AN ASSESSMENT OF PERSONNEL AND INFRASTRUCTURAL READINESS FOR THE IMPLEMENTATION OF THE NEW BASIC SCHOOL SCIENCE CURRICULUM IN THE NORTHERN REGION OF GHANA

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ABSTRACT

This study investigated the personnel and infrastructure readiness for the implementation of the basic science curriculum of the Ghana Education Service. The study adopted the descriptive survey using the mixed-method approach. The population of the study is made up of all basic school science teachers of the Northern region of Ghana. A purposive sampling technique was adopted to sample 150 basic school science teachers for the study and randomly select 10 teachers for the interview. A structured questionnaire and interview guide were used to gather data for the study. This research found that basic school teachers in Ghana's Northern Region meet numerous challenges, including a limited curriculum and inadequate knowledge about the new curriculum. This is coupled with the unavailability of resources to help in the implementation of the curriculum. In general, the findings of this study show that teachers' preparation is moderate, and the material or infrastructure needed for implementation is also lacking for the successful implementation of the new basic science curriculum.

Keywords: Basic Science, Curriculum, Infrastructure, Readiness, Personnel.

INTRODUCTION

The educational system in Ghana in recent times experienced significant uplifts aimed at enhancing its competitiveness in the global education system. Consequently, curriculum development and educational reform processes are subjected to periodic review, revision, and modifications (Johnson, 2001). In alignment with the country's vision to improve its educational system, the National Council of Curriculum and Assessment (NaCCA) has designed a new and in-depth Standard-based curriculum. When implemented, the new curriculum will promote meaningful life-long learning and eradicate all forms of assessment that encourage rote learning. Policy-makers and educators in Ghana appreciate the contribution of science and technology in accelerating national development and promoting inclusiveness in education, especially in present times. The enactment of the new curriculum has become a necessity in the realization of the nation's educational goals. Successful implementation of the new curriculum however relies on infrastructural and personnel readiness.

Successful implementation of the integrated science curriculum relies heavily on the readiness of the personnel (teachers) who are the main implementors of the curriculum. According to Alsubaie

(2016), there should be significant progressions made in training teachers to actively reflect the needs of the societal in each phase of the process of developing the curriculum. An important contributory factor to the successful implementation of the new curriculum is the professional development of teachers (Handler, 2010). As implementors of the curriculum, teachers ought to have adequate familiarity of the curriculum. An assertion by Nsibande (2002) indicates that headteachers in schools are inadequately informed about the curriculum and thus are unable offer assistance to teachers when required. Teachers therefore fail to plan for certain aspects of the curriculum. Nsibande (2002) contends that teachers' lack of confidence and poor lesson planning during instruction is as a result of their inadequate knowledge of the curriculum.

It is therefore imperative for curriculum teachers and facilitators to have adequate knowledge about the field of curriculum management and assessment of student's performance to address problematic curriculum areas. Stiggins (2005) indicated that the lack of avenues for teachers to learn proper assessment practices and techniques is the reason why teachers fail to adequately prepare before conducting the new assessment for learning.

According to Mandukwini (2016), basic schools need to be supplied with the resources necessary to meet the curriculum needs. Schools in Ghana generally have certain basic physical resources that support curriculum management. The management of a school's curriculum is largely dependent on the availability of resources such as those listed above.

One of the hallmarks of the standard-based curriculum is its attempt to fuse technology in the teaching and learning of integrated science. The successful implementation of the integrated science curriculum allows schools to provide more flexibility in implementing new technology-based teaching and learning actions. Williamson and Payton (2009) indicated that, blended learning is part of the possibilities, which blends learning on various online platforms with traditional forms of instructional delivery.

The idea of blending technological pedagogical knowledge in the teaching and learning of science is to maximize learning outcomes, thus shifting the focus from the technology alone to its impact on the teaching and learning of science (Smaldino, Lowther, & Russell, 2008). Integration of technology in the teaching and learning of science has provided avenues for learners to gain knowledge and skills from diverse sources, this has in many ways improved the teaching and learning of science. This is in sharp contrast with the traditional classrooms approach in which the learners are able to use the technological knowledge and equipment to learn 'with' and 'through' computers (Du Plessis & Webb, 2012). The use of technology in integrated science education necessitates a shift in the approach of teaching and learning. Facilitators/Teachers, for example, are the people who will be most affected by this shift. The effectiveness of this procedure will be determined by their ability to satisfy the additional expectations for curriculum implementation.

