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JUNIOR HIGH SCHOOL MATHEMATICS TEACHERS' BELIEFS AND THEIR INSTRUCTIONAL PRACTICES AND ITS EFFECTS ON STUDENTS' ACADEMIC PERFORMANCE

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ABSTRACT: *For over a decade now, students' performance in mathematics at the Junior High School leaves much to be desired. The trend in performance by students at the said level has made researchers ascertain the indicators and factors responsible for this low performance. As a matter of fact, a number of studies conducted have mentioned teachers' beliefs and their instructional practices as one of the major factors that determines students' performance in mathematics. This study, however, focused on finding out the effect of Junior High School teachers'beliefs and their instructional practices on the academic performance of students in mathematics. The study was conducted in the Cape Coast Metropolis in the Central Region of Ghana and utilized the descriptive survey design to explore the phenomenon in question. A sample of 31 teachers and 306 students were involved in the study. Analysis of results revealed that teachers who were involved in the study hold constructivist beliefs, however, there were discrepancies in the practices they enact in their classroom. Furthermore, there was no statistically significant effect of teachers' beliefs and instructional practices on students' performance. Implications for these findings to the teaching and learning of mathematics and teachers' professional development are discussed in the work.*

KEYWORDS: Academic Performance, Beliefs, Instructional Practices, Effects, National Minimum Standards, Content Standards

INTRODUCTION AND STATEMENT OF THE PROBLEM

Over the past few years, performance of students in mathematics has become something for mathematics educators, stakeholders and several researchers to think of what really could be the cause of this canker. An area of keen interest for educators in mathematics has been examining the inter-correlations that exist between teachers' beliefs, teaching practices and students' performance in the mathematics. Philipp (2007), refers to beliefs as "psychologically held understandings, premises, or propositions about the world that are thought to be true" p. 259. Several teachers embrace diverse beliefs about the nature of the subject they teach, the ways and practices employed in teaching and learning their various subjects, their ability to teach the subject to mention but a few (Cross, 2009). A study conducted by Lloyd (2003) posits that beliefs play a very vital role in that policy makers can implement reforms in the curriculum when they are able to alter the beliefs teachers hold about how students learn. This to a large extent presupposes that teachers' beliefs

influence the way they teach which also influence students learning and for that matter their performance. In like manner, Parajes (1992) underscored that the individual theories that teachers formulate with regard to the nature of mathematics as a subject and the teaching and learning of mathematics is of great importance in their choice of teaching practices and decision making which in turn reflects the teachers' belief. Beswick (2007) posits that the ability of teachers to create a meaningful and friendly classroom atmosphere and instructional activities can be outlined from what Evans (2003) indicate as the three dimensions of mathematics teachers' beliefs. These dimensions include: teachers' beliefs about the nature of mathematics, beliefs about learning mathematics and the last one is beliefs about teaching mathematics. The beliefs that teachers hold about a particular subject may be as a result of the experiences they have acquired, unchanged attitudes and their conceptions they have gathered with regards to a particular subject. There seems to be a general haste to cover topics without given pupils the opportunity to acquire deeper understanding and insights of the topics been taught (Anamuah-Mensah, Mereku & Ghartey-Ampiah, 2008). They therefore make use of approaches that seem to be quicker and easier in order to complete the syllabus.

A number of studies (For example, Pajares, 1992; Richardson, 2003; Negreiros,2017) have established that the teacher's beliefs about the nature of mathematics and their beliefs about teaching and learning of the subject is an essential factor that affects the efficiency of the teacher within the classroom, the decision that teacher make as well as the classroom practices they use. Similarly, Wilkins (2008) reiterated that in the quest of understanding instructional practices of teachers, comprehending their beliefs is a key step towards the realization of that goal. However, other studies have also specified that beliefs that teachers hold and their instructional practices do not always correlate because there are several other factors that may inspire a teacher's choice of instructional practice (Bolden & Newton, 2008). Even though most teachers have heard about the potential of the use of the constructivist instructional strategies to improve pupils' academic performance (Opoku-Asare, 2004; Kim, 2005), there is little research that has examined teachers' beliefs and instructional practices and the use of constructivist teaching and learning approach in Ghana.

It is worth noting that in Ghana, students' performance in mathematics as indicated in various reports from that of national large scale assessments such as the National Education Assessment (NEA), Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA), national examinations such as the Basic Education Certificate Examinations (BECE) and the West African Senior Secondary Certificate (WASSCE) as well as international large scale assessments such as TIMSS bring to the fore that performance of Ghanaian students in numeracy over the years leaves much to be desired (Mereku, 2012). Report by Anamuah-Mensah, Mereku and Asabere-Ameyaw (2004) revealed that generally Ghanaian students' performance on mathematics test in the TIMSS 2003 mathematics tests calls for concern. It was indicated that the mean scale scores obtained in mathematics was as low as 276, placing the nation last (that's 45th out of 46 participating countries). According to the TIMSS 2003 report, as cited in Anamuah-Mensah, Mereku and Asabere-Ameyaw (2004), the performance of

Ghanaian students was one of the lowest as compared to other African countries that took part in the examination.

However, the introduction of a new curriculum in Ghana in the year 2007 and further changes made in 2012 were all directed towards shifting mathematics instruction from a more teacher centred method to a more learner focused and hands-on method to address issues relating to performance. Some studies (Asiedu-Addo, 2004; Frempong & Ayia, 2007; Adetunde, 2007; Frempong, 2010) have been conducted in the country with regard to enhancing the mathematics instruction and also increasing performance of students in the subject. None of these studies have examined mathematics teachers' beliefs and practices and its effects on students' performance at the junior high school level. Majority of the studies on teachers' beliefs and instructional practices present in literature were conducted in advanced countries. After the introduction of the 2012 curriculum in Ghana, the only study conducted on teachers' beliefs and practices was conducted by Ampadu (2013). His study also failed to address the effects of mathematics teachers' beliefs and practices on performance of students in mathematics. Student centred methods of teaching also known as constructivism has been advocated through several studies as a key method of teaching mathematics that enhances students understanding.

