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Impact Of Ghanaian In-Service Teachers' Epistemological Beliefs On Their Instructional Practices

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Abstract: ***Epistemological belief systems continue to receive the attention of researchers from Western and Asian contexts. However, nations in Sub-Saharan Africa are yet to join this important discussion. The main purpose of this study was to investigate the epistemological beliefs and instructional practices of in-service teachers in Ghana and how these beliefs related to instructional practices. The results indicated that Ghanaian in-service teachers had somewhat novice epistemological beliefs. The researcher found significant differences among the four dimensions of epistemological beliefs. The results also indicated no correlational relationship between epistemological beliefs and instructional practices of in-service teachers in Ghana. However, there were significant correlational relationships between epistemological beliefs and instructional practices based on the years of teaching. The implications for practice are discussed.***

Keywords: Epistemological beliefs, instructional practices, in-service teachers, Ghana

I. INTRODUCTION

The concept of personal epistemology (the nature of knowledge and the process of knowing) has been researched for over four decades now, and is one of the areas that continues to attract the attention of researchers (Hofer & Pintrich, 1997; Hofer, 2004). An individual develops his or her personal epistemological beliefs that reflect his or her fundamental assumptions about the nature of knowledge and the process of knowing over the years from childhood to adulthood. Epistemological beliefs serve as an underlying foundation at a subconscious level for our actions at a conscious level in many aspects of our lives. Instructional practice is one of them. According to Hofer (2001), personal epistemology is closely associated with the reasons why teachers make certain instructional decisions in their classrooms. Confirming Hofer's assertion, Trigwell and Prosser (2004) observed that "there are systematic relations between the ways teachers' teach and the quality of their students' learning" (p. 421). Therefore, it may be logical to assume that teachers' epistemological beliefs could fundamentally influence students' learning outcomes mediated through their instructional practice. Hence, understanding of epistemological beliefs of teachers is important in ensuring students' success in the learning process (Hofer, 2001; Trigwell & Prosser, 2001; Braten & Stromso, 2006).

Within the epistemological beliefs field, much of the research has focused on college students' epistemological beliefs with other academic variables (e.g. Hofer, 2000; Perry, 1970). Researchers have explored college students' beliefs and theories about the nature of knowledge and the process of knowing (Hofer, 2001; 2004). Early research in epistemological beliefs focused on college students (e.g. Baxter-Magolda 1992; Perry, 1970; Schommer, 1990). In recent years, the research has extended to more diverse populations, including teachers (Olafson & Schraw, 2006). Nevertheless, the number of empirical studies that focuses on classroom teachers' epistemology is still limited (Chai, Khine, and Teo, 2006). Moreover, the existing research on personal epistemological beliefs was conducted in the context of western culture (Brew, 2001). There has not been much research on personal epistemology in non-western contexts, especially in Sub-Saharan Africa. We believe that it is important to add empirical evidence from an African context

to enrich our understanding about the effects of epistemological beliefs in educational settings. Therefore, in this study, we investigated in-service teachers in Ghana about their epistemological beliefs and how their belief systems shape their instructional practices. The results of this study will potentially present a case for the need for epistemological beliefs to be consciously embedded in teacher education programs in Ghana.

RESEARCH QUESTIONS

- ✓ What is the level of Ghanaian in-service teachers' epistemological beliefs systems?
- ✓ Is there a correlational relationship between epistemological beliefs and instructional practices of Ghanaian in-service teachers?

II. LITERATURE REVIEW

A. PERSONAL EPISTEMOLOGY

The concept of personal epistemology was first studied in the late 1960s (Perry, 1970). Perry (1970) used college students and found that college students possessed four main stages of beliefs: dualism, multiplism, relativism, and commitment. Dualism referred to the view of knowledge as either right or wrong and that it had to be transmitted by leaders or expert source. Multiplism, as the second stage, implied the mixture of personal views as well as absolute truth. At this stage, college students began to think that there were other ways or sources of knowing besides what had been obtained from authorities. During the relativist stage, students no longer believed in absolute truth and started to see knowledge as meaning making, which usually varied from one individual to another. At the last stage (commitment), college students relied solely on making sense of experiences and using evidence to support what they believed about a particular body of knowledge.