So, the question is are the schools in the northern region of Ghana ready for a successful implementation of the Integrated science curriculum? This study, therefore, sought to assess the personnel and infrastructural readiness for the implementation of the new Basic School Science curriculum in the Northern region of Ghana.

METHODOLOGY

The study adopted the descriptive survey using the mixed-method approach. The population of the study is made up of all basic school science teachers of the Northern region of Ghana. A purposive sampling technique was adopted to sample 150 basic school science teachers for the study and randomly selected 10 teachers for the interview. A structured questionnaire and interview guide were used to gather data for the study. The questionnaire was constructed based on a 4-point Likert scale with levels of agreement expressed as follows: 1 (Strongly Disagree), 2 (Disagree), 3 (Agree), and 4 (Strongly Agree). Participants were required to read and mark their responses in the questionnaire given to them by the researchers. Analysis of data from the questionnaire was done using frequency, mean, and standard deviation whiles the interview data was analyzed thematically.

The researcher administered the study questionnaire to selected individuals after the purpose of the study was explained to them and confidentiality was assured. The researchers also randomly sampled 10 integrated science teachers to conduct the interview. The interview was structured to inspire teachers to make unrestricted comments. Interview questions posed were centered on factors that affected the readiness of teachers to implement the new curriculum. The main question from the interviews was stated as follows: “what are the factors that you think affect the implementation of the new curriculum? Following the main question were these set of questions: “Could you elaborate?”, “is there any other factors you want to talk about?” “How do these factors disturb you as an implementer of the curriculum?”. These questions were asked purposely to promote a deeper understanding of the main question and in some ways seek clarifications. Respondents in each interview were motivated to further explain their responses or share more information concerning the factors that they said affected their implementation of the new curriculum.

RESULTS AND DISCUSSIONS

RESULTS

One hundred and fifty teachers at the basic school were used for the study using the online purposive sampling technique. The distribution according to their gender, educational qualification, and teaching experience is as follows:

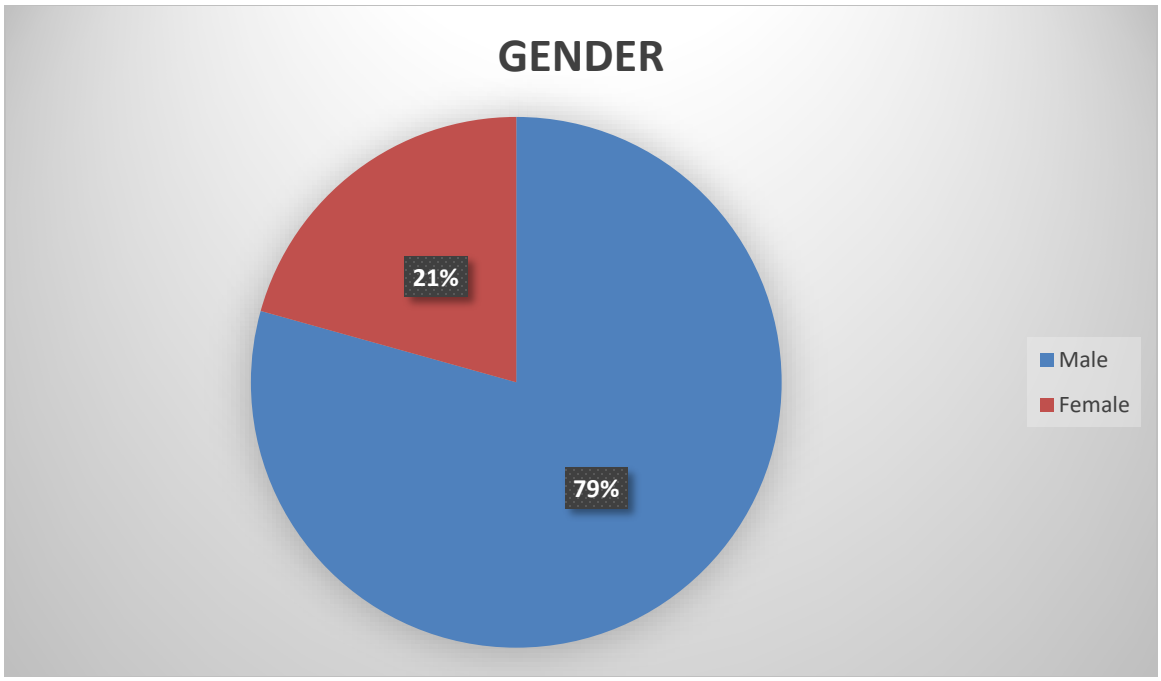

Figure 1: Gender of respondents

Data from the figure 1 indicates that 79% of the respondents are males and the remaining 21% are females. This is to say that more than half of the respondents are males.

