

**CLASSROOM DESIGN AND LEARNER ACHIEVEMENT IN PUBLIC PRIMARY
SCHOOLS IN CENTRAL DIVISION ARUA CITY, UGANDA**

BY

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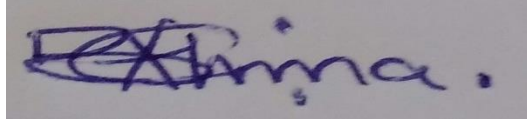
**A DISSERTATION SUBMITTED TO THE FACULTY OF EDUCATION
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AWARD OF MASTER OF EDUCATION IN EDUCATIONAL
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DECLARATION

Bako Alima Caroline declares that this dissertation is my own work and that it has never been presented, wholly or partially, to any university or other institution of higher learning for the award of a Master of Education in Educational Planning and Management.

Signature

A rectangular box containing a handwritten signature in blue ink. The signature appears to be 'Bako Alima Caroline' written in a cursive, somewhat stylized script.

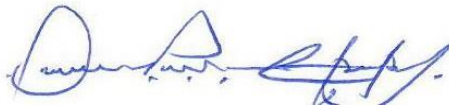
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APPROVAL

This dissertation, titled “Classroom Design and Learner Achievement in Public Primary Schools in Central Division, Arua City, Uganda”, has been prepared and submitted under my supervision.



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DEDICATION

I dedicate this work to the Almighty God who has seen me through this struggle to date and to my family.

ACKNOWLEDGMENT

I would like to acknowledge the Almighty God for the wisdom and strength that he accorded me through the process of writing this report. I would like to acknowledge Rev. Fr. Professor Epiphany Odubuker Picho and Associate Professor Paul Edabu for their tireless efforts and technical guidance to date. I also want to acknowledge my husband, Kepo Richard, who gave me the space and freedom to do my work solely as a learner. I would like to acknowledge my children: Eriku Gerard, Dindo Brian, Kepo Rachael, Kepo Pius and Deborah Kepo for accepting to live their life without the motherly support for this while

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ABSTRACT

This study examined the relationship between classroom design and learner achievement in public primary schools in the Central Division of Arua City, Uganda. It specifically examined the relationship between classroom layout, instructional materials, and learning zones with academic performance. A convergent parallel mixed-methods design was adopted, combining both quantitative and qualitative approaches to provide a comprehensive understanding. The study sampled 73 teachers and headteachers, selected through a . Quantitative data were collected using structured questionnaires and through descriptive statistics and Pearson correlation to determine the strength and significance of relationships between variables. Qualitative data were obtained through semi-structured interviews and observations, and analysed thematically. Findings revealed a moderate and statistically significant relationship between instructional materials ($r = 0.372$, $p < 0.001$) and learning zones ($r = 0.380$, $p < 0.001$) and learner achievement. However, classroom layout had a weak and non-significant relationship ($r = 0.070$, $p = 0.554$). Qualitative insights supported these results, highlighting that accessible instructional resources, well-organised learning spaces, and flexible teaching zones foster engagement, collaboration, and deeper understanding. Limited digital resources and inconsistent training were noted as key challenges. The study concludes that improved access to quality instructional materials and purposeful learning zones significantly enhance learner achievement. It contributes to educational practice by informing school leaders and policymakers of the importance of investing in classroom resources, inclusive learning spaces, and ongoing teacher development to create more effective and equitable learning environments.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter presents the background to the study, including the statement of the problem, the purpose of the study, its objectives, research questions, research hypotheses, the conceptual framework, the significance of the study, justification for the study, the scope of the study, and operational definitions. This study examined classroom design and learners' achievement in selected primary schools in the Central Division of Arua City.

1.1 Background of The Study

1.1.1 Historical Background

The relationship between classroom design and learner performance in primary schools has evolved significantly over time, influenced by changing educational philosophies, social norms, and technological advancements. In the early years of formal education in the United States, classrooms were simplistic, with learners of varying ages taught in one-room schoolhouses that primarily focused on basic literacy and numeracy skills (Keshavarz et al., 2022). However, the late 19th and early 20th centuries ushered in the Progressive Education movement, championed by educators like John Dewey. This shift introduced child-centered, interactive learning environments, incorporating group seating and hands-on materials, which significantly enhanced learner engagement and performance (Saxena et al., 2024). This historical evolution highlighted how classroom design has adapted to changing educational paradigms, impacting the learning experiences and academic achievements of primary school learners (Chen & Huang, 2023).

In the mid-1900s, a transition occurred towards standardized classroom designs featuring rows of desks, largely due to the "factory model" approach that aimed to efficiently manage large populations of learners. While this model streamlined education, it often overlooked the individual learning needs of learners, potentially hindering their academic performance (Zhang et al., 2021). The late 20th and early 21st centuries marked resurgence in focus on individualized and child-centered learning, emphasizing the critical role of classroom design in fostering active participation and improving learner outcomes. The integration of technology, including computers and interactive whiteboards, has further transformed classroom environments, enhancing learner engagement and performance (Lu et al., 2020).

In Uganda, the historical context of education has similarly emphasized basic literacy and numeracy but has been marred by infrastructure challenges and limited resources. Many Ugandan schools have struggled with inadequate facilities, affecting learner performance. However, efforts to improve classroom infrastructure have gained momentum, particularly with the introduction of Universal Primary Education (UPE) in 1997, which aimed to accommodate a growing learner population and promote quality education for all (Worline & Dutton, 2022).

In West Nile region, including Arua City, significant changes have also impacted learner performance. Despite initial challenges related to educational infrastructure, recent developments, such as the construction of new classrooms and larger facilities, have aligned with national initiatives to enhance educational quality and accessibility (Onzia, 2024). These advancements are crucial for improving learner performance, as they create conducive learning environments that support engagement and academic success.

1.1.2 Theoretical Perspective

The design of a classroom has a significant impact on how learners learn and how well they achieve academically. Constructivist theory, as proposed by Jean Piaget, and sociocultural theory, as developed by Lev Vygotsky, are two important educational concepts that illuminate how learning environments can be designed to foster social and cognitive development, ultimately enhancing academic outcomes. In primary school settings, both theories place a strong emphasis on social connection, active participation, and personalised learning experiences that cater to the diverse needs of learners (Lee et al., 2024).

