer to a personal belief about the field of epistemology. This suggests that the individual logically speculates about knowledge in philosophical mode. Whereas philosophers speculate about criterion of knowledge and knowledge, psychologists investigate epistemic beliefs about particular knowledge domain as espoused by individuals including teachers and learners. Philosophers investigate objective criteria for justification of knowledge but psychologists investigate the epistemic beliefs as empirical facts. Philosophy is speculative but psychology is empirical. Philosophy looks at the theoretical criteria of beliefs but psychology looks at the fact of belief. It is for this reason that philosophy is second order discipline while

psychology is first order. Psychology is descriptive study of beliefs as mental facts but philosophy is critical study of the normative criteria of epistemic beliefs. In Kantian terminology philosophers study the condition for possibility of epistemic beliefs. Psychologists look for a reliable and valid measure of indicators of epistemic beliefs while philosophers would look for assumptions of epistemological theory.

Hennessey (2007) clarified that educational psychologists investigate 'the number of factors inherent in the conceptualizations of beliefs' (Hennessey, p. 2). Beliefs about knowledge are either uni-dimensional or multidimensional. Philosophers focus on conceptual clarity of epistemic frameworks for beliefs about knowledge (Hennessey, 2007).

Hennessey (2007) asserts that psychology of personal epistemology has established in research that teachers' epistemic beliefs influence students beliefs about knowledge via the pedagogical practices employed in classrooms. Pedagogical practices of teachers directly impact students' learning. It is therefore imperative to investigate these practices, and the beliefs of teachers that influence these practices.

This study looks at the epistemological base of epistemic beliefs for pedagogy of CBC. The thrust of the main thesis is that classroom teachers in Kenya can only use pedagogy of CBC if the undergirding epistemology is made explicit. Teachers in Kenya must have epistemic beliefs consonant with epistemology of CBC.

Douglas (1996) examined how teachers could justify their epistemic beliefs. He suggested a method of talking to other fellow teachers. This he said may sound anti-intellectual and anti-research but the main point was to indicate the necessity of 'a discourse community' that acts as a 'support group.' Teacher epistemic beliefs are prima facie putative knowledge assumed as justifiable true belief. The litmus test of

knowledge claim is in its justification. Douglas (1996) favored pragmatic justification of epistemic belief against foundationalism. Whereas foundationalism places justification of true belief on some 'ultimate authority' like sense data or reason akin to Cartesian clear and distinct ideas, pragmatic justification of true belief uses consequences in problem solving. Using authority of discourse community a teacher may bring her epistemic belief to scrutiny, assessment and for possible modification. Douglas (1996) recommends a pragmatic model for justification of epistemic belief to be vested in a community of supporting teachers serving as a test of peer review. The teacher's community of discourse offers an opportunity to a teacher to bring forth her tacit beliefs for review by fellow teacher practitioners.

Kavitha (2014) examines various challenges of Higher Education within the context of India's commitment to the development of a knowledge-based society. She asserts that in contemporary societies the focus is on 'knowledge economy' which has made the role of education more important in human capital development. She further argues that education enhances people's productivity, creativity and encourages entrepreneurship and technical advances. She points out that Higher education is charged with the responsibility of creating human capital required for knowledge production. The creation of human capital is 'primarily through teaching.' She cites OECD (2008) Organization for Economic Co-operation and Development which identified four major missions of tertiary education namely:

i. formation of human capital primarily through teaching
ii. building of knowledge base primarily through research and knowledge development;
iii. dissemination and use of knowledge primarily through interactions with knowledge users

iv. maintenance of knowledge primarily through inter-generational storage and transmission.

This later point is reproduction of knowledge which could make teaching under the first point become merely transmission of ready-made prepackaged knowledge. This is what Karimi (2014) called didactic competency in university teaching. Knowledge production is more about constructivist generation and use of knowledge.

The 21st century is said to be the 'knowledge century' where economic transformation is to be predicated upon knowledge creation. Ahmed (2008) cited (Mok, 2000) who refers to the 21st century as 'learning society.' Education is therefore required to prepare individuals who are creative and adaptive to changes in 'lifelong learning society' (2000). Kavitha (2014) called for balancing three aspects in the knowledge-based economy namely:

i. Knowledge production through research
ii. Knowledge transmission through education and training
iii. Knowledge transfer to economic and social actors whose role is to exploit knowledge. Higher education is the green house for nurturing future professionals, scientists and other specialists.

Kavitha (2014) does not link knowledge production to pedagogical content knowledge nor with its epistemological framework. Although her work is on Higher education which are green-houses for producing professionals or specialists for knowledge-society she does not explicitly mention teachers who are part of professionals produced by Higher Institutions of learning.

Education reform in line with Kenya's Vision 2030 has generated debate even in the mainstream print media in the country. Otieno (2017) in the Daily Nation argued at

length in favor of the intended shift in education reforms in the country. In her opinion 'the reason the government has currently embarked on a major review of the education system' is in order to bring 'change of the structure, mode of delivery and the examination framework' (Otieno, 2017, p. 20). She goes on to describe the present situation in contrast to the intended change namely that: 'The centre-piece of the new education system is competence – learners are taught mastery of concepts, which they must demonstrate during continuous assessment; as opposed to the current system of knowledge cramming and which are regurgitated at exams' (Otieno, 2017, p. 20). Otieno (2017) identifies three basic foundational elements for implementation of the new system of education namely:

i. Framework for curricular development
ii. Examination mode
iii. Teacher education.

She believes that if properly implemented the intended education reform in Kenya 'will elevate the country to a higher pedestal by producing highly competitive and creative human resources' (Otieno, 2017, p. 20). However, Otieno (2017) fails to buttress this point with one of the ten foundations of the Kenya Vision 2030 under human resource development, where it is stated that (GoK, 2007, p. ix)

> Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy. This will be done through life-long training and education…. Steps will be taken to raise labour productivity to international levels. Other steps will include establishment of new technical training institutions, as well as the enhancement of closer collaboration between industry and training institutions.

This quotation makes explicit the need for producing highly competitive and creative human resources in Kenya. This requires human capital that is constantly training and retraining according to dynamics of the knowledge economy (GoK, 2007).

Alternatively, the Sessional paper of 2012 article 4.14 (GoK, 2012, p. 31) has a similar point to the one quoted above from the Kenya Vision 2030.

Otieno (2017) revealed the current system of education in Kenya as ailing from a competitive process where students want top grades at whatever cost. It's a process where the end justifies the means that is 'the goal (is) to secure a top grade through whatever means' (Otieno, 2017, p. 19). It mattered naught whether students have 'mastered the subject or demonstrated superior knowledge' (Otieno, 2017, p. 19). In addition, part of the quality challenge of education is inadequate teaching staff, learning and teaching resources and summative examination regime. The basic question raised by Otieno (2017) is: What can we do to provide quality learning to millions of learners across the sector?

Epler (2011) undertook a study on the relationship between implicit theories of intelligence, epistemological beliefs and the teaching practices of in-service teachers. The study used a mixed method approach. The purpose of the study was to examine the role teachers' beliefs play when making instructional decisions. The study intended to 'understand how in-service teachers' beliefs are related to the teaching practices they use in the classroom. Epler (2011) summarized established knowledge in the area of epistemic beliefs and pedagogy as follows: (Epler, 2011, p. 9)

> it is known that beliefs about intelligence as well as epistemological beliefs influence teachers' planning and pedagogy, yet little is known about the direct interaction between those components…therefore educational researchers continue to advocate the need for closer examination and direct study of the relationship between teacher beliefs and educational practices.

The current research builds on the foregone research on the relationship between epistemological beliefs and pedagogy. The current research focuses on pedagogy for knowledge production in schools in Kenya. This requires research into requisite

epistemological beliefs that Kenyan teachers need as repertoire of their pedagogical content knowledge.

Epler (2011) used Dweck's theory of intelligence to assess the nature of in-service teachers' beliefs about intelligence and epistemic Belief Inventory to measure teachers' epistemological beliefs. The use of these two theories of intelligence beliefs and epistemic beliefs clarifies the difference between Otieno's (2015) research on Kenyan secondary school students' intelligent beliefs about mathematics and the current research on epistemic belief of teachers in Kenya for pedagogical content knowledge of knowledge production. Epler (2011) found out there is significant correlation between theories of Intelligence scale and Epistemic Belief Inventory. Findings also revealed a positive significant relationship between epistemic beliefs and teaching practice of teachers. Importantly it was found that advanced epistemological beliefs are related to use of learner-centered teaching practices (Epler, 2011, p. iii).

Epler (2011) traces the background of study of influence of epistemic beliefs to learning as a shift from behavioral theories that learning is influenced by environmental conditioning and not learners' mental process. The psychological shift is to the theories that move away from learners as passive recipients of information to learners as seekers and processors of information. What was lacking in earlier learning theories was 'consideration of how learning is influenced by an individual's beliefs' (Epler, 2011, p.1). Epler (2011) defines belief as any proposition, conscious or unconscious, inferred from what a person says or does. Beliefs are resident in the mind of an individual they are implicit beliefs about many things like ability, morality, knowledge and oneself. Epler (2011) stated that beliefs cannot be directly observed or measured they are inferred from what people say or do.

Epler's (2011) study distinguished three components of beliefs namely; cognitive representing knowledge, affective capable of creating emotion and behavioral that is belief can be activated when action is required. Epistemic beliefs of teachers refer to cognitive components since they are beliefs about knowledge however when enacted in pedagogical practice this cognitive component is evident is behavioral component in the pedagogical action a teacher undertakes.

Much research in psychology is by use of quantitative and qualitative research. This research however is philosophical it is about rational base for pedagogical action on epistemic belief. Epler (2011) cites various scholars to argue that epistemological beliefs influence how teachers approach teaching. Such scholars include Brownlee et al., (2000), Pajares (1992) and Tickle et al., (2005).

Like other scholars in epistemic beliefs Epler (2011) asserts that understanding of teacher beliefs is a means for understanding teachers' classroom pedagogical practices. Epler (2011) cited scholars like (Chan) 2003), Luft & Roehrig (200 Maggioni & Parkinson (2008) and Pajares (1992) to assert that teacher's epistemological beliefs influence adoption of specific pedagogical practices.

Cajigal (2010) examines pre-service teachers' beliefs about global environmental concerns from the personal level of individuals. He wanted to establish if these beliefs influence their decisions about pedagogy, curriculum and vision for teaching global climate in their science classes (2010, p.8). The first of three research questions by Cajigal (2010) was stated as follows: 'What are the epistemological, pedagogical, and curricular beliefs of science teachers about global climate change?' (Cajigal, 2010, p.10). Pre-service teachers' conceptual and pedagogical understanding of whatever phenomenon does not occur in a vacuum but it is 'influenced by deeply embedded

beliefs' (Cajigal, 2010, 9). In analysis of teaching about global climate change Cajigal (2010) cites Snider and Roehl (2007) to assert that teachers' beliefs influence classroom practice. Such beliefs may be guided by knowledge which could enhance expertise however these beliefs could degenerate into 'an ideology, dogma, or myth if not substantiated by evidence' (Cajigal, 2010, p.9). Cajigal (2010) cites Richardson (2003) to point out that beliefs of pre-service teachers are translated into practice it is therefore paramount to challenge these beliefs through 'classroom readings, dialogues, or experimentations.' It is important to understand teachers' thinking as 'they engage in learning to teach, planning, actual teaching, reflection, or assessment' (Cajigal 2010, p. 10). Understanding beliefs espoused by pre-service teachers is important for university lecturers in guiding their curricular structuring and directing the teacher education programme. There is gain in grasping the role these beliefs play in 'future perspectives and practice.' The study by Cajigal (2010) used the same theoretical framework as the present study which is the model of epistemological theories by Hofer and Pintrich (1997). Cajigal (2010) asserts that in his study 'a clear understanding of beliefs systems will enable us to better understand the teaching and learning processes in the classroom' (Cajigal, 2010, p.11).

Constructivist pedagogy is found to align itself to critical thinking in teaching. Critical thinking enables learners to filter information from vast sources. It involves 'letting students explore on their own, with the teacher as a guide.' Students who explored and interacted with the various sources of knowledge were active participants in knowledge construction (Cajigal, 2010). This idea is consistent with the concept of knowledge production intended in CBC in Kenya under Sessional Paper no 14 of 2012 (GoK, 2012). Constructivist pedagogy is a student centered approach to teaching and learning (Cajigal, 2010).

In literature review Cajigal (2010) cited numerous quantitative studies on teachers' beliefs about science curriculum. For instance, he cited Roehrig, Kruse and Kern (2007) which examined the implementations of a reform based high school chemistry curriculum in a large, urban school district. They specifically studied the 'role of the teachers' knowledge and beliefs…in their curriculum implementation' (Cajigal, 2010, p.58). Through quantitative and qualitative data, the study by Roehrig et als (2007) found out that 'the implementation of the curriculum was strongly influenced by the teachers' beliefs about teaching and learning, and the presence of a supportive network at their school' (Cajigal, 2010, p. 58). Another study reviewed by Cajigal (2010) revealed that text-book driven pedagogy is a traditional model of teaching which is common with teachers who do not bring out-of-school experiences. Such teachers were found unable to embrace reform or teach from a constructivist perspective.

Gu (2016) investigated epistemic beliefs of high school students in a project of problem-based scientific inquiry. Gu's (2016) study was in response to policy document on education reform in the United States of America namely, the National Research Council (NRC, 2012) which required that 'all American high school graduates should not only have adequate knowledge and skills of science to enter career of their choice, but also be capable of engaging in public discussion on social-scientific issues and continue to learn science outside of the school' (Gu, 2016, p.1). The NRC report required that educators 'move beyond a focus on content knowledge and process skill' and help students engage in scientific inquiry as means to aiding them understand the nature of scientific knowledge and how scientists conduct their inquiry. The move beyond content knowledge suggests meta-cognition level of understanding but it fails to capture the need of integrating knowledge content with pedagogy.

Gu (2016) argued that the current practice of science education in the United States of America does not 'reflect the epistemic aspect of authentic scientific inquiry.' This has led to students forming suboptimal epistemic beliefs about scientific inquiry. He found it as unknown how students' epistemic beliefs about science relate to inquiry methods used in science education. It is unclear how to support development of sophisticated epistemic beliefs of students about science. He resorted to the theory of Hofer and Pintrich (1997) on epistemic beliefs. He defined epistemic beliefs as 'individuals' beliefs about the nature of knowledge, how knowledge is constructed, and how knowledge can be justified' (Gu, 2016, p. v). He reasoned that research on epistemic beliefs in the context of science education can help educators examine how students understand the nature of science and how they construct scientific knowledge. He integrated research on epistemic beliefs with research on scientific inquiry to bridge the gap on knowledge about students' beliefs on method of scientific inquiry. Epistemic beliefs research has come to realize context is critical in understanding epistemic beliefs thus students' epistemic beliefs in his study are context specific in reference to scientific inquiry in the United States of America. This is critical because assessment of epistemic beliefs should be in specific context of practice so that the mental state and mental act are not confused. Traditional approach is criticized for a decontextualized approach to epistemic beliefs (Gu, 2016, p.3).

Like other researchers Gu (2016) starts literature review with defining epistemology as a 'branch of philosophy that addresses questions about the nature of knowledge and justification of knowing' (Gu, 2016, p.5). He clarified that in the field of education focus is on 'epistemology at individual level – the theories and beliefs individuals hold about how one comes to know, how knowledge can be justified, and how these beliefs influence individuals' cognitive processes' (Gu, 2016, p. 5).

He pointed out that this area of research lacks unified terminological consensus on key constructs so that the same phenomenon is referred to variously as epistemic beliefs, epistemological beliefs, personal epistemology and epistemic cognition. All these refer to 'beliefs people hold regarding the nature of knowledge and knowing process.' However, relying on Kitchener (2000), Gu (2016) argues that etymologically epistemology is theory (logos) of knowledge (episteme) that is epistemic theory. Epistemic beliefs are individual's beliefs about knowledge and knowing whereas epistemological beliefs or personal epistemology refers to beliefs about the study of knowledge and knowing or the belief about the field of epistemology. Gu (2016) chooses to use the term epistemic belief but retains the alternative terminologies when used by the researchers he cited.

Epistemic beliefs influence how students solve problems (Gu, 2016, p. 21). The discrepancy between self-reported beliefs and observed practice is distinguished by 'mental states' and 'mental acts' respectively (Searle, 1983; Stromso & Braten, 2010) as cited by Gu (2016). The former are beliefs that individuals hold in general the latter are beliefs applied in practice. This research is concerned with the latter since epistemic beliefs play a role in the teaching and learning process. Epistemic beliefs should not be interpreted in general without considering specific contexts. (Gu, 2016, p.141). The current research is about beliefs that individual teachers should put in practice. This is because according to (Gu, 2016, p.141) the two terms 'mental states' and 'mental acts' are 'two types of beliefs that represent two types of research objectives: beliefs that individuals hold in general and beliefs that individuals apply in practice.' This study seeks for epistemic beliefs that teachers are to put into practice in CBC pedagogy. Teachers' epistemic beliefs are mental acts.

Trakulphadetkrai (2012) carried a study in Thailand and argued that beliefs that teachers hold influence their perceptions and judgments which, in turn, affect their behavior in the classroom. Many studies have shown a significant relationship between teachers' pedagogical beliefs and their instructional practices. Of importance is observation by Trakulphadetkrai (2012) that any attempt to improve the quality of teaching must begin with an understanding of the conceptions held by the teachers and how these relate to their instructional practices. He goes on to cite Richardson (1994) in asserting that teachers may perpetuate practices based on questionable assumptions and beliefs.

Traditional didactic pedagogy is teacher centered where the epistemic belief is that the source of knowledge is one omniscient authority of infallible teacher and the textbook but not reason or evidence. Stability of knowledge is whether knowledge is evolving or static, whether it is isolated discrete bits or integrated concepts (Trakulphadetkrai, 2012, p. 73). Epistemic Beliefs can either be domain general or domain specific in philosophy; we are focused on domain specific in search for teachers' epistemic beliefs for CBC pedagogy.

Msendekwa (2015) in his doctoral study examined the epistemological and pedagogical beliefs of in-service and pre-service student-teachers in Tanzania. He used the EBQ and found out that there two types of pedagogies traditional and constructionism. In-service teachers were found to hold stronger constructivist conceptions than pre-service teachers. Relating these findings with Kelly (2013) we can argue that in-service teachers have more sophisticated epistemological beliefs than the pre-service teachers in Tanzania. Msendekwa (2015) and Manu et al., (2015) are the two studies that have quantitatively analyzed epistemic beliefs in Sub-Saharan Africa. Kenya is yet to join this conversation in spite of the studies by Kenyans namely Karimi (2014) and Otieno

(2015) whose study borders but fails to explicitly engage in the area of personal epistemology. This study hopes to bridge this gap at least from a theoretical perspective of philosophy of education.

Constructionist theory has featured in most literature reviewed in this study. Hyslop-Margison & Strobel (2008) have analyzed this theory based on the theory of Phillips (1995) in an article entitled the good, the bad and the ugly: the many faces of constructionism. Due to popular use of the concept of constructivism in contemporary teacher education programs Hyslop-Margison & Strobel (2008) are concerned that this concept is used without clarity on its epistemological and pedagogical implications. Their article discusses merits and limitations of constructivism. Dewey and Vygotsky views of constructivism are employed to show how constructivism is useful in enhancing understanding of the 'impediments students confront when learning new knowledge' (Hyslop-Margison & Strobel, 2008, p. 72).

The idea of acquiring new knowledge is critical in this study because education reform in Kenya requires use of pedagogy that produces or generates knowledge. Dewey maintains that learners bring prior knowledge and experience in confronting potential new knowledge. These prior beliefs, experience or knowledge may impede or facilitate acquisition of new knowledge. The prior knowledge constitutes epistemic beliefs.

Constructivism is a panacea against traditional teaching. Constructivism suggests 'a more sophisticated level within the personal epistemological framework where knowledge is something the learner constructs and not something passed from omniscient authority to the naïve passive learner.' Constructivism is a theory of learning not of teaching (Huling, 2014, p. 22). Constructivism as learning theory is based on Piaget, Vygotsky and especially Dewey (1916) who gave technical definition of

education a constructivist bias as ‘a constant reorganization or reconstructing of experience’ (Dewey, 1916, p.23). Constructivist is epistemological and pedagogical theory of how to make sense of how students learn. It can be ‘thought as a theory of knowledge used to explain how and what we know’ (Huling, 2014, p. 22).

Positivism is a contrast of constructivism (Huling 2014, p. 24). Positivism has multiple interpretations ranging from social evolutionism, philosophical meaning of logical positivism, or methodological tradition within scientific practice (Huling 2014, p. 24). However, positivism as methodology or practice means that ‘knowledge comes from single sense-data where theories are human made linkages between these data. Positivism is rooted in empiricist epistemology. This positivist-empiricist epistemology is subjected to criticism by Dewey (Dewey, 1916, p.243, 359). Huling (2014) is in agreement with Kelly (2013) in preferring constructivism to positivism in teaching.

Syomwene, Nyandusi & Yungungu (2017) authored a textbook on Core Principles in Curriculum. Coming at the time of advent of CBC in Kenya do the authors contributes to curriculum theory of knowledge production as in the Kenya Vision 2030 (GoK, 2012, article, 1.6, & 4.27). The textbook is not contextualized within the current education reform in Kenya even though in the preface it is stated that the book ‘presents practical examples and case studies in the field of curriculum with reference to Kenya’ (Syomwene, Nyandusi & Yungungu, 2017, p. x). The chapter by Nyandusi (2017) analyzes philosophical orientations in conceptualizing curriculum (Syomwene, Nyandusi & Yungungu, 2017, p. 4). He identified three philosophical orientations which underpin conceptualization of curriculum namely, epistemological, axiological and ontological.

