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Editorial Comment

The Journal of Educational Development and Practice (JED-P) is a journal of the Institute of Education, University of Cape Coast, Ghana. The journal focuses on contemporary issues in educational development in Ghana and other countries, particularly, in the context of developing countries. It also seeks to stimulate extensive dialogue and discussion on educational policy and practice. In view of this, articles that feature on the following issues are welcome: (a) Review of curriculum practice, (b) Evaluation of educational policies and practices, (c) Evaluation of various educational programmes such as interventions by Non-Governmental Organizations and governmental agencies and (d) Studies examining alternative models of educational delivery.

The journal carries original empirical and theoretical studies and targets local and international audience. Important criteria in the selection of articles for publication are: quality of presentation, conviction in argument, clarity in presentations and educational significance. It is published once a year in **December**. However, articles are received throughout the year. This fifth edition has articles of significance.

Christine Adu-Yeboah examines teacher trainees' knowledge, understanding and practice of early grade reading instruction in selected colleges of education in Ghana. She reports on the knowledge trainees exhibited about early grade reading instruction and observes that majority of the trainees demonstrated over-emphasis on procedural knowledge and how to get the sequence right even when the approach did not yield results, without reflection and adaptation. The trainees also seemed to underestimate the difficulties of teaching early grade reading. The study concludes that the process of learning to teach may play a role in knowledge acquisition and/or gaps and recommends that urgent attention be given to addressing these through the pre-service programme. It also recommends that trainees' and teachers' ability to reflect, critically engage with and analyse methods and procedures should be developed using examples of real contexts.

Douglas D. Agyei and Isaac Benning presented a case study of pre-service mathematics teachers from the University of Cape Coast, Ghana. The teachers had enrolled on an instructional technology mathematics course to develop competencies in teaching mathematics using the GeoGebra software which was being introduced to them for the first time. The study showed that introducing the open source mathematics software in the course helped the prospective mathematics teachers to develop their attitude towards the use of technology. The study also showed that the teachers' pedagogical skills, mathematics content knowledge levels, and technological skills improved.

The authors recommend that for pre-service mathematics teachers to gain full competency in using technology in mathematics teaching, technology integration courses should feature prominently in mathematics education programmes. Again, they recommend that for successful implementations of such interventions, adaptation of technology which is readily available with the potential of supporting students' higher-order thinking in mathematics should be key.

Salome Amissah-Essel and Michael Agyei investigate teacher motivation factors and assess job satisfaction among graduate teachers in the Cape Coast Municipality of Ghana. The study reports of significant levels of job satisfaction and un-motivation among graduate teachers and concludes that even though graduate teachers were somewhat satisfied with their jobs, they were unmotivated, such that not even the introduction of the Single Spine Pay Policy was motivating enough. The study recommends the need for employers and policy makers to pay particular attention to the high-order needs proposed by Maslow (1970) and Herzberg et al. (1959) for job satisfaction and motivation.

Jonathan A. Fletcher, Mark Mishiwo & Bliss Cornelis Sedega explore junior high school teachers' use of Pedagogical Content Knowledge (PCK) in teaching and learning Mathematics in the Akatsi District of Ghana. The study reports on the grand mean scores of teachers' identification of students' misconception, giving appropriate reasons for students' misconception and asking specific questions to diagnose students' misconception. The study concludes that majority of the teachers can identify the students' misconceptions but cannot articulate the reasons for those misconceptions clearly. Also, teachers cannot ask specific questions to diagnose students' misconceptions. The authors recommend that teacher training institutions and teacher education programmes integrate pedagogical content knowledge as well as teachers' knowledge of students' thinking processes into the curriculum to equip teachers with skills that would enable them to analyse students' thinking processes.

Mumuni Thompson & Eric Bayi Kandema Boro examine the affordances of the cognitive constructivist theory of learning and the sociocultural theory of learning in terms of teaching, learning and assessment practices in early childhood classrooms. This is done in view of the concern about how young people learn, an issue which has agitated the minds of theorists and researchers for a very long time. They argue that early childhood educators are becoming increasingly aware of the impact of the cognitive constructivists theory of learning and the sociocultural theory of learning on

teacher practices in kindergarten classrooms. They therefore draw educational practitioners' attention to the contrarieties and connections which are inherent in both theories to make them more efficient.

Adebomi Oyewumi draws a link between disability, poverty and the Millennium Development Goals. She reports that although there is a world-wide trend towards the inclusion of individuals with disabilities into the society, some unpleasant attitudes of the society as well as unfavourable international and national policies have systematically secluded the disabled from having equal access to education, employment opportunities, health facilities and recreational activities. The situation, she argues, predisposes and subjects persons with disabilities to abject poverty while they become a burden to their immediate family members and society. She recommends strategies that can help to meet the economic needs of persons with disabilities.

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TEACHER TRAINEES' KNOWLEDGE, UNDERSTANDING AND PRACTICE OF EARLY GRADE READING INSTRUCTION IN SELECTED GHANAIAN COLLEGES

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Abstract
This study employs the mixed method approach to examine selected teacher trainees' knowledge, understanding and practice of early grade reading. The purpose was to investigate the different kinds of knowledge that the trainees had about reading instruction, their understandings of why that knowledge is important to reading instruction and how they applied these to construct classroom practice during teaching practice. Trainees on teaching practice in 24 purposively sampled basic schools attached to four Colleges of Education (COEs) provided data for the study. Questionnaires were administered to 156 trainees, after which lesson observations and forensic interviews were conducted with 36 of them. The study found that the trainees demonstrated some knowledge about early grade reading and how it should be taught. Although there were a few positive variances in their practices, majority of them demonstrated over-emphasis on procedural knowledge and how to get the sequence right even when the approach did not yield results, without reflection and adaptation. The trainees also seemed to underestimate the difficulties of teaching early grade reading. It is recommended that urgent attention be given to addressing these identified issues through the pre-service programme, while developing trainees' and teachers' ability to reflect and critically engage and analyse methods and procedures in the light of examples of real contexts.
Key words: teacher trainees, knowledge, understanding, practice, early grade reading

Introduction

The goal of Education for All and the Millennium Development Goal (2) make it mandatory for every nation or state to ensure that by 2015, children everywhere will be able to complete a full course of primary schooling. This has impelled many countries in Sub-Sahara Africa to confront their historically low rates of enrolment. Consequently, there have been remarkable improvements in primary school enrolments.

In Ghana, primary school enrolment has increased remarkably (GSS, 2005). This has been achieved through instituted policies and strategies such as fee-free education, the capitation grant, free uniforms and exercise books in some cases and school feeding programme. However, it has become increasingly clear that it is not enough to simply make physical access to basic education available. If Education for All is to have positive social and economic consequences, then the education system must ensure that children are equipped with the basic minimum competences of literacy that will enable them to benefit from and contribute to their society's future.

Unfortunately, studies show that many children in school are not learning very much especially in language and mathematics (UNESCO, 2008), and this is particularly so in Sub-Sahara Africa. The first years of children's schooling are known to be especially important, as their early experiences with learning shape their attitudes and commitment to education and determine their educational future. Unless they make sufficient progress at this stage they are liable either to cease coming to school entirely, relapsing into illiteracy, or to become the 'silently excluded' who are not able to access the increasingly demanding work of the later grades (Liddell & Rae, 2001; Lewin, 2009). This is particularly true in reading which underpins understanding across the school curriculum. Children who achieve early success in reading are more likely to stay in school realizing immediate rates of return, while those who do not grasp the skills and point of reading are in danger of early drop out and a relapse into illiteracy (Chabbott, 2006).

Research shows that there is a relationship between quality of teaching and that of learning, and that, weaknesses in teachers' pedagogical content knowledge (PCK) and classroom practice hamper effective student learning and achievement (Pontefract & Hardman, 2005). Teacher education has been identified as both part of the problem and the solution to this situation. In the Ghanaian context, there appears to be more attention given to addressing the problem of teacher demand to meet the increasing pupil enrolment than on monitoring what actually goes on during the preparation of teachers. There also seems to be little connection between what goes on during initial teacher preparation and in schools, and how one should inform the practice of the other.

To fill the gap in knowledge about how the initial preparation of teachers impacts on their practice in the first three grades of primary school, the Teacher Preparation in Africa project (TPA), funded by the William and Flora Hewlett Foundation was set up through studies in six African countries: Ghana, Kenya, Mali, Senegal, Tanzania and Uganda. This paper reports on

part of the research that was carried out in Ghana. It addresses the following questions:

1. What do teacher trainees know and understand about early grade reading instruction?
2. How do they teach early grade reading during teaching practice?
3. How does their practice relate to what has been taught and learnt in their training?
4. What are the gaps in their knowledge and practice?

With these questions as a guide, the paper examines and describes the knowledge, understanding and practice of the trainees. It uses these as a pointer to the relationship between initial teacher preparation and pupils' attainment in reading. The findings are used to suggest feasible ways in which teacher preparation in Ghana might be improved.

The paper begins with the conceptual framework. The context follows, then the research design and methodology are described after which the results are discussed with conclusions drawn and recommendations made.

The Framework

The study was framed on the concept of competence as it relates to knowledge and understanding of the subject matter to be taught and its practice. Practice is seen to be central to good teaching. The framework is based on the understanding that good practice is a complex process which requires a great deal of different knowledge other than un-reflected application of techniques. This is derived from Shulman's (1987) conception that while content knowledge is important, teaching also requires pedagogic knowledge which concerns how to engage with learners and how to manage a classroom.

However, according to Shulman (1987), in order for these two kinds of knowledge to guide actual practice, a third category is crucial, namely pedagogical content knowledge, which is, knowing how to represent and formulate the subject matter, in order to make it comprehensible to students. This provided the basis for the study, and the purpose which was to (a) investigate the different kinds of knowledge that the trainees had about reading instruction, (b) their understandings of why that knowledge is important to reading instruction and (c) how they applied these to construct classroom practice. In this regard, the literature on what constitutes beginning reading and how to represent and formulate them to beginners was examined and used to guide the investigation.

The Nature of Reading

Reading has been defined to include the expression of several behaviours such as reading real words in isolation or in context, reading pseudo words that can be pronounced but have no meaning, reading text aloud or silently, and demonstrating comprehension of text that is read silently or orally (National Institute of Child Health & Human Development (NICHHD, 2000). Reading is done with the aim of generating meaning from a text. To achieve this, readers have to decode graphemes (lines and shapes which represent spoken sounds) into words, sentences and then continuous text and attach meaning to them. It is only when the reader achieves this aim that the cognitive work involved in the decoding exercise becomes worthwhile (Meek, 1994; Ehri, 2002).

The US-focused National Reading Panel lists five key reading skills that can enable children to read: (1) phonological awareness (discriminating different spoken sounds in words); (2) phonics (sound to letter relationship); (3) fluency (ability to read orally aloud or silently with speed, accuracy, and proper expression and contributing to comprehension); (4) Vocabulary (acquiring sight vocabulary, inferring new words) and (5) Comprehension (meaning-making) (NICHHD, 2000). While decoding is learnt first, these five reading elements are coordinated simultaneously, working together in a causal relationship or 'bootstrapping'. In this sense, the growth of one area supports the others (Stanovich, 1986). Therefore, the beginning reader must be exposed to each of these elements.

Phonological awareness, the first item in the list involves the introduction of phonics instruction, which stresses the acquisition of letter-sound correspondences and their use in reading and spelling. Phonics instruction aims at helping beginning readers to understand how letters are linked to sounds (phonemes) to form letter-sound correspondences and spelling patterns, and to help them learn how to apply this knowledge in their reading (Trudell & Schroeder, 2007). Phonological awareness is developed in a print-rich environment, and also through oral proficiency. This then leads to letter/sound identification and a build-up to syllables and words/vocabulary – or vice versa.

The ability to read fluently and pronounce and infer new vocabulary in reading is as important as the ability to make sense of text (Trudell & Schroeder, 2007). Text comprehension is the ability to interact cognitively with continuous text, a sentence or a short story to draw out meaning and create mental models of the text. It is believed that to achieve this, one requires a sight vocabulary of 95 percent of the words on the page, fluency in reading

aloud or silently and knowledge of syntax learnt from the grammar of the spoken language (Ehri, 2002; Malatesha, 2005). Cain (2010) describes the process as text integration, local and global coherence; comprehension monitoring; and knowledge of text structure, which being essential, can be taught to very young children through oral storytelling and picture books as well as continuous text.

Text comprehension is also believed to be enhanced when readers are made to actively relate the ideas represented in print to their own knowledge and experiences, and construct mental representations in memory (NICHHD, 2000). This is expected to be done through explicit instruction in the application of seven comprehension strategies, which have been shown to be highly effective (Centre for Education, 2010), namely: (1) summarising what is read (2) generating questions from the text (3) using diagrams, maps or pictures to understand the text (4) predicting what will happen (5) clarifying what has happened (6) drawing inferences and (7) self-regulating or monitoring. Research suggests that the use of a multiple strategies provides the best instruction (NICHHD, 2000; Centre for Education, 2010).

What Teachers need to know to Teach Reading

To help children to demonstrate reading ability, research recommends that teachers should have a firm grasp of the content presented in text, and more importantly, have substantial knowledge of and use different strategies to make children read (NICHHD, 2000). It is also recommended that teachers must know which of those strategies are most effective for different children. In addition, they should have theoretical knowledge of reading development, how to create and manage a print and language rich classroom, understand the different cultural contexts in which languages are used and to diagnose the proficiencies of learners (Commeyras & Inyega, 2005; Moats, 2009).

What this means is that, the acquisition of subject matter and pedagogical content knowledge must be key components of any reading teacher preparation programme (Risko et al., 2008). All of this demands a substantial knowledge base for beginner teachers of reading, and this is not easily acquired theoretically or practically. Learning to teach as with learning to talk and to read is situated learning. Therefore, training needs to be grounded in classroom practice.

The Context

In Ghana, basic school teachers (from kindergarten to junior high school) are trained mainly in a three-year post-secondary diploma-awarding Colleges of Education (CoEs), and some in two teacher training universities. All the colleges run residential programmes in which trainees spend the first two years in college to study subject matter and methodology courses, and are attached to schools to have a year-long teaching practice. Some CoEs are mandated to train generalist teachers whilst others run specialist programmes in Mathematics/Science, Technical Skills, Early Childhood Education and French. At the time of the study, there were 46 CoEs: 38 publicly-funded with at least one located in each administrative/educational region of the country and eight privately-run. Seven of the 38 public CoEs train female teachers only, one is an all-male technical-oriented college, and the remaining 30 are co-educational.

Research Methodology

A survey design with the mixed method approach was used, involving questionnaires, observation of lessons of teacher trainees and forensic interviews. This was done for the purpose of collecting broad-based data to address the main issues to be investigated in the study, for triangulation and for obtaining a deeper understanding of how trainees developed their knowledge and understanding of teaching early grade reading. Trainees undergoing one-year practicum after their two years of residential course work in college were recruited for the study.

A multi-stage sampling method was used to select the participants. Firstly, the cluster sampling approach was used to zone the 38 public colleges into three: the northern, middle and southern zones. For reasons of proximity and convenience, the middle and southern zones were selected at the first stage of the sampling process. Secondly, each zone was categorized according to two levels of settlement status (urban and rural) to select a college in each status. Rural colleges are those located in villages or small towns where: (a) the dominant occupation is small-scale farming or fishing, (b) there are few white-collar jobs or none at all, (c) there is poor road network, (d) there is lack of social amenities and (e) there are no vibrant commercial activities. On the other hand, urban colleges are those in big towns and cities with a higher level of social development than the smaller towns and villages.

On this basis, four colleges were sampled from the middle and southern zones, with one rural and one urban college from each zone. Also, sampling was done as far as possible to include colleges with both generalist and specialist programmes in each zone.

The school data was collected from three levels of settlement status, namely rural, peri-urban and urban. Peri-urban areas are rural-urban transition zones where rural and urban uses of land mix. Two basic schools each in rural, urban and peri-urban areas totalling 24. These were purposively sampled from the four sampled colleges' districts, where the trainees were undertaking teaching practice. All teacher trainees (totalling 156) who had taught reading in any of the lower primary classes (primary 1-3) before were selected to respond to questionnaires. Of that number, 36 were sampled randomly for lesson observation and forensic interviews.

Instruments

The quantitative data was obtained from a questionnaire developed from one that had been used successfully with teacher-trainees in an earlier study (Akyeampong, 2003). It demanded relatively closed responses as well as straightforward questions. It also included a series of scenarios that are likely to be encountered in teaching in early grades. Respondents were required to select responses to the scenarios which describe the most appropriate approach to teaching a particular concept or skill in reading. These responses gave access to the trainees' pedagogical content knowledge and likely pedagogical practice in reading.

Qualitative data was obtained from an observation instrument which had been validated by two principal investigators of the research group that undertook the study. The instrument looked for the use of the following in trainees' lessons: (a) the method for teaching reading, (b) procedure of the lessons in terms of the sequence of learning the content and progression within the lesson (c) teacher-led teaching/explanation (d) use of Teaching and Learning Materials (TLMs) and (e) students' engagement in group/individual work. Finally, a semi-structured interview schedule was used to ask questions around details of practice, sequencing of tasks, use of resources and progression within the lesson. Again, this form of interview was calculated to give a greater understanding of what trainees actually know and do rather than directly inferring from observation. The instruments were piloted in two schools with similar characteristics as the sampled sites, after which some modifications were made, mainly in respect of changes in terminologies to reflect the Ghanaian context.

Procedure for Data Collection

Appointments were made with school heads and teacher trainees on teaching practice for visits and data collection. On the scheduled dates, questionnaires were administered first to all the trainees at each site at once by a team of researchers and retrieved before lesson observation sessions were scheduled. This procedure was meant to aid the researchers to relate the information obtained from the questionnaires to the trainees' practice.

In all, thirty-six lessons were observed and video-recorded. Two lessons were observed each day before the forensic interviews were conducted. It must be noted however that in the lesson observations, the lessons only served as a platform for interrogation of how the trainees had learnt to teach rather than seeing them as typical of their teaching. The data collection were completed between March and June 2010.

Data Analysis

The qualitative data interviews were transcribed and imported into the Nvivo 8 qualitative data analysis software along with other appropriate texts such as summaries of observations. The interview and observation data were thus coded and sorted using a system of hierarchical categories, focusing on knowledge, understanding and practice. This enabled patterns to be identified and queries to be run. The quantitative data were analyzed using STATA software, which enabled large data sets to be analysed and to provide relevant tables and graphs.

Results and Discussion

Personal Data of Teacher Trainees

There were more male than female trainees in all the schools where data was collected. Overall, 118 (76%) males and 38 (24%) females participated in the study. Majority of them (120: 76.92%) were between the ages of 21 and 25. Twenty-one percent (21%) was between 26 and 30 years and none was over 30 years, which can be understood since most trainees enter the college of education after senior high school. Few of them (28: 18%) had had experience in teaching lower primary classes before entering teacher training.

As part of their background information, the trainees were asked to indicate where they developed their best understanding of teaching lower primary reading. About 79% of them claimed they developed in the college (see Table 1).

Table 1: Where trainees developed their best understanding of teaching reading

Items	Freq.	%
In-Service training	2	1.29
Other teachers	15	9.68
Training College	122	78.71
Working in Schools	16	10.32
Off-campus teaching practice	1	0.65
Total	156	100.00

Knowledge and Understanding of Reading

What Reading means to Teacher Trainees

Through the interviews, the trainees expressed their understanding of reading in three main ways. For the first group, reading meant the ability to decode print, with emphasis on word recognition. For the second group, reading meant the ability to demonstrate comprehension of print, especially through the explanation of key words or the main ideas in the passage (either in English or the local language). Thirdly, reading was described as the ability to answer questions on the passage. They appeared to be silent on the alphabetic, phonological awareness/phonics elements of reading and fluency although some of their lessons had elements of fluency. Thus, they demonstrated knowledge and understanding of two (vocabulary and comprehension) out of the five reading skills (phonological awareness, phonics and fluency included) espoused by the National Reading Panel (NICHHD, 2000).

Perspectives on how Reading should be Taught: Methods for Teaching Reading

Information from the trainees' questionnaire and interviews were used to describe their knowledge and understanding of how reading should be taught. In the questionnaire, when asked about the best way to help children in early grades to read, two main methods for teaching reading were listed: a variant of the look-and-say method and phonics, as Table 2 shows.

