

**A CRITIQUE OF PEDAGOGICAL METHODOLOGIES USED IN SCIENCE IN EARLY  
YEARS OF EDUCATION IN NYAMIRA COUNTY-KENYA**

**BY**


**DAVID NYANCHOKA OTACHI**

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## DECLARATION

This project is my original work, and it has never been presented for any academic award at any University.

Sign:  Date: 6<sup>TH</sup> SEPTEMBER, 2023

DAVID NYANCHOKA OTACHI

**E56/83636/2012**

This project has been submitted with our approval as University Supervisors:



Sign: \_\_\_\_\_ Date: 8<sup>TH</sup> SEPTEMBER, 2023

PROF. ATIENO KILI K'ODHIAMBO.

Associate Professor of Philosophy of Education

Department of Educational Foundations

University of Nairobi

Sign:  \_\_\_\_\_

Date: 8<sup>TH</sup> SEPTEMBER, 2023

PROF. JOSEPH MWINZI.

Associate Professor of Philosophy of Education

Department of Educational Foundations

University of Nairobi

## **DEDICATION**

I dedicate this project to my father (posthumously), who ensured I joined standard one when I knew how to read and write by teaching me using his elementary education; to my brother, Rtd Colonel Agwata, who came in handy to support my education to a large extent; to my beloved spouses: Lorna and Susan, in helping me realize this dream, and finally to my son, Moses, who ensured the correspondence to and from my supervisors was typed as fast as received.

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## **Abstract**

Effective choice, adoption, and utilization of a pedagogical methodology in the early years of education science curriculum are crucial in developing essential skills in preschool learners. In Nyamira County, the pedagogical methodologies used in science in the early years of education are mainly teacher-centred. With the implementation of the competency-based curriculum in Kenya, the methods of science instruction should be learner-centred to effectively develop and nurture essential skills in the learners. The study critiques the pedagogical methodologies used in science in the early years of education in Nyamira county. The paper analyses pedagogical methodologies, including demonstration, experiments/ practical studies, narration, play, group discussion, games, and self-directed methods. The level of implementation and effectiveness of these methodologies are also assessed. It also makes a comparison of the pedagogical methodologies used in various countries. A review of related literature is conducted using philosophical analysis and hermeneutics. Through the review of related literature, significant findings are realized and analyzed conceptually. It is found that despite the implementation of the Competency-Based Curriculum in Kenya, which supports Learner-centered pedagogical approaches, teachers still use the old pedagogical methodologies, which were mainly teacher-centred. Additionally, many teachers are not familiar with some of the learner-centred methodologies, and schools lack the necessary resources to ensure the effective adoption of these approaches. The study recommends that the government should increase resources to schools to ensure that teachers are trained on the appropriate pedagogical methodologies and to facilitate the construction and equipment of innovation hubs, and workshops. This study is significant to both scholars and other relevant stakeholders as its findings may be a pointer to unearthing the deep-rooted issues in science instruction in the early years of education. Consequently, the findings can inform future education policy guidelines and quality assurance systems.

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## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background to the study**

The study critiques pedagogical methodologies used in science in the early years of education in Kenya, taking Nyamira as a case study. This chapter presents the background to the study, the statement of the problem of the study, the purpose of the study, the objectives of the study, the research questions, the significance of the study, limitations of the study, delimitations, theoretical framework, conceptual framework, and research methodology.

For any country to have a highly skilled workforce of scientists, a strong foundation in sciences is required. Stress on science education will make sure that the workforce that is created is competitive to tackle the challenges of this century. Acquisition of science education is enhanced through appropriate pedagogical methodologies. The pedagogical methodology is a method and practice of teaching learners (Abell & Lederman, 2007). When scholars talk about the pedagogy of teaching, they refer to the technique teachers use to deliver the curriculum content to a class. When lesson planning, teachers consider different techniques of content delivery. The choice of a given technique depends on the teaching preferences, experience, and context in which they teach. Research on science teachers' classroom practices shows no record of their reports on class room practices. Classroom practices refer to a teacher's regular classroom activities that enhance their interactions with learners to bring about learning in science (Sohn Bok young, 2013). Furthermore, Khader (2012) identifies classroom practices as a set of pedagogical methodologies and classroom instruction techniques employed by the teacher to promote the learner's cognitive and skilful perceptions through appropriate classroom management, continuous evaluation, and determination

to teach to realize the set teaching objectives. The above-stated definitions imply that teachers use various pedagogical methodologies such as massed practice, learning probes, loci method, and many more in the course of any given science lesson.

It is essential to note that many types of research involving teachers' classroom practices are majorly surveys and often classify teachers' classroom activities according to traditional teaching methods (Ackerson, 2019). The classification of teaching into basic dichotomous practices such as interactivity and lecturing presents an unreliable and poor view of teaching methods that do not mirror the realities of classroom practice (Hume et al., 2019). This is because teaching is a complex and dynamic practice that involves activities occurring simultaneously during a lesson (Mangal & Mangal, 2018). According to Johnston-wilder et al. (1986), science teaching requires that a teacher should have the knowledge and content mastery of the science subjects. In addition, the teacher should employ appropriate approaches and techniques in passing the knowledge to the learners. Therefore, it is important that in a serious science learning environment, appropriate methodologies are needed in the early years of education for the development of science concepts and capabilities that can be valuable in the later life of the child.

Teachers can combine multiple pedagogical methods in the course of a lesson. This is grounded on the engagement theory of learning that proposes that comprehension comes as a result of the learner's prolonged engagement in connecting new ideas and explanations to their prior beliefs (Kersley & Shneiderman, 1998). For constructivism which is a learning approach that holds that people actively construct or come up with their knowledge and that reality is dictated by the learner's experiences, the teacher's role is to facilitate prescholar-designed efforts as per the curriculum. This approach makes learning a personal, active, and self-directed effort by creating

learning environments that permit learners to assume responsibility for their learning (Loeng, 2020).

Scholars like Plato and Nyerere perceive education which integrates science studies, as of incredible significance in society, whereby a person is shaped to be a valuable part of society, empowered to advance their culture and lead a great life (Hume et al., 2019). Plato views education's purpose as an enabler for one to develop the potentials and abilities that are innate within them (Lamichhane, 2018). This view is what Aristotle identified with the analogy of a midwife- assisting in delivering birth to thoughts and concepts which are born within every one of us souls. From this analogy of Aristotle, Plato finds a significant assembly point with Jean Jacque Rousseau's recognition of education. Rousseau argues that the person is born unique, but due to bad pedagogical methodologies employed in science education, an individual is changed, and all the uniqueness and dignity befitting a true individual is turned into simply a good character in society, where distinction gets misplaced within the poor pedagogy (Davar, 2012). According to Nyerere (1968), education's purpose is to disseminate the knowledge and wisdom gathered to preschoolers to prepare them for the role of developing and maintaining their society. They prepare for this role by acquiring relevant scientific knowledge and skills through appropriate pedagogical methodologies for science studies (Joseph & Lydia, 2009). Education prepares learners for community responsibilities which will transform and develop society in all aspects (Nyerere, 1968). A nation that invests in an education system with effective pedagogical methodologies can prosper economically.

The government of Kenya finances the education sector intensely, with the hope that it will revolutionize many sectors of the country and transform it into a modern progressive state. It uses

over 30% of its national budget for the development of education in the country in terms of recurrent and non-recurrent expenditures (Wanyama & Koskey, 2017). Several reforms have been carried out in the Kenyan education sector to enhance the development of education.

In 1981, a Presidential Working Party was tasked to assess the curriculum reform of the Kenyan education system. The commission issued a recommendation to change science education to the then science studies of education (Ambaa, 2015). The science studies were launched in January 1985 after the introduction of the 8-4-4 system following the Mackay report of 1982 (Wanjohi, 2011). Emphasis was placed on science and technical subjects like Mathematics, Agriculture, and Arts and Crafts. The focus on pedagogical methodologies for science education in Kenya is aimed at preparing learners for appropriate science knowledge acquisition in the classroom (Pedagogical Approaches and The Teaching of Science, n.d.). According to Wanjohi (2011), the 8-4-4 system, which stressed science subjects, was implemented following the 1966 conference on education at Kericho in Kenya, which emphasized the need for enhancing rural development through the knowledge gained in science classes, the International Labor Organization mission report entitled 'Employment, Incomes and Equality, and the recommendation of the National Committee on Educational Objectives and Policies of 1975. One of the reasons why the 8-4-4 program was introduced was so that it could give graduates a better practical education. Even so, the emphasis made by the 8-4-4 program on science subjects could only yield results upon the use of appropriate pedagogical approaches in teaching these science subjects.

Park & Suh (2019) observe that the science education context would orient preschoolers towards appropriate science knowledge acquisition if a teacher applies good pedagogical methodologies. Laurillard (2013) also presents such ideas by noting that scientific studies mostly emphasize

preparing learners for proper attitudinal and skills achievement. Applying constructivist approaches would improve both learner's skills and knowledge (Thomas, 2013). However, in Kenya, the pedagogical approaches used in teaching science studies in EYE are teacher-centered. The approaches encourage learners to memorize class content by rote and to complete or "cover" the science education syllabus before the terminal examination and tests are due. The conventional pedagogical methods employed by science teachers are not effective as learners continue to lack adequate scientific knowledge and practical skills (Wabuke, 2016). The continued use of teacher-centered approaches by science teachers in EYE has been explained by teachers' limitations in expanding learners' science knowledge in most science subjects (Okebukola et al., 2013). If Kenya shifts from the use of teacher-centered pedagogy to learner-centered pedagogy in teaching science subjects, improvement can be enhanced in knowledge and practical skills acquisition by the learners.

A learner-centered curriculum has been adopted in most of the West countries' education systems and has gained popularity in developing countries. The Learner-centered pedagogy is appealing because it comes with great liberation from traditional pedagogical methodologies. The methodology has been promoted in most nations throughout the world. Learner-centered pedagogy is derived from two philosophies of progressivism brought about by John Dewey and social constructivism by Lev Semenovich Vygotsky (Britton, 1987). According to consideration by Dewey, education is a powerful tool that brings about transformation in society (Herbert, 2004). His education model stressed individualized learning, whose fundamental principles are the active participation of learners and problem-solving. He focused on a democratic education where there is the freedom to act as a channel to self-realization for the learner (Dewey, 2004)

Vygotsky contributed to pedagogical approaches by giving an epistemological perspective on the nature of human knowledge and the factors which influence its acquisition. Social constructivism claims that a person's knowledge is not disseminated from one person to another but constructed or reconstructed through learner interactions within a sociocultural setting (Vygotsky, 1997). This means that knowledge is not something that is external to the learner and awaits realization but results from encountering new information through interaction with existing knowledge and learner experiences. From this view of knowledge, instead of transmitting or delivering, it should be gotten through engagement (Hebert, 2004). The central ground of the concepts and perspectives of both Dewey and Vygotsky is a focus on a learner-centered pedagogical approach. Both perspectives also focus on the promotion of attainment of knowledge through discovery, exploration, and reflection instead of gaining it through absorption and memorizing of facts and concepts through rote learning. Through learner-centered pedagogy based on Dewey and Vygotsky, instruction to learners can be directed to them based on their weaknesses and strengths. This means that each learner learns differently, and as such, their performance should not be compared with other learners, but their progress should be assessed by the use of standardized tests (Tracey & Morrow, 2012).