Nyandusi (2017) argues that the epistemological base of curriculum is concerned with 'the nature of knowledge, the source of knowledge, and the dissemination of knowledge. The classical question by Herbert Spencer is perennial for curricular epistemologists: 'What knowledge is of most worth?' According to Nyandusi (2017) curriculum is 'a body of knowledge to be transmitted' or as 'content to be taught' or 'subject matter to be mastered.' Nyandusi (2017) adds 'as a concomitant, how it should be taught or how it is taught.' This concomitant is pedagogy which shows that pedagogy is integral to curriculum (Deng, 2007). Nyandusi would have used the notion of PCK to fasten the intricate integration and concomitance of curriculum and pedagogy. This is because it is not always the case that pedagogy is concomitant to curriculum for at times pedagogical innovation occurs in curriculum free environment (Bernstein, 1975). The current study intends to discover the pedagogy concomitant to CBC in Kenya.

Hofer and Pintrich (1997) used the term enacted curriculum to describe the pedagogical fact that classroom teachers transform written curriculum by their interpretation and implementation. Teacher's enacted curriculum is informed by underlying beliefs about knowledge, learning and learners' abilities. The enacted curriculum is mediated by espoused epistemic beliefs of a teacher.

Deng (2012) in distinguishing school subjects from academic disciplines identified four competing curricular ideologies that schools are required to serve namely: academic rationalism, humanism, social efficiency and, social reconstruction (Deng, 2012, p. 41). It follows that the current CBC in Kenya under the Vision 2030 is driven by ideology of social efficiency as evident in (GoK, 2007, p. ix) and also in (GoK, 2007, article, 2.8). Under social efficiency 'the central purpose of schooling is to meet the current and future manpower needs of a society by training youth to become contributing members of society' (Deng, 2012, p. 41). This is what Dewey (1973) calls it the 'remote

term of the problem of education' which is 'the destination toward which education aims' (Dewey, 1973, p.191). 'Productive membership in society' is the ultimate educational goal that should inform both individuals and society in planning curriculum for its citizens. The learning outcome of CBC is to develop every learner's potential to become ethically engaged member of society (GoK, 2017b).

Deng (2015) goes at length to cite Michael Young in an attempt to argue that the primary object of curriculum theory is knowledge taught at schools. There is lack of a theory of knowledge of the different forms that curriculum might take. This is something Nyandusi (2017) fails to attend to particularly in his epistemological orientation of curriculum. Deng (2015) counsel for curricular scholars is to use as their point of departure 'what students have an entitlement to learn.' He promotes a knowledge-based approach to curriculum with the aim of enabling every learner regardless of background (gender, race, socioeconomic status) to gain access to formal, disciplinary knowledge; which is 'the central purpose of schooling' (Deng, 2015, p. 773). The notion of knowledge-based curricular approach is close to the idea of knowledge-based economy. However, the difference is that knowledge-based economy uses knowledge within the ideology of social efficiency (Deng, 2012). If Kenya intends to reform curriculum under CBC to be that of knowledge-production and social efficiency appropriate concomitant pedagogy is needed. 'Powerful-knowledge' is the term used to specify knowledge which allows learners to transcend 'their particular experience and gain understanding of the world; envisage alternatives and participate in debates and controversies' (Deng, 2015, p. 773). If such knowledge is not for its-own-end but for instrumental use it connects with Dewey's pragmatic theory of knowledge (Dewey, 1916).

Deng (2015) uses Schwab's theory of curriculum to criticize Michael Young. For Schwab disciplinary knowledge is a resource to be transformed for use at high school curriculum. 'Curriculum making entails a deliberative process of selecting contents from academic disciplines and other sources within a particular social and cultural context, with specific groups of learners in mind' (Deng, 2015, p.780). This statement is insightful that the curriculum is local and selective. Teachers must interpret subject matter in the context of the objectives of the local curriculum. This calls for revising of 'pedagogical content knowledge' to become 'pedagogical curricular knowledge' which underlines substitution of curricular subject matter for academic discipline at high school. This is a critique not only of Michael Young but also of Schulman (1987) as this study intends to argue. Content selection in curriculum is 'inextricably embedded in a complex web of considerations pertaining to the four curriculum commonplaces' namely: the subject matter, the learner, the teacher and the milieu (Deng, 2015).

Curriculum making is a deliberative practical process which 'starts with an understanding of learners' background, interests and needs as essential starting point.' Only from such a paedocentric perspective should the discipline represented by the scholar serve as a high school curriculum resource of education rather than a model for it' (Deng, 2015, p. 777). The decision for inclusion of academic scholarly material competing for inclusion in curriculum should ultimately be judged on its educational potential (Deng, 2015, p. 778). Klafki (2000) is cited by Deng (2015) to underscore how content in the curriculum is to be interpreted by classroom teachers so that students can experience its significance. Klafki (2000) formulated a five-step set of questions that facilitate interpretive analysis of which according to Deng (2015) questions 4 and 5 'deal with the means of actualizing the educational potential – in terms of content structure and pedagogical representations.

Deng (2015) further cited (Klafki, 2000) to state that the search for means or methods is the final step – the 'crowning' moment in lesson preparation. Klafki (2000) as cited by Deng (2015) in the context of German didaktik concept of bildung buttresses the rationale of calling PCK of Schulman (1987) pedagogical curricular knowledge. The classroom teacher's crowning moment in lesson planning is pedagogical choice of methods of instruction to represent curricular subject matters judging by where the learner is and his/her milieu. The four commonplaces of curriculum are organized and structured in the classroom by the teacher in his/her professional specialty of 'pedagogical curricular knowledge'; which indeed is the crowning moment in the teaching experience. According to Deng (2015) it is particularly imperative that (Deng, 2015, p. 778):

> The educational potential of scholarly material is not directed towards making students into scientists, mathematicians or historians. It is for the purpose of educating them to be free and responsible citizens capable of serving and improving their local communities. In this regard, the educational potential embodied in a piece of scholarly material is also ascertained in terms of meeting the needs of the community and individual students.

This quotation is well aligned with CBC in that Basic Education Curriculum Framework (GoK, 2017b) clarifies that 'Subjects/subjects/disciplines will continue to be taught and will be the vehicle through which literacy, numeracy and other competencies are developed.' CBC has primary focus on application of knowledge rather than acquisition of content mastery. 'More focus should be directed to competencies and less on content. The goal should be the appropriate application of knowledge and not necessarily just its acquisition' (GOK, 2017b, p. 27).

This evokes Dewey's (1973) theory of the three terms of education namely the proximate term (learner), the middle term (subject matter) and the ultimate term (society). These three terms constitute teachers knowledge that is teachers must have

‘considerable knowledge about the child, about the subject matter they use, and about the society in which they operate’ (Dewey, 1973, p. 191). None of these terms should eclipse the other two (Dewey, 1973, p. 191). When subject matter is the central focus to the exclusion of the other two terms, education becomes too scholarly and academic without social relevance as if we are turning learners in secondary school into scientists, mathematicians or historians. The subject matter is for use to help learners become productive members of society which is the remote term of education or ‘the destination toward which education aims’ (Dewey, 1973, p. 191). This is the point that Deng (2015) seeks to underscore in the above quotation. The curriculum content selected for CBC in Kenya should be evaluated in terms of whether its employment meets the needs of Kenyan society and whether individual learners are enabled to be free, responsible and productive members (GoK, 2017).

Two main textbooks used in philosophy of education in Kenya include one by Njoroge and Bennaars (1986) and the other by Nigerian, Akinpelu (1981). Both textbooks are for undergraduate student-teachers in education. Both books have analyzed epistemology as a branch of philosophy and also related it to education. In particular both textbooks analyze concepts of knowledge under three conditions namely; belief, truth and evidence. These three conditions of knowledge are based on analysis of knowledge as ‘justified true belief’ popular with Scheffler (1965). Both textbooks fail to raise questions on epistemic beliefs of teachers or students. The first condition of knowledge is belief which is described as ‘psychological state of mind’ or conviction that something is the case. Belief assures security of certitude but belief can be true or false (Njoroge & Bennaars 1986, p. 152). Njoroge and Bennaars (1986) fail to define belief in terms of its epistemic connection to a classroom teacher.

Akinpelu (1981) observes that classroom teachers 'impart various types of knowledge according to their disciplines' (Akinpelu, 1981, p. 12). Akinpelu (1981) is oblivious of the theory that classroom teachers are influenced by their espoused epistemic beliefs in the choice of their approach in imparting knowledge. Akinpelu's assertion that classroom teachers impart 'disciplinary knowledge' needs to be revised based on Dewey (1990) and Deng (2015) both of whom are emphatic that classroom teachers don't teach 'disciplinary knowledge' but subject matter as it features in the curriculum. Shulman (1987) used the term pedagogical content knowledge to specify the idea that teachers' expertise lies in knowledge of how to transform content for comprehension by others. Hattie (2012) would use the term teaching for 'visible learning'. It appears epistemological study in philosophy of education in Kenya needs revision based on recent scholarship on findings of researchers on epistemic beliefs in the area of 'personal epistemology.'

Wainaina (2006) wrote a chapter on epistemology and education in the textbook 'addressed to prospective and practicing teachers' in East Africa and Africa in general (2006, p.vi). He follows the default approach in epistemology which is to use Scheffler's three conditions of knowledge. He neither defines the concept of belief under belief condition of knowledge nor does he seem aware of the concept of teacher epistemic beliefs (Wainaina, 2006, p. 150). It seems that in Kenya the textbooks on philosophy of education are oblivious of the need to analyze epistemic beliefs of teachers. There is a need to move beyond Scheffler's three conditions of knowledge by including topics on epistemic beliefs of both teachers and students. This requires updating curriculum on the course on philosophy of education for pre-service student-teachers and in-service continuing professional training of teachers as required by the reformative educational policy documents emanating from Kenya Vision 2030.

The definition of epistemic belief is often preceded by the definition of epistemology. For instance, Er (2013) begins his work by stating that: 'Epistemology, one of the fundamental areas of philosophy analyzes the nature, sources, boundaries, conceptual components of knowledge, and even whether the existence of that knowledge is possible' (Er, 2013, p. 208). Then he moves on to define epistemological belief as 'the ideas of individuals about what knowledge is and the subjective beliefs of individuals are how knowledge and learning come to exist' (Er, 2013, p. 208).

Paechter et al., (2013) traced study of epistemic beliefs and origin of EBQ by citing Hofer and Pintrich (1997) and Schommer-Aikins (2002). Secondly, they analyze the nature of Schommer's EBQ. Thirdly, they describe the five independent dimensions of epistemic beliefs and how they are reducible under two categories and finally, how each dimension of epistemic belief develops from naïve to sophisticated level. Paechter et als (2013) were translating EBQ into German and made improvements on Schommer's questionnaire for German use. The five independent dimensions of epistemic beliefs include: (1) structure of knowledge, (2) stability of knowledge, (3) source of knowledge, (4) control, and (5) speed of knowledge acquisition.

> The dimension "structure of knowledge" ranges from a naïve position that knowledge is simply structured and consists of isolated components to a sophisticated position that knowledge is complex and interrelated. The dimension, "stability of knowledge," can be characterized by a position that knowledge is absolute and stable over time on the one side and by a position that knowledge is subject to a constant process of development on the other side. The dimension, "source of knowledge," ranges from the position that there is an omniscient authority to impart knowledge to a position that knowledge is acquired through individual experiences. The dimension, "control of learning processes," describes a continuum ranging from the view that the ability to learn is fixed at birth to the view that the ability to learn is acquired through experience. The dimension, "speed of knowledge acquisition," extends from the view that learning is a process which succeeds on an ad-hoc basis or not at all to the view that learning is a gradual process. (Paechter et als, 2013, p. 2)

The five dimensions are reduced into two categories namely, (1) beliefs that refer to the nature of knowledge that is, 'structure, stability, and source of knowledge' and (2) beliefs that refer to learning processes and the acquisition of knowledge, that is, 'control of learning processes and speed of knowledge acquisition' (Paechter et als, 2013, p. 2). Investigating epistemic beliefs in the context of teaching and learning requires inclusion of both beliefs on knowledge as well as beliefs on the acquisition of knowledge. This is because any focus on 'the nature of knowledge' also activates interest on 'the nature of learning' (Paechter et els, 2013, p.2).

According to Arslantas (2016) 'beliefs are strong determiners of individuals' thoughts and behavior' (Arslantas, 2016, p.215). For this reason Arslantas (2016) argues educators should pay attention especially epistemological beliefs which 'are shown to be important in the learning-teaching process' (Arslantas, 2016, p.215)

Researchers are interested in the relationship between teachers' epistemic beliefs and their pedagogical beliefs (Williams, 2013, p.37). She cites (Lyons, 1990) to clarify that epistemological dimensions of teachers' beliefs comprise conceptions of themselves as knowers and conceptions of the nature of disciplinary knowledge they have to teach and the ways they believe it ought to be taught, their view of students' epistemic stances and their expectations about student in learning.

Green and Hood (2016) analyzed epistemic beliefs to fill the knowledge-gap since there is 'no previous published review of epistemic belief specific to teaching and learning psychology' (Green and Hood, 2016, p.4). According to Green and Hood (2016) critical perspective regarding new knowledge requires relatively sophisticated epistemic beliefs. This means that pedagogy of knowledge production in Kenya requires teachers

to possess sophisticated epistemic beliefs than those they use in default pedagogy of knowledge reproduction.

Arslantas (2016) traces the origin of study of epistemological beliefs as a 'branch of philosophy in education and psychology' in the work of Piaget which was based on genetic epistemology in the 1950s (Arslantas, 2016, p. 215). Piaget drew attention to this field of study 'in which philosophy and psychology are intersected by presenting his cognitive development theory that he defined with the concept of genetic epistemology.' Arslantas (2016) supports this claim by citing (Hofer & Pintrich, 1997; Schommer-Aikins, 2004). After Piaget the next significant founder of epistemic belief is Perry an educational psychologist in 1970. It was Perry who undertook the first studies in epistemic beliefs which defined as 'individuals' perspectives on what knowledge is, how it is acquired, its certainty, limitation and criteria' (Arslantas, 2016, p. 215). Perry identified four types of epistemological beliefs that teacher candidates have during their teacher education program namely; dualism, multiplism, relativism and commitment (Arslantas, 2016, p. 215). His focus group was male education students.

Another key personality in development of epistemic belief study is Schommer (1990) who tried to explain epistemic beliefs with a model of four dimensions namely: simplicity of knowledge, certainty of knowledge, quick learning, and learning being an innate ability. According to Arslantas (2016), Schommer (1990) defined epistemic beliefs as 'individual's subjective beliefs of the definition of knowledge and the way in which the process of acquiring knowledge takes place' (Arslantas, 2016, p. 215).

Yet another milestone was classification of epistemic beliefs is based on study by Magolda (1992) in a five-year longitudinal study similar to that of Perry, Magolda

focused on a sample of university students through interviews and open-ended questions reflecting on students' epistemic beliefs (Arslantas, 2016, p.215). Magolda (1992) located epistemic beliefs under four dimensions namely: absolute, transitional, independent, and commitment. Individuals who are absolutists believe knowledge is certain that experts know everything and students' duty is to memorize what is delivered by experts. The transitionists begin to realize experts are not omniscient that after all knowledge may not be certain or absolute. The independents believe most knowledge is content that is uncertain and experts are not the sole source of knowledge. Those who have committed epistemic beliefs recognize that knowledge is contextual, they believe some knowledge can be more valuable than some other knowledge depending on context and that certainty is not in the nature of knowledge. Individuals with highly developed epistemic beliefs think that knowledge is complex not simple, that knowledge changes, that learning takes time not suddenly, that ability is key and it can be improved thus learning is not fixed at birth as something innate (Arslantas, 2016, p.216).

Epistemic beliefs can change through social interaction and reflective thinking (Arslantas, 2016, p.216). There is a reciprocal relation between students' epistemic beliefs and their learning strategies they use to process knowledge. Epistemic beliefs influence how students study and the learning strategies they use affect formation of epistemic beliefs.

Cognition and meta-cognition are used but distinguished in study of epistemic beliefs. Cognitive skills are required in fulfilling a task but meta-cognitive skills play a role in understanding how the task is done. Meta-cognitive skills are better determiners of learning than intelligence thus cognitive impediments that limit students' learning process can be compensated for by cognitive awareness (Arslantas, 2016, p.216). Er

(2013) points at research which report that epistemic beliefs are directly linked to individuals' comprehension, meta-comprehension, persistence, and interpretation of information.

Arslantas (2016) focused study on the relationship between teacher candidates' epistemological beliefs and academic achievement. The findings were that teacher epistemic beliefs differ depending on area of study. Same findings were reported by Er (2013) who reported that students in the faculty of science and literature had a stronger belief that learning depends on effort not ability but those in faculty of education believed learning depends on ability and that there is only one unchangeable truth.

This study is not empirical qualitative research it is philosophical study that focuses on conceptual and logical argument to infer teacher epistemic beliefs necessary for pedagogical content knowledge of knowledge production. Cajigal (2010) did not specify epistemic beliefs but was focused on a wide range of beliefs namely epistemological, pedagogical and curricular. He did not seek to find out the relationship between epistemological and pedagogical beliefs. The study by Cajigal (2010) can guide in finding out incoming behavior of pre-service student-teachers so that interventions are made in their study experiences to guide them form useful beliefs.

This study intends to derive teacher epistemic beliefs from epistemology of CBC. These epistemic beliefs under the concept of pedagogical content knowledge are hoped to influence classroom instructional practices that will transform classrooms into sites of knowledge production.

In this literature review studies analyzed include Dewey's pragmatism, epistemic beliefs in personal epistemology, pedagogical reasoning and action, and pedagogical content knowledge. Most research uses empirical method in quantitative and qualitative

research design in description of teacher epistemic beliefs and their influence on pedagogical behavior. Philosophical analysis of epistemology and pedagogy is mainly in the theoretical framework in a few studies in the area of personal epistemology. Most textbooks on philosophy of education include analysis of knowledge which includes the three conditions belief, truth and evidence condition. But there is no analysis of epistemic beliefs as such. There is a need to analyze the belief condition of knowledge in terms of what beliefs both students and teachers hold about knowledge in various domains. Analysis of teacher epistemic beliefs in personal epistemology is done by administration of EBQ originally developed by Schommer (1990). Kenya is yet to participate in this new area of study on personal epistemology both in empirical and theoretical research. This study will contribute as philosophical theoretical research in Kenya on epistemic beliefs of classroom teachers for pedagogical aligned to curriculum of knowledge production which is intended in education reform under Kenya Vision 2030 and in CBC.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter discusses the methodology employed in this study. It clarifies the nature of philosophical research by demonstrating its uniqueness from qualitative research. Philosophical research is *sui generis*. It is neither quantitative nor qualitative research. Neither is it Mixed Method Research (MMR).

3.2 Philosophical Research Design

This study was in the area of philosophy of education. It employed philosophical research design. Research design in philosophy of education diagnoses general, fundamental and conceptual problems pertaining to educational policy, theory and practice (Popper 1963, Archambault, 1972; Randall, 1996; Dewey, 1966). Philosophical research design in education is appropriate in critical examination of logical, epistemological, axiological and ontological study in educational policy, theory and practice (Munk 1965; Kaufmann, 1966). Research design in philosophy is tailored to investigate conceptual and normative problems; it does not aim at addressing gaps in empirical factual knowledge (Golding, 2013; Oriare, 2007). Factual questions require empirical approach but philosophical questions are normative and conceptual. They attract rational reflection and evaluation, analysis and critical argument (Baskarada, & Koronios, 2017).

Philosophical research design examines problems arising from problem-situations which are outside philosophy for instance, in mathematics, politics, religion, social life, history (Popper, 1963). Popper (1963) used italics to state that: ‘Genuine philosophical problems are always rooted in original problems outside philosophy and they die if these roots decay’ (Popper, 1963, p. 72) He clarified that the primacy of philosophical

research design is *search* for philosophical problems in non-philosophical areas. He cautioned against preoccupation with methods in philosophy which is susceptible to the belief that philosophy is application (of whatever technique one has). The view of philosophy as application of a method degenerates into schools of thought where disciples of a method outdo each other in hairsplitting pseudo-problems. In such a case philosophers 'study' philosophy instead of being forced into philosophy by the pressure of non-philosophical problem-situation. Such non-philosophical problem situations may include political, historical or sociological questions; or issues arising in professional practice like medicine, research, education or in legal practice. In the Popperian view there are no pure philosophical problems. The caution by Popper (1963) against preoccupation with a method in research insulates philosophers against what Chamberlain (2000) called methodolatry.