The 2012 mathematics syllabus for JHSs in Ghana, stipulated that in order to achieve the general aims of the mathematics curriculum, mathematics instructors must provide the needed opportunities for students to realize the specific minimum objectives which are the National Minimum Standards (NMS). These content standards bring to the fore what every student in Ghana can and needs to learn in mathematics. It must be noted that these standards are hinged on the proposition that not all students are capable of learning rigorous mathematics and learning it well, and all are capable of learning far more than is currently expected. At this point one would be wondering what then is happening in our classrooms and what could be the role of the teacher in influencing students' academic performance.

Bimbola and Daniel (2010) indicated that there exists a great need to examine the teachers' beliefs and practices in developing nations which Ghana is no exception because most of these nations are embarking on reforms in education. They further added that these reforms have been inspired by some learning theories including constructivism. However, it is not clear whether junior high school mathematics teachers within the Cape Coast metropolis beliefs and instructional practices have any influence on students' academic performance and as to whether they have inclination towards the constructivist philosophy of teaching since it is enshrined in the mathematics curriculum and to a large extent would influence students' academic performance. It is in the light of these that this present study sought to investigate the effects of junior high school mathematics teachers' beliefs and their instructional practices on students' academic performance in mathematics.

THEORETICAL FRAMEWORK

It is an undisputable fact that beliefs held by most teachers and their instructional practices are backed by certain experiences and information they have had either in their education or as a result of what they are practicing on the field. Somehow, these information, education or experiences are backed by some learning theories in teaching. The theoretical framework backing this study include the constructivists theory of learning and the behaviourists learning theory. To a large extent, these learning theories are schools of philosophical thought which have affected educationists' view of teaching and learning. These theories present viewpoints, ideas and other propositions that one way or the other influence teachers' beliefs, their way of thought and practices in the classroom. The two key proponents of the behaviourism theory of learning, Skinner and Watson, studied how learning is influenced by environmental changes and tried to show that human behaviours can be predicted and regulated (Skinner, 1974). Behaviourists made the claim that "only observable, measurable, outward behaviour is worthy of scientific inquiry" (Bush, 2006, p. 14). They also proposed that knowledge exists independently and outside of individuals. Learners are thus considered as "*tabular rasa*" that is blank slate and must be fed with knowledge and experience. To the behaviourists, individuals possess no prior knowledge before entering the classroom, as a result, teachers must treat them as such and provide all the information that students would need to excel in class and in their lives (Scheurman, 1998). Also, the learning process subjectively depends on the noticeable changes in behaviour. Scheurman, (1998) indicated that from the viewpoint of the behaviourists, learning refers to the acquisition of a new behaviour or a change in behaviour. Teachers who make use of this learning theory are seen to make use of drill and practice, repetitive practice, giving of extrinsic motivation and the use of rules in teaching. This approach is mainly teacher centred rather than student centred. The major deficiency of this learning theory is that, learners are not trained for problem solving and innovative thinking. Furthermore, students do what they are instructed to do and are mostly prepared to remember simple facts, respond automatically or perform tasks. Some teachers make use of this learning theory approach in mathematics teaching and learning. In a nutshell, some mathematics teachers result to the viewpoints and practices proposed by the behaviourist learning theory in their classroom instruction. Mostly, the behaviourism theory is associated with the traditional teaching and learning models (Harasim, 2017).

Introducing a new curriculum in Ghana in 2007 and further changes made in 2012 were all directed towards shifting mathematics instruction from a teacher-centred approach to a more oriented and realistic approach for learners. This called for the introduction of constructivist learning approach to teaching and learning. This learning theory is based on the premise that, learners build or construct their individual knowledge through personal experiences and internal knowledge. Hence it contradicts the behaviourist theory which postulates that the individual is a *tabular rasa*. Constructivism is a theory whose roots originated from the ancient philosophies of Greece and theories published by Giambattista Vico in the 1700 on the construction of knowledge (Warrick, 2001). Several scholars such as Piaget and Vygotsky have made crucial contributions to the study of knowledge construction dating

back to the last one and half century. Warrick (2001) defined constructivism as "a philosophy on how knowledge is created or obtained" (p. 6). The fundamental beliefs that underpin the theory of constructivism is in two folds namely: students actively construct knowledge but not passive recipients from the environment; and students depend on their experiences of the world and make modifications in order to adapt to a new knowledge (Jaworski, 1993). It is important to note that constructivism is regarded and used as a philosophy of learning (Muijs & Reynolds, 2000). It can be inferred from this assertion that constructivism can be used by teachers to guide their teaching practices.

Richardson (2003) asserted that various authors compare constructivist teaching to traditional teaching models to indicate the differences that exist between these two teaching approaches. Four principles were suggested by Marlowe and Page (2005) to differentiate constructivist learning and traditional learning. These principles include: (1) Learning to the constructivist is characterized by students constructing their own knowledge and not receiving it. (2) To constructivists, learning is an active process but not a passive one. (3) Constructivist describe learning not as mere recall instead comprehension and application. (4) Constructivist learning is characterised by thinking and analysis but not accumulation and memorization of facts.

To the constructivists, learning is dependent on how a person interprets his or her experiences and gives them meaning. Knowledge therefore is built up by the learner, and just as everybody has different experiences and ideas, learning is unique and unalike for every person. In this scenario, the teacher serves as a facilitator to direct students in constructing their own knowledge. This theory focuses on creating interpersonal competencies for problem solving. Some of the teaching approaches in constructivism include case studies, research projects, brainstorming and collaborative learning. Ghana's curriculum encourages teachers to make use of this theory of learning but there could be a possibility where some teachers still possess beliefs of behaviourism and other teacher centred approaches to teaching.

A mathematics teacher may identify himself or herself with either of these theories with regards to their beliefs and practices. To identify the beliefs and practices that teachers are using in the mathematics classroom, a research study needs to be conducted in order to obtain an empirical proofs and evidence of which stakeholders can rely on to make improvement hence the need for this study.

