CURRICULUM KNOWLEDGE OF SCIENCE TEACHERS AND ITS EFFECTS ON ACADEMIC PERFORMANCE OF PUPILS

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ABSTRACT

The study investigated the curriculum content knowledge of science teachers and its effects on the academic performance of pupils. Theory of teachers' knowledge and constructivist learning theory formed the framework that guided the study. The study used a mixed methods design, incorporating both quantitative and qualitative techniques to collect data. The sample consisted of 59 public Junior High school science teachers. A questionnaire on science teachers' curriculum knowledge (STCK) and science teacher's assessment practices (STAP) was used to collect quantitative data while a classroom observation schedule was used to collect qualitative data on teachers' classroom science instructional practice (STIP). The study revealed that the teachers have weak science background knowledge. The teachers' curriculum knowledge influenced science teachers' instructional and assessment practices thus contributing to the pupils' poor performance in science. Also, the Junior High School science teachers' curriculum content knowledge was weak. The Junior High School science teachers' preferred teaching method was teacher-centred instead of learner – centred. A number of implications for science teachers' curriculum knowledge instruction and assessment practices and its relation to pupils' academic performance were made. The study therefore recommend that teachers' background and science curriculum knowledge should be assessed before assigning them to teach science at the junior high schools but not just a trained teacher.

Keywords: Curriculum knowledge, assessment practices, instructional practice, curriculum materials.

INTRODUCTION

It is a known fact that performance of pupils in science at the Junior and Senior High Schools in Ghana has been the concern for the public, stakeholders and successive governments since the 1960s till date. It is easy to recognize that although the stakeholders in education have put in a lot of interventions to ensure that pupils perform well in science. Some of these interventions include the introduction of science clinics for pupils and workshops for science teachers, introduction of distance education for teachers to enhance professional development and the introduction of presidential special initiative (PSI) in science education through electronic media to supplement classroom science teaching. Despite all these initiatives only about 53% of junior high school students gain admission into senior high schools, and low performance in science could be one of the contributory factors (Anamuah – Mensah & Asabere – Ameyaw, 2004). However, since teachers' curriculum knowledge, instructional and assessment practices are likely to play a role in shaping the factors that affect students' performance. It is therefore very important to examine these relevant factors vis-a-vise student performance. Improvement of pupil's performance in science in accordance with the current 2007 science educational reform agenda requires teachers to use different instructional

strategies that can facilitate pupils' science concepts formation (CRDD, 2007).. This calls for teachers' knowledge on the curriculum content and recommended teaching methods/strategies. This is because teachers' curriculum knowledge could play a vital role in classroom practices. Teachers with low curriculum knowledge may actually be harmful to their students by passing on inaccurate ideas by using inappropriate teaching materials (Ball & MacDiarmid, 1990).

A teacher with adequate curriculum knowledge is able to organize science classroom instruction and assessment effectively. The current teaching science curriculum requires the Ghanaian science teacher to relinquish singular claims to authority or power in the classroom and to play the role of a coach or facilitator who owes the pupils a duty to assist the latter to achieve the curriculum goals. Pedagogy becomes a task of articulating learning goals and identifying the forms of doing that promotes development toward those goals. Generally, there are two main goals of Junior High School (JHS) Science education in Ghana. First, it is to inculcate in pupils scientific and technological literacy and scientific culture, so that in future they can make informed choices in their personal lives and approach challenges within the workplace during a systematic and logical order. Second, it aims to produce competent professionals in the various scientific disciplines who can carry out research and development at the highest level (CRDD, 2012). But the achievements of these goals could depend on the science teachers' classroom practices. Although in Ghana it appears little research has addressed science teachers' curriculum knowledge, it stands to reason that science teachers' evaluative practices are likewise influenced by their conceptions of what constitutes proper classroom practices. These conceptions come into play to determine the paths teachers take. The Ghana science curriculum recommends teachers to use school based assessment. Also in practice the junior high school science teachers are required to use both formal and informal assessment [(CRDD, 2012).

