Curriculum Deficiency Syndrome: An Impediment to Holistic Basic Science Education in The Western Region of Ghana

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Abstract: **This study examines basic science teachers' classroom professional practices and how it influences learners' understanding of basic scientific concepts. The study also examines factors that militate against effective science professional teacher practices in handling the new standard based curriculum in science as well as factors which aggravate Curriculum Deficiency Syndrome (CDS) and what basic science teachers can do to improve the situation. The study employed the descriptive survey design using stratified random sampling in selecting two strata consisting 12 Junior High school teachers(K-12) and 60 upper primary science teachers (K-9) drawn from three districts in the western regions of Ghana. A questionnaire and an interview guide were the main instruments used in collecting data for the study. To ensure validity and reliability of the instruments employed in this study, the instruments were pilot tested at Zion cluster of schools in Takoradi. Experts from the Science Education Department of Holy Child College of Education proof read the items. Some of the items were reframed while a number of items measuring the same constructs were properly aligned. Items whose specificity could not be properly aligned with the constructs being measured were deleted. Analysis of data revealed that classroom professional practices of basic school science teachers fall short of the curricula expectations. Teachers could not plan remedial instructions for learners with CDS. This is because the 3-day crush national training held prior to the implementation of the new curriculum could not equip basic science teachers with the skills expected in teaching the new curriculum. Time constraints, large class size, inadequate in-service training and lack of flexibility on the daily schedules in the basic schools prevented science teachers from making the desired impact during instructions. Teachers resorted to teaching basic science concepts in abstract due to unavailability of science resources. The study recommends basic science teachers develop a plan to assist learners experiencing curriculum deficiency syndrome to overcome their challenges in the teaching and learning of basic science. The study also recommends action research, in-service training, exposure to current innovative pedagogies (flipped class teaching, concept mapping, and augmented multimedia) and access to science resources to enable basic science teachers help reverse this trend.**

Keywords**; science experiments, science curriculum, science resources, critical thinking, teacher professional development, problem solving.**

I. INTRODUCTION

The rapid technological development associated with globalization, and the quest to develop smart ways of life has come with attendant human problems that need urgent solutions. Solving the problems of the 21st century era demands individuals with critical and analytical thinking dispositions, to unravel the myth surrounding the solution to problems [15]. The quest to produce citizens with critical thinking dispositions and problem solving skills [4] has changed the face of teaching in the 21st century. Nations the world over have and continue to revise their educational curricula to encompass the skill-demands of the 21st century which form the requisite competences required for modern day living. The implementation of revised educational curricula has a lot of implications for the basic school science teacher since teachers are the key factors on which nations extend and implement their developmental agenda. Teachers, thus have become the main fulcrum around which the educational tapestry of every nation revolves.

Many countries including Ghana have embarked on major curricula reforms to increase and develop the professional teacher competence which is invariably linked with teacher development for work. Teacher professional development must be geared towards furnishing teachers with adequate knowledge, skills and values that will inure to the benefits of their learners [9]. This suggests that the knowledge, beliefs and perception of science teachers play a pivotal role in understanding the tenets of the new standard based curriculum since they are the main implementers [11];[16]. Many science teachers have asserted that the new curriculum would produce creative, mathematical and scientific Ghanaian learners who will grow to become critical thinkers capable of solving the myriad of problems confronting the country. Countries the world over have developed modern innovative learner-centered approaches to science teaching and learning, formed science teacher professional bodies (community of science practitioners), developed professional teaching standards and established national science teaching boards aimed at ensuring high standards of science teacher professionalism in the classroom.

All these strategies are aimed at helping the basic school science teacher to professionally perform their responsibilities imbued with the canons of the basic science curriculum which includes encouraging group work to foster collaboration, assisting learners to get lifelong experiences by observing phenomenon and developing scientific skills, preparing learners for the job market and higher academic work by developing critical thinking through reasoning, and promoting a sense of good judgment in solving societal problems [27]. It goes without saying that science teacher 'professionality' training has become a key component in science education in today's world. The strategies put in place by science education experts are also intended to develop the competences of the basic school science teacher to perform creditably within the professional space of teaching. However, notwithstanding these innovations, educationists in Africa continuously complain of the falling standards of education on the continent particularly in integrated science; Ghana is not an exception. This baffling situation casts doubts on the competency of the basic school science teacher practices which is aimed at equipping the citizenry with the intended knowledge, skills and attitudes and critical thinking required for living in the current world ravaged with lots of human problems.