Dewey (1946) was of similar view in advising that philosophers should shift from preoccupation with problems of philosophy and instead focus on *problems of men*. Problems of men mean issues outside traditional technical philosophical excogitations. Dewey (1916) had observed in a similar vein that: 'The student of philosophy "in itself" is always in danger of taking it as so much nimble or severe intellectual exercise – as something said by philosophers and concerning them alone' (Dewey, 1916, p. 353)

The non-philosophical context of philosophical problems accounts for the existence of philosophy of various disciplines for instance philosophy of religion, political philosophy, philosophy of science, philosophy of social science, research philosophy. This is the reason why philosophy is referred to as a second-degree (Collingwood, 1994) or second-order activity of inquiry (Oruka, 1991). Philosophical problems presuppose first-order activity of inquiry in a given experience of academic discipline or areas of professional practice. Activities undertaken in religion, science, history or

education are first order but when philosophy examines the presuppositions, methods, or assumptions of these activities it constitutes a second order activity of inquiry. Dewey (1973) argued that philosophy of education deals with philosophical problems as they arise in social practice such as education. Philosophical problems are questions about meaning, truth and logical relation of fundamental ideas. Such questions resist solutions via methods of empirical sciences (Woodhouse, 1993). This means that philosophical research design of education is a second order activity of study.

The research methods which a researcher is adept at determine the kinds of questions that will be studied (Ruitenberg, 2010; Oseghare, 1991; Caws, 1968). Just like sociological or historical methods cannot be imposed on research in chemistry, likewise non-philosophical methods should not be imposed on philosophical research (Kani & Saad, 2015). In the debate on the existence of African philosophy, Oruka (1991) explains how some philosophers used anthropological field-work to solve the problem of the existence of African philosophy. Their result was something called 'ethnophilosophy' which was neither philosophy nor anthropology. These philosophers are criticized for failure to get 'through anthropological fogs to philosophical grounds' (Oruka, 1991, p. 5). Research design in philosophy of education does not involve designing questionnaires or the coding of interview transcripts (Ruitenberg, 2010). Philosophical research design does not employ empirical experiments, survey, or statistics (Ross, 2011). Philosophical research design is focused on philosophical questions which are broadly normative and conceptual. The focus is on general and fundamental ideas presupposed in various areas of inquiry, practice or worldview (Worley, 2015; Oruka, 1991; Munk, 1965). Philosophical questions are not amenable to scientific empirical investigation (Radder, 1997; Randall, 1996). Philosophical research design seeks for ideal criteria of meaning and employs logical rigor in

reasoning to justify conclusions. Philosophical research seeks for deeper meaning of social practice by use of critical reflection and analysis of concepts and arguments rather than use of empirical data (Osorio, 2014).

Qualitative research focuses on data in form of texts (words) rather than on numerical data (Creswell, 2012). Philosophical research focuses on analysis of arguments and concepts rather than statistical analysis of data (Ruitenberg, 2010; Polkinghorne, 1983; Woodhouse, 1993). This is evident in analytical philosophy of education (Siegel, 2018). Analytical Philosophy of Education (APE) may focus on linguistic analysis but the focus is on normative conceptual clarification and elucidations of meaning of fundamental educational concepts, beliefs, arguments and assumptions (Siegel, 2018; Wingo, 1974; Popper 1963). Normative approach in philosophy is an inquiry into basic ideas and beliefs that enable us to form reasoned views on how educational issues should be approached (Wingo, 1974). Qualitative research is exploratory, it uses inductive reasoning. It is ideographic, contextual, ethnographic and focuses on case-studies (Siegel, 2018; Crewell, 2012; Chamberlain, 2000).

In strict sense philosophical methods allow for individual freedom of individual judgment to accomplish work at hand (Oseghare, 1991). This is because philosophy is personal, critical, second-order activity of reason not concerned with a consensus or a cosy unanimity of opinions (Oseghare, 1991). More importantly philosophers are more concerned with sensitivity to philosophical problems rather than a research method or technique (Popper, 1963). Philosophical method is like a ladder once it serves its use it is discarded (Wittgenstein). Fundamentally philosophical research is about reasoning and argumentation in solving problems (Kani & Saad, 2015). By use of logic philosophical inquiry proceeds by arguments and counter arguments, a dialectical process immortalized in Platonic dialogues (Maina, 2011).

Philosophical research addresses problems of conceptions not gaps in factual knowledge the latter belongs to empirical science. Golding (2013) raised the question: 'Must we gather data? His response was that there exists philosophical research which is not data dependent and therefore cannot be said to be quantitative or qualitative. He criticized quantitative and qualitative research for borrowing conceptual products from philosophical research yet failing to recognize the essence of philosophical research. Philosophy is about how things should be -conceptually, normatively and in praxis – rather than how things are (Golding, 2013). Philosophical problems are conceptual and normative; they do not by their nature require resolution through gathering empirical data. Though such data is important it tells what is the case rather than what should be (Golding, 2013; Radder, 1997). Philosophy is neither quantitative nor qualitative in its research paradigm (Golding, 2013; Ruitenberg, 2010). Philosophical research does not conduct empirical experiments, surveys, statistics (Ross, 2011; W.B.E., Vol 15). Decision to consider relevance of data collection in a study is based on the purpose of the study (Peersman, 2014). The purpose of this study was not to fill a gap in empirical knowledge; it was conceptual and normative. It therefore employed philosophical methods.

Philosophical research builds arguments on the available data of sciences but does not itself involve gathering data (Golding, 2013), thus Dewey (1973) defined philosophy as thinking of what the known demands of us. What is known to us is the knowledge of the world both natural and social phenomena as told by the sciences. The main task in philosophy is thinking, reasoning, not gathering and analyzing data. Philosophy is about taking a position and rationally arguing for it (Golding, 2013; Oseghare, 1991). It is not about what data will be gathered and analyzed but what position and argument

to take in a given issue. Evaluation in philosophy is about strength and validity of argument not quantity of data gathered (Golding, 2013).

Oancea & Orchard (2012) provides arguments on how philosophy should engage with government policy documents on education. The difference between policy documents and philosophy is that whereas the former is "technical, practical and instrumental" philosophy is "normative reflective and critical discipline." The role of philosophy is to address second-order questions, explore alternative approaches, tools and ways of analysis that can 'challenge or illuminate the treatment of first order questions' (Oancea & Orchard, 2012, p.589).

The article is useful in suggesting avenues for philosophers to engage constructively in dialogue with other critical and reflective resources in education. These may include: Opportunities for the engagement of philosophy and philosophers with policy and policymakers. Alternatively it might occur through planned, strategically determined public engagement activity, potentially enabling subtle shifts in the terms of public debates and in public perceptions of the issues at stake and their implications. The media offers another potential channel through which philosophers might provoke policy responses. Philosophical training (such as initiation into distinctively philosophical modes of argument and questions) tailored to the needs of policy makers at various stages of their career might also be a way of bringing philosophy and policy together. More direct influence is also possible, for example by taking advantage of opportunities for philosophers' participation in policy advisory committees and in parliamentary inquiries, or through their work with think-tanks and lobbying groups. (Oancea & Orchard, 2012, p.577)

Oancea & Orchard (2012) shed light on how philosophers in education should be contributing to educational theory, policy and vision which underlie practices in administration, pedagogy or curricular matters. For instance, the current research draws pedagogical implications from educational policy documents in Kenya. Such policy documents included the Kenya Vision 2030, Sessional Paper no. 14 of 2012 and National Education Sector Strategic Plan (NESSP) Vol. II (GoK, 2015). The focus is to analyze epistemological ground of the concept of CBC and its pedagogical implication for classroom teachers in Kenya. This is research is a second-order activity of study whose nature is critical reflection on fundamental epistemological and pedagogical assumptions of CBC in Kenya.

Philosophical research in education involves analysis of government educational policies by exposing their premises, consequences, and alternatives (Scheffler, 1966). The aim in philosophical research is to improve understanding of educational theory, practice and policy by clarification of conceptual apparatus used in education. It includes analysis and evaluation of logical structure of arguments in education. The aim is to expose assumptions, gaps in arguments and inadequacies in the structure of arguments in educational theory and policies. Philosophers are attracted by general concepts and argumentations underlying important decisions in education. The purpose is to test their rational base, expose untenable assumptions and analogies (Scheffler, 1966).

The rupture in educational research between quantitative and qualitative research, arises from dualistic philosophy of knowledge about objective world and human interpreted world (Heyting, 2001). The rupture engenders ‘paradigm war’ between quantitative-statistical, experimental paradigm and qualitative/ethnographic/exploratory paradigm (Siegel, 2018; Creswell, 2012). Whereas quantitative research deals with ‘hard data’,

qualitative research deals with ‘soft data’ (Allwood, 2012). Quantitative research is regarded as tough-minded experimental research but qualitative research is characterized as tender-mindedness (Chamberlain, 2000). Mixed Methods Research (MMR) attempts rapprochement between the two paradigms but this presupposes relaxation of the use of the term paradigm from Kuhn’s meaning. Philosophical research constitutes its own paradigm in its focus on conceptual, normative and argumentative problems (Radder, 1997).

Philosophical research does not tell us about the world, that is the realm of natural and social sciences (Dewey, 1966). Philosophy is second degree research that takes critical reflection on other disciplines in terms of their ontological, axiological and epistemological assumptions (Collingwood, 1994). This is evident in philosophy of natural science, philosophy of social sciences, philosophy of history, philosophy of behavioral science, philosophy of culture, philosophy of mathematics, philosophy of language, philosophy of religion, philosophy of art and philosophy of education. Philosophers have neglected research on ontological, epistemological and axiological presuppositions of quantitative, qualitative and MMR approaches to research. Much is said on ‘research philosophy’ but philosophical problems arising from research paradigms there is little if anything is said (Baskarada & Koronios, 2017). As Golding (2013) observed researchers borrow philosophical concepts but without doing philosophy. Allwood (2011) argues that the divide between quantitative and qualitative research is taken for granted. He believes this view is simplistic and misleading and requires critical scrutiny. His paper can serve as an example of the nature of philosophical research whose essence is taking a position and constructing critical arguments in its defense. He states: ‘I will argue and attempt to show different ways that the distinction between qualitative and quantitative research does not live up to (the

given) criteria' (Allwood, 2012, p.141). Qualitative research emerged as a reaction to limitation of statistical analysis of human phenomena. Wilhelm Dilthey's contrast between natural and human sciences provided the thought-model for the emergency of the two paradigms in the second half of the 20th century (1970s and 1980s). However, the binary thinking that divides the two research paradigms is fallacious because the distinction is fraught with contradictions and inconsistencies (Allwood, 2012).

My view is that the binary thinking in research constitutes fallacy of false-dichotomy and the idea of MMR is contradictory if the issues raised by Allwood (2011) remain unresolved. Allwood (2012) pointed out that the binary thinking in research precludes the possibility of creativity in innovative discovery of new or better research methods because it assumes any new research methods developed must fit the prevalent divide. This concern of Allwood (2012) is corroborated by Golding (2013) who argued that philosophy is neither quantitative nor qualitative, much less MMR. The preoccupation with application of available research methods without sufficient attention to the nature of research problems leads to methodolatry (Chamberlain, 2000). The fallacy of reductionism in qualitative methodolatry is evident in the assumption that any research method 'that does not involve statistical analysis' is qualitative (Chamberlain, 2000, p. 288). As if to defend theoretical research such as philosophy Chamberlain (2000) criticizes qualitative research for its lack theoretical reflection. There is avoidance of theoretical thinking in qualitative research, a kind of 'flight from theory'. (Chamberlain, 2000, p.291) continues to argue that:

> The dominance of method promotes obtaining and analyzing data as the primary objective of research, rather than thinking about the phenomenon under investigation and how it should be theorized.

The thinking that Chamberlain (2000) is referring to is critical thinking or reflexive thought about research which is second order thought akin to philosophical thought (Dewey, 1973). This suggests a new area of philosophical research to investigate theoretical presuppositions and limitations of thinking prevalent in qualitative and quantitative research. Unfortunately, philosophical methodology has not received adequate attention as a distinct branch of philosophy (Caws, 1968). Often the assumption is that study of logic equips one with normative principles of philosophical thought (Oriare, 2007).

3.3 Methodology of the Present

The present study was theoretical philosophical research (Radder, 1997). It focused on epistemological presuppositions, assumptions and pedagogical implications of CBC in Kenya. The present researcher found inspiration in engaging with policy documents on education in Kenya from Rorty (1998) who argued that fruitful and responsible discussion of educational policy inevitably leads to the underlying larger philosophic questions. These questions were found to be fundamentally epistemological, namely on the nature of theory of knowledge presupposed by Kenya government policy documents on CBC? Rorty (1998) is emphatic that theories of knowledge imply educational reform and educational policy is blind without explicit guiding philosophy.

This study employed Dewey's (four steps in research or philosophical thinking in problem-solving namely: Experience of difficulty. Location and definition of the problem, suggestion of a solution, and reasoning to justify the suggested solution as warranted assertibility. Golding (2014) has comparable steps in philosophical method or approach to philosophical problems.

The researcher began by general interest in reading the government policy document on the Kenya Vision 2030 (GoK, 2007). The striking concept was the need to modernize teacher education. The next government policy document was Sessional paper no 14 of 2012 which on chapter nine focused on teacher education where it is observed that in particular that most difficult element to change in the teaching profession is instructional practices (Gok, 2012). The need for pedagogical reform in teacher education in Kenya was expressed in government policy namely National Education Sector Plan (GoK, 2015). Report by Kenya Institute on Curriculum Development (KICD, 2018) on implementation of CBC observed that teachers had pedagogical challenges in adapting to the new demands of CBC. Reflecting on the notes formed from analysis of these government policy documents the research wondered what literature review could shed light on the relationship between curriculum reform and pedagogy. Sessional paper no 14 of 2012 suggested that scholars in Kenya have not kept abreast with recent pedagogical research. The current research began a general search on the internet on modern scholarship on pedagogy. This general reading eventually narrowed on the scholarship in a new area called personal epistemology. This area is psychological study which presupposes that pedagogy is enactment of teacher's epistemic beliefs. It is predominantly quantitative-based research. The main research instrument is epistemological belief questionnaire which is used to collect empirical data to test the general theory of personal epistemology. No such study was found to be done in Kenya though some African scholars in Tanzania and Ghana had carried such studies.

The researcher wanted to establish a normative criterion of epistemic beliefs which teachers in Kenya should espouse in order to enact pedagogy aligned to CBC as required by government policy documents. The researcher therefore believed empirical

research was not the appropriate focus. The gap was felt in lack of knowledge of requisite epistemic beliefs for enactment of what government policy documents called appropriate pedagogical approaches for CBC. To administer epistemological belief questionnaires on Kenyan teachers who reveal the espoused epistemic beliefs but could not tell the desirable epistemic beliefs for CBC. The way to establish appropriate epistemic beliefs for pedagogy of CBC was to derive them logically from epistemology of CBC as conceptualized in Kenyan policy documents.

The researcher formulated this as the first research objective to examine theory of knowledge undergirding CBC. The description of competencies required in the new curriculum resonated with Dewey's theory of knowledge, curriculum and pedagogy. One policy document on CBC suggested that Dewey is associated with constructivist pedagogy and therefore relevant in Kenya. The research question sought to find out whether theory of knowledge of CBC is related to Dewey's. From the findings of the first research objective the research formulated the second research objective which was to derive the implications of epistemic beliefs from epistemology of CBC. This was a central part of this study. The epistemic beliefs that were logical derivatives of theory of knowledge of CBC were to be ideal for espouse of Kenyan teachers. Going by central theory of personal epistemology that epistemic beliefs are enacted in classroom pedagogy the researcher undertook to demonstrate that enactment of epistemic beliefs is not mechanical but should involve reasoning. The reasoning involved in enacting epistemic beliefs in the entailed pedagogy is called pedagogical reasoning. This kind of reasoning is articulated by Schulman (1978) in his concept of pedagogical content knowledge. This led the researcher to formulate third research objective which sought to demonstrate by argument how through pedagogical reasoning implied by concept of pedagogical content knowledge teachers in Kenya can

enact the ideal epistemic beliefs from epistemology of CBC in pedagogical approach anticipated by Kenya policy documents on CBC.

It is clear that the problem-situation was located in reading government policy documents on the need for pedagogical reforms in line with the new curriculum. This led to the definition of the problem of this research namely how to find epistemic beliefs for teachers to be enacted in pedagogy for CBC. The suggestion was made that this can be done by analyzing epistemology of CBC and deriving from it the implied epistemic beliefs. This suggestion was worked out and it further revealed that epistemic beliefs require pedagogical reasoning for their enactment.

3.4 Data Collection

The researcher visited libraries including Blessed Allamano library of Consolata Institute of philosophy, Nairobi. Pope Paul the sixth library of the Catholic University of Eastern Africa, Nairobi. Post-Modern library of Kenyatta University, Nairobi and Margret Thatcher library of Moi University, Eldoret. The first two libraries were found useful because they had relevant most recent documents for this research. Moi university library was useful for online resources but Catholic University of Eastern Africa had more accessible online resources. The government policy documents like Vision 2030, GoK (2012), NESSP (GoK, 2015), Gok (2017), GoK (2017a) were accessed online on free access websites. Other scholarly documents related to epistemic beliefs and pedagogical content knowledge included academic doctoral degree theses, masters' degree dissertations, and published articles in refereed scholarly journals. Other sources included reference works like Routledge encyclopedia of philosophy, Encyclopedia Britannica, and online Stanford encyclopedia of philosophy of education.

This chapter discussed the nature of philosophical research. Specifically, this study was anchored on Dewey's theory of knowledge which informed critical analysis of Kenya's government policy documents on CBC reforms. The aim of this approach was to draw logical conclusions and recommendations for pedagogy of CBC in Kenya. Philosophical research is not an exemplar of qualitative research. The essence of philosophical research lies in logical rigor of normative analysis of argument and elucidation of fundamental concepts presupposed by policy, theory, practice or science. The researcher has described the method he employed which was critical study of government policy on the new curriculum in Kenya. The researcher articulated how he went about formulating and working on the three research objectives which have a logical relationship. This research was speculative, normative and logical argument in defending the thesis on teacher's epistemic beliefs for pedagogy of CBC which means pedagogy of formulating subject matter in terms of learner's experiences.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents the data, analyses, interpretations and discusses research findings based on the three research questions and the respective research objectives. The chapter is subdivided into three sections with respect to the three research questions and corresponding research objectives.

4.2 Research objective one: Analysis of theory of knowledge underpinning CBC in Kenya in light of Dewey's theory of knowledge.

This first section of chapter four is based on the first research objective and the corresponding research question. The research objective was: To examine whether theory of knowledge underpinning CBC is based on Dewey's theory of knowledge. The corresponding research question was: Is the theory of knowledge underpinning CBC based on Dewey's theory of knowledge?

The need to unearth theory of knowledge for CBC is meant to avoid the fallacy of nominally accepting one educational philosophy while in practice accommodating ourselves to another. Dewey (1916) observed that it is a challenge to undertake the task of curricular reorganization and in particular to keep at it persistently. The curricular shift in Kenya's basic education can be likened to the Copernican revolution in astronomy due to its paradigmatic shift with emphasis on knowledge construction rather than knowledge transmission (GoK, 2007). The intended curricular shift in education reform in Kenya is endocentric or learner-centered in its emphasis on learners' developing core competencies namely: communication and collaboration; critical thinking and problem solving; creativity and imagination; citizenship; digital literacy;

learning to learn; and self-efficacy (GoK, 2017b). To borrow Dewey's words, we can state that (Dewey, 1990, p. 34):

> Now the change which is coming into our education is the shifting of the center of gravity. It is a change, a revolution, not unlike that introduced by Copernicus when the astronomical center shifted from the earth to the sun. In this case the child becomes the sun about which the appliances of education revolve; he is the center about which they are organized.

CBC in Kenya is a radical curricular shift from knowledge transmission to knowledge construction and application (GoK, 2017b). It is a paradigm shift from merely recycling transmitted knowledge to learner's construction, generation, adaptation, reconstruction and utilization of knowledge in innovative ways. Curriculum of knowledge transmission can be referred to as 'old education' (Dewey, 1990). Characteristics of 'old education' include learners' passivity of attitude, mechanical massing of children, uniformity of curriculum and instructional method. The center of gravity of the curriculum for knowledge transmission is 'outside the child'. It is 'in the teacher, the textbook' but not 'in the immediate instincts and activities of the child himself' (1990). The shift to child-centered CBC calls for modernizing pedagogical approaches in classroom instructional practices (GoK, 2007).

The pedagogical imperative of the CBC is that the life of the child becomes the all-controlling aim. But Dewey (1990) aware of possible misunderstanding of that statement poses the question: 'If you begin with the child's ideas, impulses, and interests…how is he going to get the necessary discipline, culture, and information?' Dewey responds that it is not about exciting and indulging 'these impulses of the child' nor are we 'to ignore and repress these activities' rather we 'can direct the child's activities, giving them exercise along certain lines, and can thus lead up to the goal which logically stands at the end of the paths followed' (Dewey, 1990, p. 37).

However according to the theory of this study such a shift cannot be realized unless teachers are enabled to reflect on their epistemic beliefs which influence their pedagogical practices. Since epistemic beliefs are derivatives of a theory of knowledge undergirding the curriculum this section will attempt to analyze theory of knowledge presupposed by the CBC in Kenya.

Herbert Spencer raised the classical question which demonstrates the epistemological base of curricular choices, namely: What knowledge is of most worth? The selection of curriculum content is in response to Herbart Spencer's classical question: What knowledge is of most worth? Dewey (1973) commented on Spencer's thesis by stating that 'utility is the criterion by which we should select the materials which form the curriculum of the school.' CBC in Kenya requires learners to learn how to use acquired knowledge and skills (KICD, 2018). This comment suggests a pragmatic epistemological ethos of curriculum. Knowledge is of most worth judged from needs assessment of social, economic and political ideology of a given nation at a given time and circumstance. What knowledge is of most worth under the ideology of Vision 2030 in Kenya? The response is given in Sessional Paper no 14 of 2012 in calling for curricular shift from knowledge reproduction to CBC for knowledge application. It is a shift from mental accumulation of facts, information, theories and concepts to competency on how to continuously construct/generate/create and reconstruct knowledge for use in novel situations and problems in real life. It is about learning how to learn rather than learning a specific concept to be regurgitated for examination and thereafter forgotten.

