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ACADEMIC ACHIEVEMENT OF PRIMARY SCHOOL PUPILS BETWEEN SPECIALIST AND GENERALIST TEACHING OF SCIENCE / TECHNOLOGY IN THE ANGLOPHONE SUB-SYSTEM OF EDUCATION IN CAMEROON

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Abstract
The study was designed to investigate the academic achievement of primary school pupils between specialist and generalist teaching of science / technology in the anglophone sub-system of education in Cameroon. The study employed a concurrent triangulation mixed – method combining both a quasi - experimental design and a survey design. Two generalist classrooms and two specialist classrooms with 60 students each were equally shared between the North West and South West Regions. The head teachers of the four schools were interviewed. The instruments for data collection was the Achievement Test for Level three Primary School pupils (ATLPS) and an interview guide for school heads. Quantitative Data was analysed with the support of SPSS 21.0 while qualitative data went through thematic analysis. Findings showed that the specialist class had a performance of 75.2 over 100, very significantly higher than the 47.1 over 100 recorded in the generalist class (P=0.000). The hypothesis here stated is then rejected, thus implying that specialist approach of teaching is much more appropriate in enhancing pupils' academic performance than the currently and unfortunately sustained generalist approach. It was generally perceived that teaching method, assessment and pupils' academic achievement were more effective in the specialist classrooms. Supervision was perceived more challenging in generalist classrooms. It was recommended that there should be a gradual integration of specialist teaching in the educational system, generalist teachers should be upgraded in subject where they are more comfortable in prospect of specialist teaching, and an improvement on administrative supervision and decision making, Training of specialist teachers to be included in the curriculum of Teacher Training Colleges.

Keywords Academic Achievement, Primary School, Pupils, Specialist and Generalist Teaching of Science / Technology, Anglophone Sub-System of Education.

INTRODUCTION

The academic achievement of primary school pupils is a critical indicator of educational effectiveness and future success. In the Anglophone sub-system of education in Cameroon, the teaching of Science/Technology is approached through both specialist and generalist teaching methods. Specialist teaching involves instructors with specific expertise in the subject, while generalist teaching involves teachers covering multiple subjects. Understanding the impact of these teaching approaches on the academic achievement of primary school pupils in Science/Technology is crucial for educational policy and practice. This paper aims to examine and compare the academic achievement of primary school pupils between specialist and generalist teaching of Science/Technology in the Anglophone sub-system of education in Cameroon.

Primary education is vital in promoting positive development in children. It is particularly important in laying solid foundations for the acquisition of knowledge and skills that will enable a pupil to function effectively in the society and since the rest of the educational system depends on it, the primary level is therefore the key to the success or failure of the whole system. To lay a solid foundation for other levels of education it is important that primary education attains its objectives which include; inculcating permanent literacy, numeracy, the ability to communicate effectively; attaining scientific skills, critical and reflective thinking and promote patriotism, fairness, understanding national unity and above all science and technology. The child, the subject and the teacher are at the core of educational experiences needed to meet these objectives, (Ejesi, 2018).

Over the years the Cameroon curriculum has changed to improve on pupils skills to enable them to effectively integrate into secondary education so, primary education no longer limits itself to literacy and numeracy. It requires pupils to acquire these general skills. However, while it is in the curriculum, it is observed that, pupils face challenges that have a negative effect on their performance. According to Annalene et al (2021), the quality of education directly related to the quality of instruction in the classrooms and the availability of competent teachers is vital in constructing the educational system. The most significant factor in improving pupils' achievement is employing qualified teachers in all schools. According to Tambo (2012), as cited by Ntui (2017), the teacher, who is the 'engine'' in the educational sector has a big role to play in the achievement of educational goals. Teachers should give the most appropriate tools, including content knowledge and skills and teaching methodology, to do their work professionally. Teacher competency plays a tremendous role in pupils' performance. Moreover, effective teachers possess broad knowledge in the content areas that they teach and often have majored in those specialised areas.

In this vein, the knowledge level of teachers on subjects is significantly and consistently related to learners 'achievement level whereby teacher content knowledge, teaching method, assessment method, and supervision and decision making by the head teacher affect pupils academic achievement and according to Ololube (2017), it is simply not possible for a single teacher to transmit culture and skills to pupils' of varying ages who will ultimately enter diverse occupation. To this effect, science, technology and mathematics underperformance has become a perennial concern which can prevent the child from functioning effectively. It is in this light that this research seeks to investigate the impact of specialist teaching of science, technology and mathematics on pupil's academic achievement to see if content knowledge, teaching method and assessment method of teachers and supervision and decision making of head teachers has an impact on pupils' academic achievement.

In essence, Low enrolment of science, technology and mathematics into secondary and higher institutions in the Anglophone sub-system of education have been known to evolve from the poor background of learners in

science, technology and mathematics education at the basic levels of their education. Poor academic achievement in science, technology and mathematics is generally attributed to ineffective teaching pedagogies (Reardon, 2018). A significant number of primary school pupils in the Anglophone Sub-system of education in Cameroon do not perform well in mathematics (Endeley & Etomes 2019). According to Endeley (2016), in the English-speaking subsystem of education in Cameroon the literacy level in the upper primary school was significantly low and a similar study also revealed that mathematics achievement is generally low (Endeley, 2017).The prevailing low academic achievement in Science, Technology, and Mathematics of primary school pupils during the Government Common Entrance and First School Leaving Certificate Examination for the past five years is a clear indication that the teaching and learning process is facing a serious problem. Even though stakeholders in education had and are still making efforts to improve the quality of Science, Technology and Mathematics education in terms of content delivery, by retraining the teachers in various workshops and seminars, yet there has been little or no remarkable improvement in the achievement rate. For this reason, many educational practitioners, researchers as well as parents and other stakeholders in education are expressing concerns about learners' academic achievement in primary schools. They wonder why pupils are unable to carry out basic skill after living primary school (Endeley, 2016). If the primary school's achievement in these subjects do not meet the educational goals of eradicating illiteracy, then the teacher attributes and administrative skills that influence pupils' achievement may be problematic.

If pupils were achieving all the outcomes of the curriculum which is designed to guide the development of knowledge, skills and attitudes in the learners and to set the foundation for learning with emphasis on Science, Technology, Engineering and Mathematics (STEM), primary school learners will attain knowledge-based, skill-based and attitude-based proficiencies upon graduation. In this way, they will be able to cope with the different educational and/or professional options available to them at the end of the primary school cycle and embrace lifelong learning, no matter the post-primary path they choose. It is against this backdrop that the researcher seeks to investigate the impact of subject specialist teaching of Science, Technology and Mathematics (STM) in primary schools in the Anglophone Sub-system of education in Cameroon to see if it can (in terms of content knowledge, teaching methods, assessment, supervision and decision making) improve the situation of learners and meet national policy goals.

This study has as major objective to find out the difference in the academic achievement of primary school pupils under specialist teaching compared to generalist teaching of Science and Technology.

Based on the above objective, one hypothesis was tested which verified the significant difference in the academic achievement of primary school pupils between specialist and generalist teaching of Science / Technology.