The professional practices of the science teacher in the classroom forms an integral part towards achieving the set objectives of the science curriculum. Teachers are expected to engage in standardised professional practices which are aimed at developing the capabilities of the basic school learners with the intent to achieve. Effective science teachers use different approaches depending on their students' needs, their learning objectives and the types of knowledge they intend to impart [13]. These professional practices define the philosophies, integrity, credibility and the identity of the science teacher. It also demonstrates the competency and skills possessed by the science teachers in delivering the basic school curriculum. Basic science teachers are expected to engage in practical activities during teaching, reflective practices, action research, assessment with immediate feedback, monitoring of pupils learning, provision of remedial to pupils who may miss out on the lesson content, and above all sharing of relevant information that contributes to science teacher professionalism development [35]. Science teachers, thus play a key role in offering quality basic science education to learners [18].

Curriculum has been defined by many researchers depending on the perspectives and the lenses with which they perceive it. Curriculum includes all the planned and unplanned courses of study. In the broader sense, the basic science curriculum refers to the totality of all learning experiences of the learner while in school [26] from Primary Year Four (learners aged 9 years old, K-9) through to JHS Year 3 (learners aged 14 years old, K-12). The curriculum is principally influenced by the dynamics of our immediate society and environment which inadvertently controls our behavior and our way of life. It encompasses both hidden and overt which are aimed at equipping learners to become more broadened in their scope of thought as well as becoming aware of the individual human potentials as a person. In science education, the curriculum is perceived to be the knowledge and skill a learner is expected to acquire, the standards expected of learners at every stage**,** the objectives that we as educators expect them to meet, the units and lessons that educators teach, the assignments and projects set for the learners, the science resources used in aiding understanding, and the assessments techniques and other methods used in evaluating the teaching and learning of basic science [36]. It is very important to note that the rigid nature of the daily schedules of the basic school curriculum in Ghana, coupled with heavy workload, lack of teaching and learning resources, large class sizes and short contact class periods prevents basic school science teachers from meeting their daily targets [1]. Science teachers do not have the flexibility to professionally engage learners who may miss out on daily instructions. Research suggests that a sizable number of basic school science teachers engage in practices that fall short of the professional practices expected of them [24]. The basic school curriculum for a particular day is so loaded with activities from dawn to dusk that there is no room for the science teacher to attend to pressing instructional needs of some learners who may be having academic difficulties. The basic school curriculum however, expects pupils to develop certain key competences at each stage of the way. These competencies expected of pupils at each stage of the education ladder are known as performance standards. Performance standards being a key component of the science curriculum is premised on the fact that lower level concepts form the basis for upper foundational development and as such pupils are expected to be guided to do a mastery of the basic science concepts so as to develop control over the upper level science concepts. Although most research in classroom teacher professional practices have identified time constraints as the limiting factor preventing teachers from addressing the challenges of learners requiring assistance and remedial on daily basis, the challenges inherent in the implementation process of the new standard based curriculum have compounded the problems of the basic school science teacher. The curriculum did not come with primary readers for science and this makes it difficult for science teachers to select the right materials that will complement learners reading in the classroom. The challenge with this practice is that it prevents the education sector from ensuring standardization especially when the National standardised test for basic schools in Ghana is staring at our faces. There is also a mismatch between the expected performance standards and the activities needed to develop those standards. The basic school curriculum fails to identify the exact materials which should be used in performing particular hands-on activities in the classrooms in order to develop the minds and heart of the basic school learners in science [3]. Another complexity imposed by the new curriculum and the teacher professional practices is the expected workloads and targets teachers are to complete with a term. Science teachers struggle in their attempt to complete the already loaded science curriculum. This situation forces

the science teachers to teach the subject without engaging in hands-on practical activities that seeks to inspire interest and curiosity in the learners [3]. Many science teachers concentrate on teaching science theoretically with the intension to meet the expected targets as set out by their district inspectorate team. In the absence of resources to aid science teaching, science teachers have resorted to teaching scientific concepts in abstract making their instructions very boring, a recipe for low learner performance in science. Learners are prevented from engaging in practical activities which guides the development of science process skills and form the basis for creative thinking [2];[20]. Learners have become passive recipients of repository knowledge from teachers [28]. One can also question the effectiveness of the pre-implementation training teachers went through which failed to equip science teachers with the needed skills required for teaching the new curriculum. Again, the numerous interventions put in place to complement pupils reading in the basic schools tend to confuse teachers since the content of one intervention may conflict with another and could have serious implications for basic science instructions.