Table 2: The best approach to use to teach early grade reading

Item	%
The best way to help children in lower primary to read is to look at pictures and read whole words or sentences	94
The best way to help children in lower primary to read is to teach them sounds or syllables in words	96
The best way to help children in lower primary to read is to repeat words after the teacher	97

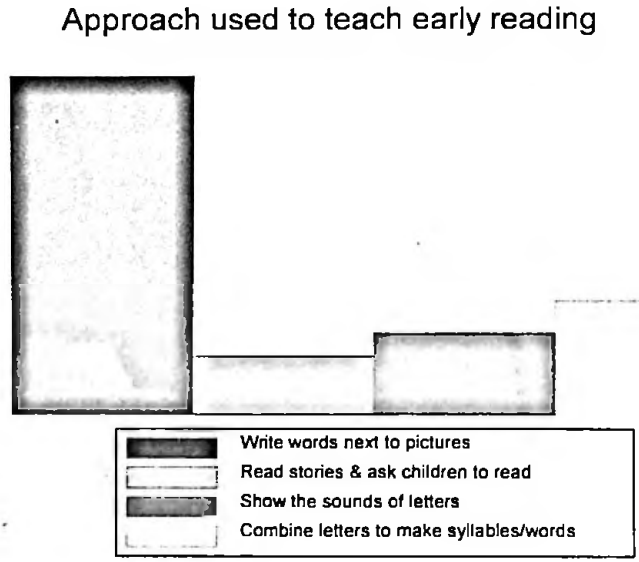

Figure 1. Approach used to teach early reading

Interestingly, the trainees placed more emphasis on the look-and-say (also known as the 'rapid automatic naming of words'), which involves writing words next to pictures (Figure 1) and pupils' repetition of words after the teacher (97%), followed by the syllabic or phonic method (96%) as shown in Table 2. In the interviews, they explained that it was the most suitable for teaching reading at the lower primary. Nevertheless, the variant of the look-

and-say approach which was rated highly has the tendency to encourage rote learning and drilling without particular focus on teaching the shape of whole words or individual sounds, though it is needed to enhance visual and phonological awareness.

In the interviews, only one of the trainees (out of 36) could describe clearly all the methods for teaching reading which were stated in the college syllabus. While the syllabus listed the phonics, the 'look-and-say', the syllabic and a combination of these, the trainees mentioned the question and answer, discussion, activity method, picture method, role-play and pupil-centred methods. Some of them admitted that though they were taught at college, they had forgotten them.

Stages of the Reading Lesson

Generally, all the teacher trainees demonstrated their knowledge of the procedure for teaching reading by describing three sequential steps. These were (i) the preliminary, (ii) reading and (iii) the post-reading stages. They also described the activities that should be used in each stage. Activities for the first stage were revision of Relevant Previous Knowledge (RPK), teaching and drilling of key words, prediction activities through picture description or the title of the text.

At the reading stage, the activities they listed included silent reading, the teacher's model reading, model reading by a good reader and reading aloud (chorus/recitation) by the whole class, in rows and individually, irrespective of the class. The purpose of the reading aloud and silent reading exercises was, according to them, to develop fluency. For reading aloud, some of the trainees explained that it was helpful for pupils with specific pronunciation difficulties to learn from their colleagues. This explanation seemed oblivious to whether the teacher heard them read correctly or not.

According to them, the last stage of the lesson was for checking comprehension. The only comprehension strategy they seemed to know and talked about, however was answering the teacher's questions based on the text.

Trainees' Teaching Practices

Methods Employed in Reading Lessons

Majority of the trainees preferred the look-and-say method, as has been indicated earlier. Some acknowledged that it was the most commonly used method:

It is more used than this phonic one; even I have not seen the use of this phonic method here.
When I was in the primary school, the only method the teacher used was look-and-say. (male trainee)

Those who used this approach mostly tended to spend a lot of time on vocabulary drills and reading aloud after the teacher. They also devoted much time to explaining key words, usually through pictures and in the local language, asking for pupils' explanation of the key words or passage (through the local language) and forming sentences with them. A few others used demonstration and word associations such as synonyms or antonyms. In such lessons, more time was devoted to the last stage of the lesson where pupils were made to answer comprehension questions. Very few trainees (e.g. only one out of 9 observed in one college district) used the phonic method and combined it with the look-and-say two methods.

In their 'look-and-say' lessons, the trainees showed the word, sentence or reading passage either on the chalkboard or cardboard, pronounced or read them out and asked pupils to repeat several times, quite mindlessly. In effect, the teacher 'trains the pupil to look at the graphic representation (form) of print and then say the word' (GES, 204: 193) without breaking it into smaller bits. In actual fact, the Ghana Education Service (GES, 2004) textbook on Methods of Teaching English for the UTDBE programme suggests that pupils should first be introduced to formal reading through 'the Look-and-Say Method' (p. 203) because among other things, it makes reading easier for pupils with the teacher's model.

The GES textbook also acknowledges that with the 'look-and-say' method, pupils cannot read new lessons by themselves and as such, cannot become independent readers. It therefore recommends that the phonic method be used to complement and overcome the shortcomings of the 'look-and-say' method. Nevertheless, the trainees stuck to 'look-and-say, even when their pupils could not recognise words and read after a number of repeated drills. In one lesson in primary 3 for example, when pupils had difficulty reading, the teacher still continued with the chorus reading/recitation of the text throughout the lesson. At the end, only 3 (probably the best) of the 69 pupils in the class who were invited all the time to read could read. When asked why she thought the children could not read, she located the problem with the children and not with her method:

Not most of them can read. I think you observed it. They cannot read so unless I use the reading aloud. I read and they read after me. I allow someone to read and they read

> *after the person. They are very slow learners and if you don't take care, you wouldn't mind them. Look at the way they were reading. If it wasn't you here, I will use the cane.* (female trainee)

Her reference to the cane as a way to motivate progress in reading is revealing, but it also showed a lack of knowledge about the complexities of teaching and learning a foreign language, which is a qualitatively more challenging learning experience than learning to read in one's first language (Alidou et al., 2006; Opoku-Amankwa 2009). It also showed a lack of deep reflection on why her approach was not working and what alternatives would provide a solution. According to this teacher, the 'look-and-say' method was the most familiar and one used by long-serving teachers in her school, and although she claimed knowledge of phonics she had never used it in practice.

In a number of the lesson observations, sometimes pupils were unable to read fluently and confidently which teachers interpreted not as a failure of their methods, but a 'problem' with the child. There were several instances where pupils were unable to identify words on flash cards after the teacher had drilled and asked them to match word cards with words on the board and read through all the key words in the passage fluently.

Only one teacher used the phonic method in combination with the look-and-say to teach vocabulary to class 2, where after introducing the word-attack strategy, many pupils used the phonological awareness to attempt reading the text. Few lessons employed word-attack strategies.

In the interviews, the trainees singled out the phonics approach to teaching as the most challenging and explained that this was because colleges did not give this as much attention, as they did with other methods.

> *The pronunciation of the sounds and the letters is very difficult. You can see some letters having different sounds but when you are pronouncing them it will be also different. So that confuses you the teacher. Even in college it was difficult and yet they did not have enough lessons on it* (male trainee).

The importance of both the phonological and word identification approach in early reading has been highlighted in the literature (Bentolila & Germain, 2005; Trudell & Schroeder, 2007), especially as a remediation strategy for struggling readers of a second language (Slavin, Lake, Davis & Madden, 2009). In his comprehensive review of studies that investigate how children learn to read in grade 1 (in the US), Stanovich (1986) reveals that phonemic awareness (and phonics blending) is the most important predictor

of early reading ability, more than vocabulary and oral comprehension. Indeed, Slavin et al. (2009) reveal that in the UK and US, phonics instruction constitutes an important component of the early reading programme, apparently because of the evidence in the literature that explicit, systematic phonics instruction has been used widely over a long period of time with positive results, and has proven effective with children of different ages, abilities, and socio-economic backgrounds (NICHHD, 2000).

Also, in multilingual African classrooms, phonics instruction is recommended in the early stages of literacy acquisition, especially when the regularity of phoneme-grapheme correspondence helps the reader to recognise or decode new words (Trudell & Schroeder, 2007). It is rather worrying that although the Ghanaian teacher trainees in this study knew about the role of phonics and phonemes, in practice, they did not consider it even as a remediation strategy. It seems it is not given the focused attention it deserves in training, leading to difficulties in actually applying the method especially in distinguishing certain sounds (e.g. /k/ and /c/) and linking them to pronunciation.

Strategies used to Teach Reading

In practice, all the trainees adhered rigidly to the three stages of the lesson and their activities. Most of them tried to get this sequence right. Very few prepared pictures on cardboards and used sentence cards together with word cards; some used none at all. The word cards were however, ineffectively used, without allowing the pupils to interact with them. They simply flashed them while they pronounced the words, and put them aside without going back to them throughout the rest of the lesson. Also, in a few cases (five out of thirty-six), teachers engaged the children in activities by demonstrating how to join cut-out word cards to form sentences, after which the pupils took turns to do the same and to read them aloud to the class after the teacher's model.

Overall, most lessons adopted the whole-class chorus reading approach where there was much emphasis on rote reading, even though it is known to prevent vocabulary recognition. This produced what Malatesha (2005) calls the 'Matthew' effect, whereby students with better vocabulary knowledge read more often and in the process improve their comprehension while those with poor vocabulary knowledge read less. Although they believed that group reading enabled good readers to help the weak and shy ones to read, few trainees applied this in their lessons, claiming it was time-consuming.

At the last stage of reading lessons, the teacher trainees used two questions and in a few instances, summary/explanation of the text) out of the even strategies which are known to help pupils make sense of a text comprehension strategies). This is contrary to what research suggests about he use of multiple strategies (including but not limited to summarising, generating questions of the text, using diagrams, maps and pictures, etc.) to nhance text comprehension (NICHHD, 2000).

On the whole, trainees over-relied on fixed teaching procedures as their nain concern was to get the procedures right and seemed less aware or concerned about whether it actually helped pupils develop skills in reading. In he process, they employed knowledge transmission (e.g. teaching new words, eading to the hearing of the pupils, explaining the passage to them, etc,), and ailed to help pupils who were clearly having difficulties with reading. They could not also use a range of techniques in their lessons. It fits Ehri's (2002) description of teachers who often follow procedures set down in manuals rather than having a wide knowledge of varying processes and skills that readers need to acquire in both theory and practice.

Conclusion

The teacher trainees exhibited limited knowledge base of both the theory and practice of teaching reading, particularly through the phonic approach. As a result, they lacked the motivation to use it due to the challenges they might encounter, as too many words deviate from the general rule of usage. Therefore, the phonic approach seemed to be under-utilised, although it plays a more important role in helping children from poorer background develop early reading ability than reliance on the whole word (i.e. look-and-say).

The trainees did not demonstrate adequate knowledge and understanding of how to apply a variety of teaching strategies to meet the needs of pupils from different socio-economic backgrounds, and about the fact that a single approach does not yield results for all children and indeed, all contexts. That might explain why they failed to employ a mix of different methods and strategies. Their presentation therefore, suggested that they feel simply possessing knowledge of methods, a laid down set of teaching procedures, teaching and learning materials and a convenient selection of certain strategies were all they needed to teach reading effectively. Such simplistic understandings underestimate the challenges and difficulties of teaching early grade reading.

Their knowledge and understanding of teaching early grade reading rarely reflected what they actually did in the classrooms, and none of what

they expressed knowledge about was applied to any great effect. In seeking to get the teaching sequence right, they over-emphasised procedural knowledge and although they knew for example that TLMs are central to developing conceptual understanding, in practice, they presented them ritualistically.

The transmission method which puts the teacher at the centre of the lesson was the trainees' main mode of lesson delivery: teaching new words, using the TLMs, reading to the hearing of the pupils and explaining the passage to them. Teaching of reading was mostly from the perspective of the teacher (focusing on how to 'deliver' well) and not the child. As such, the pupils' challenges with reading (probably as a result of the transmission and recitation methods) were interpreted as general problems with children and not about the teaching methods. The practice of reflection was not observed in the teacher trainees' practice, neither was there a critical analysis of why approaches did not yield results, and the ability to adapt teaching to suit actual situations.

It is understandable that fluency can be developed through real texts visible to all students, read aloud many times by the teacher or students (Dombey, 2011). Nevertheless, that is just one of the five reading elements that should be coordinated simultaneously, so that the growth of one area supports the others (Stanovich, 1986). Therefore, a focus on only one reading skill over and above another will weaken reading development (NICHHD, 2000). Given this understanding, there is the tendency that over a period of time, the trainees' over emphasis on reading aloud which ended up being a recitation without word recognition, and their use of only one comprehension strategy (asking questions on the text) will weaken the reading development of their early graders.

Evidently, the fact that one possesses theoretical and/or practical knowledge about language teaching does not in itself, guarantee that one will necessarily be able to make children read. Getting children to read a second language is a complex task, and its complexities are well articulated in the literature (Alidou *et al.*, 2006; Trudell & Schroeder, 2007; Opoku-Amankwa, 2009).

Recommendations

The gaps in teacher trainees' knowledge, understanding and teaching of reading have implications for the pre-service and In-Service Education and Training (INSET) programmes. The pre-service programme especially should make trainees appreciate better how reading for meaning is as important as decoding in early grade teaching. They should also know and use a range of

methods for teaching decoding such as analytical and synthetic phonics, syllabic, syntactic, whole word, text or visual approaches. It should expose trainees to a range of approaches to comprehension like oral storytelling, getting pupils to ask questions about the text or produce summaries, drawing pictures or diagrams and relating a text to pupils' own experience (NICHHD, 2000). It is also important to increase trainees' awareness of expectations in the primary school curriculum for young children's reading in the early grades, for instance, that pupils should be able to read a short story or paragraph fluently and with understanding by the end of grade three.

It is suggested that the implementation of all the components of the pre-service programme should be monitored to ensure that it places more emphasis on effective study of practice. In such a practice-based curriculum, college lessons would be linked to the practical requirements of primary school teaching, thus, exposing trainees to the actual primary school curriculum and school context. This should ensure the critical study of best teaching practices of experienced teachers observed during practicum, visits to schools where good practices are known to be exhibited or through videos of lessons. Also, reading behaviours of pupils in real schools and examples of their work would help to identify their conceptions and misconceptions. These can then be brought into the college methodology classrooms for analysis. This way, trainees' existing knowledge and beliefs about reading can be challenged and altered through explicit examples, tutor modelling the pedagogic strategies and opportunities for extensive and guided practice to develop pedagogical content knowledge.

Similarly, during INSET programmes, teachers can be shown videos of best practices of early grade reading instruction. This will also serve to train experienced teachers to mentor struggling teacher trainees in real classrooms during teaching practice. With time, the trainees would have enough good examples to draw from and mentor others, thereby, reproducing competent teachers to do the same.

The practicum as a component of the pre-service programme is faced with a big challenge. In many schools, the practicum period is the time the experienced teachers give themselves a break, leaving the trainees without mentors. This practice must be checked. Trainees should be supported and mentored by experienced teachers to enable them to observe and use good practices. Experienced teachers and mentors should therefore be trained and supported by college tutors to provide instructional support to meet this need and to demonstrate good examples to trainee teachers.

Mentors should support trainees in specific ways that will promote children's reading, such as (a) how to monitor children's fluency in reading, (b) how to identify those who need assistance and how to use a variety of strategies or differentiated tasks to suit different learners and contexts (c) introducing new methodologies that move away from rote learning/reading and teacher-centred procedures to activity, discovery and child-centred procedures, (d) demonstrating how to use phonics instruction and other word-attack strategies to develop children's skill of independent reading.

The findings of the study also suggest that college tutors may need retraining on specific areas of reading identified in this study, and on current teaching methodologies. This should enable them to understand the school context well enough to facilitate trainees' experience of this, and to be able to support mentors to play their roles effectively.

The pre-service programme bears the biggest responsibility for producing teachers who are capable of translating knowledge into effective practice well enough to make children literate. Since the trainees develop their best understanding of teaching early grade reading from the college, it is important that improvement begins from there.

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PRE-SERVICE TEACHERS' USE AND PERCEPTIONS OF GEOGEBRA SOFTWARE AS AN INSTRUCTIONAL TOOL IN TEACHING MATHEMATICS

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Abstract
This paper presents a case study of 85 pre-service mathematics teachers from the University of Cape Coast, Ghana; who enrolled in an instructional technology mathematics course to develop competencies in teaching mathematics using the GeoGebra software which was being introduced to them for the first time. The study focused on an in-depth investigation of the pre-service teachers" perceptions and use of GeoGebra in teaching mathematics. Questionnaire, interviews and lesson artefacts developed by the teachers were the data sources of the study. Descriptive, t-test and effect size statistics were used to analyse the quantitative data whereas the interview data and lesson artefacts were analysed qualitatively. Statistical analysis confirmed that the use of the GeoGebra helped pre-service teachers expand their own understanding of mathematical concepts as well as their knowledge of Instructional strategies. The study also indicated that two perceived barriers; lack of awareness of the GeoGebra software and time constraint in designing GeoGebra lessons hinder pre-service teachers" use of the tool. That notwithstanding, the pre-service teachers" perceived developed attitudes and pedagogical views on the use of GeoGebra point to its potential as an instructional tool in developing their experiences in technology integration within an initial teacher education programme in Ghana.

Introduction

The introduction of information and communication technology (ICT) has become an essential tool that supports innovative teaching and enhances

students" continuous learning process (Kirschner, 2001; García-Valcárce Muñoz-Repiso, & Tejedor, 2006). For instance, Bos (2009) and Page (2002 held that when technology is used with appropriate pedagogy in mathematic classroom, it improves students" academic achievement. Bos (2009) asserte that "if mathematics is seen as problem solving and thoughtfully teamed wit technology, deep conceptual learning can be a reality" (p. 527). ICT learnin environments give students fluency in varieties of representational systems provide opportunities to create and modify representational forms, develo skill in making and exploring virtual environments, and emphasis mathematics as a fundamental way of making sense of the world (Ang & Lee 2005; Yu, 2008). The National Council of Teachers of Mathematics, NCTM (2003) affirmed that technology is an important tool for learning mathematic in the 21st century, and all schools must ensure that all their students hav access to technology. Furthermore, NCTM explained that effective teacher maximise the potential of technology to develop students' understandin stimulate their interest, and increase their proficiency in mathematics. Whe technology is used strategically, it can provide access to mathematics for al students (NCTM, 2003).

The literature reviewed suggests that the use of technology in teachin and learning of mathematics yields positive results and teachers are considere most instrumental agent in educational changes. However, mathematic teachers have not widely used technology in teaching (Yuen, Law, Lee & Lee 2010). This condition can also be said of mathematics teachers in Ghana Agyei and Voogt (2011) reported that mathematics teachers in Ghana are ye to fully integrate technology in teaching and learning of mathematics becaus of a number of reasons, which include: lack of knowledge about ways t integrate ICT in lesson, lack of training opportunities for ICT integratio knowledge acquisition and lack of application software that they can use i mathematics lesson.

This study focused on the areas that require further attention to enable teachers use ICT in mathematics teaching. In particular, a professional development scenario that will assist pre-service teachers develop skills i ways to integrate ICT in their teaching processes was one of the significan issues identified by the researchers. Bearing in mind the complexity of the problems most mathematics classroom in Ghana face in terms of ICT infrastructure and lack of application software, the GeoGebra open software that offers a technology readily available and user friendly among mathematics classroom with the potential to enhance teachers' knowledge and skills of integrating technology in teaching mathematics (Wakwinji, 2011;

Mainali & Key, 2012) and to support students' higher-order thinking in mathematics was proposed for use in professional development programmes. GeoGebra is dynamic mathematics software for teaching and learning mathematics from middle school through college level (see Hohenwarter & Preiner, 2007). It combines the ease-of-use of dynamic geometry software with some basic features of computer algebra systems. Although primarily focused on secondary school curriculums, GeoGebra is also an interesting tool for college level courses as it can help to bridge concepts from geometry, algebra, and calculus. The use of GeoGebra in this study will ensure that pre-service teachers will be able to use existing hardware and software in creative and situation specific ways to design ICT resources to accomplish their teaching goals in the future.

Enhancing the potential of GeoGebra in Teaching Mathematics through professional development arrangement

Teachers play a central role in their students' learning and for that matter teacher professional development has become an essential component of most of the educational policies (Petras, Jamil & Mohamed, 2012). Teacher professional development is far and wide recognised as the most effective strategy to promote teacher change. Professional development involves comprehensive, intensive, and effective approaches in raising teachers' familiarity with requisite skills and content they are teaching (Knapp, 2003). Numerous studies have involved a wide range of strategies in preparing teachers to integrate GeoGebra software in teaching mathematics effectively.

Lu (2008) used exploratory and multiple-case studies approach to investigate two English and two Taiwanese upper-secondary teachers' conceptions of technology and their pedagogies incorporating dynamic manipulation with GeoGebra into mathematical discourse. The results of his study revealed that some teachers tended to perceive GeoGebra as not merely a tool but rather an environment for teaching and learning mathematics. He also found that the teachers employed a wide variety of strategies to integrate GeoGebra into their teaching practices, such as preparation for teaching materials, presentation of mathematical content and concepts, classroom activities for interaction with pupils and investigation of mathematics. Lastly, he found that teachers' teaching practices are considerably influenced by their conceptions of GeoGebra in relation to mathematical knowledge and their cultural traditions.