Based on Perry's pioneering work, a number of researchers have attempted to define the nature of epistemological beliefs, as well as its constructs. For example, Schommer (1990) defined personal epistemology "as a system of more or less independent beliefs, conceptualized as beliefs about the simplicity, certainty, and source of knowledge" (p. 540). Hofer (2002) stated that epistemology was "concerned with the origin, nature, limits, methods, and justification of human knowledge" (p. 4). White (2000) categorized epistemology into "…certainty of knowledge, simplicity of knowledge, source of knowledge and justification for knowing" (p, 279). The variations of these definitions may be due to, according to Brownlee et al. (2009), the set of variables that they have studied in this domain. Though these definitions vary, they also gave a broader perspective in terms of the constructs of epistemological beliefs. For this study, we chose Hofer and Pintrich's conceptual framework of epistemological beliefs as it encompasses more broadly the definitions discussed in the literature. In their comprehensive meta-analysis and review of the major studies on epistemological beliefs, Hofer and Pintrich (1997) suggested that the concept of personal epistemology be generally categorized into two main areas: nature of knowledge and process of knowing. This former area is further divided into the construct of certainty of knowledge and simplicity of knowledge, while the latter area is divided into the construct of source of knowledge and justification of knowledge.

Hofer and Pintrich (1997) explained that the nature of knowledge was concerned with how an individual perceived knowledge. They then further divided this aspect into certainty of knowledge and simplicity of knowledge. The second area as suggested by Hofer and Pintrich (1997) was the nature of knowing. This aspect referred to the process by which people received or acquired knowledge. Similar to the nature of knowledge, this aspect had two sub-components: source of knowledge and justification of knowledge. With a team of researchers, Hofer (2000) conducted a factor analysis study to examine the constructs of epistemological beliefs. They found evidence that the four thematic constructs, which were certainty of knowledge, simplicity of knowledge, source of knowledge, and the justification of knowing, seemed to be consistent with most of the research studies in personal epistemology (Hofer, 2000). However, she also observed from the factor analysis and concluded that certainty and simplicity of knowledge merged unto one construct (eight items) with source of knowledge (four items), justification for knowing (four items), and attainment of truth (two items) making the last of the dimensions. As a result, the four dimensions of epistemological beliefs overserved by Hofer (2000) were certainty/simplicity of knowledge, source of knowledge, justification for knowing, and attainability of truth, on which this study will be based.

Certainty/simplicity of knowledge. Certainty of knowledge refers to the extent to which an individual sees knowledge as stable or constantly undergoing changes. The simplicity of knowledge component concerned whether knowledge was a collection of unrelated facts or knowledge was integrated and closely interrelated. At the lower level, an individual sees knowledge as unchanging. The simplicity of knowledge, as hypothesized by Schommer (1990; 1994), can be explained as the view about knowledge as a collection of basic facts or the integration and interrelatedness of ideas. Since these two separate dimensions were loaded onto the same factor, this subscale will be explained as a continuum between viewing knowledge as absolute (unchanging) and unrelated to the perception of knowledge as tentative and interrelated.

Source of knowledge. This dimension identifies an individual's beliefs about how and where knowledge is formed. Source of knowledge distinguishes between knowledge as a transmission of information between giver and receiver and knowledge as an internal construction of ideas. In other words, this dimension deals with whether knowledge is external to the individual or resides within the individual (Perry, 1970). Most of the researchers in this field see source of knowledge as developmental in nature (Baxter-Magolda, 1992; King & Kitchener, 1994; Schommer, 1990).

Justification for knowing. The justification for knowing dimension refers to a continuum within which individuals judge the correctness and accuracy of knowledge (Hofer & Pintrich, 1997). This justification of knowledge component

dealt with knowledge as being able to evaluate the accuracy or correctness through evidential support. On the lower level of Hofer's discipline-focused epistemological scale, individuals discriminate between information based on observation. On the higher level of this scale, the individual uses a set of criteria to evaluate the correctness or accuracy of knowledge (Hofer, 2000).