All these problems impact heavily on the basic science teachers preventing them from engaging effectively with learners' on daily basis. These short falls continue every day until such a time that the learners go to the next stage of the educational ladder. It can therefore be said that learners move to a succeeding class without mastery of the curricular content in science of the preceding class. The piling up of pupils' academic difficulty with time develops into a situation known as curriculum deficiency (CD), and when learners' are unable to cope with academic work because of the stress posed by their academic difficulty, then it becomes a curriculum deficiency syndrome (CDS). Pupils with CDS do not show adequate performance standards expected of their class and so lack the competencies required for continuing academic work in basic science. This situation, if not curtailed may result in a downward trend in basic science preventing the state from developing the citizenry with critical thinking and problem solving skills required for modern day living. Learners who cannot cope with the succeeding class' academic work may miss out in science totally, requiring an intervention to continue their education, while those who may cope a little, are bound to develop challenges which might prevent them from reaching their full academic potentials in science. Some other learners may totally lose interest in science and may eventually give up if adequate measures are not put in place.

This situation coupled with certain sociological factors is serving as great disincentive to learners' continuous access to basic education in science. It can therefore be said that CDS is a great threat to learners' education because it prevents those who will grow to become informed scientist from developing their potential academic prowess. CDS results from the inability of professional science teachers to engage in effective teacher practices required for developing basic school learners' academic competences in science. It is important to note that good teaching and learning is an element of successful students' achievement [17].

Statement of the problem

The professional teacher practices of the basic school science teacher is an integral function towards achieving the curriculum set for basic schools. Science teachers as change agents are expected to perform their professional roles dutifully and tactfully in order to make impact on the learners they teach. Science teachers are expected to be resourceful and innovative so as to provide learner-centered instructions that meet the needs of every individual learner [22]. However, the actual teacher practice in classrooms differs considerably due to resource availability and teacher competences. This suggests that actual teacher practices vary from class to class depending on the class dynamics. This condition is born out of the daily time schedules which do not allow adequate flexibility during the daily instructions. The situation in basic schools in Ghana where daily schedules of the curriculum are loaded with activities from dawn to dusk, places a challenge on the classroom teachers. Teachers are constrained with time to attend to learners who may require some assistance and remedial during science instructions.

The situation if not checked, may develop to the extent that learners may lose interest in school due to academic challenges in basic science. These challenges if not addressed may go a long way to prevent learners from developing their academic potentials in science. It is for this reason that this study is conducted to determine the basic school science teachers' professional practices in relation to their professional competencies.

To help address these issues, the following questions were formulated to guide the study.

1. What are the professional teacher classroom practices expected of basic school science teachers?
2. To what extent do teachers fall short of these professional practices when teaching science?
3. What factors contribute to Curriculum Deficiency Syndrome (CDS) in basic schools in the western region of Ghana?

II. METHODS AND INSTRUMENTS

The descriptive survey design was employed for the study. Descriptive survey design is non- experimental since it examines the effect between non-manipulated variables in a natural setting [14]. It ensures that reliable amount of responses are obtained from a wider range of subjects by providing meaningful impression of events used in explaining effects and behaviour of the subjects. The descriptive survey design was adopted to enable the researcher report on basic science classroom teacher practices and its impact on pupils especially learners who require extra assistance in science to make sturdy progress from one class to the other. It was also to enable the researcher explore some of the strategies that could be put in place by basic science teachers for providing

remedial measures to learners who may require assistance in order to master bits and pieces of the curriculum content.

Population and Sampling

The stratified random sampling subjected to science teacher availability at the time of the data collection was used to select all 72 basic science teachers in three districts located in the western region of Ghana. Two strata were created from the basic science teachers. One stratum consisted of twelve Junior High School (JHS) science teachers drawn from the three districts namely Sekondi-Takoradi Metropolitan Education Directorate (ST-Med), Effia-Kwesimintsim Municipal Education Directorate (EK-Med) and the Ahanta West Municipal Education Directorate (AW-Med). Four JHS science teachers were sampled from each district. The second stratum consisted of 60 upper primary class teachers teaching science as part of their daily schedules. Twenty teachers each were drawn from the three identified districts. The teachers were asked to declare their willingness to be part of the study. Initial exclusion counts revealed twenty-eight teachers declining from a total of six schools. The sampling was extended for two more schools in each district until the total population of willing teachers was obtained.

Two main instruments were employed by the researcher in collecting data for the study. They included a questionnaire on basic science classroom teacher practices and an interview guide on the difficulties basic science teachers encounter while using the new science curriculum. The questionnaire was designed to solicit the teachers' views on their classroom professional practices and some of the strategies employed to overcome their curriculum deficiencies in science as well as teachers' knowledge of use of current innovative learner centered pedagogies employed in teaching basic science. SPSS version 21.0 was used to analyse the descriptive statistics obtained. The interview sought to explore how teachers manage their classrooms as well as training regime put in place by the three district directorate of education in developing science teacher competency for teaching, and the activities performed by basic science teachers during teaching to develop learners' interest in science. The information from the interview enabled the researcher to triangulate the information collected using the questionnaire. Five teachers each (one JHS teacher and four upper primary teachers) from each district were interviewed. The qualitative data obtained from the interview were played several times. The issues were put into groups. The groups were then classified and put into themes related to the construct being investigated.