Many nations in developing countries, particularly in Sub-Saharan Africa, Kenya included, have started to embrace learner-centered pedagogy. This behavior has prompted researchers and policymakers to address the issue of how teachers adopt new methods of learning that are different from the initially used teacher-centered ones. Currently, in African countries such as Kenya, learner-centered pedagogy has not fully taken root in schools leading us to very important questions on how the teachers in Africa and particularly Kenya, view learner-centered pedagogy

and the challenges they face in adopting it. Are teachers in EYE trained and equipped with the right education on how to adopt learner-centered pedagogy?

In the year 2009, after a review was made of the 8-4-4 system, the Kenya Institute of Education (KIE), currently known as the Kenya Institute of Curriculum Development (KICD), concluded that the 8-4-4 system did not emphasize practical skills, which are fundamental for the development of the learners. After the new constitution was inaugurated in 2010, the re-alignment of training and the education system as per the new constitution was conducted by a task force chaired by Professor Douglas Odhiambo to ensure that the education offered helped in realizing Kenya's vision 2030 (Korir, 2016). Vision 2030 is aimed at transforming Kenya into an industrialized, middle-income state which provides an improved standard of life to its citizens in a safe and clean environment. The task force gave a recommendation that focused on restructuring various programs in the 8-4-4 system to include a competence structure that recognizes and emphasizes equipping learners with practical skills besides knowledge (Wairimu, 2020). In the year 2017, KICD did away with the 8-4-4 System and launched a new education system, "the Kenya Competency-based Curriculum (CBC)." CBC emphasizes the importance of developing practical skills alongside knowledge and making an application of competencies to real-life situations (Nyakangi, 2020). KICD provides that the preschool science objectives are needed to foster interest and develop positive attitudes towards sciences and to emphasize the importance of sciences in our daily life. Science studies are a fundamental tool in industrialization and technology and, therefore, helpful in the advancement of our society. For this reason, all children need this important tool to enhance productivity based on their abilities so that, in the long run, they can make a contribution to the government's economy and also improve their skills and qualities as human beings.

For many countries, the standards of achievement in sciences have been an issue of concern. It is with this respect that the Kenyan government 1998 initiated a project, "The strengthening of mathematics and science in secondary school education (SMASSE)." Science teachers must possess an admiration, passion, and positive attitude toward the manipulation of complex science concepts (Ualesi & Ward, 2018). The teaching of science requires that the teacher should have sound knowledge of the content to teach and appropriate methods or techniques through which to impart the knowledge to the learners. There are various methods of teaching science. The methods range from 'talk and chalk' to practical methods (Edger, 1994). Teaching methods have proved to be varying depending on the current trend and technological state. Over time, there has been a transition of the methods from the traditional and old expository ones to the child-centered kind of methods.

Science teachers can use a range of methods which include: discussions, lectures, group work, games, play, projects, textbook reading, science modelling, and experiments, among many other methods. The teachers employ a given method depending on the topic of study and the level of the learners. Instructional methods used rely on the technique employed, and the technique employed depends on the lesson content (Mutunga & Breakell, 1992). As much as both the old and current methods are essential and applicable, the choice of the appropriate method largely depends on the content being taught. Lately, the emphasis on science teaching methods is on those methods that are more practical, for instance, experimentation, play, and games. Comprehension of concepts in childhood must be based on practical experience. Interactive methods have proved to be more effective in teaching children. This is because they tend to keep the learners alert and therefore enhance cognition and concentration (Ualesi & Ward, 2018). Poor teaching results when the teachers employ an inappropriate method in teaching the learners. An inappropriate method makes



the learners lose the motivation and interest to learn and creates a negative attitude in the learners about the topic and consequently leads to low grades. There is a very close association between the science teaching methodology and learners' performance (Keith, 1997).

The arguments about teachers' classroom pedagogical methodologies make it imperative to ascertain what classroom pedagogical methodologies science teachers employ in their regular interactions with preschool learners. Therefore, this is the reason the current study seeks to explore the pedagogical methodologies used in teaching science in the early years of education in Nyamira County.

### **1.2 Statement of the problem**

Despite efforts by the Kenyan Ministry of Education to implement learner-centered pedagogical methodologies through CBC in teaching science in the early years of education, still, most teaching approaches are not focused on the learner and can be described as teacher-centered. Therefore, this study explores the existing science teaching methodologies for preschoolers with Nyamira County as a case of reference; to suggest appropriate pedagogical approaches that will enable the effective achievement of science knowledge and skills among learners. Nyamira County is chosen for this study not as a region with its peculiar teaching pedagogies but as representative of the Kenya national methodologies applicable in the EYE. Kenya is divided into forty-seven counties, which have their government headed by governors. Although some aspects of education are devolved, a large part is managed by the national government. Classroom instruction dynamics are similar across the country because they are determined by the Kenya Institute of Curriculum development (KICD), which is charged with the responsibility of curriculum design and implementation. EYE in Nyamira county is compromised as teachers still use pedagogical methods from the former 7-4-2-3 system. Methodologies from this system are mainly teacher-centered. These methodologies

affect the scientific knowledge gained by learners, which in turn affects their productivity when solving problems as adults. The Competence-Based Curriculum proposes that with the unique endowment of counties with different resources, pedagogical methods are supposed to equip learners with competencies that address the unique needs of each county. The study seeks to philosophically analyze and explore appropriate pedagogical methodologies that can be used in science in the early years of education in Nyamira County.

### **1.3 Purpose of the study**

This study's purpose is to explore the pedagogical methodologies applied in science teaching in the early years of education in Nyamira county-Kenya.

### **1.4 Objectives of the study**

- i. To analyze the pedagogical methods of science teaching in EYE in Kenya and assess their effectiveness in equipping the learners with practical skills.
- ii. To assess the implications of pedagogical methods in EYE learners in Kenya
- iii. To critically examine the knowledge gaps in science teaching in EYE in Kenya and propose ways to bridge these gaps

### **1.5 Research questions**

- i. What are the pedagogical methods used in science teaching in EYE in Kenya?
- ii. What are the implications of pedagogical methods for EYE learners in Kenya?
- iii. What are the knowledge gaps in science teaching in EYE in Kenya?

### **1.6 Significance of the study**

The study's findings and recommendations offer curriculum planners, education policymakers, and practitioners alternative and additional pedagogical approaches essential in achieving the

objectives of pedagogical methodologies used in science in the early years of education. The study also enhances the development of a curriculum that nurtures the unique interest of learners.

### **1.7 Limitations of the study**

The pedagogical methodologies used in teaching science studies in the early years of education are influenced by many factors, such as teacher-to-learners ratios, budgetary allocations, and government policies, among other factors. Therefore, it is not possible to exhaustively study all these factors due to time and financial constraints.

### **1.8 Delimitations of the study**

The study delimits itself to science subjects of preschool learners only. It only discusses the aspects of pedagogical methodologies used in teaching science studies in the early years of education in Kenya.

### **1.9 Assumption of the study**

The study assumes that analysis of the pedagogical methods provides the desired objectives. It sees this analysis as an endeavor that helps in solving the problem of effective pedagogical methodologies for science in Kenya.

### **1.10 Research methodology and ethical consideration**

The study conducts a review of related literature using philosophical analysis methods to explore the pedagogical methodologies applied in science teaching in the early years of education in Kenya. The philosophical analysis involves clarification of questions and answers by exploring sufficient and necessary conditions which give meaning to a term (Onkware, 2002). What is a necessary condition? Copi and Cohen (1990) note that it is a condition for the occurrence of a particular event without which that event cannot occur. The analysis serves to make the question precise so that to develop the knowledge of how to respond to it. Besides, analysis breaks down

ideas and concepts into pieces that can be easily understood. Through analysis, facts are disassembled to determine their coherence, thereby making it possible to establish inconsistencies and contradictions, which can then be avoided. Additionally, analysis familiarizes the researcher with the original lines of argument and opens up avenues for critical reflection that promotes the formulation of normative views (Holma, 2009). In the study, an analysis made is useful in several ways: One, by providing a clear understanding of the concept of science education. Two, examine the pedagogical methodologies involved in imparting knowledge and skills in EYE. The study requires no ethical approval as the information will be retrieved from accumulated literature.

### **1.11 Theoretical framework**

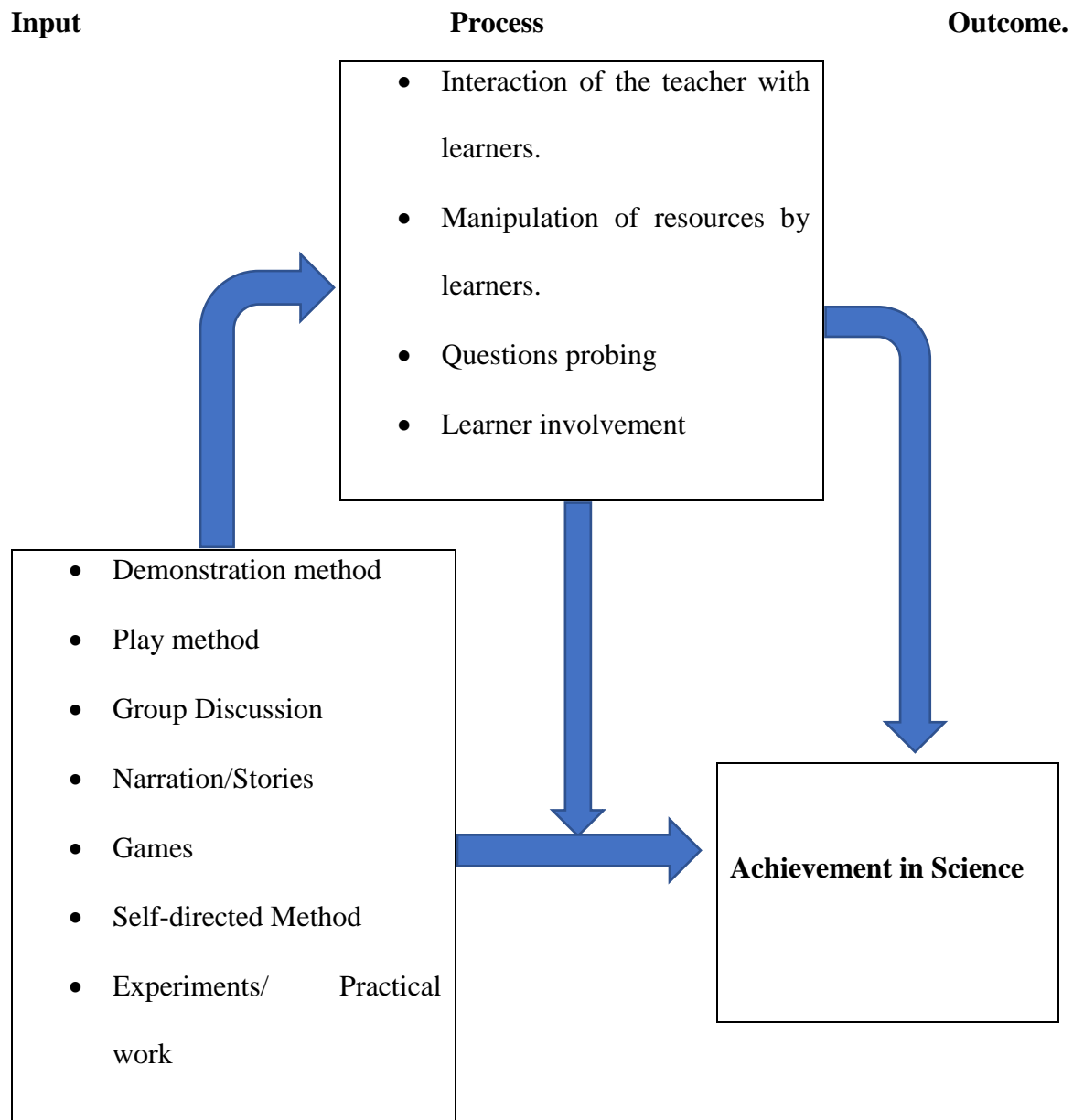
This study is grounded on the constructivism theory, which was first developed by Jean Piaget (1960). The theory holds that the early progression of children's cognitive development happens when they interact with their environment to acquire social, physical, and logical knowledge. The knowledge acquired is crucial for learners' understanding and performance in science. Active classroom interactions with the teachers and peers equip the learners with essential skills and attitudes to participate in problem-solving. Through active classroom interactions, learners can verbalize their thinking and explain and justify their solutions. Consequently, learners can comprehend the concepts in a problem and apply their conceptual framework to incorporate alternative methods of problem-solving in science. Pedagogical methods that align with the social constructivism theory include those that involve meaningful interaction of learners, such as small group collaboration and class discussions (Wood, 1995). Such methods are very significant for preschoolers' engagement in classroom learning and therefore need to be adopted in teaching science lessons (classroom). Constructivists view science teaching in terms of how it enhances the construction of knowledge by preschooler learners. The view focuses on how learners draw