Attainability of truth. This construct indicates a continuum as to whether experts or scholars will eventually get to the truth. With this, individuals at the higher level will always be seeking new knowledge beyond what is classified as the truth, whereas novices will accept any information as the truth without questioning (Hofer, 2000).

B. IN-SERVICE TEACHERS' EPISTEMOLOGICAL BELIEFS

Little research has been conducted on the epistemology of in-service teachers (Bruning, Schraw, & Norby, 2011; Elafson & Schraw, 2006). Investigating teachers' epistemological beliefs about teaching knowledge and from where that knowledge comes from, Buehl and Fives (2009), through open-ended responses, analyzed fifty-three preservice and fifty-seven in-service teachers in terms of the source and stability of knowledge. At the end of the study, they found that both preservice and in-service teachers possess a range of beliefs on teaching knowledge. From the responses given, both preservice and in-service teachers share common epistemological beliefs. However, these beliefs do not usually translate into their corresponding instructional practices.

Also, to gain a better perspective of the epistemological beliefs of in-service chemistry teachers at the high school level, Veal (2004), through a case study, followed two high school in-service chemistry teachers. Wanting to see the link between these in-service teachers' knowledge base and their beliefs about teaching, the researcher used the methods course, practicum experience and student teaching internships to evaluate these constructs. Pedagogical content, knowledge vignettes, micro-genetic models and other data sources were administered by the researcher to monitor the conceptual changes that took place among the participants overtime. The results of this study showed that the epistemological beliefs about the content knowledge did not change. However, their conceptions about teaching did change: one focusing on epistemic understanding and the other on subjective realization.

C. EPISTEMOLOGY AND RELATIONSHIP TO INSTRUCTIONAL PRACTICES

The concept of personal epistemology partially dictates the instructional practices as well as learning preferences of students. Brownlee (2003b) observed that epistemology serves as a "filtering role" as teachers with advanced epistemological beliefs create opportunity for students to construct meaning within the learning environment, whereas those with naïve epistemology see truth as "absolute and categorical," thereby transmitting knowledge to their students (p. 2). Tsai and Chung (2005) also noted that epistemological beliefs have influence on educators' learning approaches, mode of thinking, and acquisition of information. Their findings in the field support the assertion that constructivist-inclined students tend to use more cognitive resources to attain higher-order learning goals than those who possess simple epistemological beliefs.

Hermans et al. (2008) studied 525 elementary school teachers to understand the impact of teachers' epistemological beliefs as an antecedent to the use of computers for open-ended discussions. They found that teachers' beliefs were a stronger determinant in explaining why they used computers in their classrooms to improve the efficiency and depth of their learning. Teachers with sophisticated epistemological beliefs were more likely to use computers in their classrooms for higher-order teaching and learning activities whereas those with naïve epistemological beliefs were unlikely to use computers to help students learn. Furthermore, Zohar (2006) concluded that in order to provide adequate support for students' higher-order learning, teachers require advanced epistemological knowledge that serves as an underlying philosophical guidance for their teaching.

On the other hand, Jacobson et al. (2010) found that Singaporean teachers' epistemological beliefs about knowledge and knowing did not determine their pedagogical practices. They surveyed 1,882 teachers from 51 Singaporean schools about their beliefs on how knowledge and learning influence the uses of information and communication technology (ICT), pedagogical approaches, and types of assessments used in schools. What they realized was that certain teachers make instructional decisions not based on their epistemological beliefs about the nature of knowledge but specifically to prepare their students for standardized examinations. This result showed that teachers' instructional practices are not exclusively dictated by their epistemological beliefs. External factors such as meeting requirements of helping students pass standardized tests could also influence their instructional decisions.

III. METHODOLOGY

This study employed a quantitative research method to survey in-service teachers in Ghana about their epistemological beliefs and how these beliefs related to their instructional practices.