Validity and reliability of instruments

To ensure validity and reliability of the instruments used in this study, a pilot study was conducted on 20 teachers to collect data using the instruments at Zion cluster of schools in Takoradi. Experts from the Science Education Department of Holy Child College of Education reviewed the items. The responses to the items were weighed against the constructs being measured by the study. Some of the items were reframed while a number of items measuring the same constructs were properly aligned. Items whose specificity could not be properly aligned with the constructs being measured were deleted.

Ethical consideration

All teachers sampled for the study were assured of their confidentiality and anonymity of this study. They were made aware that the information collected will be used only for academic purposes. The teachers were assured that under no circumstance will the information be given to a third party. To ensure anonymity of the schools involved in the study, the names of their schools will not appear in the research. To ensure strict adherence to th3e ethics, all names employed in this study are all pseudo names.

Analysis of data obtained with the questionnaire Demographic data

Table 1.0 Years of teaching experience

Respondents	frequency	percentage
1-5 years	10	13.9
6-10 years	14	19.4
11-15 years	18	25.0
16-20 years	20	27.8
Above 20 years	10	13.9
Total	72	100

Source; field data, 2022

Table 1 above, indicates that the teachers sampled in the three districts who were involved in teaching basic science are experienced science teachers who have taught for between ten to twenty five years and above 62(86.1%). This indicates that majority of the teachers teaching basic science in the public schools in the three districts of the western region have enormous experience as far as basic science teaching is concerned. The ramification for this experience is that where the needed resources are not available for teaching the new standard-based activity-centered science curriculum, the teachers will relapse and resort to teaching science using the traditional method characterised by theory without practice.

Table 2.0 Highest Educational Qualification

Respondents	frequency	percentage
Untrained Teachers Diploma (UTTBE)	2	2.8
Diploma in Basic Education (DBE)	18	25.0
Bachelor of education (B.Ed)	45	62.5
B.Sc/BA/B.Eng	2	2.8
Master of education (M.Ed)	2	2.8
MA/M.Sc/M.Eng	2	2.8
Mphil	1	1.4
Total	72	100

Source; field data, 2022

From table 2.0 above, it can be concluded that most of the teachers teaching basic school science in the public basic schools in the three selected districts of the western region have the basic qualification needed for teaching science. Most of the teachers 45(62.5%) possesses bachelor of education which is the basic qualification needed for teaching science as prescribed by the new curriculum. However, it is very important to note that there exist a nexus between teacher qualification and teacher competence. [6] Contends that teacher qualification and teacher competency is needed for effective teaching in science. Experienced, well committed, dedicated and qualified science teachers help develop the interest of learners in science thereby facilitating learners' performance.

Table 3.0 Science Teachers' Classroom Professional Practices

Item	SA	A	D	SD
awareness of current innovative pedagogies	6 (8.3)	20(27.8)	26(36.1)	20(27.8)
employed innovative pedagogies	2(2.8)	22(30.6)	28(38.9)	20(27.8)
engaged learners in science experiments	10(13.9)	12(16.7)	24(33.3)	26(36.1)
encouraged learners to state observations	10(13.90	20(27.8)	30(41.7)	12(16,7)
allowed learners to explain observations	12(16.7)	12(16.7)	30(41.7)	18(25.0)
learners relate experiment to real life situation	12(16.7)	8(11.1)	30(41.7)	22(30.6)
marked learners expression work; prompt feedback	16(22.2)	8(11.1)	30(41.7)	18(25.0)
engaged remedial lessons with pupils	12(16.7)	18(25.0)	26(36.1)	16(22.2)
administered science projects once a term	20(27.8)	8(11.1)	20(27.8)	24(33.3)
Went on field visit with learners	8(11.1)	2838.9	24(33.3)	12(16.7)

