Interactive instructional approaches to teaching Integrated Science and their effect on students' performance: A study in a Ghanaian University Context

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ABSTRACT

This study determined the effect of an interactive approach to teaching and learning on students' performance in selected concepts in Integrated Science. The study took place at the University of Education, Winneba, in the Central Region of Ghana. First year Integrated Science students were purposively selected for the study. The sample of the study comprised of 40 Level 100 students made up of 4 females and 36 males. Test items were the main instruments used to collect data for the study. The students completed a pre-intervention test before each lesson after which an interactive instructional approach was used to teach the selected concepts in Integrated Science, after which a similar test, but different in content was administered as a post-intervention test. Statistical Package for the Social Sciences (SPSS) version 20.0, for windows and Hake's normalized gain were used to analyse the data. The findings from the average normalized gain of the post-intervention and pre-intervention test scores showed a gain of 0.76, indicating the effectiveness of this interactive instructional approach. The study recommends the use of interactive instructional approaches for teaching Integrated Science lessons at the first-year level of the university.

Keywords: interactive instruction, concept-based, VARK modes, case study, Integrated Science

1 INTRODUCTION

Science education involves the cultivation and the disciplining of the mind. Individuals use science for the improvement of their lives as well as to cope with an increasing technological world. This includes both the pursuit of academic and professional programmes in science and allied fields (Akpan, 1992).

Ifamuyiwa and Alebiosu (2008) have indicated that science education plays a vital role in the lives of individuals and the development of a nation scientifically and technologically. Ifamuyiwa and Alebiosu further assert that, the gateway to the survival of a nation scientifically and technologically is scientific literacy, which can only be achieved through science education. To wit, many nations, seeing the need for science education, have devised various means of getting their young generations interested in the study of science. Various scientific

policies have been established, while various explorative, inquiry-based, interactive and engaging methods of teaching the subject have been developed (Antwi, Anderson, & Sakyi -Hagan, 2014; Seidenberg, 2013; Namrata, Amrita, & Singh, 2014). In the USA, to increase the quantity and quality of science and technology workers in the country, the federal government in 1950 established the National Science Foundation (NSF); its primary mission was to initiate, support, and promote basic scientific research and education (Mazuzan, 1994). In Nigeria, the Federal Government of Nigeria National Policy on Education (2004) provided educational expenditure on science and technology (Ifamuyiwa & Alebiosu, 2008). The Nigerian government also came up with a policy that 60 percent of the students seeking admission into the nation's Universities, Polytechnics and Colleges of Education should be admitted for science-oriented courses, while 40 percent of the students should be considered for Arts and Social Science courses (Ajibola, 2008). Ghana has not been left out in the quest for nations to get their young population to be interested in science. According to the Ministry of Environment Science and Technology Innovation (MESTI), Ghana's vision of the National Science Technology and Innovation Policy (May, 2017) is to support national socio-economic development goals with a view to lifting Ghana to a middle income status by the year 2030 through the perpetuation of a science and technology culture at all levels of society, which is driven by the promotion of innovation and mastery of known and proven technologies and their application in industry and other sectors of the economy (MESTI, 2017). The policy has its basic objectives among others as:

i. ensuring that by the year 2030, 60% of all students in the public universities and 80% of those in the polytechnics and vocational institutions are registered in science and science related disciplines;

ii. promoting post-graduate education in scientific disciplines, targeting 10% of the student population in tertiary educational institutions enrolling at the post-graduate level;

iii. creating special incentives for students and graduates of Science, Technology, Engineering and Mathematics (STEM)

iv. improving science education at all levels and in all aspects of the educational system, especially at the basic and secondary level with emphasis on creativity and innovation (MESTI, 2017).

There is every indication that many countries desire to increase the number of students studying science subjects in order to meet an expected demand for increased numbers of scientists and to address under-representation in the subject (ACOLA 2013; EACEA 2011; BERA, 2011; Royal Society 2014; MESTI, 2017). Despite the growing importance of science and technology in all realms of life in any society, students continue to show ambivalence toward the study of science education (Anderson, 2006).

In England, a study conducted by Sheldrake, Mujtaba and Reiss (2019) indicated that while secondary school students have often considered science to be fairly interesting and relevant for wider careers, relatively few have chosen to study (non-compulsory) upper-secondary science subjects, especially physics, and few have aspired to become scientists (DeWitt, Archer, & Osborne, 2014; Institute of Physics, 2014; Jenkins & Nelson, 2005; RoyalSociety, 2008).

A study in Australia by Palmer, Burke and Aubusson (2017) revealed that many children become disenchanted with science when they enter high school and develop a view that the subject is irrelevant and uninteresting (Goodrum, Hackling, & Rennie, 2001). They further reveal that when given the opportunity to choose subjects for their final years of schooling, almost half of Australian Year 10 (typically age 15–16) students do not choose a science subject for their final two years of schooling and instead choose alternative subjects from the wide range of courses available to them (Lyons & Quinn, 2015; Lyons & Quinn, 2010).

In their study on students' interest and attitudes towards the study of science, Antwi, Anderson, and Sakyi- Hagan (2015) established that many students across Africa also show such negative attitudes towards the study of science at both pre-tertiary and tertiary levels of education (Omosewo, 1999; Usun, 2004; Olugbenga & Adebayo, 2010; Aina, 2012; Antwi, 2013). According to Anamuah-Mensah (2004), there are many reasons for this situation of Ghanaian students' failure and ambivalence in science education. Anamuah-Mensah considers over-dependence on the chalk-and-talk instructional approach as a major cause for students' disinterest and failures in science learning. Other uncreative and traditional methods of teaching and learning are textbook dependent teaching and learning; examination-oriented teaching; learning by rote memorization; lack of science practical work in most schools; and even where they are done they are designed in a cookbook manner to confirm known answers, as well as the use of de-contextualised curricula.

In September 2015, 193 countries including Ghana, adopted the 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals (SDGs) ensconced at the heart of it, and pledged to ensure that the seventeen SDGs were given the necessary attention they deserved (UNDP, 2017). SDG Goal Four (4), which talks about quality education by 2030, is likely to be achieved if teaching and learning is made relevant to the students we teach, through varied means, that appeal to the multifaceted needs of the students (GSDR Global Sustainable Development Report, 2019).

A lot of research in teaching and learning of science education point to the fact that there is the need to adopt interactive and more engaging methods in teaching the subject to make it more meaningful, arouse and sustain students' interests in studying it and improve their performance (Akpan, 1992; Anderson, 2006; Jenkins & Nelson, 2005; Namrata, Amrita, & Singh, 2014; Antwi, Anderson, & Sakyi- Hagan, 2015). As a result, the idea for teaching in higher education is now recognised to involve much more than lectures as the means of information provision, but of more interactions and practical activities (Antwi, 2013). According to Antwi (2013), more interactive approaches to teaching integrated science, involving as many sensory modes as possible is likely to help students achieve more than the age-old traditional methods of teaching, which cripple students' achievements in understanding scientific concepts.

In this study, the authors adapted the Interactive Instructional Approach (I^2A) that uses multi modes. Interactive Instructional Approaches of teaching refer to the integration of different modes within the same text or topic to represent scientific ideas, reasoning and findings in order to facilitate understanding of lessons by learners (Vaughan & Bruce, 2008). These approaches were deemed necessary as students respond to information differently, and therefore, imperative to employ several modes during

the teaching process to cater for the different needs in the classroom.