In Kenya under the ideology of Vision 2030 curricular decision is made in favor of knowledge creation towards making Kenya a knowledge-based society. Curriculum is planned and designed in terms of the knowledge which every society deems fit its

learners. Hence curriculum development entails decision-making on the nature, and level of content that learners should acquire through education (Okello & Ocheng, 1996).

Epistemology or theory of knowledge is a cornerstone of curriculum (Mugisha & Mugimu, 2012). Curriculum needs a theory of knowledge (Young, 2013). Theory of knowledge in philosophy is epistemology. The role of epistemology in education is to analyze and demonstrate how knowledge appears in the curriculum. It clarifies the nature of knowledge, its sources, types and it assesses grounds for justifying knowledge claims. Selection and organization of forms of knowledge in curriculum is a function of planners and designers of curriculum who make decisions based on their understanding of various forms of knowledge. Deliberations on development of curriculum are therefore epistemological. It is a choice of what learners should come to know through educational experiences (Okello & Ochieng, 1996). Curriculum is designed as means to transmit knowledge and to lay foundation for knowing and meaning construction (Mugisha & Mugimu, 2012). Kirschner (2009) linked epistemology with curriculum by arguing that epistemology of most sciences is based on experimentation and discovery and as such it should be part of any curriculum aimed at producing future scientists. However, school curriculum is not aimed at producing future scientists but to develop and foster certain powers in learners.

Lack of curricular theory of knowledge misleads curricular theorists to focus on issues of power and politics to the neglect of the core business of schools (Deng, 2015). Young (2013) advocates for a knowledge-based approach to curriculum which require curricular theorists to begin by addressing the question on; ‘what students have an entitlement to learn.’ This approach focuses on the central purpose of schooling which is to enable students to access formal disciplinary knowledge as a means to transcend

their particular experiences in gaining understanding of the world. This is called 'powerful knowledge.' This approach of curriculum design requires re-contextualizing academic discipline into a school subject by selecting, sequencing and pacing academic knowledge in terms of coherence of the discipline and development of the learners. These two considerations of curricular development are termed by Dewey respectively as logical and psychological dimensions of curriculum. Deng (2015) opines that a crisis of curriculum occurs in the absence of theory of knowledge to undergird it. The selection of content or subject matter i.e knowledge selected for teaching and learning in curriculum requires an epistemological grounding.

School subjects are derivatives of academic disciplines for the aim of school subjects is development of the intellectual and moral powers of learners (Deng, 2015) or what Dewey calls dispositions or habitudes. Curriculum and pedagogy are therefore inter-related and should be enacted in harmony. However educational systems innovate as if these two are independent of each other (Bernstein, 1975). This occurs when pedagogical innovations are planned without relation to curriculum. For instance, teachers may use a particular pedagogical approach simply because they were told to do so, this misaligns pedagogy to curriculum leading to a misaligned system of education. The relation between curriculum and pedagogy is analogous to 'the intimate connection of philosophy and education'. In that connection Dewey (1916) stated that philosophy of education is (Dewey, 1916, p. 331)

> not an external application of ready-made ideas to a system of practice having a radically different origin and purpose: it is only an explicit formulation of the problems of the formation of right mental and moral habitudes in respect to the difficulties of contemporary social life.

The contemporary difficulty or problem in education reform in Kenya is 'the problem of formation of right mental … habitudes' for learners to become knowledge producers

and its competent users. The role of schooling is to enable learners to acquire powerful knowledge in academic discipline which are organized as school subjects. Academic disciplines are resources for achieving the aim of schooling; they do not end in themselves. In using academic discipline in curriculum, a theory of knowledge is required to 'differentiate different forms of knowledge but also to elucidate the concepts, principles, methods of inquiry and habits of mind within a particular knowledge form for the development of students' intellectual and moral powers' (Deng, 2015, p. 775).

Teacher's epistemic beliefs are habits of mind in teaching and learning. This theory of knowledge guides how curricular content is selected for the educational purpose of unlocking potential of learner's development or what Dewey calls psychologizing content. Theory of knowledge is necessary in curricular customization of academic disciplines which are employed as resources 'in the service of students' in the development of intellectual powers and moral dispositions' (Schwab, 1973, p. 515 as cited by Deng 2015, p. 776). Academic disciplines are not per se a model to which curriculum must conform or adapt (Deng, 2015). Curriculum making is therefore not merely re-contextualizing of academic discipline in school subjects as Young assumed rather it is appraisal of disciplinary content or substantive structure (essential concepts, principles, theories) and syntactic structure (modes of inquiry, canons of evidence and ways of proof) in terms of their educational potential for fostering intellectual and moral dispositions.

The curricular deliberative work must be done circumscribed by the four curriculum commonplaces namely the subject matter, the learner, the teacher and the milieu (Schwab 1983 as cited by Deng 2015, p. 776). Deng (2015) argued that curriculum making must begin with an understanding of learners – their background, interests and

needs-as an essential starting point. This point is at the heart of Dewey's foundation of education namely that the child as he comes to us is the point from which we start, that is the beginning of education is based on the natural resources of the child which are the innate capacities, dispositions, and impulses without which it would be impossible to educate him (Dewey, 1973) not the subject matter.

The disciplinary knowledge of the scholar is thus treated as a resource of education but not as a model for it. In curriculum making the process of selecting and translating contents of academic discipline for their educational potential is guided by interpretive categories of the end in use. The use of academic disciplinary material for educational value is not meant to make students scientists, mathematicians or historians but rather they are means or resources for educating learners according to the goals of education in the society. Sessional Paper no 14 of 2012 (GoK, 2012) under ideology of Kenya Vision 2030 points out that education is charged with the task of equipping learners with competences for 21st century knowledge-based society. Learners should be able to (GoK, 2012, article, 1.3)

> engage in lifelong learning, perform more non-routine tasks, be capable of more complex problem-solving, be able to take more decisions, understand more about what they are working on, require less supervision, assume more responsibility and as vital tools towards these ends, have better reading, quantitative reasoning and expository skills.

The 21st century competencies of knowledge-based-economy captured in the above citation suggest Dewey's idea of 'reflective experience', 'thinking in experience' or 'learning from experience' (1916). The idea of experience has two phases: the active and passive. The active phase is experimental, the passive phase is instructive, the connection between the two phases is reflective-thinking. Only then does experience become reflective, meaningful and educative. The active phase of experience is when

we try to do something that is when ‘we act upon it’ or when ‘we do something with it’ this is akin to idea of experiment. We want to find out what happens when we do something. The passive phase of experience is the consequence we ‘we suffer or undergo’ (Dewey, 1916, p. 139). Mere doing something and suffering the consequence without understanding the connection between the two phases of experience is to engage in meaningless activity. It is to perform routine monotonous tasks. Learning from experience involves intelligent grasp of the connection between activity and consequence, cause and effect. Only then we ‘learn something.’ The connection between the two phases of experience is grasped by thinking or reflecting on how the consequence is produced by the antecedent conditions.

Thought, reflection or thinking is the discernment of the relation between what we try to do and what happens in consequence. No experience is meaningful without ‘some element of thought.’ The method of trial and error is blind it is a hit and miss process. In such a case we see that a certain way of acting and a certain consequence are connected ‘but we do not see how they are’ related. This method is conjectural where we learn by making mistakes (Popper, 1963). However, with reflection we grasp what lies between so as to bind together cause and effect, activity and consequence. This provides insight and with it we control future experience, insight becomes foresight. In this way experience gains meaning it becomes reflective or thoughtful. Thinking or reflection is the intentional endeavor to discover specific connections between something which we do and the consequences which result, so that the two become continuous. The experience of doing something is therefore understood and the worker can now ‘perform more non-routine tasks’ and ‘is able to understand more about what they are working on, will require less supervision and assume more responsibility’ (GoK, 2012, article, 1.3).

Dewey's theory of 'reflective experience' is therefore useful in a CBC where learners need to be reflective and thoughtful in what they are doing. Learners acquire competency in solving problems by trial and error; conjectures and refutation methods. Mistakes become learning experiences (Popper, 1963). Teaching ceases to be 'routine and capricious behavior' since the teacher no longer accepts what has been customary as a full measure of possibility like in the attitude of let-things-continue-just-as-I-have-found-them-in-the-past. Such a teacher refuses to acknowledge responsibility for the future consequences which flow from present action.

Academic disciplinary material should be assessed and appraised in terms of their usefulness in cultivating and fostering these competences in learners. Dewey's pragmatism is a theory of justification of knowledge. He views knowledge from a practical utilitarian perspective. He writes that 'knowledge is a perception of those connections…which determine its application in a given situation' (Dewey, 1916, p. 340). It is in this context that he states that his theory of knowledge is called pragmatic. This theory holds that 'knowledge in its strict sense of something possessed consists of our intellectual resources – of all the habits that render our action intelligent.' The essential feature of pragmatic epistemology is that there is continuity of knowing with an activity which purposely modifies the environment. Knowledge consists of the dispositions we consciously use in understanding what happens when we apply it. Therefore, knowledge consists in its active use with a view to solving a problem.

Klafki (2000) is in agreement with Dewey in viewing academic disciplinary knowledge as a curricular resource and not source of curriculum. When academic disciplines become sources of curriculum then education is mere transmission or imposition of ready-made knowledge. It becomes teacher and content centered. It can be argued that this is the basis of the curriculum of knowledge-reproduction and pedagogy of

imposition or what Freire (1972) called ‘banking concept of education’ which suffers from narration sickness. Education for knowledge-reproduction or memorization was condemned by Whitehead (2008) as a ‘radical error which bids fair to stifle the genius of the modern world’ where teachers ‘pump into minds of a class a certain quantity of inert knowledge’ (Whitehead, 2008, p. 5)

Kirschner (2009) elaborates inert-knowledge as what is learned but cannot be accessed for problem solving. Whitehead (2008) identified this as ‘one of the most fatal, erroneous, and dangerous conceptions ever introduced into the theory of education.’ He poses the question ‘what is the point of teaching a child to solve a quadratic equation?” The traditional response Whitehead states goes something like this: that the mind is an instrument which needs first to be sharpened in order to be used later. Thus ‘the acquisition of the power of solving a quadratic equation is part of sharpening the mind.’ Whitehead (2000) condemned this belief as ‘analogy of mind as a dead instrument.’ His golden rule of education is as follows (Whitehead, 2008, p. 6):

> The mind is never passive, it is a perpetual activity, delicate, receptive, responsive to stimulus. You cannot postpone its life until you have sharpened it. Whatever interest attaches to your subject matter must be evoked here and now; whatever powers you are strengthening in the pupil must be exercised here and now; whatever possibilities of mental life your teaching should impart must be exhibited here and now. That is the golden rule of education, and a very difficult rule to follow.

This rule is in agreement with Dewey (1916) who argued that education is not preparation for life but life itself. Dewey (1916) was of similar critical view of empiricism as theory of knowledge which constructs learners as passive recipients of sense impression. This theory made learners mere passive spectators. Dewey (1916) used an example of ordinary observation of a child who is also actively interacting with objects in his environment. This belies the empirical theory of passive recipients of

sensation. Thus mere stimulus variation is not adequate to engage the learner if traditional empiricism is the guiding theory in pedagogy.

Deng (2015) captured the ideal of CBC by requiring academic knowledge to serve as a means of expressing, exercising and intuiting powers and must therefore be used in the service of fostering intellectual and moral habits (competencies) in learners. The selection of curricular material from disciplines and other resources must be tempered by reference to specific powers to be evoked, developed and sustained within the experiences of the learner.

Deng (2015) debunks Young's idea of building curriculum based on what all students are entitled to know instead he advocates for curriculum based on intellectual and moral dispositions or powers that all students need to develop. This requires a theory of knowledge that facilitates encounter between curricular content and pedagogy responsive to learners' experiences. The curricular theorists need awareness of expectations and demands placed on the current generation of learners so that they select, organize and transform knowledge into a curriculum that opens opportunities for learners to cultivate intellectual and moral dispositions desirable in the twenty-first century. The basis of curricular making is the vision of education centered on national ideology of development.

In Kenya under the ideology of Vision 2030 competences and skills of generating and using knowledge for social, economic and political development are privileged (Otieno 2017; GoK 2015; GoK 2012; GoK 2007). School subjects need to be reconstructed by shifting the emphasis from transmitting knowledge to cultivating desirable competencies such as developing higher-order thinking, critical thinking, innovative

creativity and imagination which are necessary for a knowledge-based society (GoK, 2017b; Deng 2015).

Deng (2015) concludes that curriculum making requires a theory of knowledge that differentiates types of knowledge and elucidates the problems, concepts, theories and methods of inquiry within a particular knowledge type which contributes to the cultivation of intellectual and moral capacities. This theory of knowledge should inform the process of selecting curriculum content. Since the purpose of education is to develop students' intellectual and moral habits, disciplinary knowledge should not be seen as an end in itself or something for transmission but should be a powerful educational resource.

Every curriculum has an explicit or implicit theory of knowledge. What theory of knowledge is presupposed by CBC? To address this question, we have to be informed by policy documents from which CBC is proposed. CBC is about a constructivist approach to teaching in order to enable learners to create and use knowledge. Six constructivist learning theories are discussed in Basic Education Curriculum Framework (GoK, 2017b) such as Dewey's social constructivism, Vygotsky's social-cultural development theory, Gardner's multiple intelligence theory, Piaget's cognitive development theory, Bruner's cognitive development theory and Erikson's theory of psychosocial development (Gok, 2017b).

Hattie is claimed to be a more recent proponent of constructivist theories. No explicit support is provided for selection of the six constructivist theories however a point is made that: 'In constructivism, the learner builds a personal interpretation of the world based on experiences and interactions, and learning is a process of constructing knowledge rather than acquiring or communicating it' ((GoK, 2017b, p. 3). The terms

‘experiences and interaction’ are reminiscent of Dewey’s ‘two principles of continuity and interaction’ which are the criteria of the value of experience (Dewey, 1938). The principle of continuity means that what is learnt as knowledge or skill in one situation becomes an instrument of understanding and dealing effectively with subsequent situations (Dewey, 1938). This captures the technical definition of education as ‘reconstruction or reorganization of experience which adds to the meaning of experience and which increases ability to direct the course of subsequent experience’ (Dewey, 1916, p. 76). Dewey (1948) is emphatic that the continuous reconstruction of experience is the only end of education. In other words, the best that can be said of any process of education is that it renders the learner capable of further education. This means that acquisition of skills, knowledge, and culture does not end in themselves but they are ‘marks of growth and means to its continuing’ (Dewey, 1948). Principle of continuity is about continuous reconstruction of experience in dealing with subsequent experience where carryover experience is brought to interact with the new situation.

Principles of continuity and interaction in their active union with each other provide the measure of the educative significance and value of experience. This point should be interpreted in light of the curricular shift to competency-based learning based on learner’s experiences (GoK, 2012). It is a point which is central in Dewey’s pragmatic theory of knowing based on reconstructing experience and learner interacting with the curriculum actively instead of passively receiving it. Basic Education Curriculum Framework recognizes Dewey as the first constructivist and in this study; Dewey is employed to provide epistemological grounding for CBC.

If knowledge is an immobile solid it has to be liquefied. It has to actively mobile in all the currents of society. Knowledge is not a preserve of some ‘high-priesthood of learning’ it is a social construct for social use (Dewey, 1990). CBC ensures every

learner has access to knowledge as a social, economic and political resource. Education should introduce and train each learner into social membership saturating him with the spirit of service providing him with instruments of effective self-direction and self-efficacy. This social view of knowledge creates ‘a larger society which is worthy, lovely and harmonious’ (Dewey, 1990, p.25).

Dewey’s theory of social constructionism is premised on his belief that man is a social animal and the heart of man’s sociality is in education (Dewey, 1948). Education as a process is life itself not preparation for life. This underscores the urgency and necessity of education for existential needs of here and now not preparation for some remote use of what is learnt. Education in its broad sense means ‘social continuity of life’ (Dewey, 1916, p.49). Social group or community sustains itself through continuous self-renewal by means of educational growth of its young. Formal education is intentional means through which ‘a delegated special group of persons’ are charged with teaching certain things via explicit materials or subject matter to the learners. Through education the society transforms learners from social aliens into robust trustees of its own resources and ideals. Chapter two of Dewey’s Democracy and Education (1916) is entitled ‘Education as a social function.’ Education is described as a process and activity of ‘shaping, forming, molding’ learners ‘into the standard form of social activity’ (Dewey, 1916, p. 10). This captures etymological definition of the word education as ‘a process of leading or bringing up,’ ‘rearing, or raising’ ‘a fostering, a nurturing, a cultivating process’ of the young by the social group ‘into its own social form’ (Dewey, 1916, p. 10).

Knowledge is constructed in a social environment of conjoint activity with others. An individual learner partakes or participates in some conjoint activity in association with others. Knowledge is constructed in an activity where learners appropriate an activity

in its social purpose with its methods and subject-matter acquires needed skill and is immersed in the social emotion of the group. Learners construct knowledge when engaged in activity in common with others whereby individual activity is directly modified by knowledge of what others are doing (Dewey, 1916).

These ideas are at the core of constructivist learning theory as elaborated in basic education curricular framework (GoK, 2017b). Fundamental principle of knowledge construction is that things gain meaning by being socially used in shared experience of co-joint action (Dewey, 1916). For instance, the Greek word helmet is better known when the learner grasps the meaning in terms of the activity in which the helmet is used. When he hears or reads, he/she rehearses imaginatively the activities in which the helmet has its use. The learner becomes mentally a partner with those who used the helmet. He engages imaginatively in a ‘shared activity’ in ‘an action having a common interest and end’ (Dewey, 1916).

The social medium of constructing knowledge neither implants certain desires and ideas directly but it sets conditions by which the learner is made a sharer or partner in the associated activity of the group so that his experience has emotional relation to the group. He will be alert to the ends of the social group and the means employed to secure a success. The beliefs and ideas acquired will be similar to those of other members of the group. The knowledge constructed is common with others since that knowledge is an ingredient of his habitual pursuits (Dewey, 1916). Knowledge, beliefs and ideas acquired by a learner should not alienate but rather transform individual to partake in the interests, purposes, and ideas current in the social group.

Social environment is the medium of a learner's construction of knowledge. What a learner knows or can know depends on the expectations, demands, approvals and

condemnation of others. A learner cannot perform his own activities without taking the activities of other learners and teachers into account. They provide indispensable conditions of realization of his tendencies.

According to Sessional Paper no 14 of 2012 article 6.1 (GoK, 2012) states that the Kenya Vision 2030 embodies national goal of education whose focus is to enlarge learner's knowledge, experiences and imaginative understanding as well as developing an awareness of moral values and capacity for life-long learning. The article continues to assert that at 'the heart of this vision is a curriculum which will provide knowledge, skills, competences and values to enable learners to move seamlessly from the education system into the world of work' (GoK, 2012, article, 6). Further academic, technical and vocational education is required to add value to what has been acquired through education. Article 6.1 (GoK, 2012) agrees with Dewey's technical definition of education as 'reconstruction or reorganization of experience which adds to the meaning of experience and which increases ability to direct the course of subsequent experience' (Dewey, 1916, p. 76). The goal of education in Kenya Vision 2030 focuses on enlarging experiences much so does Dewey's definition of education in terms of a new philosophy of experience (Dewey, 1938, p. 51). This definition of education is elaborated by Dewey, what is learned as knowledge or skill in one situation becomes an instrument of understanding and dealing effectively with situations that follow. The process goes on as long as life and learning continues (Dewey, 1938).

In describing what he calls traditional education Dewey (1938) is useful to clarify theory of knowledge undergirding CBC. For example, CBC is a shift from traditional education which was based on imposition of knowledge from above and from outside the learner's experiences. It created a gap between capacities of the learner and the subject matter, methods of learning and behavior which were alien to the learner.

Learning was to acquire what was in books as something static and immutable. The details of contrast between traditional and CBC helps to sharpen the epistemology of the CBC. CBC rejects imposition of knowledge from above it instead it fosters expression and cultivation of individuality of each learner; it fosters free activity; and instead of learning from texts and teachers, CBC fosters learning through learners experience; instead of acquisition of isolated skills and techniques by drill, CBC fosters acquisition of competencies by means of attaining ends which make direct vital appeal to learners interests, needs, talents, abilities. CBC does not aim at preparation of learners for a more or less remote future but rather it enables learners to make the most of the opportunities of present life through learning experiences (Dewey, 1938).

This contrast by Dewey of two types of education was taken up by Crowe (1985) who used the theory of Bernard Lonergan to distinguish learning from above down-wards and learning from below-upwards respectively. Crowe (1985) raised the question on whether the two types of education are mutually exclusive or complementary. His thesis is that the two types of education are complementary and can be reconciled or united as tradition and innovation, gift and achievement, heritage and development, docility and learner creativity. He used Lonergan's levels of consciousness to work a unity of the two types of education. These levels are experience, understanding, reflection (and judgment) deliberation (and decision). The four levels are concerned with data, intelligibility, truth and values.