The integration of Jean Piaget's Constructivist Theory and Lev Vygotsky's Sociocultural Theory provides a robust framework for understanding how classroom design influences learning outcomes. Both theories emphasise the importance of active participation in the learning process. Piaget's theory posits that learners construct knowledge through exploration and interaction with their environment, while Vygotsky highlights the role of social interaction and collaborative learning. By designing classrooms that promote active engagement such as flexible seating arrangements, activity centers, and collaborative spaces educators can create an environment that fosters both cognitive and social development (Yesil & Aras, 2024). In addition to emphasizing active learning environments, both theories advocate for developmentally appropriate practices. Piaget's stages of cognitive development suggest that learners engage differently based on their developmental level. Vygotsky's concept of the Zone of Proximal Development (ZPD) emphasises the importance of tasks that challenge learners while still being attainable with support. Classroom design can incorporate resources and activities that are tailored to these developmental stages, ensuring that all learners are appropriately challenged and supported. This dual focus helps to create a learning environment conducive to cognitive growth.

Moreover, social interaction and peer learning play crucial roles in both theories. Vygotsky's theory strongly emphasises the role of social interaction in the learning process. By integrating peer learning opportunities , such as group projects and discussion areas, learners can collaborate and learn from each other, which enhances their understanding and retention of knowledge. Piaget's theory complements this by emphasising that social experiences play a significant role in individual cognitive development. Therefore, a classroom designed to facilitate social interactions can effectively bridge the insights from both theories (Lynam et al., 2024).

Scaffolding and supportive instruction are also critical elements emphasized by both Piaget and Vygotsky. Piaget's emphasis on progressively challenging tasks aligns with Vygotsky's notion of guidance from more knowledgeable peers or teachers. Thoughtfully designed learning environments simplify teachers' ability to support students in diverse educational settings, from individual guidance to group activities, thereby strengthening this scaffolding (Bodrova & Leong, 2024). This approach cultivates an environment where students can pursue their independent learning while getting the necessary support to advance within their Zone of Proximal Development. Furthermore, both theoretical frameworks assert the critical role of student involvement in academic accomplishment. Classrooms that encourage exploration, interaction, and collaboration can boost motivation. When students actively participate in their education through problem-solving, group endeavors, and hands-on activities, they become more invested and driven to achieve academically. This active involvement is vital for fostering a conducive learning atmosphere, aligning with both theories (Kharroubi & ElMediouni, 2024). Ultimately, integrating Piaget's and Vygotsky's theories points to a comprehensive educational philosophy that equally values social and cognitive growth. By accommodating both independent discovery and shared learning experiences, classroom designs can foster overall academic success,

acknowledging the intertwined nature of cognitive abilities, social engagement, and emotional health (Azadi, 2024).

1.1.3 Conceptual Perspective

Learner success involves a broad spectrum of educational results, encompassing intellectual, social, and emotional progress alongside academic expertise. While academic performance has traditionally been the primary measure of accomplishment, often gauged by exams or standardized tests (Widiastuti et al., 2020), learner achievement extends beyond these scores. It includes capabilities in problem-solving, overall development, and mastery of reading and math. Social and emotional growth is also a key consideration, covering the ability to learn resiliently, interact effectively with peers, and manage emotions. For the purpose of this research, learner achievement was understood as the comprehensive development and educational outcomes of students, incorporating their academic results, literacy and numeracy skills, cognitive and social growth, and emotional development, reflecting the multifaceted nature of achievement, particularly in crucial areas like academic competence, problem-solving, social interaction, and emotional fortitude, this approach acknowledges the multifaceted nature of achievement. The study focused on the ways classroom design affects these components of achievement.

Sliwka et al. (2024) and Classroom Design (2024) define classroom design as the intentional layout of the physical space to support efficient teaching and learning. Creating a conducive learning environment involves carefully arranging furniture, resources, and other aspects of the surroundings, such as lighting, sound, and the physical layout. Active participation, collaboration, and cognitive growth, all vital for student success, are encouraged in a thoughtfully designed classroom (Mohammed et al., 2020). Ogungeru (2023) defines classroom design as the arrangement of the physical space, encompassing lighting, acoustics, and furniture, to cultivate an

environment that fosters engagement, learning, and group work. Similarly, Fisher & Frey (2014) emphasize that classroom design should consider psychological elements influencing student motivation, interaction, and academic results, beyond just the physical structure. They argue that a stimulating and supportive atmosphere is essential for promoting social interaction and cognitive advancement in students.

Papaioannou et al. and Phillips, (2023) posit that classrooms must incorporate flexible seating arrangements and materials that support a diversity of learning styles. According to their recommendations, a well-designed classroom should prioritise learners' needs by providing them with access to tools that promote personalised learning and enhance academic performance. Baker (2018) further notes that classroom design is a critical factor in shaping the social dynamics among learners, facilitating or hindering collaboration, communication, and peer relationships all of which are vital for academic success. Sanguinetti, (2024) further notes that to promote equal participation and achievement, an inclusive classroom design should consider the various demands of all learners guaranteeing accessibility and adaptation.

The purpose of this study is to define classroom design as the thoughtful placement of environmental and physical components in a learning environment to support efficient instruction.

1.1.4 Contextual Perspective

Arua City, a new urban area in Uganda, has been significantly reorganized administratively. It has transitioned from being a municipality within Arua District to a complete city with two distinct areas: Arua Central and Ayivu. This transition has placed increased demand on the city's Education Department to ensure the provision of quality education across both government-aided and private primary schools. As the city continues to grow rapidly, so too does the urgency to align its

educational infrastructure, pedagogical practices, and learning environments with the evolving needs of its young and expanding population.

Despite efforts by the Ministry of Education and Sports, alongside school Boards of Governors and parents' associations, a critical yet underexplored factor hindering effective learning in Arua City's primary schools particularly within the Central Division is the inadequate attention to classroom design and learning resources. While the National Teacher Policy (2019) emphasizes teacher performance and academic outcomes, this focus is undermined by systemic issues within the physical and instructional environment in which learning occurs.