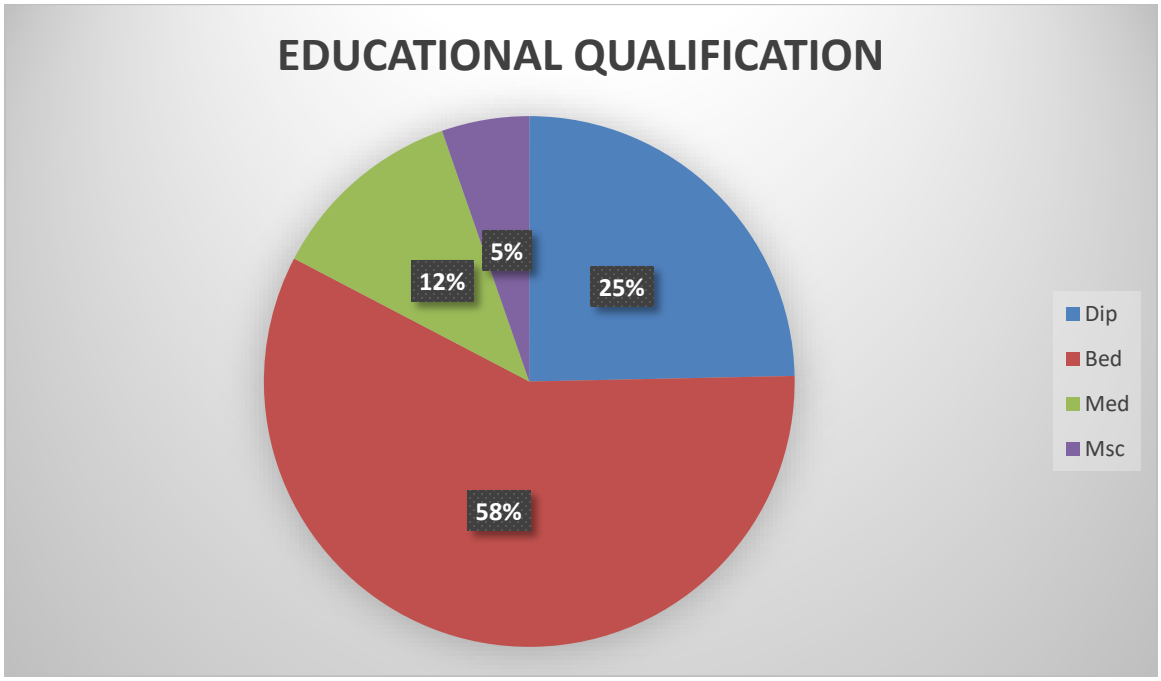

Figure 2: Educational Qualification of respondents

Figure 2 also indicated the educational qualification of respondents where 37(25%) of the respondents had a diploma in education degree; 87(58%) had a Bachelor of Education degree in basic education and science education; 18(12%) has a Master of Education degree and the remaining 8(5%) had a Master of Science degree. This indicates that as many as 95% of the respondents are trained teachers and well equipped to implement a curriculum.

