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Epistemological and Pedagogical Beliefs of Pre-service and In-service Teachers in a Tanzanian Context

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Epistemological and Pedagogical Beliefs of Pre-service and In-service Teachers in a

Tanzanian Context

by

Michael B. Msendekwa

Dissertation

Presented to the Faculty of the

Graduate School of Education at

Seattle Pacific University

In Partial Fulfillment of the Requirements for the

Doctor of Philosophy in Education Degree

Seattle Pacific University

February 2015

Epistemological and Pedagogical Beliefs of Pre-service and In-service Teachers in a

Tanzanian Context

by

Michael B. Msendekwa

A dissertation submitted in partial fulfillment

of the requirement of the degree of

Doctor of Philosophy in Education

Seattle Pacific University

2015

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_____

Rick Eigenbrood, Dean, School of Education

Dedication

This dissertation is dedicated to my parents, Bedson Msendekwa (my father), Veryani Msendekwa (my biological mother who passed away when I was still young), Catherine, my step mother who raised me but unfortunately passed away when I had already my bachelor degree. Thanks my parents for your valued contributions in my life.

University of Tanzania (RIP) and others that I have not mentioned because of space. All of them know who they are, and have been important contributors to the success of my doctoral program. I am deeply grateful and hold them in high esteem.

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Seattle Pacific University

Abstract

Epistemological and Pedagogical Beliefs of Pre-service and In-service Teachers in a

Tanzanian Context

By Michael B. Msendekwa

Chairperson of the Dissertation Committee: William Nagy

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This study investigated the epistemological and pedagogical beliefs of pre-service and

in-service teachers working toward a degree in education at a university in Tanzania. A total

of 702 pre-service and in-service teachers from year one and three participated in the study.

The Teaching and Learning Conception Questionnaire (Chan & Elliott, 2004b; Lee, Zhang,

Song, & Huang 2013) was used to measure student-teachers' pedagogical beliefs, and the

Epistemological Beliefs Questionnaire (Chan & Elliott, 2000, 2004b; Lee, Zhang, Song, &

Huang, 2013) to measure their epistemological beliefs.

Factor analysis of data from the Teaching and Learning Conception Questionnaire

resulted in a two-factor solution very similar to that found by other researchers (Chan &

Elliott, 2000, 2004b; Yilmaz & Sahil, 2011), with the factors representing a traditional

conception and a constructivist conception. The two factors were not correlated, $r = .04$, $p >$

.05. Student-teachers had a mean of 4.24 on the constructive conception whereas a mean of

3.20 on traditional conception, on a five-point scale where 1 = 'strongly disagree' and 5 =

'strongly agree.' MANOVA found significant main effects of year of study, $F(1, 606) =$

22.11, $p = .001$, $\eta^2 = .04$, and Teacher type, $F(1, 606) = 8.67$, $p = .001$, $\eta^2 = .01$, for the

traditional conception. Third year students were closer to neutral in their beliefs about the

traditional conception than first year students, and in-service teachers closer to neutral than

pre-service teachers. For the constructivist conception, there was a significant interaction of teacher type and year of study for constructivist conception, $F(1, 606) = 10.68$, $p = .001$, $\eta^2 = .02$. In year one, in-service teachers held more strongly to the constructivist conception than pre-service teachers, but in year three, there was no difference between these groups.

Factor analysis of data from the Epistemological Beliefs Questionnaire resulted in a four-factor solution somewhat similar to that found by other researchers (Chan & Elliott, 2000, 2004b; Lee, Zhang, Song, & Huang, 2013). Factors representing student-teachers' epistemological beliefs were not further analyzed due to low Cronbach's alphas.

Implications for practice and suggestions for future research are highlighted in the study.

Chapter One

Introduction

Background of the Study

With the rapid rise of globalization, the Tanzanian government undertook reforms in different sectors, including education. In the educational reform of 2005, Tanzania launched a paradigm shift from a focus on teaching to a focus on learning. This shift called for change, including the renovation of the Tanzanian Education Curriculum; or, as the National Report of the United Republic of Tanzania of 2008 reads:

> the syllabuses have been reviewed in the spirit of constructivism. While the reviewed syllabuses emphasize learner-centered methods of teaching and learning, it goes hand-in-hand with constructivism, which insists that the learner should learn through his/her activities. Syllabus review has also been done to enhance participatory approach of teaching which aims at benefiting students with different abilities so as to capture their learning needs. (p. 12)

This reform reflects contemporary educational thought. It sounds beneficial, as it takes the education system from an essentialist to a progressive curriculum, from teacher-centered pedagogical instruction to learner-centered pedagogical instruction reflecting a constructivist approach. Constructivism is a view of learning and development that emphasizes the active role of the learner in building understanding and making sense of the world, in which learners use their prior understanding and experience to construct, elaborate or restructure their current knowledge (Duffy & Cunningham, 1996; Eggen & Kauchak, 2001). McCombs and Whisler (1997) stipulate the benefit of a learner-centered instructional approach as:

to better meet the needs of more students - that is, to have more of them stay in school, learn, and exit school with the knowledge and skills needed to become productive and satisfied citizens and with the desire to continue learning after formal schooling has ended. (p. 36)

Generally, this reform is directed toward enabling students to be capable of constructing and discovering their own knowledge. It is the position of constructivists, like Jerome Bruner, that knowledge discovered is more useful to learners than knowledge merely received (Bruner, 1967; Ellis, 2004).

The implementation of the Tanzanian 2005 Primary (Elementary) and Secondary School Curriculum, which calls for a learner-centered curriculum and instructional approach, is still problematic for many teachers in Tanzania (Kafyulilo, Rugambuka, & Moses, 2012; Mosha, 2012; Msendekwa, 2010; Rweyemamu, 2012). Among the critical issues are that teachers do not get enough pre-service or in-service teacher training focused on how a learner-centered instructional approach works; nor is adequate training provided to address teachers' and students' perceptions of the learner-centered approach which the Ministry of Education and Vocational Training (MoEVT) has insisted teachers adopt. These perceptions include the teachers' opinion that the learner-centered instructional approach is time-

consuming, it does not allow students to properly understand the content, it makes teachers to be seen as not knowledgeable, it does not go with the pace of examination pressures, it creates difficulty in covering the syllabus, and it is unworkable in big classes (Kafyulilo, Rugambuka, & Moses, 2012; Mosha, 2012; Msendekwa, 2010; Rweyemamu, 2012).

All these findings are the result of qualitative studies. The present study went beyond the above-mentioned studies. It had two purposes: 1) to identify and examine sources of

teachers' beliefs that impede the adoption of the Tanzania education reform, and 2) to do so

utilizing a quantitative research approach that allows for more generalizability. In particular,

this study focused on teachers' epistemological beliefs as an important basis of their

pedagogical beliefs. Epistemological beliefs are beliefs about the nature of knowledge and

knowledge acquisition or learning (Chan & Elliott, 2004a). In order to implement any

education reform, there is a need to involve teachers as they play a dominant role in

implementing the curriculum. Teachers are critical components of processes of change

because they can decide whether to implement the reform or not (Isikoglu, Basturk, &

Karaca, 2009). In order for teachers to change their curricular orientation, there must be

change in their beliefs (Beck, Czerniak, & Lumpe, 2000; Prawat, 1992).

This aligns with a study done by Pajares (1992) that focused on how teachers'

instructional practices are closely influenced by pedagogical beliefs. Moreover, Hasweh

(2003) found that teachers with traditional essentialist beliefs tend to use a teacher-centered

instructional approach while teachers with constructivist beliefs tend to use a learner-centered

instructional approach. Furthermore, teachers' pedagogical beliefs have been found to be

influenced by their epistemological beliefs; that is, the way they think about what the source

of knowledge is, and how people learn that knowledge (Chai, 2010; Chan & Elliott, 2004b;

Cheng, Chan, Tang, & Cheng, 2009; Schommer-Aikins & Easter, 2008). So, knowing

teachers' epistemological and pedagogical beliefs would help policy makers, as well as

curriculum reformers determine the kind of pedagogy the teachers are likely to employ in

classrooms. Hence, they could explore ways to change teachers' beliefs towards the proposed

curriculum reform.

Problem Statement

Previous researchers have found a relationship between teachers' beliefs and their

classroom practices (Haney, Czerniak, & Lumpe, 1996; Fang, 1996; Minor, Onwuegbuzie,

Witcher, & James, 2002; Pajares, 1992; Prawt, 1992; Vacc & Bright, 1999; Wilson &

Winerburg, 1988). Lee, Zhang, Song, and Huang (2013) found that teachers' epistemological

beliefs can impact teachers' instructional practices directly or indirectly, through the effects

of their beliefs on teachers' conceptions of teaching and learning. More specifically, Hasweh

(2003) and Isikoglu, Basturk, and Karaca (2009) found that teachers with constructivist

beliefs are more likely to employ learner-centered instructional practices than teachers with

traditional, essentialist beliefs. Weinberg and McCombs (2001) and Meece (2003) found that

learner-centered practices were correlated with students' motivation and achievement.

In summary, many researchers consider teachers to be important agents of change in

implementing educational reforms (Anagun & Anilan, 2013) and researchers suggested that

teachers' beliefs drive instructional practices (Pajares, 1992; and Richardson, 1996).

Therefore, in order to change classroom teaching practices, teachers' pedagogical beliefs

should be considered (Hart, 2002). For recommended classroom practices to be implemented

there is a need to consider teachers' epistemological beliefs, as well; that is, about what the

source of knowledge is and how knowledge is acquired. Epistemological beliefs and

pedagogical beliefs of teachers have been thoroughly and well documented in certain

contexts, including US, Middle Eastern countries such as Turkey, and Asian countries such as

Singapore and China. A few researchers have also begun to explore the relationship between epistemological beliefs and pedagogical beliefs, and the results are promising, although there needs to be more research to determine the nature of this relationship (Chan & Elliott, 2004b).

As was mentioned above, the nation of Tanzania adopted a pedagogical reform that aims at developing a learner-centered approach to education. The implementation of the Tanzanian 2005 Primary (Elementary) and Secondary School Curriculum, which calls for a learner-centered curriculum and instructional approach, is still problematic for many teachers in Tanzania (Kafyulilo, Rugambuka, & Moses, 2012; Mosha, 2012; Msendekwa, 2010; Rweyemamu, 2012). This reform can only succeed if teachers' beliefs are aligned with the goals of the reform (Handal & Herrington, 2003). To influence teachers' beliefs about a learner-centered approach to education, it is first necessary to determine the teachers' epistemological and pedagogical beliefs, the relationship between these beliefs and the teachers' instructional practices, and, then, the extent to which teachers' epistemological and pedagogical beliefs are associated among pre-service and in-service teachers.

No such study is known to have been conducted in Tanzania, or in sub-Saharan Africa, to examine the epistemological and pedagogical beliefs of teachers, the relationships between their epistemological and pedagogical beliefs and the implications of these for instructional practice. To address the problem of this gap in knowledge, this researcher examined these beliefs, the variance in them by year of study, and the relationships between the epistemological and pedagogical beliefs of pre-service and in-service teachers in Tanzania.

Purpose of the Study

The purposes of the present study were twofold: First, to determine if student-teachers' epistemological and pedagogical beliefs varied based on their year of study and teacher type. The second purpose was to investigate the relationships of epistemological and pedagogical beliefs of pre-service and in-service teachers at St. John's University of Tanzania.

Rationale of Study

Knowing the epistemological and pedagogical beliefs of pre-service and in-service teachers could have a huge impact on the work of curriculum reformers, policy makers and other educational supervisors and leaders. That knowledge could inform them about how to think of the best ways to effect changes in teachers' epistemological and pedagogical beliefs towards the goal of a successful curriculum reform. This study was intended to add to the body of knowledge on how epistemological and pedagogical beliefs predict or contribute to the kinds of pedagogical instruction existing in a Tanzanian context.

Research Questions

This study was designed and conducted to address the following five research questions:

1) Are there differences between the epistemological beliefs of student-teachers in the first year and those of student-teachers in the third year of study at St. John's University of Tanzania?

2) Are there differences between the pedagogical beliefs of student-teachers in the first year and those of student-teachers in the third year of study at St. John's University of Tanzania?

3) Are there differences in the epistemological beliefs between pre-service and in-service teachers at St. John's University of Tanzania?

4) Are there differences in the pedagogical beliefs between pre-service and in-service teachers at St. John's University of Tanzania?

5) Is there a relationship between student-teachers' epistemological beliefs and pedagogical beliefs at St. John's University of Tanzania?

Research Hypotheses

This study had the following hypotheses:

Alternative hypothesis. There will be a statistically significant difference of student-teachers' epistemological beliefs between years one and three. Specifically, it predicts that year three students will have more sophisticated epistemological beliefs than year one students.

Null hypothesis. There will be no statistically significant difference of student-teachers' epistemological beliefs between years one and three.

Alternative hypothesis. There will be a statistically significant difference of student-teachers' pedagogical beliefs between years one and three. Specifically, it is predicted that students will have a more constructivist approach in year three than year one.

Null hypothesis. There will be no statistically significant difference of student-teachers' pedagogical beliefs between years one and three.

Alternative hypothesis. There will be a statistically significant difference of epistemological beliefs between pre-service and in-service teachers at St. John's University of Tanzania. Specifically, it is predicted that in-service teachers will have more sophisticated epistemological beliefs than pre-service teachers.

Null hypothesis. There will be no statistically significant difference of epistemological beliefs between pre-service and in-service teachers at St. John's University of Tanzania.

Alternative hypothesis. There will be a statistically significant difference of pedagogical beliefs between pre-service and in-service teachers at St. John's University of Tanzania. Specifically, it is predicted that in-service teachers will have a more constructivist approach than pre-service teachers.

Null hypothesis. There will be no statistically significant difference of pedagogical beliefs between pre-service and in-service teachers at St. John's University of Tanzania.

Alternative hypothesis. There will be one or more statistically significant relationships between student-teachers' epistemological and pedagogical beliefs at St. John's University of Tanzania.

Null hypothesis. There won't be a statistically significant relationship between student-teachers' epistemological and pedagogical beliefs at St. John's University of Tanzania.

At this point, a review of the literature will be helpful in providing additional information about curriculum reform in Tanzania, the theoretical background related to learner-centered instruction, the development of epistemological beliefs and how they are related to pedagogical beliefs and student achievement.

Chapter Two

Review of Literature

This chapter explores various aspects of education related to teachers' epistemological and pedagogical beliefs. First, the chapter reviews the trends of curriculum reform in Tanzania. Second, it reviews the theoretical basis of a learner-centered instructional approach. Third, it reviews the history of the development of epistemological beliefs. Finally, it explores the relationships of epistemological beliefs and (a) pedagogical beliefs and (b) students' academic achievement.