In a study carried out with a sample of undergraduate students studying at the University of Southern Queensland (USQ) by Sankey, Birch and Gardiner (2010) it was found that only four out of the sixty participants preferred to be instructed using aural mode. The majority of the students appreciated interactive instructional approaches using multiple modes of learning. The authors connected the improvement in the scores that students obtained between the pre-intervention test and post-intervention test. The qualitative data clearly indicated that students perceived that learning resources with additional representations of content assisted their comprehension, understanding and retention of content (Sankey, Birch, & Gardiner, 2010). The additional representations also made content more interesting and enjoyable to them. In particular, students expressed a strong preference for a combination of learning resources and options. According to Sankey, Birch and Gardiner (2010), the importance of improving student progression and retention, and engendering a joy of learning, leading to life-long learning, educators should be encouraged to continue to explore the use of interactive instructions.

In a research by Picciano (2009), it was discovered that multimodal designs of teaching allow learners to experience learning in ways that they are more comfortable with, while challenging them to learn in other ways as well. To understand further the interaction between the senses and how teachers can capitalize upon this phenomenon in their classrooms, Mayer (2005) demonstrated the advantages of including as many senses as possible in the learning process. One of Mayer's experiments that exemplify this point involved three groups of people. One group received information delivered via one sense (hearing), another, the same information from another sense (sight), and the third group the same information using a combination of the first two senses. The results confirmed that the multisensory group did better than the unisensory groups. According to Mayer (2005), they had superior and more accurate recall and had better resolution, which lasted longer. Mayer further indicated that the benefits were not just confined to a combination of sight and sound. When touch was combined with visual information, recognition learning leaped by almost 30%, as compared with touch alone. Mayer (2005) contends that students learn more deeply from a combination of words and pictures than from words alone; known as the "multimedia effect".

Highly interactive multimodal learning environments allow instructional elements to be presented in more than one sensory mode. In turn, materials that are presented in a variety of presentation modes may lead learners to perceive that it is easier to learn and improve attention, thus leading to improved learning performance; in particular, for lower-achieving students (Chen & Fu, 2003; Moreno & Mayer, 2007; Zywno, 2003). This mode of learning according to Jewitt, Kress, Ogborn and Tsatsarelis (2001) also deepen students' understanding of scientific knowledge leading to enhanced grasping of concepts. Again, the interactive approach to teaching and learning enables students to accurately translate a concept from one mode to another easily (Lesh, Post, & Behr, 1987).

Furthermore, Shah and Freedman (2003) discuss a number of benefits of using visualisations in learning environments, including: (1) promoting learning by providing an external representation of the information; (2) deeper processing of

information; and (3) maintaining learner attention by making the information more attractive and motivating, hence making complex information easier to comprehend. Fadel (2008) also found out that students engaged in learning that incorporates multimodal designs, on the average, outperform students who learn using traditional approaches with single modes.

2 STATEMENT OF THE PROBLEM

The researchers, who have lectured at the University of Education, Winneba for several years had observed over the years that first year (level 100) Integrated Science students, who had just completed secondary education, came into tertiary education with a lot of difficulties, perhaps due to the instructional methods used to teach at the pre-tertiary levels (Anamuah-Mensah, 2004). These students show lack of conceptual understanding in many scientific principles in their courses of study, which result in ambivalence towards their study of Integrated Science. This greatly informed the choice of this level for the study. Specifically, the researchers noted that first-year students who participated in this study lacked the conceptual understanding needed to excel in learning basic scientific concepts, which mostly affected their performance in classroom exercises and laboratory activities. Similarly, the researchers realised that these students experienced difficulties with chalk-and-talk when scientific concepts were explained. It is in this direction that the researchers of this study employed a versatile and a more student-centred approach (I^2A) to teaching, in order to help Integrated Science (Physics Minor) students who had enrolled in the researchers' class to generate their own knowledge and understanding of scientific concepts, and apply them to their studies. The study, therefore, aimed to investigate the effect of a highly Interactive Instructional Approach (I^2A) to teaching Integrated Science using multi modes on the performance of Integrated Science (Physics minor) first year university students.

3 THEORETICAL FRAMEWORK OF THE STUDY

The main theoretical framework underpinning this study is the situated cognition theory. Situated cognition is a theory which emphasizes that people's knowledge is constructed within and linked to the activity, context and culture in which it was learned (Brown, Collins & Dugid, 1989). According to research, learning is social and not isolated. As people learn while interacting with each other through shared activities and through language, they discuss, share knowledge and problem-solve during these tasks (Hurst, Wallace, & Nixon, 2013).

The phenomenon observed in many classrooms is that, the teacher expends a lot of energy preparing lecture notes, reading various texts, picking out the most important points and organizing them in a cohesive manner, writing the lecture notes and delivering the information to students who sit passively often thinking about everything but what the teacher is saying. This is in contrast to social learning (Brown, Collins, & Dugid, 1989). Vacca and Vacca (2002) contend that we need to shift "the burden of learning from teachers' shoulders to students'. In this case students must be made to actively participate in the teaching and learning process. According to Hurst, Wallace and Nixon (2013), one way for students to shoulder the responsibility of learning is for them to be the readers, writers, speakers, listeners and thinkers in the classroom through active engagement in social interaction with others (Alvermann & Phelps, 2005; Vacca, Vacca, & Mraz, 2011). All their senses should be engaged in the teaching and learning process.

According to Russell and McGuigan (2001), learners need to generate different representations of a concept and recode the representations in various modes to make meaning out of them.

Cognitive apprenticeship is considered an important aspect of situated cognition (Brown, Collins, & Dugid, 1989). During this social interaction between a novice learner and an expert, important skills, interactions and experiences are shared. The novice learns from the expert as an apprentice, and the expert often passes down methods, skills and experiences which the apprentice can learn only from the expert and which are authentic learning (Brown, Collins, & Newman, 1989). In Hurst, Wallace and Nixon's (2013) research, they intimate that the main intent of cognitive apprenticeship, which has some similarity to Vygotsky's Zone of Proximal Development (Vygotsky, 1978), is to engage the learner in meaningful and constructive activities that encourage augmentation and preparation of new skills and conceptions (Moll, 1990; Newman, Griffin, & Cole, 1989). This theory has helped researchers understand more widely about how people learn because it has focused on what people learn in their everyday experiences, which are authentic contexts for a variety of skills (Brown, Collins, & Newman, 1989). In addition, it has also helped educators to understand how to capitalize on knowledge and skills that their students already possess in order to help them learn new content and skills. Therefore, in this study, the researchers employed highly interactive instructional approaches using multiple modes to help the students generate their own knowledge and apply the understanding to learning scientific concepts. The introduction of multimodal methods of learning helped the students to accomplish different levels of tasks through different degrees of skills, which also helped them to recognize that no one is an embodiment of expertise, and thus encouraged them to understand that learning is a continuing process (Vygotsky, 1978).

The objective of this research was to determine the level of performance of first year university students in Integrated Science after the use of Interactive Instructional Approaches in teaching selected concepts in Energy.

The question which guided the study was:

What effect could the use of interactive instructional approach have on the performance of students in their learning of Integrated Science?

This study therefore investigated the effect of Interactive Instructional Approaches to teaching on students' performance in selected concepts in Energy at the University of Education, Winneba, Ghana.

4 METHODOLOGY

First-year Physics minor students made up of 40 students were purposively sampled from a group of 134 Integrated Science students for this study. The research was conducted in three phases. The first phase was the problem identification. The second phase was the preparation and teaching of lessons using I^2A to teach selected topics on Energy, and the final phase was data collection, coding and analysis. Both authors dealt with the first phase of the research after a thorough discussion. The first author then handled the second phase of the research with occasional assistance from the second author. Both authors handled the third phase, as well as drew the conclusion after mutual discussion at the end of the whole research.