Source; field data, 2022

Table 3.0 depicts a rather worrying situation in the basic school classrooms where science teaching takes place. This is because majority of the teachers 46(63.9%) sampled in both upper primary and JHS contended that they were not aware of the current innovative pedagogies used in teaching science. It was obvious from among the teachers 48(66.7%) that since they were not aware of the current innovative pedagogies, they did not employ them in their teaching. Another worrying situation reveals that 50(69.4%) teachers did not engage their learners in any science experiment or practical work. A sizable proportion of the teachers 42(58.4%) sampled indicated that they did not encourage learners to make their various observations during experiments. Majority of the teachers 48(66.7%) did not allow the learners to explain their observation made during science experiments. Another 52(72.3%) teachers indicated it was difficult to relate science experiments with real life issues because it was not easy to embark on field visits 44(61.1%) or engage learners in at least one project per term. A seemingly worrying trend related to the issue of assessment in the basic science classrooms in the schools sampled indicated that, the teachers 48(66.7%) could not administer expression work and mark promptly by providing feedback to encourage learners' develop interest and confidence. The teachers 42(58.4%) again indicated that it was difficult to administer remedial lessons for learners who miss out understanding science concepts or the main topic for the day because the curriculum for a day is overloaded with activities from morning till closing. This gloomy picture painted by the teachers indicated that the professional classroom teacher practices of the basic school science teachers in the three districts leaves much to be desired.

Table 4.0 Impediments to science teacher professional practices

Item	SA	A	D	SD
had access to basic science curriculum	10 (13.9)	30 (41.7)	24 (33.3)	8 (11.1)
availability of science resources to enable science teaching	18(25.0)	8(11.1)	18 (25.0)	28(38.8)
had no training on how to use science resources	16(22)	22(30,6)	20(37.8)	14(19.4)
science curriculum specifies the resources to use	8(11.1)	30(41.7)	20(37.8)	14(19.4)
able to improvise science resources	12(16.7)	20(37.8)	28(38.8)	12(16.7)
trained prior to implementation of new curriculum	14(19.4)	14(19.4)	18(25.0)	26(36.1)

Source; field data, 2022

From table 4.0 above, it can be deduced that majority of the teachers 40(55.3%) confirmed having direct access to the basic school curriculum which guides them in selecting strands to be taught. More than half of the teachers 38(52.9%) sampled indicated that the curriculum specifies the teaching resources to be used in teaching the various science concepts. However, some teachers 46(63.8%) contended these resources are not readily available for use. A sizable number of the teachers 44(61.1%) indicated that they had received a 3-day training prior to the implementation of the new standard based curriculum. However, the teachers 40(55.3%) said the training did not consider improvisation techniques required for making nonexistent resources for teaching. Half of the teachers 36(50%) sampled were of the view that they did not receive any training in the use of science resources essential for teaching basic school science. From the responses above, it can be concluded that the training commissioned by the Ministry of Education prior to the implementation of the new standard based activity oriented curriculum did not equip the science teachers in the three districts with the skill requirement for teaching basic school science. The basic science teachers thus lack the skills needed in selecting and preparing teaching learning resources as well as the techniques employed in using these resources to get the best out of the learners.

Table 5.0 Factors accounting for CDS in Classrooms

Item	SA	A	D	SD
groomed by experienced science teacher	8(11.1)	24(33.3)	32(44.4)	8(11.1)
had science pedagogy training while at college or university	2(2.8)	26(36.1)	18(25.0)	26(36.1)
Able to use flipped classroom techniques	6(8.3)	20(37.8)	28(38.8)	18(25.0)
Able to conduct action research to assist pupils	8(11.1)	24(33.3)	24(33.3)	16(22)
Meet learners with difficulty.	8(11.1)	14(19.4)	20(37.8)	30(41.7)

Source; field data, 2022

From Table 4.0 above, it can be concluded that the training science teachers went through while at college or university had not prepared them adequately to be very confident in teaching. The teacher's area of expertise falls outside the teaching of basic science. This offers considerable challenges and apprehension when dealing teaching science [23]. The teachers most of whom had distance education had not been exposed to the current pedagogies of teaching science and so their practices do not include a plan to provide remedial to learners who miss out on daily instructions. This is because majority of the teachers 46(63.8%) were of the opinion that they could not employ flipped teaching technique to enable learners who have miss out on a concept get more information at home to be consolidated by the teachers at school. A high proportion of the teachers 40(55.3%) sampled rated that they had not received grooming from an experienced science teacher to equip them with skills for real teaching in class. Some of the teachers 40 (55.3%) could not engage in action research to address pressing difficulties of learner's academics. Majority of the teacher's indicated that it was extremely difficult for them to meet learners with academic difficulties outside the instructional hours to help address learner's difficulty because they are usually tired after the day's instruction. From the analysis of data above, it can be concluded that the rigid nature of the basic school curriculum coupled with inability of basic science teachers to use innovative strategies in providing learners with remedial is preventing learners with daily academic challenges to pile up. This condition if not checked can de-motivate learners from developing interest in science.