concepts from their surroundings and make sense of the world around them and the ways in which they engage their explorations and thinking. Glasersfeld (1999) noted that "Learners' do not just passively absorb their environment, but rather they actively operate on it." As a result, a preschooler's prior knowledge is critical in constructing new knowledge. This perspective fosters the creation of a classroom environment that is learner-centered and that presents learners with opportunities to develop skills and gain knowledge.

Constructivist theorists view preschoolers as actively engaged in making meaning. Using the constructivist theory approach to teach science allows the teacher to easily assess learners' abilities to share, analyze, build, collaborate and investigate based on what they already know rather than what processes, skills, and facts they can produce. To ensure effective pedagogy, teachers should be innovative in adopting and implementing teaching methods that can incorporate trends and current issues in education, such as the use of ICT. Teachers need to keep themselves up-to-date with emerging trends in education by taking a researcher's role to find out the current pedagogical methods that are in line with the constructivist theory. Social construction theory is central to this study as it helps in the identification of different pedagogical methods that influence the learning of science in the early years of education. Besides, it outlines crucial aspects concerning how preschoolers construct scientific knowledge through interaction between themselves and their teachers. The aspects highlighted to make it easy for the researcher to identify and point out weaknesses in the pedagogical methods used, instructional resources, and learners' attitudes toward learning science. The study is done with the aim of improving performance in science education at EYE

### **1.12 Conceptual Framework**

The figure illustrated below shows the relationship between the various interactive methods employed by a teacher in teaching science and the participation of learners toward achieving good performance in sciences.



*Fig1: A conceptual framework of interactive methods employed by a teacher in teaching science and the participation of learners towards achieving good performance in sciences.*

The study aims at assessing the teaching methodology and how the employment of the appropriate methodology can be significant in changing the current trend of poor performance in science

learning areas. There are many teaching methodologies, and all of them have different levels of learner participation. Good achievement in science learning areas can be realized depending on the method used and how the teacher adopts it.

### **1.13 Operational definition of terms**

**Curriculum** - it refers to the content taught in different subjects in  
primary and preschools

**Constructivism** - is the idea that learners construct knowledge for themselves and each  
learner individually and socially constructs meaning as they learn.

**Concepts** - are packages of meaning that are conceived in mind and considered worth  
of learning

**Education** - is the acquisition of knowledge and experience as well as the development of  
attitudes, habits, and skills which help a person attain a full and worthwhile life  
in this world.

**Pedagogical methodology** - is an approach to the teaching and learning process comprising  
different phases, including generative, academic/topical, and creative action,  
which occurs simultaneously. Each phase is uniquely characterized to create and  
transform learners through different experiences and activities depending on the  
subject themes. Consequently, creating the critical consciousness of learners  
in their learning and general lives.



**Pedagogy-** it is the science of teaching, including how teaching is carried out.

**Philosophy-** refers to the intellectual process that deals with an attempt to comprehend, interpret and unify reality.

**Learner** - a child who is learning a subject or skill at his/her young age.

**Small Group Discussion-** It is an organized conversation among learners in which they share their opinions, ideas, and views and also listen and learn from those of other learners.

**Self-Directed Method** -It is a learning methodology whereby the learners are in control of their learning processes.

#### **1.14 Organization of the Study**

The study is organized into five chapters. Chapter one comprises the background of the study, the purpose of the study, objectives of the study, research questions, significance of the study, limitations of the study, delimitations of the study, assumptions of the study, research methodology, and organization of the study.

Chapter two involves the review of related literature to the study given under the following headings: introduction, interactive methods, demonstration, experiments/practical work, narratives/ stories, play, group discussion, games, self-directed method, pedagogical methodologies in England, France & Germany, pedagogical methodologies in Egypt, pedagogical methodologies in Tanzania, pedagogical methodologies in Kenya, theoretical framework, conceptual framework all in which the analysis is made.

Chapter three contains an explanation of the implications of pedagogical methods on EYE, the role of the teacher in implementing pedagogical methods, and factors influencing the choice of a pedagogical method.

Chapter four contains a discussion of the challenges and considerations in implementing pedagogical methodologies.

Chapter five contains the summary, conclusion, and recommendations made from the analysis of the study.

## **CHAPTER TWO**

### **PEDAGOGICAL VIEWS ON EARLY YEARS OF EDUCATION**

#### **2.0 Introduction**

This chapter contains literature related to the pedagogical methodologies used in science in the early years of education. The literature is presented under the following headings: Interactive methods, which are explained under demonstration method, experiments/ practical studies, and narration method. Play, group discussion, games, and self-directed methods are also explained. This chapter also makes a comparison of the pedagogical methodologies used in science in the early years of education in various countries. The countries that are used in making the comparisons include England, France, Germany, Egypt, Uganda, and Kenya. Additionally, this chapter contains the theoretical and conceptual framework of the study. The literature review provides concrete information and insight into different matters that are utilized in establishing the strengths and challenges of past studies and, consequently, their connection to the study.

#### **2.1 Interactive methods**

Interactive methods are those that enable learners to use their senses and/or limbs to acquire knowledge. They allow learners to manipulate and explore the environment through hands-on activities. During the early years of learning, a child undergoes rapid development in all areas and actively begins to learn and develop various concepts. In these years, the child advances from having visual thoughts to critical analysis of concepts. Day in and day out, in children's lives, they encounter science concepts. They gain scientific knowledge and concepts through their daily encounters with various objects (Willingham et al., 2015). The type of science knowledge and concepts gained by children depends on their developmental stage. A teacher should make a

perfect plan for a scientific program that comprises different methodologies and techniques in teaching science in the early years of education. For appropriate pedagogical methodologies to be used in scientific studies in the early years of education, scholars in education have rallied for an increase in research-based, innovative, learner-centered pedagogical methods. These methods include inquiry-based methods, group learning methods, the use of problem-solving teaching approaches, and variants of the conceptual change models, among others (Njoku, 2004). In Kenya, particularly Nyamira county, classroom assessments in the early years of learning show that teaching methods used in science classrooms are mainly expository and teacher-centered (Onsare, 2014). Chenge & Syomwene (2016) observed that regardless of the advocacies and recommendations of innovative pedagogical methodologies for science subjects, science teachers still rely mainly on the expository methods in which they simply implement pre-planned instruction to learners with or without the use of science education curriculum. Below is a discussion of the most recommended interactive and innovative pedagogical methodologies used in science teaching in the early years of education level.

### **2.1.1 Demonstration**

A demonstration is a practical exposition or illustration by the teacher to a science class regarding a scientific concept, often using a physical device to clarify an explanation (Butter & Wren, 1960). The reason for demonstrating is to display a concept or principle so that it is easier for the learners to easily understand and put into practice what they learn. A demonstration is not only done by the teacher but can be done by the learners and the entire class. A demonstration is an effective teaching methodology because learners not only hear but see how a particular science concept or principle works and can easily apply it in their everyday lives. Questions are usually used during

demonstrations to trigger thinking in learners about the concept being illustrated (Popham & Baker, 1970).

The demonstration method is a traditional teaching strategy that is often employed in Kenya's Early Years of Education classrooms. This method involves the teacher demonstrating a task or concept to the students, who then imitate or practice the task themselves. While this method has some benefits, there are also several limitations that should be considered when evaluating its effectiveness in the classroom.

One of the main benefits of the demonstration method is that it allows students to see a concrete example of the task or concept that is being taught. This can be especially helpful for visual learners who may struggle to understand abstract ideas. Additionally, the demonstration method can be a useful tool for introducing new or complex concepts to students, as it allows them to see the task in action before attempting it themselves.

However, the demonstration method also has several limitations. One of the main drawbacks of this method is that it can be less effective for students who have different learning styles, such as auditory or kinesthetic learners. Additionally, the demonstration method can be less effective for students who have different levels of prior knowledge or experience with the task or concept being taught. This is because the demonstration may be too complex or too simple for some students, which can lead to confusion or frustration.

Another limitation of the demonstration method is that it can be less effective for students who are not highly motivated or engaged in the lesson. This is because the demonstration method relies heavily on the teacher to keep the students' attention and interest, and if the teacher is not able to

do so, the students may become disengaged. Lastly, the demonstration method can be less effective for students who have different cultural backgrounds or experiences since the way the teacher is teaching may not be relatable to the student's backgrounds or experiences.

Although demonstration is used in the early years of education in Kenya, it is not employed fully to ensure learners unlock new possibilities for experimentation with science materials. When using demonstration, science teachers should allow the learners enough time to practice the demonstrated skill and encourage them to ask questions about the skill. Additionally, the teachers should give further guidance and directions on how the skill can be used with other concepts, materials, and techniques in problem-solving.

### **2.1.2 Experiments/ practical work**

Experiments involve carrying out certain procedures under given conditions to test a scientific concept or principle. The science theories, concepts, and principles learnt are made practical through experiments. Experiments and practical work trigger curiosity in the learners and also provide clarification of various science concepts. This methodology not only enhances learning but also motivates the learners as they can apply the learnt concepts through practical work (Millar, 2004). Learning by the experimental and practical method enhances the ability of the learners to remember science concepts and creates a lasting memory of the science content. According to Heather (2009), the process of learning is achieved through experiences in life and education - experimental learning-take a central part of the learning process of children. Experimental learning advances psychomotor skills in children and helps them to make scientific relationships and in making concrete assertions on science (Githua, 2002).

Experiments are often employed in Kenya's Early Years of Education classrooms as a way to engage students in active learning and to promote a deeper understanding of scientific concepts. One of the main benefits of using experiments as a pedagogical method is that it allows students to actively engage with the material, which can lead to a deeper understanding of the concepts being taught (Koehler & Mishra, 2009). Additionally, experiments can be a powerful tool for promoting critical thinking and problem-solving skills (Jones et al., 2016). However, there are several limitations to the use of experiments as a pedagogical method that should be considered.