Teachers beliefs in mathematics

Several research studies (e.g. Ernest, 1989; Handal, 2003, Beswick, 2012; Minarni, Nugraheni & Retnawati 2018) accentuate that teachers' beliefs in mathematics can be characterized by three key themes which includes: *beliefs about the nature of mathematics, beliefs about learning mathematics and beliefs about teaching mathematics*. Ernest (1989) indicated that beliefs about nature of mathematics are to a large extent characterised by teachers' views concerning mathematics as a subject of study. Teachers' beliefs about

teaching mathematics describes the views teachers hold about their roles inside the classroom including the classroom activities they undertake and the strategies they employ for classroom instruction. Beliefs about learning includes perceptions of the role of students in learning effectively (Thompson, 1992). The present study also sought to identify teachers' beliefs across these subscales that are aligned with the constructivism learning theory. For example, Beswick's (2005) belief survey questionnaire on teachers' beliefs in mathematics indicated that the constructs; "mathematics is a way of thinking", "mathematics involves problem solving, figuring out relationships and patterns", "mathematics is dynamic and expanding" are constructivists mathematical beliefs on the nature of mathematics.

Teachers' beliefs in teaching and learning mathematics

Assuah, Yakubu, Asiedu-Addo and Arthur (2016) performed a research on ideas, beliefs and practices of constructivist instructional strategies of primary school mathematics teachers. The study adopted the sequential exploratory design, using purposive sampling to select 252 mathematics teachers (126 lower primary teachers and 126 upper primary teachers) from schools in the Upper East region. Observations and interviews were used to gather qualitative data for the study. It was observed that, the teachers have a positive perception towards constructivist instructional strategies. Teachers also agreed that, constructivist approach improves pupils' academic performance and enables them develop positive attitude towards mathematics. Based on the findings, teachers were asked if they support the use of constructive learning approach to teaching and majority agreed that did support it. The controversy here is that, almost every teacher believes the constructive learning theory is most preferred and yields better student performance than other learning theories, but it could also be that they do not make use of it in teaching. The present study would thus investigate which learning theory teachers make use of in teaching.

A study by Golafshani (2013) examined how the instructional practices of four Grade 9 applied mathematics teachers related to their beliefs about the use of manipulatives in teaching mathematics, its influence on students' learning, and enabling and disabling factors. During the study views and opinions of teachers with regards to their beliefs and possible alterations in their beliefs about the usage of manipulatives after taking part in a training course were assembled using questionnaire and observation field notes. Data analysis revealed that, while the training program was progressing, the teachers were more desirous to employ the use manipulatives in their classroom instruction. It was also reported by the teachers that using manipulatives had some substantial impact on the students' learning, particularly, struggling students; yet, its major effect was on producing an environment that enabled students' learning through diverse methods of teaching.

Instructional practices of teachers in the mathematics classroom

Research conducted by Assuah et al. (2016) indicates that teachers often did not involve their pupils during assessment strategies which are constructive in nature. They proposed that the teachers' inability to frequently implement the constructivist instructional strategies

could be due to their inadequate pedagogical knowledge of constructivist instructional strategies. They also stated that it could also be due to the teachers' inability to have expert and experienced teachers who would expose them to constructivist instructional strategies. The study also revealed that, teachers never gave pupils appropriate feedback during assessment, because they did not explain to pupils why they selected some answer choices. This signifies that though teachers agree constructivist learning theory is effective in improving in teaching and learning, teachers do not make full use of it in teaching.

Al Said, Du, Alkhatib, Romanowski and Barham (2019) explored mathematics teachers' beliefs, practices and belief change in implementing problem-based learning (PBL) in Qatari primary governmental school. Data for the study was gathered through the use of multiple sources of qualitative data. These included metaphors, lesson plans and interviews with seventeen mathematics teachers. Findings showed that although teachers showed positive attitudes and were willing to use innovative teaching approaches, its implementation proves to be more problematic and time-consuming for them. Hence teachers do not practice problem-based learning in totality when giving lessons. They blame it on numerous challenges they encounter which includes; teachers' insecurity and inadequate confidence, inadequate support from school and students, strain in facilitating student partnership and extra workload.

Umugiraneza, Bansilal and North (2017) also explored teachers' practices in teaching mathematics and statistics in KwaZulu-Natal Schools. 75 mathematics teachers from the KwaZulu-Natal schools responded to a questionnaire made up of both close-ended and open-ended items for the study. The results from the analysed data showed that teachers were more likely to report different methods for teaching mathematics but a single method when teaching statistics. Generally, the teachers reported the use of a single method for assessment. Also, it was revealed that in most cases focus was on teacher-centred instructional strategies. Additionally, it was discovered that participants background characteristics such as age, gender, teaching experience, participation in professional development course and further studies correlated with their choice of different teaching and assessment methods.

Relationship between teachers' beliefs, their instructional practices and students' performance

Minarni, Retnawati and Nugraheni (2018) conducted a research on mathematics teachers' beliefs and its influence on teaching practice and student achievement. In the study, the method of narrative reviews was selected for the synthesis of finding. It was indicated that mathematics teachers' beliefs direct teacher to determine teaching practice considered correct, student centred learning approaches improves student achievement. Additionally, the findings disclosed that teachers' beliefs and teaching practices aligned with student centred learning can assist students to actively construct their mathematics knowledge and advance mathematics learning and achievement. Also, results indicated a significant association between teachers' practices and students' achievement.

Polly, McGee, Wang, Lambert, Pugalee and Johnson (2013) conducted a research study on the association that exist between teacher' beliefs, enacted practices, and student learning in mathematics. The study made use of data collected from 35 teachers and 494 elementary school students. Students achievement were ascertained by a curriculum-based tests. Significant coherence was identified between teacher beliefs and practices; however, no significant relationships were identified between teachers' beliefs or their instructional practices and student achievement in mathematics.

Kaymakamoglu (2018) conducted on a research study on teachers' beliefs, perceived practices and actual classroom practices in relation to teacher-centred (traditional) and learner-centred (constructivist) teaching. The study employed multiple methods (interviews, observations) to assemble in-depth data on teachers' beliefs, their perceived practices and the actual practices they enact during their classroom instructions. The findings from their study revealed that teachers showed some differences in their beliefs. The interview showed that teachers beliefs were aligned to constructivist beliefs. Nevertheless, further observations revealed that most of the teachers enacted more of traditional practices rather than the constructivist practices they perceived.