In spring 2010 and 2012, Bu, Mumba and Henson (2013) conducted two studies in which they integrated GeoGebra in an online professional development courses to develop mathematical problem solving skills for K-8 in-service elementary school teacher in a rural region of a Midwest state in the United States of America. The professional development activities included incorporating a variety of pedagogical components such as video-based demonstration, affective intervention, and social and cognitive scaffoldings to support 58 teachers' exploration of the new technologies and the mathematical content. After intensive online instruction, a 25-item questionnaire was administered to collect data on participants' attitudes, curricular awareness, mathematical content, and pedagogical reflection regarding the integration of GeoGebra. The results showed that the use of GeoGebra challenged teachers' views about the nature of mathematics and student-teacher interactions and further enriched their mathematical knowledge and pedagogical choices. Bu, Mumba and Henson (2013)'s study confirmed that a "well-designed GeoGebra integration may eventually help control the complexity and provide genuine mathematics learning experience to teachers and students alike" (p. 75).

Mainali and Key (2012) also used a four-day introductory workshop to explore the teachers' impressions and beliefs about the use of GeoGebra in mathematics teaching and learning. The study used fifteen mathematics teachers in Nepal. They found that the potential for using GeoGebra to teach and learn mathematics in Nepal is very large. The study also showed that participants who took part in the study had positive impressions, feelings, and beliefs about the use of the GeoGebra in classroom.

From the foregoing discussion, one can infer that when teachers begin to explore new technology through mathematical content and pedagogy, it is likely that they may succeed in bringing innovative change in their classrooms. This was reiterated by Cross (2009) that once teachers saw some positive results with their students they were more likely to continue using the GeoGebra in their classrooms.

In this study, a professional development programme was designed to prepare pre-service teachers to integrate Geogebra software as a tool in designing lessons within a mathematics-specific teacher education programme. The characteristics of the professional development arrangement are discussed in the next section.

The Professional Development Arrangement

In Ghana there are two universities that train mathematics teachers for senior high schools in the country. These universities are University of Cape Coast (UCC) and University of Education, Winneba. In University of Cape Coast, the Department of Science and Mathematics Education is responsible for the training of senior high school mathematics teachers. This study was conducted in that department where the researchers taught the final year students in an instructional technology course. The course was designed to enable students develop and use instructional materials to enhance teaching and learning in the classroom.

Based on the rationale of the course, the researchers introduced the GeoGebra for the first time in the course to enhance pre-service mathematics teachers' knowledge and skills in developing technology-based instructional materials in mathematics. Out of the twelve teaching weeks of the semester, three weeks (week 5, 6 and 7) were used to take the pre-service teachers through the use of the GeoGebra. In each week, the researchers met the pre-service teachers twice: two-hour lecture and another one-hour lecture on different days. The two-hour lectures were mostly the researchers-led activities where the students were introduced to the various constructing tools in the GeoGebra window and how to use them. The one- hour lectures were mostly hands-on-activities by the students. Here, the students worked in pairs to practice GeoGebra-based activities based on the previous lesson.

In lesson 1, students were introduced to how they could access GeoGebra software online and how to make a construction, format it, and produce a worksheet using GeoGebra software. In lesson 2, the students were guided through the following activities: drawing regular and irregular polygons, drawing of graphs of given functions, transformation of points/objects (reflection, rotation, translation by a vector, enlargement) and how to export work developed in GeoGebra to MS word. In lesson 3, they used the GeoGebra to find mean, median, mode, standard deviation and variation; draw histograms, box whisker diagram and scatter plots; construct tangent to the graph of functions; and determine area under a curve using Riemann sum and definite integral. At the end of the three weeks, the pre-service teachers were asked to select mathematical topics suitable for teaching with GeoGebra, make use of the affordances of the application software and design learning activities that will foster higher order thinking in mathematics among learners. They were to work in teams of two to design these lessons and prepare to teach them subsequently in their future classrooms. The pre-service in this study developed a number of lessons including polynomial

functions, calculus, statistics and plane geometry. The lesson artefacts they developed contained the following: GeoGebra-based lesson plan which was to guide the teacher to deliver the lesson, student worksheet to ensure hands on activities by student in the lesson delivery and the designed GeoGebra interface which provided an interactive learning environment for modelling mathematics concepts. They did this over a period of two weeks.

Research Questions and Research Design

The study examined pre-service teachers' use and perceptions of GeoGebra use in teaching and learning mathematics at the senior high school level. It was also to identify the extent to which GeoGebra as a tool can help pre-service teachers develop their content, pedagogy and technology knowledge. The following research questions were asked to guide the study.

1. What are the perceived barriers of pre-service teachers in using GeoGebra as an instructional tool to teach mathematics?
2. What are the perceived opportunities of pre-service teachers in using GeoGebra as an instructional tool to teach mathematics?
3. To what extent do pre-service teachers develop their knowledge and skills needed to design and enact GeoGebra supported lesson in mathematics

A case study of pre-service teachers in the teacher education programme in UCC was applied. The study focused on an in-depth investigation of the pre-service teachers' perceptions and use of GeoGebra in teaching mathematics. Consequently the units of analysis were the pre-service teachers and the case was the professional development arrangement which was organised within the context of the mathematics teacher education programme at the University of Cape Coast. The study employed an embedded mixed method of quantitative and qualitative evidence. This was to ensure that a more comprehensive understanding required to inform decision making is reached.

METHODS

Participants

The study used 85 final year pre-service mathematics teachers (74 males and 11 females) in Bachelor of Education (Mathematics) programme at university of Cape Coast, Cape Coast, Ghana. The B.Ed (Mathematics) is a 4-year programme which prepares them to teach at the Senior High School when they graduate. Forty-four (51.8%) of them were between the age of 20-25 years, 23 (27.1%) were 26-30 years, 12 (14.1%) were 31-40 years and 3 (3.5%) were

41 years and above. All 85 participants responded and completed a questionnaire survey which was administered to them before and after the instructional technology course. Four teams of pre-service teachers whose lesson artefacts were sampled and analysed were also interviewed after the the course. Prior to this study, the pre-service teachers did not have any experiences in technology-supported lessons neither as part of their training nor in their pre-university education.

Instruments

A questionnaire consisting of 50 items adapted from Bu, Mumba, Henson and Wright (2013) was used to collect data on pre-service teachers' perceptions about the use of GeoGebra in teaching mathematics before and immediately after the course implementation.

The items were constructed on 6 sub-scales and were reported as: Awareness (pre-service teachers' consciousness about the use of GeoGebra as a tool in teaching mathematics) Conceptual Understanding (ones' understanding of mathematical concepts when GeoGebra is used as tool to enhance teaching/learning), Attitudes (affective, cognitive and conative) of pre-service teachers to use GeoGebra, Competency (pre-service teachers' ability to use Geogebra to teach mathematics), Pedagogical views related to the use of GeoGebra and Adaptation (applicability of GeoGebra with existing learning materials). For all the six sub-scales, a five-point Lickert scale (1=strongly disagree, 5= strongly agree) was used. The scores are interpreted as follows: 1 is the lowest possible score which represents a very strong negative response, while 5 is the highest possible score which represents a very strong positive response. Rescaling of some items worded negatively was done so that a high score was interpreted to mean the reverse. The number of items and Cronbach alpha reliability coefficients of the various sub-scales are reported in Table 1.

Table 1: Cronbach Alpha Reliability Coefficients of the variou Constructs

Sub-scale	Number of items	Cronbach alpha reliability coefficients
Awareness	6	0.821
Attitudes	11	0.783
Adaptation	5	0.782
Conceptual Understanding	6	0.722
Pedagogical views	12	0.917
Competency	10	0.933

From the Table 1, the reliability coefficients are within the acceptabl range (Pallant, 2001) for all the sub-scales. The questionnaire also had som open ended items to help participant express their views freely about their us of GeoGebra.

Following the administration of the questionnaire after the course, fou teams of pre-service teachers whose lessons artefact were randomly selecte and analysed were also interviewed. The interview focused on teachers experiences and opinions of planning and preparing GeoGebra-based lesso whereas the lesson evaluation assessed evidence of technological and conter knowledge in the GeoGebra written lessons.

To analyze the data, descriptive, t-test and effect size statistics wer used to analyse the quantitative data whereas the interview data and lesso artefacts were analysed qualitatively using data reduction technique (Miles & Huberman, 1994).

RESULTS

Barriers to GeoGebra use as an Instructional Tool

Research question 1 sought to explore barriers of pre-service teachers in usin GeoGebra as an instructional tool to teach mathematics. What was perceive to be important barrier in using GeoGebra as an instructional tool was reporte in pre-service teachers' lack of awareness about the use of GeoGebra as a too in teaching mathematics. Respondents were asked to indicate their levels o agreement on awareness of the GeoGebra software as an importa instructional tool for mathematics teaching on a five-point Likert scale befo the course. Table 2 provides the mean scores and standard deviations of the responses.

Table 2: Pre- service teachers' awareness levels of GeoGebra software (N=85)

Item	Mean	SD
I am familiar with the GeoGebra software before I was introduced to it in this course.	1.46	0.895
I have used GeoGebra before in my mathematics lesson	1.68	1.177
The constructing tools in the GeoGebra are familiar to me	2.39	1.448
I have seen other teachers use GeoGebra in the classroom	1.86	1.338
I have downloaded the software from the internet before this programme	2.09	1.469
I know about some exemplary materials of GeoGebra	2.14	1.347
Overall Awareness level	**1.83**	**0.902**

The result shows that the pre-service mathematics teachers have very low level of awareness of the GeoGebra before the course (mean = 1.831, St. Dev. = .901). This means the pre-services teachers were unfamiliar with GeoGebra software before it was introduced to them in this course. They had neither use nor seen other teachers use GeoGebra in the mathematics classroom.

Pre-service teachers were also given the opportunity to enumerate barriers they perceive could hinder their use of the GeoGebra software as an instructional tool in the real classroom situation after the professional development programme.

Out of the total of 85 pre-service mathematics teachers, 40 (47.1%) of them did not indicate any perceive barrier using GeoGebra in their future lessons. Apparently, these participants did not encounter any peculiar problem using the tool during the programme or perhaps they were reluctant to provide any responses in this regard. Table 3 shows the distribution of possible barriers of GeoGebra use as were reported by the pre-service mathematics teachers.

Table 3: Pre-service perceived barriers of using GeoGebra tool in teaching (N=85)

Possible barriers	Number Respondents	Percentage
1. Time constraints	45	52.9
2. Lack of computer literacy skills	12	14.1
3. Irregular internet accessibility	15	17.6
4. Frequent power outage	18	21.2
5. Difficulty in using the GeoGebra to teach some topics in mathematics	8	9.4

The results show that 'time constraint' was the only significant barrier the pre-service mathematics teachers perceive could hinder their use of GeoGebra in their future lessons. Pre-service teachers reiterated that preparing and enacting GeoGebra-based mathematics lessons could be time consuming and would require a lot of commitment from teachers who would want to use the software in his/her classroom. Apparently, the teachers needed more time to develop their skill in designing mathematics lessons in this new environment.

Opportunities to use GeoGebra as an Instructional Tool

In answering research question 2, opportunities that existed to use GeoGebra as an instructional tool in teaching mathematics were explored in 3 areas: pre-service teachers' perceived developed attitudes, pre-service teachers' perceived pedagogical views related to the use of GeoGebra and their reported views about GeoGebra software applicability (adaptation) with existing learning materials.

Pre-service mathematics teachers' perceived attitude towards the use of GeoGebra in teaching

A comparison of attitudes of the pre-service teachers before and after the course was conducted. A paired sample t-test showed that pre-service teachers' attitudes toward the use of GeoGebra in mathematics teaching improved significantly after the course on all 11 items that were used to measure level of their attitudes. The overall attitudes (Before: $M = 1.62$, $SD = 0.26$; After: $M = 4.13$, $SD = 0.61$; p-value = .0001) also showed significant difference with a large effect size (d = 5.35) before and after the course. This

is an indication that pre-service teachers developed positive attitudes as they got introduced to the tool and seem to suggest that when particular mathematical software is introduced to pre-service mathematics teachers, it turns to improve their attitude towards the integration of technology in mathematics teaching. Table 4 shows the results of the paired sample t-test for samples of the test items measuring the pre-service teachers' attitudes.

Table 4: Pre-service mathematics teachers' levels of attitude ($N = 85$)

Attitudes towards the use of GeoGebra	Before the course		After the course		*p*-value	Effect Size(Cohen d)
	M	*SD*	*M*	*SD*		
I like using GeoGebra	2.27	1.08	4.06	1.04	0.0001	1.68
I am open to explorations using GeoGebra	1.54	0.66	4.92	0.07	0001	7.20
I need a lot of time to think before I use GeoGebra software to teach mathematics.	1.19	0.47	3.28	1.13	0.0001	2.41
I will continue to learn and use GeoGebra.	1.27	0.51	3.93	1.12	0.0001	3.06
GeoGebra makes mathematics easy for me to learn and teach it.	2.87	0.82	4.46	1.39	0.0001	1.39

Level of significance, $\alpha = .05$

***Pre-service teachers* perceived pedagogical views on the use of GeoGebra**

A paired sample t-test to compare the pre-service teachers' pedagogical views (before and after the course) was significant for all the measuring items (sample of items are shown in Table 5) with the largest area of change occurring in the item 'GeoGebra software can help me reach out to more students' (gain= 4.22). The item with the least reported change (gain= 0.79) was '*GeoGebra motivates me to find effective approach in teaching mathematics*'.

Table 5: Pre-service teachers Geogebra pedagogical views (N=85)

Pedagogical Views	Before the Course		After the course		p-value	Effect size (Cohen d)
	M	*SD*	*M*	*SD*		
Using GeoGebra can make my lesson practical.	1.42	0.67	3.22	1.26	0.0001	1.78
I can use the GeoGebra to a design a lesson to meet the needs of my students.	1.44	0.66	3.54	1.18	0.0001	2.20
GeoGebra software can help me reach out to more students.	1.46	0.63	4.27	0.70	0.0001	4.22
GeoGebra software will help me to design meaningful activities for students.	1.67	0.66	4.21	0.93	0.0001	3.15
GeoGebra motivates me to find effective approach in teaching mathematics	2.34	1.11	3.24	1.16	0.0001	0.79

Level of significance $\alpha = .05$

The overall views (Before: $M = 1.79$, $SD = 0.44$; After: $M = 3.89$, S = 0.45, p-value = 0.0001) also showed significant difference with a large effe size (d = 4.71) before and after the course. Thus, the results suggest th GeoGebra environment appeared useful to pre-service teachers in designi and planning activities to teach ICT-enhanced lessons. This might ha enhanced their pedagogical reasoning and views.

Adaptation (Applicability of GeoGebra with existing learning materials)
The extent to which pre-service teachers can apply the Geogebra tool to existing mathematics learning materials was also investigated.

Table 6: Applicability of the GeoGebra in the existing learning materials (N=85)

	M	*SD*
I can use GeoGebra hand in hand with manipulatives to teach mathematics	4.40	0.736
I can apply GeoGebra to teach mathematics with the existing syllabus.	3.95	0.830
I can use the GeoGebra with the teachers' mathematics handbook	3.40	0.720
I can apply GeoGebra to teach mathematics with a lesson plan	4..30	0.871
Overall	**4.01**	**0.558**

$\alpha = .05$, Std. Dev. = standard deviation

Table 6 shows the mean scores of pre-service teachers' responses provided after the course. The results of the study showed that existing materials such as manipulative (M = 4.40, SD = 0.736) for teaching mathematics, mathematics lesson plan (M = 4.30, SD = 0.871), mathematics teachers' handbook (M = 3.40, SD = 0.720) and mathematics syllabus (M = 3.95, SD = 0.830) all can be used alongside the GeoGebra software. Table 6 shows a descriptive statistics of pre-service teachers' responses.

Pre-service Teachers' Development of Conceptual Understanding and Competencies
A major question dealt with in the study was how pre-service teachers developed their own conceptual understanding and skills needed to design and enact GeoGebra supported lesson in mathematics after the Instructional technology course. Analyses of pre-service teachers' self-report data and developed lesson artifact answer this question

Pre-service mathematics teachers' conceptual understanding
The result in Table 7 shows the extent to which the introduction of GeoGebra in the Instructional technology course enhanced pre-service mathematics teachers' content knowledge

$$\hat{a}=\begin{pmatrix}3\\1\end{pmatrix}, b=\begin{pmatrix}3\\4\end{pmatrix}, \hat{c}=\begin{pmatrix}-3\\-3\end{pmatrix}, \hat{d}=\begin{pmatrix}4\\0\end{pmatrix}, \hat{e}=\begin{pmatrix}0\\6\end{pmatrix}, \hat{f}=\begin{pmatrix}3\\-4\end{pmatrix}$$

Figure 1: The snapshot of the sample work of PSMT 1 in GeoGebra window

The following are excerpts from interview with another pre-service teacher PSMT2.

R: To what extent is the use of GeoGebra useful or not useful to you in terms of mathematics contents?

PSMT 2: In fact the GeoGebra is fantastic. I can use it to explore so many things. For example the slider in the GeoGebra constructing tools has helped me to understand the orientation of the cubic function, $y=ax^3+bx^2+cx+d$. *At first I have to create a table for an ordered pairs of points before I can sketch the graph of* $y=x^3$. *Now, I know that if the coefficient of* x^3 *is positive the graph will move* [he used the right hand to gesture the orientation of the graph of $y=x^3$ to show that the graph will increase then it will get to the point of inflexion and finally increase again]. *Sir, the value of d will tell me where the graph will cut the y-axis. Hmm sir there was something I never "know"* [he paused and continued]. *Unlike a quadratic equation which may have no real roots, a cubic equation always has at least one real root. It is so simple now. When it comes to transformation and statistics it so simple now.*

Figure 2 is the snapshot of some mathematics contents he used the GeoGebra to generate.

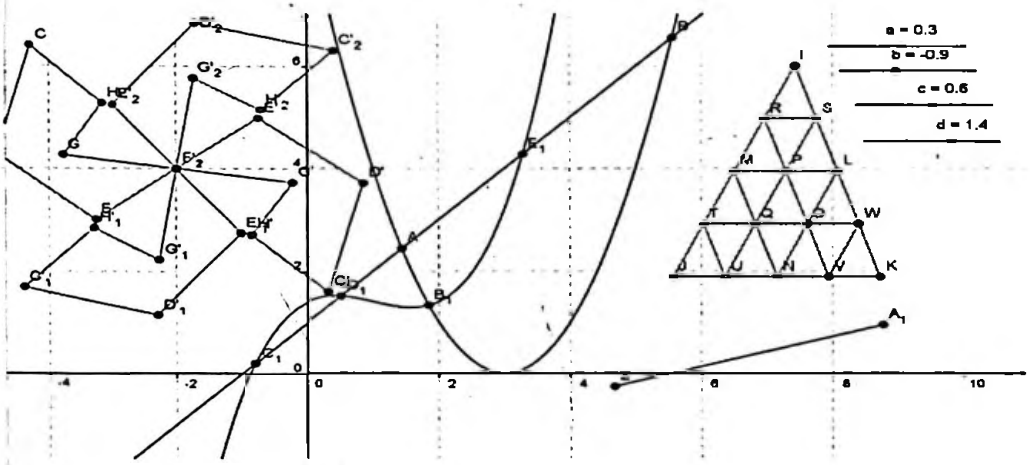

Figure 2: Snapshot showing sample work of PSMT 2 in GeoGebra environment

From the interviews and the sample output of their work, it is clear that the GeoGebra environment helped to enhance the pre-service mathematics teachers' content knowledge in mathematics. The GeoGebra helped most of the pre-service mathematics teachers to conceptualise some mathematical ideas that they have been deficient of earlier before the study. This was clearly shown in the work of PSMT 2. Interviews revealed that one of them had indicated that "*the slider in the GeoGebra constructing tools has helped me to understand the orientation of the cubic function* $y = ax^3 + bx^2 + cx + d$ ". He added that it the first time he understood that "*unlike a quadratic equation which may have no real roots, a cubic equation always has at least one real root. It is so simple now*".

It is apparent that the pre-service teachers in the study developed conceptual understanding of the various topics they worked on even though these were topics they had learnt several years ago and as teachers were supposed to be teaching them. Thus, the teachers expanded their knowledge about the mathematical concepts with the GeoGebra not because they were new, but because they realized they did not yet completely understand the concepts.

Pre-service mathematics teachers' competency in using GeoGebra

Pre-service teachers' competencies in using GeoGebra as an Instructional tool were ascertained before and after the Instructional technology course. Ten items were used to explore pre-service teachers' levels of performing specific tasks with GeoGebra. For each item, they were expected to indicate their ability level to perform the task: excellent (advanced) = 5, good (proficient) = 4, satisfactory (progressing) = 3, learning = 2 or poor (can't use it) = 1. The pre-post test scores of their responses are shown in Table 8.