Freire (1972) in rejecting what he called 'banking concept of education' demonstrated how it produced a dialectical opposition between teacher and learner (Freire, 1972): The teacher teaches and the students are taught. The teacher knows everything and the students know nothing. The teacher thinks and the students are thought about. The teacher talks and the students listen – meekly. The teacher disciplines and the students

are disciplined. The teacher chooses and enforces his choices, and the students comply. The teacher acts and the students have the illusion of acting through the action of the teacher. The teacher chooses the program content, and the students (who were not consulted) adapt to it. The teacher confuses the authority of knowledge with his own professional authority, which he sets in opposition to the freedom of the students. The teacher is the Subject of the learning process, while the pupils are mere objects.

The banking concept of education is useful in demonstrating the malaise of curriculum of knowledge reproduction and its attendant pedagogy. Freire (1972) observed banking education mirrors 'oppressive society.' Students memorize mechanically the narrated content of the teacher. Students become containers, receptacles to be filled by the teacher's narration. Students are appraised as good if they serve meekly as receptacles. Freire (1972) elaborated that education 'becomes an act of depositing, in which the students are the depositories and the teacher is the depositor' (Freire, 172, p.59). Students patiently 'receive, memorize, and repeat' the scope of action allowed to students extends only as far as receiving, filling, and storing the deposits. The robbed of creativity, transformation and are objectified as absolutely ignorant. Knowledge is a gift which the teacher bestows to students who know nothing (Freire, 1972, p. 58))

However, in opposition to dialectical opposition created by banking education, Freire (1972) proposed problem-solving education which is similar to CBC. Knowledge emerges only through invention and re-invention, through restless, impatient, continuing, hopeful inquiry that learners pursue in the world, with the world, and with each other. This latter statement captures Dewey's idea of social constructivist theory of knowledge as underscored by twin principles of continuity and interaction (Dewey, 1938).

Kirschner (2009) is yet another scholar who contrasts two ideological factions in education one faction argues for all teaching and instruction to be based upon classical sage-on-the-stage, expository and didactic approaches to universal truths. The other faction is social constructivists who believe learners can only learn by constructing their own knowledge. Kirschner (2009) believes neither faction has plenitude of 'truth' rather it lies in the middle. This view is reminiscent of that of Dewey in pointing out the gap between traditional and progressive education (Dewey, 1938, p.14).

The shift to CBC (GoK, 2012) requires theory of knowledge of curriculum, a theory of experience so that it becomes a curriculum of, by and for experience of learners (Dewey, 1938). Learners experience is the base for deciding upon subject-matter, methods of instruction and school discipline. Primary responsibility of educators is to recognize in the concrete surroundings what is conducive for learners to have educational experience. The educator should utilize the surroundings, physical and social so as to extract from them what they have to contribute in building up worthwhile experiences for learners. Teacher's role is to organize the conditions under which learners are to have experience in the right direction. Dewey asserts that human experience is ultimately social; it involves interaction and communication with others. The teacher has moral responsibility to put his wider experience at the disposal of fostering worthwhile experiences for learners.

Dewey's theory of knowing is pragmatic, it integrates knowing with doing. Knowing is judged from the actual scientific procedure of inquiry it integrates theory and practice. Doing or activity is at the heart of knowing. Pragmatism wholeheartedly surrenders separation of knowing and doing. They are two sides of a coin. The integration of knowing and doing facilitates fruitful interaction between cognition and practice (Dewey, 1938). Pragmatism focuses on how authentic beliefs can operate

fruitfully and efficaciously in connecting with practical problems that are urgent in actual life (Alexander, 2006).

'Pragmatic' is the term Dewey (1916) used to describe theory of knowledge. It maintains continuity of knowing with learning activity. Pragmatic theory of knowledge conceptualizes knowledge as an intellectual resource used to enable us to adapt the environment to our needs and to adapt our aims and desires to the situation in which we live. Dewey conceptualizes knowledge as a dynamic act in which dispositions are applied 'to straightening out a perplexity.' Perplexity is a problematic situation that creates disequilibrium between 'ourselves and the world in which we live' (Dewey, 1910). Knowledge is not something we possess passively but it consists of the dispositions we consciously use in understanding what now happens. By conceiving the connection between ourselves and the world in which we live. Pragmatic theory of knowledge sees in knowledge the method by which one experience is made available in giving direction and meaning to another (Dewey, 1938; 1916).

Further clarity on Dewey's pragmatic constructivist theory of knowledge can be afforded by observing that for him 'education is a social process' (Dewey, 1916, p. 36). We can therefore qualify his constructivist theory as pragmatic social constructionism. Social constructionism presupposes social epistemology. Jha & Devi (2014) explain relation between social constructionism and social epistemology as follows (Jha & Devi, 2014, p. 55):

> Social epistemology as a growing discipline concerns how individual beliefs and knowledge are acquired not in isolation but with the interaction in social settings and whereas social constructivism as a theory talks about individual learning through social interaction particularly in educational context. Social epistemology is concerned with how knowledge is created, transmitted and utilized in a society.'

In social constructionism, knowledge worth having is justified by its social utility. Education should cultivate dispositions which direct the ability to useful ends by engaging in activity where one person's use of material and tools is consciously referred to the use other persons are making of their capacities and appliances. Dewey (1916) calls this social direction disposition attained in education.

A constructivist view of learning postulates that knowledge is a mental representation that is actively built by the learner as part of the process of making sense of the world (Jones & Cowie, 2011). Constructivist pragmatic theory of knowledge requires the learner to build knowledge in learning experience without intellectual servitude on the teacher. Dewey (1990) asserts that Plato describes a slave as 'one who in his actions does not express his own ideas, but those of some other man' (Dewey, 1990, p. 23). To avoid this intellectual slavery of learners reproducing ideas of teachers Dewey suggests that it is 'our social problem now, even more urgently than in the time of Plato, that method, purpose, understanding, shall exist in the consciousness of the one who does the work, that his activity shall have meaning to himself' (Dewey, 1990, p. 23). This view of Dewey is relevant for CBC in Kenya where Sessional Paper no. 14 of 2012 article 1.3 requires 21st Kenya workers in knowledge-based society to 'understand more about what they are working on' (GoK, 2012). Dewey (1990) supports this idea by his caution that workers should not be 'mere appendages to the machines which they employ' (Dewey, 1990, p. 24). Rather a worker in constructivist social theory of knowledge should be educated 'to develop his imagination and his sympathetic insight as to the social and scientific values found in his work' (Dewey, 1990, p. 24).

Dewey's constructivist social pragmatic theory of knowledge is social as evident in his linking of ideas of construction and production to society. He writes (Dewey, 1990, p. 24):

> Unless the instincts of construction and production are systematically laid hold in the years of childhood and youth, until they are trained in social directions, enriched by historical interpretation, controlled and illuminated by scientific methods, we certainly are in no position even to locate the source of our economic evils, much less to deal with them effectively.

Constructivist pragmatic theory of knowledge is social in that learners are to be trained in social direction by ensuring that their impulses to construct and produce knowledge is controlled and enlightened by scientific methods. This again ties social constructionism to a pragmatic view of knowledge which employs scientific method of experimentation. Scientific method is supposed to enlighten learner's construction of knowledge in learning experiences.

Pragmatic social construction of knowledge is transformative in that it develops the learner's mind in power and knowledge and becomes more and more a medium, an instrument, an organ of understanding – and is thereby transformed. This instrumental view of learner's mind is useful in transforming belief in view of learner's mind as an empty receptacle to be filled with bits and pieces of information by teacher as is the case in traditional pedagogy of banking education (Freire, 1972).

The theory of knowledge undergirding CBC in Kenya is pragmatic social constructionism of Dewey. Policy documents on CBC in Kenya view Dewey's theory of knowledge as foundational but no theoretical argument is made. The study has demonstrated how Dewey's theory of knowledge undergirds CBC in Kenya. Pragmatic social construction views educational experiences as means to empower and engage learners with competencies of how to construct, reconstruct and use knowledge for social good. This is a departure from theory of knowledge as some inert, immobile, static thing to be transmitted to learners as passive spectators and receptacles of knowledge. The theory of knowledge CBC views learners as the center of gravity in

knowledge construction and reflective experiential learning. According to Basic Education Curriculum Framework (GoK, 2017b) Dewey's social constructivism theory posits that learning is experiential, participatory and arises from the learner's interests. It promotes activity based learning where learner has an opportunity to think for themselves and articulate their thoughts through creativity and collaboration (GoK, 2017b, p. 34). This helps the learner to think for themselves and develop critical reflection skills. Knowledge is made and remade to address challenges that daily experiences present. Knowledge is fluid, liquified resource for thinking in social, economic and politics experiences of the learners' environment.

4.3 Research objective two: Teachers' epistemic beliefs derived from theory of knowledge of CBC

This section of chapter four is based on the second research objective and the corresponding research question. The second research question was: What repertoire of teachers' epistemic beliefs aligned with learners' experiences can be derived from theory of knowledge underpinning CBC?

It is not evident whether teachers' epistemic beliefs were factored in the KICD piloting of CBC (KICD, 2018). Teachers' pedagogical competency for the new curriculum was not based on theory of knowledge undergirding CBC. There is a gap of knowledge in teachers' epistemic beliefs in relation to theory of knowledge undergirding CBC in Kenya and for effective training of CBC implementers (GoK, 2017b). However, Basic Education Curriculum Framework proposed development of training manuals for CBC implementers with specific learning outcomes as stated in (GoK, 2017b) namely, that: By the end of the capacity building session, participants should be able to:

i. Acquire the knowledge, skills and attitudes necessary for curriculum reform.

ii. Portray competence and positive attitudes.

iii. Apply innovative pedagogical approaches and models.

iv. Participate in service learning.

v. Demonstrate competencies in assessment.

vi. Conceptualise parental empowerment and engagement.

vii. Establish communities for learning best practice.

viii. Be self- reflective, self-improving and supportive

One of the training manual to be developed for training of teachers to implement CBC is meant to cover the area on 'Appropriate Pedagogy and Approaches.' Its description is as follows (GoK, 2017b):

> Learner centred teachers teach learners how to think, solve problems, evaluate evidence, analyse arguments, and generate hypotheses – all those learning skills essential to mastering material in a discipline. They do not assume that students pick up these skills on their own, automatically. Research consistently confirms that learning skills develop faster if they are taught explicitly along with the content.

This study interprets the descriptors of learner centered teachers as epistemic beliefs for competency in implementing CBC. These epistemic descriptors correspond to the 21st century competencies analyzed in (GoK, 2012, article, 1.3) and the seven competencies of CBC (GoK, 2017b). The above descriptors of learner centered teacher reveal sophisticated level of teachers' epistemic beliefs because they use verbs of higher order thinking in Blooms taxonomy of cognitive domain.

In searching for teachers' epistemic beliefs for pedagogy of CBC we are reminded by Dewey (1916) that:

> In general, it may be said that the things which we take for granted without inquiry or reflection are just the things which determine our

> conscious thinking and decide our conclusions. And these habitudes which lie below the level of reflection are just those which have been formed in the constant give and take of relationship with others' (Dewey, 1916, p.23)

This citation from Dewey (1916) applies itself to teacher's epistemic beliefs which are taken for granted even when they influence a teacher's classroom pedagogical practices. They however remain unexamined in teacher education programs in Kenya and in the teachers' preparedness in implementation of CBC. There is copious evidence that teachers' beliefs and views about students, teaching and the subject matter influence classroom instructional practice (Gu, 2016; William, 2013; Hofer & Pintrich, 2002; Kelly, 2013; Khader, 2012; Khakasa, 2009; Hennessey, 2007; Neel, 2008; Koulaidis, 1987; Kirschner, 2009; Sitoe 2006; Msendekwa, 2015;, Lee et als, 2013; Paechter et als, 2013; Epler, 2011; Er, 2013; Cajital, 2010). The teacher has to believe something as true in order to teach it. True belief without justification is not knowledge. It remains merely a claim which begs for rational justification. Justification of true belief is the litmus test of status of knowledge of an epistemic belief. The method of a teacher to determine whether belief is justifiable is by peer review in conversation with teacher practitioners who constitute a discourse community (Douglas, 1996). Teacher epistemic authority is to be vested in a pragmatic model in form of a community of teachers to whom a teacher subjects her belief for peer review, a trusted community of teaching practitioners. The teacher places her epistemic belief to the 'test of peer scrutiny, assessment and possible modification' (Jones & Cowie, 2011).

Teacher epistemic beliefs connote how an individual teacher views the nature and sources of knowledge, process of knowing and learning (Hofer, 2001). They are about how a teacher believes knowledge is acquired and constructed, from where knowledge is derived and how knowledge is evaluated (Ziegler, 2015). The academic area that studies epistemic beliefs is called Personal Epistemology. It is mainly done from the

perspective of psychological research which tests hypotheses empirically (Kuhn, 2000). Epistemic beliefs are studied empirically by psychologists from the perspective of their educational implications (Kuhn, 2000). Kuhn proposes a progressive integration of the subjective and objective dimensions of knowing as the essence of attaining maturation of epistemic beliefs.

This study developed theory of knowledge presupposed by CBC. From theory of knowledge of CBC teachers' epistemic beliefs are to be derived and developed. This in principle ensures that teachers will hold onto matured epistemic beliefs aligned to theory of knowledge of CBC. The teachers' epistemic beliefs derived from such a theory of knowledge will be prescribed as normative requirements and teachers are required to change if their default epistemic beliefs are at variance with what is expected of them. Teacher education programs must therefore have an established set of epistemic beliefs which student-teachers are expected to hold aligned to the curriculum they are getting ready to implement.

Epistemic beliefs are enacted in pedagogical instructional behavior of teachers' in classroom teaching and learning activities. To borrow from Aristotelian categories epistemic beliefs are formal causes while pedagogical actions are material causes. Material cause is potential for determination by the actuality of the formal cause. The epistemic beliefs are acts while pedagogical actions are potentialities. Whatever a teacher does pedagogically (material actions) is actualization of epistemic belief (a mental act).

The theory of knowledge of CBC was found and described in this study as 'social pragmatic constructivism.' It is social because knowledge is produced in intersubjective interaction between teachers and learners. Learning experience is a process of inter-

subjective reconstruction of knowledge in the spirit of social cooperation and community life within school and classroom environments. Education is the heart of the sociality of man (Dewey, 1916).

This study found out that pragmatic social constructionism is the theory of knowledge that undergirds CBC. Classroom pedagogy is the site for enactment of epistemic beliefs espoused by a teacher (Hofer, 2002; Littledyke, 1996; Chai, 2010; Gu, 2016). Epistemic beliefs are teacher's views about knowledge, knowing and learning. The pedagogy of CBC should be enactment of epistemic beliefs derived from theory of knowledge of CBC. Dewey's pragmatic social constructionism is the theory of knowledge underlying CBC in Kenya. Teachers in Kenya should espouse epistemic beliefs derived from theory of knowledge of pragmatic social constructionism. This will increase the possibility of enactment of pedagogy of CBC. The following are epistemic beliefs logically derived from theory of knowledge of CBC.

4.3.1 Learning how to learn

Social constructivist theory of Dewey is prominent in Basic Education Curriculum Framework (GoK, 2017b). It is a learning theory rather than teaching theory. The shift from knowledge reproduction to knowledge production (GoK, 2012; GoK, 2007) is a shift from the old focus on teaching to the new focus on learning. Teachers must shift from analogy of dispensers or transmitters of knowledge to co-creators of knowledge with learners. The shift is also from mere acquiring of knowledge to inquiring for deeper, further learning and knowledge. Teachers must learn how to learn if they are to light the same spark in learners. The teacher is fellow learner with learners in the class. The classroom is a community of inquirers, collaborative learning is constructivist of new knowledge, new perspectives. Constructivist learning is creative learning for it is open to test new ideas and suggestions. Learning how to learn is a competency under

CBC. It is a process skill on how to inquire, learn, construct, use, modify and create knowledge. As a process skill learning how to learn displaces teaching as transmission of readymade products in textbooks. The new focus marks a shift from what is taught to how it is learnt. It is about activity of learning rather than listening to teacher's talk about something (Freire, 1972). Teaching as narration is displaced by learning how to learn. Learning how to learn is the beginning of a lifelong journey for teacher's continuous self-improvement.

4.3.2 Instrumentalism

In pragmatic social constructionism of CBC, knowledge of school subject matter is a means not an end in itself. Knowledge of school subject matter is instrumental as a tool or resource to work with in accomplishing a task, solving problems and for use in thinking (Dewey, 1916). Theory of knowledge for CBC in Kenya is instrumentalist. Teachers in Kenya should espouse instrumentalist views of knowledge in their subject matter. Knowledge of curricular content is a means of empowering learners to acquire desired competencies not something to be stored in mind.

4.3.3 Reflective Practitioner

Teaching is a reflective practice which requires teacher to critically reflect on the experiences emanating from teaching and learning situations (Schon, 1983). Teacher's reflection includes mental reviewing, reconstructing, reenacting and critically analyzing one's own and the learner's performance. This suggests that teaching is a reflective practice and teacher is a reflective practitioner (Mezirow, 1998). Reflection after teaching helps to visualize how the teacher and learners interacted within the classroom activities. Some insights arise from such reflection and are useful in subsequent classroom encounter with learners. Continuous reflection after encounter with learners' experiences accumulates teacher's pedagogical wisdom of practice. The

teacher develops habit of self-reflection and self-criticism. Reflective thinking engenders a type of critical thinking, 'the type of deeper insight that comes from interrogating one's practice and making explicit the assumptions and values that underpin it' (Winch, et al, 2014, p. 21).This is an aspect of Socratic maxim that unexamined life is not worth living (Plato, Apology, 38A). It applies in teaching to mean teaching without personal reflection fails to create opportunity to grow or expand experience. Reflective teachers find it worthwhile to continuously learn from their experience and are ready to improve on their practice.

4.3.4 Pedagogical Reasoning

Teacher's knowledge of curriculum content is pedagogical. The teacher interprets and represents lesson object based on learners experience, abilities, weaknesses and interests. Pedagogical reasoning is teacher's competence in critical thinking on how to introduce a concept based on learner's context. Dewey (1916) called it inductive teaching in contrast to deductive teaching which imposes concepts on learners. Pedagogical reasoning under CBC requires teachers to integrate content knowledge with pedagogical learner knowledge. Based on the teacher's knowledge of learners' diversity, abilities, weaknesses and interests the teacher deliberates on the most appropriate approach to use. This creates opportunities for pedagogical creativity and innovation as required under CBC.

4.3.5 Experimentation

Teachers in Kenya should espouse a constructivist experimental view of classroom knowledge of curriculum. The method of constructing knowledge is experimentation which revolutionized science since the seventeenth century (Dewey, 1916). Experimentation integrates learner's experience with reason thereby avoiding traditional opposition between empiricism and rationalism. In the loose sense

experimentation is trying to do something guided by an aim and a method to observe what happens as consequence. This way experience becomes instructive and rationally significant. Dewey (1916) calls this a new philosophy of experience and knowledge. The method of experimentation resolves the traditional separation of doing and knowing. Progress of experimental method has demonstrated that 'genuine knowledge and fruitful understanding' are 'offspring of doing.' Knowledge is not 'attained purely mentally – just inside the head' rather knowers 'have to do something to the things when they wish to find out something; they have to alter conditions.' This is a generalized method of laboratory method of experimentation the aim is 'discovery of the condition under which labor may become intellectually fruitful and not merely externally productive' (Dewey, 1916, 300). Classroom teachers should integrate teaching and teaching activities that involve learners' experience in learning by doing.

4.3.6 Experiential Learning

Dewey's (1916) concept of experience as a source of knowledge significantly differs from traditional empiricism. Traditional empiricism considered experience as pure cognition identifying it with 'a passive reception of isolated sensations.' Dewey's theory of experience is new in that experience is reconstructed as 'primarily practical, not cognitive.' Experience is about 'doing and undergoing the consequences of doing' (Dewey, 1916, p. 276). It is doing something guided by suggestions of thought in order to result in 'securely tested knowledge.' Experience for Dewey 'ceases to be empirical and becomes experimental.' At the same time reason 'ceases to be a remote and ideal faculty, and signifies all the resources by which activity is made fruitful in meaning.' This view of experience brings about a new method of education which does away with bookish teaching and learning methods.

Ability to learn from experience constitutes a teacher's plasticity for professional growth. It defines experiential learning, the ability to learn from experience that has power to retain from one experience something which is of avail in coping with the difficulties of a later situation. Teachers should have the power to modify actions on the basis of the results of prior experiences, the power to develop dispositions (Dewey, 1916). The concept of experience is at the heart of Dewey's technical definition of education as 'that reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience' (Dewey, 1916, p. 76). Teachers in Kenya should espouse the belief that classroom activities should be based on experience 'of, by, and for' learners. This means that learners' experience should be the basis for deciding upon subject-matter, methods of instruction and discipline and social organization of the school. The central role for learners' experience as part of epistemic belief is that education based on learners' experience guides in selecting from present experience and past experience what will be fruitful and creative in subsequent learning experience. The present experience of learners should generate problems for teachers so that they resort to the past experiences in search of suggestions which could supply meaning to the present experience of the learner. However, learners' past experiences are to be constantly reorganized or reconstructed to better anticipate what is going to happen and to avert undesirable outcomes. To avoid dogmatism and backwardness learners' past experiences are to serve as resources for the present but not standards or patterns to be reproduced in future experiences.