Classrooms in many primary schools in Arua Central Division remain poorly structured and inadequately equipped to support learner-centered approaches. Key elements, such as visual aids, locally improvised teaching and learning materials, purposeful classroom arrangements, and clearly designated learning zones, are frequently absent or underutilised. These components are essential for promoting interactive, engaging, and inclusive learning experiences; yet, their neglect has become characteristic of many learning environments in the city.

The lack of visual aids and locally available instructional materials deprives learners of the opportunity to visualize abstract concepts, which is especially detrimental in early education where concrete experiences are critical for cognitive development. Furthermore, most classrooms are not arranged to support group work or differentiated instruction. Instead, they follow rigid, teacher-centered layouts that limit interaction, collaboration, and meaningful engagement with the curriculum. The absence of structured learning zones dedicated areas within classrooms designed for specific activities such as reading, creativity, or problem-solving further constrains the development of essential 21st-century skills.

Large class sizes, a common feature of urban schools in Arua City, exacerbate these structural and pedagogical shortcomings. Teachers are often burdened with managing multiple streams in overcrowded settings, leaving minimal room for personalized instruction and formative assessment. As a result, teaching tends to emphasize rote memorization and preparation for high-stakes end-of-year examinations. This exam-oriented culture prioritizes performance metrics over holistic learning, contributing to shallow understanding and limiting the long-term academic growth of learners.

Table 1: Learner Performance In Primary Leaving Examination In Arua City, 2022

Education Challenge	Statistics
Percentage of learners with D2 grades	41.6%
Percentage of learners with D1 grades	8.3%
Percentage of learners who failed exams	12%
Percentage of learners absent during exams	3.7%

Source: Education Status Report of Arua City, (2022)

These alarming statistics highlight significant learning gaps, suggesting that current classroom environments are not adequately supporting academic achievement. While teacher competency and curriculum design remain vital, the physical and instructional conditions of the classroom must be recognized as equally influential determinants of learner success.

Given these challenges, the need to investigate the relationship between classroom design including the use of visual aids, improvised materials, learning zones, and seating arrangements and learner achievement is both urgent and necessary. The persistent neglect of these classroom-level factors represents a critical barrier to educational improvement in Arua City. Therefore, this

study aims to investigate whether and how these underutilised elements contribute to the observed disparities in academic performance, with the ultimate goal of informing practical interventions and policy reforms that improve learning outcomes in primary schools.

1.2 Statement of the Problem

Classroom designs function not only as physical spaces but also as dynamic, well-organised learning environments that actively support and enhance learner achievement. Such classrooms are characterised by flexible layouts that support a range of teaching strategies, differentiated learning zones that encourage both independent and collaborative tasks, and the presence of adequate, engaging instructional materials that appeal to diverse learning styles. These essential elements are crucial not only for fostering learner achievement but also for cultivating critical thinking, creativity, and the lifelong learning skills indispensable for the holistic development of young learners.

However, in the public primary schools of Central Division, Arua City, the prevailing classroom designs fall significantly short of these educational standards. Despite numerous policy reforms and educational initiatives, learner performance remains alarmingly low and stagnant. For instance, recent assessments reveal that a significant percentage of primary learners in the Central Division, specifically in The central division of Arua City fails to meet foundational literacy and numeracy benchmarks, a trend that directly impacts overall academic progression (Arua City Education Status Report, 2023). Classrooms are frequently overcrowded and feature traditional, rigid seating arrangements that severely inhibit learner interaction, movement, and active engagement (OECD, 2020). This lack of flexible layouts directly impedes the effective implementation of learner-centred pedagogies, such as group discussions, role-playing, and project-based learning (Dugger & Smith, 2021). Furthermore, many schools are demonstrably

poorly resourced, with limited and often outdated instructional materials that fail to support interactive or exploratory learning. Teachers are consequently compelled to rely almost solely on verbal explanations, which render abstract concepts profoundly difficult for learners to grasp, particularly at the foundational primary levels (UNESCO, 2022). Moreover, most classrooms lack adequately designated learning zones that cater to diverse educational activities such as reading, experimentation, or collaboration, thereby undermining efforts towards differentiated instruction.

Although interventions such as curriculum reviews and teacher capacity-building efforts have been undertaken to improve learning outcomes, these initiatives have largely focused on *what* is taught rather than *how* and crucially, *where* it is taught (Milner IV, 2012; World Bank, 2023). The physical and pedagogical design of classrooms has been largely overlooked as a strategic leverage point, despite a growing body of research that consistently emphasizes its profound impact on learner achievement. While the existing global literature robustly affirms the role of classroom design in enhancing learner achievement, a critical void remains in empirical studies that have explored this relationship within the specific context of under-resourced educational settings, such as those found in Arua City. Specifically, there is a pronounced lack of localized evidence examining how classroom layout, the availability of learning materials, and the presence (or absence) of structured learning zones collectively or individually influence learner achievement.

This study, therefore, seeks to address this critical empirical and contextual gap by systematically investigating the intricate relationship between classroom design and learner achievement in public primary schools in the Central Division of Arua City.

1.3 Purpose of The Study

The purpose of this study was to establish the relationship between classroom design and learner achievement in public primary schools in Central Division in Arua City, Uganda.

1.4 Objectives of The Study

1. To establish the relationship between classroom layout and learner achievement in public primary schools in Central Division in Arua City.
2. To establish the relationship between materials and resources and learner achievement in public primary schools in Central Division in Arua City.
3. To establish the relationship between learning zones and learner achievement in public primary schools in Central Division in Arua City.

1.5 Research Question

1. What is the relationship between classroom layout and learner achievement in public primary schools in Central Division in Arua City?
2. What is the relationship between materials and resources and learner achievement in public primary schools in Central Division in Arua City?
3. What is the relationship between learning zones and learner achievement in public primary schools in Central Division in Arua City?

1.6 Null Hypotheses

1. There is no significant relationship between classroom layout and learner achievement in public primary schools in Central Division in Arua City.
2. There is no significant relationship between materials and resources and learner achievement in public primary schools in Central Division in Arua City.