III. FINDINGS AND DISCUSSIONS

It was obvious from the analysis of the data obtained from table 3.0 that basic school science teachers are not aware of the current innovative pedagogies used in teaching basic science. This meant that the basic science teachers were used to the old tradition of teaching the subject without recourse to current innovative pedagogies (flipped teaching, concept mapping or augmented multimedia instructions) which are more learner-centered [34]. The teachers resort to teaching basic science without the practical component intended for developing conceptual understanding among the basic school learners. Science teachers thus teach theoretical-practical which does not involve hands-on activity intended to develop the hearts and minds of the learners in science [28]; [3]. Basic science teachers need exposure and polishing of their pedagogical variables in order to meet the modern trends of teaching science [21]. The teachers attested that they hardly ever performed experiments in science due to time constraints and inadequate resources for its conduct. They contend that instructional materials are inadequate; students are made to read textbooks while the teachers explain the concepts to them instead of the students carrying out activities as suggested by the new science curriculum [10]. This assertion by the teachers is in tandem with [25] when they pointed out that science resources, time constraints and teacher content knowledge and pedagogical variables are major problems affecting the teaching of practical in science in schools. The teachers were of the opinion that the large class sizes made it difficult for the conduct of hands-on practical activities meant to develop learners understanding of scientific concepts. This observation by the teachers is consistent with the assertion made by [30] when they reiterated that the use of teaching learning resources in teaching science results in meaningful learning by arousing learners' interest and motivating them. Availability of adequate instructional materials and strategies give students the chance to use their senses of hearing, smelling, tasting, seeing, and feeling [31] which aids their conceptual understanding. Where practical work is necessary to develop understanding, the teachers resort to practical demonstrations by telling the learners what to expect without allowing them opportunities to observe and explain their findings using inquiry and scientific basis. When learners are not allowed the opportunity to conduct experiments by making their own meaning from observed phenomenon, it stifles their creativity and deprives them of the critical thinking disposition needed for advance academic and practical work in science.

The teachers also reiterated that it was difficult to relate the basic science experiments to real life applications. This, they contended was difficult because most of the learners did not understand basic concepts in science. They said, the limited time does not allow effective discussion of science concepts in relation to how they are applied in solving problems. The type of exercises administered by the basic science teachers is dependent on the prescribe exercises related to the topic and not the experiments. The teachers did not allow the learners freedom to discover facts and concepts all by themselves. The teachers also contended that it was difficult for them to mark promptly and provide feedback because of the large class size [5]. Teachers are not able to use the feedback from exercises to inspire the learners develop interest in science.

The teachers complained that "the curriculum for everyday is so loaded" and there is "only one teacher teaching and marking and doing everything". It was quite disappointing to know that the teachers complained they are not able to assign project work and also embark on field visits.

This situation is very pathetic owing to the heavy impact that these activities can have on the development of scientific

knowledge of the learners. It is important learners are introduced to the world of work of the scientist so that learners develop interest in science at an early stage in life. The practices of the classroom teacher do not spur up interest of the basic school learners who may want to pursue science in the near future. The observation above was confirmed during the interview when some teachers made the following comments;

"I usually pick items from the science corner and use them as teaching learning resources".

"I cannot devout more time to doing experiments". My head teacher and SISO will always count the number of exercises done to determine my work output.

"The teaching learning materials are woefully inadequate for use by all pupils owing to the large number of pupils in class. I usually demonstrate".

"I need to cover most of the strands in the curriculum so I write notes and explain along"

"I undertake practical activities in the form of demonstration once a while because I make a lot of sacrifices by providing materials using my own money from my pockets"

"As a teacher I do more discussions than experiments because resources for teaching science are simply not available".

"Sometimes when the learners interact with the materials after science lesson they become happy and motivated" but in the current circumstance I cannot boldly confirm that it develops their curiosity because they are hardly ever used during lessons because of time constraints.

From the discussions above, it can be concluded that the basic school science teacher professional practices in the classroom fall short of the expectations of the curriculum. Basic school science teachers require continuous professional development to become accustomed to the modern methods and skills for managing instructions in science.