Table 8: Pre-service mathematics teachers' competencies (N=85)

Item	Before the course		After the course		*p*-value	Effect size (Cohen d)
	M	*SD*	*M*	*SD*		
I can use the GeoGebra to develop lesson in polynomial functions.	1.39	0.66	3.46	1.02	0.0001	2.41
I can use the GeoGebra to teach graph of polynomial functions.	1.40	0.62	3.73	0.94	0.0001	2.92
I can use the GeoGebra to teach bar chart.	1.45	0.63	3.75	0.94	0.0001	2.87
I can use the GeoGebra to teach histogram.	1.66	0.75	3.75	0.90	0.0001	2.52
I can use the GeoGebra to teach box plot.	1.74	0.66	3.66	0.92	0.0001	2.40
I can use the GeoGebra to teach scatter plot	1.89	0.90	3.57	0.94	0.0001	1.83
I can use the GeoGebra to teach polygons.	1.93	0.88	3.78	1.02	0.0001	1.94

I can use the GeoGebra to teach differentiation.	2.00	2.35	3.22	1.17	0.0001	0.66
I can use the GeoGebra to teach integration.	2.14	1.12	3.19	1.13	0.0001	0.93
I can use the GeoGebra to teach circle theorems.	2.34	2,53	3.17	1.16	0.0001	0.42
Overall Teachers' Competency	**1.79**	**0.49**	**3.56**	**0.79**	**0.0001**	**2.69**

The results indicate that the pre-service mathematics teachers' ability to use the GeoGebra after the instructional technology course improved significantly (Before: $M = 1.79$, SD = 0.49; After: M = 3.56, $SD = 0.79$, p-value = 0.0001, effect size (Cohen d = 2.69).

Clearly, the responses from the pre-service mathematics teachers in this study indicate that when particular mathematical software is introduced in course it helps them to develop the knowledge and skills of technology integration in mathematics. A case in point is the lesson on Circle Theorems developed by Atobrah (Pseudonym) a member of PSMT 4. Figure 3 is snapshot of their lesson document. Atobrah was able to demonstrate clearly how learners could be assisted in the use of GeoGebra to deduce circle theorems. According to him, these are difficult concepts to teach when using the conventional method without the support of any technological tool. Thus, Atobrah explained that he had developed the skill of using GeoGebra and can assist his students to learn mathematics better because the tool will assist his students picture the mathematical concepts they are learning.

Agathar (from PSMT 3) also mentioned in an interview that having developed the skill of representing graphs on the GeoGebra window, she could easily guide her students to identify general patterns and properties of families of functions such as quadratic and linear functions.

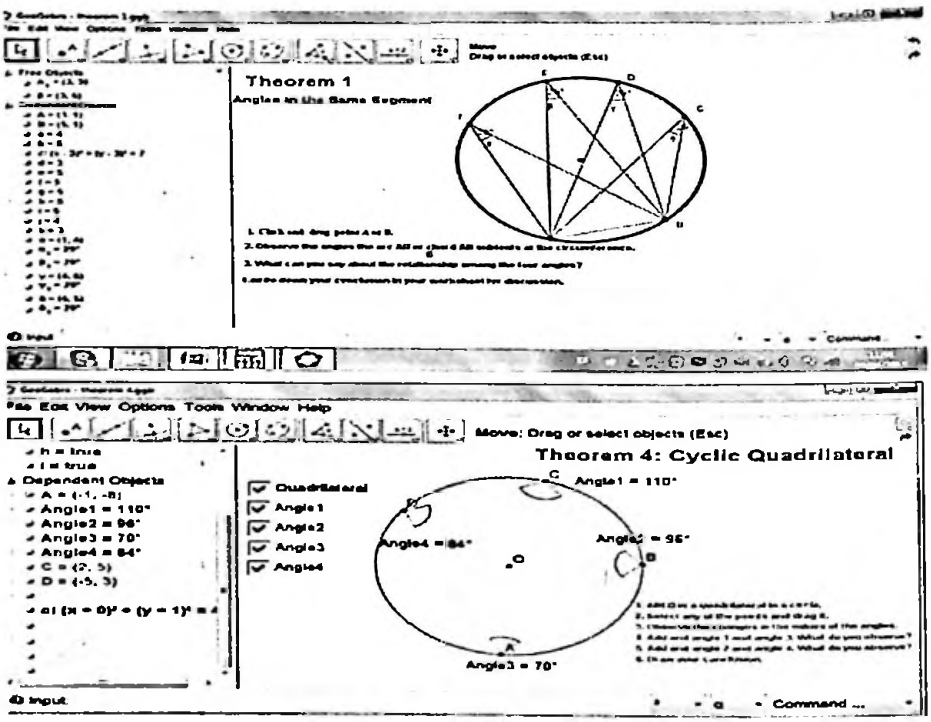

Figure 3: Snapshots of circle theorems developed by Atobrah

Pre-service teachers outlined a number of reasons why they would want to use the GeoGebra Instructional tool in their future lessons. Among major reasons they gave include: it makes teaching and learning easier, it enables student-centred learning, it gives pictorial presentation of mathematical concepts, and it makes the teacher to be flexible in the mathematics classroom.

Discussion

The focus of this study was to examine the pre-service mathematics teachers' use and perceptions about the use of GeoGebra software in mathematics teaching. Specifically, the study explored the potential of developing pre-service teachers' conceptual understanding of mathematics and their competency to design and enact GeoGebra supported lessons. The study also investigated the barriers and opportunities (as reported in pre-service teachers'

perceptions) of using GeoGebra as an Instructional tool in teaching mathematics.

Despite the fact that GeoGebra software is free, easily accessible and easy to use, the results of this study indicated that the pre-service mathematics teachers had very low level of awareness of the software before it was introduced in the course. It was observed prior to the introduction of the software that the pre-service mathematics teachers were aware that the Ghana mathematics syllabus for senior school requires them to guide their students to competently use computers or calculator to solve realistic mathematically problem, however, the prospective mathematics teachers in this study were least aware of the potential of mathematical software to apply in the classroom. The pre-service teachers' lack of awareness about the use of GeoGebra as a tool is likely to impede its use in mathematics classrooms. This result is consistent with the findings of the study conducted by Adebowale (2012). Adebowale conducted a study on primary and secondary school teachers level of awareness of Nigeria's educational policy for integrating ICT in classroom teaching and learning. He found that only a small percentage of the respondents possess a high level of awareness of the country's educational policy on ICT. They went further to indicate that a considerable proportion of the respondents (35.1%) were either completely ignorant of the policy or possess poor levels of its awareness.

Inspite of the teachers' lack of awareness of the potential of the GeoGebra software as an Instructional tool, pre-services teachers who participated in the study demonstrated knowledge and skills in designing and preparing to enact GoeGebra-based lessons in their lesson plan artefacts after the Instructional technology course. This was confirmed by their significant gains in their perceived developed competencies as were reported. Thus, the introduction of the GeoGebra in teacher professional development course seems to be a good approach to enhance pre-service mathematics teachers' ability in using mathematics-specific software. This supports an observation by Yigit (2014) that pre-service mathematics teachers' competency to use technology in mathematics teaching and learning could be effectively enhanced through a lesson or a course

The findings also indicate that the pre-service teachers expanded their own understanding of mathematical concepts as they explored the GeoGebra supported lessons; the pre-service teachers improved their subject matter in various topics in mathematics they worked on. Consequently, the use of GeoGebra helped the pre-service teachers to develop their mathematics

content significantly. This result confirms evidences that have been shown in literature that the GeoGebra software has the potential to promote conceptual understanding in mathematics; GeoGebra promotes learners' interests towards mathematics and advance their cognitive abilities as well (Antohe, 2009).

The study showed that several opportunities existed for pre-service teachers to be trained to be able to integrate GeoGebra in their teaching. Firstly, it was encouraging to find that contemporary mathematics teachers appeared generally supportive and confident to use GeoGebra in their future classrooms. The overwhelming large gains in their self-reported attitudinal measures after the Instructional technology course augers well for the pre-service teachers to use GeoGebra to improve teaching in their future lessons. Sabzian and Gilakjani (2013) and Teo (2006) remarked that the success of any initiatives to implement computer technology in an educational programme depends on the support and attitudes of teachers involved. The finding also aligns with the study conducted by Yildirim's (2000) on the topic: *Effects of an educational computing course on pre-service and in-service teachers: A discussion and analysis of attitudes and use*. Yildirim found that teachers' attitudes significantly improved after the computer literacy course.

Secondly, the extent to which the GeoGebra software can be used along with existing learning materials as were reported by the pre-service teachers is another opportunity worth noting. Similar to findings by Bu, Mumba, Henson (2013), the study showed that pre-service mathematics teachers can conveniently adopt GeoGebra to the existing teaching and learning materials such mathematics manipulative, mathematics lesson plan, mathematics teachers' handbook and the mathematics syllabus.

Lastly, the study showed that the pre-service teachers expanded their own knowledge of Instructional strategies for integrating GeoGebra learning activities in mathematics lessons. The pre-service teachers' perceived report on GeoGebra pedagogical views confirmed this. The pre-service mathematics teachers in this study indicated very strongly that they could use the GeoGebra to make mathematics lessons more practical, provide more effective ways of making lesson interesting and help to design lesson to meet the needs of students. This result confirms that the use of GeoGebra provides a real opportunity for teachers to rethink fundamental pedagogical issues in teaching and learning of mathematics along with the approaches to learning that students need to apply in classrooms (International GeoGebra Institute, 2015).

In spite of the opportunities discussed, the study highlighted time constraint as a significant barrier which could hinder pre-service teachers' use of GeoGebra in their future classrooms. They pre-service teachers reiterated

that preparing and enacting GeoGebra-based mathematics lessons could be time consuming and would require a lot of commitment from teachers who would want to use the software in his/her classroom. This finding illuminates that the teachers needed more time to practice this new approach to develop their repertoires and expertise in designing and teaching mathematics lessons with GeoGebra in a more desirable way. This is similar to findings from Fishman and Davis (2006) which explains that building expertise in teaching a subject matter with technology should be viewed as a long term trajectory that goes beyond pre-service teacher education in formal settings. Fishman and Davis argued that as teachers gain more experience, they can continue to expand their knowledge base as well as strengthen the connection between content, pedagogy and technology.

Conclusion and Recommendation

The study has shown that introducing the open source mathematics software in an Instructional technology course to the prospective mathematics teachers helped to develop their attitude towards the use of technology. It also improved their pedagogical skills, mathematics content knowledge levels, and technological skills. The study therefore recommends that for pre-service mathematics teachers to gain full competency in using technology in mathematics teaching, technology integration courses should feature prominently in mathematics education programmes. For successful implementations of such interventions, adaptation of technology which is readily available with the potential of supporting students' higher-order thinking in mathematics should be key.

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JOB SATISFACTION AND MOTIVATION LEVELS OF GRADUATE TEACHERS IN CAPE COAST, GHANA

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Abstract
This study examined teacher motivation and job satisfaction among graduate teachers in Cape Coast, Ghana. Factors that affected teacher motivation and the sources of motivation in teaching were highlighted. Maslow's (1970) need satisfaction variables and Herzberg et al.'s (1959) man's work needs; "motivating factors" and "hygiene factors" formed the components of needs satisfaction in this study. The population consisted of 960 graduate teachers in 11 government senior high schools. The non-proportional quota and convenience sampling procedures were used to select 10 teachers from each school. Mertler's (2002) questionnaire on job satisfaction and perception of motivation among teachers was adapted and modified to solicit responses. Data were analysed using frequencies and percentages. The survey revealed that even though graduate teachers were somewhat satisfied with their jobs, they were un-motivated. Teachers who were dissatisfied with their jobs and were poorly motivated were not likely to perform effectively. The motivated group were most motivated by the job context and content. It was recommended that employers and policy makers should pay particular attention to the higher-order needs proposed by Maslow (1970) and Herzberg et al. (1959) for job satisfaction and motivation.

Key Words: Job satisfaction, Teacher motivation, Teachers salary, Single Spine Pay Policy.

Introduction

Henry Ford, an American Industrialist pointed out the importance of human resources by saying: "Take my business, burn up my building, but give me my people and I will build the business right back again" (Khan, Aslam & Lodhi, 2011, p. 12). He believed that with hard work and commitment, employees could change the fortunes of any institution, but if their needs are not identified

and satisfied, they can plunge the institution into a dike. According to Shah, Rehman, Akhtar, Zafar and Riaz (2012), the most common human resource management practices for retaining and motivating human capital in an institution are rewards and recognition. These practices when provided by the employer make the employee satisfied as well as highly motivated.

Job satisfaction refers to the individual matching of personal needs to the perceived potential of the occupation for satisfying those needs (Shah et al., 2012). Price (2001) defined job satisfaction as the affective orientation an employee has towards his or her work. To Ho, Chang, Shih and Liang (2009), job satisfaction can influence organisational commitment which is the prime area of research for the authors. From the foregoing it suffices to state that job satisfaction is crucial to the production outcomes, commitment levels and social integration of employees of an establishment. Disparities in salary structure between younger and experienced employees do not usually bring good results in organisations. Khan et al. (2011) indicated that young workers are satisfied with the salaries they have, but experienced workers are not paid according to their functions. Ho et al. (2009) hinted that the discrepancy of expectations of a person; what he or she wants and what he or she gains to a large extent determine the intensity of job satisfaction.

Job satisfaction can therefore be seen as the extent to which employees feel positively or negatively about different aspects of a job. These aspects include task orientation, laid down structures, timing, job conditions, compensation, and relationship with co-workers. Khan et al. (2001) reiterated that employee's satisfaction results in pleasant environment in an organisation; the higher the prestige of the job, the greater the job satisfaction (Peretomode, 1991; Whawo, 1993). Reis et al. (2000) contended that when teachers' needs are satisfied, it promotes their psychological well-being and enables optimal functioning and performance. They become well motivated and willing to offer their maximum best for the sustenance of their job. Job satisfaction therefore pivots on motivation.

Motivation relates to the willingness to exert high levels of effort toward organisational goals, conditioned by the ability to satisfy some individual needs (Robbins, 1991). It is the set of internal and external forces that initiate work-related behaviour and determines its form, direction, intensity and duration (Pinder, 1998). Motivation is a factor that exerts a driving force on our actions and work. A highly motivated team of employees helps in achieving the goals of an institution. Obisi (2003) reiterated that no matter how qualified and skilled an employee is, without adequate motivation, he or she would be like an engine without oil which will eventually break

down. Ifinedo (2003) pointed out that it is easy to spot a motivated worker: usually exhibiting high levels of agility, dedication, enthusiasm, focus, zeal, and general performance. He revealed that some of the indicators of motivated employees are their contribution to organisational objectives and goals.

Motivation can be divided into two types; intrinsic (internal) and extrinsic (external). Intrinsic motivation emanates from an interest or enjoyment in the task itself and exists within the individual. Intrinsically motivated individuals have a higher tendency to engage in a task willingly and to improve on their skills. Extrinsic motivation comes from outside of the individual or relies on external pressures or a desire for a reward. Research from different parts of the world indicates that the causes of dissatisfaction and demotivation are mostly outside the control of the teachers. These causes include rewards (e.g. money, grades) (Kilbride, 2013), salary and fringe benefits (Monyatsi, 2012), job security (Doyle & Kim, 1999), and promotion and training opportunities (Bennell & Acheampong, 2007). Kilbride pointed out that a cheering crowd and the desire to win a trophy are also extrinsic incentives.

This study was based on the content theories of motivation. The content theories included; Maslow's Hierarchy of Needs Theory, Herzberg, Mausner and Snyderman Two-Factor Theory, Alderfer's Existence-Relatedness-Growth (ERG) Theory and McClelland's Achievement Motivation Theory. These theorists believed in inner factors that motivate an individual and so formulated the assumption that individuals have set of needs or desires and outcomes which they embark upon with actions to achieve them (Kwarteng, Obeng-Mensah, & Bosompem, 2012).

The need satisfaction variables were divided into five areas based on Maslow's (1970) categorisation. They were physiological, security, social, self-esteem and self-actualisation needs. Herzberg, Mausner and Snyderman (1959) also contributed immensely to the literature on motivation. They categorised man's work needs into "motivating factors" (achievement, status, opportunity for advancement, responsibility, recognition, growth and job challenge) and "hygiene factors" (pay/salary and other benefits, job security, working conditions, company policy and administration, quality of supervision, and interpersonal relationships). When in place, the hygiene needs result in general satisfaction and prevention of dissatisfaction. The motivator needs also result in high motivation, high satisfaction and strong commitment. These areas of needs formed the components of needs satisfaction in this study.

The literature reviewed suggests a relationship between job satisfaction and motivation in any organisational set up. Ololube (2005) indicated a link between the two terms. He acknowledged that job satisfaction is one part of the motivational process. It is possible that an employee may display low motivation from the organisation's perspective yet enjoy every aspect of the job. This state represents high job satisfaction. A highly motivated employee might also be satisfied with every aspect of his or her job (Peretomode, 1991). Ubom (2001) did not find extrinsic incentives (merit pay or effective teaching rewards) to affect teacher job satisfaction and effectiveness among Nigerian teachers.

In a study on determinants of motivation of senior high school agricultural science teachers in the Central Region of Ghana, Kwarteng et al. (2012) indicated that teachers perceived an average level of motivation through job satisfaction, supervision, promotion and involvement in goal setting. The authors indicated a positive and significant relationship between motivation and work conditions, and recognition.

Teachers prefer to be in communities that are easily accessible and having better economic and social possession. They are happy with good pay, big schools where they have the chance of professional growth; where there is not much workload and where they get the administration's support (Sargtent & Hannum, 2005). Teachers may be considered as dissatisfied with their jobs if they have no hand in the formulation of policies in these jobs. If the teachers are satisfied, then they are to a greater extent committed and involved in their job. Job stress, unfriendliness, stance of incompetence in the classroom and un-conducive working conditions could be growing problems that keep teachers out of the profession (Engelkng, as cited in Shah et al., 2012). When the suitable psychological states are provided to employees, it helps to enhance high work motivation and work satisfaction, and these parameters depend upon job characteristics (Frase & Sorenson, as cited in Shah et al., 2012)

Teacher job dissatisfaction has received a lot of attention in Ghana due to the fact that schools witness inadequate teaching personnel, teacher strikes, absenteeism, molestation of teachers leading to requests for transfer, and vacation of post. Graduate teachers leave the profession for other jobs probably because of low motivation and lack of job satisfaction. These are not withstanding the fact that the teacher's level of zeal and devotion is one of the important factors that affect the learner's zest and motivation to learn (Dörnyei, 1998).

Purpose of the Study

The purpose of this study was to examine job satisfaction and motivation levels of graduate teachers in the Cape Coast Metropolis of Ghana. It focused on the assessment of the factors that affected the job satisfaction of teachers and explored the factors that served as motivating or un-motivating. The study was delimited to graduate teachers in public senior high schools in Cape Coast during the closing stages of the 2012/2013 academic year.

Research Questions

1. What are the factors that serve as motivating or un-motivating for graduate teachers in public Senior High Schools (SHS) in Cape Coast?
2. What is the overall level of motivation of graduate teachers in public SHS in Cape Coast with the implementation of the Single Spine Pay Policy (SSPP)?
3. What is the overall level of motivation and job satisfaction of graduate teachers in public SHS in Cape Coast?

Methodology

A survey research design was used in this study to investigate job satisfaction and motivation levels of graduate teachers. The population consisted of 960 graduate teachers teaching in public SHS in the Cape Coast Metropolis. These teachers have undergone programmes of study at the university and obtained various degrees and have been employed permanently by the Ghana Education Service (GES). A sample size of 110 participants was selected for the study from the 11 public SHS in the Cape Coast Metropolis. Fraenkel and Wallen's (2000) contention that a minimum sample of 100 participants was essential for descriptive studies if any meaningful inferences were to be drawn to generalise to the accessible population, justified the choice of the sample. The non-proportional quota and convenience sampling procedures were used to select 10 teachers from each school; five males and five females. These methods were used to ensure that smaller groups were adequately represented in the sample (Ogah, 2013).

Mertler's (2002) questionnaire on job satisfaction and perception of motivation among middle and high school teachers was adapted and used to solicit responses from the respondents. The questionnaire was developed with themes on the works of Maslow (1970) and Herzberg et al. (1959) which covered all the aspects of teacher-related motivation and job satisfaction factors. The questionnaire had a high reliability coefficient. An item on SSPP

public SHS to personally administer and obtain the opinions of the teachers over a three-week period. The questionnaires were given to ten teachers (5 males and 5 females) in each school who gave their consent to participate in the study.

Data Analysis

Three research questions were formulated to provide focus and direction to the study. The collected data were coded and analysed using the Statistical Package for Service Solutions (SPSS) version 20.0 software to generate frequencies and percentages, after screening to determine missing values and outliers. Based on the analysis and interpretation of data, conclusions were drawn and recommendations were made. Normality, through the use of histograms was also concluded. Frequency counts and percentage scores of the responses were computed. Conclusions were made based on the various frequencies and percentages.

Results

This section presents the results of the findings. It begins with a description of the demographic characteristics of respondents, shown in Table 1.

Table 1: Teacher Demographic Characteristics

Measures	Items	Frequency	Percent
Gender	Female	55	50
	Male	55	50
Age	21-25 Years	10	9.1
	26-30 Years	18	16.4
	31-35 Years	29	26.4
	36-40 Years	34	30.9
	41-45 Years	16	14.5
	46-50 Years	3	2.7
Years of teaching experience			
	1-5 Years	18	16.4
	6-10 Years	24	21.8
	11-15 Years	32	29.1
	16-20 Years	19	17.3
	21-25 Years	14	12.7
	26-30 Years	3	2.7

Table 1 indicates that 91 (82.8%) of the respondents were aged 21-40 years. Only 19 (17.2%) were above 40 years. About 80% (n = 89) of the teachers had been teaching for 6-25 years. This information indicates that although majority of the teachers were in their prime age, they had worked for a considerable length of time reminiscent of a job they were interested in or will remain in as a lifelong endeavour. The 16.4% (n = 18) were those who could probably exit the profession when prevailing conditions cannot sustain their interest, expectations and satisfaction as speculated by Ingersoll (as cited in Riggs, 2013) that 40-50% of teachers leave the classroom within their first five years.