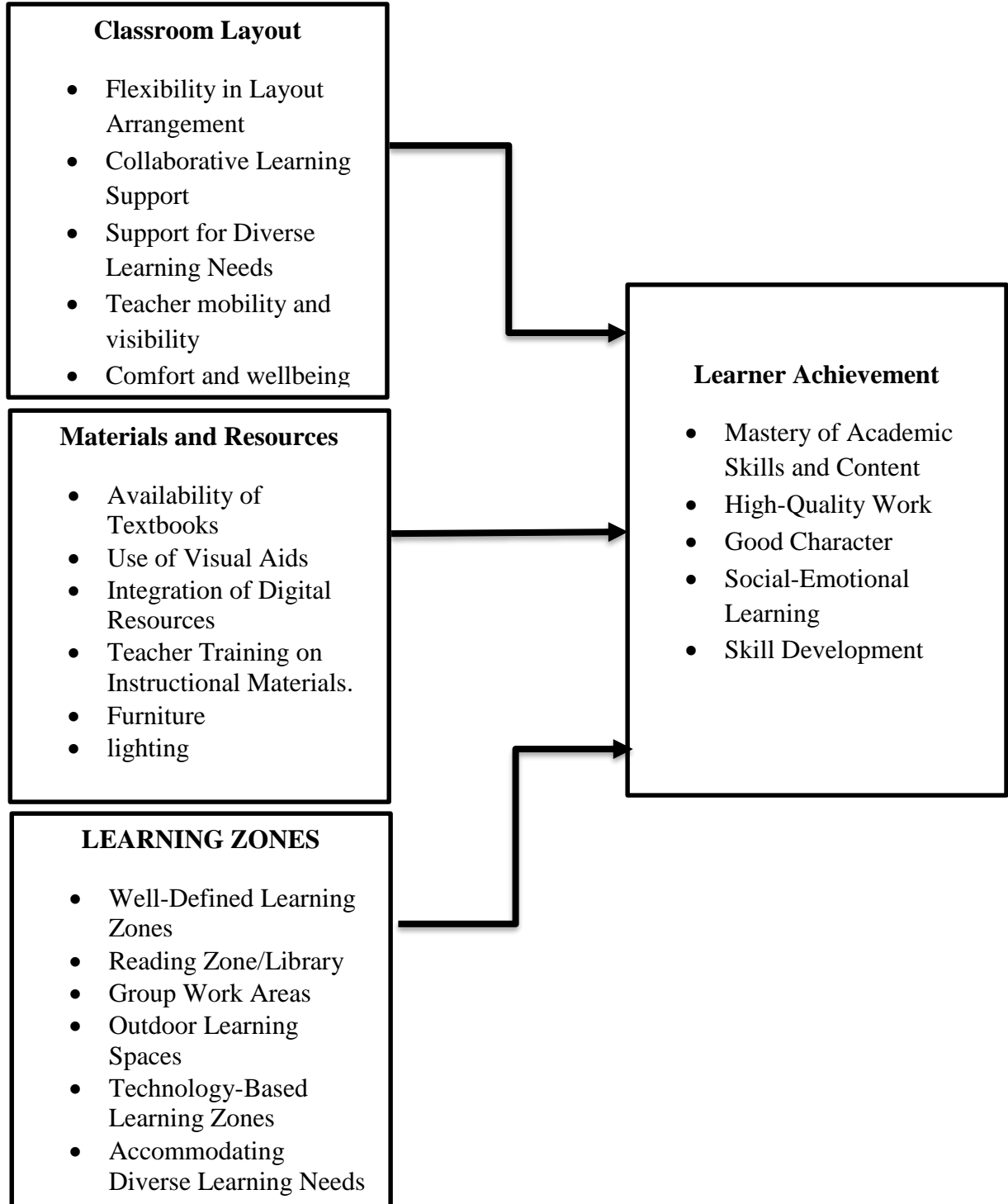
3. There is no significant relationship between learning zones and learner achievement in public primary schools in Central Division in Arua City.

1.7 Conceptual Framework

A conceptual framework is a theoretical structure that provides a systematic basis for understanding and investigating the relationships between variables in a particular research context,(Ager & Strang, 2008). In the context of classroom design and learner achievement in primary schools, classroom design serves as the independent variable, and learner achievement is the dependent

CLASSROOM DESIGN (IV)

LEARNER ACHIEVEMENT (DV)



Source: (Schallert et al., 2022).

1.8 Scope of The Study

1.8.1 Geographical Scope

The study was conducted in selected government-aided primary schools within Arua City, with a particular focus on schools located in the Central Division. This area was chosen due to its accessibility and the availability of relevant performance data, as well as reports that indicated persistent challenges related to classroom infrastructure and learning environments.

1.8.2 Content Scope

This research examined the relationship between classroom design and learner achievement. It focused on key aspects of classroom design such as layout, designated learning zones, instructional materials, and available resources. Learner achievement was assessed based on academic performance and the degree of learner engagement

1.8.3 Time Scope

This study focused on the period from 2018 to 2024 to investigate the relationship between classroom design and learner achievement in selected government-aided primary schools in Arua City. This specific timeframe was critical as it coincided with a period marked by a notable decline in educational performance, as indicated by reports such as the 2022 Arua City Education Status Report. During these years, a significant proportion of learners demonstrated poor academic outcomes, raising concerns among educators, policymakers, and stakeholders about the underlying factors affecting learner achievement including the learning environment.

Focusing on the 2018–2024 period enabled the researcher to frame and contextualize the findings within a meaningful and relevant historical and educational landscape. This range captured both

the pre- and post-reform phases in Uganda's education sector, including the implementation of several government policies aimed at improving learning outcomes, infrastructure development, and school management.

1.9 Significance of The Study

The study on classroom design and learner achievement in selected primary schools in Arua City carries significant implications for policymakers, school management, and researchers.

Policymakers; The study will serve as a valuable resource for informed decision-making in the realm of education. It will equip them with the data and insights to make well-informed policy changes that can lead to more effective classroom design, subsequently enhancing learner achievement. Additionally, this knowledge will enable efficient resource allocation, allowing policymakers to direct investments towards areas that have a direct impact on learner outcomes, such as classroom design improvements, ultimately maximizing the efficiency of educational budgets.

School management; the study findings will help create optimized learning environments. This will help bring up insights to enhance teaching and learning outcomes within institutions, thereby improving the overall educational experience for both learners and teachers. Furthermore, the study will help underscore the importance of classroom design in learner achievement, enabling school administrators to develop professional development programs for teachers and staff that align with the study recommendations.