The instruments used to collect data were self-constructed pre-test and post-test

items. The internal consistency of the research instruments was determined using test-retest reliability. The reliability coefficients of both pre-test and post-test were 0.76 and 0.81 respectively. According to Borg, Gall and Gall (1993) coefficient of reliability values above 0.75 are considered reliable. Hence, the reliability coefficient values obtained were considered consistent.

Four major topics on Energy (The Concept of Energy, Energy Types, Classifying Energy Types and Conservation of Energy) were purposively taught interactively, and then assessed for this study. Prior to teaching each lesson, the students wrote a pre-test which was scored over 10 marks. The pre-tests sought to identify students' weaknesses in their understanding of the concepts based on what they had been taught previously at the pre-tertiary level. Each pre- test (Appendix A) was followed by a highly interactive lesson employing multi modes of instruction (group work, group discussions simulations and videos). Post-tests that were also scored over 10 marks each, were written after each topic. The post-test questions sought to determine the effect of the interactive lessons on the students' understanding and hence performance.

The strategy used for the interactive lessons was based on using visual, aural, read or write and kinaesthetic (VARK) multimodal instructional approaches introduced by Fleming (2007) in the constructivist teaching approach. The authors sought to engage at least three senses of the learners at any point in time. The steps included, but not limited to:

Interactive brainstorming, which was typically performed in group sessions. Students were mostly grouped in twos or fours for interactive sessions. Each student had a partner in the group. It proved very useful for generating creative thoughts and ideas in the learners and helped activated their prior relevant knowledge.

Think, pair and share, where a problem or a question was posed by the researchers and then the students were to collaboratively solve it. Each pair was given sufficient time to form a conclusion and permitted to participant in drawing a conclusion using his or her personal voice. As one student explained a concept the other student evaluated what was being shared. The researchers gave remarks or comments based on what the students had shared, after which the students were given the opportunity for reflection. Where necessary, the pair had an opportunity to reshare their conclusions after reflection. By so doing, every member of the class gained from the learning experiences of each other.

Discussion, where the students became conscious of their own and others' thoughts. They shared their ideas, and sometimes defended their answers until a consensus was reached about the solution to the question without the interference of the researchers. The groups constructed their tentative answers freely and submitted a common answer to the researchers after the discussion.

Video and simulation sessions, where specific simulations and interactive videos were explored by learners with guidance from researchers to explain certain abstract concepts. The students, through these videos saw at first hand some perceived difficult concepts like energy conservation law, heat as a form of energy, differences between heat and energy vividly explained with simulations or videos from the internet. Aside the excitement accompanying the opportunity of understanding concepts which hitherto were not clear to them, the students interacted with each other and also with the researchers for further learning to take place.

Results and Discussion

Results from students' pre-intervention and post intervention test scores were compared to assess their conceptual gains. The results are presented in Tables 1 and 2.

Table 1: Students' Pre-Intervention Test Scores

Test	N	Mean Score Values (Std. Error)	SD	Variance
The Concept of Energy	40	2.60 (0.202)	1.28	1.63
Energy Types	40	2.75 (0.272)	1.72	2.96
Classifying Energy Types	40	2.93 (0.285)	1.80	3.25
Conservation of Energy	40	3.40 (0.359)	2.27	5.17
Overall Average	40	2.92 (0.267)	1.76	3.25

Table 1 shows students' mean scores, the standard error, standard deviation (SD) and the variance in the pre-intervention test score for each lesson. Results from the Table indicated that all the mean score values of the pre-intervention test fell below the average score of 5. This indicated that the overall performance of the students was poor.

The findings observed from students' scores revealed a number of factors that caused their difficulties in learning the selected topics. It appeared most of the students could only memorize the definitions of terms rather than the ability to interpret and comprehend the concepts. This was because most of the questions tested students' abilities to interpret, comprehend and construct concepts which most of the students could not do. Another key observation was that, students tended to give explanations to concepts using alternative conceptions which were not in line with current thinking. Again, it seemed that the single mode of instruction which had been used to teach them at their pre-tertiary level alone did not cater for most of their learning styles in class. This is also likely to be the one of the reasons why they recorded low overall mean score mark.

Table 2: Students' Post-Intervention Test Scores.

Test	N	Mean Score Values	SD	SE	Variance
The Concept of Energy	40	7.75	2.67	0.42	7.12
Energy Types	40	8.35	1.96	0.31	3.82
Classifying Energy Types	40	8.50	1.83	0.29	3.33
Conservation of Energy	40	8.60	1.37	0.22	1.89

Overall Average	40	8.30	1.96	0.31	4.04

The mean scores obtained by the students in the post-tests are reported in Table 2. The table also shows the standard deviation (SD), standard error (SE) and the variance in the post-intervention test score for each lesson.

From Table 2, it is evident that the overall mean score value of the post intervention test was above the average mark of 5. Additionally, the overall mean score value of the post-intervention test (8.30) was significantly higher than the overall mean score of the pre-intervention test (2.92). This indicated an improvement in performance of the students after the interactive lessons.

To determine the effectiveness of the interactive lessons in improving students' performance, the mean scores for the pre-intervention test and post-intervention test for each lesson were analysed based on Hake normalized gain theory (Hake, 1998). According to Hake, the normalized gain is the ratio of the difference in mean scores between post intervention test and pre-intervention test to the difference in maximum score of the test to that of the pre-intervention test (Hake, 1998). It is mathematically presented as

$$< g > = \frac{\textbf{Post intervention test mean score – pre– intervention test mean score}}{\textbf{maximum score of the test – pre–intervention test mean score}}$$

Using the gain score, Hake classified interactive lessons into one of three groups:

High gain; < g > greater than 0.7

Medium gain; < g > between 0.3 and 0.7

Low gain; < g > less than 0.3 (Hake, 1998).

The results presented in Tables 1 and 2 were used to calculate the normalized gain for each lesson. Table 3 shows the normalized gains (Hake gain) for all the lessons.

Table 3. Hake Gain (g) Values for the Lessons

Topic	N	Mean Pre-Intervention test	Mean Post-Intervention test	Hake Gain	SD
The Concept of Energy	40	2.60	7.75	0.70	0.36
Energy Types	40	2.75	8.35	0.77	0.36
Classifying Energy Types	40	2.93	8.50	0.79	0.36
Conservation of Energy	40	3.40	8.60	0.80	0.36
Overall Average	40	2.90	8.30	0.76	0.36

The normalized gain (g) for the first lesson after the intervention recorded a medium gain of 0.70, which indicated that the lessons were effective. The second and the third lessons also recorded higher mean scores in the post intervention tests and had Hake gains of 0.77 and 0.79, respectively. Again, the last lesson also saw a rise in their normalized gains value to 0.80. This shows that all the interactive lessons recorded very high gains (Hake, 1998).

The findings based on the normalized gain revealed that the highly interactive instructional approach to teaching using multi modes deepened students' understanding of scientific knowledge, as thinking became easy to students (Jewitt, Kress, Ogborn, & Tsatsarelis, 2001) . Again, the approach accurately translated a concept from one mode to another which enabled students to grasp the concept being taught easily (Lesh, Post, & Behr, 1987).

Furthermore, to determine the statistical difference in students' mean scores for the pre-intervention tests and post-intervention tests, an independent-sample t-test was used to analyse the lessons. Table 4 shows the significant differences between the pre- intervention and post-intervention test scores of the lessons.

Table 4: Statistical Difference between Pre-intervention and post-intervention test scores

Test	Pre-intervention mean	Post-intervention mean	Mean difference	Significant difference
The Concept of Energy	2.60	7.75	5.15	0.00
Energy Types	2.75	8.35	5.60	0.00
Classifying Energy Types	2.93	8.50	5.57	0.00
Conservation of Energy	3.35	8.60	5.25	0.00

Significant level at $\rho < 0.05$

Independent-sample t-test analysis showed that the differences in the mean scores of the students' means for the pre-intervention and post-intervention test were statistically significant with ρ-values of less than 0.05. These ρ-values indicated that the students had better knowledge and improved conceptual understanding in the selected topics after they had been exposed to the highly interactive instructional approaches using multiple modes. They reaffirm the findings of a study of Russell and McGuigan (2001) that students need to generate different representations of a concept and recode the representations in various modes.