Muijs and Renynolds (2000) conducted a study on School Effectiveness and Teacher Effectiveness in Mathematics: Some Preliminary Findings from the Evaluation of the Mathematics Enhancement Programme (Primary). Data was assembled from a total of 78 teachers and 2,128 students. A classroom observation instrument developed for the study was used to measure teacher behaviours and a curriculum-based Numeracy test was used to test students' achievement. Results revealed that student achievement increases if the teachers involve students actively in the classroom by providing a summary and evaluation of the learning objectives, and inviting students to be actively involved in classroom discussions. It was concluded that teaching practices have a significant effect on students' achievement in mathematics.

Teachers' beliefs and practices related to mathematics instruction was researched on by Stipek, Givvin, Salmon and MacGyvers (2000). Beliefs and practices related to mathematics were assessed for 21 fourth-grade through sixth-grade teachers. Participants were from elementary schools throughout Los Angeles. The results from the study indicated a significant consistency among teachers' beliefs and consistent relationships between their beliefs and their practices. They concluded that, traditional beliefs were more associated with traditional practices.

Zakaria and Maat (2012) conducted a study to determine the mathematics secondary school teachers' beliefs and teaching practices. Questionnaire was administered to 51 teachers who were grouped according to their years of teaching experience. The dimensions of mathematics beliefs used for the study encompassed beliefs about the nature of mathematics, beliefs about teaching mathematics and beliefs about learning mathematics. The key findings of the study exposed a moderate significant correlation between teachers'

mathematical beliefs and their instructional practices. They thus concluded that the formation of good beliefs in mathematics would guide teachers to employ the use of constructive and efficient teaching practices. Similarly, Beswick et al. (2009) and Muir (2008) opined that the teaching practices enacted by teachers during their lessons are shaped by the diverse beliefs they have concerning the subject.

Conceptual framework

A number of research findings (Stipek, et al. 2000; Zakaria and Maat, 2012; Minarni, et al., 2018) have identified linkages between teachers' beliefs, their practices, and students' performance. From the foregoing review, the researchers developed the conceptual framework illustrated below to underpin the current study.

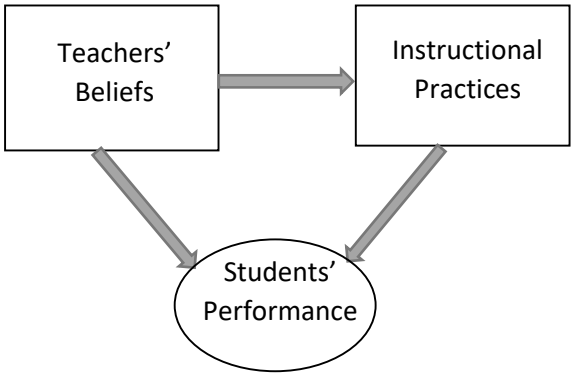

Figure 1: Conceptual framework

Figure 1 shows a linkage between teachers' beliefs and instructional practices. Wilkins (2008) stated that in the quest of understanding instructional practices of teachers, comprehending their beliefs is a key step towards the realization of that goal. According to Wilkins (2008), there exist some relationship between teachers' beliefs and practices. On the contrary, Bolden and Newton, (2008) held the view that teachers' beliefs and their instructional practices do not always correlate because several other factors may influence a teacher's choice of instructional practice.

The framework also shows a link between instructional practices and students' performance. The instructional practices in this view refers to the ways and methods that teachers employ in their classrooms to teach. It is undeniable that, the kind of instructional method employed by the teacher has some effect on how students understand concepts which in turn determines how students perform. On this ground, good instructional practices contribute to good performance while bad teaching methods also lead to poor performance.

Finally, the framework shows a connection between teachers' beliefs and students' performance. Nonetheless, numerous research studies have also reported that sometimes teachers' beliefs are not associated with their teaching practice (Mellado,1998; Simmons, Emory, Coker, Finnegan, & Crockett, 1999). This indicates that, there could be some beliefs

that the teacher possesses which are not practiced physically but somehow influence students' performance indirectly. The study would also focus on this aspect to discover if beliefs teachers hold in mathematics influence students' performance.

Purpose/Objectives of the study

With the present students of the 21st century, teaching of mathematics as a matter of fact through a traditional or conventional classroom setting breeds few, if not none, changes in the improvement of mathematics learning. As matter of fact, today's students who find themselves in a conventional or traditional classroom settings, do not have enough preparation before lesson begins, learn while the teacher is presenting and discussing the concepts and complete the day's work with a take home assignment that will be submitted before the next class. This way of teaching and learning, was and is still prevailing in most of our classrooms in Ghana which has led to quite a number of issues regarding the academic performance of our students at the junior high school level.

Given the crucial role that teachers play, however, the main purpose of this study was to examine teachers' beliefs and their practices and its effect on the academic performance of students in mathematics at the JHS level in the Cape Coast Metropolis in the Central Region of Ghana. Basically, the study sought to:

1. ascertain JHS mathematics teachers' beliefs about the nature of mathematics and the teaching and learning of mathematics.
2. determine the instructional practices enacted by JHS mathematics teachers.
3. explore the relationship between teachers' beliefs and their instructional practices.
4. identify the effects of JHS teachers' beliefs and their practices on students' performance in mathematics.

Research Questions

The following questions served as a guide for this study:

1. What beliefs do Junior High School mathematics teachers hold?
2. What instructional practices are enacted by Junior High School mathematics teachers during mathematics lessons?

Research Hypotheses

In order to comprehensively address the purpose of this study, the following research hypotheses were also formulated:

1. There is no statistically significant relationship between mathematics teachers' beliefs and their instructional practices.
2. Junior High School mathematics teachers' beliefs and their practices have no statistically significant effect on students' academic performance in mathematics.