The researchers; the study will motivate further exploration of the relationship between classroom design and learner achievement. It will serve as a valuable reference point, encouraging

scholars to build upon this research to conduct additional investigations in diverse educational contexts. The study will contribute to the advancement of educational theories by shedding light on the complex interplay between physical learning environments and academic performance, potentially leading to the development of new educational theories that can guide future research and practice in the field of education.

1.10 Justification of The Study

This study is justified by the significant correlation between the physical learning environment and educational outcomes. In the context of Arua City, which has experienced a concerning decline in educational standards in recent years, this research is highly relevant, to elucidate how classroom design influences learner achievement, offering valuable insights for policy development and practical school management improvements. In a time when educational policymakers are actively working to enhance education quality, this study has the potential to contribute significantly through evidence-based decision-making and efficient resource allocation, ultimately resulting in improved learner achievement and a more effective educational environment in Arua City primary schools.

1.11 Operational Definition of Terms

"Classroom design is the strategic arrangement of physical space to support a variety of teaching methods and learning styles. It involves considerations of furniture, lighting, technology integration, and spatial layout to create an environment conducive to learning." (Lippman (2010)

"The design of educational spaces goes beyond aesthetics and functionality; it encompasses the psychological and emotional well-being of learners. Effective classroom design should promote engagement, collaboration, and creativity" (Blackmore et al., 2011).

"Classroom design refers to the process of creating learning environments that are flexible, adaptable, and inclusive. To support a variety of learning activities, this involves the use of technology, ergonomic furniture, and careful spatial planning (JISC, 2006).

Classroom Design: The planning and placement of environmental and physical components in a classroom to support efficient teaching and learning is referred to as classroom design. It includes the design, furnishings, supplies, and equipment, all of which are thoughtfully arranged to produce a setting that is favorable to learning.

Layout and Furniture: The physical configuration of desks, chairs, teaching aids, and other components in a classroom is referred to as layout and furniture. In order to maximize accessibility, visibility, and engagement, the layout places furniture and learning areas in a way that is both practical and comfortable for teachers and students.

Materials and Resources: The educational tools, supplies, and aids that are available in the classroom to support teaching and learning are referred to as materials and resources. Textbooks, technology, manipulatives, reference materials, and any other resources that improve the educational process can all fall under this category.

Learning Zones: Learning zones refer to designated areas within the classroom that are designed for specific learning activities or purposes. These areas are often created to accommodate diverse learning styles and encourage collaborative, independent, or group learning. Learning zones can be organised for activities such as reading, group discussions, hands-on experiments, or quiet study.

Learner Achievement in Primary School: Learner achievement in primary school pertains to the educational outcomes, performance, and accomplishments of learners in the primary school level. It is typically measured by academic success, including test scores, grades, and other relevant indicators of learning, and serves as an essential assessment of learners' knowledge and skills acquired during their primary education.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents a literature review. It is divided into four sections. The first section presents the theoretical review. The second section reviews the literature on the relationship between classroom layout and furniture on learner achievement. The third section addresses literature on the relationship between Materials and resources and learner achievement. The final section examines the literature on the relationship between learning zones and learner achievement. Therefore, the literature review will help the researcher to document what other researchers have done and to identify the knowledge gap. The material used in the review includes magazines, journals, other learning materials, and related websites accessed over the Internet.

2.1 Theoretical Review

Classroom design has a significant influence on how learners engage with their learning environment and, consequently, on their academic performance. Two major educational theories Jean Piaget's Constructivist Theory and Lev Vygotsky's Sociocultural Theory provide critical insights into how learning spaces can be structured to enhance both social and cognitive development, which are essential for academic success. By focusing on these theories, this review highlights how classroom design can optimise learning by promoting active engagement, fostering social interaction, and providing developmentally appropriate instruction.

Jean Piaget's Constructivist Theory

Jean Piaget's constructivist theory emphasises that learning is an active process in which individuals build their understanding of the world through interaction with their environment (Piaget, 1954). Piaget argues that rather than passively absorbing information, students actively construct knowledge through exploration, problem-solving, and hands-on activities. According to this theory, it is crucial to create classroom layouts that encourage active learning, in which students engage with both the physical environment and the teaching resources. According to Piaget's theory, classrooms ought to be flexible enough to accommodate different kinds of interactions. The active learning process is supported by flexible seating arrangements that allow students to move around freely, form groups, and engage with the materials.

Such settings encourage exploration, which is essential for cognitive development because it allows students to participate in activities that are appropriate for their developmental stages, claim Yesil and Aras (2024). For instance, older students can work on abstract reasoning and problem-solving exercises, but younger students gain more from practical, hands-on activities.

Additionally, Piaget's concept of fixed developmental stages has been criticized for being too rigid, as research now shows that children's cognitive development can be more fluid and influenced by context and instruction. These gaps suggest that while Piaget's theory provides a valuable foundation for classroom design and active learning, it should be complemented with more socially and culturally responsive approaches to fully support diverse learners.

Lev Vygotsky's Sociocultural Theory

Lev Vygotsky's sociocultural theory takes a different approach, focusing on the role of social interaction and cultural context in learning. Central to Vygotsky's theory is the concept of the Zone of Proximal Development (ZPD), which represents the difference between what a learner can do independently and what they can achieve with the assistance of a more knowledgeable peer or teacher (Vygotsky, 1978). Vygotsky's theory when it is guided through social collaboration and teacher guidance, making these elements essential to the learning process.

Vygotsky's theory highlights the importance of social interaction in learning.

Furthermore, Vygotsky underscores the contribution of peer learning to cognitive development. In environments that promote interaction and communication among students, such as through collaborative work zones or cooperative seating, students can benefit from the knowledge and insights of their peers. Tailor et al. (2024) argue that learners can often accomplish tasks in collaboration with peers that they would find challenging to complete alone, highlighting the importance of designing classrooms that encourage group learning and interaction. e. Furthermore, Oo et al. (2024) stress that learning environments that foster social and cognitive development are essential for maximizing students' potential, particularly in elementary school settings where foundational skills are being established. Lev Vygotsky's Sociocultural Theory and Jean Piaget's Constructivist Theory both offer insightful perspectives on how classroom design can affect students' academic performance and learning. The best conditions for social and cognitive development are produced in classrooms that encourage teamwork, active engagement, and customized learning opportunities. Teachers can promote students' academic success by encouraging engagement, inquiry, and social interaction in the classroom by incorporating the ideas of both theories.