Variations in science teachers' curriculum knowledge about science and teaching may influence the way that science programmes are implemented. Interpreting a research finding, Tobin (1987) showed that the root cause for the problems in science classes may not be external examinations or prescriptive curricula, but rather it may be related to teachers' knowledge about what to teach, how to teach it, how students learn and what is to be assessed. However, since 2009 till date the Kwaebibirem District has been classified as one of the poor performers at the Basic Education Certificate Examination (BECE) in the Region. In 2013 the district was rated last in terms of performance at the BECE in the Region and placed among the last six districts in Ghana (GES, 2013). The professional competence of the Junior High School science teachers in the Kwaebibirem District could be favourably compared to that of other Junior High School science teachers in other districts of the region. This is because the same science curriculum and curriculum materials provided by Ghana Education Service are used in the colleges of education. Besides, the science teachers in public Junior High Schools use similar prescribed science curriculum and curriculum materials provided by the Ghana Education Service. The Junior High School science curriculum also recommends the use of similar learner-centred teaching methods and common form of assessment.

The low performance of pupils in science called for public concern which a lot of researchers have tried to find out the possible causes of this situation. For instance, Osei (2004) and Acheampong (2004) conducted a research on science teachers instructional and assessment practice, Anamuah – Mensah and Asabere-Ameyaw (2004) conducted studies on the use of mother language as a medium of science instruction in basic schools and Ngman – Wara (2011) also conducted research on the contextualization of science instruction. But these studies appear to focus less on science teacher's curriculum knowledge in science. Also the success of

pupils in science education and the progress of a nation will depend on science teachers who ensure the development of the innate capacities of all students (National Science Forum, 2004). The study therefore seeks to investigate the curriculum knowledge of science teachers and its effects on academic performance of pupils at Kwaebibirem District, Ghana.

Materials and Method

The study was conducted within the Kwaebibirem District within the Eastern Region of Ghana. There were 70 Junior High Schools science teachers at the time of study of which 59 were in government schools and the remaining 11 were in privately owned schools. Purposive sampling method was used to select the sample for the study. The accessible population was 70 Junior High School science teachers in both privately-owned and government-owned junior high schools in Kwaebibirem District. Out of the 70 teachers, 59 of them were public school teachers while the remaining 11 were privately owned school teachers. The 59 public Junior High School science teachers were purposely used as the study sample. 10 teachers were observed during the study. The reason for the choice of government school science teachers was that the teachers use the syllabus, textbooks and other curriculum materials supplied by the Ghana Education Service. The study adopted a descriptive survey research design using mixed methodologies to collect data for the study. The mixed methodologies included using both quantitative and qualitative approaches to collect data (Creswell, 2009). Multiple data collection methods involving both quantitative and qualitative approaches were used. The instruments used to collect data for the study were questionnaire and systematic classroom observation. The questionnaire was used to collect quantitative data on the junior high school science teachers' general curriculum knowledge and assessment practices while the observation was used to collect qualitative data on the teachers' instructional practices. The questionnaire used in the first phase of the data collection for the study provided primary data on the basis of which the classroom observation was carried out at the second phase of the data collection.

Results and Discussion

Table 1: Junior High School science teachers' knowledge about some content of science curriculum (n=46)

Item	Correct %(f)	Incorrect %(f)	No answer %(f)
Rationale for teaching science	8.5(4)	17.0(8)	74.5(35)
Number of themes of science curriculum	57.5(27)	17.0(8)	25.5(12)
Knowledge about themes of science curriculum	49.0(23)	17.0(8)	34.0(16)
Knowledge about number of periods per week	34.1(16)	40.4(19)	25.5(12)
Knowledge about periods allocated for teaching theory	25.5(12)	50.1(24)	23.4(11)
Knowledge about periods allocated for teaching practical	31.9(14)	42.6(20)	25.5(12)
Knowledge about weight of knowledge and comprehension	24.5(12)	66.0(31)	8.5(4)
Knowledge about weight of application of knowledge	21.3(10)	48.9(23)	29.8(14)

Knowledge about weight of experimental and process skill	4.2(2)	53.2(25)	42.6(20)
Knowledge about recommended instructional approach	4.3(2)	31.9(15)	63.8(30)
Knowledge about recommended methods of assessment.	29.8(14)	14.9(7)	55.3(26)