The results are also congruent with Picciano (2009) who identified the benefits of multimodal designs as allowing students to experience learning in ways that they are more comfortable with and challenges them to experience and learn in other ways as well. According to Russell and McGuigan (2001) and Picciano (2009) I^2As allow students to concentrate on the physical meaning of abstract concepts, hence, obtaining an in-depth understanding of the theory. All these attributes of Interactive I^2A may have contributed to better understanding of concepts leading to a high performance. These findings have significant implications on the approach to teaching since they

suggest that incorporating varied instruction into Integrated Science courses may be a valuable tool for improving the performance of students.

Again, lessons of this nature where students' sources of stimulus were varied breaks monotony in the lesson and makes class livelier. According to Jewitt, Kress, Ogborn and Tsatsarelis (2001), this approach catered for a range of different modal preferences and provided students with a choice on how they can access key content, and therefore may be considered a more inclusive response or stimulates metacognition to the needs of learners.

5 CONCLUSION

The introduction of the interactive instructional approach produced a significant improvement in students' learning and understanding of the concept of Energy. Students' abilities to interpret and comprehend the concepts were enhanced when they were taught using highly interactive instructional approaches which also improved their knowledge in the concept. It helped students to properly interpret and comprehend concepts. The I^2A also motivated and catered for individual differences among the students during Integrated Science lessons.

6 IMPLICATIONS

Primarily, teachers' instructional approaches have direct effect on learners' understanding and it correlates with students' achievement (Tatto, 2001). The findings of this study indicated that the Interactive Instructional Approach had a direct impact on teaching and students' performance. This approach when adopted is likely to improve the students' knowledge in concepts in science courses. The different modes of instructional approach could be used to cater for students' learning styles, arouse and sustain their interest in the classroom. The method of instruction used in the study also motivated and challenged the students to think critically about concepts in the teaching process. The study therefore suggests that students should be taught using highly interactive instructional approaches using multiple modes in the teaching of scientific concepts.

In conclusion, Integrated Science concepts should be taught using I^2As to improve students' abilities to interpret and comprehend concepts. This is because it creates a conducive and friendly environment for all students with different learning styles in the classroom.

7 RECOMMENDATIONS

Based on the findings of the study, it is recommended that Integrated Science teachers in pre-tertiary schools should model their instructions to break the monotony of chalk-and-talk in the classroom. Also, innovative, highly interactive and more effective student-centred strategies such as multimodal instructions should be used at all levels in teaching Integrated Science lessons particularly, and all science-based subjects to promote meaningful learning of scientific concepts.

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Appendix A: Sample of Pre-Assessment Test

1. What is kinetic energy?
   a. Stored energy
   b. energy of motion
   c. energy of friction
   d. energy stored in chemical bonds
2. How do we express the total amount of energy a moving object has?
   a. KE x PE
   b. KE + PE
   c. KE - PE
   d. KE / PE
3. What type of energy represents the sum of the KE and PE that a moving object has?
   a. chemical energy
   b. total mechanical energy
   c. electromagnetic energy
   d. electrical energy
4. When a roller coaster cart falls towards the ground, what happens to its potential energy?
   a. Increases
   b. Decreases
   c. Stays the same
   d. Nothing
5. What is the kinetic energy of a ball sitting on top of a hill?
   a. 0 J
   b. less than 0 J
   c. more than 0 J
6. The Law of Conservation of Energy states that total amount of energy in a closed system will always
   a. stay the same
   b. increase
   c. decrease
   d. cannot be determined
7. Based on the formula for potential energy, what 2 variables influence PE the most?
   a. mass and height
   b. mass and velocity
   c. velocity and height
   d. velocity and mass
8. What is being transferred as you do work?
   a. Energy
   b. Heat
   c. Power
   d. Gravitational Potential Energy
9. List the energy conversions that occur when riding a bicycle.

List four different forms or types of energy. Give one example of a conversion from each of these forms to another form.

Who is disengaging the gear? Is school leadership the impediment in the implementation of the new curriculum in Zimbabwe?

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ABSTRACT

School leadership is there to build 'learning bridges' between learners and the curriculum content (Everand, Morris & Wilson, 2004, p. x). This study seeks to investigate challenges that school leadership face in the implementation of the new curriculum in Zimbabwean primary schools. It particularly examines the dissonance between the current implementation level and the expected standard of implementation. The implementation of a new curriculum requires effective school leadership (Bennett, Crawford & Cartwright, 2003). The key stakeholder in the process of curriculum implementation in any education system is school leadership. This article argues that school leadership should have a clear picture of what to do and how for effective implementation of any new curriculum. The curriculum introduced in Zimbabwe is not spared. The study was located within the qualitative paradigm using semi-structured interviews and focus group discussions to generate. Purposive sampling was done to select information rich cases from among school leaders in Masvingo Province. The study highlighted a number of complex challenges linked to school leadership which include the problem of suffering from multiple meanings and conceptual complexity of the new curriculum and lack of orientation on the new curriculum. The study also revealed that school leadership has not been sufficiently retrained for fitness of purpose. The study thus recommends retooling of school leadership so that they develop the craft competency needed in the implementation of the new curriculum.

Key words

school leadership, curriculum, curriculum implementation, leadership, perspectives, implementation, craft literacy, craft competency

1 INTRODUCTION

Some schools are more effective and more successful because they are better led than others (Everand, Morris & Wilson, 2004, p. x). There is growing recognition among educational leadership and management scholars and practitioners of the crucial role that school leadership plays in curriculum implementation (Hallinger, 2016). The Zimbabwean formal curriculum has been evolving over the years. When European colonialists and missionaries came to Zimbabwe, they introduced a two-tier education system. There was the academic curriculum that catered for whites learners and another to show their supremacy over the blacks and the watered down curriculum for the Africans (Shizha & Karivo, 2011, p. ix). At independence in 1980 Zimbabwe's quest to change the curriculum was too high. The

government wanted wanted to address the needs and concerns of most Africans who felt they had been disadvantaged for too long. Mutumbuka (1978) highlights that at the onset of independence, the Zimbabwean curriculum needed a new mentality and a new direction and thus needed to be reviewed. Why? The Eurocentric colonial curriculum excluded African traditional norms and values and was bent on alienating black Zimbabwean learners from African culture which was considered inferior nothing worth learning. To address such a legacy, many curriculum policy changes took place although in the beginning they were incremental. The Zimbabwean government introduced a new curriculum in 2014 for primary and secondary education. School leadership is expected to play a pivotal role in ensuring that the new curriculum is effectively implemented. There are glaring challenges that militate against effective implementation of the new curriculum. School leadership, in particular, seems not to be clear about where to go and is not in the gear. This study seeks to extrapolate school leadership challenges in the implementation of the new curriculum in Zimbabwe. School leadership bears the responsibility to take Africans out of the straight jacket of colonial mentality which considered Africans as in educable idiots. Historically, white supremacy considered Africans as lazy and difficult to teach. Such a view is expressed by whites who had this to say:

> The Mashona are by nature lazy, frivolous and very difficult to be kept attentive under instruction, hence much patience and tact is needed in school (Atkinson, 1972, p. 33).