Background: Trends of Curriculum Reform in Tanzania

Since independence in 1961, there has been a debate on how to improve the quality of education in Tanzania. There have been two major reforms in education. The first reform was in 1967 when Mwalimu Julius Nyerere, the first president of Tanzania, introduced the philosophy of Education for Self Reliance (ESR). Education for Self Reliance (ESR) aimed to provide individuals with an education that would make them not only self-sufficient but also play an active role in the community (Nyerere, 1967). Education for Self Reliance (ESR) emphasized the importance of teachers and students engaging in productive activities. Students were expected to participate in the planning and decision-making process of organizing the activities done at school. Nyerere (1968), argued that:

We should not determine the type of things children are taught in primary schools by the things a doctor, engineer, teacher, economist, or administrator needs to know. Most of our pupils will never be any of these things. We should determine the type of things taught in the primary schools by the things which the boy or girl ought to know – that is, the skills he [she] ought to acquire and the values he [she] ought to cherish if

he [or she] is to live happily and well in a socialist and predominantly rural society, and contribute to the improvement of life there. Our sights must be on the majority, we must be aiming at determining the curriculum and syllabus. (p. 282)

Nyerere had a vision that students should get an education that would make them self-reliant and able to play an active role in the community. Students were to be prepared to develop various competencies related to community needs, focusing on the ability to fit well with the needs of the community in their future life. Students were enrolled at the age of seven years with the implication that, after they had spent another seven years in school, they would have matured enough to take responsibility in the community. So, it appears that the curriculum was to be centered in the society. It was community-centered.

Further, Nyerere continued to challenge the educational system in Tanzania that was inherited from the colonials by identifying four shortcomings: 1) education was designed to meet the interests and needs of a very small proportion of citizens; 2) it was a divorced education - an education that uprooted participants from their society and separated a school from its society; 3) education was book knowledge and a diploma syndrome without experience, while Nyerere advocated for a balance between academic or book knowledge and life experience; and that 4) the education failed to combine school learning with work (Hinzen & Hundsdorfer, 1979). Unfortunately, this philosophical perspective was misinterpreted by parents, students and teachers and lasted only for five years. Psacharopolous (1989), for example, noted that "emphasis on more practical work is interpreted by parents, teachers, and students as an inferior alternative to academic schooling" (p. 183). Also, it was argued that the statement of ESR was vague. Saunders and Vulliamy (1983) concluded that:

the statement was more of a cultural statement than a curriculum policy document. It did not provide and perhaps did not intend to provide, a base for the day to day action constituting teaching practices. Education for self-reliance was complex, generalizable, and was not congruent with teachers' existing practices and expectations. (p. 356)

There are many questions that could be raised and discussed here. However, this topic is beyond the scope of this paper.

The result of public reaction was that the Tanzanian curriculum turned again to a content-based education, as it was inherited from the colonial regime, which was implemented using a teacher-centered instructional approach (Ministry of Education and Culture, 1995). Other minor reforms happened in 1979 which were intended to strengthen the Education for Self-Reliance (ESR) (Tanzania Institute of Education, 2013). Furthermore, in 1997, reform was influenced by the multiparty system that was introduced in 1992. One feature of this minor reform was to teach civics in primary schools and general studies in secondary schools, instead of politics (TIE, 2013).

In 2005, the second major Tanzanian reform was that of shifting from the content-based curriculum to a competency-based curriculum. This reform was planned to be implemented in 2006 (Ministry of Education and Vocational Training, 2005). A content-based curriculum emphasizes the mastery of subject area content while a competency-based curriculum focuses on helping students to develop various competencies which they can use in life (Kimaryo, 2011). This implied that in both content- and competency-based curricula, content is very important but a competency-based curriculum goes farther, not only in mastering content but also in developing students' behavioral competence in the form of utilization of knowledge and demonstration of skills. It also implies that the competencies

that students develop are not 'present-oriented;' rather, they are 'future oriented.' This means

that students are to be prepared for future life, as emphasized in one of the objectives of

primary education in Tanzania, which is "to prepare the child to enter the world of work"

(Ministry of Educational and Vocational Training, 2005, p. V). A competency-based

curriculum focuses on the acquisition of skills and competencies which in turn calls for

changes in teaching, learning and assessment approaches (Kafyulilo, Rugambuka, & Moses,

2012).   However, a competency-based curriculum addresses what learners are to do rather

than what they are expected to understand, as Jerome Bruner warned, when he labeled this,

mere performance (Bruner, 1967; Ellis, 2004). Ainsworth (1977) noted more than four

decades ago that "competency-based education is the latest manifestation of the behaviorist

movement which has occupied educational theory for the past twenty years or so" (p. 321-

322). This implied that competency-based education originates from behaviorist theory. Its

main focus is not the possession of education but what one does in real life with the education

(Weddel, 2006).

In order to implement the 2005 reform, the Ministry of Education and Culture advised

teachers to change their teaching strategies, from a teacher-centered instructional approach to

a learner-centered instructional approach (URT, 1995). As stated in Chapter One, the

implementation of this reform has faced difficulties. So, one of the foci involved in this study

is to identify the epistemological beliefs of teachers so as to understand what they believe

about what knowledge is and how knowledge is acquired. Several recent studies indicated

that epistemological beliefs drive teachers' pedagogy (Lee, Zhang, Song, & Huang, 2013),

and because teachers play a big role in implementing any curriculum (Isikoglu, Basturk, &

Karaca, 2009), it is worthwhile knowing what their beliefs are in terms of epistemology, which drives their instructional pedagogy. So, it is worthwhile to discuss two topics which carry this study, pedagogy and epistemology.

Instructional Pedagogy as Education Reform in Tanzania

At the level of national policy, Tanzania made a shift in instructional pedagogy from a teacher-centered instructional approach to a learner-centered instructional approach. The teacher-centered instructional approach assumes that knowledge should be transmitted from the teacher - the authority, to learners who are recipients of knowledge. This approach creates a passive role for learners involved in the process of teaching and learning (McCombs & Whisler, 1997). The teacher-centered approach is typically perceived as the traditional approach of teaching. It originates from the essentialist school of thought, and implements a knowledge-centered curriculum (Ellis, 2004; Parkay, Hans, & Anctil, 2010).

The learner-centered instructional approach that has been adopted in the paradigm shift recommended in the Tanzanian schools focuses on learners (URT, 1995). Learners are assumed to be able to construct their own knowledge while teachers act as facilitators of learning. It originates from a constructivist theory that assumes that every individual is capable of the construction of knowledge (Piaget, 1972). Because the Tanzanian educational reform is directed toward a learner-centered instructional approach, it is worthwhile examining the approach in more detail.

Theoretical Basis of the Learner-Centered Instructional Approach

A learner-centered approach is grounded in constructivist theory which posits that learning requires each learner to construct his/her own understanding by tying new information to prior experiences. It assumes that knowledge emerges through interactions and

experiences among learners and through reflection on the learner's own ideas (Vavrus, Thomas & Bartlett, 2011). Constructivism is a view of learning and development that emphasizes the active role of the learner in building understanding and making sense of the world in which learners use prior understanding in concert with current experiences to construct, elaborate or restructure their knowledge (Duffy & Cunningham, 1996; Eggen & Kauchak, 2001). Several prominent educational scholars and psychologists, John Dewey, Jean Piaget and Lev Vygotsky, are associated with constructivism and have demonstrated its relevance to pedagogy. Each of them made distinct contributions to the development of constructivist theory and focused on its various influences. However, they all see knowledge as emerging in specific situations and contexts. Also, they consider knowledge as relevant for teachers and students when it is 'in use' rather than when it is 'delivered' in a way that

dissociates it from previous experience and from the opportunity for engagement with it (Vavrus, Thomas, & Bartlett, 2011). So, this suggests that teachers should create conditions for learners to discover and actively construct knowledge - to learn to learn - and to develop higher order thinking skills of analysis and synthesis through inquiry-oriented lessons in the classroom. So, this means that lessons should encourage learners to draw upon, connect and analyze their prior knowledge and experiences through self-discovery and interaction with other learners and with teachers (Brooks & Brooks, 1999).

Since this study acknowledges the work of the three prominent educational scholars and psychologists - Jean Piaget, Lev Vygotsky and John Dewey - who are associated with constructivism that leads to a learner-centered pedagogical approach, it is worthwhile looking at their contributions to this theory and approach.

Jean Piaget (1896-1980) was a genetic epistemologist who studied child development in order to discover or understand psychological structures that underlay the formation of

concepts (Piaget, 1967). Piaget explained that human beings are capable of constructing knowledge by using mental or cognitive structures, which is based on the active role of the learner. He noted that, "….all knowledge is tied to action, and knowing an object or an event is to use it by assimilating it to an action scheme……" (Piaget, 1967, pp. 14-15) and that "to assimilate a sensorial image or an object, whether through simple assimilation, recognition, or generalizing extension, is to insert it in a system of schemata, in other words, to give it a meaning" (Piaget, 1952, p. 189). This also implies that learning for a child is a product of self-organization as noted by Piaget (1937) that "intelligence organizes the world by organizing itself" (p. 311).

Thus, from a constructivist   perspective, knowledge is not passively received from the world, from others, or from authoritative sources. Rather, all knowledge is created as individuals (and groups) adapt to and make sense of their experiential worlds (MacLellan & Soden, 2007). The above statement is backed up by Piaget (1972) when he noted that " any new acquisition consists of assimilating an object or a situation to a previous scheme by thus enlarging it" (p. 69). And " a schema never has an absolute beginning because it derives from previous knowledge through a process of successive differentiation" (Piaget, 1967, p. 26). Therefore, this perspective holds that learners should construct and reconstruct knowledge in order to learn effectively and use previous knowledge, too.

Piaget's main contribution to constructivism is on how individuals construct knowledge. Cognitive constructivism came directly from Piaget's work in which he proposed

that humans cannot be given information which they immediately understand and use;

instead, humans must construct their own knowledge (Piaget, 1972). So, for Piaget, the

development of human intellect proceeds through adaptation and organization. Adaptation is,

in his terms, a process of assimilation and accommodation, where external events are

assimilated into existing understanding, but unfamiliar events, which do not fit with existing

knowledge, are accommodated into the mind, thereby changing its organization. He also

suggested that experience matters in the development of intelligence since "at every level,

experience is necessary to the development of intelligence" (Piaget, 1952, p. 362). Therefore,

recognizing that this process occurs within each individual student at a different rate helps the

teacher to facilitate constructivist learning through a learner-centered instructional approach.

While Piaget focused on the construction of knowledge by the individual, Vygotsky

examined the individual's construction of knowledge in relation to competent others.

The work of Lev Vygotsky, a Russian psychologist (1896-1934), has relevance for a

discussion of constructivism derived from his use of the language of constructivist theory,

thought, and their mediation by society. Vygotsky held the position that the child gradually

internalizes external and social speech in social activities, including communication, with

more competent others. Although social speech is internalized in adulthood, Vygotsky argued

that it still preserves its intrinsic collaborative character. In his experiments, Vygotsky

studied the difference between the child's reasoning when working independently versus

reasoning when working with a more competent person. He devised the notion of the *zone of*

proximal development (ZPD) to reflect on the potential for learning created by this difference.

For Vygotsky, this segment of child development controls how a child learns. The zone of

proximal development has been described as "the distance between the actual development

level as determined by independent problem solving and the level of potential development

as determined through problem solving under adult guidance or in collaboration with more

peers" (Vygotsky, 1978, p. 86). Vygotsky's findings suggested that learning environments

should involve guided interactions that permit children to reflect on inconsistencies and to

change their conceptions through communication. So, Vygotsky emphasized social

constructivism. Social interaction, as conceptualized by Vygotsky, insists that learning occurs

as children work in small groups to solve problems. When students work in small groups,

they cooperate in many ways and, as Vygotsky believed, students have a lot to offer one

another (Powell & Kalina, 2009). By discussing problems in a group, internalization of

knowledge occurs for each individual at a different rate according to their own experience

(Vygotsky, 1978). Vygotsky encouraged cooperation within each learning group, the

approach which currently is known as cooperative learning. As he asserted, "learning

awakens a variety of internal developmental processes that are able to operate only when the

child is interacting with people in his environment and in cooperation with his peers"

(Vygotsky, 1978, p. 90). From this perspective, interacting is an important ingredient in

ensuring the learning necessary to construct knowledge. And, working in small groups

furthers cooperation in the learning process and not competition. Davis (2009) agreed,

suggesting that "students working in small groups tend to learn more of what is taught and

retain it longer than when the same content is presented in other instructional formats" (p.

147). However, with this strong statement, Davis did not provide evidence to support her

thesis but referred to other researchers who report this. So, through this, content is studied not

as isolated facts but as broad concepts and interdisciplinary themes as compared to the

teacher-centered instructional approach where emphasis of subject/content mastery is the great concern (Hensen, 2004; Jadallah, 2000; Maypole & Davies, 2001).

The work of Vygotsky brings the individual into the social learning context. John Dewey adds a third, congruent perspective on the construction of knowledge in which students' active problem-solving in this social learning context is supported by learner-centered pedagogy that leads to students' utilization of knowledge gained from previous experiences to develop new ideas and expand their knowledge.

John Dewey, American philosopher and educator (1859-1952) wrote that education depends on action-knowledge and ideas emerge only from a situation in which learners have the opportunity to draw out experiences that have meaning and importance to them. Dewey emphasized the "belief that all genuine education comes about through experiences" (Dewey, 1938, p. 25). Dewey argued that human thought is practical problem-solving, which proceeds by testing rival hypotheses. According to Dewey, these problem-solving experiences occur in a social context, such as a classroom, where students join together in manipulating materials and observing outcomes. Dewey also insisted on freedom in the development of learners. He argued that if the whole person is to be educated, then physical and social freedom must be consciously incorporated into the classroom. He said, "Enforced quiet and acquiescence prevent pupils from disclosing their real natures. They enforce artificial uniformity" (Dewey, 1938, p. 62). This implied that learners need to be free in order to learn better, and through that freedom in class, learners can interact with one another and hence learn from each other. Also the above quote acknowledges that each learner has a "real nature" involving a unique

way of learning, and, in addition, making all of them to be quiet can mean that you want learners to be passive and not active.

Dewey also emphasized how teachers should act in a classroom. The role of the teacher should be to help learners set a strong purpose for their learning and find the path by which that purpose is best met, since

….growth depends upon the presence of difficulty to be overcome by the exercise of intelligence. Once more, it is part of the educator's responsibility to see equally to two things: First, that the problem grows out of the conditions of the experience being had in the present, and that it is within the range of the capacity of students; and, secondly, that it is such that it arouses in the learner an active quest for information and production of new ideas. (Dewey, 1938, p. 79)

Dewey here insisted that teachers be facilitators for the learners and the learning environment, assisting students to use the learned ideas and facts as a base for further experiences.

So, from the three above-mentioned prominent educational scholars, it might be observed that Piaget contributed the ideas of cognitive transformation in individual learning and development; Vygotsky contributed the idea that learning and development were integrally tied to communicative interactions with others; and Dewey contributed the idea that schools had to bring real world problems into the school curriculum. In considering the work of these three scholars in relation to constructivism, their contributions can be grouped into three categories: 1) how learning happens, 2) the instructor's role, and 3) the student's role. Learning should emphasize problem-solving and understanding, content should be

presented holistically, and not in separate smaller parts, in an interactive environment, and authentic tasks should be used. Instructors should be facilitators and pose problems which are relevant to students, should emphasize hands-on and real-world experiences, and testing should be integrated with tasks and not be a separate activity; while students should create new understanding and support their learning by engaging in reflection on their work.