One of the main drawbacks is that experiments can be time-consuming and resource-intensive, which can be a challenge in resource-constrained classrooms (Jegede, 2009). Additionally, experiments can be less effective for students who have different learning styles, such as auditory or kinesthetic learners (Jegede, 2009). Another limitation of experiments as a pedagogical method is that they may not be suitable for all scientific concepts or principles, especially those that are abstract or theoretical in nature (Jegede, 2009). Furthermore, it may not be suitable for all students. For example, students with disabilities or special needs may find it difficult to participate in experiments due to physical limitations or lack of access to equipment (Jegede, 2009).

Lastly, the experiments as a pedagogical method may not be suitable for all cultural backgrounds or experiences. For example, students from different cultures may have different ways of understanding and interacting with scientific concepts, and the method employed may not be relatable to their background or experiences. Although experiments are used as a pedagogical methodology in teaching science, there is a challenge of schools having all the needed materials, instruments, and equipment for experiments. Besides, there is a gap in transferring the concepts learnt in class through experiments to solve real-life problems.

### **2.1.3 Narratives/Stories**

Narration entails an oral outline of chronological, systematic events together with explanations of concepts and questions with regard to the concepts explained in the narration. The narration or story should always be in line with the study content. The effectiveness of this methodology lies in the teacher's ability to bring out a narrative that the learners can relate to and one that is relevant to the science concept being taught. Storytelling is usually very appealing and interesting to most learners. Through storytelling, certain concepts can easily be remembered by the learners. According to Rodgers (2011), the limitation of this methodology is that it is difficult to find a relevant story to narrate in some teaching areas. However, storytelling is an effective method when it meets the relevance of the study content as it raises curiosity in learners.

Narratives and stories have been used as a pedagogical method in teaching science in the early years of education in Kenya with the belief that they can make learning more engaging and memorable for young learners. However, there are some limitations to using this method in teaching science.

One of the limitations is that narratives and stories can oversimplify complex scientific concepts. For example, a story about a seed growing into a tree may not accurately convey the complex process of photosynthesis (Tilstone & Ellis, 2020). This can lead to misconceptions and a lack of understanding of the underlying scientific principles.

Another limitation is that the use of narratives and stories in teaching science can lead to a lack of emphasis on scientific inquiry and experimentation (Njoroge & Gichoya, 2018). Science education should focus on helping students develop the skills to observe, question, and test hypotheses, rather than just relaying information through a story.



Additionally, the use of narratives and stories as a pedagogical method may not be inclusive for all learners. Some students may struggle to understand or engage with the narrative, particularly if it is culturally or linguistically distant from their own experiences (Njoroge & Gichoya, 2018).

Overall, while the use of narratives and stories can be an effective pedagogical method in teaching science in the early years of education in Kenya, it is important to be aware of its limitations. Teachers should also be mindful of the potential oversimplification of complex scientific concepts, lack of emphasis on scientific inquiry and experimentation, and potential inclusivity issues when using this method.

#### **2.1.4 Play**

Play is a very active channel through which children can learn science. Through play, children have an opportunity to have an enjoyable learning session. Play should be guided by teachers so that children engage in effective, relevant play. It allows the learners to freely experiment with their surroundings and pour their expressions. An observation by Fisher & Raymond (2005) noted that children have two environments of learning, indoor and outdoor classrooms. Outdoor classrooms are regarded as an extension of the indoor classroom. The activities in outdoor classrooms are made in such a way that they promote psychomotor and social skills. During play in outdoor classrooms, children gain scientific skills of identification, observation, analysis, and many other essential skills. Play also helps the development of eye-to-hand coordination in children. As observed by Farrant (1997), play serves many important roles as it develops competencies, triggers imagination, and facilitates creativity among children. Play allows children to face challenges head-on that might have seemed difficult from a scientific point of view.

Play has been widely used as a pedagogical method in teaching science in the early years of education in Kenya, as it is believed to be an effective way to engage young learners and promote their curiosity and interest in science. However, there are some limitations to using play as a pedagogical method in teaching science.

One limitation is that play-based teaching can be less structured and may lack clear learning objectives (Njoroge & Gichoya, 2018). This can lead to a lack of focus on specific science concepts and skills, which can make it difficult for students to make connections and transfer their learning to new situations.

Another limitation is that play-based teaching may not provide enough opportunities for students to engage in scientific inquiry and experimentation (Mukuria & Kioko, 2019). Science education should focus on helping students develop the skills to observe, question, and test hypotheses, which are important skills that are best developed through hands-on experimentation and inquiry.

Additionally, play-based teaching can be challenging to assess, as it is often difficult to measure student learning and progress in a play-based setting (Mukuria & Kioko, 2019). Without clear assessment methods, it may be difficult for teachers to determine whether students are meeting learning objectives and making progress in their understanding of science concepts.

While play-based teaching can be an effective pedagogical method in teaching science in the early years of education in Kenya, it is important to be aware of its limitations. Teachers should also be mindful of the potential lack of structure and clear learning objectives, lack of opportunities for scientific inquiry and experimentation, and difficulty in assessment when using play as a teaching method. Furthermore, teachers should also balance play-based teaching with more structured and

inquiry-based teaching methods to ensure that students have opportunities to develop a strong foundation in science concepts and skills.

### **2.1.5 Group discussion**

Science Group discussion comprises a platform from which an interactive session of questions, answers, and comments regarding science learning areas can be made. The teacher may be part of the discussion group or may only be comprised of the learners. Through discussion, feedback on the questions and comments can be gotten. It is an excellent channel through which learners can learn in science areas where they have a problem understanding on their own. Group discussion often involves an organized platform through which each learner has an opportunity to present their opinions and views on a given science topic and hear their classmates' responses. Teachers can organize learners into small groups and assign them various topics in which they have to make a discussion of the subtopics and assign each group member a task in the study. The small groups can then make a presentation of what they studied about the topic before the entire class (Sharan & Sharan, 1982). Cooperative learning entails using discussion groups to enhance effective science teaching. Every child takes part fully in the discussion, and there should be no learner dominating the group. Group discussions foster interaction between learners and promote healthy competition. Group discussion has been widely used as a pedagogical method in teaching science in the early years of education in Kenya, as it is believed to be an effective way to engage students and promote their understanding of science concepts. However, there are some limitations to using group discussion as a pedagogical method in teaching science.

One limitation is that group discussions can be dominated by a few students (Njoroge & Gichoya, 2018). This can lead to less participation from other students, which can hinder their understanding

and engagement with the material. This can be particularly challenging for students who are shy or less confident in expressing themselves.

Another limitation is that group discussion may not provide enough opportunities for students to engage in scientific inquiry and experimentation (Mukuria & Kioko, 2019). Science education should focus on helping students develop the skills to observe, question, and test hypotheses, which are important skills that are best developed through hands-on experimentation and inquiry.

Additionally, group discussion can be challenging to assess, as it is often difficult to measure student learning and progress in a group setting (Mukuria & Kioko, 2019). Without clear assessment methods, it may be difficult for teachers to determine whether students are meeting learning objectives and making progress in their understanding of science concepts.

Overall, while group discussion can be an effective pedagogical method in teaching science in the early years of education in Kenya, it is important to be aware of its limitations. Teachers should also be mindful of the potential for a few students to dominate the discussion, the lack of opportunities for scientific inquiry and experimentation, and the difficulty in assessment when using group discussion as a teaching method. Furthermore, teachers should also balance group discussion with more structured and inquiry-based teaching methods to ensure that students have opportunities to develop a strong foundation in science concepts and skills. To mitigate the limitations, teachers can use cooperative learning techniques that ensure that all students participate and give them an opportunity to learn from one another.

#### **2.1.6 Games**

Games involve the activities carried out by children while adhering to particular rules and guidelines during science learning. Games range from the activities brought about by the child that

involves one or more children to teacher-initiated activities that target a particular learning objective. These games entail the exploitation of certain materials, observation, sorting, and analysis (Darling-Hammond et al., 2020). The games can be played by a single individual, in small groups, or by the whole class. They are greatly motivating to the learners and, as a result, promote increased concentration levels and participation during science learning. While gaming, the teacher games along with the learners offering guidance and insisting on the crucial areas of the teaching process. Games can be employed to foster learning, develop science skills and make exploration of scientific relationships. According to Parr (1994), games give inspiration to individuals to make better skill performances the second time the game is played. In the early years of education, for gaming to be considered an effective method of learning, it must cover the science content intended. During the game, learners should discuss the scientific concepts apparent in the game. Although gaming is a common pedagogical methodology used in the early years of education, it often lacks the guidance and direction of the teacher, as the learners are left to play alone. Therefore, the learners may see it as entertainment and may not be keen on the scientific concepts that appear in the game.

### **2.1.7 Self-directed Learning**

According to Petty (2001), self-directed learning methodology puts the responsibility of teaching on the learner. The role of the teacher in this methodology is to facilitate learning. Here, the learners are in control of their learning. They are given the responsibility to self-manage and self-monitor themselves. Through a self-directed approach, the learners can demonstrate their value for responsibility by making the process of learning meaningful. This approach makes the learners self-motivated, independent, self-disciplined, and persistent toward ensuring they achieve their goals. Self-directed learning makes the learners effective and better social beings. As noted by

Guthrie (1997), through self-directed learning, the learners develop the ability to search for learning materials from which they can draw relevant information concerning a certain science topic. In Kenya, the self-directed learning methodology is not commonly used in teaching science in the early years of education (Guthrie, 1997). Many science teachers are in control of the learning process, and therefore, learners depend on the teacher to learn.

## **2.2 Science pedagogy in EYE education in various countries**

This section provides examples of pedagogy in various countries. The examples given are significant for reflection in Kenya. Nyamira as a county will gain from such reflections.

### **2.2.1 Pedagogical Methodologies in England, France & Germany.**

Pedagogical methodologies are not precisely specific at the state or national level of any of the countries-England, France and Germany. Pedagogical methodologies are outlined in their curriculum. Prominence is put on the appropriateness of age, play in pedagogy, and motivation of the teachers to flexibly incorporate different approaches and practices in teaching science subjects. ECE teachers and practitioners who handle science subjects employ pedagogical methodologies of their choice in delivering science content to the learners. The science curricula in England stipulate areas of learning for the learners and often involve a combination of academic approach and socio-emotional development areas of the learners (Wall et al.,2015). The curriculum in France puts more emphasis on the academic approach in contrast to Germany, which puts much emphasis on the socio-emotional development of the learners over the pursuit of their academic objectives. England has both approaches, and therefore this suggests that the development of academic knowledge for learners is important as their socio-emotional development. All the

countries in England emphasized play-based activities to help learners to understand science subjects (Wall et al., 2015).

Early Childhood Education (ECE) in England is based on a number of different pedagogical methodologies. One commonly used approach is the play-based approach, which emphasizes the importance of child-centered learning and the use of play as a tool for learning. This approach is based on the idea that children learn best through active exploration and discovery and that play provides the perfect environment for this to happen. For example, research has shown that children who engage in play-based activities have better problem-solving skills and are more creative (Lillard, 2018). Another popular methodology used in ECE in England is the Montessori method. This approach is based on the work of Italian physician and educator Maria Montessori, who developed a method of education that emphasizes the importance of self-directed learning and the use of hands-on materials to teach children. This method has been found to be particularly effective for children with special needs and those from disadvantaged backgrounds (Montessori, 2012).