Design and Instrumentation

The research design employed in this study was the descriptive survey design. This is because the study sought to find out Junior High School teachers' beliefs, their teaching practices and its effects on students' performance in mathematics. This design was necessary because according to Cresswell (2012) it is one design in which the investigator administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviours, or characteristics of the subjects involved. The survey conducted in this study used a standard set of questions to get a broad overview of the group's opinions, beliefs, self-reported behaviours, and demographic and background information (Onley & Barnes, 2008). Descriptive survey design enjoys the strength of explaining educational phenomena in terms of the conditions or relationships that exist, opinions that are held by students, teachers, parents and experts (Cresswell, 2012).

The data used for analysis was obtained through the use of a questionnaire and an achievement test. The questionnaire was used to illicit responses from junior high school teachers about their beliefs and practices in the teaching and learning of mathematics. The questionnaire was divided into three sections namely sections A, B and C. Section A covered the demographic details of respondents including age, sex, highest academic qualification and teaching experience. Section B followed with thirteen items on teachers' beliefs on the nature of mathematics, teachers' beliefs about teaching mathematics and teachers' beliefs about learning mathematics. Items on teachers' beliefs were adapted from Beswick (2005) and Perry et al.'s (1999) belief survey questionnaire about teachers' beliefs in mathematics. Respondents were required to indicate on a five-point Likert scale the extent to which they agreed or disagreed with the items on the said phenomenon. Section C on the other hand, comprise sixteen items on teachers' instructional practices which was adapted from Swan (2007) and Guffin (2008), which consisted of 25 items. Also, an achievement test comprising thirty items was used to measure the performance of the students in mathematics.

Selection of participants

The purpose of the study was to investigate junior high school teachers' beliefs, teaching practices and its effects on students' performance in mathematics. As a result, the study used in-service junior high school mathematics teachers and their students within the Cape Coast Metropolis in the Central Regions of Ghana. The study comprised 31 junior high school mathematics teachers and 306 JHS 3 students from intact classes of the selected teachers. The target population for the study was all JHS mathematics teachers and the JHS 3 students in the Cape Coast Metropolis. However, the accessible population was all JHS mathematics teachers and the JHS 3 students of the schools involved in the study. The study employed the multi-stage sampling techniques to obtain both the schools and the participants that took part in the study. The Purposive, Convenience and Simple random sampling techniques were used in selecting the schools and participants for the study. In all, 31 mathematics teachers and 306 students were selected from eleven junior high schools from the Cape Coast Metropolis for the study.

Validity of Instrument

The phenomenon of interests in this study was junior high school teachers' beliefs, their instructional practices and its effects on students' performance. The instruments administered composed of items measuring teachers' beliefs and instructional practices thus the instrument measured what it purports to measure. The face validity of the questionnaire was further determined by the researcher and other colleagues in the area of mathematics education integration after systematic review of the instruments.

Reliability

The reliability of the Likert scale questionnaire as well as the achievement test items were determined using the Cronbach's alpha. All items on both instruments were seen to be measuring phenomenon were found to be reasonably reliable as they all scored an alpha coefficient of above 0.6. The Cronbach's alpha estimated internal consistency reliability by determining how all items on the instruments related to all other items and to the entire instrument. The Cronbach's alpha for the items on teachers' beliefs was 0.77 and that of teachers' instructional practices was 0.78. The Cronbach's alpha co-efficient obtained for the two subscales indicate a strong reliability coefficient as emphasized by Jackson (2015) that Cronbach's alpha of 0.7 or more denotes strong reliability for the scale. Test items on the achievement test were adopted from the West African Examination Council's Basic Education Certificate Examination (BECE) past questions and that generated a Cronbach's alpha co-efficient of 0.92. Though test items meant to find out students' performance are standardized reliability of the test was still conducted.

Data Collection Procedure

The primary purpose of this research was to examine teachers' beliefs, instructional practices and its effect on students' performance in mathematics at the JHS level. To ensure confidentiality, names of teachers and students who participated in the study were not recorded on the instrument. An initial visit was paid to the schools as well as the in-service mathematics teachers and their students, which were finally involved in the research. During the visit, audience was sought from heads of the schools, teachers as well as students who were going to be involved in the study. At the meeting, the purpose of the study, its duration, and potential benefits were explained to the heads and teachers as well as all other participants for their consent to participate in the study and also allow the study to take place in their schools. Also, at these meetings, decisions about dates and times for the administration of the instrument were taken.

Altogether, administration of these instruments lasted for four weeks as minimum of two schools were covered in a day. In each school, the participating teachers were brought together in the staff common room after the close of classes so as not to disrupt normal class hours. Each session lasted for about two hours.

The instruments were administered to all the 31 in-service junior high school mathematics teachers in the selected schools as well as the 306 students. The administered instruments were supervised by the researcher. The completed instruments were then collected from the teachers as well as the students and analyzed based on the phenomenon.

DATA ANALYSIS AND DISCUSSION

As already explained, data for this study was obtained from teachers who teach mathematics and third year students at the junior high school level in the Cape Coast Metropolis using a five-point Likert scale questionnaire and achievement test. The responses to the five-point Likert scale questionnaire as well as the achievement test as provided by the respondents were first edited, coded and scored as required. Since data analysis is aimed at answering research questions that guided the particular study and testing the entire hypothesis made in the study, data analysis was done and organized according to the study's research questions and hypotheses.

Descriptive statistics such as mean and standard deviations were used in identifying the kind of beliefs and instructional practices junior high school mathematics teachers possess and enact respectively. Also, to determine if any relationship exist between teachers' beliefs and instructional practices, Pearson Product Moment Correlation was employed. Lastly, multiple regression analysis was conducted to determine the effect of teachers' beliefs and their instructional practices on students' performance.

Research Question One:
What beliefs do Junior High School mathematics teachers hold?

The first research question that guided this study was, "What beliefs do Junior High School mathematics teachers hold?" This research question basically sought to identify the beliefs held by junior high school mathematics teachers. In other to do a good job, the beliefs were grouped into three different categories; beliefs about the nature of mathematics, beliefs about teaching mathematics and beliefs about learning mathematics. The mean and standard deviation scores on these three categories of beliefs were conducted to better explain the kind of belief they hold. The criterion mean score for teachers' beliefs was 3.0. Consequently, any teacher belief construct with a mean score greater than 3.0 means teachers possess that kind of belief. On the other hand, a mean score lesser than 3.0 indicates that the teacher does not possess that kind of belief construct. Table 1 shows the mean and standard deviation scores on the beliefs of Junior High School mathematics teachers.