The admittedly different but entirely congruent contributions of Piaget, Vygotsky, and Dewey, which form much of the basis of what has come to be known as constructivist theory, suggest that a learner-centered pedagogical approach has much to recommend it. This raises the issue of teachers who are utilizing pedagogical approaches that are affected by their training and experience, that reflect their personal epistemology

History of the Development of Personal Epistemology

Epistemology is a branch of philosophy that deals with the nature and justification of knowledge. Studies focusing on epistemological development can be traced back to 1970 when Perry attempted to understand how students interpreted pluralistic educational experiences which lead to a theory of epistemological development in college students (Hofer & Pintrich, 1997). Perry wanted to know the reasons for college students responding in dramatically different ways to the plurality of their college experience. Perry had the assumption that the difference in college students' personality would give a rich explanation (Hofer, 2002). Perry developed an instrument called Checklist of Educational Values (CLEV), and administered it to a random sample of 313 first-year college students. He then selected 31 students to be interviewed at the end of the year. With this interview, Perry aimed to encourage college students to express what was conspicuous in their experiences in college. Perry wanted students to express themselves in their own terms. Perry found

students' epistemological beliefs were in progress from dualistic to a multiplicity of views of

the nature of knowledge as students progressed with learning (Perry, 1968; Schommer,

1990). Also, Perry found that college students' ways of constructing their world were not

influenced much by personality, as evidence of developmental process (Hofer & Pintrich,

1997). So, from the college students' interviews, Perry and his colleagues came out with a

scheme of intellectual and ethical development that had nine positions clustered into four

categories (Kurfiss, 1988; Moore, 1994).

Perry's Scheme of Intellectual and Ethical Development

Perry (1968) identified nine intellectual and ethical developmental positions. These

positions are developmental in nature in that they progress as individuals mature. So, a

person's beliefs and reasons change as he/she matures. The developmental positions are:

position one, basic maturity; position two, full dualism; position three, early and late

multiplicity; position five, relativism; position six, commitment foreseen; and position seven

through nine, evolving commitments. These positions are clustered into four categories:

dualism, multiplicity, relativism, and commitment within relativism. The first category is

dualism that includes positions one and two. This category is characterized by right-and-

wrong views of the world. This category acknowledges authority to know the truth and

transmit it to the learners. The second category is multiplicity. This category includes

positions three and four. In this category, position three represents a modification of dualism,

which is the "beginning of recognition of diversity and uncertainty" (Hofer & Pintrich, 1997,

p. 91). Position three is the beginning of the recognition of diversity and uncertainty. Dualism

is modified again in position four whereby "areas in which there are no absolute answers are outside the realm of authority" (Hofer & Pintrich, 1997 p. 91). The third cluster includes positions five and six. In position five, individuals make a shift from a dualistic view of the world to a view of contextual relativism. Here there is a perception that individuals are the active makers of meaning while in position six, individuals perceive knowledge as relative, contingent, and contextual; and start to realize the need to choose and affirm one's own commitments. The fourth and final cluster includes positions seven through nine. In this cluster, individuals make and affirm commitments to values, careers, relationships, and personal identity; however, these positions were not commonly found among college students. So, from this trend of epistemological development, Perry treats epistemological development as occurring in stages. However, major areas of research in epistemology have come up with two additional research perspectives.

Major Areas of Research in Epistemology

Since the beginning of Perry's study, Hofer and Pintrich (1997) reported three major areas of research in epistemology. The first group of researchers has been interested in how individuals interpret their educational experiences (Baxter Magolda, 1987, 1992; Belenky, Clinchy, Goldberger, Tarule, 1986; Perry, 1970, 1981). Perry pioneered this group.

The second group has been interested in how epistemological assumptions influence thinking and reasoning processes. This group focuses on reflective judgment (King & Kitchener, 1994; Kitchener & King, 1981; Kitchener, Fischer, & Wood, 1993), and skills of argumentation (Kuhan, 1991, 1993).

The third group, which is more recent, takes the approach that epistemological ideas are a system of beliefs that may be more or less independent rather than reflecting a coherent developmental structure (Ryan, 1984a, 1984b; Schommer, 1990, 1994b). This third group looks on the relationship of epistemological beliefs with respect to other constructs, as, for example, learning comprehension (Schommer, 1990, 1993b), student achievement (Sturb & Stern, 2002), conceptions about learning (Chai, Teo, & Lee, 2009; Chan, 2009; Chan & Elliott, 2004b), gender, field of study (Tumkaya, 2012), pedagogical beliefs (Chai, 2010), and with respect to subjects of study like physics, chemistry and biology (Topcu, 2012). This study takes the approach of this third group; hence, there is a need of looking at it in detail.

Schommer's Epistemological Belief System

This study takes the approach of the third group of researchers on epistemology: looking at the relationship of epistemological beliefs and other constructs. It is worthwhile to examine Schommer's ideas as the pioneer of the group. Schommer (1990) suggested that individual epistemology existed as a set of separate dimensions, each representing a specific epistemological belief, something which is different from Perry's model, which has progressive stages. Schommer admited the complexity in defining epistemological belief systems, but argues that for more precise definitions, the issues of a) multiplicity and singularity, b) the independence and dependence among beliefs, and c) the domain specificity and generality of beliefs should be incorporated.

Schommer (1994a) explains that beliefs within the system are more or less independent. Here she means that there is more than one belief to consider in personal epistemology. For instance, at first she hypothesized five beliefs:

a) stability of knowledge, ranging from tentative to unchanging; b) the structure of

knowledge, ranging from isolated bits to integrated concepts; c) the source of

knowledge, ranging from handed down by authority to gleaned from observation and

reason, d) the speed of knowledge acquisition, ranging from quick-all-or-none

learning to gradual learning, and e) the control of knowledge acquisition, ranging

from fixed at birth to life-long improvement. (Schommer, p. 104-105 in Hofer &

Pintrich, 2002)

However, after exploratory factor analysis, only four factors, stability and structure of

knowledge, and the speed and control of knowledge were retained. After identifying the four

epistemological beliefs, it is important to look at the research on relations between

epistemological and pedagogical beliefs.

Relationships between Epistemological and Pedagogical beliefs

Chan & Elliot (2004) examined the relationships between epistemological beliefs and

teachers' conceptions about learning. The researchers used a convenience sample of 385

Hong Kong teacher education students. The researchers used two instruments; 1)

epistemological beliefs questionnaire (EBQ), and 2) teaching and learning conceptions

questionnaire (TLCQ). The purpose of the study was to examine the conceptions about

teaching and learning held by college students in Hong Kong.

The epistemological beliefs questionnaire (EBQ) was adopted from Schommer's 63-

item questionnaire. Chan & Elliot conducted a factor analysis of the 63-item questionnaire

which extracted four factors and named them as 1) Innate/Fixed Ability, 2) Learning

Effort/Process, 3) Authority/Expert Knowledge and, 4) Certainty Knowledge. These factors/

dimensions also aligned with Schommer's argument that they are continua, with two

extremities. The four dimensions were clarified more as follows:

Innate/ Fixed Ability. This dimension refers to ability being innate and fixed at one

extreme point, while at the other extreme point ability is considered as changeable. For

instance, items in this dimension can be "there isn't much you can do to make yourself

smarter as your ability is fixed at birth." Also it can be like, "one's innate ability limits what

one can learn" (Chan & Elliott, 2004b, p. (821)

Learning Effort/ Process. This dimension refers to hard work; at one extreme, effort

spent in drilling while at the other end, understanding is used. Examples of items in this

dimension are, "if people can't understand something right away, they should keep on trying."

Also, "one learns little if one does not work hard" (Chan & Elliot, 2002, p. 401; 2004, p. 821).

Authority/ Expert Knowledge. This dimension refers to knowledge being imparted

by authority person/experts on one extreme point, and knowledge being constructed by

individuals on the other extreme point. Examples of items in this dimension are like,"

sometimes I don't believe the facts in textbooks written by authorities." Also "even advice

from experts should be questioned" (Chan & Elliott, 2004b. p. 821).

Certainty Knowledge. This dimension refers to whether knowledge is certain,

permanent and unchanged at one extreme, and knowledge is ever-changing at the other

extreme point. Examples of items in this dimension are like, "scientists will ultimately get to

truth if they keep searching for it." Also, "scientific knowledge is certain and does not

change" (Chan & Elliott, 2004b, p. 821).

The above four factors/ dimensions came from 30 items. Originally, Chan and Elliott

(2004b) conducted principal axis factor analysis on the Hong Kong sample using Schommer's

63-item questionnaire and Schommer's 12 hypothetical-conceptual subscales as variables.

Varimax and Oblimin rotations were conducted as Schommer had done before. The factor

structure pattern of the oblimin rotation was not clear compared to the varimax. Seeing this

unclear factor structure pattern, Chan and Elliot decided not to choose Schommer' factor

structure (2002). Chan and Elliot did a factor analysis using the 63-item questionnaire to

check if these items loaded to Schommer's 12 conceptual subscales, but they did not load. So,

they decided to abandon the 12 conceptual subscales and adopted Schommer's 63-item

questionnaire and developed other items from the literature related to the study in order to

develop an instrument that would suit the Hong Kong context. Some of Schommer's 63-item

questionnaire was reworded. Hence, they got a total of 45 items that were administered to

385 teacher education students. A principal axis factor analysis was conducted using oblimin

rotation that yielded 30 items that loaded to the four factors discussed above. The four

factors/ dimensions that were extracted had internal consistence of Cronbach alpha ranging

from .6 to .7. The Cronbach alpha value ranging from .6 to .7 is acceptable according to Field

(2009). The 30 items' extracted scale was validated using confirmatory factor analysis (CFA),

which gave a satisfactory goodness of fit index (GFI = .93, AGFI = .90, RMSEA = .058, RMR = .064).

The second instrument that was used is the teaching and learning conceptions questionnaire (TLCQ). This instrument was developed and validated by Chan and Elliot by following all the procedures for developing an instrument including making a review of the literature, and dialogue with experts (Chan & Elliot, 2002). After conducting a pilot study across 12 months, with repeated process of factor analysis, they got a 35-item questionnaire. Exploratory factor analysis was conducted and yielded two factors which were named traditional and constructivist with 30 items loaded with factor loadings of .30 or above. The Cronbach Alpha value of the whole scale of 30 items was .84, and the two factors traditional and constructivist having .84 each. The questionnaire was then validated using confirmatory factor analysis (CFA) which yielded satisfactory goodness of fit index (GFI =.93, AGFI = .91, RMSEA = .54, RMR = .50).

The two factors/ dimensions of the TLCQ are briefly described as follows: Constructivist conception- This dimension advocates the use of the learner-centered instructional approach in teaching and learning. Examples of items in this dimension are like, "it is important that a teacher understands the feelings of the students." Also, "good teachers always encourage students to think for answers themselves" (Chan & Elliott, 2004b, p. 822). The traditional conception advocates the use of the teacher-centered instructional approach in teaching and learning. Examples of items are like, "during the lesson, it is important to keep students confined to the text books and the desks." Also, "learning means remembering what the teacher has taught; good students keep quiet and follow teacher's instruction in class"

(Chan & Elliott, 2004b, p. 822). From the above explanations of the two factors, the constructivist conception and traditional conception, can be seen as one factor on opposite ends of a single continuum, and if they are separate, someone can think of having a strong negative correlation as they seem to be in opposition. Yilmaz and Sahin (2011) conducted a confirmatory factor analysis of the teaching and learning conceptions questionnaire, and found that the correlation between the constructivist and traditional conceptions is .31. This correlation suggests the two factors to be related but its correlation is not strong enough to form one factor as it doesn't exceed .3 (Field, 2009; Pet, Lackey, & Sullivan, 2003).

Findings from this Chan and Elliot (2004b) study showed that there were significant relations between Innate/Fixed Ability, Authority/Expert Knowledge and Certainty Knowledge with a Traditional conception, and Learning Effort/Process with a Constructivist conception. These findings support the notion in the literature that teachers' pedagogies are belief-driven.

Another study conducted by Lee, Zangh, Song, and Huang (2013) examined how the beliefs of Chinese in-service teachers concerning knowledge and knowledge acquisition influence their instructional classroom practices in junior secondary schools. Leithwood et al. (2010) asserted three overlapping orientations to instruction, which are 1) focused instruction-which emphasizes the responsibility of teachers to manage time in classroom, teachers engaging students in specific activities, 2) grouping practices- emphasizes cooperative rather than individualized learning, and 3) standard contemporary practices that reflect a learner-centered approach, and emphasizing student learning. The central objective of Lee *et al* (2013) study was to determine the relationships between epistemological and pedagogical beliefs in terms of conceptions of teaching and learning, and instructional practices. The epistemological beliefs questionnaire and teaching and learning conceptions

questionnaire were adopted from Chan and Ellis (2004b). The study was comprised of 1008

junior secondary school teachers. Findings revealed that there was a relationship between

epistemological beliefs and conceptions of teaching and learning. Teachers' epistemological

beliefs were good predictors of their conceptions of teaching and learning as Lee *et al* (2013)

asserted that "teachers' epistemological beliefs were found to significantly predict their

conceptions of teaching and learning (p. 134). Specifically, both Innate/Fixed Ability and

Certainty Knowledge were found to be significantly and negatively associated with

constructivist conception (β = - 0.17 for Innate/ Fixed Ability; β = - 0.15 for Certainty

Knowledge but positively related to traditional conception, β = 0.41 for Innate/ Fixed Ability;

and β = 0.41 for Certainty Knowledge. The findings of this study can advise policy makers,

educational managers/leaders and other educational stake holders on the best ways of

implementing professional development as they will be aware of what currently is the

direction of teachers' beliefs.

Chai, Teo, and Lee (2009) conducted a study to investigate whether there is a change

in the epistemological, and teaching and learning beliefs of pre-service teachers in Singapore

before and after a nine-month teacher preparation course. Findings on epistemological beliefs

revealed that at the beginning of the course, teachers were not inclined to relativistic

epistemological beliefs while at the end of the program, pre-service teachers were reported to

have generally relativistic epistemological beliefs. Also in beliefs about teaching and

learning, pre-service teachers exhibited significant changes in constructivist and traditional

teaching. The mean score of constructivist teaching decreased, whereas the mean score of

traditional teaching increased. These findings shocked this researcher, who was expecting to

see the opposite. However, after having a close look, Table 4: Descriptive Data and Results of Paired Samples t-test (p. 357) shows the differences of the mean score between pre-test and post-test are very tiny and they reflect changes from a more extreme position to a position slightly closer to the center. For instance, the factor 'Learning Processes' has a pre-test mean score of 4.20 and post-test mean score of 4.18. The only substantial difference that can be noticed is the factor 'Authority/ Expert Knowledge' which has a mean score of 3.78 on the pre-test and 2.15 on the post-test. Also there was a tiny difference on the pre-test mean score of 4.25 on 'Constructivist Teaching, and 4.18 on the post-test mean score. With these tiny differences, the results of this study should be interpreted with care, and one should not conclude that teachers were inclined to relativistic epistemological beliefs. The constructivist mean score of the pre-test decreased on the post-test.

A study done by Yilmaz and Sahin (2011) examined the pre-service teachers' conceptions of teaching and their epistemological beliefs. One of their objectives was to find out whether there was a relationship between pre-service teaching conceptions of teaching and their epistemological beliefs. The findings indicated that in an item like *reality is single and the same for all* (which is a naive epistemological belief) was found to be negatively correlated with the conception of constructivist teaching ($r = -.14$, $p < .01$) and positively correlated with traditional teaching ($r = .15$, $p < .01$). Also the belief that *intelligence is multiple, such that every person learns some subject better than others* (sophisticated epistemological belief) was found to be positively correlated with the conception of constructivist teaching ($r = .41$, $p < .01$) and negatively correlated with the conception of traditional teaching ($r = - .17$, $p < .01$).

So, generally the findings of the research indicate that there is a relationship between pedagogical beliefs and epistemological beliefs. Specifically, sophisticated epistemological beliefs correlate positively to constructivist teaching and negatively to traditional teaching. Likewise, naïve epistemological beliefs correlate positively to traditional teaching and negatively to constructivist teaching.