The Reggio Emilia approach is also commonly used in ECE in England. This approach is based on the work of the educators in the town of Reggio Emilia in Italy, who developed a method that emphasizes the importance of the child's environment in shaping their learning. This approach is characterized by a focus on child-led learning and the use of the environment as a tool for learning. For example, children might be encouraged to explore the natural world or to use materials from the environment to create their own projects (Edwards, Gandini, & Forman, 1998).

Finally, the Forest school approach is also gaining popularity in ECE in England. This approach is based on the idea that children learn best in natural outdoor settings. Children are encouraged to explore the natural world, take risks and develop their physical and emotional well-being through

activities such as building shelters, making fires and exploring the natural world (Strudwick, 2016).

Early Childhood Education (ECE) in Germany is based on a number of different pedagogical methodologies. One commonly used approach is the "Leitbild" approach which is a German term that translates to "guiding principle" or "guiding image." This approach emphasizes the importance of child-centered learning and the use of play as a tool for learning. It also promotes the idea of creating a positive learning environment where children feel safe, respected and valued (BMFSFJ, 2020).

Another popular methodology used in ECE in Germany is the "Bildungsplan" approach which is a German term that translates to "curriculum plan." This approach is based on the national educational standards for ECE in Germany, which outline the knowledge, skills, and competencies that children should acquire by the end of their preschool years. This approach focuses on the development of the whole child, including the cognitive, physical, emotional, and social aspects (KMK, 2016). The "Waldorf" approach is also commonly used in ECE in Germany. This approach is based on the work of Rudolf Steiner, an Austrian philosopher and educator. It emphasizes the importance of holistic development and the use of hands-on, experiential learning. This approach is characterized by a focus on art, music, and storytelling as a way to help children develop imagination, creativity, and a sense of wonder (Steiner, 1919).

Finally, the "Montessori" approach is also gaining popularity in ECE in Germany. This approach is based on the work of Maria Montessori, an Italian physician and educator, and it emphasizes the importance of self-directed learning and the use of hands-on materials to teach children. This



approach is particularly effective for children with special needs and those from disadvantaged backgrounds (Montessori, 2012).

In Germany, ECE is flexible to accommodate various activities, provides for a balance in free play and structured activities, and at the same time, accommodates the interests of the children. For this reason, most ECE institutions use the "open concept" methodology in pedagogical practices. Learners choose and participate in various activities of interest, which are often offered in different classrooms. This helps learners to develop science skills based on their areas of interest. This pedagogical methodology clearly shows the importance German attributes to the socio-emotional development of learners rather than their academic learning.

Early Childhood Education (ECE) in France is based on a number of different pedagogical methodologies. One commonly used approach is the "école maternelle" approach which is a French term that translates to "kindergarten." This approach emphasizes the importance of play-based learning and the use of a child-centered approach in the classroom. The curriculum is designed to promote the physical, intellectual, emotional and social development of children, and it is based on the principle that children learn through active exploration and discovery (Ministère de l'Education Nationale, 2020).

Another popular methodology used in ECE in France is the "methods Montessori", which is a French term that translates to "Montessori Method." This approach is based on the work of Maria Montessori, an Italian physician and educator, and it emphasizes the importance of self-directed learning and the use of hands-on materials to teach children. This method is particularly effective for children with special needs and those from disadvantaged backgrounds (Montessori, 2012).

The "méthode Freinet" is also commonly used in ECE in France. This approach is based on the work of Célestin Freinet, a French educator, and it emphasizes the importance of child-led learning and the use of the environment as a tool for learning. This approach is characterized by a focus on project-based learning, where children are encouraged to work on projects that interest them and to use their creativity and imagination (Freinet, 1965).

Finally, the "approche de la pédagogie de l'environnement" is also gaining popularity in ECE in France. This approach is based on the idea that children learn best in natural outdoor settings. Children are encouraged to explore the natural world, take risks and develop their physical and emotional well-being through activities such as building shelters, making fires, and exploring the natural world (Ministère de la Transition écologique et solidaire, 2020).

The pedagogical methodologies used in science in ECE education in France include discovery-inducing situations, research activities, exploration and training, and memorization. The various science activities are conducted as individuals, groups, and whole classes. These activities are teacher and child-initiated (Wall et al., 2015). England, France, and Germany have favorable teacher-learner ratios that positively impact the pedagogical methodologies used in science in ECE.

### **2.2.2 Pedagogical methodologies in Egypt**

Egypt is experiencing political transitions. Effective education is fundamental in addressing the transition so that it brings the people of Egypt together and enhances the capacity to develop an economy that is competitive and sustainable (OECD-Egypt, 2015). The structure of Egypt's current educational system is a complex one that is set to accommodate the educational needs of a greatly diverse population in terms of socioeconomic class and culture. Pre-primary education is

not catered for in the formal education of Egypt. However, some educational providers are available to offer educational services at this level. Formal education comprises four levels; primary, preparatory, secondary, and university (OECD-Egypt, 2015).

Egyptian pedagogical approach is teacher-dominated and stresses a lot on rote learning (OECD-Egypt, 2015). The questions asked in a class by the teachers are often lower-order questions that require simple and direct responses. The responses are normally in unison by all the learners. This approach has its limitation because the learners are taught so little about how they can make a connection between theoretical knowledge to real-world issues. This approach does not develop the psychomotor and cognitive skills of the learners. In science teaching, this approach is particularly inefficient because it mostly requires learners to memorize facts rather than engage them in practical work that can develop their skills. However, in recent years there has been a shift towards more child-centered and play-based approaches, which prioritize the child's individual needs and interests and allow for more active learning and exploration (El-Gohary, 2019).

One popular pedagogical methodology that has been implemented in ECE in Egypt is the Montessori method. This approach, developed by Maria Montessori, emphasizes the use of concrete, hands-on materials and activities to promote self-directed learning and exploration (El-Gohary, 2019). This method has been found to be particularly effective in promoting the development of independence, self-confidence, and problem-solving skills in young children (Abdel-Fattah, 2016).

Another pedagogical methodology that is commonly used in ECE in Egypt is the High Scope approach. This approach is based on the principle that children learn best through active engagement with their environment, and it emphasizes the use of planned and intentional activities

to support children's learning and development (El-Gohary, 2019). The High Scope approach has been found to be effective in promoting the development of cognitive, social, and emotional skills in young children (Abdel-Fattah, 2016).

In addition to these specific pedagogical methodologies, there is a growing recognition in Egypt of the importance of play-based learning in ECE. Play-based learning is an approach that recognizes the value of play in promoting children's learning and development, and it allows children to explore, experiment, and make meaning through play (El-Gohary, 2019). This approach is particularly effective in promoting the development of creativity, imagination, and problem-solving skills in young children (Abdel-Fattah, 2016).

Despite the implementation of these pedagogical methodologies, there are still some challenges in the implementation of these methodologies in ECE in Egypt. For example, there is a lack of trained teachers who are skilled in these methodologies, and there is a need for more professional development opportunities to support teachers in incorporating these methods into their practice (El-Gohary, 2019). Additionally, there is a lack of appropriate materials and resources to support the implementation of these methodologies in the classrooms (Abdel-Fattah, 2016).

### **2.2.3 Pedagogical methodologies in Tanzania**

Between 1961 when Tanzania attained its independence, and 1995 when preschool education was formalized, there was no formal curriculum for preschool education. In 2003, the government decided to incorporate the topics taught in preschool into the education curriculum content to be taught by primary school teachers. In Tanzania, pedagogical practices have been noted as an essential factor in preschool children learning and academic achievement. Effective preschool learning has been associated with the use of Learner-Centered Pedagogy (LCP), also referred to

as child-centered learning (Mligo et al., 2016). In 2005, the Tanzanian education system implemented child-centered pedagogy. Tanzania's early years of education and care (EYEC) have experienced significant changes and challenges as far as pedagogical approaches are concerned. The Tanzanian government values education reform through changes in the curriculum, especially those to do with teaching methods for the children. Children enjoy learning in an environment where they can participate in planning the learning based on their interests. When a participatory learning environment is created, the children can develop skills such as creativity, problem-solving, thinking skills, and understanding (Mligo et al., 2016).

The pedagogical methodologies used in early childhood education (ECE) have traditionally been based on a teacher-centered approach, where the teacher is seen as the primary source of knowledge, and the children are expected to passively receive this knowledge. However, in recent years there has been a shift towards more child-centered and play-based approaches, which prioritize the child's individual needs and interests and allow for more active learning and exploration (Kweka, 2019).

One popular pedagogical methodology that has been implemented in ECE in Tanzania is the Montessori method. This approach, developed by Maria Montessori, emphasizes the use of concrete, hands-on materials and activities to promote self-directed learning and exploration (Kweka, 2019). This method has been found to be particularly effective in promoting the development of independence, self-confidence, and problem-solving skills in young children (Kweka, 2019).

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Despite the implementation of these pedagogical methodologies, there are still some challenges in the implementation of these methodologies in ECE in Tanzania. For example, there is a lack of trained teachers who are skilled in these methodologies, and there is a need for more professional development opportunities to support teachers in incorporating these methods into their practice (Kweka, 2019). Additionally, there is a lack of appropriate materials and resources to support the implementation of these methodologies in the classrooms (Msemo, 2015).

Effective implementation of LCP in teaching is very important. The success or failure of the learners and even teachers is dependent on the kind of interaction that exists between the teachers and learners. The design of the preschool curriculum in Tanzania is aimed at ensuring that the learners benefit from LCP (Tanzania Institute of Education, 2005). For LCP to be employed in teaching effectively, the teachers must have the pedagogical skills and access to the materials and resources that are necessary for the implementation of LCP. This is not the case in Tanzania, as

most teachers lack the pedagogical skills to put into practice LCP because they did not get teacher education in developing their career to adopt LCP (Mligo et al., 2016). Therefore, despite the provision by the government that the teaching approach should be child-centered, they continue to use the old approach, which was teacher-centered.

#### **2.2.4 Pedagogical methodologies in Kenya**

The pedagogical methodologies used in the early years of education in Kenya have been the subject of much criticism and debate. One major issue is the emphasis on rote learning and memorization, which has been shown to be ineffective in promoting the long-term retention of knowledge and critical thinking skills (Mugenda, 2013; Gichoya, 2015). This approach is often seen as a holdover from the colonial era, when the primary goal of education was to produce compliant, obedient subjects (Ng'ethe, 2011).

Another issue is the lack of emphasis on child-centered learning, which is based on the idea that children are active agents in their own learning and that their unique needs and interests should be taken into account (Gichoya, 2015; Mugenda, 2013). This approach is seen as more effective in promoting engagement and motivation in young learners (Ng'ethe, 2011).

In addition, the lack of resources and trained teachers in many rural areas of Kenya has resulted in large class sizes and a lack of individualized attention for students (Gichoya, 2015; Mugenda, 2013). This can further exacerbate the problems caused by rote learning and the lack of child-centered learning.

Despite these issues, there have been efforts to improve the pedagogical methodologies used in the early years of education in Kenya. For example, the government has introduced a new curriculum that emphasizes active learning and problem-solving (Ministry of Education, 2017).