2. Literature Review

Teaching methods are standard procedures of presenting subject matter and organizing teacher-learner interaction during a lesson. Each teaching strategy is associated with a method. Teaching methods can be general and specific. General teaching methods are the procedure that is common in the teaching of a different subject. On the other hand, specific teaching methods may apply mainly to specific teaching subjects. The teaching methods used by teachers determine the extent to which learners perform in their academics. Nkeng and Mambeh (2007) cited by Abdirahman (2020), viewed teaching methods as those techniques and strategies used by teachers in their efforts to facilitate students learning. It is an activity that translates curriculum goals and objectives into experiences that learners acquire during their interaction with their teacher. Therefore,

the ability of the teacher to appropriately use the different strategies may go a long way to improve the learners' academic performance.

According to Tambo (2012), teaching methods are important components of the curriculum for they determine how effective the objectives would be attained. The teaching methods are chosen based on the objectives to be attained. According to Ayeni (2011), teaching is a continuous process that involves bringing about desirable changes in learners through the use of appropriate methods. Adunola (2012) indicated that to bring desirable changes in learners, teaching methods used by educators should be best for the subject matter. Furthermore, Bharadwaj and Pal (2011) sustained that teaching methods work effectively mainly if they suit learners' needs since every learner interprets and responds to questions in a unique way (Chang, 2010). To facilitate the process of knowledge transmission, teachers should apply appropriate teaching methods that best suit specific objectives and level exit outcomes (Ganyaupfu, 2013). As such, alignment of teaching methods with learners' needs and preferred learning influence learners' academic attainments (Zeeb, 2004).

There are three main methods that teachers use in teaching:

Teacher-centred methods: Under this method, learners simply obtain information from the teacher without building their engagement level with the subject being taught (Boud & Feletti, 1999 as cited by Isa et al., 2020). The approach is least practical, more theoretical, and memorizing. It does not apply activity-based learning to encourage learners to learn real-life problems based on applied knowledge. Since the teacher controls the transmission and sharing of knowledge, he should attempt to maximize the delivery of information while minimizing time and effort. As a result, both the interest and understanding of learners may get lost. To address such shortfalls, Zakaria, Chin and Daud (2010) specified that, teaching should not merely focus on dispensing rules, definitions and procedures for learners to memorize, but should also actively engage learners as primary participants.

Learner-centred method: With the advent of the concept of discovery learning, many scholars today widely adopt more supple learner-centred methods to enhance active learning (Greitzer, 2002). Most teachers today apply the learner-centred approach to promote interest, analytical research, critical thinking and enjoyment among learners (Hesson & Shad, 2007). The teaching method is regarded as more effective since it does not centralise the flow of knowledge from the teacher to the learner (Greitzer, 2002). Daluba (2013) opined that for better performance of learners, the use of activity stimulating and learner-centred approach like the demonstration method instead of depending on the conventional approach like the lecture method needs to be embraced. Learner-centred approaches which are more effective are more encouraged because they embrace the concept of discovery learning (Brindle, 2015).

Teacher-student interactive method: This teaching method applies the strategies used by both teacher-centred and learner-centred approaches. Most teachers today apply the teacher-learner interactive approach to promote interest, analytical research, critical thinking, and enjoyment among learners (Hesson & Shad, 2007). The method encourages the learners to search for relevant knowledge rather than the teacher monopolizing the transmission of information to the learners. According to Walker (2003), the discussion along with the learning material method when properly used can develop the learners' higher learning skills. It can give the learners increased capability for generalization and transfer, a sense of the relevance of learning, and the ability to analyse, synthesize and apply what is learned (Walker, 2003). According to Nabea (2020), present society is technologically oriented and information rich. Knowledge of mathematics is important and so children need to develop mathematical skills to be effective, contributing and confident member of the technologically oriented society (Govindan &

Ramaa, 2013). A specialist may use a diversity of these methods depending on the lesson and the climate of the classroom environment.

In the Cameroon context, teaching methods are special procedures through which educational goals are attained. The Cameroon education system has experienced pedagogic evolutions from the Objective-Based Approach (OBA) through the Inferential Thinking Approach that was referred to as "New Pedagogic Approach" to the Competence-based Approach (CBA) or the Behavioural Objective-based Approach which is in use today. The CBA facilitates the development of skills through the practice of Project Based Learning, Cooperative Learning and Integrated Theme Learning (Cameroon primary School Curriculum, 2018).

Project-based learning is a pragmatic approach to learning in which learners create their own knowledge through learning activities built around intellectual inquiry and a high degree of engagement with meaningful tasks. Projects are designed to allow learners with a variety of different learning styles to demonstrate their acquired knowledge, skills and attitudes. Therefore, a well-designed Project-Based Learning activity is one which addresses different learning styles and does not assume that all learners can demonstrate their knowledge, skills and attitudes in a single or standard way. It is an effective way of connecting classroom activities to the real world through a process of integrating the four broad based competences in the learner's life. PBL is an "investigative" or "discovery" type of learning. It is a research-based method of learning, wherein, together with the learners, questions are asked, investigated and solutions proposed and presented.

Cooperative learning is a specific kind of collaborative learning. In cooperative learning, pupils work together in small teams on a structured activity. They are individually accountable for their work, and for the work of the group as a whole. The Integrated Theme Learning and Cooperative Learning are supporting strategies of the PBL. The strategy consists of putting learners into small, mixed-ability learning teams. They are responsible not only for learning the contents in question, but also for helping their teammates learn. The most amazing thing here is that the learning process becomes a web, wherein you do not succeed alone. The learners must be made to understand that if one person fails, the entire team/boat sinks, and if one person succeeds, the success affects everyone else. Within cooperative learning teams, pupils discuss the material to be learned with one another, and support each other to understand it, and encourage and help one another to have a clear understanding of their participation.

The use of integrated learning themes represents the fundamentals of project-based learning. They facilitate the learning-teaching process and make the essence of PBL come to light. The process entails integrating themes that have been developed in order to facilitate teaching-learning in the Primary School. These themes will constitute the basis of contextualizing the concepts of the subjects. Integrated learning themes are the foundation on which all the activities for a defined period of time within the school year are expected to take place. This can be done for some weeks, months or beyond and has a direct impact on project-based learning. An integrated approach unites all subjects and gives opportunities to the learners to learn more through variant contents. Children will consequently develop a deeper understanding of contents in their local contexts. The approach allows learners to explore, gather, process, refine and present information. It also allows learners to engage in purposeful and relevant learning. Learners are expected to see the interconnectedness within curriculum areas. It is based on skill development around a particular theme that is relevant to the pupils in the class (Cameroon primary School Curriculum, 2018).

According to Tuimur and Chemwei (2015), learning occurs best when a multiplicity of senses are involved, other than overreliance on verbal communication alone (teacher-centeredness). Instructional materials are

important for effective teaching of pupils, coupled with the fact that the primary school class is made up of diverse learners. One important dimension in teacher education that is getting a lot of attention is related to the use of instructional materials. Instructional materials are those materials used by a teacher to simplify their teaching. These instructional materials bring life to learning by stimulating students to learn. The use of instructional materials in the classroom has the potential to help the teacher explain new concepts clearly, resulting in a better pupils understanding of the concepts being taught. However, they are not ending in themselves but they are means to an end (Kadzera, 2006).