Other studies that indicate the relationship between epistemological beliefs and pedagogical beliefs are Kang and Wallace's (2005) study of science teachers' epistemological beliefs and teaching goals related to their use of lab activities. The study found that teachers, who viewed science as a body of factual information, were inclined to express transmissions pedagogy. The findings support the claim that naïve epistemological beliefs correlate to traditional teaching.

Schraw and Olafson (2002) using interview methods, found that 23 out of 24 practicing teachers can be categorized as relativist. In this case, they tended to prefer constructivist pedagogy. Their findings indicate that teachers with sophisticated beliefs will tend to use a constructivist approach, and probably those with naive beliefs will use a traditional approach.

So, generally what is known about the relationship between epistemological beliefs and pedagogical beliefs is that naïve epistemological beliefs correlate positively to traditional teaching while sophisticated epistemological beliefs correlate positively to constructivist teaching.

Relationship between Teachers' Pedagogical Beliefs and Student Achievement

Pedagogical beliefs can be defined as preferences for of specific types of instructional methods to use in the process of teaching and learning (Chai, 2010). These pedagogical beliefs are mainly categorized into the knowledge transmission view or the knowledge construction view. Before looking at the relationship between pedagogical beliefs and student achievement, it is worthwhile to look at the relationship between pedagogical beliefs and teachers' classroom practices. The notion here is that if teachers' pedagogical beliefs can lead to teachers' classroom practices, then this practice might contribute to student achievement.

Pajares (1992) asserts that pedagogical beliefs influence teacher classroom instructional practices. In other words it can be said that teachers' beliefs drive teachers' pedagogy.

Hasweh (2003) found that teachers with traditional essentialist beliefs tend to use a teacher-centered instructional approach while teachers with constructivist beliefs tend to use a learner-centered instructional approach.

Bernardo and Limjap (2012) assert that teachers' pedagogical beliefs are important predictors of student achievement because they actually shape the teachers' practices.

However, Fang (1996) in his review of research on teachers beliefs and practices, points to the consistency and inconsistency of this relationship. In explaining the inconsistency, he noted that the complexities of classroom life can constrain teachers' abilities to attend to their beliefs and provide instruction that aligns with their theoretical beliefs. In this case, it can be that the relationship between pedagogical beliefs and student achievement can also be both

consistent and inconsistent if teachers' classroom pedagogical practices can be good

predictors of students' achievement.

A study done by Bernardo and Limjap (2012) investigated the influence of teachers'

pedagogical beliefs and reported practices on students' achievement in Basic Mathematics in

the Philippines. The study investigated the pedagogical beliefs of elementary and high school

mathematics teachers. One of the research questions was to find whether there are differences

in the pedagogical beliefs and practices of teachers in high performing, average performing,

and low performing schools. Findings indicated that teachers' endorsement of more

progressive beliefs seem to be associated with their students' higher level of achievement.

However, these beliefs still did not seem to be fully realized in the actual practices of the

teachers. So, such findings should be interpreted with care when talking about the

relationship between pedagogical beliefs and student achievement.

Weinberger and McCombs (2001) investigated the relationship between learner-

centered practices and the academic and non-academic outcomes of upper and middle school

students from grades four through eight. In particular, they examined the relationships

between student perceptions of the learner-centeredness of their teacher's classroom practices

and a variety of student academic outcomes, as well as including the number of class

absences and incidents of disruptive behavior. Data were collected from 4,203 upper

elementary and middle school students and 230 teachers from 31 rural, urban, and suburban

elementary and middle schools using the Assessment of Learner-Centered Practice (ALCP)

survey. Results indicated that there was a correlation between teachers' beliefs and students'

perceptions and motivation, but higher correlations were found between students' own

perceptions of teachers' learner-centeredness and student motivation, achievement and

behavior. With regard to the perspectives of both learners and teachers and how these relate

to learner motivation and achievements, findings also suggested that the relationships

between teachers' perceptions of their practice and student motivation and outcomes became

stronger as teachers moved towards learner-centeredness. As students' perceptions of their

teacher's classroom practices became more learner-centered, not only did academic

performance increase as assessed by both classroom grades and standardized achievement

tests, but also non-academic outcomes such as motivation to learn, school attendance and

school disruption improved. From these findings, it can be seen how the learner-centered

beliefs which is one of the category of pedagogical beliefs can have positive impact on

students' achievement

Firn (2002) investigated the relationship of learner-centered beliefs of 7th grade

Mathematics teachers and students achievement on the Mathematics section of the

Washington Assessment of Student Learning (WASL). The researcher had twofold purposes:

1) to determine the level of learner-centered beliefs of 7th grade mathematics teachers from

selected middle schools in the state of Washington, and 2) to investigate and examine if and

to what extent possible causal relationships existed between the differences in teacher beliefs

and the performance of students on the mathematics section on the Washington Assessment

of Student Learning (WASL). Generally the researcher did not find statistical significance

with respect to a difference between learner-centered and non-learner-centered mathematics

teachers' beliefs with students' achievements. This may be because of the small number of

participants (31), or a teacher's learner-centered pedagogical belief is not the only or most

vivid factor that leads to students' higher achievement in mathematics, or that the teacher's

learner-centered pedagogical beliefs are more related to other aspects like motivation and less

to cognitive constructs.

So, the relationship between teachers' pedagogical beliefs and students' achievement

is equivocal. There are some consistencies and inconsistencies it this relationship.

Chapter Three

Research Methodology

The purpose of this study was to examine the variations and relationships of epistemological and pedagogical beliefs of student-teachers based on their year of study and teacher type. The chapter contains a discussion of the following dimensions of the study: (a) research design, (b) participants and sampling process, (c) description of instruments, d) procedures of administering the questionnaires and, (e) how the data were analyzed.

Research Design

This present study used two research designs: comparative and correlational. A comparative design was used to compare beliefs of pre-service with those of in-service teachers, and beliefs of student- teachers in their first year of study with those of student-teachers in their third year of study. A correlation design was used to examine relationships between epistemological beliefs and pedagogical beliefs. As Gall, Gall, and Borg (2007) explain, a correlational design "seeks to discover the direction and magnitude of the relationship among variables through the use of correlational statistics" (p. 636).

Participants and Sampling Process

The participants in this study consisted of 1,000 pre-service and in-service teachers from years one and three at St. John's University of Tanzania. The participants were from the Bachelor of Science with Education (BSc Ed), Bachelor of Arts with Education (BA Ed), and Bachelor of Commerce with Education (BCom Ed) programs. This is a convenience sample; however, the researcher selected these participants for the following reasons: (1) they are prepared to be teachers with bachelor degrees in Tanzanian schools, and (2) year one are in

the beginning of the teacher education program while year three exit the teacher education program. Among this sample, there are teachers who hold certificates and diplomas in teaching who have been teaching in different primary (elementary) and secondary schools in Tanzania, who in this study are identified as in-service teachers while those who come directly from advanced level secondary schools are labeled as pre-service teachers. Year one students are those who are in the first year of their education program while year three are those who are in the third, or final year of the education program.

Students joining St. John's University of Tanzania come from different regions of Tanzania. So, the sample represents teachers in the context of Tanzania.

Although the expected research sample was 1000 pre-service and in-service teachers from the first and third years of the BSc Ed, BA Ed, and BCom Ed programs, the actual return rate was 702 subjects, which is 70.2% of the estimated sample. Details of demographics are discussed in the next chapter.

Instrumentation

The study used a survey instrument comprised of two combined questionnaires: 1) the Epistemological Beliefs Questionnaire (EBQ) developed by Schommer (1989, 1990, 1993a, 1993b, 1994a, 1994b, 1998; Schommer, & Rhodes, 1992; Schommer, & Walker, 1995), and validated and modified by Chan and Elliott (2000, 2004b) and Lee, Zhang, Song, and Huang (2013); and 2) the Teaching and Learning Conceptions Questionnaire (TLCQ) developed and validated by Chan and Elliot (2004), and also validated by Lee, Zhang, Song, and Huang (2013).

The survey instrument was organized in two parts as follows: Part A consisted of demographics which included gender, year of study, name of the program, teaching subjects,

age, teaching experience, religion, and parents' education. Part B consisted of the

Epistemological Beliefs Questionnaire (EBQ) and the Teaching and Learning Conceptions

Questionnaire (TLQ). The EBQ had a total of 30 items that represent four dimensions:

Innate/Fixed Ability (13 items), Learning Effort/ Process (6 items), Authority/ Expert

Knowledge (6 items), and Certainty Knowledge (5 items). These four factors had internal

consistency of Cronbach alpha ranging from .6 to .7 (Chai, 2010; Chai, Teo, & Lee, 2009;

Chai & Khane, 2008; Chan, 2003; Chan & Elliott, 1998, 2000, 2002, 2004; Cheng *et al*,

2009; Yilmaz & Sahin, 2004, 2011). The Teaching and Learning Conceptions Questionnaire

(TLCQ) had 30 items, representing two dimensions: Constructivist Conceptions (12 items),

and Traditional Conceptions (18 items), with Cronbach alpha value of .84 each factor (Chan

& Elliot, 2002). The entire questionnaire had a total of 60 items, and used a five-point Likert

scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Scoring. Each demographic item was scored as a discrete variable. For instance,

teacher type was coded as pre-service = 1, in-service = 2; year of study was coded as year one

= 1, year three = 3. For each scale, scoring was divided into subscales known as factors/

dimensions in this study. To get a score for each factor, all items in a particular factor were

added up and the total was divided by the number of items in a particular factor. For instance,

factor one in EBQ had eight items. These eight items were added up and the sum was divided

by eight to get the score for factor one. This procedure was done to the rest of the three

factors of EBQ and the two factors of TLCQ.

Procedures

The Faculty Dean of Humanities and Education at St. John's University of Tanzania

administered the questionnaires to first and third year college-students in regular classes.

Participation in this study was voluntary and participants were told that their ratings on the questionnaire would be kept confidential and had no impact on their coursework and grades. The Dean gave the informed consent letter to the participants before they filled out the questionnaires. The participants read and signed the informed consent letter and then completed the questionnaires which took 20 to 30 minutes. The sample of the informed consent letter and the questionnaires are attached in the Appendices A and B. This procedure of administering the questionnaires was followed for both year one and three participants. The participants were asked to rate their beliefs about teaching and learning using a five-point Likert scale ranging from 1 to 5 -'Strongly Disagree to Strongly Agree.'

Data Analysis

The researcher computed descriptive statistics to determine normality of variables and to identify possible outliers. A principal axis factoring (PFA) with oblimin rotation was conducted on EBQ and Exploratory factor analysis (EFA) with oblimin rotation on TLCQ to determine the validity of the instruments. In order to check for reliability of individual factors and to find out whether the epistemological and pedagogical dimensions found in earlier research apply to this population, Cronbach's alpha was calculated for each factor on the

EBQ and TLCQ instrument. Research questions number one through four were answered by computing two separate MANOVAs. The first MANOVA was for type of teacher (pre-service and in-service) and years of study (year one and year three) as independent variables and scores from the four dimensions of epistemological beliefs (Innate/Fixed Ability, Learning Effort/Process, Authority/ Expert Knowledge, and Certainty Knowledge) as dependent variables. The second MANOVA took the same independent variables (type of teacher and year of study) as independent variables, with factors representing pedagogical beliefs from the TLCQ (Tradition Teaching and Constructivist Teaching) as dependent

variables. The researcher chose to compute MANOVA instead of several ANOVAs for these reasons: First of all, several researchers who used the EBQ and TLCQ instruments in their studies which are related to this study used MANOVA. For instance Chan and Elliot, and Schommer used MANOVA (Chan & Elliott, 2002; Schommer, 1993a). Likewise, Mvududu used MANOVA when she had more than one dependent variable (Mvududu, 2003). Second, using MANOVA protects against committing Type I error which can be committed easily with several ANOVAs. Third, MANOVA can reveal differences which might not be discovered when using several ANOVAs (Field, 2009; Tabachnick & Fidell, 2013). Fourth, the constructs/ factors on the instruments are related; for instance, the constructivist method construct and traditional method construct in TLCQ are related. Fifth, there is the possibility of the factors in each of the instruments (EBQ /TLCQ) being correlated. The above reasons supported the researcher to use MANOVA instead of several ANOVAs.

Pearson Product-Moment Correlations were computed to determine relationships between student-teachers' epistemological and pedagogical beliefs. The Pearson Product-Moment Correlations were intended to answer research question number five.

Chapter Four

Results

The purpose of this study was to examine the variations and relationships of epistemological and pedagogical beliefs of student-teachers based on their year of study and teacher type. Descriptive statistics will be presented followed by inferential analyses used to test hypotheses.

Demographic Information

One thousand (N= 1,000) questionnaires were administered to first and third year student-teachers at St. John's University of Tanzania. Two hundred and ninety eight student-teachers declined to sign the informed consent letter. Therefore, the Dean didn't return these questionnaires. Demographic data was compiled in eight areas: 1) year of study, 2) program of study, 3) gender, 4) age, 5) teacher type, 6) teaching experience, 7) religion, and 8) highest education of parent(s).

Seven hundred and two student-teachers participated in this study. Two thirds of participants were in the third year. The majority of students were from BA Ed, BSc ED, and very few from BCom Ed. Two-thirds were males while one-third were females, and the age of the majority of participants were between 18 to 29 years old. Three-quarters were pre-service teachers while one-quarter were in-service teachers. Half of the participants had no teaching experience. More than three thirds of participants were Christian, the rest were Muslims and other faiths. Half of the participants' parents had no schooling (see Tables 1-8 for details of the demographics).

Table 1

Student-Teachers Year of Study

Year of study	n (701)	%
One	241	34.3
Three	460	65.5
Total	701	99.9

Table 2

Distribution of Student-Teachers in Program of Study

Program of study	n (700)	%
BAEd	318	45.3
BScEd	363	51.7
BComEd	19	2.7
Total	700	99.7

Table 3

Gender of Student-Teachers

Gender	*n* (697)	*%*
Male	465	66.7
Female	232	33.3
Total	697	100

Table 4

Student-Teachers Age

Age	*n* (702)	%
18 -– 23	221	31.5
24 -– 29	337	48
30 -– 34	86	12.3
35 -– 39	33	4.7
40 -– 44	15	2.1
45 -– 49	9	1.3
50+	1	.1
Total	702	100

Table 5

Student-Teachers Type

Teacher type	*n* (699)	*%*
Pre-service	503	72
In-service	196	28
Total	699	100

Table 6

Teaching Experience of Student-Teachers

# of years	*n* (700)	%
None	344	49.1
Less than a year	159	22.7
1 – 5	139	19.9
6 - 10	40	5.7
11+	18	2.6
Total	700	100

Table 7

Religions of Student-Teachers

Religion	*n* (699)	*%*
Christian	610	87.3
Muslim	81	11.6
Other	8	1.1
Total	699	100

Table 8

Highest Education Reached by One of Student-Teachers' Parents

Level of education	*n* (698)	%
Didn't go to school	55	7.9
Middle school	105	15
STD VII	261	37.4
Form IV	145	20.8
Form VI	57	8.2
Bachelor	54	7.7
Master	16	2.3
PhD	5	.7
Total	698	100

Data Analysis

Psychometric Properties of EBQ and TLCQ. To assess the validity of the EBQ, a principal axis factoring (PAF) was conducted on 30 items with oblimin rotation. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = .68. Bartlett's test of sphericity x^2 (435) = 1703.93, p = 001, indicated that correlations between items were sufficiently large for PAF. An initial analysis was run to obtain eigenvalues for each factor in the data. Ten factors had eigenvalues over Kaiser's criterion of 1 and in combination explained 51.36% of the variance. However, the scree plot showed inflexions that would justify retaining four factors. The items that cluster on the same factors suggest that factor 1 represents learning efforts, factor 2 certainty of knowledge, factor 3 facts versus process, and factor 4 innate/ fixed ability (see Appendix C). The PAF analytical procedure was the same used by Chan and Elliot in developing the original EBQ instrument (Chan & Elliot, 2002). The analysis provided a similar number of factors and similar factor content, though in different arrangements and slightly different factor names. In order to assess reliability of the EBQ instrument, Cronbach alpha was calculated for each factor and had these values: Factor 1: learning efforts, α =.51, factor 2: certainty knowledge, α = .59, factor 3: facts vs process, α = .24, factor 4: innate/ fixed ability, α = .25. The first two factors seem to have acceptable Cronbach alphas while the last two factors have very low Cronbach alphas. These factors were calculated by adding all the items greater than .3 that loaded in a particular factor and the sum was divided by the number of items. In other words, for each factor, an overall score was computed by taking the mean of all items that had a loading greater than .3 on that factor. Field (2009) suggested the value of .7 to .8 as adequate to such type of a test. Table 10 shows Cronbach's alpha, means, and standard deviations of identified

epistemological beliefs of the student-teachers of St. John's University of Tanzania who

completed the questionnaire (see Table 10).