School leadership should emancipate learners from mental slavery and create bridges that enable effective implementation of the new curriculum in Zimbabwe. Of importance is that school leaders should demonstrate supremacy of their minds (effective leadership in both action and thought) and be enlightened to look at the breath and depth of the updated curriculum in order to implemented it with fidelity.

2 BACKGROUND TO THE STUDY

School leadership is faced with complexities and ambiguities that eventually make their leadership role a challenging one (Simkins, 2005) when implementing a new curriculum. **"**Curriculum change is a journey, not a blueprint" (Fullan, 1993, p. 24). There is growing emphasis on the importance of strong school leadership as a key factor in successful implementation (Hammad & Shah, 2018, p. 755) of a new curriculum and the leaders' ability to employ adequate knowledge and skills to manage diversity and dissonance in schools (Keung & Rockinson-Szapkin, 2013; Walker & Cheong, 2009). This study sought to investigate school leadership challenges in the implementation of the new curriculum in primary schools in Zimbabwe. The implementation of a new curriculum requires effective school leadership (Bennett, Crawford & Cartwright, 2003). The key stakeholders in the process of curriculum implementation in any education system are school leadership. This article argues that school leadership should have a clear picture of what to do and how to do it for effective implementation of any new curriculum. The new curriculum introduced in Zimbabwe is not spared. The bases of curriculum reform were underlined by the MoPSE in its curriculum review framework as follows:

> There is need to transform the structure and curriculum of the country's education system in order to adequately

> meet the evolving national development aspirations. This should see greater focus being placed on the teaching and learning of science, technology engineering and mathematics, including a prioritization of youth empowerment and entrepreneurship development (Ministry of Primary and Secondary Education, 2013, p. 1).

The above citation denotes serious implications to school leadership in the Zimbabwean context. It is important to note that there is need for school leadership to figure the internal efficiency during the implementation process otherwise mere exposure to science, mathematics, technology, among others, does not bring about the intended changes in the education system. Internal efficiency of the education system hinges on what is happening to inputs, process and outputs. Internal efficiency is an important dimension of the concepts of success and quality of implementation of any new curriculum. It is usually measured by indicators such as student input/output ratios or survival/ attrition rates, learning efficiency, teacher utilization and retention, and teacher effectiveness. It also shows the survival rate of a cohort of students as they go through the current education system (Galabawa, 2003, p. 4). It is argued that there must be a constant quest on the part of school leadership to see whether the same outputs in terms of measured learning achievement can be achieved with fewer financial or real resource inputs (Galabawa, 2003, p. 4). Quality and relevance issues thus become critical pillars that are set out by effective school leadership as critical guideposts during implementation.

The mere introduction of a new curriculum does not necessarily guarantee an improvement of the country's education system. School leadership stands out as the fulcrum to curriculum implementation in any context. School leadership is vital to the success of the curriculum paradigm shift (October, 2009, p. 11). The ushering in of the new curriculum in Zimbabwe requires knowledge and skills to implement it with fidelity (Wiles & Bondi, 2014). Effective implementation particularly of new curricula requires school leadership to feel confident in the delivery to ensure accurate implementation (American Institute for Research, 2016). It is argued that in the process of curriculum implementation many variables that include school leadership is central to whether a curriculum is delivered consistently, effectively and with efficacy to enable support of learner progress and growth (Lochner, Conrad & Graham, 2015). Various stakeholders view the new curriculum that has been ushered in the schools with mixed feelings in the education system in Zimbabwe. In particular, school leadership, which is at the helm of curriculum implementation, has a lot of mist on the way forward.

Schools need leadership that has the necessary qualities for effective implementation of the new curriculum. Rutherford (1985) suggests that schools need school leadership with a vision. With this vision in mind, school leadership works towards a shared understanding of the goals and the coordination of the curriculum and instruction (Rutherford, 1985, p. 32). It is also argued that school leadership should be able to translate the vision into action and should be so influential in determining how a new curriculum should be implemented (Hallinger, 2017; Hallinger & Bryat, 2013). It is the responsibility of school leadership to raise expectations of teachers and learners Hallinger & Hammad, 2017) so that the pith

of implementation is raised. All this is only possible if the school leadership has knowledge of the expectations and realistic goals of the new curriculum. Effective school leadership creates an environment of supportive efforts to achieve curriculum goals (Rutherford, 1985, p. 3). The blame for failure to learn by school pupils is always shouldered on school leadership.

Darling-Hammond (2010) laments that many schools suffer from weak teaching and impoverished learning and fail to effectively implement new curriculum changes. This is against the backdrop of professional school leadership that is expected to possess proficiency (Goodyear, 1992) in curriculum implementation. In the same vein it is argued that school leadership holds teachers and students to account for the curriculum and the standards (Pinar, 2012). Leithwood, Harris & Hopkins (2008) stress that successful school leadership requires four basic sets of practices namely, "building vision and setting directions; understanding and developing people; redesigning the organisation and managing the teaching and learning programme" (Leithwood, Harris & Hopkins (2008, p. 29). This has relevance to curriculum implementation and demands that school leadership should meet the challenges head on. Hallinger, Lee & Walker (2011) explored challenges in implementing different programmes in international schools in Saudi Arabia and found out that school leadership encountered problems in curriculum implementation, assessment and pedagogical approaches. This study is linked to challenges encountered by school leadership in implementing the new curriculum in Zimbabwe.

The development of education in Zimbabwe has undergone many phases since the colonial era and after the attainment of national independence. After independence, the Zimbabwe government went on a reform course designed to eliminate the imbalances and inequalities that existed during the colonial era. In 1999 the Nziramasanga Commission of Inquiry was set to address more specifically on specific areas in the education and training systems requiring reform (Government of Zimbabwe, 1999). The commission of inquiry recommended the need for curriculum reform in the Ministry of Primary and Secondary Education. The process to reform the curriculum took quite a long time but like flowing waters, the new curriculum has been introduced. What remains is the critical mass that is required by school leadership for its effective implementation. In this article, I want to ventilate the argument advanced by Blake and Mouton (1985: 1) that "The character of leadership is a significant factor in organisation success or failure." What is critical in any change is the influence of school leadership in the process of implementation of the change. Craft literacy and craft competence are issues school leadership should possess for effective implementation of a new curriculum.

3 STATEMENT OF THE PROBLEM

Parents are arguing that there is a lot of lip service in the implementation of the new curriculum. The problem in Zimbabwe is that the new curriculum is not being implemented with fidelity. School leadership seems not to understand how to effectively implement the new curriculum. They are failing to understand the practice and processes. Concerns from Zimbabwean society show that low level pass rate has to do with the ineffective implementation of the new curriculum. While some people might argue that literature to teach the new curriculum is not available and there are no resources but the problem hits at lack of innovativeness on the part of school leadership. School leadership is not fitted and

tuned to understand the work and methods of effective implementation of the new curriculum. The problem extends to lack of professional knowledge when implementing the curriculum. The gap also expands to cover a lack of professional development on the implementation of the new curriculum for both school leadership and classroom practitioners. School leadership is increasingly an absent presence in the discourses of education policy, an object rather than a subject of discourse. The curriculum is just handed down to schools. School leadership is the change agent and they have the responsibility of managing the implementation of the curriculum. To that end, school leadership has to be conversant with the subject content and methods of all subjects taught in the schools. While effective implementation of the new curriculum might bring about learner growth of knowledge and academic preparedness (Polikoff & Porter, 2014), lack of it might disengage the school leadership gear and become impediments to curriculum implementation. There is thus a void in terms of whether school leadership is the impediment in the implementation of the new curriculum particularly in Masvingo Province, Zimbabwe. My basic research question is:

What are the school leadership impediments to the implementation of the new curriculum in Masvingo Province, Zimbabwe?