Learners' experience is conceptualized in experimental not empirical terms. Empirical view of learners' experience is theoretically associated with philosophers who argue knowledge is from senses alone. Experimental-experience of learners is based on the

use of scientific methods which test ideas to observe their consequences in securing desired outcomes or averting undesired results. Learners' empirical-experience makes reason passive recipient of sense data since it is apriori assumed to be tabula rasa but in the case of learners' experimental-experience reason is viewed as a resource and instrument of trying out what an idea suggests to secure tested or knowledge or warranted assertibility. Learners experience ceases to be empirical and becomes experimental.

4.3.7 Habits

Epistemic beliefs are habits of thought with ability of subsequent change from the environmental experiences (Gu, 2016). Teachers' epistemic beliefs are cognitive habits of active use of the environment in teaching. Epistemic beliefs are habits which transform the environment as a factor in teaching. Teachers' epistemic beliefs should be active capacities to readjust the activity of teachers to meet new conditions of learners' experiences in the environment. As active habits, epistemic beliefs involve thought, invention and initiative in applying capacities to new ends as teaching and learning environment demands.

4.3.8 Tentative Knowledge

In pragmatic social constructivism knowledge is viewed as tentative and hypothetical (Dewey, 1916). Knowledge is tentative subject to testing and experimentation in actual practical application. Knowledge is not absolute or certain it is rather subject to verification or falsification in actual practical experience. This means that teachers should approach subject matter as presenting knowledge as something coming after experience. All a priori knowledge is tentative hypothesis awaiting adjudication of experience as consequence of its application in a situation. Knowledge of an idea, principle, theory or belief is tested by practical success in working out a solution to a

problem. The true place of knowledge is in experience because the 'function of knowledge is to make one experience freely available in other experiences' (Dewey, 1916, p. 364). Learners acquire knowledge when they demonstrate competency in perception of those connections of an idea, principle, formula or theory which determine its applicability in a given situation. Knowledge is not something settled as solid fact. Rather knowledge is viewed dynamically in reference to its subsequent use in thinking. It is 'a means to learn, to discovery' in further inquiry. It furnishes the means of understanding of what is going on now or what is to be done within learner's experience. Knowledge supplies learners' experience with resources by which to interpret and manage the unknown that confronts them in the learning experience. It is useful in connecting gaps in partial facts or givens in a learning situation. But when knowledge is divorced from use in giving meaning to what learners are undergoing, or what learners are expected to do, it drops out of consciousness and becomes an object of aesthetic contemplation (Dewey, 1916).

Teachers should espouse the epistemic belief that knowledge should be viewed in its applicability to the present predicament, puzzle or problem of learners' experience in learning. This is one of the core competencies in CBC. Value of knowledge in curriculum is in its availability in dealing with what learners are yet to be in teaching and learning experience. Knowledge is employed to make thinking fruitful, that is the value of knowledge is subordinate to its use in pedagogical thinking which views subject matter in learners' experience.

What whitehead (2008) calls fossilized and inner ideas are learners' acquisition of knowledge that lacks fruitful connection with the ongoing experience in the wider life of their society. Knowledge is reduced to appropriating subject matter stored in books. This lacks credentials of experiential knowledge for it fails to fructify in the learners'

own life experience. In schools the custom is to look upon learners as theoretical spectators, minds which appropriate knowledge by direct energy of intellect. Dewey (1916) continues to observe that the 'very word pupil has almost come to mean one who is engaged not in having fruitful experiences but in absorbing knowledge directly…purely intellectual and cognitive' (Dewey, 1916, p. 140). Bodily activity in learning is considered to hinder an intruder 'a distraction, an evil.' The bodily activity of learners is considered the chief source of indiscipline in the classroom for teachers to find ways to suppress the bodily activities of learners (Dewey, 1916, p. 141). Teachers have come to place premium 'on physical quietude, on silence, on rigid uniformity of posture and movement.' This situation arises due to 'dualism of mind and body' where learning is reduced to 'spiritual' purely intellectual and cognitive affairs. The passive learner becomes bored and the teacher now has to find ways to make the lesson interesting after dealing with the problem of discipline of the body.

4.3.9 Pragmatic

Teachers in Kenya should espouse pragmatic epistemic belief which is a method of pedagogical thinking that maintains continuity between teaching activity and learners' experience in their environment (Dewey, 1916). Pragmatism of Dewey holds that knowledge is an intellectual resource that renders action intelligent in performing a task. Knowledge is restricted to only what is organized as a disposition to enable us adapt the environment to our needs and to adapt our aims and desires to the situation in which we find ourselves (Dewey, 1916). Teacher's knowledge of curricular subject matter is not something to be held tenaciously in mind but it is the disposition to consciously employ it in dealing with a learner's level of understanding in their experiential context. Knowledge of curricular content is a resource to straighten out a perplexity, by

conceiving the connection between teacher's knowledge and the world in which learners live.

Pragmatism is a theory of knowledge for a democratic society where free exchange of experience views teacher's knowledge as the method by which learner's experience is made available in giving direction and meaning to teaching and learning activities. The logic of experimental science supplies intellectual instruments to work out and formulate pragmatic theory of knowledge. It is logic with pedagogical implication for knowledge construction at school done in associated living and in activities or occupations with social relevance for learners.

Pragmatic teaching and learning must be tied to the experience of the learner. Traditionally learning was misconstrued as mere absorption of facts and information it was so exclusively an individual affair that it tended very naturally to pass into selfishness (Dewey, 1990). There is a lack of social motive for mere acquisition of knowledge as inert facts and information. In exclusive individual affairs of learning the 'measure of success is competitive one' where learners compete in storing up, accumulating the maximum information. Dewey states that this inter-learner competition is so severe that it is considered a 'school crime' for a learner to help another in academic tasks (Dewey, 1990, p. 16). Yet learning as social construction of knowledge should involve mutual assistance, cooperation and association. In social construction of knowledge helping another learner is 'an aid in setting free the powers and furthering the impulse of the one helped' (Dewey, 1990, p. 16).

Social construction of knowledge is through free communication, exchange of ideas, suggestions, and results where both success and failures of previous experiences becomes resources. School organizes itself on a social basis where comparison of

individuals is not based on quantity of personally appropriated information but on the quality of work done (Dewey, 1990, p. 16). The school is a miniature community, an embryonic society associated and affiliated to the life experience of wider society (Dewey,1990). School work is freed from economic stress. The aim is not the economic value of products constructed at school but 'the development of social power and insight.' It is this liberation from narrow utilities, this openness to the possibilities of the human spirit that makes practical activities at school 'allies of art and centers of science and history' (Dewey, 1990).

4.3.10 Sociality

Teachers should espouse epistemic beliefs that are socially developed from what actually exists in social experience of learners. Epistemic beliefs arise from a variety of shared undertakings and experiences of teachers and learners as members of society. From social stimulation and in response to experience of learners, teachers should formulate subject matter as a social function. If teachers have diversity of social stimulations, they will encounter novelty which will challenge them to think and reflect on how best to contextualize subject matter for learner's comprehension. Epistemic beliefs should be products of democratic society where teachers have numerous and varied points of shared common interests with other members of society. There should be free interaction between the teacher profession body with other social bodies so that teachers are challenged to continuously readjust their epistemic beliefs to meet the new situations and challenges produced by various groups and interests of the learners. Sociality of epistemic beliefs is based on the view of teaching profession as a democratic practice that is primarily a mode of associated living, of conjoint and communicated professional experience between teachers masterly of curricular content and learner's experiences. Teachers participate in teaching as an individual who refers

their action to that of learner's and considers the action of learners to give point and direction to subsequent teaching and learning activities. This sociality of epistemic beliefs helps to break down the barriers between teachers and learner's experiences. Teachers should be responsive to the interests and concerns of learners since this liberates his powers from limitations of personal and subjective views.

In defense of sociality of epistemic beliefs Dewey (1916) cautions against exaggerated ideas of self-reliance which tempts an individual to feel self-sufficient in mastery of curricular content without regard to learner's needs, interests, abilities and challenges. Such a teacher may become aloof and indifferent to concerns of learners. A teacher may therefore become insensitive to his professional relations to learners and may suffer from the illusion of being able to understand subject matter but fail to recognize his weakness in inability to relate it with experiences of learners. Dewey would call this some pedagogical 'unnamed form of insanity' (Dewey, 1916, p.320). Sociality is about interdependence for professional growth. It is the power of working together but not a weakness. The aim of a teacher is to serve learners needs, teachers cannot afford to be aloof to social influence and experiences of learners. Epistemic belief of sociality means cultivation of power to join freely and fully in shared or common activities between learners and teachers.

4.3.11 Problem Solving

Khakasa (2009) in her doctoral dissertation on proficiency in pedagogical content knowledge of secondary school mathematics teachers in Kenya found out that problem solving is not practiced in teaching and learning of mathematics. She recommended research on problem solving which she believes is 'central to the learning of mathematics.' Teachers were found unable to practice problem solving much worse they demonstrated misunderstanding of problem solving (Khakasa, 2009, p.272).

Dewey is chief proponent of problem solving which constitutes ‘general features of a reflective experience’ (Dewey, 1916, p. 150). Problem solving is thinking in experience not in abstraction. Teachers in Kenya should espouse epistemic belief of problem solving based on thinking as an experience with five steps namely (i) a felt difficulty (ii) its location and definition (iii) suggestion of possible solution (iv) development by reasoning of the bearings of the suggestions (v) further observation and experiment leading to its acceptance or rejection, that is the conclusion of belief or disbelief (Dewey, 1910, p. 72). Teachers’ epistemic belief in problem solving is a resource for dealing with pedagogical problems in teaching and learning situations.

4.3.12 Paedocentric: Learner centered

CBC is learner centric in its focus on ‘nurturing every learner’s potential’ (GoK, 2017b). It is paedocentric or learner centered curriculum. CBC is learner focused and flexibility of the teacher is required in response to diversity of learner’s needs and in creating learning opportunities (GoK, 2017b). Teachers are required to recognize the difference between disciplinary logic of academic expert’s perspective and teacher’s pedagogical knowledge of teaching a subject matter. The learner centered teacher agrees with Dewey (1990) that the learner is ‘the starting-point, the center, and the end’ of teacher’s professional work (Dewey, 1990, p.187). This means curriculum is for the child not the other way-round (Dewey, 1990, p.209). Paedocentric teachers do not believe that learners automatically ‘pick up skills on their own’ (GoK, 2017b) rather they integrate learning skills with the content they teach. They make their learning visible (GoK, 2017b). This engenders deep learning and teaching efforts becomes visible in learning outcomes as proposed under Hattie’s visible learning theory (GoK, 2017b). When the teaching is visible the student knows what to do and how to do it (GoK, 2017b).

4.3.13 Multidimensional Epistemic beliefs

Schommer (1994) developed five independent dimensions of epistemic beliefs namely: (1) structure of knowledge, (2) stability of knowledge, (3) source of knowledge, (4) control, and (5) speed of knowledge acquisition. Based on the five dimensions of Schommer's scheme of analysis of epistemic beliefs, the teacher's epistemic beliefs derived from theory of knowledge of CBC reveal the following.

i. Structure of knowledge: Knowledge is not simply structured and consisting of isolated bits but rather knowledge is viewed as complex and interrelated.
ii. Stability of knowledge: Knowledge is subject to a constant process of development not perennially absolute and stable.
iii. Source of knowledge: Knowledge is acquired through learner's multiple experiential learning but not from an omniscient authority of teacher.
iv. Control of learning processes: Ability to learn is acquired through experience that is the ability to learn is not fixed at birth but is improvable.
v. Speed of knowledge acquisition: Learning is a gradual process and not an ad-hoc event

Epistemic beliefs from CBC theory of knowledge are relativist, pluralist, objectivist, evolutional and tentative (Gu, 2016).

This section two of chapter four has discussed and interpreted research findings based on the second research objective and its respective research question. Teachers' epistemic beliefs were logically derived from theory of knowledge underpinning CBC. Teachers' should be enabled to espouse these epistemic beliefs because they are logically derived from theory of knowledge of the curriculum they are to implement. These epistemic beliefs should influence teachers in enacting pedagogical approaches

aligned with CBC. These epistemic beliefs are captured under descriptors such as instrumentalism, reflective thinking, pedagogical reasoning, experimentation, experiential, habits, tentative knowledge, pragmatism, sociality, problem solving, and learner centered. The epistemic beliefs are multidimensional based on Schommers five dimensional scale that ranges from sophisticated to naïve. These epistemic beliefs should be included in the manual for training implementers of CBC because they correspond to expected learning outcomes for capacity building of CBC implementers as required by Basic Education Curriculum Framework.

4.4 Research objective three: PCK for enactment of pedagogy aligned with CBC

This third section of chapter four is based on the third research objective and the corresponding research question. The third research question was: How can the concept of PCK lead Kenyan teachers in enacting epistemic beliefs for pedagogy aligned with CBC?

The policy documents on CBC in Kenya expected teachers to have modern pedagogical approaches aligned with learners' experiences (GoK, 2017b; GoK, 2015; GoK, 2012; GoK, 2007). For instance, CBC requires a teacher to develop capacity to 'Know how learners develop and learn, and address each learner's background and unique learning needs to reflect diversity and equity' (GoK, 2017b, p.129). Dewey (1990) captured the pedagogical problem of the CBC by drawing from experiences of the learner. He observed that: 'The child is already intensely active, and the question of education is the question of taking hold of his activities, of giving them direction' (Dewey, 1990, p. 36). In ordinary experience we do not encounter a child as 'a listening being' but as an 'already intensely active' being (Dewey, 1990). The teachers' pedagogical role consists in not how to make the learner active participant for already the learner is active in life but rather the teacher must find out how to direct and organize how the learner is to

make use of his activity toward valuable results, instead of scattering or being left to merely impulsive expression. The most revealing experience of the learner is the home environment. At home parents recognize what is best for the child such that a parent is able to supply what is needed for the child to learn and grow. At such a home we find the child learning through the social conversation: statements are made, inquiries arise, topics are discussed, and the child continually learns. The child has opportunities to 'state his experiences, his misconceptions are corrected.' The child is an active participant in domestic activities thereby he gets habits of industry, order, and regard for the rights and ideas of others, and the fundamental habit of subordinating his activities to the general interest of the household (Dewey, 1990). His learning experiences extend to outdoor activities in his neighborhood to the larger world open to him. Dewey advises that if we organize and generalize all of this, we have the ideal school (Dewey, 1990).

If the analogy of child learning at home is enlarged to school experience pedagogy is not something to be discovered. Pedagogy becomes a question of doing systematically and in a large, intelligent, and competent way what' at home is done 'comparatively meager and haphazard manner' (Dewey, 1990). The school becomes the ideal home enlarged. At school the learner is brought into contact with a greater number of grown-ups and other children his social learning environment becomes freest and richest. The school is born out of limitations of the home environment thus the life of the child becomes the all controlling aim of the school. This theory of Dewey coincides with Basic Education Curriculum Framework which requires teacher under CBC to develop capacity of valuing 'the experiences the student brings to class and allow these experiences to be recognized in the classroom and further each student's development' (GoK, 2017b).

Pedagogical problems were described by Dewey in terms of social function of education namely how to ' discover the method by which the young' are to transform the quality of (their) experience till it partakes in the interests, purposes, and ideas currently in the social group (Dewey, 1916). Dewey (1916) suggested and argued that it is by means of environment by which he meant continuity of the surroundings with active tendencies of the learner. Environment includes things with which a man varies in his characteristic activities. For instance, the astronomer's environment is his telescope and the stars at which he gazes and varies his activities.

John Hattie's theory is advocated for in policy on Basic Education Curriculum Framework (BECF). It may be modern and recent theory but it needs to be appraised in terms of Vision 2030 and theory of knowledge of CBC (GoK, 2017b). Basic Education Curriculum Framework identified its 'theoretical approach' in the definition that a 'theory is an abstract general explanation of observations or a subject under study that can be relied upon to provide guidance for practice' (GoK, 2017b, p. 2). Instructional design theory focuses on the means to attain learning objectives and offers guidelines on methods to use in different situations in curriculum implementation (GoK, 2017b). The instructional design theory of John Hattie (Gok, 2017b) is cited in the observation that 'globally, fundamental changes in education systems have important implications for curriculum reform. Learners need to be able to think about and solve problems, work in teams, communicate through discussions, take initiatives and bring diverse perspectives to their learning' (GoK, 2017b).

The instruction theory of John Hattie (GoK, 2017b) is called 'visible learning' where teaching has to be viewed in terms of its impact on learning. This means 'an enhanced role for teachers as they become evaluators of their own teaching' (Gok, 2017b, p. 3) in terms of its impact on learning by learners. For Hattie (GoK, 2017b, p.3):

> visible learning and teaching occurs when teachers see learning through the eyes of students and help them become their own teachers. It entails making student learning visible to teachers so that they can know whether they are having an impact on this learning, this is an important component of becoming a lifelong learner…. The 'learning' part of visible learning is the need to think of teaching with learning in the forefront and with the idea that we should consider teaching in terms of its impact on student learning.'

The authors of Basic Education Curriculum Framework conclude that the theory of 'visible learning' is 'important in designing a competency based curriculum' (Gok, 2017b). Curriculum is designed with reference to social and individual needs in specific circumstances of a society. CBC is based on the ideology of Vision 2030. Based on CBC appropriate pedagogy is supposed to evolve with its instructional design. It is therefore incorrect for authors of Basic Education Curriculum Framework to state that Visible Learning is important in designing CBC. According to the theory of this study pedagogy including its instructional designs is enactment of epistemic beliefs of individual teachers. Teachers' epistemic beliefs should be aligned to theory of CBC. The theory of visible learning is not demonstrably a logical derivative of theory of knowledge of CBC as conceptualized under ideology of Vision 2030.

Policy documents on education in Kenya like Sessional Paper no 14 of 2012 highlighted areas of concern. For instance, that teacher education should be grounded on researched needs assessment (GoK, 2012). On what needs assessment is Visible Learning seeking to address? Article 9.11vi placed great emphasis on teaching methodology. However, the theory of visible learning is not introduced in response to this need. While Sessional Paper (GoK, 2012) required in-depth study on improving quality of teachers, the advocates of Visible Learning fail to relate it to this need. While it is observed that teacher education in Kenya has not kept pace with recent developments in the world (GoK, 2012) this is not reason for haphazard introduction of any theory into Kenya. To

what extent does theory of Visible Learning reflect aspirations of Vision 2030 (GoK, 2012).

Some key stakeholders in teacher education are public universities in Kenya to what length has proponents of Visible Learning gone in order to harmonize differences in curriculum, teaching practice and delivery methods based on the theory of John Hattie? (GoK, 2012). It is observed that the hardest element to change in the teaching profession is changing instructional practices. How will the introduction of theory of Visible Learning be done in order to address this challenge of changing instructional practices?

The theory of Visible Learning however, may be useful in equipping teachers with the knowledge and ability to identify and develop the educational needs of the learner (GoK, 2012). It nonetheless needs to be assessed in terms of its fit with theory of knowledge of CBC.

When teaching is visible the student knows what to do and how to do it (GoK, 2017b). When the learning is visible the teacher knows if learning is occurring or not. The learning goal should be explicit and challenging. Both teacher and learner work together to attain the goal, provide feedback and ascertain whether the student has attained the goal. It is when a teacher has an appropriate mental frame combined with appropriate actions that these two together achieve a positive learning effect. We need to help teachers develop a mental frame in which they see as their primary role to evaluate their effect on learning.

Hattie argues that teachers' beliefs and commitments are the greatest influences on student achievement over which we have some control. It is the belief system of the teacher that really matters. Based on review of literature Hattie identified five major dimensions of excellent teachers. He called them five beliefs of expert teachers. Expert

teachers identify the most important ways to represent the subjects they teach. Research on visible learning showed that teachers' subject-matter knowledge did not improve student achievement. However, expert teachers do differ in how they organize and use this content knowledge. They know how to introduce new content knowledge in a way that integrates it with students' prior knowledge, they can relate current lessons with other subject areas, and they can adapt the lesson according to student's needs. They have greater strategies at stock to help students. They are better able to predict when students will make errors and respond when they do. They seek out evidence of who has not learned, whose is not making progress and they problem solve and adapt their teaching accordingly.

Pedagogically appropriate teacher engagement of students as part of assessment of learning that is responsive to student ideas and interests require teachers to have appropriate content knowledge and knowledge of their students and, be able to access and deploy this at an instance. This is the concept of teacher's knowledge-as-action an idea circumscribed by the concept of pedagogical curricular knowledge (Jones & Cowie, 2011, p. 52).

While Basic Education Curriculum Framework (GoK, 2017b) advocates for use of John Hattie's theory of Visible Learning as appropriate for CBC another government policy document on the CBC namely, Vulnerable Marginalized Groups Framework (VMGF) failed to mention visible learning but instead introduced for the first time in policy documents on education in Kenya the concept of PCK (GoK, 2017a). Vulnerable Marginalized Groups Framework is a policy that among other things aims at providing teachers with professional development in subject matter as well as PCK to teachers of Science, Mathematics and English (SME) (GoK, 2017a). The objective is to improve classroom teaching practice by enhancing pedagogical content knowledge of teachers

teaching the said three subjects (Gok, 2017a). This is part of capacity building of teachers as an aspect of teacher professional development already strongly advocated for in the National Education Sector Strategic Plan (GoK, 2015).

The concept of PCK is not defined in the policy document on Vulnerable Marginalized Groups Framework (GoK, 2017a). The concept is employed as something to be added to subject matter. This is contrary to the correct interpretation of this concept based on its inventor Lee Shulman (1987).