A. PARTICIPANTS

The participants comprised 111 in-service teachers from one of the district directorates of education in Ghana. The number of years in teaching and the level where participants taught were collected. The researcher used purposive sampling to invite the subjects to participate in the study. The in-service teachers were surveyed on their epistemological beliefs and instructional practices. The participation was anonymous so that the participating in-service teachers could be honest in their responses. Participation in this study was voluntary.

B. INSTRUMENT

Discipline-Focused Epistemological Beliefs Questionnaire. Hofer's disciplined-focused epistemological beliefs instrument (Hofer, 2000) was developed by a team of researchers who were familiar with the literature on personal epistemology. This instrument has been validated by a number of studies, for example, Qian and Alvermann (1995) and Cazan (2013). Cazan (2013) reported Cronbach Alpha for all four dimensions as certainty of knowledge (.75), source of knowledge (.67), simplicity of knowledge (.65), and justification for knowing (.55). Most of the items of the epistemological beliefs questionnaire were modified by inserting "*in the field of education*" to remind participants to approach each survey question with a teacher's mindset. The disciplined-focused epistemological beliefs questionnaire instrument had eighteen items based on the conclusion of the factor analysis by Hofer (2000).

Instructional Practice Questionnaire. The instructional practice questionnaire (Hung, 2014) comprised of eleven items on a Likert scale with four of the survey questions reversed (intru_2, instru_3, instru_5, and instru_7). The last three items qua_1, qua _2, and qua _3 on the instructional practice questionnaire were designed to gather additional qualitative information. Item qua_1 asked in-service teachers whether they will be able to practice what they believed to be best practice, whereas item qua_2 asked teachers to check whether they were constructivist or behaviorist. The last question (item qua_3) specifically required the participants to choose from six possible factors that could prevent them from practicing the educational philosophy to which they subscribed.

C. PROCEDURE

To respect the rights of the participants as human subjects, this research commenced after the researcher had satisfied all the ethical concerns of the education directorate in Ghana. The in-service teachers were contacted through their head teachers to officially inform them of the impending study as well as how their involvement as participants was needed. Specific dates for the survey administration were announced to teachers on two occasions, before the actual survey questions were administered. The researchers, in collaboration with the district directorate of education, sent paper-based copies of survey to in-service teachers in various schools to respond to the questions/items. Before the in-service teachers began responding to the survey, they were informed that their participation was totally voluntary and they had the right to opt out of the study at any point in time. The total data collection period lasted three weeks.

IV. RESULTS

A. IN-SERVICE TEACHERS' EPISTEMOLOGICAL BELIEFS

The mean score of Ghanaian in-service teachers' overall epistemological beliefs was 2.9 with a standard deviation of .51, which indicated a moderate level of sophistication in their belief systems. As for the individual dimensions of epistemological beliefs, the Ghanaian in-service teachers obtained a mean score of 2.3 (SD = .57) for certainty/simplicity of knowledge, 3.2 (SD = 1.4) for source of knowledge, 3.1 (SD = .60) for justification for knowing, and 4.1 (SD = 1.2) for attainability of truth, respectively.

Dimensions	In-service teachers Mean (*SD*)
Overall epistemology	2.9 (*.51*)
Certainty/Simplicity of knowledge.	2.3 (*.57*)
Source of knowledge	3.2 (*1.4*)
Justification for knowing	3.1 (*.60*)
Attainability of truth	4.1 (*1.2*)
Instructional Practice	2.0 *(.45)*
	(n) = 111

Note. Individual items were rated on Likert scale; high score indicates agreement with less sophistication. (*n* = 111).

Table 1: Descriptive Statistics on Epistemological Beliefs Dimensions & Instructional Practices

A series of paired-sampled t-tests were used to test the differences among the four dimensions of epistemology of the participants. It was found that there was a significant difference among all the four dimensions of epistemological beliefs of in-service teachers. There were significant differences between certainty/simplicity of knowledge and the other three dimensions with source: $t(110) = -6.343$, $p < .001$, justification: $t(110) = -11.938$, $p < .001$, and attainability of truth: $t(110) = -13.559$, $p < .001$. Also, a significant difference was found between justification of knowing and attainability of truth, $t(110) = -8.736$, $p < .001$. No significant difference was found between source of knowledge and justification of knowing: $t(110) = .955$, $p < .34$, or between source of knowledge and attainability of truth, $t(110) = -5.739$, $p < .70$. The results implied that in-service teachers did not have the same level of belief across the nature of knowledge and the process of knowing (See Table 2).