4 RESEARCH QUESTIONS

1. Does school leadership have adequate knowledge about the new curriculum?
2. To what extent does school leadership understand pedagogy and instruction for effective teaching and learning of the new curriculum?
3. What challenges are faced by school leadership in improving the internal efficiency in the implementation of the new curriculum?

5 CONCEPTUAL FRAMEWORK: THE CONCEPT IMPLEMENTATION

Implementation can be described as "a dynamic construct, which refers to the process of continuous specification and redefinition of the essential characteristics of an innovation by developers and users during the planning and implementation phases of the planned change process" (Fullan & Pomfret, 1975, p. 71). There are two critical players in the implementation process, inter alia, developers and users who should see the process together in the same way from the planning process to the implementation stage. If any player is left out at any one stage then the orientation differs and implementation fails. This study hinges on the aspect of users who include school leadership. These are the perceived drivers in the implementation of the new curriculum. The process of curriculum implementation requires school leadership to possess craft literacy and craft competence. Craft literacy in this case refers to the ability by school leadership to translate and interpret content in context correctly, understanding requirements, understanding procedures, understanding what is expected of you, understanding what to do and evaluating and analysing processes. Craft competence refers to the ability by school leadership to conceptualise successful and effective models of implementation by knowing what action to take, knowing how to go about following procedures, putting plans in place, knowing how to implement and knowing the

processes and knowing what to evaluate and what to analyse (Nyoni, 2007).

For effective curriculum implementation, quite a number of variables have a role to play. It is argued in theory and practice that for effective implementation of any curriculum to take place, there are five critical variables that have to be considered (Brynard, 2005, p. 13-21). The five variables which shape the directions of implementation are *content, context, commitment, capacity* and *clients and outside coalitions*. These are the fountain pillars when implementing a new curriculum and it is relevant to closely look at these variables in studies that deal with curriculum change and implementation. This study deals with impediments in the implementation of the new curriculum in Zimbabwe in the eyes of primary school leadership.

5.1 Content

The first crucial variable is the *content*. Curriculum determines the content that is learnt because it spells out all the matter that must be taught. Brynard (2005) notes that the content of a programme or policy is vital with regard to what it spells out as the means that it will employ in order to achieve its objectives. Based on the above exposition, it shows that the role of the content of a programme is to bring out its objectives and specific ways of how to achieve the agreed outcomes. In the context of the Zimbabwean curriculum, there is a glaring lack of implementation guide as evidenced by the lukewarm approach where the education authorities seem to shift the burden to school leadership to run their own schools without getting relevant textbooks from the government. Syllabuses are general guide which can be interpreted differently in different schools. Lack of specified content thus renders it difficult for school leadership to help teachers on the content to be taught at each specified grade level.

5.2 Context

The second crucial variable is *context*. Rogan and Grayson (2003:1175) hold the view that the process of change is context-specific, hence implementation must take into account the context of a particular school with regard to its teachers, learners, leadership and environment. The same view is echoed by Berman (1980) & O'Toole (1986) cited by Brynard (2005:17) who also proclaim that "a context-free theory of implementation is not likely to produce powerful explanations or accurate predictions." To that effect, implementation of a curriculum depends on the context it is given by school leadership in a particular school. Some schools are in deprived contexts and find it very difficult to procure relevant and adequate resource materials like computers, computer laboratories, among others. Where there is no option to take, school leadership will sit back waiting for the government to bring in such resources because some communities cannot manage to buy such gargets and also to construct laboratories so required.

5.3 Commitment

The third variable is that of *commitment*. Effective implementation of the curriculum demands high level of commitment by school leadership. It is the responsibility of school leadership to engage the various stakeholders in the provision of buildings like classrooms, laboratories, dormitories, playground, among others. There is need for school leadership to get political will, government support, institutional support and total commitment by implementers of the curriculum, like teachers, in order to achieve its objectives. Brynard (2005) summarises the thinking on

the significance of commitment by saying that firstly, commitment is important at all levels through which policy passes. Secondly, that commitment will be influenced by and will influence all the other variables. In the light of what has been said with regards to commitment and in the context of this study, if school leadership is unwilling or unable, then little will happen (Brynard, 2005:18).

5.4 Capacity

Brynard (2005) further notes that *capacity* is the fourth variable. The issue of having school leadership with the capacity to implement the curriculum is critical through providing adequate resources. We need not have many learners who come to learn very little or nothing at all due to lack of leadership capacity. School leadership has the role to play in capacitating the whole spectrum of the curriculum implementers. The explanation of implementation capacity is viewed as the availability of and access to human, financial, material, technological and logistical resources (Nafungo, 2015). Failure to secure those resources is tantamount to implementation failure. It is further argued that that there are also the intangible requirements which are critical for transforming rhetoric into action, for example, leadership, motivation, willingness and endurance. When school leaders are equipped with craft competency, they have the implementation capacity which will enable them to be in a position to bring about the required results in providing the services required.

5.5 Clients and outside coalitions

Clients and the outside community are of importance for effective implementation of curriculum. The support of *clients and outside coalitions* is the final critical variable. Elmore in (Brynard, 2005:20) explains that implementation is affected by the formation of local coalitions of individuals who are affected by the policy. If teachers collaborate among themselves with the support of the school leadership, parents, among others, they will be empowered with the capacity to improve practice in the implementation of the curriculum (Sergiovanni, 2005:298).

It is crucial to identify both local and outside stakeholders in order to garner their support. The stakeholders include, inter alia; district schools' inspectors and local school communities. The schools' inspectors, who are responsible for a cluster of schools in a given District within Zimbabwe's ten Education Provinces, are capable of influencing change since they are government representatives at district level. Local school communities are important stakeholders as they are capable of providing adequate resources. Effective school leadership has to connect all these stakeholders so that they operate as a system for effective implementation of the new curriculum. Literature has demonstrated that it is imperative that implementers pay particular attention to all the critical variables that are cited above to guard against implementation failure.

6 KEY FACETS FOR IMPLEMENTATION OF A NEW CURRICULUM

At this point it is imperative that i look at the key facets for the implementation of a new curriculum.

Who is disengaging the gear



(Adapted from Duran, Hepburn, Irvine, Kaufmann, Anthony, Horen and Perry, 2009:45**)**

Of importance is that the authors cited above point to the need for strong leadership to act as the driver for effective curriculum implementation. All the other factors pointed here are controlled and manipulated by leadership.

7 THEORETICAL FRAMEWORKS

With Zimbabwean educational system, curriculum changes are initiated and dictated from the government and then carried out in the schools with school leadership at the helm of the implementation process. In this section I look at the theories that undergirded the study. The two theories are transformational leadership theory and the collaborative leadership theory. These two theories complement one another.

8 TRANSFORMATIONAL LEADERSHIP THEORY IN EDUCATION

Transformative leadership is one such style that can produce positive results within an organization. Research on school reforms show that highly successful reforms are often led by school leadership with the transformative leadership style (Bass & Avolio, 1994). School leaders who employ the characteristics of transformative leadership are viewed as those who:

- Stimulate interest among colleagues and followers to view their work from new perspectives
- Generate awareness of the mission or vision of the team and that of the organization
- Develop colleagues and followers to higher levels of ability and potential; and
- Motivate colleagues and followers to look beyond their own interests

> towards those that will benefit the group (Bass & Avolio, 1994, p.2)

Bass & Avolio (1994) further advance the argument that transformational leaders exhibit at least one of the following specific traits, also known as the *Four Is*:

- Idealized influence: set side their own agendas and are highly professional;
- Inspirational motivation: the organization has a clear view of the tasks ahead;
- Intellectual stimulation: values multiple perspectives and new ideas without negative feedback; and
- Individualized consideration: trusts their team to carry out assigned tasks and duties without micro-managing the process (Bass & Avolio, 1994, p. 3).