To assess the validity and reliability of TLCQ, exploratory factor analysis (EFA) was

conducted on the 30 items with oblimin rotation. The Kaiser-Meyer-Olkin (KMO) measure

verified the sampling adequacy for the analysis, KMO = .80 which is well above the

acceptable limit of .5 (Field, 2009). Bartlett's test of sphericity x^2 (435) = 2793.42, p = .001,

indicated that correlations between items were sufficiently large for EFA. An initial analysis

was run to obtain eigenvalues for each factor in the data. Eight factors had eigenvalues over

Kaiser's criterion of 1 and in combination explained 48.50% of the variance in post rotation.

Inspection of scree plot showed inflexions that would justify retaining two factors. Therefore,

two factors were retained and accounted for 23.69% of variance in post rotation. The items

that cluster on the same factors suggest that factor 1 represents traditional conception, and

factor 2 represents constructivist conception. The assignments of items to factors were almost

identical to that found in earlier studies. Cronbach alphas were calculated from these two

factors and produced the following values: Factor 1: Traditional conception, α = .75, factor 2:

Constructivist conception, α = 75. Field (2009) suggested a Cronbach of .7 to .8 was adequate

for such type of a test. Table 11 shows the Cronbach's alpha, means, and standard deviations

for TLCQ of St. John's University of Tanzania student-teachers. The mean score of the

student-teachers in this sample on constructivist conception subscale (M = 4.23) is well above

the midpoint of 3, indicating that these student-teachers are in favor of constructivist

conception beliefs. However, the mean score of these student-teachers on traditional

conception (M = 3.21) which is only slightly above the midpoint of 3 indicating that the majority of the student teachers are neutral; that is, they do not seem either to favor or reject the traditional conception beliefs.

Table 9

Cronbach's Alpha, Mean, and Standard Deviation for the EBQ Dimensions

Dimension/ Factor	Cronbach's alpha	Mean	Standard deviation
Learning efforts (11 items)	.51	2.75	.61
Certainty knowledge (5 items) (11 items)	.59	3.90	.48
Facts vs process (6 items)	.24	2.98	.53
Innate / fixed ability (8 items)	.25	3.50	.60

Table 10

Cronbach's Alpha, Mean, and Standard Deviation for TLCQ

Dimension/ Factor	Cronbach's alpha	Mean	Standard Deviation
Traditional conception	.75	3.21	.52
Constructivist conception	.70	4.23	.43

Assumptions for MANOVA. Before computing MANOVA, its assumptions were checked. MANOVA has assumptions of multivariate normality, homogeneity of variances, and independence of observations (Field, 2009; Tabachnick & Fidell, 2013). The assumption of multivariate normality was checked through the use of Skewness and Kurtosis. Both Skewness and Kurtosis (see Table 12) provided enough evidence that the dependent variables are normally distributed. Levene's test was used to check the assumption of homogeneity of variances.

Table 11

Means, SD, Skewness, and Kurtosis for EBQ and TLCQ

	n	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
							Std. Error		Std. Error
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Error	Statistic	Error
EBQ FACTORS									
Innate/Fixed ability	659	1.13	4.38	2.75	.61	-.04	.10	-.22	.19
Learning efforts/Process	620	1.00	5.00	3.90	.48	-.64	.10	1.97	.20
Authority/Expert knowledge	671	1.17	4.67	2.98	.53	-.20	.09	.23	.19
Certainty knowledge	685	1.60	5.00	3.50	.60	-.22	.09	.02	.19
TLCQ FACTORS									
Constructivist conception	655	2.50	5.00	4.23	.43	-.59	.10	.53	.19
Tradition conception	646	1.50	4.56	3.21	.52	-.27	.10	.04	.19
Valid *n* (listwise)	518								

Statistical Procedures and Tests of Their Parametric Assumptions

For the hypotheses that include pedagogical beliefs, a MANOVA were conducted.

MANOVA was not conducted for hypotheses that included epistemological beliefs because

of the low Cronbach alphas of EBQ factors. Research hypotheses related to the EBQ will not be further discussed in the results section.

Hypotheses

Hypothesis 1. There will be a statistically significant difference of student-teachers' epistemological beliefs between years one and three. Specifically, it is predicted that Year Three students will have more sophisticated epistemological beliefs than Year One students.

Multivariate analysis of variance (MANOVA) was not conducted to examine the differences in epistemological beliefs between first year and third year student-teachers. This is because of the low reliability the instrument factors.

Hypothesis 2. There will be a statistically significant difference of student-teachers' pedagogical beliefs between years one and three. Specifically, it is predicted that student-teachers will have a more constructivist approach in year three than year one.

To test this hypothesis, the means and standard deviation (SD) for the two pedagogical dimensions (Constructivist conception and Traditional conception) were computed. The means score (M) of the pedagogical conceptions by year of study are as follow: Constructivist conception for year one and three are $M = 4.26$, and $M = 4.22$ respectively. Traditional conception for year one and three are, $M = 3.21$, and 3.10 respectively (see Table 12).

Table 12

Descriptive Statistics of Conception of Teaching and Learning by Year of Study and Teacher Type

	Year of study	Teacher type	Mean	Std. Deviation	*n*
Constructivist conception	One	Pre-service	4.17	.42	129
		In-service	4.36	.40	81
		Total	4.24	.42	210
	Three	Pre-service	4.26	.39	310
		In-service	4.20	.49	90
		Total	4.24	.41	400
	Total	Pre-service	4.23	.40	439
		In-service	4.27	.45	171
		Total	4.24	.42	610
Tradition conception	One	Pre-service	3.39	.41	129
		In-service	3.25	.56	81
		Total	3.34	.48	210
	Three	Pre-service	3.16	.53	310
		In-service	3.03	.55	90
		Total	3.13	.53	400
	Total	Pre-service	3.23	.51	439
		In-service	3.13	.56	171
		Total	3.20	.52	610

The grand mean score and SD for Constructivist conception ($n = 655$) were 4.24 and .43 respectively while the grand mean score and SD for the Traditional conception ($n = 646$) were 3.21 and .52 respectively (see Table 10).

A MANOVA at a significance level of .05 was computed to TLCQ response data of the two pedagogical beliefs dimensions across year of study and type of teacher which both had two levels. Using Wilks' Lambda, a significant overall F was found for year of study, Wilks' lambda = .96, $F(2, 605) = 11.24$, $p < .05$, $\eta^2 = .036$; type of teacher, Wilks' lambda = .98, $F(2, 605) = 6.09$, $p > .001$ $\eta^2 = .020$; and the interaction between year of study and type of teacher, Wilks' lambda = .98, $F(2, 605) = 5.38$, $p < .05$, $\eta^2 = .017$ (see Table 12). Follow-up univariate tests were conducted for each of the DVs on year of study and teacher type. The ANOVA on year of study was significant for the Traditional conception $F(1, 643) = 18.98$, $p = .001$ while for the Constructivist conception, the effect of year of study was not significant, $F(1, 652) = .38$, $p = .37$. The ANOVA on teacher type was significant for the Traditional conception, $F(1, 641) = 6.39$, $p = .001$, while the Constructivist conception, $F(1, 650) = 1.62$, $p > .05$ was not significant. The interaction between year of study and teacher type on the Constructivist conception was found to be significant, $F(1, 606) = 10.68$, $p = .001$, $\eta^2 = .02$, (see Table 14).

Table 13

Wilk′s Lambda Multivariate Test

Effect	Value	*F*	Hypothesis df	Error df	Sig.	Partial Eta squared
Year of study	.96	11.24	2.00	605.00	.00	.04
Teacher type	.98	6.09	2.00	605.00	.00	.02
Teacher type*year of study	.98	5.38	2.00	605.00	.01	.02

Table14.

Univariate Effects of Year of study and Teacher type on Pedagogical Beliefs

Conception		F	p	η^2
Constructivist	Year of study	.81	.37	.00
	Teacher type	2.94	.09	.01
	Year of study*Teacher type	10.68	.00	.02
Traditional	Year of study	22.11	.00	.04
	Teacher type	8.67	.00	.01
	Year of study*Teacher type	.02	.90	.00
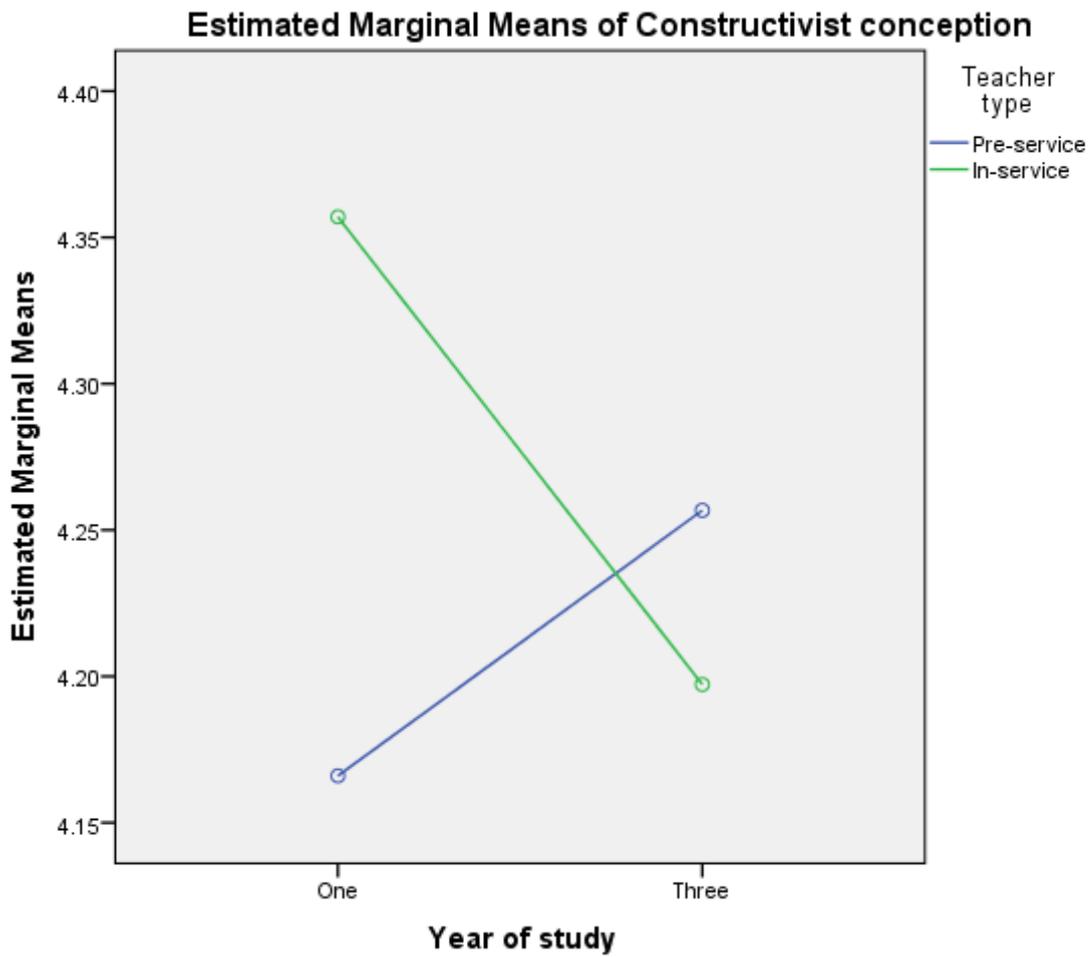
Figure 1. Interaction Plot Showing Means for the Constructivist Conception by Year of Study and

Teacher Type.

The interaction plot shows that in-service, year one student-teachers begin with an extremist constructivist approach with a mean of 4.36 and tend to move a little closer to the mid-point, to a mean of 4.20 in year three. That is, the scores of in-service student-teachers' constructivist conception decrease as year of study increases. However, it is opposite to the pre-service, year one student-teachers that begin with lower constructivist and moves to higher constructivist scores. In other words, scores on the constructivist conception of pre-service teachers increase as the year of study increases.