variables	Mean Diff. (*SD*)	(t)	Significance
Certainty/Source	-.90(*1.5*)	-6.343	.001**
Certainty/Justification	-.77 (*.68*)	-11.938	.001**
Certainty/Attainment	-1.8 (*1.4*)	-13.559	.001**
Source/Justification	-.13 (*1.4*)	.955	.34
Source/Attainment	-.86 (*1.6*)	-5.739	.70
Justification/Attainment	-.99 (*1.2*)	-8.736	.001**

*Note. Individual items were rated on Likert scale; high score indicates agreement with less sophistication. (n =111). *p < .05, **p < .01.*

Table 2: T Test for Differences among the four dimensions of in-service teachers' epistemological beliefs

In terms of educational philosophy, which was measured by item qua_2 *(I am more inclined to educational philosophy of... constructivism/behaviorism*), 39.6% (44 out of 111) of the participants identified themselves with the constructivist philosophical paradigm whereas 60.4% (67 out of 111) indicated being behaviorist. When asked whether they were practicing instructional methods based on their educational philosophy (*I feel that I am not practicing the educational philosophy to which I subscribe to*), Only few teachers (13 out of 111) felt they were not likely to organize their instructional

environment based on their educational philosophy. This implied that majority of in-service teachers had no difficulty practicing their philosophical beliefs in the classroom.

An independent sample t-test was performed to test whether there was a difference between the constructivist and behaviorist in-service teachers' instructional practices. A significant difference was found between the two groups' instructional practice scores (constructivist group, Mean = 2.2, SD = *.52*; behaviorist group, Mean = 1.9, SD =*.39*; $t(109) = 2.882$, p <. 01). This results indicated that constructivist in-service teachers were more likely than behaviorist in-service teachers to adopt traditional learning methods.

Also, the Pearson product-moment correlation coefficient was performed to test whether there was a correlational relationship between the in-service teachers' epistemological beliefs and their instructional practices. The overall epistemological beliefs of in-service teachers did not have a significant correlational relationship with their instructional practices (r = .04, p = .66). The result implied that the Ghanaian in-service teachers were not likely to teach based on their educational philosophy. However, when examining the relationships between the in-service teachers' instructional practices and their individual dimensions of epistemological beliefs, two significant correlational relationships were found. They were certainty/simplicity of knowledge (r = 0.24, p < 0.01) and attainability of truth (r = -0.38, p < 0.001). The more they believed knowledge is simple and certain or truth is not likely attainable, the more likely they subscribed to behaviorist instructional philosophy.

Variables	Correlation Coefficient (r)	p value
Overall epistemological beliefs	.04	.66
Certainty/simplicity of knowledge	.24*	.01
Source of knowledge: authority	.04	.70
Justification for knowing: personal	-.02	.84
Attainability of truth	-.38**	.001

*Note. Individual items were rated on Likert scale; high score indicates agreement with less sophistication. (n = 111). *p < .05, **p < .01.*

Table 3: Relationship between Epistemological Beliefs Dimensions and Instructional Practice

V. DISCUSSION

The overall epistemological beliefs score of 2.9 put the in-service teachers in Ghana in the middle point of the scale, which indicated a moderate level of sophistication in their epistemological beliefs systems. Also, a number of significant differences were found among different dimensions of the in-service teachers' epistemological beliefs systems. It is not surprising to find differences among different dimensions of the teachers' epistemological beliefs as a number of studies have reported similar results (e.g. Cheng, et al. 2009; Tanase and Wang, 2010; Yilmaz-Tuzun & Topcu, 2008). However, what do these differences mean in the context of Ghanaian teachers' preparation and instructional practices in their classrooms? Furthermore, we did not find a significant correlational relationship between the Ghanaian in-service teachers' overall epistemological beliefs and their instructional practices. In the following, we will analyze these main findings in more detail.