According to Abdullahi et al. (2010), instructional materials are tools locally made or imported that help to facilitate the teaching/learning process. To Adalikwu & Iorkpilgh (2013), instructional materials serve as a channel between the teacher and the learners in delivering instructions. They may also serve as the motivation for the teaching-learning process. The use of instructional materials in teaching and learning at the primary school level help the learners to explore, experiment, create and interact with the environment intensively. The quality uses of instructional materials help to provide learners with an enabling environment to learn Mathematics (Meremikwu, 2008). Instructional materials make teaching and learning more effective. They can be manipulated, seen, heard or talked about as instruments which facilitate such activity. Esu, Enukoha and Umoren (2004) stated that instructional materials are necessary ingredients in the development of any curriculum.

The central role of textbooks and other learning and teaching materials (LTM) in enhancing the quality of learning and improving student performance is widely recognized (Smart & Jagannathan, 2018). Quality LTM are crucial for achieving SDG 4. Ensuring that every institution has appropriate learning materials and technology is a key strategy for reaching target 4a in particular. Offorma (2009) as cited in Usman and Adewumi (2006) stated that successful implementation of any curriculum is fully dependent on the quality and quantity of instructional materials available to teachers and pupils for use in schools. Instructional materials stimulate learner's interest; help both the teacher and the learner to overcome physical limitation during presentation of subject matter. Similarly, materials enrich learning and make it more pleasurable. They are used as checks to the teachers' knowledge and means of transmission. Instructional materials also give the teacher the air of guidance, coordination, supervision and more time for correction, brighten the classroom and bring variety in the class lesson (Eya, 2004).

The teachers need to use various and appropriate teaching methods and instructional materials, in order to develop positive attitudes of learners towards the subject. Instructional materials supplement, clarify, vitalize, emphasize instruction and enhance learning in the process of transmitting knowledge, ideas, skills, and attitude. This calls for teacher resourcefulness and improvisation on the parts of the Mathematics, science and technology teachers. The ability of the teacher to make use of "local" materials in place of "standard" ready-made materials makes lesson more effective and improved the leaners' achievement. It is a fact that classroom learning depends on effective communication, skilful application of the several techniques and materials for learning. When adequate instructional materials are added to suitable methods, efficiency in learning is assured (Abdullahi et al., 2010).

Both teachers and students need instructional materials for the successful teaching and learning of any subject (Janovsky, 2015). Within this vein, Msafiri (2017) argues that instructional materials help teachers to easily achieve instructional objectives and students to understand the content in practical ways. Ogbu (2015) observed that a teacher that uses teaching aids to deliver his or her lesson will cover more facts in less time than one who rely on only oral lesson delivery. Brudett and Smith

(2003) in their study based on 57 schools in England and Wales concluded that the learning institutions with abundant learning and teaching resources perform better than the institutions without. Karla (2007) considers teaching materials as partial construction of knowledge. He adds that these materials are described as artefacts that in some cases, by using different forms of symbolic representation, and in other cases as direct references of objects incorporated into teaching strategies, help to reconstruct knowledge through the creation of partial meanings of the curricular concepts. According to Alemnge and Andongaba (2021), for quality instruction to be achieved, citing Ogbondah (2007), the teacher's level of resourcefulness and creativity in the identification and use of instructional materials is very important. According to Kay (2008), instructional materials stimulates the students desire to learn. It assists learning process, promote better understanding and help to overcome physical difficulties in presenting the subject content.

The choice of Instructional materials according to the prescription of the Cameroon curriculum has to be in line with the lesson to be taught. It doesn't have to be dangerous and should be adapted to the age of the learner. It should preferably be concrete; semi-concrete material is equally accepted. Local, natural and found materials should be used to cut down on cost. You are also encouraged to use appropriate Information and Communication Technology tools to teach. The technique to using instructional materials depends on the availability of the resources and the activity to be carried out. For example, a radio or a television can be used as a medium for receiving information. The teacher can ask pupils to watch a television slot (football, story, cartoon, series,) at home or in school and then organise a class discussion. On the other hand, a tape can be used to listen to a song and learn the melody. Also, a cell phone can be displayed for learners to study letters of the English or French alphabet and numbers. A cell phone can also be used as an ICT tool to teach parts of a computer (keyboard, monitor, internal mouse (Teacher's Handbook for The Cameroon Nursery and Primary School Curricula).

The Teaching of Mathematics, Science and Technology

According to the Cameroon Primary School Curriculum (2018), the teaching of mathematics is geared towards developing the learner's creativity, initiative and problem-solving skills. It equally develops logical and inferential thinking, the ability to deduce and visualize in space and time. Through mathematics, the learner improves his/her knowledge of science, technology, agriculture and engineering. It is also necessary for financial literacy and relevant to most forms of employment. Mastering Mathematics entails the acquisition of knowledge, skills and attitudes as well as problem solving skills related to the different integrated learning themes. Primary School learners need these in computation, logical thinking and problem solving to construct knowledge and understand the world around them. The mathematics syllabus also guides teachers, educators and examiners to prepare for teaching and learning as well as for formative and summative assessment. In this curriculum, five components of Mathematics have been developed, namely: Sets and Logic, Numbers and Operations, Measurement and Size, Geometry and Space, and Statistics and Graphs.

Science and Technology penetrates every aspect of societal life and therefore has become an important component in the learning-teaching programmes at every level of education. It enables learners to understand themselves and their environment as well as adapt to the ever-changing world in which they live. The teaching of Science and Technology develops the spirit of curiosity, creativity and innovation. Through Science and Technology, learners will be able to predict and analyse causes and effects of phenomena and use scientific approaches to solve emerging problems. These skills will be developed in Health Education, Environmental Science as

well as in Technology and Engineering. This subject has been developed from domains that were derived from the following national core skills: Use of basic notions in Mathematics, Science and Technology; Demonstration of the spirit of autonomy, a sense of initiative, creativity, and innovation; Practice of lifelong learning and the four broad-based competences (Cameroon Primary School Curriculum, 2018).