Table 1: Mean and Standard Deviation scores on the beliefs of Junior High School mathematics teachers

Statements	N	Mean	SD
1. Mathematics involves creativity and new ideas that can be tried independently	31	4.19	.909
2. Mathematical problems can be solved in many ways	31	4.61	.667
3. Students learn by actively constructing their knowledge	31	4.19	.980
4. Students learn actively through finding solutions independently of mathematical problems provided by teachers	31	4.06	.964
5. Students should be given the opportunity to think independently about mathematics problems before the teacher shows how to solve them	31	4.32	1.012
6. Every student can be successful at learning mathematics	31	4.29	.783
7. Learning is enhanced when students explain and demonstrate their solutions to others	31	4.39	.803
8. Teachers provide manipulative materials for students to explore mathematical ideas and concepts themselves	31	4.26	.631
9. Teachers provide students with problem solving situations to investigate in small groups	31	4.39	.615
10. Teachers' role is to guide students rather than telling students what they should do	31	4.48	.626
11. Mathematics is a way of thinking	31	4.48	.508
12. Mathematics is dynamic and expanding	31	4.23	.617
13. Mathematics involves problem solving, figuring out relationships, and patterns	31	4.42	.502
Mean of means		4.33	

Source: Field survey, 2020. "N" = Number of teachers "SD" = Standard deviation

A cursory look at Table 1 indicates that generally junior high school mathematics teachers possess high positive belief regarding mathematics. It can be inferred from Table 1 that, Junior High School teachers' responses to the items "every student can be successful at learning mathematics (M=4.29, SD =.783), mathematics involves problem solving, figuring out relationships, and patterns (M=4.42, SD=.502)" is an indication that teachers agree to

constructivist beliefs on the nature of mathematics. The results also show that responses to "mathematical problems can be solved in many ways (M=4.61, SD=.667), students learn by actively constructing their knowledge (M=4.19, SD=.980)" indicate that teachers are aligned to constructivist beliefs on the learning of mathematics. Further, teachers' responses on items such as "teachers provide students with problem solving situations to investigate in small groups (M=4.39, SD=.615), teachers' role is to guide students rather than telling students what they should do (M=4.48, SD=.626) suggest that teachers agree to constructivist beliefs about the teaching of mathematics. It can be said from the results that teachers involved in this associate themselves with the constructivist beliefs of the nature of mathematics, as well as the teaching and learning of mathematics. A critical analysis of interview data from the field indicates that 29 out of the 31 respondents asserted that they belief in student-centred approach of teaching. Some of the teachers interacted with had this to say:

Teacher I: "I always make sure that I give my students the chance to work on every tasks I give to them in class. This is because through that the students learn for themselves and knowledge acquired last longer"

Teacher II: "I have always preferred students doing hands-on activity than teaching them everything myself because through those activities they are able to learn a lot and it helps them retain knowledge acquired"

I can be deduced from the statements from these two teachers who were part of the 29 and are inclined to student-centred approach of teaching that they strongly belief in the constructivist philosophy of teaching. This finding confirms that of Beswick's (2005) whose belief survey questionnaire on teachers' beliefs in mathematics indicated that "mathematics is a way of thinking", "mathematics involves problem solving, figuring out relationships and patterns", "mathematics is dynamic and expanding" are constructivists mathematical beliefs on the nature of mathematics. This finding on teachers' beliefs is also in line with study of Assuah, Yakubu, Asiedu-Addo and Arthur (2016) who performed a research on primary school mathematics teachers' ideas, beliefs and practices of constructivist instructional strategies. They observed that, the teachers have a positive perception towards constructivist instructional strategies. Generally, the implication of this finding is that Junior High School mathematics teachers believe that every student in their mathematics classroom is capable of doing mathematics by him or herself. Also, one can conclude that mathematics as a subject is dynamic and for that matter learnt better if teachers employ creativity and allow students to it themselves in the course of teaching it.

Research question two: What instructional practices are enacted by junior high school mathematics teachers in their mathematics lessons?

This research question was answered using data collected from junior high school mathematics teachers from eleven schools in the municipality. Mean and standard deviation scores were used to describe the instructional practices of these mathematics teachers during

teaching and learning. Therefore, mean scores of any teacher instructional practice which is above 3.0 depicts that the teacher make use of such an approach to teaching and learning, and a mean score of below 3.0 indicates that they do not ascribe to the teaching and learning approach. Table 3 presents the results of instructional practices enacted by these teachers in their various classroom.

Table 2: Mean and Standard Deviation scores on instructional practices enacted by junior high school mathematics teachers in the classroom

Statements	N	Mean	SD
14. Students work on their own, consulting a neighbour from time to time.	31	2.65	1.082
15. Students choose which question to tackle in class.	31	3.10	1.106
16. Students compare different methods for doing mathematics	31	3.45	.994
17. I teach each topic from the beginning, assuming they don't have any knowledge on the topic	31	3.06	1.459
18. I draw links between topics and move back and forth between topics	31	3.65	1.199
19. I am surprise by the ideas that come up in a lesson	31	3.03	1.080
20. Students learn through discussing their ideas	31	4.00	.931
21. Students work collaboratively in pairs or small groups	31	3.42	1.119
22. Students invent their own methods	31	2.45	1.091
23. I teach each student differently according to individual needs	31	2.68	1.107
24. I encourage students to make and discuss mistakes	31	3.58	1.311
25. I skip between topics as the need arises	31	2.09	1.044
26. I connect mathematics topics to students' lives outside the classroom.	31	3.61	1.145
27. I use hands-on materials (e.g. Blocks, manipulatives etc) to teach mathematics	31	3.51	1.122
28. I use cooperative group in mathematics instruction	31	3.23	1.203
29. I encourage students to explain their thinking	31	3.94	.963
Mean of Means		3.05	

Source: Field survey (2020) N=Number of teachers, SD=Standard Deviation.