The result in Table 1 indicates that the number of teachers who provided correct answers for the rational was 8.5% and 57.5% for the number of themes. The number of teachers who gave incorrect answers for that rational and number of themes was 17.0% each. Those who did not give any answer consisted of 74.5% for rational and 25.5% for number of themes. The teachers who did not give any answer were of the view that they do not know them and therefore decided not to guess. These results prove that more than half of the teachers have knowledge about the themes of science curriculum but few of them have adequate knowledge about science curriculum. Also about half of the teachers 49.0% correctly stated the themes of the JHS science curriculum while 17.0% of the teachers provided incorrect statements. About a third of the teachers reported that they did not know the themes and decided not to guess anything which may be different from themes stated in the science curriculum. The result indicates that 34.1% of the teachers were able to state correctly the science teaching periods per week while 40.4% of the teachers gave incorrect answers. About a quarter of the respondents did not parade any statement. On the periods allocated for teaching theory, 25.5% of the teachers provided correct answers while 50.1% of the teachers provided incorrect statements. Teachers who did not provide any response constituted 23.4%. Also, 31.9% of the teachers correctly stated the periods for teaching practical while 42.6% gave incorrect statements. Teachers who did not give any response for periods of teaching practical were 25.5%. Furthermore, these results prove that about 88% of the respondents knew nothing about the teaching loads of science instruction. This may influence their lesson preparation, delivery and assessment.

Also the results indicate that 24.5%, 21.3% and 4.2% of the JHS science teachers respectively provided the correct weight for knowledge and comprehension, application of knowledge and experimental and process skill while 66.0%, 48.9% and 53.2% of the teachers respectively gave incorrect answers. Teachers who did not give any response were 8.5%, 29.8 and 42.6% respectively for each profile. On the average about 86% of the teachers knew nothing about the weight of the themes of the science curriculum. Therefore, their assessment task may not be set up to standard which could assist pupils to perform effectively in science. The results indicate that 4.3% and 29.8% of the teachers respectively were able to correctly state the instructional approaches and assessment practices recommended in the science curriculum while 31.9% and 14.9% of the teachers respectively gave incorrect answers. More than half of the respondents (63.8% and 55.3%) indicated no knowledge of the recommended instructional approaches and assessment. Again, the results presented indicate that the majority of the JHS science teachers did not have adequate knowledge about some of the components of the JHS science curriculum. This may influence science teachers instructional and assessment practices negatively.

Table 2. JHS science teachers' classroom instructional practices at introduction stage.

Introduction Stage	% of Practice									
	T1*	**T2***	**T3***	**T4***	**T5***	**T6***	**T7***	**T8***	**T9**	**T10***
State the purpose and expectations for learning	80	80	80	60	80	80	80	80	40	80
Creates curiosity and gets student attention	20	20		40	20	40	20	20		20
Raise appropriate questions	90	90	90	90	90	90	90	90	90	90
Elicits responses that uncover prior Knowledge	100	100	100	70	100	100	100	100	10	100
Identified and records student thinking	80	30	30	30	30	30	30	30		80
Create the opportunity for pupils to question	80	40	20	80	40	40	20	20	20	20
Average % practice	**75**	**60**	**53.3**	**61.7**	**61.7**	**63.3**	**66.7**	**66.7**	**41.7**	**65**

(The teachers labelled with the symbol * were those who used introduction activities effectively)

Table 2 indicates that 50% of the teachers encouraged pupils to work in groups while all the teachers observed provided common experiences. Also about 50% of the teachers observed and listened as pupils raised questions but only 30% of the teachers asked probing questions to redirect pupils. None of the teachers provided time for pupils to puzzle through problems and therefore none of the teachers added concepts to the collective memory of the pupils by recording ideas. Only 30% of the teachers encouraged pupils to explain concepts in their own words and referred pupils to existing data and evidence. None of the teachers asked for justification and clarification of concepts from the pupils but rather directed the lesson by formally providing definitions. Also none of the teachers used audio- visual/electronic resources, used pupils' experience and encouraged pupils to interact during lessons. About 30% of the teachers used classroom norms and discussions while none of them used Meta-cognitive strategies to guide discussions and asked questions that justifies. Though all the teachers waited time after asking questions and none of the teachers asked questions that challenged pupils' thinking. Also 40% of the teachers asked questions that allowed pupils to change their mind and encouraged pupils to use formal labels while none of the teachers encouraged pupils to apply or extend concepts. But only 20% of teachers reminded pupils of alternative explanations of concepts.