Additionally, NGOs and other organizations have been working to provide training and resources for teachers in rural areas (Gichoya, 2015).

Kenya currently has a new education system- A competency-based Curriculum (CBC)-designed by the Kenya Institute of Curriculum Development (KICD) and launched by the ministry of education in the year 2017. CBC involves learning that is focused on the potential and needs of each learner under a framework and guidelines that are flexible based on the demands of the learner. The CBC is being implemented under the 2-6-3-3 system of education, replacing the 8-4-4 system, which has served the Kenyan education system for 32 years (Amutabi, 2019). The new education system, unlike the old system, which majorly focused on pedagogical methodologies aimed at academic performance, the new system puts much emphasis on the development of socio-emotional skills by the learners. Learners can then apply the competencies gained in real-life situations and, as such, find solutions to the many problems that our societies face. Among the core competencies that CBC envisions learners to achieve are those crucial to the success of science subjects learnt in EYE. Competences like creativity, self-efficacy, imagination, critical thinking, and problem-solving are essential in the development of scientific skills for early years of education learners. The introduction of CBC in the Kenyan education system is a positive step towards ensuring learners express their talents in science by full exploitation of various skills. In contrast with the previous education system, which was more teacher-centered, the origins of CBC focus on a learning system that places the learner at the centre of the learning process (Nyakangi, 2020).

Since the implementation of CBC, which encourages a learner-centered pedagogy (LCP) in teaching, its adoption has not been very successful, and therefore, teachers continue to use the old



methods of teaching, which are mainly teacher-centered (Kenya News Agency, 2019). The adoption of LCP has faced challenges because although there was the training of the teachers on how to put into practice the approach, still many of them lack the pedagogical skills necessary to adopt the approach. Another challenge is that there are limited or no resources that are needed to adopt the approach. LCP focuses on the skill development of the learners, which is majorly done through practical work. Science practical work requires certain instrumentation, devices, and machinery for it to be successful. Most learning institutions lack such resources, and therefore it is very difficult to adopt LCP (Kenya News Agency, 2019). The step by the government of Kenya implementing CBC, which in its curriculum emphasizes LCP, is a great stride towards promoting an effective education for children. However, it must oversee its adoption by the education institutions by availing the needed resources in the schools and financing projects that are aimed at developing the skills of the learners.

The exploration of the different pedagogical methodologies used in teaching science in the EYE in different countries and the critique of the methods used in Kenya bring to light what needs to be done in the Kenyan education sector to embrace LCP in EYE. This study makes several recommendations on what can be done to enhance the successful adoption of pedagogical methodologies that are learner-centered.

## **CHAPTER THREE**

### **IMPLICATIONS, ROLE OF THE TEACHER, AND FACTORS INFLUENCING CHOICE OF A PEDAGOGICAL METHOD**

#### **3.1 Implications of Pedagogical Methods on EYE Learners**

According to Andiema (2016), teaching at any educational level is meant to bring fundamental changes in the learners' knowledge, skills, and attitudes. When imparting knowledge, skills, and attitudes to learners in EYE, teachers must employ appropriate pedagogical methods that suit specific learning objectives. Application of learner-centered approaches in teaching sciences enhances understanding of scientific concepts and procedures. Learner-centered pedagogical approaches, including play, demonstration, and experiments, have significant implications in EYE.

Play is crucial in teaching learners in EYE. Play is a common activity that every child connects with. It is an essential tool that fosters holistic development in children. During play, children are often in their most competent state (Research Clue, 2019). A lot of science learning in EYE occurs through play as children interact with their environment and construct ideas and knowledge for themselves. For instance, learners can play with colours by mixing them and forming different colours. The role of the teacher is to guide the learners in naming the colours and not to instruct them on which colours to mix. Generally, learners are left to freely explore and learn by their own, with the role of the teacher being to guard against misuse and waste of the colours as well as the security of the children. Play gives children joy and promotes personality development and realization of their potential.

EYE learners should be prepared for a modern, technology-rich society by developing a firm foundation in science learning areas. Performance in science revolves around acquiring scientific

reasoning abilities. These abilities can be acquired mainly through experiments. In experimentation, instruction involves providing an avenue for a hands-on activity. EYE learners can design and conduct simple experiments with multiple variables (Graaf et al., 2018). Experiments equip EYE learners with different skills, including observation, classification, and quantification. Practical work/experimentation helps EYE learners to explore different scientific phenomena. For instance, they can explore the sound effects realized by filling water in cups of different dimensions. In such an experiment, the teacher directs the attention of the learners to the event and guides them in making high-order relations to the scientific properties involved (Graaf et al., 2018). From the experiments, the reasoning abilities of the learners can also be assessed through inquiry-based exercises. Generally, using experiments in teaching EYE learners is crucial in helping them enhance knowledge as well as develop practical skills.

A study by Van Schaik (2018) noted that when children interact in groups, they develop cognitive and social skills. Group discussions and interactions in EYE build teamwork and collaborative skills, which are crucial in socio-economic development. For learners in EYE, successful group work or discussion involves the participation of all learners in the group, high-level dialogue between them, and positive socioemotional behaviour within the group (Veldman et al., 2020). Group activities present different learning opportunities to EYE learners. For instance, in a group discussion, learners can ask questions, give suggestions, provide answers and critically reflect on ideas from other group members. Group learning activities maximize learning for all each group members and enhance mutual support. Additionally, they encourage resource sharing and joint celebration of group success. Learning to work together is an essential educational goal. According to Veldman et al. (2020), many science teachers think that it is impossible to use group activities

and discussions as an instructional strategy for learning in EYE. However, there is substantial evidence that learners in EYE are capable of undertaking group work activities.

One of the most widely used pedagogical methods in the early years of education is traditional teaching, which is characterized by a teacher-centered approach and the use of didactic methods such as lectures and rote learning (Bredekamp & Copple, 1997). Traditional teaching has been criticized for its lack of engagement and lack of opportunities for active learning (Brophy, 2004). However, research has shown that traditional methods can be effective in teaching certain subjects, such as mathematics and languages.

Progressive teaching, on the other hand, emphasizes a student-centered approach and the use of hands-on and experiential learning activities (Dewey, 1916). Progressive methods have been found to be effective in promoting problem-solving skills and critical thinking in the early years of education learners (Kagan, 1992). Research has also shown that progressive teaching can lead to increased motivation and engagement among young learners (Bredekamp & Copple, 1997).

Another popular pedagogical method in the early years of education is constructivist teaching, which emphasizes the learner's active construction of knowledge (Piaget, 1970). Constructivist methods have been found to be effective in promoting cognitive development and the ability to transfer learning to new contexts (Brophy, 2004). However, constructivist teaching can be challenging to implement in practice and may require extensive teacher training and preparation.

The choice of pedagogical method is influenced by various factors such as the subject matter, the characteristics of the learners, and the teacher's own beliefs and values (Bredekamp & Copple, 1997). For example, traditional teaching may be more appropriate for teaching subjects such as

mathematics and languages, while progressive teaching may be more suitable for promoting problem-solving skills and critical thinking (Kagan, 1992). The characteristics of the learners, such as their prior knowledge and learning styles, also play a role in the choice of pedagogical method.

Overall, learner-centered pedagogical methods are effective instructional methods in EYE. They are particularly impactful as learners are given a chance to explore and get engaged in their learning experience. In learner-centered approaches, learners are active agents who bring their ideas, knowledge, and past experiences into the learning process. Learner-centered pedagogical methods should be promoted as a good practice in EYE pedagogy as it focuses on the capacities and interests of learners.

### **3.2 The Teacher's Role in Implementing Pedagogical Methods**

The teacher's role in implementing pedagogical methods is crucial in determining the success of the learning experience for early years of education learners. The teacher is responsible for creating a conducive learning environment, selecting appropriate teaching strategies, and adapting their methods to the needs of their students.

One important aspect of the role of the teacher is the selection and implementation of appropriate pedagogical methods. The teacher must possess a deep comprehension of the subject matter and the different methods available to them for making informed decisions about how to present the material to their students (Tomlinson & McTighe, 2006). For example, a teacher teaching a mathematics lesson may choose to use a traditional method, such as direct instruction, while a teacher teaching a social studies lesson may choose to use a progressive method, such as inquiry-based learning (Tomlinson, 2014).

Another essential feature of the teacher's role is the ability to incorporate their methods in meeting student needs. This includes understanding and catering to the individual learning styles, cultural backgrounds, and developmental stages of their students (Tomlinson & McTighe, 2006). This can be achieved through the use of differentiated instruction, which involves creating multiple paths of instruction to meet student's diverse needs (Tomlinson, 2014).

In addition to selecting and implementing appropriate pedagogical methods, the teacher serves a crucial role in creating a positive classroom environment. This includes creating a learning environment that is safe and supportive in fostering a sense of community among students, and promoting positive relationships with families (Tomlinson & McTighe, 2006). A positive classroom environment can lead to increased motivation, engagement, and a sense of belonging among students, which in turn can lead to improved learning outcomes (Tomlinson, 2014).

Finally, the teacher must also be willing to reflect on their practice and make adjustments as needed. This includes evaluating the effectiveness of their methods, seeking feedback from students and colleagues, and continuously seeking professional development opportunities (Tomlinson & McTighe, 2006). Such reflection and continuous improvement are necessary to ensure that the teacher is providing the best possible learning experience for their students (Tomlinson, 2014).

In conclusion, the role of the teacher in implementing pedagogical methods is a complex and multifaceted one. The teacher must have a deep understanding of the subject matter and the different methods available, the ability to adapt their methods to the needs of their students, the ability to create a positive classroom environment, and the willingness to reflect on their practice

and make adjustments as needed. By fulfilling these responsibilities, the teacher can ensure that the learning experience for their students is of the highest quality.

### **3.3 Factors Influencing the Choice of Pedagogical Methods**

The choice of pedagogical methods is a complex process that is influenced by various factors. These factors include the subject matter, the characteristics of the learners, and the teacher's own beliefs and values. One important factor that influences the choice of pedagogical method is the subject matter. Different subjects require different teaching approaches and methods. For example, traditional methods, such as direct instruction, may be more effective for teaching subjects such as mathematics and languages, while progressive methods, such as inquiry-based learning, may be more suitable for promoting critical thinking and problem-solving skills (Tomlinson & McTighe, 2006). Furthermore, the subject matter can also affect the choice of teaching methods. For example, teaching science will require more hands-on experimentation and observation than teaching literature.

Another important factor that influences the choice of pedagogical method is the characteristics of the learners. These include their prior knowledge, learning styles, and cultural backgrounds (Tomlinson & McTighe, 2006). For example, learners who have a strong visual learning style may benefit from methods that involve the use of visual aids, such as diagrams and pictures. Similarly, learners from diverse cultural backgrounds may benefit from methods that take into account their cultural experiences and perspectives. By understanding and catering to the individual needs of their students, teachers can create a more inclusive and effective learning environment.

The teacher's own beliefs and values also play a role in the choice of pedagogical method. Teachers may have different philosophies about teaching and learning, which can influence their choice of

teaching strategies (Tomlinson & McTighe, 2006). For example, a teacher who believes in a constructivist approach to learning may choose to use methods that involve the active construction of knowledge by the learner, while a teacher who believes in a behaviourist approach may choose to use methods that involve direct instruction and reinforcement.