Table 2 indicates that out of the sixteen items that were used to ascertain these teachers' instructional practices, only five had mean scores above 3.0. Analysis of data revealed that these teachers had quite high mean scores on the following instructional practices "I allow students to compare different methods for doing mathematics" (M=3.45, SD= .995); "I draw links between topics and move back and forth between topics" (M=3.65, SD= 1.198); "Students learn through discussing their ideas" (M=4.00, SD= .931); "I encourage students to make and discuss mistakes" (M= 3.58, SD= 1.311); and finally "I encourage students to explain their thinking" (M=3.94, SD=.964).

Surprisingly, low mean scores were recorded on the following indicating there were inconsistencies in their practices; "Students work on their own", "Consulting a neighbour from time to time" (M=2.65, SD=1.082); "Students invent their own methods" (M=2.45, SD= 1.091); "I teach each student differently according to individual needs" (M=2.68, SD= 1.107); and "I skip between topics as the need arises" (M=2.10, SD=1.044).

The overall mean on these mathematics teachers' instructional practices (M=3.05) can be used to make an inference that the teachers involved in the study make use of constructivist teaching approaches in moderation. Hence teachers' practices are not fully aligned with constructivist teaching and learning approach but may be used in conjunction with behaviourist teaching and learning approaches which are quite in contradiction to the constructivist. This finding as matter of fact indicates that what teachers profess to do is different from what the actually do in practice. It also explains why these teachers are almost neutral or indecisive when it comes to the use of constructivist teaching and learning approaches.

The outcome of the study conducted by Umugiraneza, et al. (2017) posits that teachers make use of more than one method when teaching mathematics. They further mentioned that teachers allow students to compare different methods for doing mathematics in the classroom which conforms to the finding of this study. Also, the total responses on the instructional practices of teachers proved that they do not practice constructivist teaching and learning approaches in totality but incorporate some aspects of constructivism in teaching and learning. This is so much in line with Assuah et al (2016) whose findings revealed that teachers do not involve their pupils in assessment strategies which are constructive in nature.

The implication of this finding is that although the national curriculum has been reviewed to be in line with the constructivist teaching approach, Junior High School Mathematics teachers do not buy wholly into that teaching philosophy. Hence constructivist teaching and learning approach has not been fully integrated into the teaching and learning of mathematics at the said level. Another implication of this finding is that teachers who teach at the said level approaches which seem comfortable to them more often than the constructivist approach of teaching.

Hypothesis One: There exist no statistically significant relationship between mathematics teachers' beliefs and their instructional practices.

The first hypothesis was used to ascertain if a relationship existed between Junior High School teachers' beliefs and their instructional practices. Correlation was used to identify if a relationship existed between teachers' beliefs and practices. The results are shown in Table 3.

Table 3: Relationship between mathematics teachers' beliefs and their instructional practices.

Variables	N	Mean	SD	Pearson Correlation(r)	R	Sig.
Teachers' beliefs	31	56.32	5.069	.264	.07	.151
Instructional practices	31	51.45	8.729			

Source: Field survey, (2020) Significance level $p < 0.05$ R= coefficient of determination

A critical look at Table 3 shows that the Pearson Product Moment Correlation Coefficient ($r = .264$) suggests a weak positive correlation between Junior High School mathematics teachers' beliefs and their instructional practices. Cohen (1988) emphasizes that correlation coefficient between 0.10 and 0.29 is small hence weak. The coefficient of determination ($R = .07$) explains that only 7% variance is shared between the two variables. This means that Junior High School mathematics teachers' beliefs explain only 7 percent of the variance in responses in the items for their instructional practices. However, the relationship between Junior High School mathematics teachers' beliefs and their instructional practices was not statistically significant ($p = .151$). It can therefore be concluded that no statistically significant relationship exists between Junior High School mathematics teachers' beliefs and their instructional practices.

This means that, some of the instructional practices enacted by the mathematics teachers during their lessons do not align with their beliefs. For example, a teacher may agree to the belief that mathematical problems can be solved in many ways but in practice the teacher may use only one method in solving mathematical problems for students. This finding contradicts the findings of Zakaria and Maat (2012) and Stipek et al. (2000). Both studies revealed a moderate significant correlation between teachers' beliefs and instructional practices. These studies suggested that teachers' practices are mostly shaped by the diverse beliefs they have about the particular subject.

On the contrary, this study is in consonance with a prior research conducted by Assuah et al (2016). It was revealed from their study that teachers often did not involve their pupils during assessment strategies which are constructive in nature. They proposed that the

teachers' inability to frequently implement the constructivist instructional strategies could be due to their inadequate pedagogical knowledge of constructivist instructional strategies. Also, this finding is consistent with a current discovery made by Kaymakamoglu, (2018). The study revealed that teachers' beliefs were aligned to constructivist beliefs, nevertheless, further observations revealed that most of the teachers enacted more of traditional practices rather than the constructivist practices they perceived. The implication of this finding is that, although Junior High School mathematics teachers agree to the beliefs of the constructivist learning theory, they would hardly make full use of it in teaching their students.

Hypothesis two: Mathematics teachers' beliefs and their practices have no statistically significant effect on students' academic performance in mathematics.

The responses that were gathered from the subscales of the questionnaire were transformed into teachers' beliefs and instructional practices. These two variables together with students' scores in the achievement scores were used to conduct a multiple regression analysis to ascertain the effect of Junior High School teachers' beliefs and instructional practices on students' performance in mathematics. The scores (out of a total of 30 marks) of the students indicated low performance (M = 11.80, SD = 4.572). The teachers' beliefs and their instructional practices were used as the predictor variables while the scores of students (performance) was used as the dependent variable for the regression model. The results are illustrated in the Table 4.