Quite a number of researchers have further developed the original works of Bass & Avolio (1994) and now identify additional aspects of transformational leadership in the light of school reform efforts (Leithwood & Jantzi, 2000; Jantzi & Steinbach, 1999; Oslen & Chrispeels, 2009). The additional aspects they bring forth include, inter alia (a) building a school vision, (b) garnering commitment through shared goals, (c) high performance expectations, (d) modeling best practices and important organizational values, (e) providing individualized support, (f) providing intellectual stimulation, (g) building a productive school culture, and (h) establishing structures to foster participation in decision making (Oslen & Chrispeels, 2009, p. 385). Marks and Printy (2003) strongly suggest that transformational leadership is most needed when schools are undergoing significant change or reform. This is the case with the Zimbabwean school curriculum which is undergoing an over whole review. Transformational leadership can thus become the key that unlocks the capabilities of people to work towards effective curriculum implementation (Leithwood, Harris & Hopkins, 2008, p. 29) and has the most potential of helping an organization move forward towards successful change/ implementation efforts (Kirby, Paradise & King, 1992). Each participant then has to be nurtured (Kirby, et al, 1992) so that they are capable of meeting the implementation challenges and capable of doing the expected (Bass & Avolio, 1994).

9 COLLABORATIVE LEADERSHIP IN EDUCATION

Connected to transformational leadership in curriculum implementation is collaborative leadership in education. There are three distinct segments in collaborative leadership which include, among others, shared school governance, collaborative decisions and broad participation in efforts to evaluate the school's academic development (Hallinger, 2004; Heck and Hallinger, 2010). Collaborative leadership goes beyond transformational leadership in that the shared reform efforts target specifically at improving academic outcomes (Hallinger & Heck, 2010b). Collaborative leadership brings together all the key stakeholders in the decision making process and every one is responsible for the academic outcomes (Hallinger, & Heck, 2010a).

10 LITERATURE

Implementation of a curriculum policy on its own is a complex task that demands craftiness by those who are charged with that responsibility. Literature points to the fact that:

> There is broad agreement that implementation is a decidedly complex endeavour, more complex than the policies,

> programmes, procedures, techniques, or technologies that are the subject of the implementation efforts (Fixsen, Naoom, Blase, Friedman & Wallace, 2005, p. 2).

Talented leadership is therefore needed in schools so that what is complex can be made simple for effective implementation.

Heck & Hallinger (2010) conducted a study which examined effectiveness of collaborative leadership in school reforms and found out that it brings stakeholders together within the school community in order to accomplish needed changes. In the same vein, Hockett (2015) carried out a study to examine the role of the principal in the successes and challenges of the implementing a new secondary school curriculum in Kenya. They found out that for the school with the highest level of implementation the principal's leadership role was a key factor in the transformational efforts and the deep systematic changes in the school. It was also found out that principals who motivated teachers made teachers invest their efforts and time in effective implementation of the curriculum.

Fullan (2001) maintains that principals are indeed integral to change efforts within schools. In the same vein, it is argued that leadership not only matters…the impact of leadership tends to be greatest in schools where the learning needs of students are most acute (Lithwood, Seashore-Louis, Anderson and Wahlstrom, 2004). There is a wealth of evidence to suggest that the quality of leadership positively enhances teaching and learning (Harris, 2004). There is not a single documented case of a school successfully turning around its pupil achievement trajectory in the absence of talented leadership. One explanation for this is that leadership serves as a catalyst for unleashing the potential capacities that already exist in the organization (Leithwood et al, 2008).

11 RESEARCH METHODOLOGY

The study was qualitative and was conducted in Masvingo province to investigate school leadership challenges in implementing the new curriculum. Approval letters to conduct the study were obtained in advance. In view of the unexplored nature of the research issue in this specific province of Zimbabwe and the associated complexity and sensitivity, a qualitative exploratory study was designed using semi-structured interviews and focus group discussions to seek views and perspectives of school leadership. A qualitative approach is often suitable when trying to understand the way in which participants make sense of a particular phenomenon, which in this case were the school leadership challenges in curriculum implementation in schools in Masvingo province.

12 FINDINGS AND DISCUSSION

12.1 We need effective school leadership for uncertain times

P1: These are uncertain times where we need re-tooled school leadership to clear misunderstandings teachers have on how to implement the curriculum.

P2: "What is troubling is that there is confusion and lack of clarity from Zimsec on the syllabi. Taking an example from the Geography examinations of 2018, even teachers were at sea in terms of what areas the students were going to be examined on, so the students just became guinea pigs".

P3: "Inadequate resources have been allocated to the education sector, it looks like it is not a government priority"

P4: "The major problems that come with the new curriculum are that there was inadequate consultation before its introduction.

P5: I find it very difficult to go and supervise lessons for things that I am not sure of as well, as head

The findings are pointing to the need for school leadership to create constancy of purpose in order to be effective in curriculum implementation. In one of his principles Deming highlights that leadership should create constancy of purpose for continual improvement of products and service …allocating resources to provide for long-range needs rather than short-term profitability, with a plan to become competitive, to stay in business, and to provide jobs. Deming advances the argument that doing your best is not good enough. You have to know what to do. Then do your best (Deming as cited in Neave, 2012). School leadership should not go about saying they are doing their best but should really know what they are doing and then do their best to ensure effective implementation of the curriculum.

12.2 School leadership is suffering from multiple meanings and conceptual complexity of the new curriculum

P1: I do not seem to follow the new learning areas that are being proposed

P2: It is not easy to interpret whatever has been given and you wonder how one can speak about the new matter with confidence.

P3: The whole truth lies on issues of correct interpretation. We needed to be given the depth and breadth of it to avoid guess work

It is noted that the fundamental human quest is the search for meaning and the basic capacity for this search is experienced in the …process of interpretation of the text (Macdonald as cited in Slattery, 2006). True search of meaning brings about the vision of what and how to implement. Lack of proper interpretation of texts might lead to lip service in the process of new curriculum implementation. The problem of how to improve teaching and learning has bothered educators at least since the inception of modern schools (Mitchell & Sackney, 2015). It is the responsibility of school leadership to clear the path for teachers and remove stumps and blocks that hinder effective implementation of the curriculum.

12.3 School leadership that fails to retrain teachers

P1: School leadership has not retrained teachers sufficiently to teach and handle the new curriculum with ease.

P2: Learning areas that have been introduced are just new to most teachers and this requires serious induction of programmes by school leadership.

P3: Some kind of new orientation is required but school leadership is not geared towards that.

Teachers are revealing their doubts, anxieties and difficulties in implementing the new curriculum. The practice of curriculum implementation requires continuous sharpening of pedagogical and didactic skills. For effective implementation, Deming advises that school leadership should institute training on the job. School leaders have to institute modern methods of training on and for the job, including deputy heads and senior teachers, to make better use of all staff (Deming as cited in Neave, 2012). Deming

further argues that teachers require new skills to keep up with changes in materials, methods, design, machinery, techniques, and service, among others. It is argued that:

> It is simply unrealistic to expect that introducing reforms … in a situation which is not basically organised to engage in change will do anything but give reform a bad name (Fullan, 1993, p. 4).

The playfield for change has to be level so that implementers do not face any hindrances. The net effect of lack of teacher orientation is implementation failure.

12.4 Lack of knowledge of the internal efficiency in curriculum implementation

P1: Our school leaders have not ordered adequate text books for use in the teaching and learning.

P2: Most teachers are just at sea in terms of what to teach and this is quite a serious drawback.

P3: The new textbooks have not been produced in adequate quantities for the teachers and learners. The introduction of a new curriculum has to be a holistic programme with all factors considered before it is implemented.