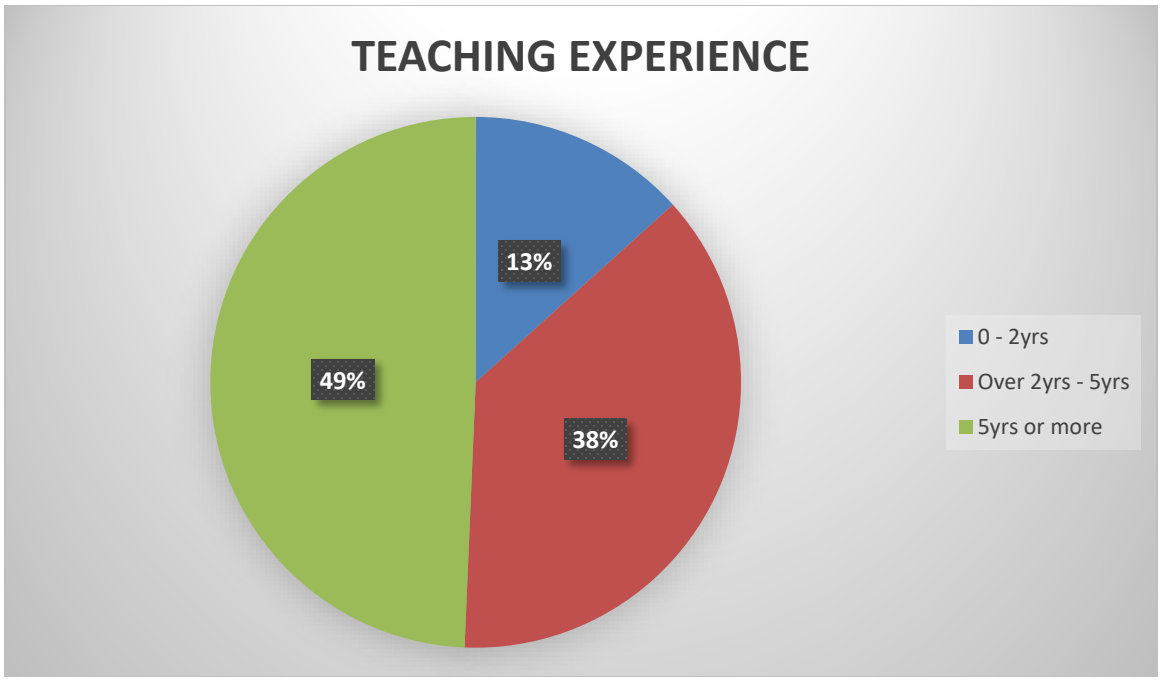

Figure 3: Teaching experience of respondents

Figure 3 also indicates the teaching experience of respondents where 19.5(13%) of the respondents has a maximum of 2years of teaching experience; 57(38%) have a maximum of 5years of teaching experience whiles 73.5(49%) have more than 5years teaching experience. This stipulates that as many as 87% of the respondents have more than two years of teaching experience that can contribute to the implementation of the new curriculum.

Table 1: Availability of Infrastructure

STATEMENT	SD (%)	D (%)	A (%)	SA (%)	M (SD)
Science laboratory is provided in the school	142 (94.7)	8 (5.3)	0 (0.0)	0 (0.0)	1.1 (0.2)
Science kits are brought to the classroom to aid teaching and learning	121 (80.7)	17 (18.0)	2 (1.3)	0 (0.0)	1.2 (0.4)
The laboratory is functional at the moment	141 (94.0)	9 (6.0)	0 (0.0)	0 (0.0)	1.1 (0.2)
Equipment and materials are adequately provided in the laboratory	139 (92.7)	11 (7.3)	0 (0.0)	0 (0.0)	1.1 (0.3)
The library is stocked with science materials	106 (70.7)	28 (18.7)	8 (5.3)	8 (5.3)	1.5 (0.8)

M=Mean, SD= Standard Deviation ***Source: Field data 2021.***

The table above was intended to assess the availability of infrastructure facilities and materials for teaching basic science.

The results hold that 94.7% of the respondents strongly asserted that a science laboratory is not provided for their teaching of the subject and 5.3% also believe that a science laboratory has not been provided. Various researchers have written about the benefits of science laboratories in science education. In the science laboratory, students are made to carry out experiments on science concepts learned in the classrooms and this in many ways enhances students' observatory and

manipulative skills. Cumulative exposure of students to laboratory experiments on science concepts makes the teaching and learning of science more practical and impactful. Given this, the role of the science laboratory in the comprehension and utilization of scientific concepts can never be overemphasized. Boghai (1979) reported that laboratory activities appeared to be very helpful for students rated as medium to low in achievement on pretest measures. Godomsky (1971) also indicated that students' problem-solving ability in chemistry increased through laboratory instruction, thus making it an effective instructional technique in chemistry. He explained that this could be possible only if experiments were initiated by problems without clear directions. To foster the cognitive development of older, disadvantaged students in a laboratory setting, activities designed to create disequilibrium were used by researchers (McKinnon, 1976; McDermott et al., 1980). Of all the importance of science laboratories to the teaching of science, they have not been provided to help make science concepts concrete for the basic school children.

Other teachers were of the view that they even lacked science kits if not the whole laboratory. The data presented show that about 100% of the teachers agree with the fact that they lacked science kits for their class lessons.