Availability of curriculum materials for teaching science in basic schools

Analysis of table 4.0 above indicated that teachers had access to the science curriculum in their schools (both primary and JHS). However, teachers disagreed having access to science resources needed to teach the basic science curriculum efficiently. The teachers contended that lack of science apparatus and materials for science teaching has limited the teaching of science in the basic schools to mere teacher explanation without the learners manipulating materials to aid in knowledge construction. Science is perceived to be difficult, boring and not interesting [6] by the learners because of lack of use of science resources in teaching. The teachers indicated that in the absence of resources to aid science teaching, they have resorted to teaching scientific concepts in abstract thus making the science teaching very boring which is an answer for low learner's performance in science. Some of the teachers observed that due to absence of teaching learning resources in the JHS, they have resorted to using the apparatus in the science kit boxes which are out-dated in teaching science concepts. The teachers' assertion above is in tandem with the assertion made by [6] when he concerted that large class sizes, inadequate funding, insufficient curriculum resources, poor teaching methods, skills and lack of supports for teachers among other factors further limit the quality of Integrated Science teaching and learning in Ghanaian schools. The teachers were of the opinion that the new science curriculum specifies the resources to be used in teaching each topic (strands) confidently. However, lack of access to curriculum supporting materials like textbooks, workbooks, and teacher's handbook and science resources for teaching has made the teaching of basic science very daunting and very boring. The teachers also noted that the curriculum training done prior to the implementation of the new curriculum did not make the desired impact since it failed to equip them with the skill dispositions for teaching science concepts effectively. Teachers were constrained preparing resources in teaching science because the training did not equip them with the skills in improvisation. Where the resources for a particular strand is not available finding a substitute to be used in teaching the concepts becomes a challenge for the teacher who does not have experience in developing science resources from local materials.

From the observations above, it can be concluded that the lack of curriculum supporting materials coupled with ineffective curriculum training prior to the implementation of the new science curriculum and teachers' inability to improvise for non existing resources has rendered the science teachers in the basic school highly ineffective and inefficient.

Factors accounting for curriculum deficiency in basic science

There exist differences in pupil's academic performance and by extension the extent to which learners can understand and assimilate scientific concepts taught. Some learners develop understanding of scientific concepts very fast while others struggle in an attempt to develop basic understanding of scientific concepts. This means that teachers as facilitators have to employ a variety of differentiated pedagogical strategies to get the learners to understand the concepts taught. This suggests that basic science teachers develop and plan an alternative instructional path in guiding pupils who do not master pieces of information during the daily instructions to catch up.

Science teachers are expected to engage in action research, innovative pedagogies and activity oriented science teaching to enable learners with difficulties understanding scientific concepts to overcome their problems. However, analysis of the responses in table 5.0 indicated that it was difficult for them to offer academic assistance to learners who miss out on scientific concepts or does not develop understanding of the topic taught during instruction. The teachers contend it was difficult to offer remedial class to learners who do not catch

up because "there is not time to and the curriculum is loaded from morning till closing". That it does not allow any space for the teacher to offer extra academic assistance to learners who require them. The teachers also claimed that it was difficult to use more learner centered pedagogies in teaching to enable most learners develop basic understanding of concepts taught during science instruction.

According to [28], because of inadequate time allocation to science curriculum on the teaching time table, most teachers rush through the science subject matter without giving chance to students to engage in practical activities for effective utilization of their science knowledge and so develop difficulty in understanding the concepts. The observation made by [28], is consistent with the assertion made by [29] when they posit that increasing number of learners is another factor that militates against effective teaching of science. They noted that basic science classrooms experiencing an upsurge in the population of learners with much demand for classroom space and laboratory facilities. This has compelled teachers to always engage in-class instruction without offering any instructional assistance

Factors militating against Curriculum Deficiency Syndrome in science

Table 5.0 above depicts that most of the basic science teachers did not receive specialised training in college or university to enable them teach the subject confidently and competently. This situation can motivate most of the basic science teachers to relapse by adopting the traditional strategies employed in teaching science especially where adequate resources are not available. The teachers again confirmed that they "have not had any Professional Learning Communities session where they are introduced to effective, innovative or modern strategies" for teaching basic science. Even though most of the teachers confirmed engaging in mentorship prior to completion of college, they did not receive science specific mentoring to enable them teach basic science. This situation is again worrying because it casts a slur on the professional training regime put in place by the colleges of education and the universities for training teachers. [29] asserts that colleges and universities should create the necessary friendly environment that will enable will be teachers to acquaint themselves with all the resources that will be made available during training so as to get them to be innovative, resourceful and to adopt differentiated instructional approach to achieve high learning outcomes on completion. This suggests that while at training to become teachers, colleges and universities must seek to the totality of the development of the teacher both in content and pedagogy to get them imbued with the skill drives for effective and efficient teaching. The teachers also confirmed that even though they had attended workshops, the workshops were not aimed at helping them teach science. According to [32] science teachers require upgrading and retraining through refresher training and workshops to sharpen their skills in lesson delivery. From the indicators above, it can be concluded that teachers have not received any specialized training aimed at equipping them with the pedagogical skills and content dispositions particularly for teaching basic school science. It must be emphasised that the training and preparation of science teachers is a critical issue in augmenting teacher professional performance [12]. Science teachers in the basic schools lack the basic training required for teaching science [37]. The in-service training and workshops organised by the Education Directorate has been generic and does not concentrate on science teaching in the basic schools. It can be perceived that most of the teachers especially teaching in JHS are not subject specialist in science but that they were posted there just to fill the vacancies in order that they teach science. Many researchers have identified that the quality of science teaching and learning could be affected by many factors including content knowledge and pedagogical skills of the teacher due to poor teacher preparation, inadequate, and inappropriate instructional materials, medium of instruction, lack of effective supervision and monitoring at school, lack of motivation for teachers, inadequate number of qualified teachers to fill empty classrooms, poor attitude, and interest of pupils among [7]. It would not be out of context to say that because the teachers did not have training insights into science teaching, their teaching did not drive the needed curiosity, interest and motivation essential for learning science. However, it is important to note that adequate and effective science teacher training is necessary to inspire learners to want to achieve.