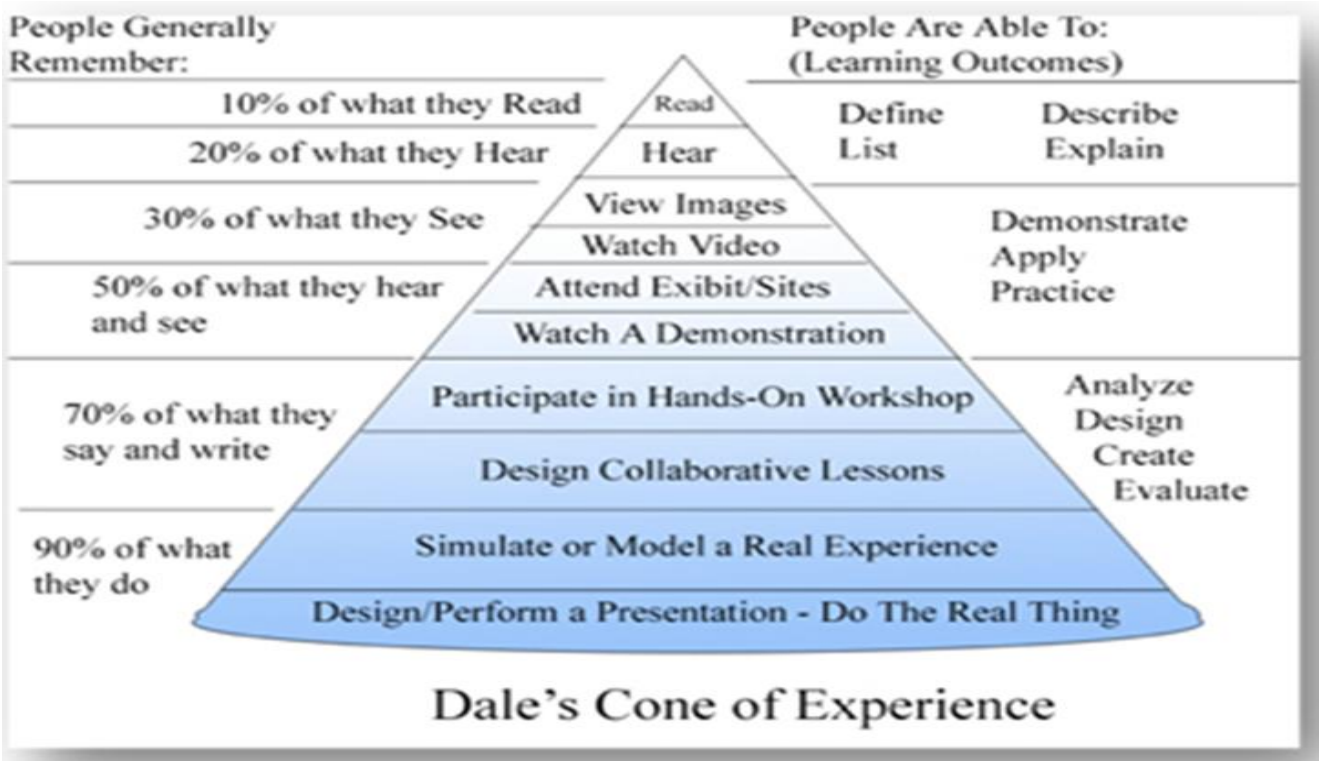
In the Cameroonian context, being an Anglophone or a Francophone does not justify any negligence in the provision of learning values or facilities. Equity refers to the provision of equal access and opportunities to all learners irrespective of socio-economic and cultural backgrounds. Equity frowns on all forms of discrimination. The socio-economic, cultural and political causes of lack of equity are to be traced in order to limit it from education (Nelson, Palonsky, & McCarthy, 2006:81). The presence of equity is what ensures democratic education in a multicultural context like Cameroon. This study limits itself within Deweyan pedagogy of interest in democratic education. This theory explains the problem of equity and quality education in the educational achievements in the Cameroonian society. Barriers to harmonization affect equity pedagogy, which is a major characteristic in multicultural and democratic education alternatives. By equity pedagogy, all learners are given equal opportunities and privileges to develop their potentials. The teaching and evaluation procedures are established to foster the aptitudes, needs and experience of learner's quality education. It is also determined from the fact that the learners acquire the necessary skills to enhance their full integration into the community. Within this framework, quality education is possible if the curricula in Cameroon enhance the acquisition of the basic achievement levels of all learners in the various schools. This fact is possible with a harmonized pedagogic structure and evaluation process even if these educational values are transmitted within the processes and procedures of the respective cultures. This is not the case with the educational sub-systems in Cameroon. There is no harmony in the English and French pedagogic structure and evaluation process and thereby no equity and quality education in the schools.

Theoretically, Dale's Cone of Experience by Edgar Dale (1969) is a model that incorporates several theories related to instructional design and learning processes. During the 1960s, Edgar Dale theorized that learners retain more information by what they "do" as opposed to what is "heard", "read" or "observed". His research led to the development of the Cone of Experience. Today, this "learning by doing" has become known as "experiential learning" or "action learning" (Heidi, 2017). According to Dutta (2020), the concept of cone of experience was given by Edger Dale in 1946. The learning experiences are placed at hierarchical manner in the cone with reference to their relative position in the teaching-learning process. This is a visual model which is made of eleven stages starting from concrete experiences at the base of the cone and then it becomes more and more abstract as it reaches the peak. The arrangement in the cone is based on the principle of concretization to abstraction and on the number of senses involved. The more senses are involved in direct, purposeful experience, but it does not mean that concrete experience is the most effective way of getting knowledge. The experiences at each stage can be mixed and are interrelated in order to foster more meaningful learning.

The cone of learning describes and visualizes Dale's views on the teaching methodologies available to us and how effective different forms of instruction are at imparting knowledge. It comes with percentages that indicate the retention rates of each mode of instruction; however, the education community is in disagreement on whether these percentages were highlighted by Dale or not. It appears that they have sprung up out of nowhere, but we will consider them as they form the basis of the learning theory. The cone of learning offers a basis for teaching by outlining the modalities of how we learn. However, the field of education has progressed quite a bit since the first

instance of the cone of learning. Our understanding of the human mind has also expanded. This leads us to factor in multiple variables that go into learning. Educators have a duty in our society to deliver knowledge with the utmost effectiveness. They are always on the lookout for novel ways to help learners understand what they have learned.

Figure 1: Illustration of Dale's Cone of Experience



Source: Edgar Dale (1969) P: 108

According to Dale's experience, Pupils generally remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see & hear, 70% of what they say & write and 90% of what they say and do. According to Dale's research, the least effective method at the top, involves learning from information presented through verbal symbols, that is., listening to spoken words. The most effective methods at the bottom, involves direct, purposeful learning experiences, such as hands-on or field experience. Direct purposeful experiences represent reality or the closet things to real, everyday life. The cone charts the average retention rate for various methods of teaching. The further you progress down the cone, the greater the learning and the more information is likely to be retained. It also suggests that when choosing an instructional method, it is important to remember that involving learners in the process strengthens knowledge retention. It reveals that "action-learning" techniques result in up to 90% retention. People learn best when they use perceptual learning styles. Perceptual learning styles are sensory based; the more sensory channels possible in interacting with a resource, the better chance that many students can learn from it. According to Dale, instructors should design instructional activities that build upon more real-life experiences. Dales' cone of experience is a tool to help instructors make decisions about resources and activities.

In Dale's perspective, most students in schools

did not learn how to think, discover, and solve real problems. Rather, students were forced to memorize facts and knowledge in most schools, and as a result, any knowledge they acquired was inert in their real lives. For this reason, he argued that we should have revolutionary approaches to improve the quality of educational learning environments. To build learning environments infused with rich experiences, Dale argued for the development of new materials and methods of instruction. Dale promoted the potential of audio-visual materials, believing that they could provide vivid and memorable experiences and extend them regardless of the limitations of time and space. Learners benefit from multiple modes of learning. These can not only be passive in nature but also those that promote active participation. Although Dale's cone of learning may not be the best indicator of retention, it definitely highlights the different learning approaches you can use in your classroom.

The implications of Dale's Cone of Experience to this study are that it can facilitate learning and ease teaching. Specialist teachers do understand how to increase the retention rate of learners by involving the learner. This means that while the learner participate and get involved in the learning process by expression, they awaken the sensory organs. This theory helps teachers to plan different kinds of learning experiences in order to create the most effective learning environment for the purpose of studying contents. It helps teachers to plan different kinds of learning experiences in order to create the most effective learning environment for the purpose of studying. It helps teachers make decisions about resources to be used in teaching that best suits different activities.