A. DIFFERENCES IN THE EPISTEMOLOGICAL BELIEFS DIMENSIONS

The paired-sampled t-test indicated five significant differences between the four epistemological beliefs dimensions of teachers in Ghana. However, there was no significant difference between justification for knowing with source of knowledge. As the results indicated, certainty/simplicity of knowledge (2.3) was the most sophisticated dimension of the Ghanaian teachers' epistemological beliefs systems and it differed significantly from all of the other three dimensions (3.2, 3.1, and 4.1 respectively). It was also the only dimension that was under midpoint on the scale. This discrepancy might have resulted from the nature and the chance for an individual to experience something that would lead him/her to make a leap from one stage to the next stage (or move toward the more sophisticated end) of his/her epistemological beliefs system. Realizing that knowledge is not simple or unchanged seems to be more likely to be encountered in an individual's everyday life than the other three dimensions. Thus, this moderately sophisticated score of certainty/simplicity of knowledge could have been a result of the teachers' life experiences. On the other hand, the development of the beliefs in source of knowledge, justification of knowing, and attainability of truth may require an individual to engage in a higher level of philosophical discussions about these issues, or to be explicitly guided to realize the deeper meaning of knowledge and the process of knowing.

Though the overall score of the Ghanaian in-service teachers' epistemological beliefs was at about midpoint on the scale, the profile of the four dimensions in fact revealed that their epistemological beliefs leaned toward the less sophisticated end. The dimension of attainability of truth was an especially clear indicator of these teachers' notion of knowledge (which was almost 1 point higher than certainty/simplicity of knowledge). When they believe an ultimate truth is attainable, then a logical association about knowledge is the absolute nature of knowledge, which indicates a less sophisticated level of epistemology. Furthermore, the teachers' beliefs in justification of knowing and source of knowledge also leaned toward the less sophisticated end.

The responsibility of teachers, unlike other professions, is to help students to learn so as to be able to solve personal and societal challenges in life. To do this, teachers need to possess a more sophisticated level of belief system than their students about knowledge in order to effectively tackle this challenge in the classroom. Yet, how would a teacher's epistemological beliefs system with various levels of sophistication affect how they guide their students in their learning in the classroom? Is it necessary that a teacher has to possess high sophistication in all four dimensions of knowledge in order to be effective in

teaching, or is one certain dimension more critical than the others in this regard? If so, which one? Also, is it possible that the importance of sophistication of the dimensions is subject specific or grade level specific? These are questions that may need further investigation.

B. RELATIONSHIP BETWEEN EPISTEMOLOGICAL BELIEFS AND INSTRUCTIONAL PRACTICE

As indicated in the previous section, there was no correlational relationship between overall epistemological beliefs and instructional practices of the in-service teachers. In other words, there was no indication that the teachers' epistemological beliefs (i.e. educational philosophy) decisively influenced their actual instructional practices. This finding disagreed with the researchers who asserted that teachers' epistemological beliefs could have effects on their instructional practices e.g. (Pajares, 1992). However, our findings should be taken with caution. One thing that needs to be taken into account is that the philosophy of constructivism is somewhat new in Ghanaian educational context. The actualization of a philosophy is a long and complex process. Transitioning from one set of instructional practices (behaviorism) to another (constructivism) may take even longer to fulfil. The result that 39.6% of the participants identified themselves with constructivism while 60.4% indicated being behaviorist reflects and indicates the occurrence of the transition. Thus, during the beginning period of embracing a new educational philosophy, it is very possible that the teachers were still trying to find their position in the two continuums of epistemological beliefs and instructional philosophy, as well as to reconcile them. The teachers' varying and somewhat polarizing scores in the four dimensions of their epistemological beliefs may also serve as support for this speculation.