Factors that Motivate or Demotivate Graduate Teachers in Public SHS in Cape Coast

To answer this research question, responses to questionnaire items 9a-10j were used. Details of the items that received the highest and two lowest ratings have been presented in Table 2.

Table 2: Respondents' Perception of Factors that are Motivating for Teachers

Response	HM F (%)	M F (%)	NMUm F (%)	Um F (%)	HUm F (%)
Interpersonal relationships with colleagues	14(12.7)	65(59.1)	12(10.9)	15(13.6)	4(3.6)
Sense of achievement	30(27.3)	48(43.6)	23(20.9)	7(6.4)	2(1.8)
Being selected as "Teacher of the Year" in the district	3(2.7)	65(59.1)	12(10.9)	21(19.1)	9(8.2)
Having students thank a teacher for aiding in the understanding of a difficult concept	9(8.2)	57(51.8)	23(20.9)	14(12.7)	7(6.4)
Sense of accountability	12(10.9)	53(48.2)	22(20)	18(16.4)	5(4.5)
Potential for professional growth	12(10.9)	51(46.4)	27(24.5)	13(11.8)	7(6.4)
Recognition	8(7.3)	51(46.4)	29(26.4)	13(11.8)	9(8.2)
Status	6(5.5)	47(42.7)	35(31.8)	17(15.5)	5(4.5)
Salary levels	15(13.6)	18(16.4)	29(26.4)	41(37.3)	7(6.4)
Disciplinary policies	-(-)	9(8.2)	61(55.5)	37(33.6)	3(2.7)

HM = Highly Motivating; M = Motivating; NMUm = Neither Motivating nor Un-motivating;
Um = Un-motivating; HUm = Highly Un-motivating
NOTE: Only the 11 highest and 2 lowest ranked responses were included in the table.

Out of the 28 variables of teaching related sources of job satisfaction and motivation related factors measured in this study, teachers were most motivated by both the job context and content. Being selected as "teacher of the year" in the district (59.1%, n = 65) and interpersonal relationships with colleagues (59.1%, n = 65) were the two topmost factors that motivated graduate teachers in public SHSs in Cape Coast. Over 2% and 12.7% respectively were highly motivated by the two constructs. Other factors that substantially influenced motivation of teachers were having students thank a teacher for aiding in the understanding of difficult concepts (51.8%, n = 57), and sense of accountability (48.2%, n = 53). They were however, not motivated by their salary levels (37.3%, n = 41) and disciplinary policies of the service (33.6%, n = 37).

Overall Level of Motivation of Graduate Teachers with the Implementation of the Single Spine Pay Policy

This was to find out whether teachers were motivated because they had been migrated unto the SSPP. Responses to item number 11 were used. Table 3 shows the responses to the item.

Table 3: Teachers' Motivation from the Current Salary on the Single Spine Pay Policy

Response	Frequency	Percent
Highly motivating	3	2.7
Motivating	19	17.3
Neither motivating nor un-motivating	35	31.8
Un-motivating	34	30.9
Highly un-motivating	19	17.3
Total	**110**	**100.0**

Table 3 indicates that a total of 53 representing 48.2% of the teachers mentioned that the SSPP was un-motivating and highly un-motivating. However, 31.8% (n = 35) of the teachers saw it as neither motivating nor un-motivating while 17.3% (n = 19) saw it as motivating. The neutral group took consolation in the increase in salary, but did not envisage any major advancement in their lifestyle. They could therefore not associate themselves with any motivationary stance. The result that graduate teachers in Cape Coast are not motivated by the implementation of the SSPP indicates that overall, their motivation level is low.

Overall Level of Motivation and Job Satisfaction of Graduate Teachers in Public SHS in Cape Coast

To answer this research question, responses to items 5-8 were used. Tables 4-7 show the responses to the questions.

Table 4: Teachers' Overall Level of Satisfaction with their Job

Response	Frequency	Percent
Very satisfied	12	10.9
Somewhat satisfied	68	61.8
Somewhat dissatisfied	26	23.6
Very dissatisfied	4	3.6
Total	**110**	**100.0**

Table 5: Teachers' Decision to Continue as Teachers if they had the Opportunity to Start a new Career

Response	Frequency	Percent
Yes	67	60.9
No	43	39.1
Total	**110**	**100.0**

Table 6: Teachers' Opinion about whether their Co-Workers were Motivated

Response	Frequency	Percent
Yes	31	28.2
No	79	71.8
Total	**110**	**100.0**

Table 4 shows the response distributions of the overall level of teachers' job satisfaction. A total of 80 representing 72.7% of the teachers responded that they were satisfied, whilst 4 representing 3.6% responded that they were very dissatisfied with their job as teachers. Table 5 revealed that 67 (60.9%) responded positively to continuing as teachers if they had the opportunity to start a new career. The remaining 43 (39.1%) would look for new jobs. However, when asked whether they believed that the teachers with whom they worked were motivated, 79 (71.8%) responded in the negative (Table 6). In their estimation of the co-workers who were un-motivated, Table 7 revealed

that 71 (64%) indicated "more than 10". A little over 22% knew between 5-8 colleagues. The responses of the teachers revealed that even though graduate teachers were somewhat satisfied with their job as teachers, they were un-motivated.

Table 7: Teachers' Estimation of their Un-Motivated Co-Workers

Response	Frequency	Percent
1-2	7	6.4
3-4	3	2.7
5-6	13	11.9
7-8	12	10.9
9-10	4	3.6
More than 10	71	64.5
Total	**110**	**100.0**

Discussion of Results

The results of this study agreed with most of the findings associated with the relationship between job satisfaction, motivation and job performance (Ifinedo, 2003; Ubom, 2001). These results did not differ from previous works on job satisfaction and motivation of employees in general although the possibility of differences accorded job and needs satisfaction was sustainable. The results indicated that the satisfaction of man's needs (Maslow, 1970) and the hygiene and motivator factors (Herzberg *et al.*, 1959) were significant in influencing the job satisfaction and motivation levels of graduate teachers in SHS in the Cape Coast Metropolis of Ghana. For instance, teachers in this study were most motivated by both the job context and content. They preferred establishing coherent interpersonal relationships with their colleagues and receiving annual awards as teachers of the year in the district. Also, they considered having students thank a teacher for aiding in the understanding of a difficult concept, and having a sense of accountability as important factors that motivate them. Teachers would be satisfied if these factors were present in their teaching job and believed that they will be motivated. This result confirms Herzberg *et al.* (1959) that the hygiene factors and motivators were important in different ways and degrees in predicting teachers' job satisfaction. On the other hand they were un-motivated by their salary levels and disciplinary policies of the service. This confirms a report by Riggs (2013) that the expectations from teachers as compared to the amounts they are paid is reprehensible.

Teachers' salary on the SSPP was un-motivating and highly un-motivating to graduate teachers of SHSs in Cape Coast (48.2%, n = 53). The results agree with the study by Ubom (2001) who did not find extrinsic incentives (merit pay or effective teaching rewards) to affect teacher job satisfaction and effectiveness among Nigerian teachers. Research from different parts of the world has highlighted that the causes of dissatisfaction and demotivation such as rewards [e.g. money, grades] (Kilbride, 2013), and salary and fringe benefits (Monyatsi, 2012) are mostly outside the control of the teachers. Shah *et al.* (2012) however, identified increased pay as a key factor behind job satisfaction. This result implies that graduate teachers are not motivated even with the implementation of the SSPP and the subsequent increase in pay. This calls for further enhancement of the teacher's salary and the provision of attractive salary packages which will be competitive and comparable to other government departments.

Although the graduate teachers were satisfied with their job as teachers (72.7%), they were un-motivated (71.8%). Peretomode (1991) and Whawo (1993) have argued that the higher the prestige of the job, the greater the job satisfaction. However, according to Ololube (2005), many workers are satisfied in even the least prestigious jobs. That is, they simply like what they do.

Reis *et al.* (2000) were in agreement that when teachers' needs are satisfied, it promotes their psychological well-being and enables optimal functioning and performance. Teachers' failure to "glitter" should however, be expected if these environmental and personality factors are non-existent. Ubom and Joshua (2004) indicated that teachers are human beings with various needs to be satisfied, and failure to have such needs satisfied leads to frustration, nonchalant attitude towards work and rebellion. The needs of graduate teachers in Ghana should therefore not be compromised for any other thing if the future of the students they teach is paramount among the priorities of nation.

Conclusions and Recommendations

The responses of the teachers revealed that even though graduate teachers were somewhat satisfied with their job as teachers, they were un-motivated. Not even the introduction of the SSPP was motivating enough. Teachers who are dissatisfied with their jobs and are poorly motivated are not likely to perform well and may even behave unprofessionally. Those who were motivated were most motivated by the job context and content, that is interpersonal relationship with colleagues, recognition, and feedback from

students. Based on the above findings, it is recommended that employers and policy makers pay particular attention to the higher-order needs proposed by Maslow and Herzberg *et al.* for job satisfaction and motivation. Lastly, the Ministry of Education in conjunction with the Ghana Education Service should institute policies to adequately recognise or motivate teachers with annual material rewards and grant them study leave with pay to take up studies in institutions of higher learning.

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JUNIOR HIGH SCHOOL TEACHERS' USE OF PEDAGOGICAL CONTENT KNOWLEDGE IN TEACHING AND LEARNING MATHEMATICS IN AKATSI DISTRICT OF GHANA

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Abstract
The purpose of this study is to explore how teachers use their pedagogical content knowledge (teachers' knowledge of content and students' thinking) to identify and diagnose students' misconceptions in addition and division of fractions. Teachers were expected to identify students' misconceptions, give reasons for these misconceptions and ask specific questions to diagnose students' thinking processes that lead to the misconceptions. A total of 40 teachers teaching mathematics were purposively selected from schools which performed poorly in the 2010 Basic Education Certificate Examinations in the Akatsi District. Questionnaires with four in-class problems consisting of students' commonest misconceptions in addition and division of fraction were used to collect data. Descriptive statistics was used to analyse the data. It was found that the majority of the teachers could identify students' misconceptions but could not articulate the reasons for such misconceptions clearly. It was also found that teachers could not ask specific questions to diagnose students' misconceptions. It was recommended that teacher training institutions integrate pedagogical content knowledge (teachers' knowledge of content and students' thinking) into the curriculum to equip teachers with skills that would enable them analyse students' thinking processes.

Key Words: pedagogical content knowledge, mathematics, fractions, errors — teachers'

Introduction

Teaching and learning of mathematics has attracted the attention of not only mathematics education researchers in Ghana but also the Government of Ghana. According to Anamuah-Mensah, Mereku and Ampiah (2008), junior high school form 2 students performed poorly in the 2004 Trends in Mathematics and Science Study (TIMSS) and when TIMSS data was analysed in the context for learning mathematics in Ghanaian schools, it was observed that students have little opportunity to use concepts, solve routine problems and reason mathematically.

Asiedu-Addo and Yidana (2000) discussed basic school pupils' poor performance in mathematics vis-a vis teachers' competence in Ghana and found that pupils' poor performance was due to teachers' low content knowledge and pedagogical knowledge in mathematics. Meanwhile, Darling-Hammond (2006) observed that quality teachers play a crucial role in developing students' knowledge, understanding and competencies needed to reach their full potential and contribute to their democratic society. Hence, the importance of quality teaching cannot be overemphasised since students need greater knowledge and skills to survive and succeed.

Kennedy (2001) was of the view that in order to achieve quality classroom teaching, the solutions should start from teachers. According to Kennedy (2001):

> *It is true that we want and need a 'quality profession'. Yet it is equally true that we need individual teachers who make up the profession to be committed to quality teaching..... what the profession says as a whole should come to life in individual classrooms (p. 6).*

Since 1989, international development partners such as the United States Agency for International Development (USAID), the Department for International Development (DFID) and Japan International Cooperation Agency (JICA) have embarked upon professional development programmes to improve the level of teaching in an effort to improve the quality of teaching which would in turn raise student achievement. Despite a decade of reforms, there is still concern that students' achievement in mathematics and science has not improved sufficiently to reflect the huge investment in basic education development (Ansu-Kyeremeh et al, 2002).

Ghanaian education researchers have also carried out research studies to reveal some of the difficulties pupils face learning mathematics by looking at teachers' content knowledge and pedagogical knowledge (Davis & Ampiah, 2008; Asiedu-Addo & Yidana, 2000). However, no study in Ghana has

particularly looked at teachers' pedagogical content knowledge in order to ascertain their knowledge of students' misconception or thinking processes, teachers' knowledge of reasons for students' misconception and how teachers ask questions to diagnose students' thought processes.

Literature Review

Literature has revealed that there is increasing evidence that teachers' knowledge of students' thought processes and reasoning during teaching and learning influences students' concept formation in mathematics (Gearheart& Saxe, 2004). Shulman (1986) pointed this out nearly 30 years ago when he specified the kinds of content knowledge teachers need beyond subject matter knowledge in order to teach their students effectively. Shulman defined pedagogical content knowledge as the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interest and abilities of learners, and presented for instruction.

Chick and Baker (2005) explored the usefulness of a framework for investigating the pedagogical content knowledge of two primary mathematics teachers who completed a questionnaire on Mathematics teaching and were later interviewed about their responses. Five solutions containing students' misunderstanding were given to the teachers to identify the students' misunderstanding and describe approaches they would use to teach subtraction of whole numbers, long divisions, addition of unlike fractions, decimals and ratio. It was found that the two teachers identified the students' misunderstanding but could not give the reasons for the students' misunderstanding.

Similarly, Oyunaa (2008) conducted a study on how mathematics teachers transform subject matter knowledge into classroom teaching. The study investigated two groups of teachers who had common professional degrees. The researcher categorized subject matter knowledge into content knowledge, pedagogical content knowledge and curriculum knowledge and their transformation in the classroom, focusing on fractions. Oyunaa pointed out that when teachers transform pedagogical content knowledge into classroom teaching, they emphasize one of the three categories of knowledge in accordance to the emphasized knowledge where the categories of knowledge are modified in the process to suit classroom teaching.

Turnuklu and Yesildere (2007) conducted a research involving 45 primary mathematics teachers. Four solutions containing students' misunderstanding were given in order to reveal the teachers' approaches to

teaching mathematics in topics of fractions, integers and decimals. Each of the problems fundamentally focused on teachers' interpretations of students' misconceptions or misunderstandings of Mathematical knowledge which was analysed quantitatively and qualitatively. It was found that teachers identified students' misconceptions but have difficulty in determining the reasons for the students' misconceptions about fractions and decimal fractions.

Ball, Mark, and Phleps (2007) explored teachers' pedagogical content knowledge, using an approach that was characterized as working 'bottom up'. They reported that teachers need both content and pedagogical knowledge to be able to organize classroom instruction, and present key ideas and concepts. This is because teachers could not give reasons for students' misunderstanding after identifying students' misconceptions.

Stacey, Steinle, Irwin, and Bana (2001) investigated teachers' content and pedagogical content knowledge of decimal numeration. Teachers were asked to complete decimal comparison test, mark items they thought would be difficult for students, and explain why it was difficult. It was recommended that teachers should emphasize content knowledge that integrates different aspects of number knowledge, and pedagogical content knowledge that includes thorough understanding of students' common difficulties.

Theoretical Framework

The study was based on Shulman's (1986) transformative theory of pedagogical content knowledge — *knowledge of content and students' thinking (KCS)*. Shulman identified that discipline knowledge alone is insufficient for successful teaching. According to Shulman (1986) teachers need a special knowledge of students' thinking to understand typical student conceptions, and why these conceptions exist. For that matter, Shulman presented a strong case for pedagogical content knowledge (PCK) as a specific form of knowledge for teaching which allows teachers to understand and anticipate particular preconceptions or learning difficulties of their students. Shulman's knowledge of content and students' thinking prepares teachers to be able to identify students' misconceptions, identify reasons responsible for students' misconceptions and diagnose students' thinking with appropriate questions. Indeed, Ball, Mark and Phleps (2008) reported that teachers needed the pedagogical content knowledge to be able to organize classroom instructions, and present key ideas and concepts to students because Mathematical knowledge required for teaching is indeed multidimensional.

Also, World Bank (2007) thematic study on Developing Science, Mathematics and Information Communication Technology Education in Sub-Saharan Africa (SMICT) with Ghana among the ten countries selected, indicated that inadequate pedagogical content knowledge of teachers in mathematics put limitations on the successful implementation of new curricular with intended new content and teaching methodology. It was identified that teachers did not have sufficient confidence in their ability to deal with matters if students went wrong during lessons.

In GES/ JICA (2008) survey on lesson observation, it was found that pupils' errors and mistakes were not well dealt with. This was because teachers teaching mathematics in basic schools lacked error analysis skills. According to the survey team, in order to improve classroom practice, teachers need to be equipped with not only subject content knowledge and teaching strategy but also pedagogical content knowledge which provides teachers with perspective as to how to use teaching and learning materials, how to enhance the learning of pupils and how to analyse pupils' mistakes since utilizing pupils' mistakes can be one of the most effective strategies of teaching and learning.

However, no specific research has been conducted as a follow up to confirm the observations made in World Bank (2007) thematic study and GES/ JICA (2008) survey on lesson observation. The present study intended to investigate teachers' pedagogical content knowledge vis-à-vis identification of pupils' misconceptions, giving reasons for pupils' misconceptions and asking specific questions to diagnose pupils' misconceptions in the teaching and learning of addition and division of fractions.

The purpose of the study was therefore to explore how junior high school teachers teaching Mathematics use their pedagogical content knowledge to identify pupils' misconceptions, give reasons for pupils' misconceptions and ask specific questions to diagnose pupils' misconceptions in the teaching and learning of addition and division of fractions.

Research Questions

The study intended to answer the following three questions:

1. How well do junior high school mathematics teachers use their pedagogical content knowledge to identify students' misconceptions in addition and division of fractions?
2. To what extent can teachers give reasons for pupils' misconceptions in addition and division of fractions?

3. How well do junior high school teachers use their pedagogical content knowledge to ask questions in order to diagnose students' misconceptions in addition and division of fractions?

Research Design

The research made use of descriptive survey design. This type of research would assist to describe the characteristics that exist in a population, but not to determine the cause-and- effect relationship. The justification for the use of the design was that it would provide detailed description of the professional competence of mathematics teachers and how these translated into the teaching and learning of addition and division of fractions.

Population and Sampling

The population for the study was 220 teachers in 35 junior high schools in the Akatsi District of the Volta Region. There were 10 circuits in the district from which eight (8) schools were purposively selected based on the schools' performance in the 2010 Basic Education Certificate Examinations provided by the Akatsi District Education Office. There were forty teachers in the selected schools for the study which comprised 38 males and 2 females. All the teachers in the selected schools took part in the study because they all taught mathematics.

Instrument

The instrument used for the study was a questionnaire. Some items in the questionnaire on the misconceptions of addition and division of fractions were adapted from a similar instrument used in a study conducted by Chick and Baker (2005). The questions adapted from Chick and Baker comprised four in-class problems which consisted of two questions each on addition and division of fractions. The four in-class problems were designed to investigate the use of teachers' PCK to identify students' misconceptions, give reasons for students' misconceptions, and ask specific questions to diagnose students' thinking processes.

The questionnaire was structured with open ended items. The complete questionnaire was given to a team of supervisors in the field of mathematics education for expert judgment in order to ensure content validity and item relevance. The questionnaire-approach was suitable because it allowed teachers to make considered responses to the questionnaire without feeling pressured to answer on the spot.

Pilot Study

The questionnaire was pilot tested at Abor Weme Junior High School for item relevance. This school was not part of the population for the study. Twelve mathematics teachers took part in the study. The teachers' responses led to the restructuring and modification of some of the items in the questionnaire. During the pilot study, teachers' responses were read to them and discussed in order to find out if what they wrote were exactly what they intended to write. This was to enable us compare their responses with the responses of the teachers in the main study.

Data Collection Procedure

The researchers visited the junior high schools selected and administered the questionnaires to forty (40) teachers who were teaching mathematics in the eight schools purposively selected. Face to face discussion was held before the questionnaires were administered to the teachers. There were twelve (12) items on teachers' pedagogical content knowledge in the questionnaire which were sub-divided into three thematic areas namely, identification of students' misconception, giving reason(s) for students' misconception, and diagnosing students' misconception through specific questioning.

Data Analysis

Data were analysed using frequencies and means. The frequencies for each of the criteria were set according to the components of pedagogical content knowledge. The criteria for each problem are listed below:

1) Identifying students' misconception
2) Giving appropriate reason(s) for students' misconception
3) Asking specific questions to diagnose students' misconception.