3. Methodology

The study employed a concurrent triangulation mixed – method combining both a quasi - experimental design and a survey design. Two generalist classrooms and two specialist classrooms with 60 students each were equally shared between the North West and South West Regions. The head teachers of the four schools were interviewed. The instruments for data collection was the Achievement Test for Level three Primary School pupils (ATLPS) and an interview guide for school heads. Quantitative Data was analysed with the support of SPSS 21.0 while qualitative data went through thematic analysis.

4. Findings and Discussion

The findings of the study will be presented and supported by literature and the works of other researchers. Quantitative data will be presented first followed qualitative data.

4.1 Is There a Difference in the Academic Achievement of Primary School Pupils Between Specialist and Generalist Teaching of Science/ Technology?

Table 11: Comparing Academic Performance in Science / Technology Among Pupils Taught by Specialist Teachers and Those Taught by Generalist Teachers in the Southwest Region

Type of school	Stats	Scie/Tech1 (30)	Scie/Tech2 (70)	Total Scie/Tech (100)
Specialist class	N	60	60	60
	Mean	23.6	51.7	75.3
	Median	24.0	52.5	76.0
	SEM	0.4	1.2	1.3
	Minimum	18.0	36.0	56.0
	Maximum	30.0	68.0	94.0
	SD	2.7	9.1	10.4

Generalist class	N	60	60	60
	Mean	15.3	29.4	44.7
	Median	16.0	28.0	44.0
	SEM	0.6	1.8	2.4
	Minimum	10.0	10.0	20.0
	Maximum	24.0	60.0	82.0
	SD	4.7	13.8	18.3

In the Southwest experimental setting, the average score in Science / Technology in the first assessment was 23.6 over 30 in the specialist class, higher than the 15.3 over 30 recorded in the generalist class. The trend was the same in the second assessment with the specialist class scoring 51.7 over 70, far higher than the 29.4 over 70 for the generalist class. Research has shown that specialized instruction can lead to improved student outcomes. A study by Hattie (2009) conducted a meta-analysis of various educational interventions and found that instructional programs that focused on specific subject areas, such as STEM subjects, had a positive effect on student achievement. Moreover, a study by Kini and Podolsky (2016) examined the impact of teacher specialization on student achievement in mathematics. The researchers found that schools with specialized math teachers had higher student achievement in mathematics compared to schools with generalist teachers. This suggests that subject-specific instruction can contribute to improved performance in that particular subject.

The findings related to the assessments in the Southwest experimental setting align with the idea that specialized instruction in Science/Technology can lead to higher achievement scores. The specialist class, with teachers who likely had a deeper understanding of the subject matter, performed significantly better than the generalist class. It is important to consider that there may be other factors at play that could influence the observed differences in achievement scores. For instance, variations in instructional methods, teacher effectiveness, and student characteristics can also impact student performance.

As for the total score in Science / Technology, the specialist class was far above the generalist class with an average of 75.3 over 100 as compared to 44.7 over 100 for the generalist class. A study by Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009) examined the impact of teacher specialization on student achievement across multiple subjects. The study found that schools with specialized teachers had higher overall student achievement compared to schools with generalist teachers. Moreover, a study by Hanushek, Kain, and Rivkin (2005) investigated the relationship between teacher specialization and student achievement across various subjects. The researchers found that teacher specialization had a positive effect on student outcomes, with specialized teachers leading to higher overall achievement across subjects. The findings related to the total scores in Science/Technology align with the notion that specialized instruction in these subjects can lead to improved overall student achievement. The specialist class, with teachers who likely had a deeper content knowledge and expertise in Science/Technology, outperformed the generalist class in terms of overall scores.

Table 12: Comparing Academic Performance in Science / Technology Among Pupils Taught by Specialist Teachers and Those Taught by Generalist Teachers in the Northwest Region

Type of school	Stats	Scie/Tech1 (30)	Scie/Tech2 (70)	Total Scie/Tech (100)
Specialist class	N	60	60	60
	Mean	23.6	51.6	75.1
	Median	24.0	52.5	76.0
	SEM	0.3	1.2	1.3
	Minimum	18.0	36.0	58.0
	Maximum	30.0	68.0	93.0
	SD	2.7	9.2	10.4
Generalist class	N	60	60	60
	Mean	15.6	34.4	49.5
	Median	16.0	34.0	50.0
	SEM	0.7	1.3	2.0
	Minimum	10.0	16.0	20.0
	Maximum	24.0	60.0	84.0
	SD	5.0	10.0	15.2

In the Northwest experimental setting, the average in Science / Technology in the first assessment was 23.6 over 30 in the specialist class, higher than the 15.6 over 30 recorded in the generalist class. The trend was the same in the second assessment with the specialist class scoring 51.6 over 70, far higher than the 34.4 over 70 for the generalist class. Ronfeldt, Lankford, Loeb, and Wyckoff (2013) examined the impact of teacher specialization on student achievement. The study found that teachers who specialized in a particular subject tended to have higher value-added scores in that subject compared to teachers who taught multiple subjects. This indicates that subject specialization can contribute to improved student achievement.

Furthermore, Darling-Hammond, Chung, and Frelow (2002) explored the impact of teacher specialization in mathematics and science on student achievement. The study found that schools with teachers who specialized in mathematics and science had higher student achievement in those subjects compared to schools with generalist teachers. This suggests that specialized content knowledge in specific subjects can positively affect student outcomes. The findings related to the assessments in the Northwest experimental setting align with the existing research, indicating that specialized instruction in Science/Technology can lead to higher achievement scores. The specialist class, likely benefiting from teachers' deeper understanding and expertise in the subject matter, consistently outperformed the generalist class in both assessments.

As for the total score in Science / Technology, the specialist class was far above the generalist class with an average of 75.1 over 100 as compared to 49.5 over 100 for the generalist class. The trend in the Northwest region was the same as in the Southwest region with specialist class having performed higher all though. Goldhaber and Brewer (2000) examined the relationship between teacher specialization and student achievement. The researchers found that students taught by teachers who specialized in a particular subject achieved higher scores on standardized tests compared to students taught by generalist teachers. The findings related to the total scores in Science/Technology in the Northwest experimental setting align with the existing research, indicating that specialized instruction can contribute to improved overall student achievement. The specialist class, likely

benefiting from teachers' deeper content knowledge and expertise in Science/Technology, consistently outperformed the generalist class in terms of total scores.

Table 13: Comparing Academic Performance in Science / Technology Among Pupils Taught by Specialist Teachers and Those Taught by Generalist Teachers

Type of school	Stats	Scie/Tech1 (30)	Scie/Tech2 (70)	Total Scie/Tech (100)
Specialist class	N	120	120	120
	Mean	23.6	51.6	75.2
	Median	24.0	52.5	76.0
	SEM	0.2	0.8	0.9
	Minimum	18.0	36.0	56.0
	Maximum	30.0	68.0	94.0
	SD	2.7	9.1	10.3
Generalist class	N	120	120	120
	Mean	15.5	31.9	47.1
	Median	16.0	32.0	49.0
	SEM	0.4	1.1	1.5
	Minimum	10.0	10.0	20.0
	Maximum	24.0	60.0	84.0
	SD	4.9	12.3	16.9

In overall, considering Southwest and Northwest combined, the average in Science / Technology in the first assessment was 23.6 over 30 in the specialist class, higher than the 15.5 over 30 recorded in the generalist class. The trend was the same in the second assessment with the specialist class scoring 51.6 over 70, far higher than the 31.9 over 70 for the generalist class. A study by Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009) examined the impact of teacher specialization on student achievement across multiple subjects. The study found that schools with specialized teachers had higher overall student achievement compared to schools with generalist teachers. The findings related to the assessments in both the Southwest and Northwest experimental settings align with the existing research, indicating that specialized instruction in Science/Technology can lead to higher achievement scores. The specialist class consistently outperformed the generalist class in both assessments, indicating the potential benefits of subject-specific instruction.