Regarding the traditional conception by year of study and teacher type, for both pre-service and in-service student-teachers, the means for year three are somewhat lower than the means for year one, and closer to the midpoint of the scale (see Figure 2).
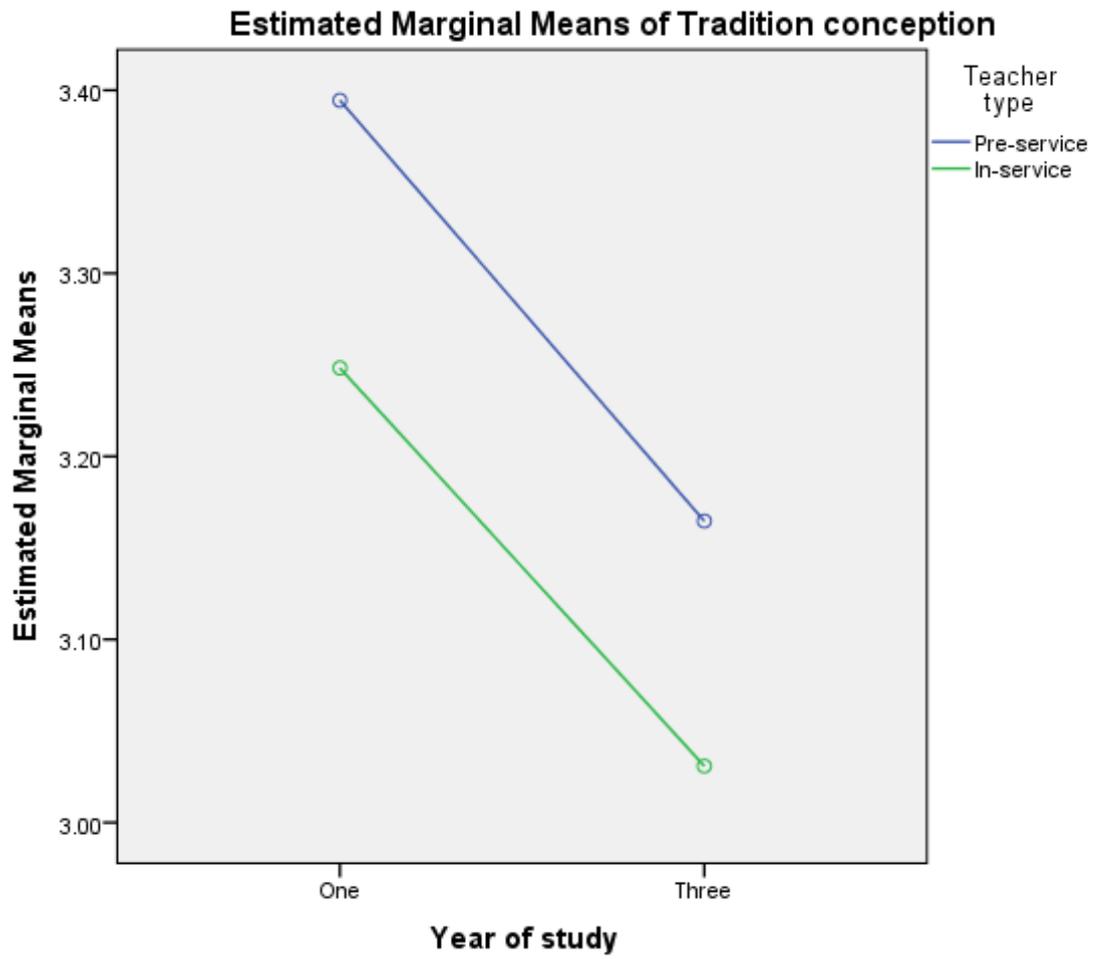
Figure 2. Plot Showing Means for Traditional Conception by Year of Study and Teacher Type
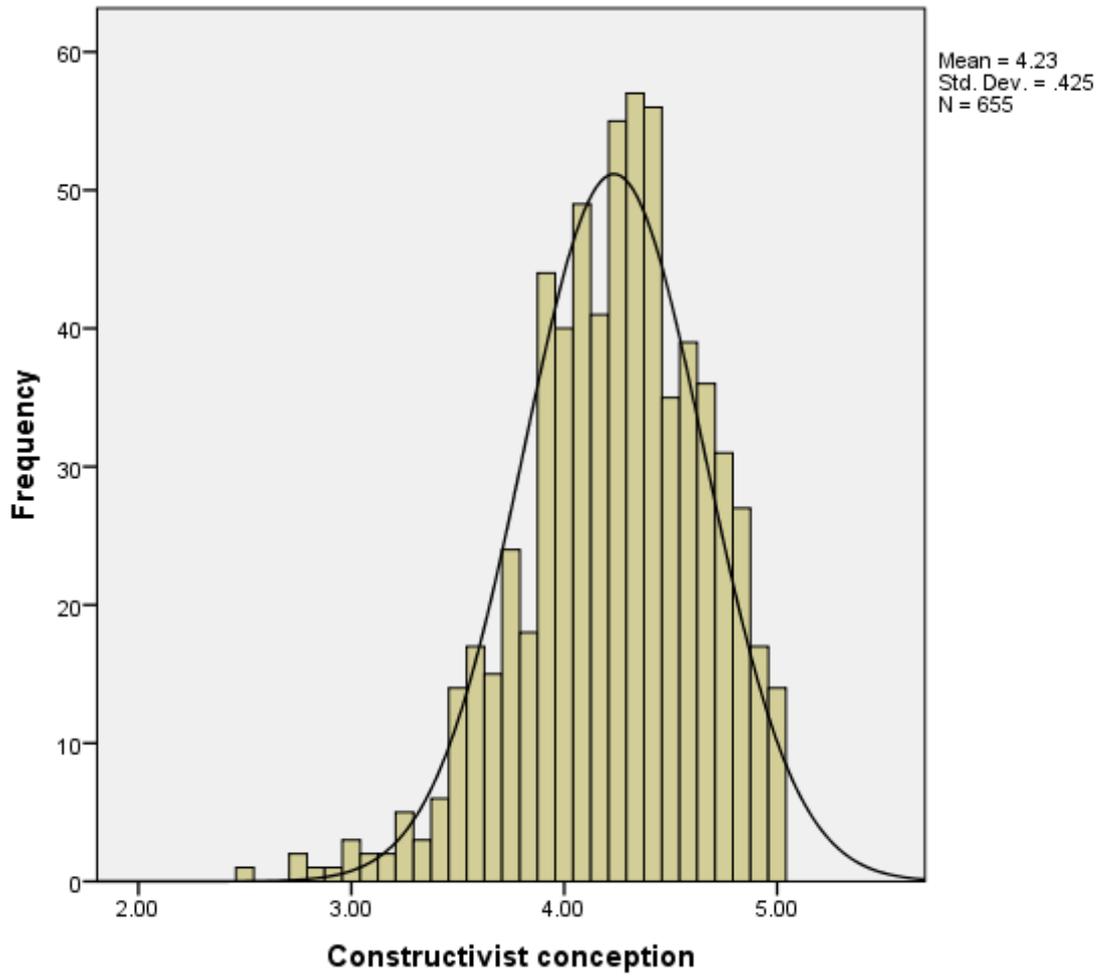
Figure 3. Distributions of Student-teachers on Constructivist Conception Beliefs.

FFF
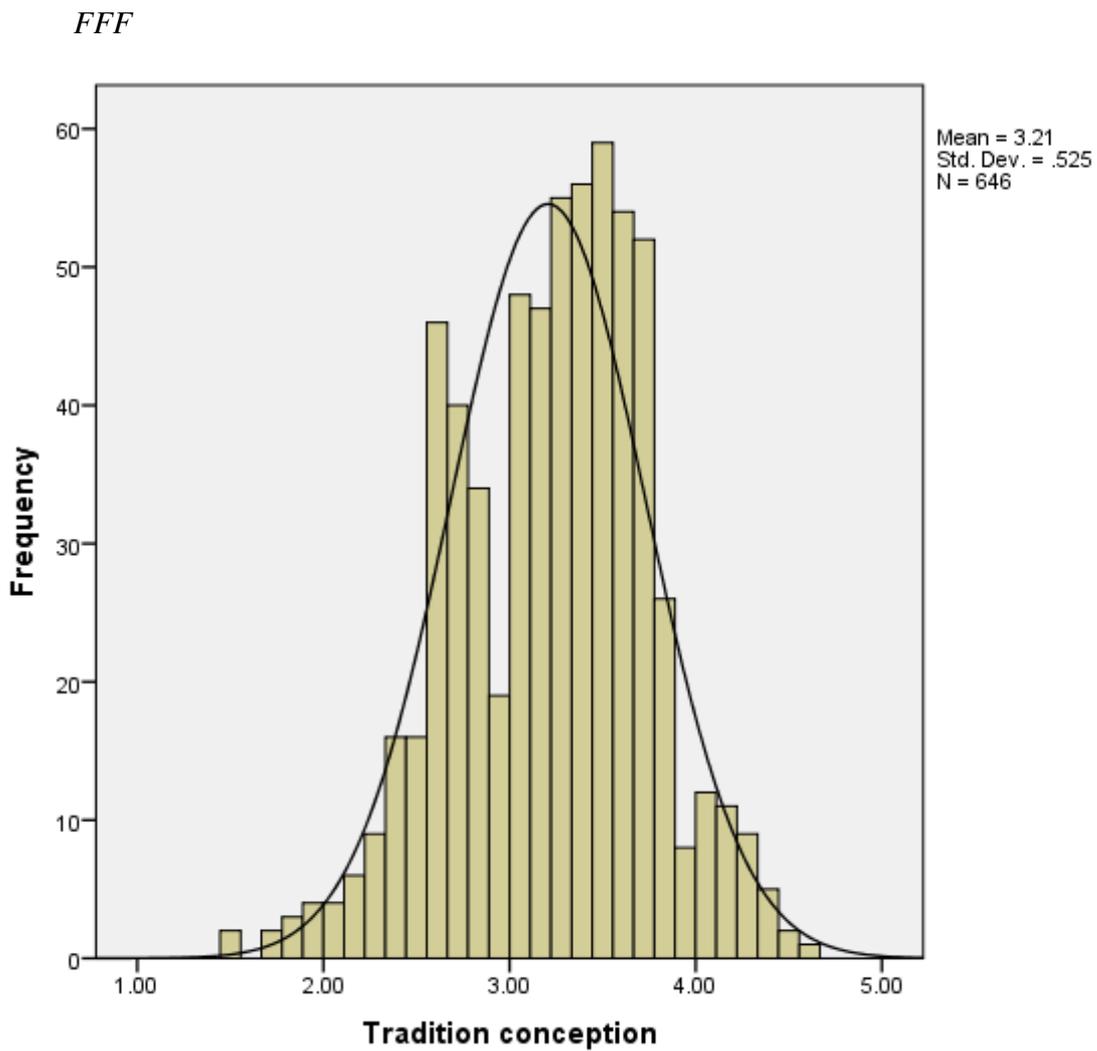
Figure 4. Distribution of Student-teachers on Traditional Conception Beliefs

Following a significant interaction between year of study and teacher type on the constructivist conception, a test of simple effects was conducted to examine the effects of year of study or type of teacher. This was done by comparing means of the dependent variable (constructivist conception) in rows and/or columns. Simple main effects analysis showed that pre-service teachers in year one were significantly more constructivist than year three pre-service teachers ($p = .00$).

Table 15

Effect of Teacher Type on the Constructivist Conception for Year One Student-teachers

			Sum of Squares	df	Mean Square	F	Sig.
Constructivist conception * Teacher type	Between Groups	(Combined)	2.26	1	2.26	12.51	.000
	Within Groups		40.27	223	.18		
	Total		42.53	224			

a. Year of study = One

Hypothesis 3. There will be a statistically significant difference of epistemological beliefs between pre-service and in-service teachers at St. John's University of Tanzania. Specifically, it is predicted that in-service teachers will have more sophisticated epistemological beliefs than pre-service teachers.

MANOVA was not computed on the four epistemological beliefs (Innate/ Fixed Ability, Learning Efforts/ Process, Authority/ Expert Knowledge, and Certainty Knowledge) scores as dependent variables and type of teacher (Pre-service and In-service) as the independent variable, because the EBQ was considered to have low reliability on the scores.

Hypothesis 4. There will be a statistically significant difference of pedagogical beliefs between pre-service and in-service teachers at St. John's University of Tanzania. Specifically, it is predicted that in-service teachers will have a belief in a more constructivist approach than pre-service teachers.

To examine the differences in pedagogical beliefs of the type of teacher (pre-service and ins-service), descriptive statistics were first analyzed.

Looking at Table 13, pre-service teachers have a constructivist conception mean (*M*) of 4.23 and *SD* = .40 while in-service teachers have a constructivist conception mean of 4.27 and *SD* = .45. Considering the traditional conception, pre-service teachers have a mean of 3.23 and *SD* = .51 while in-service teachers have a mean of 3.13 and *SD* = .56.

After considering the descriptive statistics, inferential statistics showed that the year of study was statistically significant on traditional conception, $F(1, 606) = 22.11$, $p = .001$, $\eta 2 = .04$. Teacher type was statistically significant on traditional conception, $F(1, 606) = 8.67$, $p = .001$, $\eta^2 = .01$. There was statistically interactional significance of teacher type and year of study on constructivist conception, $F(1, 606) = 10.68$, $p = .001$, $\eta^2 = .02$. Pairwise comparison showed that there was a statistically significant difference in means between pre-service teachers and in-service teachers at $p = .01$ for Traditional Conceptions but not Constructivist Conceptions (see Table 16).

Table 16

Pre- service and In- service Teachers Pairwise Comparisons

Dependent Variable	(I) Teacher type	(J) Teacher type	Mean Differen ce (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Constructivist	Pre-service	In-service	-.07	.04	.09	-.14	.01
	In-service	Pre-service	.07	.04	.09	-.01	.14
Traditional	Pre-service	In-service	.14[*]	.05	.00	.05	.23
	In-service	Pre-service	-.14[*]	.05	.00	-.23	-.05

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Hypothesis 5. There will be one or more statistically significant relationships between student-teachers' epistemological and pedagogical beliefs at St. John's University of Tanzania.

To examine the relationships between student-teachers' epistemological beliefs and pedagogical beliefs, the Pearson correlation coefficient was not computed to EBQ's belief factors/dimensions (Innate/ Fixed Ability, Learning Efforts/ Process, Authority/ Expert Knowledge, and Certainty Knowledge) because of the low Cronbach alphas to be low on the EBQ.

Chapter Five

Summary and Discussion

The first section of this chapter summarizes the study's purposes, methodology and

the predictions made before the results. The results are interpreted in light of earlier research.

The limitations specific to this study and suggestions for further research are in the final

section of this chapter.

Summary of Research Purposes, Predictions and Methodology

The purposes of this study were twofold. The first was to determine if student-

teachers' epistemological and pedagogical beliefs varied based on their year of study and type

of teacher. The second purpose was to investigate the relationships of epistemological and

pedagogical beliefs of pre-service and in-service teachers at St. John's University of

Tanzania.

The researcher had the following predictions: The first prediction was that third-year

student-teachers would have more sophisticated epistemological beliefs while first year

student-teachers would have naïve epistemological beliefs. The second prediction was that

third year student-teachers would have constructivist conception beliefs while first year

student-teachers would have traditional conception beliefs. The third prediction was that in-

service teachers would have more sophisticated epistemological beliefs while pre-service

teachers would have more naïve epistemological beliefs. The fourth prediction was that in-

service teachers would have constructivist conception beliefs while pre-service teachers

would have traditional conception beliefs; and, the fifth prediction was that one or more

dimensions of student-teachers' epistemological beliefs would have relationships with one of the dimensions of pedagogical beliefs.

The participants from this study were student-teachers (pre-service and in-service teachers) from St. John's University of Tanzania in Dodoma, Tanzania. The participants were first and third year pre-service and in-service teachers. The first year students were selected because they were considered to be beginners to the teacher education program, while the third year students were selected because they were nearly ready to exit the teacher education program.

The reliability of instruments was assessed by using Cronbach alpha which showed the internal consistency of the instruments. Principal axis factoring (PAF) with oblimin rotation was computed to EBQ while exploratory factor analysis (EFA) with oblimin rotation was computed to TLCQ to assess the construct validity of the instruments. Descriptive and inferential statistics were computed to address the research hypotheses. In inferential statistics, MANOVA was computed to address hypotheses two and four.

Discussion of the Results

The EBQ and TLCQ are reviewed in the first section. The second section discusses each of the hypotheses' results. However, hypotheses two and four are discussed together because MANOVA output for the two IVs and two DVs produces answers for the aforementioned hypotheses. The implications for practice, limitations of the study and suggestions for further research are discussed in the third section.