In the analyses, three (3) points each were given for correct identification of misconceptions, correct reasons for misconception, and asking specific questions (what the student did wrong) to diagnose students' misconception. Two (2) points each were given for providing insufficient reasons for students' misconceptions and asking leading questions (questions directing students towards correct answers) instead of specific questions to diagnose students' misconceptions and one (1) point each was given for only -identification of students' misconception, and asking unclear questions (ambiguous questions) to diagnose students' misconceptions.

Also, a grand mean between 2.45 – 3.00 was determined as excellent; a grand mean between 1.95 —2.44 as moderate and a grand mean between 1.00

scores were calculated and used for assessing their performance on all 4 problems combined and they were interpreted according to the three (3) criteria listed above.

Results

Research Question 1: How well do junior high school mathematics teachers use their pedagogical content knowledge to identify students' misconceptions in addition and division of fractions?

Table 1: Number and Percentage of Teachers' Responses Regarding Identification of Students' Misconceptions

Nature of Error	1 point	3 point	Mean score $(f_1x_1 + f_3x_3)/40$
Solution $\frac{3}{7} + \frac{2}{7} = \frac{5}{14}$	10 (25%)	30 (75%)	2.50
Solution $\frac{3}{8} + \frac{1}{9} = \frac{4}{17}$	15 (37.5%)	25(62.5%)	2.25
Solution $\frac{9}{10} \div \frac{3}{10} = \frac{10}{9} \div \frac{3}{10} = \frac{30}{90}$	16(40%)	24(60%	2.20
Solution $4 \div \frac{1}{4} = \frac{1}{4} \times 4 = 1$	18(45%)	22(55%)	2.10
Grand Mean	36.9%	63.1%	2.26

Where x_1 is the score 1, x_3 is the score 3 and f_i is the corresponding frequency.

Table 1 indicates that a large number of teachers (Mean = 63.1%) was able to identify students' misconceptions. This showed that most of the teachers were aware of students' misconceptions when carrying out operation on fractions. A grand mean of 2.26 indicated that on the average, the teachers used pedagogical content knowledge on identification of students' misconceptions reasonably well.

Research Question 2: To what extent can teachers give reasons for pupils' misconceptions in addition and division of fractions?

Table 2: Number and Percentage of Teachers' Responses Regarding Teachers' Knowledge of Reasons for Students' Misconceptions

Nature of Error	1 point for Inaccurate reason	2 points for Insufficient reason	3 points for Good reason	Mean score $(f_1x_1 + f_2x_{2+} f_3x_3)/40$
Solution $\frac{3}{7} + \frac{2}{7} = \frac{5}{14}$	18(45%)	1 (2.25%)	21(52.5%)	2.08
Solution $\frac{3}{8} + \frac{1}{9} =$	26 (65%)	2 (5%)	12 (30%)	1.65
Solution $\frac{9}{10} \div \frac{3}{10} = \frac{10}{9} \div \frac{3}{10} = \frac{30}{90}$	25 (62.5%)	1 (2.5%)	14(35%)	1.73
Solution 4 $\div \frac{1}{4} = \frac{1}{4} \times 4 = 1$	26 (65%)	2 (5%)	12 (30%)	1.65
Grand Mean	**59.4%**	**14.8%**	**36.9%**	**1.78**

Where x_1 is the score 1, x_2 is the score 2, x_3 is the score 3 and f_i is the corresponding frequency, Table 2 shows that 59.4% of the teachers could not give any accurate reasons for pupils' misconceptions, while 36.9% of the teachers were able to give sufficient reasons for pupils' misconceptions. However, 14.8% gave insufficient reasons for pupils' misconceptions. Even though most of the teachers (Mean = 63.1%) were able to identify students' misconceptions, it was evident from Table 2 that a greater proportion (74.2%: 59.4% + 14.8%) of the teachers were not able to give convincing reasons to support the reasons why students showed those incorrect thought processes. A grand mean of 1.78 revealed that on the average the teachers had insufficient pedagogical content knowledge on giving appropriate reason(s) for students' misconceptions.

Research Question 3: How well do junior high school teachers use their pedagogical content knowledge to ask questions in order to diagnose students' misconceptions in addition and division of fractions?

Table 3: Number and Percentage of Teachers' Responses Regarding Questions Teachers ask to Diagnose Students' Misconceptions

Nature of Error	1 point for asking unclear questions	2 points for asking leading questions	3 points for asking specific questions	Mean score $(f_1x_1 + f_2x_2 + f_3x_3)/40$
Solution $\frac{3}{7} + \frac{2}{7} = \frac{5}{14}$	15(37.5%)	20 (50%)	5(12.5%)	1.75
Solution $\frac{3}{8} + \frac{1}{9} = \frac{4}{17}$	16 (40%)	18 (45%)	6 (15%)	1.75
Solution $\frac{9}{10} \div \frac{3}{10} = \frac{10}{9} \div \frac{3}{10} = \frac{30}{90}$	10 (25%)	24 (60%)	6 (15%)	1.90
Solution $4 \div \frac{1}{4} = \frac{1}{4} \times 4 = 1$	6 (15%)	30 (75%)	4(10%)	1.95
Grand Mean	**29.4%**	**57.5%**	**13.1%**	**1.84**

Where x_1 is the score 1, x_2 is the score 2, x_3 is the score 3 and f_i is the corresponding frequency, Table 3 indicates that a large number of teachers (Mean =57.5%) asked leading questions which were giving clues to the correct answers. Indeed, leading questions could not enable teachers to ascertain what actually went wrong during the students' thought processes unlike specific questions which would reveal what actually went wrong during the students' thinking processes. Only a small number (Mean =13.1%) asked specific questions that could reveal the students' thinking process that led to the misconceptions. This was because from Table 2, a greater proportion (74.2%: 59.4% + 14.8%) of the teachers could not give sufficient reasons why students exhibited those incorrect thought processes. A grand mean of 1.84 in Table 3 shows that on the average the teachers have insufficient pedagogical content knowledge on asking specific questions to diagnose students' misconceptions.

Discussion

The results in Table 1 and Table 2 showed that teachers were able to identify students' misconceptions but could not articulate the reasons for the misconceptions. The finding is consistent with the study conducted by Stacey, Helme, Steinle, Baturo, Irwin, and Bana (2001) who recommended that

teacher education needed to emphasize content knowledge that integrates pedagogical content knowledge that includes thorough understanding of students' common difficulties. It is also in line with the study conducted by GES/JICA (2008) which revealed that teachers' inability to articulate clearly reasons for students' misconceptions could be attributed to lack of error analysis skills. Again, it is supported by Chick and Baker (2005) and Ball, Mark and Phleps (2008) who found in their studies that teachers did not have sufficient knowledge of the reasons for students' misconceptions. As a result, most of the teachers failed to give specific reasons behind students' wrong conception and/ or reasoning.

Furthermore, the finding is consistent with Turnuklu and Yesildere's (2007) study which also revealed that teachers have difficulty in determining reasons for students' misconceptions. The results in Table 3 also pointed out that teachers were asking leading questions instead of specific questions to diagnose students' misconceptions. This finding gave credence to the study conducted by Battey, Chan, Franke, and Webb (2009) who also found that substantial minority of teachers asked specific questions to elicit students' misconceptions.

Conclusions

Based on the findings and discussions that followed, it can be concluded that:

1. most teachers were able to identify students' misconception;
2. teachers could not give sufficient reasons for the students' misconceptions and
3. teachers could not ask specific questions to diagnose students' misconceptions.

Recommendations

Based on the discussion and conclusions, it was recommended that;

1. Teacher training institutions could integrate pedagogical content knowledge (teachers' knowledge of students' thinking) courses which would equip teacher trainees with skills to analyse students' thinking processes.
2. Through School-Based INSET (SBI) and Cluster-Based INSET (CBI), the Ministry of Education in collaboration with the Ghana Education Service should emphasise pedagogical content knowledge activities to equip teachers with skills to analyze students' thinking processes.
3. The Ministry of Education in collaboration with the Curriculum Research and Development Division (CRDD) should explicitly

incorporate the concepts of pedagogical content knowledge into the Mathematics curriculum to enable teachers gain better insights into pupils' thinking to enable them perform proper error analysis on pupils' misconceptions.

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A CRITICAL ANALYSIS OF THE COGNITIVE CONSTRUCTIVIST AND SOCIOCULTURAL THEORIES AS A FRAME FOR KINDERGARTEN EDUCATION

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Abstract
The concern for how young children learn has been an issue that has agitated the minds of theories and researchers for a very long time. However, currently early childhood educators are becoming increasingly aware of the impact of the cognitive constructivist theory of learning and the sociocultural theory of learning on teacher practices in kindergarten classrooms. Thus, the main thrust of the paper was to examine the affordances of the two theories of learning in terms of teaching and learning and assessment practices in early childhood classrooms. In addition, the contrarieties and connections which are inherent in both theories would be extensively discussed.

Introduction

From the standpoint of the Western world, for a very long time, the education of young children has always been anchored on theories of learning and development. These theories often highlight how young children gain consciousness and understanding about the world within which they find themselves. Traditionally, this conception about how children construct their own knowledge is deeply rooted in the writings of Rousseau, Pestalozzi and Gesell. The theories of these personalities were later refined and improved upon by Piaget and this crystallised into the genetic epistemology or cognitive constructivist theory of learning which constitutes one of the theoretical frameworks underpinning early childhood curriculum. As observed by Kamii and Ewing (1982), Piaget's cognitive constructivist theory which underscores early childhood curriculum aims at providing learning experiences which are suitable for children's age and level of development while at the same time providing room for them to construct their own knowledge. This suggests that

children tend to construct their own knowledge and understandings about the world and its phenomena whenever they are given the opportunity to explore their environment.

Piaget's version of constructivism sees the child as a solitary learner. However, Vygotsky's sociocultural theory which has become an integral part of the theoretical frameworks for the early childhood curriculum presents another view of children's development in which social interactions between children and adults become the bedrock for young children's acquisition of knowledge. As a result, knowledge which is deemed appropriate stems from the sociocultural practices, beliefs, and experiences of the community within which the child is born. Vygotsky situated his work in a tradition which dates back to Dewey (1805, 1952); Hegel (1807, 1967); Marx, (1867, 1977); Lenin (1870, 1924) and Parker and Goicocchea (2000). However, there are also points of convergence between the two theories with respect to how children develop. Thus, the kindergarten curriculum and approaches to teaching and learning in kindergarten classrooms are predicated on Piaget's cognitive constructivist theory and Vygotsky's sociocultural theory both of which highlight how young children construct knowledge and their understandings about the world around them. The two theories are anchored on constructivism. Constructivism is a meaning- making theory that gives clarification about the nature of knowledge and how young children learn. Children's actual understanding about concepts stems from the processes involved in knowledge creation which usually hinges on the interactions between children's prior knowledge and new experiences they go through in life. Thus, individual children create their own knowledge through the interplay between what they already know such as ideas, events and various forms of activities they engage in and outside kindergarten classrooms. Therefore, a kindergarten teacher serves as a guide, facilitator and a partner in exploration and as well inspires children to interrogate issues that play out in every learning context.

These processes serve as means of helping young children make meaning about the world around them (Simpson, 2008; Fox, 2010; Matusov & Hayness, 2000; Parker & Goicoechea, 2010; Ultamer, 2012). The thrust of this paper therefore, is to critically examine the affordances of Piaget's cognitive constructivist theory (Wadworth, 2003) and Vygotsky's sociocultural theory (Wertch, 1983) in terms of teaching and learning, and assessment practices in kindergarten classrooms. It also examines the contrarieties and connections which are inherent in the theories. The paper will be configured as follows; first, the affordances of the two constructivist

theories in terms of teaching and learning, and assessment practices in kindergarten classrooms would be highlighted and examined; second, the contrarieties which are inherent in both theories would be extensively discussed and finally, the elements that connect both theories would be examined to unearth the commonalities that are inherent in both theories.

Education in Kindergarten Classrooms

The theoretical frameworks of Piaget and Vygotsky's underpin the kindergarten curriculum in Ghana. The teaching and learning in kindergarten classrooms is therefore, anchored on the notion that young children actively create their own knowledge by relying on what they currently known to construct knowledge within the context of the physical and the social world. Therefore, by juxtaposing their prior experiences with their current experiences they are able to identify patterns and trends from their new experiences for the purpose of understanding the world around them (DeVries, Zan, Hilderbrant, Edmiaston & Sales, 2006). Constructivism education therefore, refers to a learning environment that takes into consideration the interest of young children by providing opportunities for them to experiment and cooperate among themselves in the course of engaging in tasks that have been assigned to them (Kamii & DeVries, 1993).

Constructivist Principles of Teaching in Kindergarten Classrooms

In kindergarten classrooms, teachers who subscribe to the constructivist principles of teaching are expected to have an in-depth knowledge about the roles they are expected to play in every facet of the teaching and learning process. Teachers who often use teaching approaches which are characterised by telling and directing children's activities have no place in constructivist kindergarten classrooms. Nonetheless, if they want to remain relevant within the context of constructivist kindergarten classrooms, they ought not to see themselves as frontal agents for producing knowledge. Rather they should make room for kindergarten children to actively engage in a variety of activities for the purpose of making meaning out of their experiences (DeVries et al, 2006). Thus, constructivist teachers act as facilitators hence, they only assist young children to construct their own knowledge in the classrooms. The constructivist teaching principles in kindergarten classrooms include creating a co-operative sociomoral environment; provoking children's interest; teaching in terms of the kind of knowledge involved; selecting content that challenges children: stimulating children's reasoning: providing adequate

time for children to explore and linking ongoing documentation and assessment with curriculum activities.

Institute a Cooperative Sociomoral Environment

The creation of a sociomoral ambiance within the kindergarten classroom is one of the principles underlining constructivist approaches to teaching in kindergarten classrooms. The sociomoral environment encompasses all facets of interpersonal relationships that cover every aspect of the child's experiences. These relationships tend to have an impact on children's learning because it engenders holistic development of children in terms of intellectual, physical, emotional, moral, social and spiritual aspects of life (DeVries, et.al 2006). Thus, a constructivist teacher is expected to consider children's needs and what individual children want to learn and then incorporate them into the curriculum. This eventually creates a classroom environment where children consider the views of their peers in their daily interactions with certain elements within the classroom and even beyond the classroom settings. In addition, children tend to see each other as equals hence, in the course of engaging in group activities they are inclined to value the views expressed by their colleagues with respect to how a task assigned to them by the teacher should be accomplished. However, this does not mean that the children have the liberty to do whatever pleases them. The teacher exercises modicum of checks and controls to make sure that none of them infringes on the rights of other children or engages in acts that are untoward (Kamii & DeVries, 1993).

Provoke Children's Interest

Children learn better if the activities they engage in are of interest them. In addition, the interest that a child shows in a particular activity appears to be an indicator of the potential that a child has. The learning environment in kindergarten classroom should be configured in such a way that the interest of individual children becomes an overriding factor in determining the elements that should be incorporated into the curriculum (DeVries, 1993). This implies that if a kindergarten curriculum is crafted within the context of children's interests, it is likely to provoke the interest of individual children to engage in certain activities. This has the possibility of providing a platform for the teachers to have inkling and insights about the uniqueness that individual children bring into the classroom context. The constructivist teacher therefore, is expected to keenly observe children as a means of identifying the interest of individual children. This would make it possible for the teacher to

incorporate appropriate activities into the curriculum to help individual children harness the uniqueness that each of them brings into the classroom context (DeVries, 1993). However, DeVries, Zan, Hildebrendt, Edmiaston and Salas (2006) outline the following parameters to guide teachers in a constructivist kindergarten classroom in the course of selecting activities for a particular lesson: First, the teachers should select materials and activities which are likely to attract a child's interest. DeVries et al (2006) further argue that the selection of materials and activities along these lines could take the form of displaying variety of materials for children to explore the possibility of identifying materials that best suit their interest. Second, there is the need for the teacher to explain the relevance of each material on display.

However, in the course of explaining the uses of each of the materials on display the teacher is expected to observe individual children for a while to establish whether some of them would be attracted to any of the materials or activities on display. Again, for the purpose of establishing the uniqueness or the interest that individual children bring into the classroom context, there is the need for the teacher to keenly observe what children do instinctively because this is a precursor for identifying a child's interest. Young children do not always express their viewpoints on whatever activities they are engaged in. However, by keenly observing them, the teacher would be able to predict certain possible questions that a child may be pondering over. In addition, there is the need for the teacher to find out from individual children what they want to learn.

However, some of the young children are usually not in a position to figure out what they want to learn hence, there is the need for the teacher to device ingenious ways of helping young children who find themselves in such situations. For example, whenever a situation of this nature presents itself, the teacher can fall on one of the children's expressed interest as a basis of finding out if other children would like to engage in a similar activity.

Finally, there is the need for the teacher to give individual children sufficient time to decide as to which of the activities best suit their interest (DeVries, 1993). In short, selection of materials and activities that are of interest to the child, identifying the uniqueness that each child brings to the classroom and providing sufficient time for children as to which material best suits their interest tend to influence children's learning.

Teach in terms of the kind of Knowledge involved

Piaget's categorization of knowledge is very useful for constructivist teaching in kindergarten classrooms. This comprises physical knowledge, logico-mathematical knowledge, and arbitrary conventional knowledge (Wadsworth, 2003). Physical knowledge for example is created when children observe how an object reacts to certain actions undertaken by them. For instance, when a child pushes a ball and observes it rolls along. In the course of observing the reactions of the object in question, the child tends to construct a kind of knowledge termed as logico-mathematical. For example, when a child pushes a cube and comes to the realisation that the movement differs from that of the ball, then the conclusion he or she might draw is that the difference between the objects is not based on the nature of the objects but it stems from the knowledge constructed within the child's mindet in terms of the differences in the movement patterns of the two objects.

Therefore, the logico-mathematical relations constitute the basis of intelligence. Hence, individual children within the kindergarten classrooms are capable of becoming intelligent if only they are engaged in requisite activities within the kindergarten settings. As a consequence, physical activities are not only meant to help children understand the physical world but are also geared towards developing the intelligence of individual children as well. The third type of knowledge which is termed as arbitrary conventional knowledge is a kind of knowledge that can be acquired through other people (Kamii & DeVries, 1993). Hence, within the classroom context this sort of knowledge is usually transmitted to children through teachers. For example, arbitrary knowledge comprises names of objects and concepts. The import of the three types of knowledge for kindergarten teachers is that it helps them to employ differing approaches in teaching the various knowledge forms. If it is arbitrary, the kindergarten teacher is expected to tell or show children the object in question. If it is physical, the teacher is expected to engage children in varieties of activities to enable them establish the reactions therein. These sorts of activities can be done on individual basis or in small groups. In addition, if it is logico-mathematical, the teacher is expected to provide experiences which would help children to construct their own knowledge (Kamii & DeVries, 1993; DeVries, et al 2006).

Select Content that Challenges Children

Several authors (DeVries,1993; Kamii & DeVries, 1993; DeVries et al., 2006) argue that constructivist teachers should engender the culture of inquiry- based learning in kindergarten classrooms and evaluate the kindergarten curriculum by taking into consideration the following issues; provide activities that enhance open inquiry; make sure that activities are in sync with the intellectual ability of individual children; ensure that the activities make room for variety of responses; ensure that the activities children engage in have the possibility to trigger off children's curiosity, attract attention or provoke their interest; and as well ensure that the activities provide room for young children to think on their own. On this score, DeVries et al (2006) maintain that in the course of selecting activities for young children, the teacher is expected to determine whether the content is relevant for enhancing the development of individual children in the classroom settings. The import of this is that when activities are selected on the basis of its challenging nature, the possibility is that it can enhance the intellectual development of young children because as they engage in various activities the children are able to integrate their learning experiences by drawing linkages and disconnections across different content areas.

Stimulate Children's Reasoning

According to DeVries (1993) the constructivist kindergarten teacher is expected to employ questioning techniques and other measures to enhance the thinking capacity of young children. DeVries et al. (2006) posit that there is the need for the teacher to consider the following with respect to the line of questioning and the corresponding answers:

First, there is the need for the constructivist teacher to find out what exactly is the thinking of the child on issues relating to the activities that individual children are engaged in within the classroom context. Through good questioning skills and the corresponding answers that are provided to the questions, the teacher would be able to craft follow-up activities for the purpose of clarifying certain doubts that a child earlier on might have had about certain issues that came up in the course of engaging in certain learning activities. As children become used to the interest and value that the teacher attaches to their questions, they are likely to be emboldened and inspired to share their views on issues being discussed in class no matter how worrying the issues might seem to be. However, when a teacher has the tendency of not listening to children's wrong ideas about issues that come up during class

discussions, the children would definitely not express their views in class. The snag about this situation is that the teacher would not know the challenges that individual children would be going through to enable him or her take remedial measures to address them accordingly.

Second, the preoccupation of the constructivist teacher should be to motivate young children to engage in activities that are of interest to them. In some instances the mere presentation of materials that are rich in educational opportunities would trigger off children's interest and desire to experiment and explore certain activities. The teacher is therefore, expected to ask questions that would open the door for young children to engage in practical tasks. Nonetheless, once the child has succeeded in an accomplished task, the teacher is expected to interrogate the child further to find out from him or her how each of them did it.