On the average all the teachers scored mean percentage practice below 60%. This result proved that the teachers did not practice classroom teaching and learning activities effectively.

Table 3: Periods JHS science teachers organise assessment (n=47)

Periods teachers plan assessment	Frequency	Percentage
Start of the term	8	17.0
Weekly	23	49.0
Monthly	12	25.5
Mid – term	4	8.5
Total	**47**	**100**

Table 3 indicates that all the teachers planned assessment but at different times in the term. About half (49.0%) of the teachers planned assessment weekly. The reason the teachers gave was that they usually prepare their lessons weekly hence the preparation of weekly assessment. Also 25.5% of the teachers planned their assessment monthly. They gave a reason that they usually complete topics monthly. Other teachers (17.0%) of the teachers planned their assessment at the beginning of the term. This is because they usually prepare their scheme of work per term. But only 8.5% of the teachers assessed their lessons at the middle of the term.

Table 4. Stages at which JHS science teachers assess their pupil during instruction (n=47)

Stage of instruction teachers assess pupils	Frequency	Percentage (%)
Introduction	11	23.4
Main lesson	8	17.0
Conclusion	24	51.1
Throughout the lesson	4	8.5
Total	**47**	**100**

Teachers indicated various stages at which they assessed their students. Table 4 indicates that about more than half (51.1%) of the teachers assessed their pupils at the conclusion stage of the lesson. About 23.4% of the teachers assessed their pupils at the introduction stages of a lesson while 17.0% of the teachers assessed their pupils at the main lesson stage. But only 8.5% of the teachers assessed their pupils throughout the lesson (introduction, main lesson and conclusion stages).

Table 5: Effect of discussion of JHS pupils' assessment results help on teaching (n=47)

Categories of responses	No. of responses	Percentage (%)
Helps to adopt new teaching methods	1	2.1
Helps to identify learning difficulties and to take remedial action	2	4.2
Help teachers to identify strengths and weaknesses of pupils	25	53.2
Helps teachers to know the understanding level of pupils.	10	21.3
Help to motivate students to learn.	4	8.5
Help teachers to acknowledge the level of students	3	6.4
Other responses	2	4.3

Table 5 indicates that 2.1% of the teachers said it helped to adopt new teaching methods while 4.2% of the teachers said it helped to identify learning difficulties of students and to take remedial action. Also 53.2% of the teachers said it helped to identify strengths and weaknesses of pupils, while 21.3% of the teachers said it helped to know the understanding level of pupils. Again 8.5% of the teachers said it helped to motivate pupils to learn, while 6.4% of the teachers said it helped to know the knowledge level of pupils. But 4.3% of the teachers gave different reasons.

DISCUSSIONS

One of the expected curriculum knowledge of the JHS science teachers for science instruction and assessment is their knowledge of the rational, subject matter (content), materials and pedagogy. This knowledge refers to the teacher's knowledge about curriculum materials, content and ability to use these elements effectively during instruction and assessment to enhance teaching and learning. It also includes the interaction between subject matter knowledge, pedagogical content knowledge and teachers' practical theories. Also, science teachers' knowledge about materials, content, pedagogy and assessment influences teachers' initial planning (lesson preparation) and classroom practices (lesson delivery and evaluation). It is assumed that what teachers know and what they believe impact on their decision in planning prior to teaching and carrying out their plan. In other words, the teacher's science content knowledge, his/her knowledge of instructional and assessment strategies will shape the choice of the lesson structure (Brickhouse & Bodner, 1992; Gess-Newsome & Lederman, 1995; Lederman, 1992). The effectiveness of these elements of teachers' curriculum knowledge has a great impact on pupils' academic performance. Because teachers' curriculum knowledge influences their instruction and assessment practices.