As for the total score in Science / Technology, the specialist class was far above the generalist class with an average of 75.2 over 100 as compared to 47.1 over 100 for the generalist class. It is equally worth noting that the specialist class performed above average unlike the generalist class. The poorest student in the specialist class still scored above average, with a mark of 56.0 over 100 as compared to just 20.0 over 100 for the one from the generalist class.

The median score in the specialist class was 76.0 over 100, meaning that half of the class has scored 76.0 or above. This value was even below average, just 49.0 in the generalist class. Pupils

in the specialist class were more homogenous in their performance with a Standard Deviation (SD) of 10.3, far lower than the 16.9 recorded in the generalist class thus indicating a very high discrepancy in pupils' performances in the generalist context. DeFranco, Taylor, and Harmon (2013) investigated the impact of teacher specialization on student achievement and performance variability. The researchers found that specialized instruction led to reduced variability in student performance compared to generalist instruction. This suggests that subject-specific instruction can promote more consistent performance among students.

Furthermore, a study by Möller, Köller, and Marsh (2014) examined the effects of teacher specialization on student performance variability across different subjects. The study found that teacher specialization was associated with lower variability in student performance in specialized subjects compared to generalist subjects. This indicates that specialized instruction can contribute to a more consistent level of achievement among students. The findings related to the specialist class having a lower standard deviation and more homogeneous performance align with the existing research, indicating that specialized instruction can lead to reduced variability in student performance. The specialist class, with teachers who likely had deeper content knowledge and expertise in Science/Technology, exhibited a more consistent level of achievement compared to the generalist class.

Table 14: Thematic Analysis Depicting Head Teachers' Perceptions of Whether Level-Three Class-Five Teachers Master the Content Knowledge of Science / Technology

Code	Code description	Grounding	Quotation
Specialist classroom			
Yes	The answer was yes for the two specialist head teachers	2/2	*"Yes they do"*
Mastery	Mastery of subject matter	2/2	*"The teaching was done with ease"*
Generalist classroom			
Partially	The answer was partially for the two generalist head teachers	2/2	*"Not quite"*
No mastery	No mastery of mathematics	2/2	*"Because there are areas especially in mathematics that they avoid to teach due to the lack of content knowledge"* *"No good mastery of the subject"*

Head teachers of specialist classroom were of the opinion that level-three class-five teachers master the content knowledge of Science / Technology, unlike their counterparts of generalist classroom who perceived the mastery of subject matter to be partial. This head teacher of the specialist classroom for instance explained that "The teaching was done with ease" while this one of the generalist classrooms complained that "Because there are areas especially in mathematics that they avoid to teach due to the lack of content knowledge". A study by Hill, Ball, and Schilling (2008) revealed that teachers with a strong

understanding of the subject matter have a significant impact on student achievement. This holds true across various subjects, including mathematics and science.

In the specific context of mathematics, a study by Hill, Sleep, Lewis, and Ball (2007) found that teachers' mathematical knowledge was significantly associated with student achievement. The study emphasized the importance of teachers' deep understanding of mathematical concepts and their ability to effectively communicate and explain those concepts to students. Additionally, research has shown that teachers who possess greater content knowledge are more confident in their teaching abilities. A study by Gess-Newsome and Lederman (1999) found that teachers with higher levels of content knowledge in science reported higher levels of self-efficacy and were more likely to engage in effective instructional practices. It is important to note that while subject specialization can contribute to content mastery, effective teaching extends beyond subject knowledge alone. Pedagogical skills, including instructional strategies, classroom management, and student engagement, are also critical components of effective teaching and student learning.

Table 15: Thematic Analysis Depicting Head Teachers' Perceptions of Whether the Achievement Level of Pupils in Class Five is Good in Science, Technology

Code	Code description	Grounding	Quotation
Specialist classroom			
Yes	The answer was yes for the two specialist head teachers	2/2	*"Yes of course"*
Performance	Good performance in the subject	2/2	*"From the formative assessment administered to learners during teaching, it proves that the content was perfectly understood by the teachers. lesson was they performed well"* *"Good performance"*
Generalist classroom			
Partially	Partially could considered average	2/2	*"Partially"*
Poor performance	Poor performance	2/2	*"Not very high because teachers don't master all the subjects taught and so pupils hardly obtain high academic achievement"* *"Performance not all that good"*

Head teachers of specialist classroom were of the opinion that achievement level of pupils in class five is good in Science / Technology, unlike their counterparts of generalist classroom who perceived pupils' achievement to be average or simply poor. This head teacher of the specialist classroom for instance emphasized that "From

the formative assessment administered to learners during teaching, it proves that the content was perfectly understood by the teachers. Lesson was they performed well" while this one of the generalist classrooms complained that "Not very high because teachers don't master all the subjects taught and so pupils hardly obtain high academic achievement". Research suggests that teachers who specialize in specific subjects may have certain advantages when it comes to teaching those subjects. A study by Ronfeldt, Lankford, Loeb, and Wyckoff (2013) found that teachers who specialized in a particular subject tended to have higher value-added scores in that subject compared to teachers who taught multiple subjects. This indicates that subject specialization may contribute to improved student achievement in those specific subjects.

Moreover, a study by Darling-Hammond, Chung, and Frelow (2002) examined the impact of teacher specialization in mathematics and science on student achievement. The study found that schools with teachers who specialized in mathematics and science had higher student achievement in those subjects compared to schools with generalist teachers. This suggests that specialized content knowledge in specific subjects can positively affect student outcomes. On the other hand, it is important to note that effective teaching involves more than just subject specialization. Teachers need to possess pedagogical skills, such as instructional strategies, classroom management, and student engagement, regardless of their specialization. Furthermore, a study by Ingersoll and Strong (2011) highlighted the importance of teacher collaboration and support within schools to enhance student achievement, regardless of subject specialization.