. These thoughtfully planned classrooms are essential for satisfying students' various needs and maximizing their academic development.

2.2. Conceptual Review

Classroom design plays a central role in shaping the educational experience and influencing learners' outcomes. The physical environment of a classroom, which includes factors such as layout, furniture, lighting, and resources, can significantly impact learners' engagement, motivation, and overall academic achievement. This conceptual review explores the relationship between classroom design and learners' achievement, drawing upon relevant literature to highlight the key elements of classroom environments that contribute to effective learning.

The arrangement of furniture and space in the classroom is critical for facilitating interactions among learners and teachers. Research by Barrett et al. (2015) indicates that classrooms designed with flexible seating arrangements can promote collaboration, improve communication, and enhance learner engagement. Moreover, open layouts that avoid traditional rows can foster a more interactive and inclusive learning environment (Sullivan & Smith, 2021).

The choice of furniture contributes significantly to learners' comfort, focus, and mobility. Ergonomically designed furniture tailored to learners' needs can reduce discomfort and distractions, thereby improving concentration (Wong et al., 2020). Additionally, furniture that allows for easy reconfiguration supports different teaching styles and collaborative group work, which are essential for fostering active learning (Miller, 2019).

The impact of lighting and acoustics on learning cannot be overstated. Natural light has been linked to higher academic performance and improved well-being (Higgins et al., 2005). Furthermore, acoustic conditions, including noise levels and sound insulation, directly affect learners' ability to concentrate and comprehend lessons (Shield & Dockrell, 2003). Classrooms designed with both

effective lighting and sound management strategies tend to enhance learners' focus and productivity.

The psychological effects of colour and classroom aesthetics significantly impact learners' moods and motivation. Studies suggest that warmer colors can enhance feelings of warmth and comfort, while cooler colors can promote focus and productivity (Elliott & Maier, 2012). A visually stimulating environment that incorporates art and educational visuals can foster creativity and inspiration among learners (Kamarulzaman et al., 2020)

The incorporation of technology into classroom design has transformed learning environments. Classrooms equipped with interactive whiteboards, tablets, and digital resources create opportunities for engaging, multimedia-based applications that can enhance understanding and collaboration (Cohen & Hsu, 2020). This integration supports diverse learning styles and can lead to improved academic outcomes.

2.3. Review of Related Literature

2.3.1 Classroom Layout and Learner Achievement

Classroom design, including layout and furniture, is a critical factor in promoting active learning and learner engagement. Poorly designed classrooms can impede learning, while thoughtfully designed spaces enhance it. Leijon et al., (2024), link the state of educational facilities to higher academic achievement, noting that the physical environment affects both learner performance and behavior. This notion is further supported by Sun & Firzan, (2024), who found that well-designed physical spaces correlate with improved grades and classroom behavior.

McLeod (2023), in his exploration of Constructivist Learning Theory, extends this idea by asserting that the physical environment not only influences learning but can also shape learner behavior. For

instance, deteriorating school buildings, characterised by broken windows, dilapidated structures, and poor maintenance, are associated with negative learner behaviours.

van den Brink, F., Vollmann, M., & Tick, N. T. (2025). argues that inadequate facilities may contribute to disruptive behavior, which, in turn, hinders learning. Therefore, the quality of school infrastructure plays a dual role, affecting both the teaching-learning environment and learners' behavioral outcomes.

The literature provides substantial evidence that the physical environment of classrooms plays a pivotal role in both learner learning outcomes and behavior. From a theoretical perspective, these insights align with the tenets of Constructivist Learning Theory, which posits that the environment plays a crucial role in shaping learners' learning experiences. The emphasis on flexible seating arrangements and ergonomic furniture highlights the importance of creating spaces that foster collaboration, ease of movement, and comfort, all of which contribute to learner engagement and academic success (Orun, 2024).

Moreover, the involvement of learners in designing their learning environment aligns with learner-centred learning approaches that emphasise empowerment and community-building (Yangambi, 2023). This perspective is supported by Ahmed (2024) and Diller (2023), who suggest that both teachers and learners often fail to recognise the potential in their learning spaces.

León et al., (2024) report that seating arrangements impact the learning process. Learners occupying the front rows are generally more attentive than those in the back. Therefore, classroom seating arrangements, from a learner's point of view, symbolise their personality. In a study conducted by Paxton (2021) on the influence of seating arrangement on learners' performance, she found that classroom arrangement has a significant influence on learners' behaviour. According to

her, learners sitting at the back are often found passing notes, doodling, etc. A student's choice of seating can impact their focus, concentration, understanding, and memory retention, potentially leading to a decrease in academic performance. Nevertheless, Baker (2017) suggests that modern seating configurations, such as the traditional row setup, can be employed by educators to enhance the learning experience for students. Baker (2017) identifies the row arrangement as the most common in classrooms, characterized by three columns with four seats in the center and two at each end of the room. (Tsher (2024) highlight that children spend six to eight hours a day sitting, and forty-three minutes of every hour are spent in sedentary activities, such as (2024) highlight that children spend six to eight hours a day sitting, and forty-three minutes of every hour are spent in sedentary activities, such as sitting and listening. Sitting for long periods can cause learners to have difficulty focusing and become inattentive. It also has negative health effects, with studies showing that after sitting for twenty to thirty minutes, approximately eighty per centoximately eighty per cent of the blood in the body pools in the hips (Kerksick et al., 2024).

Research has shown that when a child's body is involved in movement, the brain is in a higher state of arousal(Wang et al., 2024)..Serceki & Curwen, (2024). In this article, we'll explore the importance of classroom storage, and how an organized space can enhance the learning experience for both teachers and learners. A well-organized classroom can maximize the available space, making it easier for learners to move around and access materials. This, in turn, can increase engagement and collaboration, as learners have the necessary resources at their fingertips, and can work together in groups.