The responses to the questionnaire indicated that about 97.9% of the teachers were professionally trained and are likely to be knowledgeable of the requirements of the JHS science curriculum. They were also aware of some teaching methods that are used during instructions. But only 26% of the sampled teachers specialised in science and science related programmes such as agricultural science at the tertiary level. Also only 20% of the teachers out of the 10 teachers selected for the classroom observation pursued science elective in senior high school while the rest (80%) pursued general art and business as their electives. It is therefore not a surprise that there is a gap between the teachers' professional knowledge and science content knowledge. Teachers' background subject matter knowledge is one of the important elements of curriculum knowledge (Goldhaber & Brewer, 2000). They again stated that teachers who teach outside the field of study (teachers teaching outside their area of subject- matter training and certification) may face some difficulties during instruction.

The findings indicated that 78.7% of the teachers have inadequate science curriculum content knowledge. Also all the teachers admitted they encountered some difficulties when teaching some topics. For example, the entire teachers indicated that they found things very difficult when teaching basic electronics and some teachers (about 55%) indicated that physics and chemistry topics were difficult to teach and few of them (about 20%) complained of biology topics. Some of the common reasons the teachers gave were that they do not have enough knowledge on those topics, the topics involve more formulas, calculations and difficult terminologies. This was more pronounced among the professional teachers with a low science background. Yet, the physics and chemistry topics in the science curriculum constitute about 50% of the entire JHS science content. Therefore, teacher inability to teach these topics effectively may affect pupils' academic performance in science. The findings also buttressed

the assertion that without the essential knowledge base of subject matter, teachers are simply unable to produce effective instruction (Grossman, 1992). A host of other studies reported by Gess-Newsome and Lederman (1995) that compared teachers' subject matter knowledge with their classroom practice concluded that the former had a significant impact on how the content was taught. The recommended instructional method in Ghanaian basic schools is a child-centred approach. Child centred instruction is an instructional approach in which pupils influence the content, activities, materials and pace of learning. This instructional approach places the pupil (learner) at the centre of the learning process and the instructor provides pupils with the opportunity to learn independently from each other and coaches them in the skills they need to do so effectively.

Inquiry-based science teaching and learning is a replication of authentic scientific investigation and a means of channelling natural human curiosity toward specific learning outcomes. The inquiry based child-centred instruction requires teachers with very strong curriculum content knowledge. Child-centred classrooms are full of curiosity, conception and misconceptions (Collins & O'Brien, 2003). Therefore, teachers should be more knowledgeable to guide pupils to solve problems, eliminate misconceptions and build on conceptions. Proper implementation of child centred instruction can lead to increased motivation in the pupils to learn, greater retention of knowledge, deeper understanding, and more positive attitude toward the subject being taught (Collins & O'Brien, 2003).

Some instances of child-centred instructional activities observed in some of the JHS science classroom, the findings indicated that about 80% of the teachers observed were able to introduce their lessons effectively by stating the purpose of the study and raising questions that elicited pupils prior knowledge while the rest (20%) of the teachers' introduced their lessons ineffectively.

At the activities stage only 50% of the teachers encouraged their pupil's to work in groups. But the group activities did not involve the use of science materials for hand on activities. The pupils were only engaged in group discussions about the topics being taught. For effective teaching and learning in science, it is recommended that schools should have science equipment and materials (CRDD, 2007). Surprisingly, none of the schools visited had any science equipment for hands-on activities.

Though teachers observed and listened as pupils raised questions during group discussion, only 30% of the teachers asked probing questions that redirected pupils' thinking. Group activities that offer pupils opportunities to dialogue and to develop skills of persuasion through communication were absent. These classroom realities therefore constitute gaps between the intended science curriculum and the implementation. The teachers did not encourage pupils to explain concepts in their own words. They rather provided them with definitions and key points from text books and pamphlets. Teachers with low subject matter knowledge mostly quoted information from books verbatim. The findings affirm Lederman's (1992) assertion that an educator with limited knowledge about pupils' misconception in science cannot offer alternative, and helpful explanations, especially if the teacher has limited science content knowledge. But the JHS science curriculum recommends that pupils should be encouraged to use their knowledge, develop analytical thinking skills, develop plans, generate new and artistic ideas and solutions, and use their knowledge in a sort of way to unravel mathematical and scientific problems while still in class (CRDD, 2007). If these aren't practiced within the science classroom, then the achievement of Junior High School science curricular goals may

remain a mirage if interventions aren't put in situ to recruit teachers with high science material knowledge to show Junior High School.