4.4.1 Pedagogical Content Knowledge (PCK)

Basic Education Curriculum Framework (GoK, 2017b, p. 129) requires teacher in CBC to develop capacity for 'in-depth content and pedagogical knowledge and use this knowledge effectively to provide learning experiences to improve learner's achievement.' The conjunction of 'content and pedagogical knowledge' keeps the two conjuncts separate but together however the conjuncts are not integrated. The conjunction of content and pedagogy does not correspond to Shulman's concept of PCK. Shulman (1987) defined PCK as a teacher's integrated understanding of subject matter, learning processes and strategies for teaching a given subject in a manner to enable learners to construct their own knowledge in a given context. It is a concept that amalgamates, integrates and comprehensive synthesis of two distinct knowledge domains: content knowledge and pedagogical knowledge (Dijk, 2014). Shulman (1986) coined the term PCK to specify the nature of knowledge specific to competence of a professional teacher. PCK is 'that special amalgam of content and knowledge that is uniquely the province of teachers, their own special form of professional understanding' (Shulman, 1987, p.8).

PCK is about ‘the most regularly taught topics in one’s subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations and demonstrations – in a word, the ways of representing and formulating the subject that makes it comprehensible to others’ (Shulman, 1986, p. 9). PCK is reminiscent of CBC requirement that teachers develop capacity to ‘use a broad range of strategies to assist students to be successful’ (GoK 2012, p. 129). This is resonates with Shulman’s elaboration of PCK. Namely, that ‘the teacher must have a veritable armamentarium of alternative forms of representation, some of which derive from research whereas others originate in the wisdom of practice’ (Shulman, 1986, p.9). PCK specifies teachers wisdom of practice in enacting epistemic beliefs in pedagogy aligned to epistemology of CBC.

The Venn diagram below illustrates the area of professional competence of a teacher. It is the overlap between ‘P’ for pedagogy and ‘CK’ for content knowledge. That area where the two circles overlap captures the concept of PCK which blends and integrates content knowledge and pedagogy. See the pointing arrow

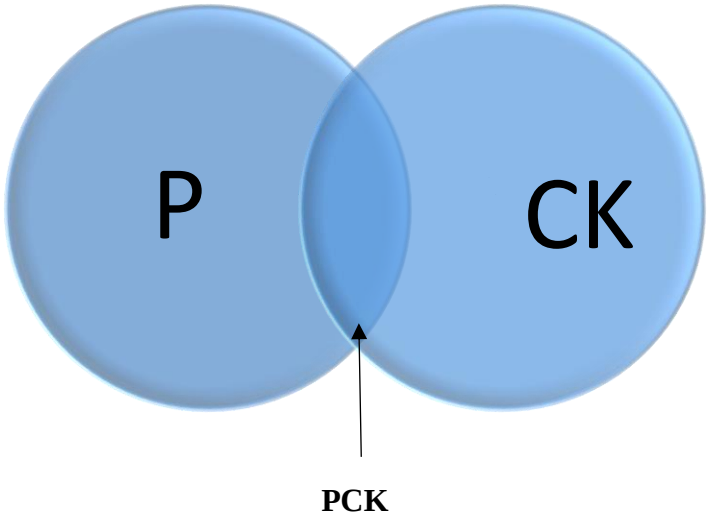

Figure 3: Venn diagram illustrating the specific area of professional expertise of the teacher namely, Pedagogical Content Knowledge.

PCK specifies seven professional knowledge dimensions of teacher's expertise (Fyall, 2012; Brant, 2006; Fives, 2004). The seven areas constitutes repertoire of dispositions of teacher's professional knowledge base, namely: (i) content knowledge, (ii) general pedagogical knowledge, (iii) pedagogical content knowledge, (iv) curriculum knowledge, (v) knowledge of educational contexts, (vi) knowledge of learners and their characteristics and (vii) knowledge of educational ends.

The epistemic authority of a classroom teacher lies in the PCK which coincides with Dewey's (1990) concept of psychologizing curriculum. The PCK is at heart of Dewey's theory of pedagogy. He elaborated that classroom teachers should not be occupied with 'subject matter in itself but rather in its interaction with the pupils' present needs and capacities' (Dewey, 1990, p. 198). This is because accumulated scholarship in subject matter taken by itself might 'get in the way of effective teaching unless the (teacher's) habitual attitude is one of concern with its interplay in the pupil's own experience' (Dewey, 1990, p. 198). The primacy of content mastery was medieval scholastic requirement for teaching which has persisted since. Teachers view content of subject matter as static and readymade for transmission. Learners passively absorb facts and

procedures imparted by the teacher. The teacher takes center stage as dispenser of prepackaged body of knowledge (Brant, 2006). Dewey revolutionized traditional teaching by centering learning. Teacher's mastery of subject matter is necessary however, the teacher's 'attention should be upon the attitude and response of the pupil' (Dewey, 1990, p. 198). Primarily, the concern of the teacher is the pedagogical task of facilitating the interplay between the learner and the subject matter. To specify the precise and unique expertise of a classroom teacher Shulman (1986) coined the term PCK.

The concept of PCK has attracted attention of researchers in Kenya. For instance, Inyega & Inyega (2017) examined the extent to which in-service professional development program impacts on the attitude of 26 veteran teachers in Kenya towards their PCK. The study findings demonstrated that teachers' attitude towards PCK is positive after ten days of training on how to improve science teaching. However, the concept of PCK was not analyzed in that study. It was treated as equivalent to pedagogy.

The study by Inyega & Inyega (2017) did not relate to Vision 2030 and the education policy documents on CBC in Kenya. The study failed to examine epistemic beliefs of teachers towards teaching of science before and after the in-service professional training of the participants.

Khakasa (2009) studied proficiency in PCK among mathematics teachers in Kenya. The study found teachers were fluent in subject matter but were deficient in the ability to transform content for comprehension of learners. The teachers lacked mathematical knowledge for teaching though they had excellent mathematical knowledge. The study found out that teachers had expert knowledge of mathematics but were deficient in understanding mathematics for teaching. The way a bachelor of education (BED)

student understands the content subject matter is different from the way a bachelor of art (BA) student does. In addition to content mastery the BED student needs to know which elements are essential for mastery in light of subsequent teaching and how to transform it for ease of learner's comprehension. BED student as a prospective teacher must understand how learning is facilitated and therefore needs to be able to foresee likely misunderstandings and areas of difficulty and have strategies available for combating such in teaching situations (Phillips, 2003). Dewey (1990) used the term psycholozing the subject matter but Hattie (GoK, 2012) called it viewing teaching from the perspective of its impact on the learner. Khakasa (2009) found out that teachers engaged in direct instruction or what Brant (2006) called medieval scholasticism and therefore teachers failed to integrate mathematical knowledge with learners experience and context. This approach obstructed teachers from understanding learners learning difficulties and therefore appropriate interventions were not forthcoming.

Machina (2012) investigated prospective teachers' preparedness to facilitate chemistry instruction in Kenya. Machina (2012) elaborated on Shulman's (1987) concept of PCK. However, he failed to use that concept to address the dichotomy between teachers' separation of mastery of subject matter content and pedagogy in the teaching of chemistry at secondary school. His study was meant to find out how teacher training colleges and universities are trying to relate the chemistry content and the subject pedagogical skills in the teacher preparation program. His study was not how the concept of pedagogical content knowledge can guide teachers' enactment of epistemic beliefs in appropriate pedagogy. Machina (2012) narrowed pedagogy to denote correct use of instructional strategies thereby failing to capture broader normative and comprehensive view of pedagogy as social ideological vision that guides in choice of instructional strategies.

The problem of pedagogy was raised by Dewey (1916) when he wrote that: 'The problem of instruction is thus that of finding materials which will engage a person in specific activities having an aim or purpose of moment or interest to him' (Dewey, 1916, p. 132). Dewey formulated the problem of pedagogy in terms of how to create learner's interest in subject matter. For Dewey (1990) the solution to the problem of pedagogy is in reforming the notion of mind and its training, the mind of a teacher is in this study viewed in terms of its intentional acts or mental acts namely epistemic beliefs (Gu, 2016).

Dewey (1990) posed pedagogical question as follows: "How, then, stands the case of child versus the Curriculum? His response is: "The case is of the child" (Dewey, 1990, p. 209): 'The child is the starting-point, the center, and the end' (Dewey, 1990, p.187). Curriculum is for the child not the other way-round. It is a subservient instrument valued for the service of self-realization of the growth, personality and character of the learner. Basic Education Curriculum Framework (GoK, 2017b, p. 29) is explicit on advocating Dewey's theory by stating that:

> According to Dewey, education is growth and not an end in itself, and thus the curriculum should arise from students' interests and should be hands-on and experience based rather than abstract. This theory underscores the emphasis of continuous, participatory and experiential learning. This is an emphasis of the practical aspect of the basic education curriculum in the curriculum reforms.

Dewey was emphatic that teacher must know wisely and thoroughly the curriculum not in itself but in reference to 'the present powers, capacities and attitudes to be asserted, exercised, and realized' in the child (Dewey, 1990, p. 209). Dewey is instructive in stating that 'the present powers of the pupil are the initial stage; the aim of the teacher represents the remote limit' (Dewey, 1916, p. 127). In between the two limits of the learner and the teacher lies means the middle conditions of acts to be performed,

difficulties to be overcome, appliances to be used' (Dewey, 1916, p. 127). These middle conditions constitute the pedagogical oscillations of a teacher. It is what creates interest between learner and subject matter. It is how the teacher intervenes between the learner and object of the lesson. The teacher must align teaching and learning activities in connection with present powers of the learner (Dewey, 1916, p. 127). Dewey elaborates further that subject-matter in curriculum must be transformed or psychologized that is, taken and developed 'within the range and scope of the child's life (Dewey, 1990, p. 208). The curriculum must bond with the 'expanding consciousness of the child' (Dewey, 1990, p. 205). The subject matter of the curriculum must grow out of past experience of the child and grow into 'application in further achievements and receptivities' (Dewey, 1990, p. 205). Otherwise curricular material in itself may alienate the learner if it is externally presented remote from the child. Pedagogical problems arise because the learner is alienated, he lacks interest and teachers have to be adventurous with ways and means to win the child back or for them to drill in the material.

For Dewey once the curricular material is psychologized the pedagogical question is resolved. The learning object is represented as the 'outgrowth of present tendencies and activities' of the child. This strategy adequately handles intellectual, practical, or ethical problems that may arise. This forestalls the possibility of 'mechanical and dead instruction' akin to medieval scholasticism because there is 'interaction' between a child's 'mental demand and material supply' from the teacher.

The problem of pedagogy in terms of how to psychologize subject matter coincides with Shulman's (1987) requirement that a teacher must know her learners. Teacher's knowledge of learners is called pedagogical learner knowledge (Darling-Hammond, 1992). CBC policy required that teachers develop capacity to 'utilize knowledge about

understanding of the students to plan instruction, set goals, select resources and design learning and assessment tasks' (GoK, 2017b, p. 129). This means the teacher should have knowledge of how learners tend to understand and mis-understand the subject matter. It is knowledge of how to anticipate and diagnose such misunderstandings and how to deal with them when they occur (Craig, 2009). The object of learning is represented from the perspective of the learner (Hussu, 1995).

Dewey (1990) cautioned against presenting subject-matter in the curriculum from the perspective of the scientist without direct relationship to the child's present experience. This is the problem that Khakasa (2009) found among mathematics teachers in Kenya. Content subject material is approached from outside the scope of learner's previous experience. The problem arises when the textbook and teacher present subject-matter to the learner from the standpoint of the specialist. Instead the subject-matter should be 'translated into life-terms' of the learner. Subject-matter needs to be psychologized, formulated into the immediate environment of individual experiencing it for the first time.

Academics subject matter has two aspects namely, for the subject experts as specialist or scientist and the other for the classroom teacher. The two aspects are neither in conflict nor identical. The scientist views the subject-matter as a given body of established truth to be employed in locating new research problems and verifying findings. He works with subject-matter to add new knowledge and conquer new frontiers of research. This is the point of view of graduates with B.A and BSC.

However, for the BED student who is a prospective teacher the subject-matter represents a stage and phase of developing experiences of learners. The problem of the teacher is pedagogical. As a teacher he is concerned with 'the ways in which that subject

may become a part of experience of the learner. The teacher is concerned with how his own knowledge of the subject-matter may assist in interpreting the child's needs and doings. He is concerned not with the subject-matter as such, but with the subject-matter as a related factor in a total and growing experience of the learner. For a teacher to see the subject-matter is to psychologize it. It is to find what is in the child's present experience that is usable with reference to the subject-matter in its social use. The teacher is not concerned with adding new knowledge to the subject-matter neither in propounding new hypotheses or verifying them but in formulating it in terms of learners' experiences. His concern is how to bring curriculum material within the scope of experience of the learner as something within the experiential continuum of the learner (Dewey, 1938). The subject-matter of the curriculum and the learner represent two limits of a single process. It is continuous reconstruction, moving from the child's present experience out into that presented by the curriculum. The subject-matter does not get into the child from without but it involves reaching out of the mind. Learning is an activity of organic assimilation starting from the method of the mind as it reaches out to assimilate it.

Shulman's concept of PCK has been subjected to criticism by Deng (2007). Based on analysis of Jerome Brunner, Joseph Schwab, and John Dewey, Deng (2007) argued that PCK assumed that transforming subject matter in teaching and learning experiences is purely a teacher's pedagogical task. Deng (2007) argued that transformation of subject matter in teaching and learning experiences is also essential in curriculum design and implementation. Teachers teach subject matter as presented in the curriculum that is already interpreted and transformed by curriculum designers and subject specialists. Classroom teachers do not teach academic disciplinary knowledge rather they teach what is in the curriculum. Teachers can only be said to interpret or transform curriculum

content subject matter in their teaching and learning situations. Based on this criticism by Deng (2007) this study will retain the substantial pedagogical meaning of Shulman's concept of PCK. However, to accommodate and account for the criticism of Deng (2007) this study will modify and rename pedagogical content knowledge to be pedagogical curricular knowledge. The substitution of 'content' with 'curricular' is intended to emphasize that classroom teachers do not teach pure academic discipline per se but curricular subject matter. Pedagogical knowledge of a teacher is how to interpret, present and transform curricular subject matter for specific need, ability, interest and milieu of a learner. The limit of Deng's (2007) criticism is that Shulman (1987) and associates were preoccupied with 'academic disciplines and pedagogical transformation' which obscured or overlooked ''the curricular task of transformation.' In conclusion 'the curricular task of transformation necessarily precedes the pedagogical task of transformation' this implies that 'what classroom teachers primarily work with is not the subject matter of an academic discipline, but the subject matter of a school subject embodied in curriculum materials for educational purposes' (Deng, 2007, p. 289).

Deng (2007) failed to make explicit reference to Dewey's work The Child and Curriculum (1990) where Dewey is explicit on how classroom teachers should mediate between the curriculum as a course of study and the learner (child). Deng (2007) however is right in correcting Shulman (1986) in that classroom teachers teach subject matter as presented by curricular and subject experts not as a content of university discipline in schools of arts and social Sciences. This is an issue that Khakasa (2009) underscored. Dewey (1990) observed that every subject has two aspects: one for scientists as a scientist or expert and the other for the teacher as a teacher. The two aspects are neither conflictual nor opposed but neither are they identical. The

disciplinary expert and the classroom teacher relate to the subject differently. The expert or scientist views the subject matter as ‘a given body of truth to be employed in locating new problems, instituting new researches.’ But the teacher is not ‘concerned with adding new facts to the science he teaches or in verifying them. He is concerned with the subject-matter as *representing a given stage and phase of the development of experience’* (Dewey, 1990, p. 201).

The primary role of a teacher as a teacher is how to induce ‘a vital and personal experience’ for the learner (Dewey, 1990, p. 202). This role is underscored by Basic Curriculum Framework (GoK, 2017b, p. 129) which requires of teachers in CBC to develop capacity to: ‘Stimulate learner reflection on prior content knowledge, link new concepts to familiar concepts and make connections to student's experiences.’ This coincides with Dewey’s technical definition of education as ‘reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience’ (Dewey, 1916, p. 76).

What concerns a teacher as a teacher ‘is the ways in which that subject may become a part of experience’ of the learner. That is how to relate it with the learner’s experience. Dewey is emphatic that the teacher must know ‘how his own knowledge of the subject-matter may assist in interpreting the child’s needs and doings, and determine the medium in which the child should be placed in order that his growth may be properly directed’ (Dewey, 1990, p. 201). Dewey asserted that the teacher is ‘concerned, not with the subject-matter as such, but with the subject-matter as a related factor in a total and growing experience. For Dewey’s teacher to see subject matter is to psychologize it. To psychologize subject-matter is to view it as ‘an outgrowth of present tendencies and activities’ of the learner. It is to translate it into life-terms of the learner’s present life. The teacher should not present the subject matter as it stands in relation to the

specialist but in relation to the learner. Failure to psychologize subject-matter results in the pedagogical evils such as external imposition of abstract content to the learner as something dead and barren. Drill and memory are employed to present facts and truths to be assimilated where material is directly supplied in the form of a lesson to be learned as a lesson. This is what is meant by mechanical and dead instruction' the result is 'lack of motivation' in the learner. There is no interaction between a learner's curiosity to know and material supplied by the teacher.

As Dewey noted the classroom pedagogical evils do not cease unless subject matter is psychologized. The content is delivered from a teacher-centered perspective as it is in textbooks which is expert's perspective and pedagogy is tailored for regurgitation of content. In pedagogical meaning for regurgitation the teacher knows neither what the present power, capacity, or attitude of learners are, nor yet how (they are) to be asserted, exercised, and realized in the learners. Pedagogy aligned with learners' experiences require the teacher to psychologize the subject-matter that is to be learner-centered which is to know the learner's present powers which are to assert themselves; his capacities which are to be exercised; his present attitudes which are to be realized. More importantly the teacher must know and know thoroughly what is embodied in that thing we call the curriculum and how to psychologize. This constitutes pedagogical curricular knowledge which is the special professional competence of a teacher as a teacher.

The instructor gives way for the teacher at the point where the material communicated by the teacher stimulates the available experience of the learner. Instruction swarms the learner with material ready made by the teacher but teaching occurs when the narrow field of experience of the learner provides the pedagogical base of introducing the wider experience of the human race. Dewey calls this 'genuine communication' because it produces a community of thought and purpose between the child and the race of which

he is the heir (Dewey, 1910). Instruction or reproductive pedagogy of old school swarms the learner with masses of material from the human race but teaching broadens the narrow experience of the learner with the wider experience of the human race. Experience of the learner as what is 'nearer at hand' for the learner 'furnishes the point of approach and the available resources' to handle the new material. The best thinking occurs when the easy and the difficult are duly proportioned to each other. The easy and the familiar are equivalents, as the strange and the difficult (Dewey, 1910). Learners' experience is old and familiar; it serves as a resource to deal with the new and strange subject of the lesson. Teaching becomes enlargement of mental vision, a sense for ideas – for principles- ready to be put to any end result.

Teacher's classroom pedagogy is reconstruction of a concept to be grasped so that knowledge of it will carry over into an effective resource in further grasping in the subject area. The teacher's problem – as a teacher – does not reside in mastering a subject-matter, but in adjusting a subject-matter to nurture learners' competency in thinking. The teacher obstructs the logic of the student's mind when he tries to impose the logical review of an expert mind that already understands the subject upon a learner's mind that is struggling to comprehend it (Dewey, 1910). Logical order of the subject-matter is made by the one who already understands it, not the path of progress followed by a mind that is learning. The former may describe a uniform straightway procedure, but the latter must be a series of tacks, of zigzag movements back and forth. The former is a logical process while the latter is pedagogical oscillations.

Dewey is among fathers of constructivist theory of teaching and learning (Neel, 2008). Constructionism is the theory that students construct their own meaning and understanding from direct experience with content that is linked to prior knowledge (Neel, 2008). Dewey (1916) advocated for conception of learning as something which

the individual does when he studies. He rejected educational dualism which separates subject matter with method of teaching and learning. Dewey (1990) in his work the school and society is critical of teachers who have subject-matter at command, and little knowledge of how this is related to the minds of those to whom it is to be taught. He termed this the division between what to teach and how to teach as unfortunate. According to Khakasa (2009) teachers' abundance of content has no significance difference on learning outcomes compared to pedagogical competence.

Pedagogical derivative from pragmatic epistemology is evident when there is connection in acquisition of knowledge in the schools with activities, or occupations (Dewey, 1916). Pragmatic epistemology has pedagogical implications where learning involves doing practical activities. Dewey cautioned against learners acquiring knowledge as a store of information aloof from doing. He referred to this as spectator theory of learning (Dewey, 1916).

The dispositions and competences demanded of Kenya's labor-force for Vision 2030 presuppose pragmatic theory of knowledge. The competences and dispositions required of Kenya's labor force in Sessional Paper 14 of 2012 under article 1.3 (GoK, 2012) easily lend themselves almost serendipitously pragmatic. For instance, capacity to 'engage in life-long learning' requires pragmatic method 'by which one experience is made available in giving direction and meaning to another.' Another competence required of Kenyan labor force is capability 'of more complex problem-solving' this relates to pragmatic epistemology where knowledge is disposition of straightening out a perplexity. Lastly, the requirement that Kenyan workers 'understand more what they are working on' suggests pragmatic knowledge 'consists of the dispositions we consciously use in understanding what now happens by conceiving the connection between ourselves and the world in which we live.' Still it is expected that for Kenya

to be globally competitive its human resource base must be ‘constantly subjected to retraining.’ The principle of constant retraining is well captured by Dewey (1916) in his technical definition of education that is education ‘is that reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience’ (Dewey, 1916, p. 76). Dewey’s technical definition of education in terms of experiential learning has fundamental relevance to teachers’ competence under CBC because teachers are required to ‘value the experiences the student brings to class and allow these experiences to be recognized in the classroom and further each student's development’ (GoK, 2012, p. 129)

Basic Education Curriculum Framework (GoK, 2012) under a section on *Teachers Capacities required for a CBC*, inter alia requires a teacher to develop ‘in-depth content and pedagogical knowledge and use this knowledge effectively to provide learning experiences to improve learner’s achievement’ (GoK, 2017b, p. 129). This is in addition to another fifteen statements on the capacity of teachers. Eight areas for ‘learning outcomes for capacity building of curriculum implementers’ fails to include capacity on how to integrate content with pedagogy. Teachers are required to apply ‘innovative pedagogical approaches and models’ (GoK 2017, p. 128) yet such pedagogical knowledge is not spoken of in terms of its integration with masterly content knowledge.