Al-Said, (2023), an organized classroom can increase efficiency, as teachers can quickly access the materials they need, and spend more time teaching and interacting with learners. This can help teachers stay on schedule, cover more material, and provide learners with a more well- rounded

education. But also, Tomlinson & Imbeau, (2023) believe that proper storage of materials and supplies can also improve safety in the classroom. By keeping hazardous materials out of reach and storing heavier items securely, teachers can reduce the risk of accidents and injuries. Therefore, effective classroom storage is essential for teachers who want to create a safe, organized, and efficient learning environment for their learners. When everything has its place, it's easier for learners to focus on their studies, and teachers can easily access the materials they need for their lessons. However, with so many materials, books, and supplies, it can be challenging to keep everything organized.

Berman et al., (2006) study on lighting and visual acuity suggest this is exactly the case. The study compared the use of standard color-temperature fluorescent lighting with the use of high-color-temperature fluorescent lighting on children's visual acuity in the classroom. The results from the study were quite enlightening if you'll pardon the pun. The study showed that high-color temperature fluorescent lighting helps learners see clearer and allows them to read faster. It also reduces the visual fatigue and glare that are typically experienced with standard color-temperature fluorescent lighting. Negiloni et al., (2019) a well-maintained and safe physical environment with attractive lighting systems fosters positive attitudes and motivations related to learners' ability to learn, academic achievement, and pro-social behavior. Negiloni et al., (2019) noted that high-quality classroom lighting improves learners' visual acuity, giving them the sight, they need to perform well in school.

However Much of the existing research is focused on developed countries, and there is limited context-specific research in low-income or developing regions such as Uganda, particularly in urban settings like Arua City. The researcher is not sure if the same results will be obtained.

Most studies by Jacob et al. (2020) and McLeod (2023) use qualitative methods. The researcher intends to use a mixed-methods approach to allow researchers to gain a deeper understanding of both the objective and subjective aspects of classroom design and learner achievement.

2.3.2 Materials and Resources and Learner Achievement

Schools must invest heavily in educational resources to create equal learning opportunities and mitigate the impact of socioeconomic disparities on academic achievement. Examining the relationship between learners' academic achievement and the educational resources provided by schools is therefore critical. Jacob et al. (2020) emphasise that employing resources such as teacher's guides supports instructional strategies and improves learner performance. Effective teachers' guides should promote pedagogical content knowledge, provide information and assistance with lesson planning, clearly convey conceptual objectives connected to recommended activities, and involve educators in reflective practice. Despite these advantages, little is known about how different educational contexts and socioeconomic backgrounds affect how well teachers' guides are used, which leaves a gap in our knowledge of their universal applicability. The potential of students can also be restricted by gender bias in instructional strategies and resources, especially in science education.

By giving some students less attention or lower-quality engagement, teachers may unintentionally perpetuate biases. According to Kirkpatrick (2024), students in middle and high school have favorable opinions of educational materials and do better in science classes when they use them. However, Luo (2024) discovers that gender and cognitive styles, like independence or field dependence, affect how well students perform. Lehane (2024) goes on to show that computer-based animations improve scientific literacy, with studies indicating that using both verbal and

visual learning systems improves recall and problem-solving skills.. Long periods of sitting have been shown to impair attentiveness and cognitive function.

Savina et al. (2016) emphasise that physical activity stimulates brain function, thereby enhancing learning and memory. Similarly, Stevens-Smith (2016) and McCaughey (2018) suggest that incorporating movement, mindfulness exercises, and flexible seating can enhance cognitive development, behaviour, and overall well-being. Khan, (2024), notes that classroom space can either facilitate or hinder movement, with smaller classrooms posing challenges to incorporating movement-based activities. However, further research is needed to explore how spatial constraints in low-resource settings can be addressed to optimize learner mobility and engagement.

Classroom storage and organisation are also essential for creating productive learning environments. Khan (2024) asserts that effective storage solutions facilitate efficient space utilisation, easy access to materials, and enhanced teamwork. Amiano, (2024) adds that well-organized classrooms improve teachers' time management, reduce distractions, and enhance safety. However, there is limited research on the impact of storage solutions on learner motivation and academic performance, particularly in resource-constrained settings.

Learning resources play a fundamental role in reducing socioeconomic disparities and improving academic achievement. Kim et al., (2023) argue that well-designed teacher guides enhance pedagogical content knowledge and instructional strategies. Alzubi (2023) finds that multimedia tools, such as animations, enhance scientific knowledge and problem-solving abilities, while Flaherty et al. (2023) highlight the importance of unbiased and comprehensive learning materials in promoting engagement. Jeong, (2023) finds that multimedia resources aid problem-solving and memory retention by engaging both verbal and visual learning pathways. This multimodal

approach ensures deeper understanding and retention of complex concepts. However, to accommodate different learning preferences and accessibility constraints.

Beyond traditional resources, interactive tools and play materials contribute to problem-solving skills, motivation, and cognitive growth. Howells et al. (2023) emphasise the importance of play in early childhood education, as it fosters mental, social, and physical development. Visual learning aids enhance knowledge recall and application, according to Li et al. (2023). Although there has been a lot of research on how educational resources affect student achievement, there are still a lot of methodological gaps, especially when it comes to low-resource environments and teacher training interventions.

2.2.3 Learning Zone and Learner Achievement

A conducive learning space that is both clean and safe is vital for students' academic achievements and overall welfare. Cooper-Kahn and Dietzel (2024) indicate that classrooms that are organized, adequately illuminated, and free from dangers enable students to focus more effectively and reduce disruptions. In schools lacking proper maintenance and safety measures, including emergency readiness, air quality, and hygiene, student learning can be negatively affected. However, this research does not explore the enduring consequences of detrimental learning environments on student outcomes. Further longitudinal research is needed to evaluate the long-term effects of declining school infrastructure on student performance and retention. Learning environments that are adaptable and flexible accommodate various teaching and learning approaches. Buzan (2024) suggests that classroom designs with modular elements, such as movable furniture and versatile zones, encourage both solitary and collaborative learning. Schools that implement flexible learning environments typically observe increased student involvement and a greater capacity to adapt to changing educational requirements. Nevertheless, this study primarily examines contemporary,

well-equipped school settings, providing minimal understanding of the effects of conventional, inflexible classroom designs, especially those with fixed seating and limited space. This represents a significant deficiency in existing literature. Consequently, subsequent research should explore affordable and feasible methods for improving adaptability in schools facing substantial infrastructural constraints.