The findings indicated that about 70% of the teachers talked throughout the lesson as pupils sat and listened while few teachers (30%) who involved the pupils in classroom discussion used question and answer methods within the body of the lesson to sustain the eye of the pupils. Again, the teachers used questions that demanded recall rather than using probing questions that might have demanded higher reasoning skills like elaborating, or exploring an idea. During the discussions, none of the teachers used the pupils' prior knowledge. But the utilization of everyday experiences of the pupils facilitates their participation within the lesson. It also improves the pupils' understanding of the concepts (Kasanda, 2002). All the teachers on the typical practiced classroom activities ineffectively. Ineffective teaching and learning activities affect pupil understanding of an idea being taught and will therefore affect their pupils' performance. At the evaluation stage the result obtained indicated that quite 60% of the teachers didn't include the utilization of formative assessment. This meant that the pupils weren't held in charge of their learning through small and whole group discussions but rather teachers gave notes and exercises but none of them was collected for review.

The information obtained from science teachers' organisation of assessment task indicated that about 49% of the teachers designed their assessment task weekly and thus the remainder indicated they designed their assessment task at the beginning of the term, monthly and midterm. None of the teachers indicated they designed their assessment task daily. On the time teachers assess their pupils, the results obtained indicated that half (50%) of the teachers indicated they assessed their pupils at the conclusion stage of the lesson and thus the remainder (50%) of the teachers assessed their learners throughout the stages of instruction, during instruction, at the highest of instruction, at the highest of a unit/topic, monthly and at the highest during one or two of the periods stated before while all the teachers (100%) indicated they assessed their pupils at the highest of a term. Teachers are expected to assess pupils throughout the science instruction but results show that they weren't practicing that. Rather they indicated they assessed their pupils mostly at the concluding stage of instruction. This means that the bulk teachers do assessment of learning and not assessment for learning. As indicated by Black (1996) assessment should be regular for teachers to constantly monitor students' progress and weaknesses for the specified action to be taken.

All teachers indicated they assessed their pupils but their kinds of assessment were purely summative. Summative assessment is the assessment that comes at the highest level of the course or unit of instruction to assess the last word outcome of that unit in terms of student learning. It is most frequently based upon cognitive gains and sometimes takes into consideration other areas of the intellect (Trowbridge, Bybee & Powell, 2004). Also Black (1996) explained that summative tests as those tests given at the highest of episodes of teaching for the aim of certifying or grading students or for evaluating the effectiveness of a curriculum. The results indicated 49% of the teachers assessed their pupils through project work. The strain on the project work is to reinforce pupils' learning by encouraging them to provide essays, poems, and artistic work and other items of learning using appropriate process skills, analysing information and other kinds of data accurately and making generalizations and conclusions. The SBA consists of End-of-month tests, assignments (specially designed for SBA) and Project. Apart from the SBA, teachers are expected to use class exercises and residential work as processes for continually evaluating pupils' class performance, and as means for encouraging improvements in learning performance (CRDD, 2007). Also the curriculum recommends that at the JHS level, pupils are expected to write down reports as a neighbourhood

of their homework assignments. In writing a report on an experiment or any kind of investigation, the pupil possesses to introduce the foremost issue within the investigation, project or report (Bartels, 2000).

Science teachers in Ghanaian public schools do not make use of formative method of assessment in assessing the progress of the pupil as students are assessed summatively to know their performance and progress. The foremost goal of formative assessment is to understand what students know and what they do not know so as to form responsive changes in teaching and learning. It is vital that teachers use techniques like observation and classroom discussions alongside analysis of tests and homework. A number of things influenced teachers' choice of assessment task. The results obtained indicate that 45.3% of the teachers indicated that they chose their assessment task from evaluation questions within the syllabus; others also indicated they selected already made questions from the textbook. Only 20.8% of the teachers indicated they assessed their pupils supported the topical objectives within the science syllabus. Though teachers can use these questions, test items that are utilized in examinations or class work also can be modified and stored within the item bank (CRDD, 2007).