From an analytical perspective, five fundamental issues which impinge on how young children learn come to the fore. First, the teacher's ability to employ good questioning skills to help young children to explore the deeper meaning of some issues that come up in the various activities that they are engaged help children to learn. These activities which can be done on an individual basis or in a group context is crucial for children's development.

Second, it also brings to the fore that problem solving activities that young children engage in are likely to influence children's intellectual development. These insights are very crucial for constructivist teachers because it helps them to configure inquiry-based learning in kindergarten classrooms with respect to physical knowledge in such a way that the development of children can be enhanced. For example, a young child may be hitting a ball against a pile of sticks and then a teacher comes in and instructs the child to pick several stones and erect a pile and hit the stones from a distance with a ball as the child did in the case of the sticks. The child is then asked by the teacher to compare and contrast the reactions of the ball in both cases.

Third, Kamii and DeVries (1993) argue that teachers have certain roles to play whenever young children are engaged in activities which best serve their interest and abilities. The teacher is expected to find ingenious ways of focusing children's thinking on a particular part of the activity which is likely to enhance their development.

Fourth, the teacher is expected to augment children's effort with very useful suggestions to help them figure out the various perspectives that a particular learning material has as they are engaged in various learning

activities. This would eventually help the children to develop the capacity of looking at issues from various angles which is at the heart of the quest of engendering critical mindedness in young children. For example, in a kindergarten classroom two young children may be trying to figure out the rate at which an orange can roll on the ground from one end of the class to another. The teacher might suggest to the children to rather compare the rate at which a football and an orange roll on the ground from start to finish. However, there is the likelihood that the children might ignore some of the suggestions of the teacher particularly in a classroom context where the teacher has succeeded in making the children autonomous thinkers (DeVries, 1993).

Finally, teachers in kindergarten classroom settings are expected to develop the reasoning capacity of young children. Hence, activities should be configured in such a way that room would be given to the children to experiment and explore different kinds of materials in their environment for the purpose of heightening their intellectual development. Meanwhile, it is important for kindergarten teachers to take cognisance of the fact that if so many questions are asked within one particular activity session there is the likelihood that the children might lose interest in the activity they are engaged in. However, interventions by the teacher become useful when it has a direct bearing on a particular task that a child is trying to accomplish. Nonetheless, these interventions have the possibility of opening up a window of opportunity for children to have insights about certain concepts, thereby opening up a new world of possibilities for them (DeVries, 1993).

Provide Adequate time for Children to Explore

Young children are not in a position to construct knowledge and its attendant complicated interrelatedness within a short span of time. On this score, DeVries et al (2006) posit that there is the need for kindergarten teachers to give children sufficient time to explore whatever task they have been engaged in. This stems from the fact that they need adequate time to acquaint themselves with the nature and workings of the materials they are interacting with. Children usually need adequate time to revisit certain themes that have bearing on activities they earlier on engaged in for the purpose of deepening their understandings about certain issues that featured in the activities. For example, in a kindergarten classroom children may be given one week to learn about domestic animals; the next week might be set aside for the study of

insects and finally the subsequent week might be earmarked for the study of different colours. However, one week for each of the activities in class is a limited time for children to even understand the workings of the materials, let alone engage in painstaking probing and investigation because it takes some time for them to become used to the learning materials. Thus, when children are given adequate time and materials to engage in activities, there is the likelihood that they would find answers to issues regarding the relationships and differences that exist between two objects.

Link ongoing Documentation and Assessment with Curriculum Activities

Assessment constitutes part and parcel of the teaching and learning process in kindergarten classrooms. In constructivist kindergarten classroom context, the import of assessment is twofold; first, it is meant to assess the progress children have made in a particular instructional segment. Second, it is also meant to establish the level of effectiveness of the various segments of the curriculum. In light of this, kindergarten teachers usually keep records about individual children's growth, development and academic progress. In addition, constructivist kindergarten teachers usually study the records of individual children for the purpose of finding out the progress that each of the children has made over a period of time in specific areas of learning.

The information that the teachers obtain from the records usually serves as a signpost of children's level of development. The assessment of children's performance and reasoning ability usually take place whenever children are engaged in learning activities in class and on the playground. This suggests that kindergarten teachers must assess curriculum primarily on the basis of the opportunities that it offers children to construct knowledge which are characterised by regular patterns and interconnections (DeVries, et al, 2006). The next section examines constructivist assessment practices of teachers in kindergarten classrooms.

Assessment in Constructivist Kindergarten Classroom

According to DeVries et.al (2006) and Kamii and DeVries, (1993) assessment in constructivist kindergarten classrooms always call for teachers who have the requisite knowledge about how young children develop and the characteristics that define the various age ranges of the children who are to be assessed. In addition, they must be well informed about the various forms of alternative assessment or authentic assessment practices which are suitable for recording the growth and development of children and evaluating the kindergarten curriculum. DeVries et al argue that the following principles

which constitute the basis for conducting meaningful assessment in kindergarten classrooms stem from the constructivist orientation to assessment.

Embed Assessment in Classroom Activities

According to DeVries et al (2006), assessment in kindergarten classrooms is mainly focused on the curriculum content and teaching practices within the classroom settings. This stems from the belief that assessment is performance-based. Hence, it focuses on the activities that young children engage in within the classroom settings. Thus, through the assessment of children's classroom activities, the teacher is able to record how young children construct knowledge as they explore and experiment with learning materials, interact with their peers in small group settings and in whole class settings. The information that teachers obtain from this exercise serves very useful purposes because it provides kindergarten teachers with insights into children's abilities, interest, reasoning and challenges.

Use multiple sources to collect Assessment Evidence

Teachers can make well-informed decisions about young children when they obtain information from different sources such as observation and checklist. Keen observation is one effective mechanism for obtaining reliable information about how a child learns without interrupting activities that children are engaged in. Kamii and DeVries (1993) observe that teachers can record classroom activities in the form of narratives in journals. They further argue that a checklist is one of the effective and efficient means of documenting children's level of attainment with respect to arbitrary conventional knowledge such as knowing the names of the letters of the alphabet, animals, numerals, objects and other concepts.

Set time aside for Systematic Observation of Children

The recording of the learning that goes on in kindergarten classrooms is a step-by-step and well-organised process but a herculean task in assessment as well. This is so because at the end of the exercise there are bound to be a number of challenges that the teacher has to contend with. First, if the teacher collects a lot of data he or she might not be in a position to review them. Second, if the data are limited in scope, the information that emanates from them might not reflect the abilities of the children who have been observed. Meanwhile, on regular basis, kindergarten teachers have been observing children mentally by

taking note of the actions and pronouncements that individual children make in class (DeVries, 1993). DeVries further argues that casual observation is limited because it lacks purpose. Thus, the data that emanate from it might not have a bearing on the realities on the ground in terms of children's abilities. Therefore, keen observation is one of the effective mechanisms for monitoring children's development in kindergarten classrooms.

Examine Curriculum through Children's Actions and Words

According to DeVries et al (2006) the actions and words of children in kindergarten classrooms are possible interest and capability indicators that kindergarten teachers can latch onto for the purpose of incorporating requisite elements into the kindergarten curriculum to help young children develop the uniqueness that each of them brings into the classroom context. Through keen observation of children's actions and effective listening skills, the teacher would be in a position to identify the interests and capabilities that individual children have. Hence, on the basis of the information the teacher obtains from these sources he or she would be well-informed to select the requisite materials and set up various forms of activities to cater for the needs of individual children. As a consequence, constructivist teachers usually take records of individual children through keen observation and effective listening for the purpose of monitoring the progress that the children are making within a particular time frame. Moreover, it is meant to meet the performance standards and goal demands established by the directorate of education. Nonetheless, DeVries (1993) observes that whenever kindergarten teachers begin to implement constructivist assessment practices, the concern has always been whether they would be able to meet the curriculum demands of the district directorate of education.

View Assessment as Process that takes Place over Time

As Kamii and DeVries (1993) observe, "Assessment of children's understanding of their experiences in early childhood settings should be perceived as a process for the collection of data over a period of time instead of an occurrence"(p.56).This suggests that if a kindergarten teacher relies on information that emanates from one instance of individual children's performance to make definitive statement about a child's performance, the teacher is not likely to get a complete picture about the actual level of development of individual children. This stems from the belief that the data

which highlight children's development over a period of time provide insights into the real level of children's development.

Examine Children's Reasoning through their Actions and Words

Chittenden (1991) maintains that the examination of the reasoning of children is a scenario where the kindergarten teacher assumes "a finding out attitude" (p.32) or a viewpoint toward assessment. The preoccupation of the constructivist kindergarten teacher in this scenario is one of inquest in which the main concern is to reflect on whatever activities that children are engaged in as the basis for monitoring children's reasoning capacity rather than relying on test scores to determine children's level of reasoning. Thus, based on the teacher's findings with respect to the reasoning ability of individual children, the teacher then could rely on this data to fashion out remedial actions to help young children develop their reasoning capabilities. As a consequence, teaching and assessment are interconnected to such an extent that it becomes extremely difficult to split them.

One effective mechanism for documenting the reasoning ability of young children is through the observation of their actions. For, example, in the course of drawing the head of a dog with its mouth wide opened, a child in a particular kindergarten class used dark colours in painting every aspect of the dog's head. At the end of the drawing session the child held the piece of art work in front of a light source. However, the child could not see the teeth of the dog, the child's astonishment, informed the teacher that he did not understand the role colours play in projecting the features of objects. The teacher then intervened by instructing him to use a different colour to highlight the teeth of the dog. Thus, the children's errors provided very useful information for the teacher to fashion out appropriate interventions to help young children to correct certain errors they make in the course of engaging in activities.

Make Assessment a Collective Endeavour

Assessment in kindergarten settings is a herculean task because it comprises observing, recording and interpretation of children's understanding and actions within the kindergarten classroom settings. Therefore, there is the need for kindergarten teachers to involve parents, children and other teachers in the assessment process. Compiling and deliberating on data that emanate from teachers' observation with others who are conversant with how children learn has the possibility of augmenting and broadening the scope of the interpretation of the data. It is therefore, important for teaching assistants and

pre-service teachers to assist the classroom teacher because it would be extremely difficult for one teacher to observe all the learning of individual children within the classroom at the same time (DeVries et al, 2002).

DeVries further argues that parents also constitute very important partners in the assessment process because they provide very useful insights with respect to how children apply some of the concepts and skills they have learnt in class within the home settings. In addition, children are seen as partners in the assessment process. For example, in a kindergarten classroom where children's views are highly valued by the teacher, there is the likelihood that the children would always be ready to inform the teacher about some of the activities they often engage in within the home settings. In the next section, we will highlight and examine the differing assessment instruments that Piaget's cognitive constructivist theory and Vygotsky's sociocultural theory have to offer the world of assessment which is oriented towards constructivism.

The two roads of Piaget and Vygotsky in Kindergarten Classroom Assessment Procedures

The assessment procedures in kindergarten classroom are often influenced by the theoretical underpinnings of Piaget's cognitive constructivist theory and Vygotsky's sociocultural theories of learning. However, a painstaking examination of the assessment procedures in both cases reveal the following remarkable differences with respect to assessment instruments for gathering information about the growth and development of young children in kindergarten classrooms.

Authentic Assessment: Piaget's Instrument of Assessment

The assessment procedures underscored by Piaget's cognitive constructivist theory of learning is termed authentic assessment. For a very long time, the use of standardized, norm-referenced test was the preferred method for assessing young children's progress in learning. Recent research findings have revealed that the use of standardised, norm reference tests to determine children's progress in kindergarten classrooms is flawed (Macy & Bagnatio, 2010). A promising alternative to standardized, norm reference test is the use of authentic assessment (Begnato & Yeh-Ho, 2006). Authentic assessment (which is also termed play-based assessment, naturalistic or performance – based) is the collection of information by familiar and knowledgeable care

givers with respect to a child's behaviour and functional abilities as they unfold in kindergarten classroom settings.

Information obtained from authentic assessment can provide a collective picture of a child's strengths and weaknesses (Bagnato &Ye-Ho, 2006; Dennis, Reuter & Simpson, 2013). As a consequence, evidence gathered from authentic assessment tends to underscore the strengths and weaknesses of young children in specific learning contexts. In addition, it serves as a platform for kindergarten teachers to judge how young children put into practice their knowledge and skills in real life contexts. The following constitute examples of authentic assessment instruments:

Interview

Interview is one of the major authentic assessment instruments. This assessment instrument is very useful because it tends to highlight the capabilities of young children across a wide spectrum of learning contexts. Authentic assessment along the lines of interview is a collaborative affair between the teacher and the parents of the individual children and others who are well-informed about how young children learn. Hence, the kindergarten teacher needs assistance from teaching assistants, other teachers and parents of individual children before the requisite information about children's level of development can be ascertained through interview (Banks, Santos & Roof, 2003).

Observation

Observation is another assessment instrument for obtaining information about the growth and development of individual children in kindergarten classrooms (Dennis, Reuter, Simpson, 2013). In the course of observation, the preoccupation of the kindergarten teacher is to look out for certain capabilities that a child demonstrates in the course of engaging in activities (Neisworth, & Bagnato, 2004). The data that emanate from observation constitute a key component of authentic assessment procedures for gathering information about the children's level of development. Assessment instruments which fall under observation include running an anecdotal record, antecedent, behaviour and consequence (ABC), analysis and permanent products or portfolios (Dennis, Reiter & Simpson, 2013).

Running records is an observation mechanism which is geared towards finding out the sequence of events that happen over a period of time. This observation procedure tends to provide details about the behaviour of young children over a period of time. It is incumbent upon kindergarten teachers who

are employing this observation procedure to be objective as much as possible so that the real behaviours of children that unfold during the observation are captured instead of the teacher's judgement of what might have happened. Kindergarten teachers are expected to include the following information: date and time of the observation, names of children involved, location of the episode and what individual children said (Dennis, 2002).

Anecdotal records provide room for the kindergarten teacher to focus on a particular behaviour of individual children over a period of time for the purpose of fashioning out effective mechanism for determining the level of development of children in a group context and on individual basis as well (Dennis, Reiter & Simpson, 2013). The ABC analysis is an observation procedure which aims at recording the behaviour of a child by first establishing what triggered off the behaviour as well as what happened after the behaviour was sparked off. These factors help kindergarten teachers to establish the reasons why individual children behave in a particular way (Clay, 2000).

Portfolio assessment might consist of samples of a child's work, photos, graphics or audiotapes. These products are incorporated into a particular file for the purpose of gathering information about certain works that the child has done over a period of time. The purpose of portfolio assessment is to monitor the progress of the child over a period of time (Gullo, 2006). Meanwhile, a blend of these data collection procedures is likely to give kindergarten teachers insights into the uniqueness that individual children bring into the kindergarten classroom context. This information would then serve as a compass to enable the kindergarten teacher to effectively plan the curriculum to make it possible for young children to harness their individual potentials.

Dynamic Assessment: Vygotsky's Instrument of Assessment

The assessment instrument which is predicated on Vygotsky's sociocultural constructivist orientation is termed dynamic assessment (Feuerstein, 1979). This is an assessment procedure in which the individual child being assessed is usually guided by a teacher whose responsibility is to identify the potential of the child and offer remedial instructions when need be. According to Palincsar (1979), dynamic assessment usually gives an indication about the performance of a child as well as how the child is likely to perform in future. Hence, the performance of a child who is being assessed through the medium of dynamic assessment is meant to inform future instruction. From a Vygotskean perspective, even though conventional statistics measures tend to

indicate children's performance in a test score, they fail to highlight the stage of development of young children. Nonetheless, dynamic assessment tends to highlight a child's level of development.

The various types of dynamic assessment include Learning Potential Device and Test-Train-Test (Palincsar, 1979). Palincar further argues that the variations stem from the nature of task a child is to engage in, the sort of support that is given and the result that is provided at the end of the assessment. For, example, the Learning Potential Device (LPD) which is the brainchild of Feuerstein (1979) is structured in such a way that the tasks aim at finding out children's level of critical thinking. Hence, it takes a child who has the ability to think critically to be able to respond appropriately to issues that are raised in the assessment protocol.

In the course of administering the LPD, the examiner freely interacts with individual children who are being examined but in the same breath the teacher takes note of the areas where the child might experience difficulty. The examiner also takes note of how the child employs reminders and prompts to resolve challenges that come up in the course of the exercise. The results that emanate from the assessment serve as a signpost for identifying the abilities that individual children have with respect to content and the strategies a child employs in resolving the problems and its possible impact on the development of children.

Another form of dynamic assessment is termed Test-Train–Test (Burdoff, 1987). This sort of assessment underscores the fact that within the context of pre-test and post –test, some modicum of learning takes place because of the guidance that is provided. In short, this type of dynamic assessment tends to portray certain aspects of competencies of children that conventional assessment is likely to gloss over. In the following section, the contrarieties which are inherent in Piaget's cognitive constructivist theory of learning and Vygotsky's sociocultural theory of learning in relation to exploring teacher practices in kindergarten classrooms are examined.

Contrarieties Inherent in Piaget's and Vygotsky's Theories of Learning

The differences between Piaget's cognitive constructivist theory of learning and Vygotsky's sociocultural theory of learning can be seen from the following perspectives:

Worldview and Philosophical Orientation

First, one major difference between the theories of Piaget and Vygotsky stems from their philosophical traditions and suppositions. Piaget's theory is lib-

in nature. To some extent, the theory emphasises individual children's acquisition of knowledge and autonomous development. However, Vygotsky's theory underscores the social context as the basis for children's development. Moreover, Piaget's theory to a great extent has been influenced by philosophers such as Plato, Descartes, Rousseau, Gesell, Raymond and Kant.

On the other hand, Vygotsky's theory has considerably been influenced by the philosophical orientation of Dewey, Hegel, Marx, Engels, and Lenin which emphasise the social context as the basis for knowledge acquisition. Nonetheless, the ontological stance of Piaget is extremely difficult to pinpoint because he incorporated varied Western European sources into his work. While Piaget to some extent is regarded as a sort of idealist, Vygotsky's ontological leaning is geared towards realism (Vienna & Stetsenko, 2006; DeVriews, 2000; Duncan, 1995).

Social Influences on Development

Second, the theories of Piaget and Vygoksky have striking differences with respect to how social factors shape the development of young children. Piaget admits that children develop within the social context. Piaget further argues that a young child's development stems from the cooperation and conflicts that he or she experiences in the course of engaging in activities with other children within the social context. Thus, Piaget excludes the historical heritage of preceding generations which have been accumulated over the years and eventually incorporated into cultural artefacts as the basis of children's development.

Vygotsky, on the other hand sees actions which constitute the basis of children's development as a social phenomenon rather than a factor that determines children's development as it is in the case of Paget's theory. In this vein, Vygotsky maintains that the development of young children is not influenced by the mere engagement in activities but rather via collaborative activities with other people within the social context (DeVries, 2000; Duncan, 1995).

Trajectory of Development

Third, even though the theories of Piaget and Vygotsky acknowledge the essence of children's development, they differ in terms of how development unfolds in young children. For example, in the case of Piaget, the intellectual capacity of the child to learn is first created within and it is just after this that the capabilities which have been created within would have relevance in terms

of a child's cognitive development which is usually predicated on the conflicts and collaborations that a child experiences in the course of interacting with certain elements and other people within the social context. However, in the case of Vygotsky the relationships that a child forges with other people within the social context constitute the basis of cognitive development. Thus, on the basis of these variations, Piaget's theory is often termed "inside-out" while that of Vygotsky's is referred to as "outside-in theory" (Lourenco, 2012; DeVries, 2000; Duncan, 1995)

Language as a Tool for Development.

Finally, another striking inconsistency about the theories of Piaget and Vygotsky arise from their conceptions about the role language plays in the cognitive development of young children. Piaget observes that children, to some extent use similar words as it is in the case of adults to express their views with respect to certain concepts in science. However, the meanings they attach to the concepts differ from that of adults. As a consequence, children's understanding of concepts in science develops in a step–by-step process which eventually leads to the development of children's understanding and application of science concepts for the benefit of society. This notion of development is likely to enhance the learners' ability to go beyond the status quo and create something novel for society. However, Vygotsky argues that language is a tool for children's acquisition of scientific concepts. This stems from Vygotsky's conception that children acquire scientific concepts through schooling (DeVries, 2000). In short, the two theories give us different insights as to how young children develop. In the next section, we will examine the connections between Piaget' and Vygotsky's theories of learning.

Connections between the Theories of Piaget and Vygotsky

The similarities between the theories of Piaget and Vygotsky can be seen from the following perspectives:

Framework for Understanding Human Psyche

First, one key connection between the theories of Piaget and Vygotsky is that they provide a framework which highlights how the intellect of young children develops. For the purpose of providing insights into how young children acquire knowledge, both Piaget and Vygotsky employed the genetic research model to explain the developmental processes of the intellect of young children. Both Piaget and Vygotsky acknowledged that the psyche of young children goes through qualitative changes over a period of time. Therefore,

there is a remarkable difference between the intellect of adults and young children. The qualitative transformations that take place in the course of a child's interactions with peers, adults and certain elements in the environment are crucial factors for engendering the intellectual development of children (Pass, 2004).