Psychometric Properties of the EBQ and TLCQ. A PAF was conducted with 30 items of EBQ. Ten factors had eigenvalues greater than 1 which accounted for 51.36%. Inspection of the scree plot showed retaining four factors which accounted for 28.03% of variance. The four factors retained were aligned with the earlier number of factors obtained during earlier research though slight differences were on factor names and arrangements. The item-total correlations of some of the items were below .3 which lead to low Cronbach's alpha for the Facts vs Process and Innate/ Fixed ability factors to be α = .24 and .25 respectively. Removal of the items that had item-total correlations of below .3 was not helpful. That is, the Cronbach's alphas remained the same. The other two factors Learning efforts and Certainty Knowledge had α = .51 and .59 respectively. Therefore, the EBQ was dropped from the analysis as it had low Cronbach's alpha, meaning that the instrument was not reliable for the particular scores. Field (2009) advised an instrument or sub scales to have Cronbach's alpha between .7 and .8 to be acceptable for use in a study. Several speculations can be made related to the low alphas of EBQ in a Tanzanian context. First, it probably may be that epistemological beliefs are more culturally independent than pedagogical beliefs. This is likely because even Chan and Elliot (2002) found that when they tried to adopt the EBQ developed by Schommer (1989, 1990) in China, it didn't work well. Other studies on epistemological beliefs in other cultures like those in Chile (Arredondo & Rucinski, 1996), Korea (Lee, 1995), and Japan (Mori, 1997) showed different results from Schommer's study.

For the TLCQ, an EFA with oblimin rotation was conducted on 30 items. Eight factors had eigenvalues above one. Inspection of the scree plot suggested the retention of two

factors. According to items loading on these two factors, the factors were named Traditional

Conception for factor 1 and Constructivist Conception for factor 2. These names are the same

obtained from earlier studies. However, the arrangements of factors are different; that is,

factor 1 is Traditional and factor 2 is Constructivist while earlier studies were vice versa. The

Cronbach's alphas for the two factors were .75 for Traditional Conception, and .70 for the

Constructivist Conception. These alphas are acceptable (Field, 2009). Items 36, 52, and 60

from Traditional Conception, and 33, 38, and 50 from Constructivist Conception were

removed because of below .3 item-total correlations. The removal of these items didn't affect

the Cronbach alphas when it was recalculated. Therefore, TLCQ was the instrument used in

the analysis while EBQ was dropped.

The researcher was surprised to observe that the correlation between Traditional and

Constructivist Conceptions was $r = .04$, not significant at $p = .29$. This correlation result is

contrary to Chan and Elliott (2004b) who observed a positive correlation of $r = .3$ whereas

Eren (2009) got a correlation of $r = -.39$. The non-significant correlation in this study may

suggest that the two subscales are quite different factors.

Analysis discussion. The discussion of the analysis is based on the outputs of

MANOVA computed with Year of Study and Teacher Type as IVs and Traditional and

Constructivist Conceptions' scores as DVs. In this case, the following two hypotheses were

addressed: There will be a statistically significant difference of student-teachers' pedagogical

beliefs between years one and three. Specifically, it is predicted that student-teachers will

have a more Constructivist approach in year three than year one (Hypothesis 2). There will

be a statistically significant difference of pedagogical beliefs between pre-service and in-

service teachers at St. John's University of Tanzania. Specifically, it is predicted that in-

service teachers will have a more constructivist approach than pre-service teachers

(Hypothesis 4). Looking to see if there was a difference in pedagogical beliefs between year

one and three, and/or between pre-service and in-service teachers, results from descriptive

statistics and MANOVA using two IVs (teacher type and year of study) and two DVs

(traditional and constructivist scores) were as follow:

Descriptive statistics. Looking at the descriptive statistics (Table 12), both pre- and

in-service teachers have a mean of 4.24 on the constructivist conception, and a mean of 3.20

on the traditional conception. The mean on the constructive conception suggests that student-

teachers preferred or believed in the constructivist approach as the best teaching strategy

because their mean score, being 4.24, is between agree and strongly agree in a 5-point Likert

scale. The graph of Figure 3 shows that most student-teachers' scores are above four, and this

is also evident when looking at the frequencies table (see Appendix D) which shows that 76%

of student-teachers score 4 and above on a Likert scale of 5 points.

The mean of 3.20 on traditional conception seems to be closer to the midpoint of 3.

This may suggest that pre- and in-service teachers neither preferred nor rejected the

traditional approach strategy. The graph in Figure 4 shows the distributions of student-

teachers' scores on traditional conception. The frequency table on traditional conception

shows that most of them are below 4 on a 5-point scale, which accounts for 93.8% (see

Appendix E). Only 6.2% are extreme traditionalists who were between 4 and 5 in the 5-point

scale.

Referring more to the descriptive statistics, results indicated that there were no

differences between first year and third year student-teachers on the constructivist conception

of teaching. First year pre- and in-service teachers had a mean (*M*) of 4.24 while third year

student-teachers had a mean (*M*) of 4.24 on the constructivist conception of teaching. Year

one and year three student-teachers seemed to be in favor of the constructivist conception as

the means were between agree and strongly agree. However, year three in-service teachers

seemed to move away from extremist constructivist (see Table 12). Concerning the

traditional conception, the mean of year one was *M* = 3.33 while year three had a mean of *M*

= 3.13. Student-teachers seemed to be neutral with the traditional conception of teaching and

learning as the mean is almost at the midpoint of 3. However, year three seemed to move

very close to neutral as they had a mean of 3.13 compared to year one with a mean of 3.33

(see Table 13).

Concerning hypothesis four which looks at differences in teacher type, descriptive

statistics showed a very tiny difference between pre-service and in-service teachers.

Descriptive statistics indicated the mean scores of pre-service and in-service student-teachers

on constructivist conception, *M* = 4.23 and *M* = 4.27 respectively, while on traditional

conception, pre-service and in-service teachers had a mean score of *M* = 3.23 and 3.13

respectively.

Inferential statistics. MANOVA indicated that year of study was statistically

significant for tradition conception, $F(1, 606) = 22.11$, $p = .001$, $\eta^2 = .04$. Though there is

statistical significance, its effect in terms of eta squared of .04 is small (common

interpretation of eta squared .01 = small, .06 = medium, and .14 = large). MANOVA

indicated a statistically significant difference in traditional conception between teacher type,

$F(1, 606) = 8.67$, $p = 00$, $\eta^2 = .01$. Eta squared of .01 is a small effect size, so the difference is

not big. The pairwise comparison indicated a mean difference of .14 between pre-service and

in-service teachers which was significant (see Table 16). This difference might suggest that

pre-service are a bit more traditional ($M = 3.23$) than in-service ($M = 3.13$). However, when we consider the mean of 3 as a midpoint, still the pre-service and in-service student-teachers neither agree nor reject the traditional approach strategy. The less constructivist beliefs of pre-service teachers might be due to the fact that they have not been exposed to the modern (i.e., constructivist) ways of teaching, and still remember how they were traditionally taught.

Also the interaction of teacher type and year of study indicated that the Year One in-service student-teachers began with an extremist constructivist approach, with a mean of 4.36 and tended to move slightly towards a mean of 4.20 in year three where it might be perceived as moving to a normal constructivist. That is, the scores on the constructivist conception decreased as the year of study increased. However, it was opposite to Year One pre-service student-teachers who began as lower constructivist and moved to higher constructivist. In other words, scores on constructivist conception of pre-service student-teachers increased as years of study increased. Regarding the interaction of tradition conception by year of study and teacher type, year one in-service student-teachers tended to move from high tradition conception approach ($M = 3.25$) to low tradition conception approach ($M = 3.03$). In other words, scores on traditional conception of year one in-service student- teachers' decrease as year of study increases. This is the same for year one pre-service student-teachers who start with Traditional beliefs of $M =3.39$ and move down to $M = 3.17$ (see Figure 2).

These results are similar to the study of Cheng *et al* (2009) that was conducted in Hong Kong, as fourth year pre-service teachers had a mean of 4.22 in the constructivist conception. The results are also aligned with the study of the adoption of the teaching-learning conception in Turkey done by Aypay (2011), where pre-service student-teachers preferred the constructivist approach, $M = 4.1$ over the traditional approach, $M = 2.7$. Another study done by Yilmaz and Sahin (2011) in Turkey, indicated that pre-service teachers were in

favor of the constructivist approach, $M = 4.25$, and sometimes with the traditional approach, $M = 2.78$. Otting, Zwaal, Tempelaar, and Gijselaers (2010) in their study of the relationship between student-teachers' epistemological beliefs and conceptions of teaching, found a significant difference between first- year pre-service teachers ($M = 3.75$) and senior students ($M = 3.88$) in the constructivist conception. Although, with a significant difference, still the means show that first-year and senior students prefer the constructivist conception.

The results of this study align also with a study by Chai, Teo and Lee (2009) who traced teachers' change on epistemological, and teaching and learning conception beliefs of postgraduate pre-service teachers in Singapore. The Singaporean teachers had a mean of $M = 4.25$ in a pre-test on the constructivist approach and a post-test mean of $M = 4.18$ after nine months; while the mean of the traditional approach in their pre-test was $M = 2.15$ and $M = 2.28$ during the posttest. The similarity of the results are in the sense that as teachers are in the final year of their program, they may tend to move away from an extreme constructivist position, whereas during the first year of their program, they may tend to move slightly towards the neutral point in the traditional conception. However, the results of this study stand in contrast to Eren's (2009) findings that third-year pre-service teachers tended to favor the constructivist approach when compared to first- and second-year pre-service student-teachers. This is because third years had stayed in the teacher education program for three years hence, been exposed to constructivist approach.

Implications for Practice

The TLCQ is based on the constructivist and traditional approach of teaching. This implies that the higher the means student-teachers score on the constructivist conception subscale, the more student-teachers believe in the constructivist approach. This is the same in

application of the traditional conception subscale in the sense that the higher the means score, the more student-teachers believe in the traditional approach.

These results are different from the predictions made that the third year pre- and in-service teachers would have more positive beliefs about the constructivist conception. Predictions based on the fact that third-year student-teachers are in their final year of the teacher education program, were made because Tanzania had instituted a pedagogical reform in 2005, so universities and teacher education colleges would have been expected to reform their curricula to meet the nation's expectations; that is, the constructivist pedagogical approach should have been emphasized in preparing teachers.

The prediction that in-service teachers would have been more constructivists was also based on the notion that these teachers have had experience with teaching and have attended teachers' colleges, studying for a level of certification and/or diplomas in teaching. Therefore, they should have been exposed to a constructivist pedagogical approach, particularly those with less than nine years of experience.

The findings that there is no statistical significance (and wherever there is, the effect size is too small) in pedagogical beliefs or conception along dimensions of years of study (year one and three) and in teacher type (pre-service and in-service) where both favor the constructivist approach, and at the same time neither reject nor agree with the traditional pedagogical belief or conception may bring a different thought. First, it may be that these student-teachers have been exposed to the constructivist approach differently; that is, third-year in-service and pre-service student-teachers may have been exposed to it in their teacher education program, while Year One pre-service student-teachers may have been exposed to the constructivist approach in secondary or high schools by observing their teachers teach.

Second, neither rejecting nor agreeing with the traditional belief or conception may imply that these teachers do not ignore the traditional conception. It might imply that they prefer the balance of the two pedagogical beliefs or conceptions. This aligns with Klein's (1996) argument that teachers might simultaneously hold both traditional and constructivist conceptions of teaching. This might be true in classroom practice as it is very rare for teachers to be pure constructivist or traditional in their pedagogical beliefs. For instance, constructivists have the notion that every student is unique and learns differently (McCombs & Whisler, 1997). This might imply that a particular student might learn well by either traditional or constructivist approaches. Third, although Yates (2006) found that student-teachers with stronger constructivist beliefs made use of constructivist pedagogical strategy or approach in classroom practice, Perkikila (2006) found that teachers' classroom practices differed with their pedagogical beliefs. The present results might be evidence that there is a similar disconnect between teachers' beliefs and their classroom practices in Tanzanian schools.

Limitations of the Research

The EBQ that was intended to be used in this present study was abandoned. This made some hypotheses concerning change of epistemological beliefs in year of study and teacher type, and also the relationships between EBQ and TLCQ not to be addressed. Dropping EBQ left part of the identified gap in knowledge unaddressed.

The sample used in this study was large ($n = 702$), which means that results that are statistically significant may, in fact, have little practical significance. This is because when the sample is large, the possibility of getting significant results increases. This reduces the internal validity of the results. For instance, in the present study there was a statistically

significant interaction of year of study and teacher type on the constructivist conception, but with a small effect size ($\eta^2 = .02$), which implies that this difference is small.

The present study measured student-teachers' pedagogical beliefs. The results of this study may prevent drawing firm conclusions on what these teachers actually practice in classrooms. Someone may not practice his/her beliefs in the classroom due to other hindering factors. Therefore, while it is shown in the results that these teachers favor the constructivist approach, they might not be applying their pedagogical beliefs to their daily classroom practices.

Suggestions for Further Study

A study should be done to develop an instrument to measure epistemological beliefs of teachers in Africa, particularly in the Tanzanian context. This recommendation is due to the low alphas obtained in the EBQ scale.

Additional research should be conducted which can include classroom observation. A study that would include classroom observation could make a comparison of student-teachers' beliefs and their real classroom practice.

A longitudinal study should be done to compare student-teachers epistemological and pedagogical differences in their year one and three, and pre-service and in-service. This will help to trace the same students from the beginning of their program to the end of the teacher education program.

Another study should be done to compare student-teachers' epistemological and pedagogical beliefs in terms of their program of study, that is, BA Ed, BSc Ed, and BCom Ed.

Concluding Remarks

The present study examined the relationships of pre-service and in-service teachers' epistemological and pedagogical beliefs. Only teachers' pedagogical beliefs were examined.

It is interesting to find that TLCQ worked better in the Tanzanian context and not the EBQ. So, there should be a study that will develop a questionnaire of epistemological beliefs that fits the Tanzanian context in order to be used in Tanzania. Furthermore, findings of the present study, apart from showing student-teachers favor the constructivist approach, found that they also neither rejected nor agreed with the traditional pedagogical approach. With the facts that both constructivist and traditional approach have strengths and weaknesses, it could be argued that the government of Tanzania, should take the initiative of embracing both approaches and clarifying and supporting their use whenever either is applicable to instruction in Tanzanian classrooms. Further research can be undertaken to refine their utilization in effective teaching.

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Appendices

Appendix A

Informed consent letter

Engaging the culture, changing the world®

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UNIVERSITY

INFORMED CONSENT

Title: The Relationships of Epistemological and Pedagogical Beliefs of Pre-Service and In-Service Teachers in Tanzanian Context

Principal Investigator:

- Michael Msendekwa, msendekwam@spu.edu, (206) 430-9099.

Advisor:

- Dr.William Nagy (Ph.D), <u>wnagy@spu.edu</u>, (206) 281-2253

PURPOSE

You are invited to take part in a research study because you are among education students at St. John's University of Tanzania where this study takes place. This study will have 1000 participants. The purpose of this study is to examine the relationships of epistemological beliefs and pedagogical beliefs of pre-service and in-service teachers at St. John's University of Tanzania, Dodoma, Tanzania.

PROCEDURES

You will fill a questionnaire which has sixty items in total. This is not a class test or assignment. You're asked to respond to all items which takes about 30 mins by circling the appropriate answer that fits your beliefs.

RISKS and DISCOMFORTS

There are no foreseeable risks or discomforts associated with this study.

BENEFITS

I do not anticipate direct benefits; however, your feedback will assist this and future research teams in understanding the epistemological and pedagogical beliefs of student-teachers at St. John's University of Tanzania.

PARTICIPATION AND ALTERNATIVES TO PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed, your data will be destroyed. Likewise, the Researcher may terminate your participation in the study at any time.

EMERGENCY MEDICAL / PSYCHOLOGICAL TREATMENT
There are no foreseeable medical or psychological risks associated with this research study.

CONFIDENTIALITY
The information in the study records will be kept confidential. Data will be stored securely and will be made available only to person conducting the study unless you specifically give permission in writing to do otherwise. No reference will be made in oral or written reports that could link you to the study.