Again, the teachers also responded on the functionality of their laboratory if some are even available. 94% of the teachers strongly disagree with fact that they had a functional laboratory facility. According to Hofstein and Lunette 2004, activities carried out in the science laboratory have over a considerable period played a very distinctive and important role in the science curriculum. Science educators have also highlighted the benefits derived from engaging students in science laboratory activities (Pickering, 1980; Garnet et al., 1995; Lunetta, 1998; Tobin, 1990; Hofstein & Lunetta, 2004). Since the end of the 19th century, when schools began to teach science systematically, the science laboratory has become a distinctive feature of science education. So, a science laboratory if available needs to function for its to impact the lives of the students as expected.

Notwithstanding, 92.7% of teachers also strongly disagree with the statement that equipment and materials are adequately provided in the laboratory that is been assigned for them to work with, as well as 7.3% also disagree with the statement. So, almost all the teachers are against the statement. Concerning library material, 10.6% of the teacher agrees with the fact that the libraries in their respective schools are stocked with the required science materials. Whiles 89.4% were against the statement that their library is stocked with these science materials. The positive influence of school libraries on students' academic achievements has been expounded by different researchers. According to Morris (2013), school libraries function as learner-oriented laboratories which support, extend, and individualize the school's curriculum. He further highlighted the function of a school's library as a center and coordinating agency for all materials used in the school.

Table 2: Availability of teaching and learning materials

STATEMENT	SD (%)	D (%)	A (%)	SA (%)	M	SD
Students' textbooks and workbooks in Science are available	118 (78.7)	27 (18)	3 (2.0)	2 (1.3)	1.3	(0.5)
The teacher's manual in Integrated science is available	138 (92.0)	8 (5.3)	3 (2.0)	1 (1.3)	1.1	(0.4)
Science materials are available in the school library	109 (72.7)	34 (22.7)	7 (4.7)	0 (0.0)	1.30	(0.6)
The Science materials in circulation are readily affordable	128 (85.3)	19 (12.7)	1 (1.3)	2 (1.3)	1.18	(0.5)
Basic science materials are in conformity with the National curriculum content	137 (91.3)	13 (8.7)	0 (0.0)	0 (0.0)	1.11	(0.3)

Source: Field data 2021. M=Mean, SD= Standard Deviation

The Researcher also probed into the availability of teaching and learning material which was indicated in the questionnaire above.

From the results gathered, 3.3% of the basic school teachers in the Northern Region made it clear that they have enough students' textbooks and handbooks to deliver their lessons in fulfillment of what the curriculum required, but with that few numbers of teachers staying in agreement with the statement, as much as 96.7% of the basic school teacher in the northern region of Ghana was against the fact that they had students' textbook and workbook to help them in their daily routine. Textbooks are often regarded as an important guide for teachers especially in their daily instructional practice, thus serving as the main teaching material that students are exposed to, (Schmidt et al., 1997; Mullis et al., 2012a; Harwood, 2017). Textbooks are therefore expected to impact students' learning progress (Törnroos, 2005). Textbooks are indispensable tools in teaching reading and comprehension in primary schools since they have a considerable impact on primary education. Textbooks and its associated materials have the role of a mediator between the different curricula; they mediate between the intended and implemented curriculum. The use of textbooks enables teachers to translate curriculum objectives into a practical instructional guide that can be used daily together with other curriculum materials. Teachers, however, can still make their own decisions on how to use the textbooks. Teachers can choose parts of the textbook that relate to their planned lessons and decide on how much time is spent on certain topics in the textbook. Schmidt et al. (1997) describe the textbook as the only "potentially implemented curriculum", therefore teachers have the liberty to adapt the materials and select the learning experiences they want their students to gain. Textbooks are usually the main educational material that students interact with within class, thus they serve as an important mediator between the implemented curriculum and the attained curriculum. These researchers affirm that textbook is important to any educational reform and therefore, should be provided to our various basic schools across the Northern Region and Ghana as a whole.

The Researcher observed that majority of the teachers (96%) are of the view that a manual for teaching Integrated science is not available as well as 4% of the teachers in the Northern part of Ghana agree that a science manual is available for their teaching routine. It was reported by the majority of the teachers in the Northern region that they lack manual for their teaching activities when it comes to their basic science topics which is a necessity for every citizen.