Table 16: Thematic Analysis Depicting Head Teachers' Perceptions of Whether the Achievement Level of Pupils in Class Five Would Have Been Better if Teachers Specialized in Science, Technology

Code	Code description	Grounding	Quotation
Yes	The answer was yes for the two generalist and specialist head teachers	4/4	*"Yes they will"*
Mastery	Specialist teacher perceived as having a better mastery of the subject	4/4	*"Since the teachers master their content knowledge, they will give out the best and pupils' academic achievement will be greater"* *"Yes I think so, because if the teachers specialize in their subject, mastering their content knowledge will be easy and therefore teaching and learning will be easy resulting to pupils' high academic achievement"*

Head teachers were all of the opinion that the achievement level of pupils in class five would have been better if teachers specialized in Science, Technology as depicted by this quotation "Since the teachers master their content knowledge, they will give out the best and pupils' academic achievement will be greater". The statement suggests that head teachers believe that if teachers specialize in Science and Technology (STEM subjects), the academic achievement of pupils in class five would be improved. This viewpoint is based on the assumption that teachers with a deep understanding of the content knowledge in these subjects will be more effective in imparting that knowledge to their students,

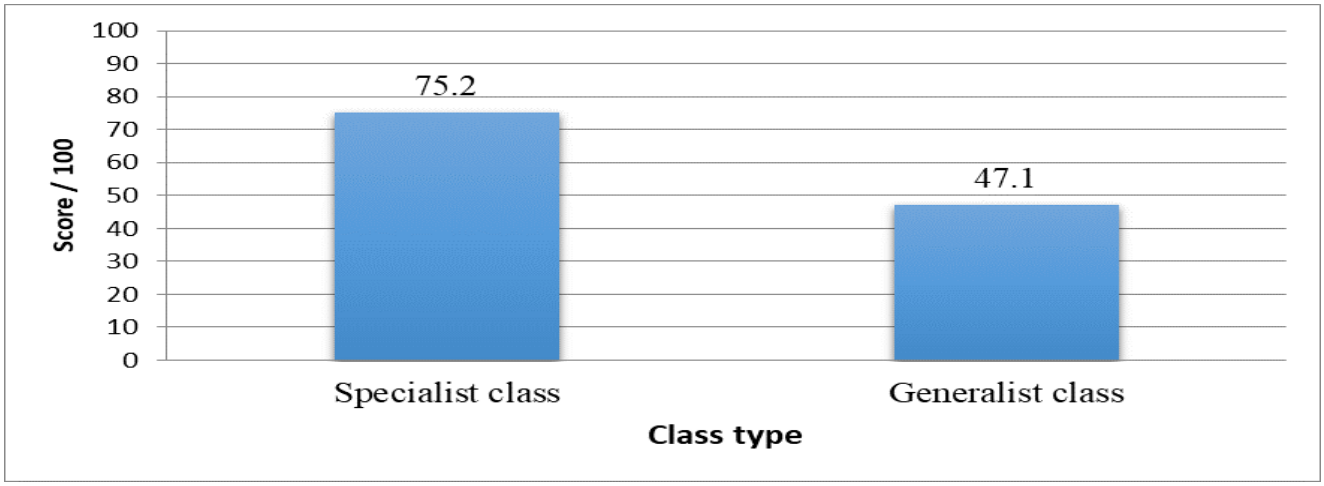
leading to better academic outcomes.

The idea of subject specialization among teachers has been a topic of interest and discussion in the field of education. Research has explored the impact of teacher content knowledge on student learning outcomes, particularly in STEM subjects. Several studies have indicated a positive relationship between teacher content knowledge and student achievement. A meta-analysis conducted by Hill, Rowan, and Ball (2005) found that teachers who had a strong understanding of the subject matter they taught had a significant impact on student achievement, especially in mathematics. Similarly, a study by Hanushek and Rivkin (2006) revealed a positive association between teacher content knowledge and student achievement in science.

Furthermore, research has shown that specialized training and professional development opportunities for teachers in specific subject areas can enhance their content knowledge and instructional effectiveness. Wilson, Macdonald, Byrne, Ewing, & Sheridan, (2008) demonstrated that teachers who participated in professional development programs focused on improving their content knowledge in mathematics were better able to promote student learning in that subject. It is important to note that while subject specialization can be beneficial, effective teaching also involves pedagogical skills, such as instructional strategies, classroom management, and student engagement. A teacher's ability to communicate and engage with students, create a positive learning environment, and provide appropriate support are all crucial factors in facilitating student achievement.

Research hypothesis one: There is no significant difference in the academic achievement of primary school pupils between specialist and generalist teaching of Science / Technology

Figure 9: Comparing Academic Performance in Science / Technology Among Pupils Taught by Specialist Teachers and Those Taught by Generalist Teachers



Ngroup=120

Mann-Whitney U: U=1224.000; P=0.000.

The specialist class had a performance of 75.2 over 100, very significantly higher than the 47.1 over 100 recorded in the generalist class (P=0.000). The hypothesis here stated is then rejected, thus implying that specialist approach of teaching is much more appropriate in

enhancing pupils' academic performance than the currently and unfortunately sustained generalist approach. Kleickmann and Möller (2012) equally resolved following their experiment that specialist teachers can better improve the academic achievement of pupils. Adunola (2012) also cherish specialist teachers' teaching method as he stated in the same vein that pupils' academic achievement in science, technology and Mathematics is highly enhanced by specialist teaching given the mastery of the subject matter by the teacher. Rhys-Evans (2020) was then right to question how can generalist primary school teachers deliver a rigorous curriculum across all subjects. The author opined that teacher reported significant improvements in pupils' outcomes, compared to the previous year when they specialised, thus highlighting the importance or need for primary schools to pay sufficient attention to specialist teaching.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the findings of this study generally highlighted the efficiency of specialist teaching as compare to the generalist counterpart as students in specialist's classroom performed significantly better as compared to their peers of generalist classroom. The general perception of head teachers indicated preference for specialist teaching mostly for higher classes which proved to be more efficient in term of mastery of content knowledge, pedagogical approach, and pupils' interest in the subject, enthusiasm, class participation, pupils' academic achievement and more relaxed classroom supervision. This explains head teachers' recommendation for educational policy to hasten the integration of specialist teaching in our educational system. Other scholars' works were generally in support of specialists teaching. It was equally recommended that generalist teachers could take specialist training in subject where they feel more comfortable. They however nuanced that whether generalist or specialist teacher, the inadequacy of infrastructure and didactic material could hamper their performance and pupils' academic achievement.

REFERENCES

1. Abdirahman, S. M. (2020). Factors influencing students' performance in mathematics in national centralized examination in secondary schools in Banadir region, Somalia. Unpublished Master's Thesis.
2. Abdullahi, A. (2010). Science teaching in Nigeria. Atoto Press. 83-87
3. Adalikwu, S. A., & Iorkpilgh, I. T. (2013). The Influence of Instructional Materials on Academic Performance of Senior Secondary School Students in Chemistry in Cross River State. Global Journal of Educational Research, 12(1), 39.
4. Adunola, O. (2012). "The impact of teachers' teaching methods on the academic performance of primary school pupils in Ijebu-Ode local cut area of Ogun State." Ego Booster Books.
5. Alemnge, F. L., & Andongaba, B. A. (2021). The Impact of Teaching Methods and Materials on the Teaching of Citizenship Education in Cameroon: A Study of Case Schools in Buea Municipality. Open Access Library Journal, 8, e6993. https//doi.org/10.4236/oalib.1106 993
6. Ayeni, A. J. (2011), "Teachers professional development and quality assurance in Nigerian Secondary Schools." World Journal of Education, 1(2),143-149.
7. Bharadwaj, B. K., & Pal, S. (2011). Mining Educational Data to Analyse Students' Performance, International Journal of Advanced Computer Science and Applications, 2(6), 63-69.
8. Boud, D., & Feletti, G. (1999), "The challenge of problem-based learning," (2nd Ed.), Kogan Page.
9. Brindle Y. S. (2015). Teacher perspectives on integrating ICT into Kenyan system of education. "A paper presented in the 1st Regional Conference on e-Learning. Increased access to education, diversity in applications and management

10. Brudett, M., & Smith, R. (2003). Leadership in education. Sage Publishers.

11. Cameroon Primary School Curriculum for English Subsystem Level III: Class 5 and Class 6 (2018).

12. Daluba, N. E. (2013). Effect of Demonstration Method of Teaching on Students' Achievement in Agricultural Science. World Journal of Education, 36, 1-7.