Another reason why pedagogical content knowledge is needed yet not acknowledged in curricular reform in Kenya is in what is stated in Basic Education Curriculum Framework (GoK, 2017b, p. 132) that is: Curriculum reform will lead to a teacher education curriculum which produces teachers who understand and promote inclusivity, and who are endowed with the following capacities:

i. Identify learners who may be having learning challenges and address their challenges in a timely fashion or make a request for further assessment and support.
ii. Develop ways of teaching that respond to individual differences and benefit all children.
iii. Teach competencies and effectively teach classes with heterogeneous learners.
iv. To establish and maintain schools that educate all children together rather than set up a complex system of different schools 'specializing' in different groups of children.

PCK is here proposed as the key to the proposal by Basic Education Curriculum Framework to develop module on 'appropriate pedagogy and approaches' for CBC implementers (GoK, 2017b). Majority of curricular innovations fail when teachers after a while relinquish the new behavior and return to old ways after a period of change. If new curricular innovation does not correspond with the teachers' knowledge and beliefs the failure in curricular reform is imminent (Rahmany et al., 2014).

Following Deng's criticism of the term pedagogical content knowledge, this study employed the term pedagogical curricular knowledge. The teacher in Kenya handles subject matter as selected and organized by experts at Kenya Institute of Curriculum Development (KICD, 2018). Pedagogical curricular knowledge is subject-matter knowledge for teaching (Phillips, 2003). The teacher understands curricular content of the teaching subject in terms of anticipating learners' needs, interests, abilities, difficulties and competences. This concept of pedagogical curricular knowledge specifies the way a professional teacher approaches the subject-matter which is pedagogically different from the way of a nonprofessional teacher. The teacher needs to know which elements are essential to be mastered so that subsequent learning will

be easy for the learner. The teacher needs to foresee likely misunderstandings and areas of difficulty for the learner. The teacher has pedagogical strategies to address such eventualities.

Epistemic beliefs are key components in the pedagogical reasoning of a teacher (Mansoor, 2008). Shulman (1978) developed the theory of 'pedagogical reasoning and action' as a means of aiding teachers to translate their content masterly into learners' context. Shulman's (1978) theory is proposed in this study for adoption as a means to overcome inconsistency between espoused teachers' beliefs and the actual classroom practice. When epistemic beliefs are rationalized based on Shulman's theory, they become pedagogical beliefs which influence classroom instructional practices (Khader, 2012).

Pedagogical curricular knowledge is practical knowledge of what a teacher knows concerning her professional work. Fenstermacher (1994) identified two types of teachers' knowledge namely formal knowledge and practical knowledge. Formal knowledge is that which a teacher acquires through the Teacher Education program while practical knowledge is what a teacher acquires in the experience of professional practice. It can be argued borrowing from Phillips (1996) that whereas formal knowledge is based on authority of reason (textbooks' propositional knowledge), practical knowledge is based on authority of experience. Fenstermacher however observed incongruence between the two types of teachers' knowledge and suggested creation of teachers' professional practical knowledge that integrates both kinds of knowledge.

Rahmany et al., (2014) suggested that integration of the two types of teachers' knowledge would happen if specific problems addressed in formal knowledge relate to

(practical knowledge) situations that teachers' face in actual classroom contexts. Craig (2009) calls for teachers to use research-based knowledge analogous to medical practice where clinicians make use of scientifically grounded knowledge to deal with a medical case. This is one way of how the difficulty of changing instructional practices can be addressed (GoK, 2012). This study argues that integration of both formal knowledge and practical knowledge can be continuously reconstructed by intertwining content knowledge with pedagogy. This is what is intended by the concept of pedagogical content knowledge.

Pedagogical curricular knowledge is practical knowledge of a teacher's technical know-how in translating subject-matter into learner's situation. It is dispositional knowledge of how to go about presenting content knowledge into ways that learner can relate with ease of comprehension. This is what Dewey (1990) referred to as a psychology curriculum. Kirschner (2009) cautioned against confusing epistemological base of a domain (i.e., how knowledge is acquired and the accepted validation procedures of that knowledge in a domain) with the psychological and pedagogic bases for teaching in that domain (i.e., strategies of instruction or a style of instruction). Kirschner (2009) is helpful in clarifying that teaching science for instance is different from *doing science* which is a clarity that is often lost when we overlook the fact that learners are not miniature experts practicing something but rather novices learning about something. This point is the hallmark of pedagogical content knowledge where professional expertise of a teacher lies in the knowledge of how to teach a subject not in making experts of learners in a discipline. The concept of pedagogical curricular knowledge helps teachers to reason pedagogically on how to integrate the two forms of knowledge which a teacher struggles to integrate as evident in Fenstermacher (1994), Roberts (1996) and Gu (2016).

Fenstermacher (1994) decried lack of congruence between knowledge teacher-trainee obtains during Teacher Education and the knowledge they construct during professional experience. He asserted that formal knowledge is for teachers but practical knowledge is of teachers. Formal knowledge is based on *authority of reason* (textbooks, propositional) but practical knowledge is based on *authority of experience* (Roberts, 1996). He goes on to observe that pedagogical knowledge is practical knowledge which is individualized by a given teacher. It is formed based on situational experience. It is about how a teacher sees and interprets events in a learning environment. It is tacit yet reflected in the person's present mind. This is what this study calls epistemic belief. This seems to suggest that practical knowledge is reflected in the mind as epistemic belief. While formal knowledge is acquired through a teacher education program, practical knowledge is constructed by the teacher in the course of professional work. Thus it is personal, contextual, relative to content handled by the subject teacher, it is relative to the context of classroom situations and it is tacit meaning not articulated conspicuously. The two types of knowledge *for* and *of* teachers constitutes what Gu (2016) called *mental state* and *mental acts* respectively. The concept of pedagogical curricular knowledge aids teachers to integrate formal knowledge with practical knowledge so that what is espoused in mind as epistemic belief is enacted in practice as instructional strategy. In other words, the teacher's mental acts become reconciled with the teacher's mental state (Gu 2016). Teachers mental acts are mental habits enacted in contextual teaching (Deng, 2015). This requires psychologizing curriculum based on pedagogical reasoning which attempts to reconcile authority of reason with authority of teacher's experience.

The pedagogical reasoning involved in psychologizing curricular content has the following phases (Shuman 1987): (1) Teacher's comprehension of curricular content.

It constitutes the formal knowledge for the teacher (Fenstermacher, 1994). (2) Transformation stages have four activities namely (i) preparation which involves critical interpretation and analysis of curricular content (ii) Representation that is thinking of how to present subject matter to learners by employing useful and relevant analogies, metaphors, examples, demonstrations, and explanations. (iii) Selection of instructional strategies for teaching and learning activities and (iv) Adaptation and tailoring the content matter to learners circumstances such as consideration of conceptions, preconceptions, misconceptions and difficulties; factoring in learners language, culture, social class, gender, motivation, age, ability, aptitude, interests, self-concept and attention. (3) Instruction or actual teaching which includes class management, class discussions, interactions, discipline, humor, questioning and other aspects of active teaching and learning, discovery or inquiry based instruction. (4) Evaluation which includes checking for students' understanding during interactive teaching and learning engagements at the end of the lesson, it also includes self-evaluation of the teacher. (5) Reflection which includes mental reviewing, reconstructing, reenacting and critically analyzing one's own and the learner's performance. This suggests that teaching is a reflective practice (Mezirow, 1998). (6) New comprehension which involves insights that arise from the enacted teaching and learning experience. This brings about new understanding which augments teacher's teaching competence. It enhances a teacher's continuous learning which enables him/her to handle subsequent teaching and learning experiences with confidence. The new comprehension captures Dewey's (1916) technical definition of education which highlights the need for continuous experiential learning by reconstructing experience for increased capacity for enhanced competency in handling future or subsequent pedagogical experiences.

The six stages are the thinking process that a teacher should undergo in enacting epistemic beliefs in appropriate pedagogical approaches for CBC. This process is metacognitive because it requires the teacher to become aware of the process that organically binds her understanding of content with its reformulation and reconstruction for comprehension by the learner. This is elaboration of how a teacher psychologizes the subject matter so that knowledge of curricular content is pedagogical, that is knowledge of content becomes knowledge of how to teach content. This requires reflection on teaching experience which demonstrates that the six phases of pedagogical reasoning empowers teachers to become reflective practitioners (Mezirow, 1998). Thus enactment of epistemic beliefs is not a simple but sophisticated thoughtful process.

Pedagogical curricular knowledge through the six stages of reasoning distinguishes teachers from subject experts. Teachers differ from experts in a field not in quantity or quality of subject matter but in how that 'knowledge is organized and used.' Teacher's should understand science from a teaching perspective (how to help students acquire scientific knowledge) while a scientist understands science from experts' perspective. Teacher's professionalism is in knowledge of how to transform subject matter for the purpose of teaching and learning goal. This according to Shulman (1987) required critical reflection on the subject matter in order to interpret it by adapting it and tailoring it to the context of students.

The subject matter is to be adapted to students' peculiarities of gender, incoming behavior, prior experience, abilities, interests, needs and challenges. This process of relating subject content to the circumstance of a specific student is described by Shulman (1987) as a continual restructuring of subject matter knowledge for the purpose of teaching. It requires a teacher's capacity for flexible understanding of their subject area in order to relate it to the level, viewpoint, need and ability of a student.

The teacher should transform subject matter not only in terms of students' situation but also in terms of social, political, cultural and physical environment of where students are learning. These two perspectives are at the core of Dewey's concept of education as both psychological and sociological. The pedagogical curricular knowledge is what Dewey would call the bridge that links psychology to sociological banks of the river of education, which separates learners from society. To use Ngugi wa Thiong'o's metaphor in the title of his novel the River between we say that pedagogical content knowledge is the bridge which links the river between the learner and the society.

This third section of chapter four has revealed that teachers require the concept of pedagogical content knowledge to enact pedagogical practices aligned with theory of knowledge of CBC. The concept of pedagogical knowledge however, must be interpreted as pedagogical curricular knowledge since teachers do not teach disciplines as in university courses of study but as subject areas selected and organized in the curriculum. The six stages of pedagogical reasoning constitute the means of transforming teachers' epistemic beliefs of curriculum into learners' experiences. This helps to address the challenge of how to change classroom practice as required by demands of CBC.

This chapter has discussed research findings based on its research objectives. The chapter was divided into three sections each looking at respective research objectives and corresponding research questions. The findings of the study have established that the undergirding theory of knowledge for CBC in Kenya is pragmatic social constructivism, which is associated with Dewey's theory of knowledge. The second research objective required that teachers' epistemic beliefs be derived from the theory of knowledge undergirding CBC. These epistemic beliefs relate to knowledge, mental habit, instrumental view, sociality, problem-solving and thought experimentation. The

third research objective employed the concept of pedagogical content knowledge as means to facilitate teachers' pedagogical thinking on how to enact espoused epistemic beliefs in classroom practice which accounts for learner' experiences. This chapter has also demonstrated that enactment of epistemic beliefs in classroom pedagogical approaches should be a mediated process through pedagogical reasoning.

CHAPTER FIVE

SUMMARY, CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

5.1 Introduction

This chapter provides study summaries based on purpose, research objectives, and research questions. Recommendations and suggestions for further research are outlined. The purpose of this study was to find epistemic beliefs for enactment of pedagogy for CBC in Kenya. The study was triggered by Vision 2030 and education reform policy documents which required teachers' in Kenya to modernize classroom pedagogical practices for effective implementation of CBC (GoK, 2007; GoK, 2012; GoK, 2015; GoK 2017a; GoK, 2017b).

5.2 Conclusion

5.2.1 CBC Policy & Modern Research on Pedagogy

Pedagogical research in Kenya was for faulted for not keeping abreast with modern research in pedagogy (GoK, 2012). Policy documents observed difficulty in changing teachers' instructional practices in response to learner centered pedagogy under CBC (Gok, 2012). The study undertook to analyze modern pedagogical studies (Gu, 2016; Arslantas, 2016; Deng, 2015; Dijk, 2014; William, 2013; Cajigal, 2010; Neel, 2008; Schommer 2004; Hofer & Pintrich 2002). Personal epistemology is the new area of pedagogical research that employs instrumentality of EBQ to identify teacher's espoused epistemic beliefs. Studies in personal epistemology have established that teachers enact espoused epistemic beliefs in their classroom pedagogical practices (Gu 2016; Rahmany et als, 2014; Paechter, Rebmann, Schloemer, et als, 2013; Chai 2010; Hofer & Pintrich 2002). However, such studies are yet to be undertaken in Kenya by use of instruments of EBQ. For instance, while Nasimiyu (2017) looked at pedagogical

beliefs among teachers in Kenya she did not consider pedagogical beliefs as functions of epistemic beliefs for CBC. Khakasa (2009) looked at Kenyan teachers' proficiency in PCK in mathematics. She did not view teachers' PCK in relation to teacher's epistemic beliefs for pedagogy of CBC. Other studies in Kenya on pedagogy include Inyega and Inyega (2017), Machina (2012), and Ngware et als (2011). All these studies did not review theory of personal epistemology on pedagogy. It is difficult to change pedagogical practices in Kenya if the teacher's epistemic beliefs are unknown.

5.2.2 Philosophical research on pedagogy

Whereas the above studies in personal epistemology and on pedagogy in Kenya are designed in quantitative research design this study employed philosophical design. Philosophy is neither quantitative nor qualitative in its research paradigm (Golding, 2013). Philosophical research does not conduct empirical experiments, surveys, and statistical analysis (Ross, 2011). Decision to consider relevance of data collection is based on the objectives and purpose of the study (Peersman, 2014). The purpose of this study was not to fill a gap in empirical knowledge. It was conceptual and normative. It therefore employed a philosophical method of epistemological analysis of theory of knowledge presupposed by CBC in Kenya. The theory of knowledge of CBC is normative logical source of teachers' epistemic beliefs. These epistemic beliefs are to be espoused by teachers in Kenya and guide in their pedagogical reasoning and enactment of instructional practices aligned to CBC. Pedagogical reasoning integrates epistemic beliefs with pedagogy in teachers' formulation of subject matter in terms of learners' experiences in the Kenyan context.

5.2.3 Teacher education

Policy on CBC required teachers to undergo training on pedagogical implementation of CBC (GoK, 2017a; GoK 2017b; GoK, 2015; GoK, 2012; GoK, 2007). Teachers

require broad, comprehensive and normative pedagogical knowledge which informs classroom behavior and instructional decisions. The training manuals to be developed include a module on pedagogical approaches for CBC. This exposes teachers to a broad pedagogical vision of how to transform content in terms of learners' experiences in the Kenyan context. This avoids opportunistic pedagogy which reduces education to techniques of passing examination. National Education Sector Strategic Plan II (2015) cautioned that examination should not drive pedagogy.

5.2.4 Change of Instructional Practice

Sessional paper no 14 of 2012 (GoK, 2012) observed that the hardest element to change and a major challenge facing the teaching profession in Kenya is how to change instructional practices. This study has shown that pedagogy which informs instructional practices can be changed by empowering teachers to examine their espoused epistemic beliefs. Epistemic beliefs are the individual teacher's view of subject matter and how learners acquire knowledge. Epistemic beliefs influence pedagogy in a relation akin to theory to practice. This study proposes that pre-service teachers should be facilitated to develop epistemic beliefs that are dynamic and flexible in line with theory of knowledge of CBC. Epistemic beliefs are open to continuous reconstruction in order to change pedagogy as circumstances demand.

Sessional paper no 14 of 2012 observed that teacher education in Kenya has not kept pace with development that has occurred in the pedagogical innovations (GoK, 2012). This study has employed recent studies in pedagogical research based on research program of personal epistemology and PCK. These two areas are integrated to suggest their inclusion in the curriculum of teacher education in Kenya for implementation of CBC.

5.2.5 Synchronous integration of Pedagogy and Content

Sessional paper no 14 of 2012 stated that teacher education focuses on 'both the subject area and pedagogy' (GoK, 2012). Further, the Sessional paper recognized concurrent and consecutive or sequential teacher education programs. Whereas the former puts pedagogy and content simultaneously in professional training of teachers, the latter involves a sequential process where after attaining Bachelor of Arts degree (B.A) or Bachelor of Science degree (BSC) a graduate moves to undertake postgraduate training in pedagogy and professional training. This study used the concept of PCK to argue against divorce between pedagogy and content. The blended model integrates content and pedagogy as advocated by Deng (2007), Dewey (1990), Shulman (1987), Darling-Hammond (1992) and Fenstermacher (1994). The consecutive model suffers from divorcing content from pedagogy. Based on modern research on pedagogy and in response CBC policy (GoK, 2007; GoK, 2012; GoK, 2015; GoK, 2017a; GoK, 2017b) the study concluded that teacher education considers implementing PCK by integrating and blending pedagogy with content. This will specify the unique professional competency of a classroom teacher which is to know subject matter in terms of how to formulate it with reference to learners' experiences. This makes unambiguous distinction between a teacher's expertise and the expertise of a specialist in academic discipline. The latter only has advanced knowledge of a subject matter but without integrated pedagogical knowledge of how to formulate it in terms of learners' experiences. Basic Education Curriculum Framework (GoK, 2017b) favors synchronous training in pedagogy and content which means that it is better than sequential training from BA or BSC and then pedagogy. 'Sequential development needs to be replaced with synchronous development. An integrated approach to develop

programmes of study, assessments, and learning and teaching resources supports a common approach that encourages interdisciplinary learning' (GoK, 2017b, p. 27).

5.2.6 Pedagogical shift

The education reform is a shift from curriculum of knowledge reproduction to CBC (GoK, 2017b, GoK, 2012, GoK, 2007). This study used theory of Dewey and personal epistemology to demonstrate that CBC is implementable via appropriate learner centered pedagogy premised on a repertoire of epistemic beliefs. Pedagogy is the enactment of a teacher's epistemic beliefs. This study argued that for efficient implementation of CBC teachers in Kenya require pedagogical shift by reconstructing their tacit epistemic beliefs in terms of theory of knowledge of CBC which is biased towards learner centered experiences, needs, abilities, interests and talents.

5.2.7 Pedagogical Social Vision

In personal epistemology as well as in policy documents on CBC in Kenya pedagogy is viewed under the narrow prism of instructional methods. However, this study has analyzed pedagogy under the broader framework of normative social vision of educational theory and practice for CBC. In this study pedagogy was reconstructed as normative socio-political vision which guides teachers' pedagogical reasoning on how to enact epistemic beliefs in instructional practices appropriate for learner centered CBC.

5.2.8 Pedagogical Content Knowledge to Pedagogical Curricular Knowledge

Schulman (1986) coined the concept PCK. However, Deng (2015) criticized PCK in that teachers do not implement content of academic disciplinary knowledge. School teachers implement curriculum content which is deliberately selected, organized and sequenced as educational experiences for intended learning outcomes. The basic

education has its objectives and the teacher is required to be competent on how to facilitate learning outcomes. Deng (2015) therefore argued that Pedagogical Content Knowledge should not emphasize content but curriculum specified at basic education. Kenyan teachers should be trained on pedagogical curricular knowledge, how to implement the set curriculum at basic education. Teachers require knowledge of the set curriculum and its pedagogy that is Pedagogical Curricular Knowledge, not more advanced content. This should be evident in pedagogical training for implementing CBC in Kenya.

5.3 Study Recommendations

The following recommendations were drawn based on the findings of the study:

i. That teacher education program integrate pedagogy with content (subject matter) so that pre-service teachers develop professional competency in PCK (how to formulate subject matter in terms of learner's experiences in CBC) and not merely transmit content for learner's passive consumption.
ii. That teacher education program include theory of knowledge underpinning CBC in order to develop repertoire of epistemic beliefs to facilitate enactment of learner centered pedagogical approaches appropriate for CBC.
iii. That pre-service teachers on practicum be assessed in terms of competency in PCK that is competency in formulating subject matter in response to individual learners' experiences.
iv. That teacher's epistemic beliefs are targeted during the teacher's CPD as means of reforming and improving learner centered pedagogical practice in line with CBC.

5.4 Suggestions for Further Research

That needs assessment for teachers' pedagogical capacity building in Kenya henceforth includes administering EBQ. This instrument should be piloted and domesticated in Kenya as it has been done elsewhere in the world. EBQ be employed in longitudinal studies in teacher education programs to identify pre-service teachers' epistemic beliefs and monitor how epistemic beliefs change in the course of their professional in-service education. That further studies using EBQ be undertaken on teachers' proficiency in implementing CBC in order to assess consistency between epistemic beliefs and theory of knowledge underpinning CBC in Kenya.

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