Again, as much as 98% of the teachers in the Northern part of Ghana reported that science materials in circulation are not readily affordable and for that matter, they are not getting the needed material. Concerning the science material affordability, 2% of the teachers also reported that they have been able to afford it and some have been improvised.

Almost all the teachers in the Northern Region of Ghana who were used for the research reported that basic science materials are not in conformity with the national curriculum content which requires new strategies and blended technology for their teaching, and for that matter, they are finding it difficult to teach the content as the curriculum is expecting it. And for that matter, the MoE needs to provide the necessary material for the implementation of the new curriculum to match teaching with expectations.

A sample of 10 basic school science teachers was randomly selected and interviewed.
When teachers were asked about their professional development and training regarding the new curriculum the following were their responses.

Personnel readiness
The researcher sought to find out their readiness for the implementation of the new curriculum
Teacher 1: "Oh I have a degree in BSc. Integrated Science Education from the University of Education Winneba, so I am fully qualified to teach Integrated Science in the junior high school but no workshop has been done on the new curriculum, I personally don't know anything about it.
Teacher 2 also stated that "for the degree, I have a Bsc Biology degree and I teach Integrated Science. However, concerning the new science curriculum, I have little knowledge about it hence I am still using the old curriculum to teach my students. It will take some time and training for me to be equipped with the dictates of the new curriculum.
Teacher 4: "okay, I have a BEd in Science Education from UCC so I can teach science to the expectation of my students". The implementation however will be difficult as we speak now because we have not received enough training to be able to implement it in the school.

Knowledge and skills:
Teacher 3: "I have the requisite knowledge of my content but the skill required for the implementation of the new curriculum is what I think will be of a disadvantage over here. So am looking forward to GES organizing a workshop for teachers of which am part to develop the skill needed".
Teacher 9: "Yes, am experienced enough to adjust to any new strategies that the curriculum is expecting, but since I was not consulted in the construction of the curriculum, I will need some form of training to acquaint myself with what is expected of me to develop the required skill".
Teacher 8: "I have knowledge and skill of what I teach that's why can deliver my lesson to the understanding of my students but with the new curriculum, I will need some time to develop a new skill about its implementation".

Infrastructure readiness
The respondents were asked about the availability of infrastructure in their schools to enable the implementation of the new curriculum. The infrastructure used here included classrooms, textbooks, laboratories (both ICT and science), and access to the internet.
Participants' responses are as follows;

Teacher 7: "Hmmm, when it comes to infrastructure, I don't even know how to put it across. We lack a whole lot of things from textbooks through to even classrooms. Some of the classes will have to even share a single classroom for their lessons. With even that, to get textbooks for our daily routine is a problem as we will need to try so hard before we can get a single book with sometimes our own money so I don't know how this new curriculum can be implemented."

The lack of internet in the classrooms was noted to be a hinderance for teachers. Over six (6) interviewees complained that there was no or poor internet connection was poor, they stated the following; *"a computer without internet is useless, and we have no internet connection in our classrooms".*

Teachers 10 said that *"they sometimes connect their smartphone with the data shown in the classroom to present internet materials"*

"Internet access? It's an eye saw. You will need to be around before I think you can believe what am about to tell you. We don't even have the ICT lab so where can I get access to the internet? Sometimes I will need to send my pupil where I can access the internet and even with that, my phone is what I use before I can let them understand what am teaching. So, internet access is a very huge problem to us over here". (Teacher 5)

Teacher 6 also reported on the availability of a science laboratory for basic school. *He said "Ever since I came to this school, I always deliver my lesson in an abstract way to my pupil, and its always been a wish, that one day, I can let my pupil appreciate the fact that science is with us through experiencing a practical aspect of it. But because we don't have a laboratory, am unable to make my pupil appreciate that fact. So, in all, we don't have a science laboratory!!".*

DISCUSSIONS

Ghana, as a country is very determined when it comes to education and is highly driven to provide top-quality education to its citizenry. Teachers in the country, therefore, have a critical role to play in the implementation of the curriculum and are usually acknowledged as an important factor that contribute to the accomplishment of any educational innovation. This study assessed teachers' and infrastructural readiness to implement a basic school curriculum within the Northern Region of Ghana. The readiness of teachers was measured using their educational qualification and teaching experiences, infrastructural adequacies, and the availability of teaching and learning materials for the implementation of the basic school curriculum.