13. Dutta, S. (2020). Teaching of geography through dale's cone of experience. http:// adamasuniversity.ac.in/teaching-of-geography-through-dales-cone-of-experience/

14. Ejesi N. S. (2018). Relative Effectiveness of The Use of Subject Specialist and Generalist Teaching Approaches on Academic Achievement of Pupils in Primary Schools in Anambra State, Nigeria. Journal of Guidance and Counselling Studies, 2018, Vol. 2, Issue 2, 116-134.

15. Endeley, M. N. (2016). Teacher's perception and practice of automatic promotion in English speaking primary schools in Cameroon. British Journal of Education, 2(4) 11-23.

16. Endeley., & Etomes. (2019). The Effect of Age on Pupils' Academic Achievement: A Comparative Analysis of Private and Public Primary School Children in Fako Division, South West Region of Cameroon. European Journal of Education Studies, 6(7), 1-9.

17. Esu, A. E. O., Enukoha, O. I., & Umoren, G. U. (2004). Curriculum development in Nigeria for colleges and universities. Calabar, BUT-BASS ENT.

18. Eya, P. E. (2004). Instructional material procedures in a challenge education system. Paper presented at the Annual natural conference organized by curriculum Development and Instructional material Centre (CUDIMAS). University of Nigeria, Nsukka.

19. Ganyaupfu, E. M. (2013). Teaching Methods and Students' Academic Performance. International Journal of Humanities and Social Science Invention ISSN (Online, 2(9), 2319–7722. Retrieved from www.ijhssi.org

20. Govindan, N., & Ramaa, S. (2013). Analysis of Errors Made by Children with Hearing Impairment. International Journal of Science and Research, 4(3), 201-208.

21. Greitzer, F. A. (2002), "Cognitive approach to student- Centred E-learning, human factors and society." 46th Annual Meeting.

22. Hanushek, E. A., & Rivkin S. G. (2006). Teacher Quality. In Eric A. Hanushek, Finis Welch (eds.). Handbook of the economics of education, 2, 1051–1078. Amsterdam: North-Holland.

23. Hesson, K., & Shad, S. (2005). Teacher perspectives on integrating ICT into subject teaching: commitment, constraints, caution and change. Journal of Curriculum Studies, 372, 155-192.

24. Hill, H. C., Rowan, B., & Ball, D. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. American Educational Research Journal, 42 (2), 371–406.

25. Isa, S. G., Mammam, M. A., Badar, Y., & Bala, T. (2020). The impact of teaching methods on academic performance of secondary school students in Nigeria. International Journal of Development Research, 10(6), 37382-37385.

26. Janovsky, A. (2015). Instructional materials: Definition, examples and evaluation. retrieved from: http://study.com/academy/lesson/instructional-materials-definition-examples-evaluation.html on 16th December, 2015

27. Kadzera, C.M., 2006. Use of instructional technologies in teacher training colleges in Malawi. Doctoral Dissertation,Virginia Polytechnic Institute And State University

28. Kay, M. C. (2008). Practical teaching. Evans Bothers.

29. Kleickmann, T., & Möller, K. (2012). Fachdidaktisches Wissen von Lehrkräften

und multiple Ziele im naturwissenschaftlichen Sachunterricht (Subject-related didactic knowledge of teachers and multiple objectives in lessons on natural sciences). Zeitschrift für Erziehungswissenschaft, 15, 55– 75.

30. Meremikwu, A. N. (2008). Instructional aids, gender and primary school pupils' achievement and retention in mathematics in Cross River State, Nigeria. Unpublished PhD thesis, University of Calabar, Nigeria.

31. Msafiri, L. (2017). Strategies for motivating teachers in Tanzanian rural public ordinary secondary schools: A case of Ushetu council in Kahama District. Unpublished Thesis. Arts in Education. The University of Dodoma, Tanzania

32. Nabea, P. K. (2020). Effect of teaching methods on academic performance in mathematics among learners with hearing impairment in Meru County, Kenya. Unpublished Master's Thesis.

33. Nelson, G. D., & Landel, C. C. (2007). A collaborative approach for elementary science. Educational Leadership, 64(4), 72-75.

34. Nkeng, P. N., & Mambeh, C. T. (2007). "Curriculum development, supervision and

35. evaluation". Limbe: The Cure Series.

36. Ntui, A. M. (2017). The Administrative Process as a Determinant of Secondary School

37. Teachers' Professional Development: The Experience of Anglophones in Upper-Nkam Division. Journal of Education and Practice, 8(8), 20-27.

38. Offorma, G. C. (2009). Curriculum implementation and instruction Enugu. Enugu: Uni world Educational Publishers (Nig.) Ltd.

39. Ogbu, J. E. (2015). Influences of Inadequate Instructional Materials and Facilities in Teaching and Learning of Electrical/Electronic Technology Education Courses. Journal of Education and Practice, 6(33), 39-46.

40. Ogbondah, L. (2007) Provision and Utilization of Instructional Materials for Secondary Schools as Predictor of High Academic Standards. Nigerian Journal of Social Studies, 17, 131-143.

41. Hanushek, E. A., Kain, J. F. & Rivkin, S. G., (2005). "Teachers, Schools, and Academic Achievement." Econometrica, The Econometric Society, 73(2), 417-458.

42. Rhys-Evans (2020). Specialist Teachers or Teachers who Specialise? By Research Schools Network on the 4th May 2020. Specialist Teachers or Teachers who… | Research Schools Network. https://researchschool.org.uk/news/specialist-teachers-or-teachers-who-specialise

43. Smart, A., & Jagannathan, S. (2018). Textbook policies in Asia: Development, publishing, printing, distribution, and future implications. Asian Development Bank.

44. Tambo, L. I. (2012) "Principles and methods of teaching": Application in Cameroon schools". Design House Limbe.

45. Tuimur, T, & Chemwei, K. (2015). Availability and Use of Instructional Materials in the Teaching of Conflict and Conflict Resolution in Primary Schools in Nandi North District, Kenya. International Journal of Education and Practice, 3(6), 224-234.

46. Usman, K. O., & Adewumi, A. O. (2006). Factor Responsible for inability of teachers to improvise instructional materials for the teaching of mathematics. JSTAN 41(1&2), 51-56.

47. Walker, G. H. (2003). Lecturing with style: The university of Tennessee. Chattanooga.

48. Wilson, G. B., Macdonald, R. A. R., Byrne, C., Ewing, S., & Sheridan, M. (2008). Dread and passion: Primary secondary teachers' views on teaching the arts. Curriculum Journal, 19, 37-53.

49. Zakaria, E., Chin, C. L., & Daud, Y. (2010). "The

effect of cooperative learning on student mathematics achievements and attitude towards mathematics. Journal of Social Sciences, 6(2), 272-275.

50. Zeeb, M. S. (2004). Improving student success through matching learning and teaching styles. University of Phoenix.