The following observations were made by the teachers during the interview in support of the above revelations.

"I think it will be better to organise practical workshops once a term to equip the basic science teachers with the skill demands for teaching the basic science curriculum. Some of us are not actual science teachers"

"Some of us did distance education and were not engaged in effective training in science teaching. The teaching practice we did was quite different from what we are teaching in schools"

"The limited training time of three days was not enough to exhaust all the skills needed for teaching basic science in schools".

"As a teacher sometimes my confidence is low because I lack basic training in science practical work like getting colors from leaves which I don't know"

From the above discussions, it can be said that the training of qualified and efficient basic science teachers by the universities and the colleges of education in Ghana needs a total over haul if the intention for teaching basic science is to equip the basic school learners with creative thinking. There is the need for training and retraining of the basic science teachers to become familiar with the current modalities of teaching science in basic schools.

IV. CONCLUSIONS

From the analysis of the data, it could be concluded that basic school science teachers engaged classroom practices fall short of the curricula expectations. Even though the teachers possess the basic qualifications permissible for teaching science in basic schools, the teachers lack the requisite pedagogical competencies coupled with practical dispositions needed for teaching basic science effectively.

Lack of science curriculum materials coupled with inadequate training and skills in using modern innovative pedagogies have reduced basic schools science teaching to a boring and uninteresting venture which does not encourage learners who may want to pursue science in the near future.

Inadequate exposure of the basic school learners to field visits and projects in science is killing the initiative of the "young scientist" who may be willing to pursue professions in science.

Lack of specialized training and ineffective grooming by experienced science teachers in science oriented practices has affected the ability of science teachers to teach effectively by developing curiosity, interest, creativity and critical thinking.

The 3-day national crush training organised for basic school teachers prior to the implementation of the new curriculum failed to equip science teachers in the three districts with the requisite professional and pedagogical variables needed for teaching basic school science competently.

The basic school curriculum is overloaded with schedules for instruction within a day that teachers do not have the flexibility during instructions to provide remedial to learners who may miss out on some science concepts.

Unavailability of science resource materials has motivated basic science teachers to resort to teaching science in abstract without any practical disposition to complement students' development in understanding basic scientific concepts.

V. RECOMMENDATIONS

The District Directorate of Education should engage basic school science teachers in continuous refresher training to equip them with the skills and dispositions needed in delivering the basic school curriculum.

The Ministry of education through the district directorate of education should organize teaching learning resources to help the teachers deliver the contents of the curriculum without any pinch of hesitation.

Basic science teachers should be encouraged by the head teachers to organise field trips and engage in science projects within their school communities to enable learners relate science concepts taught in classroom to their everyday use in life. This will help learners to appreciate the world of work of the scientist and so develop interest and curiosity of learners to study science.

The District Directorate of Education and head teachers in the basic schools must ensure that after posting of teachers from universities or colleges of education, they are assigned to experienced teachers who will mentor them to develop the skills and knowledge for teaching science in the basic schools confidently and competently.

Teachers must always mark and rate learners' exercises and assignment promptly and discuss the feedback with them while helping them to use the feedback in developing their learning potentials.

Basic school teachers should develop the habit of continuously engaging in action research in the classroom to identify pupils who may be facing academic challenges during instruction so that they can overcome CDS. This will prevent a situation where learners pile up the instructional difficulties within a day.

Basic science teachers must engage pupils in curriculum extension activities, particularly pupils who may be having academic challenges with some topics in the classroom. Innovative pedagogies such as flipped teaching, personalized learning, project-based learning, blended learning, concept mapping and augmented multimedia learning could be adopted to help pupils to develop mastery of basic science concepts.

The Directorate of Education in the three districts sampled should consider the science teachers' expertise before posting them to fill vacant positions I the basic schools.

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