However, what was interesting is the correlational relationships between individual dimensions of epistemological beliefs and the teachers' instructional practices. The more they believed knowledge was simple and certain, or truth is not likely attainable, the more likely they subscribed to behaviorist instructional philosophy. The former seems logical. However, the latter correlational relationship is quite puzzling. One explanation may be that though the teachers had been educated with constructivist educational philosophy, they still followed and taught the way that they had been taught. Therefore, regardless of what educational philosophy they subscribed, behaviorist instructional approaches were still the dominant methods used in the classrooms in Ghana. For an educational philosophy to be practiced in the classroom, the teachers have to go through the process of materializing the philosophy. Without explicit guidance or instruction, it may be difficult for the teachers to voluntarily do so. For teachers to practice the instructional methods under which they have been taught, that is a direct application. The difficulty level between these two situations is clear.

VI. CONCLUSION

In conclusion, this quantitative research sought to identify the relationship between epistemological beliefs and instructional practices of in-service teachers in Ghana. Previous literature indicated that the epistemological beliefs may have an influence on in-service teachers' decisions regarding their instructional practices. In this study, we investigated this relationship within an African context, specifically Ghana. The results showed that the Ghanaian in-service teachers held an overall moderate sophistication level of epistemological beliefs systems, while the individual dimensions of their beliefs varied significantly. We also found conflicting correlational relationships between the teachers' instructional practices and their individual dimensions of epistemological beliefs. Such inconsistency may not be easily explained with just the few possible factors that have been discussed in the earlier section. As the education system in the country has just begun to embrace contemporary educational philosophies, in addition to other social, cultural, and political factors that could very likely play a role in the results, more studies are warranted to tease out these complex relationships. This study provided a small window for education researchers to look into the development of in-service teachers' epistemological beliefs in Sub-Saharan Africa. Such data will potentially guide policy-makers, curriculum designers, teacher educators as well as in-service teachers in Ghana to strategically reform the educational system, as well as contribute to filling a piece of the puzzle in epistemological beliefs research.

REFERENCES

[1] Baxter-Magolda, M. B. (1992). Knowing and reasoning in college: Gender-related patterns in students' intellectual development. San Francisco: Jossey–Bass.
[2] Braten, I., & Stromso, J. I. (2005). The relationship between epistemological beliefs, implicit theories of intelligence, and self-regulated learning among Norwegian postsecondary students. British Journal of Educational Psychology, 75, 539–565.
[3] Brew, C. (2001). Women, mathematics and epistemology: an integrated framework. Int. Journal. Inclusive Education, 5(1), 15–32.
[4] Brownlee, J. (2003a). Paradigm shifts in pre-service teacher education students: Case studies of changes in epistemological beliefs. Australian Journal of Educational & Developmental Psychology, 3, 1-6.
[5] Brownlee, J. (2003b). Changes in primary school teachers' beliefs about knowing: A longitudinal study. Asia-Pacific Journal of Teacher Education, 31(1), 87-97.
[6] Brownlee, J., & Berthelsen, D. (2006). Personal epistemology and relational pedagogy in early childhood teacher education programs. Early Years 26(1), 17-29.
[7] Brownlee, J., Walker, S., Lennox, S., Exley, B., &Pearce, S. (2009). The first year university experience: using personal epistemology to understand effective learning and teaching in higher education. Higher Education, 58, 599–618.