Your de-identified data may be used in future research, presentations or for teaching purposes by the Principal Investigator listed above.

COMPENSATION
For participating in this study you will receive no compensation.

SUBJECT RIGHTS
If you have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study,) you may contact the Principal Investigator, Michael Msendekwa, at 323 West Dravus St, Seattle, WA 98119, and 206-430-9099 or my advisor, Dr. William Nagy, at wnagy@spu.edu, (206) 281-2253. If you have questions about your rights as a participant, contact the SPU Institutional Review Board Chair at 206-281-2201 or IRB@SPU.edu .

CONSENT
Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in this research project and agree to participate in this study. In no way does this waive your legal rights nor release the investigator, sponsors, or involved institutions from their legal and professional responsibilities.

** I have read the above information and agree to participate in this study. I have received a copy of this form.**

Participant's name (print) _____	**Researcher's name (print)** _____
Participant's signature _____	**Researcher's signature** _____
Date _____	**Date** _____

Copies to: Participant   Principal Investigator
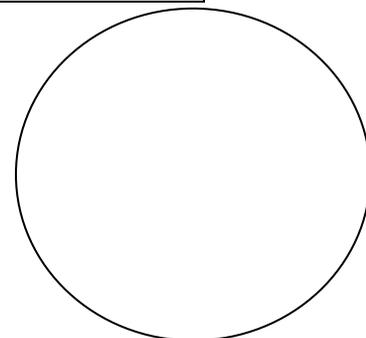
Exempt Review

Subject: IRB Approval - IRB # 141506001 (Exempt)
Dear Mr. Msendekwa,

Your research project *"The Relationships of Epistemological and Pedagogical Beliefs of Pre- service and In-service Teachers in Tanzanian Context,"* has been approved under exempt IRB review. This study was approved under exempt review as it met the following criteria.

3. _X_ Research uses survey or interview procedures or observations (including observations by participants) of public behavior AND at least one of the following conditions exist:

   a. _X_ Human participants cannot be identified directly or through identifiers code or numbers OR

   b. _x_ The participants' responses or the observations recorded, if they became known outside research, cannot reasonably place the participant at risk of criminal or civil liability or be damaging to the participant's financial standing or employment OR

   c. _x_ The research does not deal with sensitive aspects of the participant's own behavior, such as illegal conduct, drug use, sexual behavior, or use of alcohol

Your approval is in effect until **09107/2015.** Your study has been assigned IRB number: **IRB #**
141506001.

To complete your documents please add your IRB # and expiration date to you study's written recruitment material and invitation to participate in the research project.

Please contact me when you have completed collecting data for your study so that I can close your file. If you need more than one year to complete data collection, you must file a request for an extension with me six weeks before the expiration date of this study. Your request for an extension can be written or communicated through e-mail and must include a report on the status of your study. Otherwise you will need to file a new IRB application to continue with data collection after the expiration date.

Use your study number in any further communication regarding this study.

This is the only documentation that you will receive regarding your study's approval. Please print it out and add to your study's documentation.

Best Wishes in the Completion of your Research

Thomas Alsbury, IRB Committee Member-SOE Rep.
Petersen, Room 401
Ph: 206-378-5099
Email: alsburyt@spu.edu

Appendix B

EBQ and TLCQ questionnaires

Questionnaire

This questionnaire is to find out what people believe about teaching and learning. There are no rights or wrong answers. This is not a class test or assignment and your answers will not affect your coursework. Your responses will be kept completely private and confidential. It should take you less than 30 minutes to complete this questionnaire. Please respond to **all** statements.

The first eight questions ask for some general information about you. The rest of the questions ask you to circle a number that best expresses your beliefs about teaching and learning.

Demographics

1. Year of study: One / Three

2. Program of study: BA Ed / BSc Ed / B com Ed

3. Gender: Male / Female

4. Age: (a) 18 – 23 years   (b) 24 - 29 years

                           (c) 30 - 34 years   (d) 35 - 39 years

                           (e) 40 - 44 years   (f) 45 - 49 years

                           (g) 50 and above years

5. Teacher type: Pre-service / In-service

6. Teaching experience: (a) none   (b) less than a year   (c) 1- 5 years

                           (d) 6- 10 years   (e) above 11

7. Religion: (a) Christian   (b) Muslim   (c) Others

8. Highest education of your parent (s)

     (a) Didn't go to school   (b) Middle School   (c) STD VII

     (d) Form IV,   (e) Form VI,   (f) Bachelor,

     (g) Masters   (h) PhD

For each statement on the following two pages, circle the abbreviation that best fits your beliefs.

SD = Strongly Disagree; D= Disagree; N = Neutral; A = Agree; SA = Strongly Agree

Please respond to all statements.

1.	Sometimes, I don't believe the facts in text books written by authorities	SD	D	N	A	SA
2.	If scientists try hard enough, they can find the truth to almost anything	SD	D	N	A	SA
3.	Getting ahead takes a lot of work	SD	D	N	A	SA
4.	The ability to learn is innate/inborn	SD	D	N	A	SA
5.	Learning something really well takes a long time or much effort	SD	D	N	A	SA
6.	Everyone needs to learn how to learn	SD	D	N	A	SA
7.	Some people are born good learners, others are just stuck with limited ability	SD	D	N	A	SA
8.	Even advice from experts should often be questioned	SD	D	N	A	SA
9.	I believe there should exist a teaching method applicable to all learning situations	SD	D	N	A	SA
10.	If people can't understand something right away, they should keep on trying	SD	D	N	A	SA
11.	One's innate ability limits what one can learn	SD	D	N	A	SA
12.	I often wonder how much experts really know	SD	D	N	A	SA
13.	Scientists will ultimately get to the truth if they keep searching for it	SD	D	N	A	SA
14.	Anyone can figure out difficult concepts if one works hard enough	SD	D	N	A	SA
15.	Wisdom is not knowing the answers, but knowing how to find the answers	SD	D	N	A	SA
16.	The really smart (intelligent) students don't have to work hard to do well in school	SD	D	N	A	SA
17.	Scientific knowledge is certain and does not change	SD	D	N	A	SA
18.	How much you get from your learning depends mostly on your efforts	SD	D	N	A	SA
19.	People will learn better if they focus more on the process of understanding rather than the facts to be acquired.	SD	D	N	A	SA
20.	Students who begin school with "average" ability remain "average" throughout school	SD	D	N	A	SA
21.	I have no doubts in whatever the experts say	SD	D	N	A	SA
22.	One learns little if one does not work hard	SD	D	N	A	SA

23. Knowing how to learn is more important than the acquired facts	SD	D	N	A	SA
24. Some children are born incapable of learning well in certain subjects	SD	D	N	A	SA
25. Our abilities to learn are fixed at birth	SD	D	N	A	SA
26. If one tries hard enough, then one will understand the course material	SD	D	N	A	SA
27. I am very aware that teachers/ lecturers know a lot more than I do and so I agree with what they say is important rather than rely on my own judgment	SD	D	N	A	SA
28. There isn't much you can do to make yourself smarter (intelligent) as your ability is fixed at birth	SD	D	N	A	SA
29. Understanding course materials and thinking process are more important than acquiring knowledge/facts	SD	D	N	A	SA
30. I still believe in what experts say even though it differs from what I know	SD	D	N	A	SA
31. The ideas of students are important and should be carefully considered	SD	D	N	A	SA
32. The major role of the teacher is to transmit knowledge to students	SD	D	N	A	SA
33. Learning occurs primarily from drilling and practice	SD	D	N	A	SA
34. During the lesson, it is important to keep students confined to the text books and the desks	SD	D	N	A	SA
35. Teachers should have control over what students do all the time	SD	D	N	A	SA
36. Effective teaching encourages more discussion and hands on activities for students	SD	D	N	A	SA
37. Teaching is simply telling, presenting or explaining the subject matter.	SD	D	N	A	SA
38. I have really learned something when I can remember it later	SD	D	N	A	SA
39. Good teaching occurs when there is mostly teacher talk in the classroom	SD	D	N	A	SA
40. Students have to be called on all the time to keep them under control	SD	D	N	A	SA
41. Students should be given many opportunities to express their ideas	SD	D	N	A	SA
42. Learning means remembering what the teacher has taught	SD	D	N	A	SA

43.	A teacher's major task is to give students knowledge/information, assign them drill and practice, and test their recall	SD	D	N	A	SA
44.	Learning mainly involves absorbing as much information as possible	SD	D	N	A	SA
45.	Good students keep quiet and follow teacher's instruction in class	SD	D	N	A	SA
46.	In good classrooms there is a democratic and free atmosphere which stimulates students to think and interact	SD	D	N	A	SA
47.	The traditional/ lecture method for teaching is best because it covers more information/ knowledge	SD	D	N	A	SA
48.	Every child is unique or special and deserves an education tailored to his or her particular needs	SD	D	N	A	SA
49.	Good teachers always encourage students to think for answers themselves	SD	D	N	A	SA
50.	The focus for teaching is to help students construct knowledge from their learning experience instead of knowledge communication	SD	D	N	A	SA
51.	It is best if teachers exercise as much authority as possible in the classroom	SD	D	N	A	SA
52.	Different objectives and expectations in learning should be applied to different students	SD	D	N	A	SA
53.	Teaching is to provide students with accurate and complete knowledge rather than encourage them to discover it	SD	D	N	A	SA
54.	A teacher's task is to correct learning misconceptions of students right away instead of verify them for themselves	SD	D	N	A	SA
55.	Learning to teach simply means practicing the ideas from lectures without questioning them	SD	D	N	A	SA
56.	No learning can take place unless students are controlled	SD	D	N	A	SA
57.	Good teachers always make their students feel important	SD	D	N	A	SA
58.	Instruction should be flexible enough to accommodate individual differences among students	SD	D	N	A	SA
59.	It is important that a teacher understands the feelings of the students	SD	D	N	A	SA
60.	Learning means students have ample opportunities to explore, discuss and express their ideas	SD	D	N	A	SA

Appendix C

Psychometric analysis for the EBQ

PCA Oblimin with Kaiser Normalization Structure Matrix for EBQ

	Component			
	1	2	3	4
E18:	.539	-.231		.107
E10:	.509		-.136	
E15	.498	-.155	-.231	.216
E13	.472			.196
E26	.421	-.205	-.270	
E22	.402			
E6	.390		-.107	.359
E5	.385	.127		.323
E16	-.384	.296	-.111	.251
E14	.349		-.253	
E3	.303			.201
E2	.296	.292		
E21		.665	.121	
E27		.622	-.203	
E30	.168	.534	-.108	
E28	-.176	.475	-.124	.252
E17	-.115	.468		
E20	-.284	.368		.175
E19	.190		-.720	
E23	.106		-.715	.139
E29			-.574	
E1		-.154	.176	.111
E8	.236	-.288		.508
E7				.477

E24	-.310		-.244	.466
E25		.322	.127	.457
E4		.185		.421
E12				.350
E11				.349
E9	.194		.138	.318

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

Appendix D

Psychometric analysis for the TLCQ

PCA Oblimin with Kaiser Normalization Structure Matrix for TLCQ

	Component	
	1	2
P37	.623	
P32	.599	
P44	.552	
P39	.547	-.216
P43	.519	.278
P42	.511	.152
P51	.495	
P53	.490	-.266
P34	.487	
P40	.447	.141
P45	.443	
P35	.391	.231
P47	.377	
P55	.359	-.272
P56	.245	.207
P41		.572
P46		.570
P31	-.105	.522
P59		.484
P57		.477
P58		.475
P36	.122	.454
P48	-.146	.419
P49		.410

P33	.207	.407
P50		.388
P38	.170	.386
P60		.370
P52		.339
P54	.228	.296

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser

Normalization.

Appendix E

Constructivist frequency table

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.50	1	.1	.2	.2
	2.75	2	.3	.3	.5
	2.83	1	.1	.2	.6
	2.92	1	.1	.2	.8
	3.00	3	.4	.5	1.2
	3.08	2	.3	.3	1.5
	3.17	2	.3	.3	1.8
	3.25	5	.7	.8	2.6
	3.33	3	.4	.5	3.1
	3.42	6	.9	.9	4.0
	3.50	14	2.0	2.1	6.1
	3.58	17	2.4	2.6	8.7
	3.67	15	2.1	2.3	11.0
	3.75	24	3.4	3.7	14.7
	3.83	18	2.6	2.7	17.4
	3.92	44	6.3	6.7	24.1
	4.00	40	5.7	6.1	30.2
	4.08	49	7.0	7.5	37.7
	4.17	41	5.8	6.3	44.0
	4.25	55	7.8	8.4	52.4
	4.33	57	8.1	8.7	61.1
	4.42	56	8.0	8.5	69.6
	4.50	35	5.0	5.3	75.0
	4.58	39	5.6	6.0	80.9
	4.67	36	5.1	5.5	86.4

	4.75	31	4.4	4.7	91.1
	4.83	27	3.8	4.1	95.3
	4.92	17	2.4	2.6	97.9
	5.00	14	2.0	2.1	100.0
	Total	655	93.3	100.0	
Missing	System	47	6.7		
Total		702	100.0		

Appendix F

Traditional Frequency Table

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.50	2	.3	.3	.3
	1.67	1	.1	.2	.5
	1.72	1	.1	.2	.6
	1.78	1	.1	.2	.8
	1.83	2	.3	.3	1.1
	1.89	1	.1	.2	1.2
	1.94	3	.4	.5	1.7
	2.06	4	.6	.6	2.3
	2.11	3	.4	.5	2.8
	2.17	3	.4	.5	3.3
	2.22	6	.9	.9	4.2
	2.28	3	.4	.5	4.6
	2.33	8	1.1	1.2	5.9
	2.39	8	1.1	1.2	7.1
	2.44	7	1.0	1.1	8.2
	2.50	9	1.3	1.4	9.6
	2.56	17	2.4	2.6	12.2
	2.61	12	1.7	1.9	14.1
	2.67	17	2.4	2.6	16.7
	2.72	21	3.0	3.3	20.0
	2.78	19	2.7	2.9	22.9
	2.83	24	3.4	3.7	26.6
	2.89	10	1.4	1.5	28.2
	2.94	19	2.7	2.9	31.1
	3.00	30	4.3	4.6	35.8

3.06	18	2.6	2.8	38.5
3.11	27	3.8	4.2	42.7
3.17	20	2.8	3.1	45.8
3.22	24	3.4	3.7	49.5
3.28	31	4.4	4.8	54.3
3.33	28	4.0	4.3	58.7
3.39	28	4.0	4.3	63.0
3.44	32	4.6	5.0	68.0
3.50	27	3.8	4.2	72.1
3.56	36	5.1	5.6	77.7
3.61	18	2.6	2.8	80.5
3.67	12	1.7	1.9	82.4
3.72	21	3.0	3.3	85.6
3.78	19	2.7	2.9	88.5
3.83	16	2.3	2.5	91.0
3.89	10	1.4	1.5	92.6
3.94	8	1.1	1.2	93.8
4.00	6	.9	.9	94.7
4.06	6	.9	.9	95.7
4.11	6	.9	.9	96.6
4.17	5	.7	.8	97.4
4.22	3	.4	.5	97.8
4.28	6	.9	.9	98.8
4.33	4	.6	.6	99.4
4.39	1	.1	.2	99.5
4.50	2	.3	.3	99.8
4.56	1	.1	.2	100.0
Total	646	92.0	100.0	
Missing	System	56	8.0	

| Total | 702 | 100.0 |