P4: We lack the basic materials to use in the implementation process and this is a challenge

P5:The teacher pupil ratio is just abnormal and teachers find it difficult to effectively implement the curriculum in such a scenario

School leadership has an important role in improving the learning capacity of learners, because they coordinate teachers in setting standards teaching the curriculum in relevant way, and providing additional support (Susy, 2008). Textbooks form a critical mass of the internal efficiency during implementation of a curriculum. Internal efficiency refers to the links between educational inputs (such as teachers, text books) and learning achievements (Human Development in South Asia (Haq and Haq, 1998). It is the responsibility of school leadership to ensure that the learner-textbook ratio enhances effective implementation of the curriculum. While Deming advises that teachers should do it right the first time and aim at zero defects in curriculum implementation but he raises critical questions. The first question relates to how anybody can do it right the first time if he/she is given neither the time nor the materials or equipment to make it feasible? The second question relates to how one can produce zero defects if what he gets to work on is already defective? (Deming as cited in Neave, 2012).

12.5 School leadership faces resistance from both teachers and parents

P1: There is a lot of resistance from both teachers and parents and school leadership cannot walk the journey without the support of these others.

P2: Teachers in particular have no mental pictures of what to teach in the new curriculum.

P3: Parents see this in the context of paying more money to buy new textbooks, new teaching and learning materials, among others.

P4: There is strong need for school leadership to get a buy in from teachers and other stakeholders

Resistance to change could be emanating from fear of loss of power, dominance and influence, which is called **loss**

of 'turf' (Gordon, 1998, p.20) in the scholarship of leadership and management. Both teachers and parents have been used to some way of doing things which is now changing due to the coming in of the new curriculum. Such change is normally resisted. Teachers are the key drivers in the implementation of any new curriculum. Their calculated participation might mean minimal effort or even zero input into the process. It is argued that three major influences of curriculum change include external influences, organizational influences and internal influences (Stark & Lattuca, 1997, p.331). It is necessary for school leadership to understand these influences since school leaders are the torch bearers in the implementation of the new curriculum.

12.6 School leadership finds the curriculum as overloaded

P1: While it is good to have a change in the curriculum but it is highly overloaded

P2: Even the ECD learners are expected to spend the whole day learning and this is questionable

P3: The psychology of learning requires that learners need not to be overloaded so that they grasp concepts easily but to our surprise the new curriculum does not give rest to teachers and learners

P4: This is not a simple change, it is really complex in that lots of learning areas have been introduced which make it difficult to understand where to start from and what to do next

P5: Each learner is expected to do a project and a task in every learning area and this is really an overload

The idea of overloading the curriculum is a hindrance to school leadership to make effective implementation of the new curriculum. It is not a simple change in any case. It is argued that change is at once simple and complex (Fullan, 1985, p. 391). Orchestrating change effectively requires small doses and if the curriculum is overloaded then implementation fails. A lot of motivation is needed to enable teachers to see implementation in a simpler way (Adair, 2006).

12.7 Lack of clarity of goals of the new curriculum

P1: The goals of the new curriculum are not very clear to many of us

P2: I find it very difficult even to think of what is to be achieved by this new curriculum.

P3: I wonder whether these learners would fit in other countries with their knowledge of these mass displays. What really are we supposed to produce?

The issue of lack of clarity of the new curriculum is being pointed to as a hindrance to effective curriculum implementation affecting school leadership. Miles and Louis (1990, p. 58) point to the need "for action images of what to do to get there". Vague goals may make it difficult for effective implementation of the new curriculum.

12.8 Lack of literacy to supervise some of the newly introduced learning areas

P1: There are quite a number of new areas that have been introduced in this new curriculum and you know what, I have never met such content before

P2: It requires a lot of knowledge of supervision to meet the demands of effectively supervising this new curriculum

P3: Some of us have never done supervision as a course and its really taxing to cope with these requirements

The above participants seem to be pointing to lack of the 'art' or expertise in supervising the new curriculum. Supervision of educational personnel is the fountain upon which effective curriculum implementation is based and requires connoisseurship or some art for it to be effective. Supervision is a process of facilitating the professional growth of a teacher, primarily by giving the teacher feedback about classroom interactions and helping the teacher make use of that feedback in order to make teaching and implementation more effective. Connoisseurship is a concept founded by Eisner who proposes that educators like critics of the arts, bring their expertise to bear in evaluating the quality of education (Eisner, 1998, p. 63). The word connoisseurship comes from the Latin *cognoscere*, to know (Eisner, 1998, p. 6). It involves the ability to see, not merely to look. To do this we have to develop the ability to name and appreciate the different dimensions of situations and experiences, and the way they relate one to another. We have to be able to draw upon, and make use of, a wide array of information. We also have to place our experiences and understandings in a wider context, and connect them with our values and commitments. The bringing together of the different elements into a whole involves artistry (Barone, 2010).

12.9 School leadership lacks accountability

There is a tendency by school leadership not to be accountable to the implementation process. When they are dealing with these issues with parents at meetings, teachers are not invited to share their concerns with the funders of the programmes.

P1: School leadership is not emphasising on scaling-up programmes to make them realistic on the ground

P2: I do not see their level of commitment on funding of specific programmes

P3: Programmes like No Child Left Behind, Early Reading Initiative, Performance Lag Address Programme, among others, are now just being ignored

Scholars have noted high stakes of accountability era among implementers of curriculum policies in several districts. To that end, Jacobsen & Young (2013) advanced the argument that many there is need to consider the politics of accountability among policy implementers for its effective implementation. This is in line with Anderson's (1975, p.79)'s observation that "policy is made as it is being administered". At the helm of policy administration is the school leadership. Young & Lewis (2015) also highlight that it is the responsibility of those at the helm of policy implementation to see "what works".

The complexity of managing the old curriculum and the new curriculum at the same time

P1: The coming in of the new curriculum did not mean the end of the old curriculum. School leadership are in a dilemma of how to manage two types of curricula at the same time.

P2; The changes are rather too revolutionary and revolutionary changes require a lot commitment and resources and in our case these are not available.

School leadership is at the helm of curriculum management. Positive leadership should recognise that its role is to steer their school on a positive course through the sea of change ((Everand, Morris and Wilson, 2004). Curriculum management is an academic leadership, instructional leadership of the core business of the school, teaching and learning process. It requires literacy in

interpretation and execution of the curriculum policy statement. Implementation does not simply involve following a set of curriculum instructions or replacing "old" practice with "new" practice but is a process of fashioning the curriculum in such a way that it becomes part of the teacher's way of being (Valero and Skovsmore, 2002, p. 3).

13 CONCLUSIONS AND RECOMMENDATIONS

School leadership is the major change agent in curriculum change and implementation and should be responsible for ensuring that effective curriculum implementation is taking place in their schools. For school leadership to be able to do that, they need to be well versed in curriculum matters so as to offer proper supervision and guidance. Schools with leaders that have limited knowledge are at a challenge. Problems of ineffective curriculum implementation are still being experienced due to lack of orientation of the new curriculum content and it calls for several workshops for professional development by key stakeholders like school leadership. Capacitating of critical stakeholders should be the key if implementation is to be done with fidelity. There is need for school leadership to establish small curriculum advisory committees and these committees would table implementation strategies for discussion to the whole staff. Well structured discussions at staff meetings are also critical based on the understanding that the basis of the discussion is to suggest what can be done within the constraints rather than to raise complaints about implementation. In order to improve efficiency of school leadership, it is important to adopt and emphasize on decentralized system. School level decentralized system is believed to improve schooling efficiency. It is also critical for school leaders themselves to concentrate on establishing more knowledge about the complex interactions in the process of curriculum implementation.

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