Profile dimension' could also be a psychological unit for describing a selected learning behaviour. Each of the precise objectives during this syllabus contains an "action verb" that describes the behaviour the pupil is getting to be able to demonstrate after the instruction (CRDD, 2012). Knowledge, Application etc. are dimensions that need to be the prime focus of teaching and learning in schools. It has been realized unfortunately that schools still teach the low ability thinking skills of knowledge and understanding and ignore the upper ability thinking skills. Application of knowledge and Practical and Experimental Skills have equal weight that's above the load for Knowledge and Comprehension. This means that the second and third dimensions are considered more important and may therefore need more emphasis within the teaching and testing system (CRDD, 2012).

The findings indicated that 49% of the teachers assessed their pupils on Knowledge and Comprehension while only about 30% of the teachers assessed pupils on Application of knowledge and Experimental and Practical Skills. As recommended within the curriculum, the profile dimension weights indicate 20% of the whole marks are allocated to Knowledge and Comprehension, 40% of the whole marks are allocated to each of Application of knowledge and Practical and Process Skills. The load of each of the three dimensions is indicated within the last column. The ratio of theory to practice in integrated science at the junior high school level is 60:40, (CRDD, 2012). Since application of knowledge and practical and process skill constitute 80% of the whole assessment marks, teacher's hesitance to assess pupils on such areas of profile dimension could affect pupils' performance at the BECE. Effective feedback on assessment informs both teachers and learners to reinforce teaching and learning. Therefore, it's required of every teacher to supply feedback to pupils to strengthen pupils' performance.
The findings on feedback indicated that about 62% of the teachers gave both oral and written feedback to pupils and thus the remainder gave oral or written feedback relying on the mistakes made. On the other hand, the teachers indicated that pupils normally reacted to feedback but accepted regeneration. But the results obtained indicated that only a few teachers gave feedback supporting the task performed. Feedback to students reinforces successful learning and identifies the training errors that need correction (Trowbridge, Bybee & Powell, 2004). Teachers are therefore requested to supply feedback on the task performed to redirect the learners to make appropriate corrections for clear understanding of science concepts.

Feedback could also be a key aspect of formative assessment. Teachers gain feedback in different ways from their students and reciprocally provide feedback to their students. According to Ramaperasad (1983) feedback given as a neighborhood of formative assessment puts learners within the position to identify any loophole that exists between their desired learning outcome and their present knowledge, understanding or skill. Yet the teachers indicated that they only marked what pupils wrote and thus the pupils' books were returned to them either on the same day or later. When pupils are given feedback that's helpful they're encouraged and are able to focus their attention thoughtfully on their tasks rather than getting the proper answers. That is, specific comments about their errors and specific suggestions for improvement enable students to observe their progress. Thus assessments are often considered formative because the feedback is used to reinforce teaching and students' learning (Black, 1996). Feedback supplied by the teacher or as self- assessment by the scholar is supposed to reinforce the students' learning and places the learner within the central role of the training process (Brookhart, 2011).

The findings indicated that quite half (55.3%) of the teachers used assessment results for creating judgment of learners' performance while 21.3% of the teachers used the results to provide feedback to parents. But only 8.5% of the teachers indicated they use assessment results to reinforce learning. These results give clear indication that the majority of science teachers' main specialization in assessment is assessment of learning but not assessment for learning. The only kind of assessment that enhances performance is assessment for learning. Therefore, teachers' preferred use of assessment of learning will cause poor performance. Black (1996) found that assessment for learning is one of the foremost powerful ways to reinforce learning, especially among students who find learning to be tougher. By applying the principles and techniques of assessment for learning, we'll help students learn better now and achieve more areas of their educational experience. Additionally , assessment for learning is based upon an understanding of student motivation and thus the psychology of learning, so students become better learners for the rest of their lives because of their successful learning experiences.

The effect of JHS science teachers' curriculum knowledge, instruction and assessment practices on pupils' performance.

Determinants of students' performance are the topic of ongoing debate among Ghanaian educators, academics, and policy makers. However, since teachers' curriculum knowledge, instructional and assessment practices play a task in shaping the factors that affect students' performance, it's vital to look at those relevant factors to the Ghanaian society.