Table 4: Model summary on Teachers' beliefs, teachers' practices and students' performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
	.166[a]	.027	-.042	4.66714	.027	.395	2	28	.677

a. Predictors: (Constant), Teachers' practices, Teachers' beliefs
b. Dependent Variable: Scores of all schools Significance level $p < 0.05$

Table 5: ANOVA table on teachers' beliefs, teachers' practices and students' performance

	Df	Sum of Squares	Mean Square	F	Sig.
Regression	2	17.210	8.605	.395	.677[b]
Residual	28	609.901	21.782		
Total	30	627.111			

a. Dependent Variable: Scores of all schools Significance level $p < 0.05$
b. Predictors: (Constant), Teachers' practices, Teachers' beliefs

Table 6: Estimated Coefficients on teachers' beliefs, teachers' practices and students' performance

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.560	9.859		.361	.721
Teachers' beliefs	.152	.174	.168	.871	.391
Teachers' practices	-.006	.101	-.011	-.058	.954

a. Dependent Variable: Scores of all schools Significance level $p < 0.05$

Tables 4, 5 and 6 represents the results from the multiple regression analysis conducted to determine the effect of Junior High School mathematics teachers' beliefs and their practices on students' performance in mathematics. Results from Table 6 showed that teachers' beliefs positively correlate with students' performance [t = .871, p = .391]. This illustrates that constructivist teachers' beliefs impacts students' performance. Also, teachers' beliefs controls 16.8 percent of students' performance [Beta = .168]. Also, the Table 8 shows that a negative correlation exists between teachers' practices and students' performance [t = -.058, p = .954]. It can be inferred from the coefficients of the regression model shown in Table 6 and 7 that there exists a regression model between the dependent variable (students' performance) and the predictor variables (teachers' beliefs and their instructional practices). Table 7 shows that the resulting model indicates that there was no significant effect of Junior High School mathematics teachers' beliefs and their instructional practices on students' performance (p = .677). Therefore, mathematics teachers' beliefs and their instructional practices have no statistically significant effect on students' academic performance in mathematics.

The prior finding presupposes Junior High School mathematics teachers' beliefs and practices have no significant effect on students' performance. This could be as a result of the discrepancies that has been revealed earlier in this study between the beliefs and practices of the students. Also, one could infer that the low performance of the students in mathematics is not as a result of their teachers' beliefs and practices alone but other factors could play a key role. Contrary to the current findings, Minarni et al. (2018) discovered from a narrative review on mathematics teachers' beliefs and its' contribution towards teaching practice and student achievement, that teachers' beliefs guide teachers to determine teaching practices, and student-centred learning improves student achievement or performance.

The findings corroborate the discoveries that were made by Polly et al. (2013). They emphasized that no significant relationships were identified between teachers' beliefs or their instructional practices and student achievement in mathematics. It has been emphasized throughout literature and previous studies that constructivists practices have a positive impact on students' performance in mathematics, hence this finding has the

implication of training mathematics teachers to practice fully in the classroom the constructivist beliefs they profess.

Implications of the research findings for teaching, learning and policy implementation
The first implication of this study based on the findings of the first research question is the fact that since teachers involved in this study have positive belief regarding mathematics teaching and learning and as well believe in the constructivist philosophy, it is most likely that shaping their belief system through workshops and short courses would go a long way to positively impact the way teaching of the subject mathematics is done in the classroom. Also, with their (teachers) association with the constructivist inclination, institutions that matter could provide the needed environment and resources that in a way would help properly implement such beliefs to make mathematics more student oriented.

Another implication of the research finding is that, the fact that teachers profess something does not necessarily mean that's what they would necessarily practice in their classrooms. It also means that the someone knows something doesn't necessarily mean that's what the person would do in reality.

The finding that teachers' beliefs were aligned to constructivist beliefs but enacted more of traditional practices rather than the constructivist practices implies that teachers most often than not would be using more of transmission approach in teaching mathematics which to a large extent would impede proper assimilation of mathematical concepts by students. It also implies that it would be quite difficult for these teachers to learn how to provoke and then use their students' already existing ideas as a basis for facilitating their construction of new, more reasoned, more accurate or well-organized understanding in the field of mathematics. In addition, teachers involved in this study may not necessarily understand the standpoint of the constructivist philosophy of teaching. Also, it implies that learning would be done in a stereotype manner since teachers themselves believe in the traditional or conventional way of teaching.

In addition, the finding that mathematics teachers' beliefs and their instructional practices have no statistically significant effect on students' academic performance in mathematics implies that there are other factors that influence students' academic performance in mathematics apart from the usual teachers' beliefs. This in a way presupposes that as researchers in mathematics education, we must be concerned about the classroom dynamics and other classroom external factors that influence students' academic performance at the junior high school level.

CONCLUSIONS AND RECOMMENDATIONS

Analyses of data from this study led to a number of conclusions. First, it is clear that junior high school mathematics teachers who were involved in this study generally possess high positive belief regarding mathematics. It can be said from the results that teachers involved in this study associate themselves with the constructivist beliefs of the nature of

mathematics, as well as the teaching and learning of mathematics. This means that the teaching of mathematics as a subject is dynamic and for that matter learnt better if teachers employ creativity and allow students to do it themselves in the classroom. It is, however, suggested that the study be conducted on a large scale to ascertain the beliefs teachers hold at the level conducted and possibly extend it to other levels of the educational ladder.

Another conclusion that can be drawn is the fact that teachers who were involved in this study profess one thing and do otherwise. This means that mathematics teachers may claim to believe in something but in reality doing a different thing altogether. As a result, it is suggested that a study be conducted to find out what mathematics teachers profess to do and their actual practice.

Also, the study revealed that teachers' beliefs were aligned to constructivist beliefs, nevertheless, further observations revealed that most of the teachers enacted more of traditional practices rather than the constructivist practices they perceived. This presupposes that although Junior High School mathematics teachers agree to the beliefs of the constructivist learning theory, they would hardly make full use of it in teaching their students. It is then suggested that a research is conducted to find out their philosophical inclination and how it influences their teaching. In that research effort should be made to find out their understanding of the philosophical inclination they hold.

It must be emphasised that mathematics teachers' beliefs and their instructional practices have no statistically significant effect on students' academic performance in mathematics. This shows that there are other factors that plays a key role in influencing students' academic performance other than teachers beliefs and instructional practices. In that regard, it is recommended a study be conducted to look at what other factors influence junior high school students' academic performance.

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