On the premise of educational qualification, it is indicated that 25% of the respondents had a diploma in education; 58% had a Bachelor of education degree in basic education and science education; 12% had a Master of Education degree and the remaining 5% had a Master of Science degree. This indicates that as many as 95% of the respondents are trained teachers and well equipped to implement a curriculum. It is widely recognized, even among researchers in the field of education, that one of the most important school factors especially those with direct influence on students' learning progress is teacher quality (Ladd and Sorenson, 2014; Rivkin, Hanusheck, and Kain, 2005). Ndirangu (2004) argues that the progression of the curriculum is enforced by teachers, thus highlighting their significance.

According to Etiubon and Benson (2014), instructional programs for grooming teachers have been designed to include methods and practices that are geared towards the advancement of methods and practices that promotes creativity and skills for professional qualification. From previous

studies on teacher qualification and their level of teaching effectiveness in tandem with the requirement of the basic school curriculum, the results obtained appeared to be conflicting. For example, it was reported by Owoeye (2000) that students' academic achievements were greatly impacted by the level of education a teacher has. Ibrahim (2000), however, indicated that a teacher's qualification and exposure may have an extensive effect on the academic performance of students. Good academic performance could in part, contribute to the cognitive, affective (attitude), and psychomotor domains of an individual. Teachers' quality is directly proportional to students' performance. This suggests that it is important not to underestimate the role of teachers in preparing students to be successful in their examinations. The teachers' qualifications or experience in any educational system determine to a greater extent the quality of the system itself. The researcher also probed into the teaching experience of teachers on the implementation of the curriculum and it is said that 13 of the respondents has a maximum of 2years of teaching experience; 38% had a maximum of 5years of teaching experience whiles 49% has more than 5years teaching experience. This stipulates that as many as 87% of the respondents have more than two years of teaching experience that can contribute to the implementation of the new curriculum. The experiences and knowledge of teachers are unique qualities for teaching to be effective (Etiubon and Benson, 2014). Teacher experience grows when the teacher is exposed to new ideas, new commitments, and new challenges. Rice (2010) indicated that the degree of impact of teacher experiences is dependent on the teacher's level of education and subject area. He further explained that teachers' experience acquired over time ultimately improves their knowledge, skills, and productivity. These qualities facilitate students' skills and abilities to think about processes useful for exploration and analysis, and also enable a thorough understanding of concepts. According to Etiubon and Benson (2014), teachers with lots of teaching experience are very valuable to novice teachers who require continuous guidance, advice, and encouragement. Akinsolu (2005) explained that experienced teachers have to be maintained in schools if higher productivity is to be acquired because students achieve more from these teachers. Experienced teachers can identify students' problems and be ready to change methodology to assist in effective teaching and learning.

Through telephone interviews, teachers were asked about their readiness for the implementation of the new basic school curriculum, like their personal readiness, that is knowledge and skill and infrastructural readiness. The teachers outlined certain factors that impeded the integration of technology into their teaching practice and significantly influenced the implementation of the new curriculum within the Northern Region. These are some obstructions that can elucidate why teachers do not highly regard their readiness for the implementation of the new curriculum. The 10 teachers that were sampled were of the view that they have the requisite knowledge and skill for their daily teaching routine but since the curriculum is new to them, they may need some sort of in-service training to equip them as required by the new curriculum.

Notwithstanding, these teachers reported the foremost common measure that impeded teachers' readiness is the inadequate of infrastructure. inadequate teaching and learning resources or manipulatives, inadequate information and skills in using technology, and practical problems are other factors the teacher was concerned about. Others reported that they lacked classrooms and laboratories for their work. These authors (Gray, Thomas, & Lewis, 2010; Hermans, Tondeur, van Braak, & Valcke, 2008; Koehler & Mishra, 2009) states that simply bringing a lot of technology in the classroom environment was not enough to change teachers' technology behaviors without a transformation in pedagogical approaches. This research found that basic school teachers in

Ghana's Northern Region meet numerous challenges, including limited curriculum knowledge and inadequate training in integrating technology into the curriculum and ensuring technology usage in practice is consistent with the various pedagogical approaches they use.

In general, the findings of this study show that teachers' preparation is moderate, and the material or infrastructure needed for implementation is also lacking.

RECOMMENDATION

It is recommended that the government ensure that all government schools in every state and local government region have suitable school facilities. The government should raise public awareness about the dangers of inadequate infrastructural amenities in schools. Through the media, the government should encourage parents, individuals, and organizations to assist or support the government in providing suitable educational facilities for effective teaching and learning.

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