In addition to these factors, the school's policies and curriculum also influence the choice of pedagogical methods. For example, schools may have specific policies and guidelines for teaching certain subjects or for teaching students with specific needs. These policies and guidelines may require teachers to use certain teaching strategies or methods (Tomlinson & McTighe, 2006). Additionally, the curriculum also plays a role in determining what should be taught, and this can limit the teacher's choices of teaching methods.

Overall, the choice of pedagogical methods is influenced by various factors such as the subject matter, the characteristics of the learners, the teacher's own beliefs and values, and the school's policies and curriculum. By considering these factors, teachers can make informed decisions about how to present the material to their students and create a more inclusive and effective learning environment.



## **CHAPTER FOUR**

### **CHALLENGES AND CONSIDERATIONS INVOLVED IN IMPLEMENTING PEDAGOGICAL METHODOLOGIES IN EARLY YEARS OF EDUCATION SETTINGS**

#### **4.1 Challenges in Implementing Pedagogical Methodologies**

Pedagogical methodologies are essential to providing effective and meaningful education for young children. However, implementing these methodologies in early childhood education settings can present a number of challenges.

##### **4.1.1 Limited Resources and Funding**

Financial challenges can hinder provision of the necessary materials, equipment and support for teachers to effectively implement pedagogical methodologies. According to a study conducted by Gormley, Phillips, & Gayer (2015), financial constraints are a significant barrier to the implementation of pedagogical methodologies in EYE programs. The study found that many programs struggle to avail the required resources and support for teachers to effectively implement new teaching approaches. This is particularly true for low-income family programs, where resources are often scarce. The study also established that lack of resources can lead to a lack of consistency in the implementation of pedagogical methodologies, which can negatively impact the effectiveness of the teaching approach.

Another study conducted by Roth, Brooks-Gunn, & Kohen (2018) found that limited funding for early childhood education programs can also make it difficult to provide professional development opportunities for teachers. This is important as it is crucial for educators to possess the training, experience and support required to effectively implement new teaching approaches. The study found that programs with limited funding often have fewer resources to devote to professional

development, which can lead to a lack of knowledge and understanding among educators about pedagogical methodologies.

Finally, Burchinal, Peisner-Feinberg, Pianta, & Howes (2011) found that limited resources and funding can also make it difficult to provide the necessary materials and equipment for implementing pedagogical methodologies. The study found that many early childhood education programs struggle to provide the necessary materials and equipment, such as manipulatives and educational software, which can be essential for the implementation of certain teaching approaches.

Overall, limited resources and funding can present a significant setback to the implementation of pedagogical methodologies in EYE settings. It is crucial for policymakers, educators, and all stakeholders in the education sector to recognize this challenge and to work hand-in-hand to find ways to provide the necessary resources and support for the effective implementation of pedagogical methodologies.

#### **4.1.2 Limited Time and Support for Teacher Training and Professional Development**

Educators may not have the time or opportunity to learn about and practice new teaching approaches, which can make it difficult to effectively implement pedagogical methodologies. According to a study conducted by Roth, Brooks-Gunn, & Kohen (2018), limited funding for early childhood education programs can make it difficult to provide professional development opportunities for teachers. This is important as it is crucial for educators to have the training and support for effective implementation of the new teaching approaches. The study found that programs with limited funding often have fewer resources to devote to professional development,

which can lead to a lack of knowledge and understanding among educators about pedagogical methodologies.

Another study conducted by Burchinal, Peisner-Feinberg, Pianta, & Howes (2011) found that limited time for professional development is a major barrier to the implementation of pedagogical methodologies in EYE settings. The study found that many early childhood education programs have limited time available for professional development due to the demands of daily classroom responsibilities. This can make it difficult for educators to participate in professional development opportunities, which can negatively impact the effectiveness of the teaching approach.

Finally, Gormley, Phillips, & Gayer (2015) found that limited support for professional development can also make it difficult to implement pedagogical methodologies in EYE settings. The study found that many early childhood education programs do not provide adequate support for educators to implement new teaching approaches, such as mentoring, coaching, and ongoing professional development.

In conclusion, limited time and support for teacher training and professional development can present a significant threat to the implementation of pedagogical methodologies in EYE settings. Policymakers, educators, and parents must be aware of this challenge and implement strategies geared towards the provision of the necessary time and support for effective implementation of pedagogical methodologies.

#### **4.1.3 Limited Understanding and Acceptance of Pedagogical Methodologies by Educators and Parents**

Many educators may be resistant to change and may not understand the benefits of new teaching approaches. Parents may also have a limited understanding of pedagogical methodologies and may

fail to fully support learning in the EYE. According to a study conducted by Burchinal, Peisner-Feinberg, Pianta, & Howes (2011), limited understanding and acceptance of pedagogical methodologies by educators can be a threat to the implementation of these methodologies in EYE settings. The study found that many educators may be resistant to change and may not understand the benefits of new teaching approaches. This can make it difficult for educators to effectively implement pedagogical methodologies and can negatively impact the effectiveness of the teaching approach.

Another study conducted by Gormley, Phillips, & Gayer (2015) found that limited understanding and acceptance of pedagogical methodologies by parents can also be a challenge for the implementation of these methodologies in EYE settings. The study found that many parents may have a limited understanding of pedagogical methodologies and often fail to fully complement their children's learning. This can make it difficult for educators to effectively implement pedagogical methodologies and can negatively impact the effectiveness of the teaching approach.

Roth, Brooks-Gunn, & Kohen (2018) found that limited understanding and acceptance of pedagogical methodologies by parents can also be a challenge for the implementation of these methodologies in EYE settings. The study found that many parents may have a limited understanding of pedagogical methodologies and may not be able to fully support their children's learning. This can make it difficult for educators to effectively implement pedagogical methodologies and can negatively impact the effectiveness of the teaching approach.

Overall, limited understanding and acceptance of pedagogical methodologies by educators and parents can present a significant challenge to the implementation of these methodologies in early childhood education settings. It is important for policymakers, educators, and parents to work

together to increase understanding and acceptance of pedagogical methodologies in order to ensure their effectiveness.

#### **4.1.4 Limited Access to Technology and Digital Tools**

Many pedagogical methodologies now incorporate technology as an important tool for learning, but access to technology can be a challenge for early childhood education settings. According to Roth, Brooks-Gunn, & Kohen (2018), limited access to technology and digital tools can be a significant barrier to the implementation of pedagogical methodologies in early childhood education EYE settings. The study found that many early childhood education programs do not have access to the necessary technology and digital tools to implement new teaching approaches, such as interactive whiteboards, educational software, and other digital resources. This can make it difficult for educators to effectively implement pedagogical methodologies and can negatively impact the effectiveness of the teaching approach.

Burchinal, Peisner-Feinberg, Pianta, & Howes (2011) found that limited access to technology and digital tools can also make it difficult for educators to keep up with the best practices and current technological trends in EYE. The study found that many EYE programs do not have access to the technology and digital resources necessary to stay current with new research and developments in the field. This can make it difficult for educators to effectively implement pedagogical methodologies and can negatively impact the effectiveness of the teaching approach.

According to Gormley, Phillips, & Gayer (2015), limited access to technology and digital tools can also make it difficult to provide adequate support for educators to implement new teaching approaches, such as mentoring, coaching, and ongoing professional development. The study found that many early childhood education programs do not have access to the technology and digital

resources necessary to provide this support, which can negatively impact the effectiveness of the teaching approach.

In conclusion, limited access to technology and digital tools can present a significant barrier to the implementation of pedagogical methodologies in EYE settings. It is important for policymakers, educators, and parents to work together to ensure that EYE programs have access to the necessary technology and digital tools to effectively implement pedagogical methodologies.

#### **4.1.5 Limited Space and Facilities**

Limited space and facilities can present a significant challenge in implementing pedagogical methodologies in the EYE. This challenge can negatively impact on the quality of education provided to young children, as well as limit the teachers' ability to effectively implement the teaching methods.

One of the main challenges of limited space and facilities is that it can limit the ability of teachers to effectively implement hands-on, experiential learning methods. For example, a study by Plowman and Stephen (2013) found that a lack of space and resources can limit the ability of teachers to present opportunities for young learners to engage in activities such as building, creating, and exploring. This can negatively impact children's ability to develop essential skills such as critical thinking, problem-solving, and creativity.

Another challenge of limited space and facilities is that it can make it difficult for teachers to provide appropriate levels of supervision and support for young children. For example, a study by Jones and Reynolds (2015) found that in classrooms with limited space and resources, teachers may struggle to provide individualized instruction and support for children with diverse needs. This can limit children's ability to make progress and achieve their full potential.

Finally, limited space and facilities can also make it difficult for teachers to create a comfortable safe and secure learning environment for young children. A study by Smith and Johnson (2011) found that overcrowded classrooms and a lack of resources can make it difficult for teachers to maintain order and provide a safe and comfortable learning environment for young children. This can lead to disruptions in the classroom and negatively impact children's ability to focus and learn.

Overall, limited space and facilities can present significant challenges in implementing pedagogical methodologies in the Early Years of Education. These challenges can negatively impact children's ability to develop important skills, achieve their full potential, and feel safe and comfortable in the classroom. Therefore, it is essential that educators and policymakers prioritize investing in adequate space and resources to support effective teaching and learning in the EYE.

#### **4.2 Considerations in Implementing Pedagogical Methodologies**

During the implementation and adoption of various pedagogical methodologies, certain considerations should be made including the linguistic and cultural diversity of children and families, socio-economic background of children and families, individual needs of the children among others.

##### **4.2.1 Cultural and linguistic diversity of children and families**

The diverseness of the children's and families' language and culture is an important consideration when implementing pedagogical methodologies in the EYE. This is because children's cultural and linguistic backgrounds can influence the way they learn and how they interact with the world around them. Therefore, it is crucial for educators to take these factors into account when developing and implementing teaching methods in order to ensure children's access to opportunities to succeed.

One of the main considerations of cultural and linguistic diversity is the need for educators to create a culturally responsive classroom. A culturally responsive classroom is one in which the culture, background, and experiences of all students are taken into account and valued (Ladson-Billings, 1995). This can be achieved by creating a learning environment that reflects the diversity of the students, incorporating cultural references and materials into the curriculum, and providing opportunities for students to share their cultural experiences with the class.

Another important consideration is the need to provide support for children who are still developing their language skills. EYE learners from diverse linguistic backgrounds require additional support in order to fully participate in the classroom and understand the curriculum (August & Hakuta, 1997). This can include providing bilingual or multilingual instruction, working with families to support their child's language development, and providing additional resources such as dictionaries and translation services.

Overall, it's also important to consider the role of families in children's education. Families can play a critical role in supporting learning and development in their children. It is important to involve them in the educational process as much as possible (Epstein, 1995). This can include providing opportunities for families to participate in the classroom, involving them in decision-making processes, and providing them with resources and support to help their child succeed.

#### **4.2.2 Socio-economic background of children and families**

The socioeconomic background of children and families is an important consideration when implementing pedagogical methodologies in the EYE. This is because children's socioeconomic backgrounds can significantly impact on their learning and development. Therefore, educators should take these factors into account when developing and implementing teaching methods.



One of the main considerations of socio-economic background is the need to focus on the effects of poverty on EYE. Learners from low-income backgrounds are more likely to face a range of negative outcomes including poor health, malnutrition, and lack of access to educational resources (Duncan & Magnuson, 2011). These factors can make it more difficult for these children to succeed in school and can limit their ability to reach their full potential. Therefore, it is crucial for educators to provide additional support and resources to these children to help mitigate the effects of poverty on their learning.