[8] Bruning, R. H., Schraw, G. J., & Norby, M. M. (2011). Cognitive psychology and instruction. (5thed.). Boston, MA: Pearson Education, Inc.
[9] Buehl, M. M., & Fives, H. (2009).Exploring teachers' beliefs about teaching knowledge: Where does it come from? Does it change? The Journal of Experimental Education, 77(4), 367–407.
[10] Cady, J., Meier, S.L., & Lubinski, C.A. (2006). Developing mathematics teachers: The transition from preservice to experienced teacher. Journal of Educational Research, 99(5), 295-305.
[11] Cazan, A. (2013). Validity of the discipline focused epistemological beliefs questionnaire (DFEBQ) on a Romanian sample. Procedia-Social and Behavioral Sciences, 78, 713-717.
[12] Chai, C. S., Khine, M. S., & Teo, T. (2006). Epistemological beliefs on teaching and learning: A survey among preservice teachers in Singapore. Educational Media International, 43(4), 285-298.
[13] Cheng, M. M. H., Chan, K., Tang, S. Y. F., & Cheng, A. Y. N. (2009). Pre-service teacher education students' epistemological beliefs and their conceptions of teaching. Teaching and Teacher Education, 25, 319–327.
[14] Dick, W., Carey, L., & Carey, J. O. (2005). The systematic design of instruction. (7thed.). Upper Saddle River, NJ: Pearson Education, Inc.
[15] Hermans, R., Tondeur, J., Braak, J. V., & Valcke, M. (2008).The impact of primary school teachers' educational beliefs on the classroom use of computers. Computers & Education, 51, 1499–1509.
[16] Hofer, B.K. (2000). Dimensionality and disciplinary differences in personal epistemology. Contemporary Educational Psychology, 25, 378-405.
[17] Hofer, B. K. (2001). Personal epistemology research: implications for learning and teaching. Educational Psychology Review, 13(4), 353-383.
[18] Hofer, B. K. (2004). Introduction: Paradigmatic approaches to personal epistemology. Educational Psychologist, 39(1), 1-3.
[19] Hofer, B.K., and P.R. Pintrich (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. Review of Educational Research, 67(1), 88–140.
[20] Hung, W. (2014). In-service teachers' instructional practice questionnaire. Unpublished manuscript.
[21] King, P. M., & Kitchener, K. S. (1994). Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults. San Francisco, CA: Jossey–Bass.
[22] Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational Psychologist, 41(2), 75–86.
[23] Muis, K. (2004). Personal epistemology and mathematics: A critical review and synthesis of research. Review of Educational Research, 74(3), 317–378.
[24] Muis, K. (2008). Epistemic profiles and self-regulated learning: Examining relations in the context of mathematics problem solving. Contemporary Educational Psychology, 33, 177–208.
[25] Muis, K., Franco, G., & Gierus, B. (2011). Examining epistemic beliefs across conceptual and procedural knowledge in statistics. ZDM, 43(4), 507-519.
[26] Olafson, L. J., & Schraw, G. (2006). Teachers' beliefs and practices within and across domains. International Journal of Educational Research, 45, 71–84.
[27] Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. Review of Educational Research, 62, 307–332.
[28] Perry, W. G. (1970). Forms of Intellectual and Ethical Development in the College Years: A Scheme, Holt, Rinehart and Winston, New York.
[29] Qian, G., & Alvermann, D. (1995). Role of epistemological beliefs and learned helplessness in secondary school students' learning science concepts from text. Journal of Educational Psychology, 87(2), 282–292.
[30] Schommer, M. (1990). The effects of beliefs about the nature of knowledge on comprehension. Journal of Educational Psychology, 58, 498-504.
[31] Smith, P. L., & Ragan, T. J. (2005). Instructional design (3rd ed.). San Francisco: Jossey-Bass
[32] Tanase, M., & Wang, J. (2010). Initial epistemological beliefs transformation in one teacher education classroom: Case study of four preservice teachers. Teaching and Teacher Education, 26, 1238-1248.
[33] Trigwell, K., & Prosser, M. (2004). Development and use of the approaches to teaching inventory. Educational Psychology Review, 16(4), 409-424.
[34] Tsai, C.-C., & Chung, S.-C. (2005). The correlation between epistemological beliefs and preferences toward Internet-based learning environments. British Journal of Educational Technology, 36(1), 97-100.
[35] Veal, W. R. (2004). Beliefs and knowledge in chemistry teacher development. International Journal of Science Education, 26(3), 329–351.
[36] White, B. C. (2000). Pre-service teachers' epistemology viewed through perspectives on problematic classroom situations. Journal of Education for Teaching, 26, 279–305.
[37] Yilmaz-Tuzun, O., & Topcu, M. S. (2008). Relationships among preservice science teachers' Epistemological beliefs, epistemological world views, and self-efficacy beliefs. International Journal of Science Education, 30(1), 15, 65–85.
[38] Zohar, A. (2006). The nature and development of teachers' metastrategic knowledge in the context of teaching higher-order thinking. The Journal of Learning Sciences 15(3), 331-377.