The findings obtained from science teachers' curriculum knowledge on the content and materials indicated that the junior high school science teachers have low science content knowledge. a variety of misconceptions were recorded during the classroom observation, a number of which weren't addressed by the majority of the teachers. The lack of most of the teachers to handle pupils' misconceptions or inaccurate contributions in school might either flow from their lack of the acceptable science content and pedagogical knowledge or perhaps their inability to spot the misconceptions through diagnostic assessment during the lesson. This seems to verify Duit's (2004) assertion that if a teacher isn't conversant with pupils' misconceptions within the particular topic to be taught, she/he won't consider the educational strategies to use to correct them when planning for instruction. Therefore, an educator with limited knowledge about pupils' misconception, additionally to limited science content, cannot

offer meaningful alternative explanation to the pupils (Brickhouse & Bodner, 1992; Duit, 2004; Lederman, 1992).

The findings on the science teachers instructional and assessment practices indicated that the teachers preferred using teacher – centred instruction rather than child – centred instruction recommended within the science syllabus. The result on science teachers' instructional practices indicated that the majority of the teachers introduced their lessons effectively but that their activities and evaluation practices were ineffective. This is often because they were practicing a teacher- centred instructional method. At the operational stage of cognitive development where most junior high school pupils belong, this mode of instruction which amounts to rote, contradicts meaningful learning (Ajibola, 2008). It is significant to notice that learner-centred teaching approaches are emphasised in curriculum policies in most African countries including Ghana. Yet these policies are rarely applied within the classroom. Newton and Newton as cited by Abell and Lederman (2007) found, during a study involving elementary science teachers, that elementary teachers with less material knowledge interacted less, asked fewer questions and spent longer lecturing.

Also, teachers preferred assessment of learning rather than assessment for learning. This agrees with the findings of Osei (2004) during a study which investigated the mode of assessment within the then Ghanaian Junior Secondary Schools. He found that teachers always give pupils exercises and tests at the top of instruction. For instance, Ajibola (2008) reported that teachers' efforts in Nigerian basic schools were towards covering the content of the curriculum within the approved time-frame of the varsity calendar. He reported that both teachers and pupils work towards ensuring that the examination syllabi are covered.

The Ministry of Education laid more emphasis on the teaching and assessing of practical and experimental skills for college kids to accumulate knowledge domain and skills and even be ready to apply knowledge to new situations (MOE, 2007). Therefore, teachers' low curriculum knowledge could affect their science instruction and assessment negatively and this might cause poor performance of pupils in science. Since pupils' performance rely greatly on classroom science instruction and assessment, teachers with low curriculum knowledge could easily influence pupils' academic performance negatively.

CONCLUSIONS

This study represents an initial effort to supply documentation on the effect of junior high school science teachers' curriculum knowledge, instruction and assessment practices on pupils' performance. Using both quantitative and qualitative approaches, this study provided research based understanding of certain strengths and weaknesses of the present practices of Ghanaian junior high school Schools science teachers' science teaching and assessment.

The findings put the necessity of assigning teachers who have adequate science content knowledge to handle integrated science in Ghanaian junior high school. These will create new ways and opportunities for the event of pedagogical thinking within the domain of science among teachers. The knowledge about science content and materials will enable the junior high school teacher to use other ways of representing science concepts to form them understandable to pupils. a number of these alternative representations include analogies, illustration, examples, explanations and demonstration. Also science teachers are to review the varsity base assessment properly and practice them effectively in their classrooms to enhance performance. The study also revealed that teachers give feedback to students; this feedback both oral and

written was centred on praising students. The results of students' assessment were employed by teachers to form judgment and improve teaching. Teachers also discussed assessment results with students and fogeys for them to understand their performance. Appropriate feedback in assessment is the use of proper tool to enhance performance. Therefore, teachers should spend time to debate pupil's assessment task results with the pupils so as to offer proper oral and written feedback which might be accepted by the pupils to form proper amends.

Although further research is required to elaborate and substantiate the findings of this study, it provides initial evidence of science teachers' curriculum knowledge, instructional and assessment practices on pupils' academic performance in Ghanaian junior high school science classrooms and at Basic Education Certificate examinations (BECE).

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