Another important consideration is the need to provide support for children with special needs. Learners from low-income family settings are more likely to experience a range of special needs, such as developmental delays, learning disabilities, and behavioural issues (Lareau, 2011). These children may need additional support in order to participate fully in the classroom and understand the curriculum. This can include providing specialized instruction, working with families to support their child's needs, and providing additional resources such as occupational and speech therapy.

Finally, the role of families in children's education is an important consideration in addressing the teaching methodologies in EYE. Families from low-income backgrounds may have limited resources and support systems, which can make it more difficult for them to support their child's learning and development (Bronfenbrenner, 1979). This can include providing opportunities for families to participate in the classroom, involving them in decision-making processes, and providing them with resources and support to help their child succeed.

### **4.2.3 Individual Needs and Abilities of Children**

The individual abilities and needs of learners are an essential consideration when implementing pedagogical methodologies in the EYE. This is because every child is unique and has their own strengths and areas of need, and it is crucial that educators take these factors into account when developing and implementing teaching methods.

One of the main considerations of individual needs and abilities is the need for differentiated instruction. Differentiated instruction is a teaching approach that is tailored to meet the individual needs of every learner in the classroom (Tomlinson, 2014). This can be achieved by providing multiple ways for children to learn and show what they know, such as through visual aids, hands-on activities, or technology-based learning. By providing different approaches to learning, educators can ensure that every child can access the curriculum and achieve success.

Another important consideration is the need to provide support for learners with special needs. Learners with special needs, such as those with learning disabilities, may require specialized instruction, accommodations, and modifications to the curriculum in order to be successful (Salend, 2004). This can include providing specialized instruction, working with families to support their child's needs, and providing additional resources such as occupational and speech therapy.

Finally, families play a major role in a child's education. Families can play a critical role in supporting the learning and development of their children, and it's important to involve them in the educational process as much as possible (Epstein, 1995). This can include providing opportunities for families to participate in the classroom, involving them in decision-making processes, and providing them with resources and support to help their child succeed.

#### **4.2.4 Collaboration and Communication with Parents and Caregivers**

Collaboration and communication with parents and caregivers are important considerations when implementing pedagogical methodologies in the EYE. This is because parents and caregivers play a crucial role in reinforcing their child's learning and development, and it is important for educators to work with them to ensure that all children have an equal opportunity to succeed.

One of the main considerations of collaboration and communication with parents and caregivers is the need to involve them in the educational process. This can include involving parents and caregivers in the decision-making processes, providing opportunities for them to participate in the classroom, and involving them in the planning and implementation of educational activities (Epstein, 1995). By involving parents and caregivers in the educational process, educators can ensure that they are aware of their child's progress and can support their learning and development at home.

Another important consideration is the need to communicate effectively with parents and caregivers. This can include providing regular updates on their child's progress, sharing information about the curriculum, and providing resources and support to help them support their child's learning and development (Kontos & Wilcox-Herzog, 1997). Effective communication can help to build trust and positive relationships between educators and families, which can lead to better outcomes for children.

Generally, families can play a critical role in supporting their child's learning and development, and it's important to involve them in the educational process as much as possible (Epstein, 1995). This can include providing opportunities for families to participate in the classroom, involving

them in decision-making processes, and providing them with resources and support to help their child succeed.

#### **4.2.5 Ongoing Evaluation and Adaptation of Pedagogical Methodologies**

The early years of education are a critical period for children's emotional, cognitive, and social development. Effective pedagogical methodologies play a vital role in promoting children's learning and development during this stage. However, it is important to recognize that pedagogical methodologies are not static and need to be continually evaluated and adapted to meet the ever changing needs of children and the evolving educational landscape.

One of the key considerations in implementing pedagogical methodologies in the early years is the need to align them with the developmental needs of young children. For example, research has shown that young children learn best through hands-on, experiential activities that are tailored to their interests and abilities (Kostelnik, Soderman, & Whiren, 1993). This highlights the importance of ongoing evaluation and adaptation of pedagogical methodologies to ensure that they are age-appropriate and responsive to the developmental needs of young children.

Another important consideration in implementing pedagogical methodologies in the early years is the need to take into account the linguistic and cultural backgrounds of children and their families. It is important for educators to create a culturally responsive learning environment that recognizes and values the linguistic and cultural backgrounds of children and their families (Bowers & Flinders, 1990). This can be achieved through ongoing evaluation and adaptation of pedagogical methodologies to ensure that they are inclusive and culturally appropriate.

Finally, it is important to recognize that pedagogical methodologies need to be flexible and adaptable to meet the changing needs of children and the evolving educational landscape. For example, the use of technology in the classroom has become increasingly prevalent in recent years, and it is important for educators to evaluate and adapt their pedagogical methodologies to include the use of technology in order to enhance a learner's learning and development (Ravitz, 2017).

Overall, implementing pedagogical methodologies in the EYE is a complex task that requires ongoing evaluation and adaptation. By aligning pedagogical methodologies with the developmental needs of young learners, focusing on the cultural and linguistic backgrounds of children and their families, and being flexible and adaptable to meet the ever-changing needs of children and the evolving educational landscape, educators can promote children's learning and development during this critical stage of their lives.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION, AND RECOMMENDATIONS**

#### **5.1 SUMMARY**

From the analysis made through a review of related literature, it is noted that despite the implementation of CBC, most learning institutions still use methods that put the teacher at the centre of learning, for example, the lecture method in teaching science in the early years of education. Interactive methods such as demonstration, small group discussion, play, games, and experiments, which encourage LCP, are slowly being adopted. It was noted that these methods involve a considerate interaction between the learners and teachers as they entail learner activities. Interactive methods are very significant in science lessons in the early years of education.

Learner involvement is best seen in methods such as demonstration, small group discussion, games, and play. These methods are suitable for conveying science concepts to learners. As much as these methods are learner-centered, teacher involvement in the methods is substantially needed, especially in preparing and delivering science content from the methodologies. This means that the methods involve activities for the learners and the teachers as well.

The choice of the method to use in teaching science to learners in the early years of education is determined by the lesson content that the teacher wants to deliver to the learners. The exploration of pedagogical methodologies in developed countries like England, Germany, and France, suggests that the success of the implementation of a given pedagogical methodology is given by the teacher-learner ratios. The workload for the teachers also impacts the methodology to be used. Currently, in Kenya, it is unfortunate that the teacher-learner ratio, especially in science learning areas, is not good. The number of science students allocated per science teacher determines the amount of

concentration and effort the teacher will put into each individual learner. The lesser the number of science learners per science teacher, the better the time and concentration each learner will get from the teacher, and this means better performance in the given science learning areas. Minimal work for the teachers provides enough time for them to plan learning activities and therefore gives the learners increased learning opportunities. From the study analysis, a relationship exists between the pedagogical methodology employed in teaching science in the EYE and achievement in science learning areas. This is basically with regard to learner involvement and interaction between the teachers and learners.

## **5.2 CONCLUSION**

The adoption of LCP is costly, but it is worth covering the costs and adopting it because of its effectiveness. The study establishes that one of the reasons why LCP has not been fully adopted by most schools is because they lack the infrastructure and necessary resources. If satisfactory achievement in science in the early years of education is valued, then the costs for its adoption should be taken care of so that learners can enjoy and benefit from skilful science learning. CBC gives a good focus on pedagogical methodologies used in science in the early years of education in Kenya. Its focus on the socio-emotional development of the learners above their academic pursuit will go a long way in nurturing learners towards exploitation of their potential in sciences and, at the same time, grow their academic achievement. Therefore, the issues surrounding the adoption of CBC should be addressed so that learners start to benefit from it.

### **5.3 RECOMMENDATIONS**

Science being a practical and thought-revoking discipline, this study proposes that teachers employ a trial-demonstration method to enhance science learning in EYE. In this method, safety guidelines and materials are given to learners, and they are asked to come up with products and findings. For instance, a learner can be given different parts of a model, and they can come up with the assembled model of either a car, aeroplane, or bicycle. Learners who shall have successfully assembled the different parts can then demonstrate to other learners who might have failed in the competency. This method is more learner-centered compared to the conventional demonstration method, where the teacher plays an active role. A trial demonstration has various advantages, including promoting imagination, creativity, problem-solving skills, and divergent thinking. Besides, it encourages innovation and enhances access to knowledge and skills. The method also enhances a learner's self-confidence and leadership skills at the demonstration stage. However, the trial demonstration has some disadvantages. Firstly, weak or slow learners may shy off from interacting with the learning materials. Additionally, the method is time-consuming, and learners who fail to achieve it may be frustrated. Despite the few limitations, this study strongly recommends the adoption of this pedagogical methodology.

### **5.4 Other Recommendations**

Challenges facing the adoption of LCP methods in Nyamira County should be addressed through interventions aimed at adequately preparing the teachers and increasing resources in the schools.

#### **5.4.1 Teacher preparedness**

Teachers are the implementers of the curriculum through the pedagogical methodologies they employ in classroom teaching. Their preparedness in terms of skills, knowledge, and attitudes is crucial in the effective adoption of LCP methodologies. Before the roll-out of CBC in 2018, the



teachers should have been sufficiently prepared. Studies by the Teachers Service Commission (TSC) and the KICD show that teachers are ill-prepared for CBC implementation. A 2018 report by the KICD established that only 3% of teachers feel sufficiently prepared for CBC (Akala, 2021). The report suggests that CBC is being imposed on unprepared teachers. Effective implementation of CBC can only be possible if the teachers are adequately prepared and own the program. The teachers should be sufficiently prepared through workshops and seminars to ensure they have the required skills, attitudes, and knowledge that determine the success of a curriculum. Additionally, intervention programs should be put in place to enhance the capacity of science teachers in the early years of education to implement CBC. For instance, Kenya GPE Primary Education Development (PRIDE) project is one such intervention to build science teachers' capacity to implement CBC aspects in early-grade Mathematics.

#### **5.4.2 Increasing Resourcing**

Human and financial resources are crucial in the successful implementation of CBC. Teachers are a significant human resource in the early years of education. Many LCP methodologies require low teacher-to-learner ratios for them to be effectively implemented. In Kenya, many schools have a high population of learners with only limited teachers. This imbalance has frustrated the implementation of CBC as many aspects of CBC require a teacher to give personalized attention to each learner to help them develop their competencies (Akala, 2021). Therefore, TSC must employ more teachers to ensure enough human resourcing that will aid in the implementation of CBC. Financial resources are also central to the successful implementation of CBC. Learner-centered pedagogical methodologies require investment in laboratories, innovation hubs, and workshops, all of which call for proper financing to ensure they are fully equipped. Besides,

technology is crucial in realizing CBC (Mokua, 2021). Technological gadgets such as desktops, laptops, tablets, and smartphones are costly and require enough financing for them to be procured.

#### **5.4.3 In-service Training for Teachers**

In-service training for teachers should focus on LCP. During in-service training, an emphasis should be made on how to employ LCP in teaching science in the EYE. Teacher training colleges and universities should incorporate CBC and LCP in the teacher training syllabus. As teachers graduate from these institutions, they should be equipped with the skills, knowledge, and attitudes that favour LCP.

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