Dialectics as Basis for Development

Another resemblance between the theories of Piaget and Vygotsky is that both of them acknowledged dialectics as the basis for enhancing the intellectual development of young children. Even though Vygotsky employed the Marxist brand of dialectic reasoning for the purpose of enhancing the development of young children, Piaget's dialectic reasoning was idealistic in nature. In spite of this difference, both Piaget and Vygotsky conceded that dialectic reasoning engenders qualitative development of young children over a period of time (Devries, 2000).

Psychological Constructivist Theories

An additional similitude between the theories of Piaget and Vygotsky is that they are considered as constructivist theories. These theories emphasise that individual children construct their own knowledge on the basis of the interplay between what they already know and their interactions with new elements such as events and ideas that they come into contact with within the environment. Therefore, constructivism in any of its forms rejects the conventional notion that human experience is inborn which only lie in wait for the right time to unfold (Duncan ,1995).

Action as the Basis for Development

Finally, another connection between the theories of Piaget and Vygotsky is that human action is considered as a catalyst for engendering the development of young children. The theories emphasise that the relationship that is forged between individual children, their peers and teachers in classroom settings, which are usually defined by various forms of interactions such as cooperation, collaboration and problem solving constitute the basis of children's development. Therefore, development is neither inborn nor something that has already been planned but it is human action that triggers off development (Pass, 2004).

Conclusion

The examination of the affordances, contrarieties and connections which exist between the theories of Piaget and Vygotsky has indeed been very instructive because it has brought to the fore how the theories influence teacher practices in kindergarten classrooms as well as the convergences and divergences which are inherent in the theories. First, the affordances of the theories in terms of constructivist's principles of teaching and learning, assessment practices in kindergarten classrooms and the implications of the theories for teaching and learning in terms of their emphasis on activity-based learning in kindergarten classroom have been unearthed.

Furthermore, the contrarieties that exist between the theories with respect to the worldview and philosophical orientation, social influences on development, trajectory of development, and language as a tool for development have extensively been examined. The differences which are inherent in the theories are very relevant because they present differing perspectives about how young children learn. These insights would help kindergarten teachers to employ relevant constructivist teaching and learning principles and its attendant assessment practices to help young children develop their individual uniqueness.

Again, the connections which are inherent in the theories in terms of framework for human development, dialectics as basis for development, psychological constructivist theories and action as the basis for development have also been discussed. The similitude between the theories gives kindergarten teachers insights into how the active involvement of children in learning activities promotes children's construction of knowledge about their world. The theories therefore, provide insights into the developmental dilemma of young children. However, the similarities between both theories suggest that the theories can be merged. Nonetheless, any attempt to employ an eclectic approach for the purpose of merging the theories has the possibility of resulting into an incoherent theory instead of an integrated theoretical framework which Piaget and Vygotsky tried to construct. Thus, the theories should remain as they are because each of them tells half of a good story hence, each can be used to complement the other.

Implications of the Theories for Educational Administrators

The theories of Piaget and Vygotsky emphasize activity based learning in the kindergarten classrooms for children to construct their own meaning. It is implicitly and explicitly clear that the learning environment of kindergarten classrooms should be well resourced with the relevant teaching/learning

materials for maximum effect. For that to be realised, educational administrators need to be abreast with the kindergarten curriculum and ensure that relevant teaching and learning aids are procured in reasonable quantities for sufficient and maximum interactions of learners with the aids for meaningful learning to take place.

Research has shown that the more a learning activity addresses the five senses, the more effective the learning activity becomes and has more permanency. According to Mehmet and Ali (2007), the human memory works in the following proportions and so people will remember:

- 10% of what they read
- 20% of what is heard
- 30% of what they saw
- 50% of what they saw and heard
- 70% of what they said, and
- 90% of what they did and said

When due consideration is given to the retention rates above, and the kindergarten classroom setting, it is important for educational administrators to provide useful teaching aids that young children can interact with and construct their own meaning of the world around them. It is also important for sufficient time spaces to be allocated to learners accompanied by much creativity in leading kindergarten children to exhaust all the range of possible experiences that they generate in coming into contact with their new learning activities at all times.

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THE LINK BETWEEN DISABILITY, POVERTY AND THE MILLENNIUM DEVELOPMENT GOALS

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Abstract
Although there is a world-wide trend towards the inclusion of individuals with disabilities into the society, the unpleasant attitudes of society as well as the unfavourable government policies have systematically precluded the disabled from having equal access to education, employment opportunities, health facilities and recreational activities. However, this negative trend is observed in the Millennium Development Goals (MDGs) which did not specifically treat the issues of persons with disabilities. Persons with disabilities are therefore predisposed and subjected to abject poverty while they become a burden to immediate family members and look forward to aids from charity. In order to achieve the objectives of the Millennium Development Goals, persons with disabilities need to be considered for empowerment so as to reduce their total dependency on the non-disabled members of the community. Therefore, this paper discusses the relationship between disability, poverty and the Millennium Development Goals and strategies to help meet the economic needs of persons with disabilities before 2015.

Keywords: disability, poverty, Millennium Development Goals, education

Introduction

The 21st century has brought to the limelight, the commitment of international organizations, agencies and governments to making the world a better place to live in through the Millennium Development Goals (MDGs). The MDGs summarize the development goals agreed on at international conferences and the world summits during the 1990s. In September 2000, world leaders distilled the key goals and targets in the millennium declaration. The Millennium Development Goals (MDGs) have set eight (8) targets to achieve by the year 2015.

The eight goals target to increase incomes; reduce hunger; achieve universal primary education; eliminate gender inequality; reduce maternal and child mortality; reverse the spread of HIV/AIDS, tuberculosis, and malaria; reverse the loss of natural resources and biodiversity; improve access to water, sanitation, and good housing; and establish effective global partnerships. However, global targets fail to specifically target persons with disability (World Bank, 2013). As a result, individuals with disability, particularly in sub-Saharan Africa and South Asia, are among the poorest of the poor with little or no means of survival, low income and unemployment. As we approach the 2015 target date, there is the need to consider persons with disabilities in assessment of the present goals and to provide a sustainable future for them before and after 2015.

Disability Issues

Disability is a normal phenomenon in the sense that it exists in all societies, affecting predictable and identifiable proportions of each population. An estimated 10 percent of the world's population – 650 million people – live with a disability (WHO, 2009). Data from developing countries is highly variable, but generally the proportion of the disabled population is much lower than in developed countries. Ademokoya and Oyewumi (2004) stated that persons with hearing impairment, visual disability, mental retardation, speech and language disorders and learning disability hardly benefit from the general education programmes which are designed for the non-disabled counterparts. Persons with disabilities have the same needs as other people. Yet, they often face barriers to information and social services (Adigun, 2012), stigma and prejudice (Shakespeare, 1994). The ignorance and attitude of society and individuals, including health-care providers as well as ill-government policies raise most of these barriers and not the disability itself.

In the developing countries, segregated institutional systems have evolved over time, initially to care for people with disabilities, to rehabilitate and educate them. These systems have raised the functional capabilities of persons with disabilities to levels where significant numbers have become capable of mainstream social and economic participation. However, the compartmentalization of disabled people in segregated institutional systems, together with the limited expectations on which these systems are based, have worked against the social and economic inclusion of people with disabilities by perpetuating their isolation and reinforcing longstanding negative stereotypes that to this day significantly impair their ability to make social and

Due to social exclusion and discrimination in the labour market, World Bank (2013) noted that persons with disabilities may be disproportionately affected by unemployment, leading to an increased incidence of poverty. In addition, family members acting as caretakers may be unemployed, healthcare costs related to having a disability may be high, and families whose head of household is disabled are more likely to be poor. Inadequate infrastructure is a major cause for ill-health and disabling conditions. Inaccessible environments, technology, transport, products and services restrict the equal participation to economic, social activities and functional capacity of many groups of people with temporary or permanent limitations. The physical, institutional and attitudinal obstacles that restrict the exercising of basic rights and fundamental freedoms by disabled people also affect their families. Due to direct discrimination and obstacles to full social and economic participation of persons with disabilities and their families they are particularly vulnerable to poverty. Their score by all MDG indicators are at the lowest end. This is corroborated by the assertion of the Handicap International (2006) who noted that people with disabilities are not specifically protected by international legally binding rules. In contrast to other vulnerable populations, they do not benefit from the existence of a specific international body in charge of monitoring the respect of their rights.

The Twin: Disability and Poverty

Paul Wolfowitz, a former World Bank President once stated that:

> *"People with disabilities are also people with extraordinary talent. Yet they are too often forgotten. When people with disabilities are denied opportunities, they are more likely to fall into poverty -- and people living in conditions of poverty are more likely to develop disabilities. As long as societies exclude those with disabilities, they will not reach their full potential and the poor in particular will be denied opportunities that they deserve."*

In the past, all too often, persons with disabilities have been either incorrectly seen as people whose lives are defined by medical and rehabilitative needs (the medical model) or as individuals who are recipients of social and economic support (the charity model). In fact, while some persons with disabilities – like all other sections of society – do have medical concerns and need social support, the most pressing concern is poverty. Poverty is the state in which an individual lacks a certain amount of material possession or economic power to cater for his or her immediate need. Poverty

is associated with the undermining of a range of key human attributes, including health and quality of life.

Nigeria has one of the greatest development potentials in Africa given the vastness of her resources and above all her rich human resource endowment. But regardless of these potentials, Aniekan (2011) regretted that Nigeria is still among the poorest countries of the world with her economy marred by multiple difficulties. Thus poverty, in both absolute and relative terms, constitutes one of the most serious problems confronting both the disabled and nondisabled in Nigeria. Statistically, between 1960 and 1980, the poverty level covered about 28.0 percent of the population; by 1996 it rose alarmingly to about 66 percent of the population. According to the United Nation Development Program Human Development Report (2008-2009) which combined such components as level of inequality, life expectancy at birth, standard of living and access to knowledge, and education, between 2004 and 2009, poverty in Nigeria has worsened from 0.43 to 0.49. This shows that despite its vast resources, Nigeria ranks among the 25 poorest countries of the world.

UNICEF (1981) uses a prevalence figure of disability and impairments of one in ten while UNESCO (1979) estimates the prevalence of learning problems severe enough to need special education to be 10-15 percent, WHO (1981) gave a more conservative estimate of 7-10 percent for all age groups but points out that at any given time, about 1.5 percent of the total population consist of persons with disabilities. Corroborating the above figures, Mba (1995) observe that one in every one thousand Nigerian has a serious hearing problem. Considering the Nigerian population which is estimated at 150 million, it can be said that nothing less than 10 percent of her population suffers one form of disability or the other. In other words, they represent a larger percentage of the poor in Nigeria. A growing body of research shows the interrelation between persons with disabilities and poverty (Hoogeveen, 2005; Mitra & Sambamoorthi, 2008). This poverty is due to a lack of education, social marginalization, and barriers to employment. It is also due to a lack of knowledge about disability issues among decision makers, who simply do not understand that persons with disabilities need the same opportunities for poverty-reduction available to all other members of society (Filmer, 2008). According to Thomas (2005), poverty and disability are linked in a vicious downward spiral. Poverty causes disabling conditions and disability makes families vulnerable to economic, social and environmental shocks.

Lack of income and productive resources sufficient to ensure sustainable livelihoods, hunger and malnutrition, ill-health, limited or lack of access to education and other basic services as claimed by the Millennium Development Goals has reduced individuals living with disabilities to "second class citizens". Homelessness, inadequate housing, unsafe and degraded environment, social discrimination are synonymous to persons living with disabilities. According to the World Bank (2007), the proportion of disabled people is 20% among the poor. The rapid pace of urbanization has also led to the concentration of a large number of disabled people into cities where the only means for living often is to engage in begging. Disabled people are seriously under-served by all basic services. Only a small percentage of disabled children have access to schooling. While disabled people belong to the poorest of the poor neither the MDGs nor the majority of poverty reduction strategies (PRS) consider disability as an issue to be mentioned.

Poverty is both a cause and consequence of disability (Thomas, 2005). The World Bank estimates that 20% of the world's poorest people are disabled and the disability itself affects not only the individual, but their families and carers too (Elwan, 1999). Disability typically has severe, negative financial consequences for the individual and the household. One disabled focus group participant in India summed this up that if people become disabled, they have to pay a lot for health care and rehabilitation (Thomas, 2005). The economic costs of disability have three elements: direct costs of treatment; foregone income from disability and indirect costs to others who provide care. Persons with disabilities typically lack access to health and education, clean water and sanitation, have poor housing and may live in over-crowded, unsanitary and unsafe areas. However, for disabled people, their lives are typically so much harder because of their impairments. Unfortunately, persons with disabilities are typically actively and unwittingly excluded from development activities.

The Millennium Development Goals (MDGs) and Persons with Disabilities (PWDs)

The eight Millennium Development Goals (MDGs) emerged from the United Nations (UN) Millennium Declaration in 2000, and are arguably the most politically important pact ever made for international development (UNDP, 2003). They identify specific development priorities across a very broad range, including poverty, education, gender, health, environment, and international partnerships. These goals have substantially shaped development dialogue and investment; some development agencies judge all their activities on the contribution to achievement of the MDGs (Sumner & Tiwari, 2009).

The Millennium Development Goals (MDGs) represent an unprecedented global consensus about measures to reduce poverty. The Millennium Development Goals (MDGs) are the world's time-bound and quantified targets for addressing extreme poverty in its many dimensions – income, poverty, hunger, diseases, inadequate housing while promoting gender equality, education and environmental sustainability (MDG Nigeria, 2010).

Clearly, the MDGs have had notable success in encouraging global political consensus, providing a focus for advocacy, improving the targeting and flow of aid, and improving the monitoring of development projects. However, Jeff, Rukmini, Oona, Ephraim, Guy, and Veerle, et al. (2010) stated that MDGs have also encountered a range of common challenges. Challenges with the conceptualization and execution of the MDGs arise at the three discrete levels on which they are constructed: goals, targets, and indicators. The very specific nature of many goals, reflecting their diverse, independent origins, leaves considerable gaps in coverage and fails to realize synergies that could arise across their implementation. Apart from women of reproductive age and children, the Millennium Development Goals (MDG) framework does not make any reference to marginalized groups such as persons living with disabilities. With the focus only on aggregate results, national progress can be made without any change in the situation of the poorest.

According to Thomas (2005), disability is not specifically mentioned in the MDGs, but disabled people are implicitly included. Most development agencies acknowledge that the goals cannot be achieved without addressing the needs and rights of disabled people. However, the relationship and relevance of disability to the MDGs is not so well articulated and acknowledged. Attention only to averages and 'easier' groups would jeopardize the ultimate goal of poverty eradication, and may result in even more intractable poverty in 2015. These partial targets mean the MDGs framework is inherently flawed because it does not meet the needs of the world's poorest and most marginalized populations who are living with disabilities. The lack of specific attention to marginalized groups in the targets and indicators creates a real danger that efforts to achieve the MDGs will push some of the world's poorest people to the periphery. In particular, the exclusion of people with disabilities who cannot access mainstream social, economic and political life, and have limited access to almost all areas of development is extremely problematic.

MDGs and Poverty Reduction among Persons with Disability: Way out

The key to ensuring that persons with disability benefit from the MDGs is to systematically identify the factors that currently block their inclusion in programmes and policies based on the MDGs. This lack of inclusion by general development actors often is because it is incorrectly believed that special skills are needed to deal with disabilities issues and it therefore should be left to "experts". While technical assistance might be needed in some specific cases to ensure inclusion of persons with disability, most often development programmes providing things like vocational training, water and sanitation, economic support and microcredit should work in collaboration with special education professionals and other allied professional in order to make such programmes more relevant and realistic. There should be a reallocation and broader mobilization of domestic resources towards poverty reduction even among persons with disabilities as claimed by the Millennium Development Goals so as to strengthen governance and institutions, and adopt sound social and economic policies.

A greater commitment to increase funding towards delivering quality pro-poor service to persons with disability at the local level is needed. The civil society groups should increase their community watchdog role and provide critical feedback to inform policy development and planning towards poverty reduction among persons with disabilities. Equally, it is important to review the progress towards meeting the targets of poverty reduction that involve both governments and civil society groups. This mechanism could entail: independent national bodies established and tasked with monitoring progress with wide participation of a range of groups; national collection and review of data regarding persons with disability; external comparative analysis in partnership with multilateral bodies or international organizations empowering persons with disability; national analysis and decision on action in the form of public, parliamentary, press, or other forms of debate and discussion.

Another effective way of eradicating poverty among persons with disability is to empower them with education. Down through the ages, it is known that education is the antidote to poverty and ignorance and the key for unlocking natural resources. Okebukola (2013) stated that no nation striving for accelerated development does so without huge investment in education. Okebukola (2013) citing World Bank (2008) posited that there is a compelling body of research concluding that education is the main plank for economic development. Lau, et al (1991) stressed that education enables the individual to perform new tasks; to receive and process new information; to communicate

and therefore coordinate activities with one another; to evaluate and adjust to changed circumstances. Education also helps to reduce subjective uncertainty, and unnecessary anxiety, as fatalistic acceptance of the status quo, thereby enhancing the probability of adoption of new technologies or practices by the individual.

Investing in education would not only improve people's ability to acquire and use information, but it will also deepen their understanding of themselves and the world, enrich their minds by broadening their experience, and improve the choice they make as consumers, producers and citizens. Education will also strengthen their ability to meet their wants and those of their families by increasing their productivity, and their potential to achieve a higher standard of living. It will also improve their confidence and their ability to create and innovate, thus multiplying their opportunities for personal and social achievement. Therefore, organisations and governments should direct attention toward investing on educating the population of persons with disability. Investing in education could take different forms, such as massive expansion of education facilities and vocationalisation of education. Investing in vocational training would go a long way in reducing poverty, in that most children from poor homes prefer functional education which would provide them skills for earning their livelihood. Thus vocationalisation of education, diversification of courses at the secondary and higher secondary levels and setting up of technical education centres and rehabilitation centres most especially in rural areas would help in reducing poverty among people with disabilities.

Abubakar (2010) noted that the shift from general education to specifically entrepreneurship education becomes necessary in the present realities of the need to develop and empower particularly the youths in the society. There is seeming consensus on the importance of entrepreneurship in ameliorating some socio-economic problems especially poverty, unemployment, and all sort of social vices in the society. UNESCO (2008) in Enu (2012) stated that entrepreneurship education is made up of all kinds of experiences that give students the ability and vision of how to access and transform opportunities of different kinds. It goes beyond business creation but vital to fuelling a more robust global economy, brings new ideas to life through innovation, creativity and the desire to build something of lasting value. It is about increasing the ability of individuals with disabilities to anticipate and respond to societal changes. Entrepreneurship education is also seen by UNESCO as education and training which allows individuals with disabilities to develop and use their creativity and to take initiatives,

responsibility and risks, while Lee and Wong (2008) regard entrepreneurship education as a catalyst for economic development and job creation in any society. Therefore, government at all levels must continually foster educational cultures within communities to keep the entrepreneurship pipeline filled for generations to come.

Many of the current programmes that address poverty issues in the MDG can be extended to persons with disabilities with little or no modification needed. In other cases, small changes in planning at the outset of the programme or simple, low-cost adaptations can be incorporated into ongoing policies and programmes to ensure that outreach efforts to eradicate poverty reach many more persons with disabilities. Small subgroups of persons with specific types of disabilities may need disability-specific adaptations – the Deaf community for example, will often need sign language interpretation to take full advantage of services and programmes offered to the general population, people who are visually impaired will often benefit from materials made available in Braille, Mobility guide and adapted environment.

Conclusion

Individuals with disability suffer a great deal as a result of loss of function of either one or more body organs. They are susceptible to discrimination, prejudice and lack of economic prowess. Hence, they are left with little or nothing but to resort to begging for alms. Therefore, they are largely represented among Nigerians living below the poverty line or perhaps living below $2 per day. They indeed need assistance to help them come out of the abject poverty so that they too can live a fulfilled life. In other words, the mission and vision of the MDGs in eradicating poverty and hunger will be very useful and can be achieved only when all stakeholders put all resources together to ensure reduction of poverty among persons with disability. Education of persons with disability must be taken with utmost seriousness, sincerity and commitment by governments at all levels. The curriculum of students with disability should encourage entrepreneurship; they should be exposed to vocational education through individualized educational programme. Persons with disability should be encouraged to start up a small scale business with interest-free loans so that they can be independent and by doing so there will be drastic reduction in street begging and poverty rate. Persons with disability should be encouraged to compete favourably with their nondisabled counterparts when seeking for job.

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    b. An abstract on page 2, written as a single paragraph and having a maximum of 150 words.
    c. A text which starts on page 3. Page 3 should begin with the title of the paper centered at the top. The text begins below the title without the label "Introduction". The sections of the text follow each other without a break. If the paper is a research report it should include an introduction (which comprises the background, purpose and research question(s)/hypotheses), method, results, discussion, conclusion and recommendation(s)/implication(s).
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