2.3.4 Summary of Literature Review

The literature emphasises the significant role that educational resources, classroom environments, and inclusive learning zones play in improving learner achievement. Research consistently highlights the importance of teacher guides, multimedia tools, and inclusive materials in enhancing instructional quality and learner performance. Teacher guides are noted for supporting effective teaching practices by helping teachers with lesson planning, providing pedagogical content knowledge, and encouraging reflective practices (Jacob et al., 2020). Multimedia tools, particularly in science education, have shown positive effects on memory retention and problem-solving abilities (Jeong, 2023).

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter outlines the research procedures analyse data for the study on classroom design and learner achievement in public primary schools in the Central Division of Arua City, Uganda. It covers the research design, study population, sample size, and selection, sampling techniques, methods of data collection, research instruments (structured questionnaire, observation checklist, and interview guide), data quality control (validity and reliability procedures), data analysis techniques, measurement of variables, ethical considerations, and anticipated limitations.

3.1. Research Design and Approach

This study adopted a descriptive cross-sectional survey design with a mixed-methods approach, incorporating both quantitative and qualitative methods. The descriptive cross-sectional survey design was chosen because it allows the researcher to collect data from a large sample within a limited timeframe without the need for follow-up, making it efficient and cost-effective (Amin, 2005). Additionally, this design facilitates a clear understanding of the population based on a representative sample.

According to Orodho, (2009), descriptive survey designs are appropriate for exploratory and preliminary studies as they enable researchers to collect and summarize information regarding people's opinions, attitudes, and behaviors, making it suitable for investigating how classroom design influences learner achievement.

A mixed-methods approach was employed to enhance the clarity and depth of data interpretation. The quantitative approach was used to collect numerical data, which enabled the researcher to quantify relationships between classroom design features (such as seating arrangement, lighting, and learning materials) and learner engagement and achievement (Collins & Stockton, 2018). Inferential statistics (such as frequencies and percentages) were used. The qualitative approach, on the other hand, is utilized to gather textual data, providing deeper insights into how the physical learning environment influences learner learning experiences (Clark et al., 2008). This method enabled the researcher to explore the lived experiences of teachers and learners in their natural classroom settings (Ahmed et al., 2019).

3.2 Study Population

The study population consisted of teachers and administrative staff from five public primary schools in Central Division, Arua City, Uganda, namely: Awindiri Primary School, Onzivu Primary School, Niva Primary School, Arua Public Primary School, and Arua Hill Primary School. These individuals serve as key stakeholders in the school setting and possess valuable knowledge about classroom design and its impact on learner achievement.

According to Sekaran & Bougie, (2011), a population refers to the entire group of individuals or events of interest that a researcher seeks to investigate. In this study, the unit of analysis is the teaching staff and learners from the selected public primary schools.

Arua City is selected as the study area because it has a high concentration of public primary schools in the West Nile region of Uganda (District Education Department Quarterly Inspection Report, 2021). These schools are representative of the broader public education system, making them suitable for examining how classroom design influences learner achievement.

3.3 Sample Size and Selection

Sample size refers to the number of individual participants or observations selected for a study in a given statistical or research setting, such as a scientific experiment or an educational survey (Zamboni, 2018). In this study, the unit of inquiry (respondents) consisted of 5 head teachers, who are experienced and knowledgeable about classroom design and its impact on learner achievement, 76 teachers, who interact with learners daily and can provide valuable insights into how classroom environments affect academic performance. Additionally, 19 classrooms are observed to assess their design features, physical conditions, and learning environment. This brings the total study sample to 101 respondents, as illustrated in Table 2.

Table 2: Table Showing Respondents by Category, Population, Sample Size, Sampling and Data Collection Method

Category	Target population	Sample size	Sampling technique	Data collection method
Head teachers	5	5	Purposive sampling	Interview
Teachers	90	71	Random sampling	Questionnaire
Total	95	76		

Source: Krejcie and Morgan Table (1970).

3.4. Sampling Technique and Procedure

The researcher employed a random sampling method to select a diverse group of teachers, ensuring that each individual had an equal opportunity to participate, given the large number of teachers in the population.

3.5. Data Collection Methods

3.5.1. Questionnaire

A questionnaire, a tool for research, comprises a series of uniform questions designed to gather information from participants. These can be either structured, offering predefined answers, or unstructured, allowing for free-form responses. Questionnaires are commonly employed in both quantitative and qualitative research to collect data on particular variables or experiences. In the context of this research, teachers in the chosen schools were given both closed-ended and open-ended questionnaires to obtain thorough data regarding classroom design and its influence on student success. The structured questionnaires contained standardized questions aimed at collecting data on key factors such as classroom arrangement, illumination, teaching aids and materials, and designated learning areas. Teachers were able to provide in-depth explanations of their experiences and recommendations for enhancements to maximize classroom design through the use of closed-ended questions.

These answers made it easier to spot trends and themes that improved our comprehension of the relationship between classroom design and academic achievement (Creswell, 2014).

3.5.2 Interviews

Interviews, a qualitative research technique, involve direct, personal discussions between an investigator and a participant to collect thorough and detailed information. This method is particularly valuable for exploring complex topics, enabling individuals to express their perspectives, experiences, and understandings. For this research, head teachers were interviewed to gather insights into how classroom design influenced student success in public primary schools. The interviews provided the researcher with an opportunity to engage directly with the head teachers, understanding their views on classroom arrangement, features, and their impact on student academic performance.

3.5.3 Observation

Observation, a qualitative research method, involves the systematic and direct examination of people, events, or phenomena in their natural settings. In this research, observation allowed the researcher to assess the physical classroom environment and its influence on student engagement and academic performance.

Structured observation, according to Fraenkel et al. (2012), helped maintain consistency in the data collection process and ensured that all relevant aspects of the classroom environment were covered in each observation session.

To gain a thorough understanding of how classroom conditions and teaching methods varied, the researcher carried out numerous observations at various times of the day and on different days. This strategy aimed to document the dynamic nature of the classroom setting and its impact on student conduct and academic progress across diverse instructional scenarios (Higgins et al., 2005). For example, by observing at different times, the researcher could consider elements like the changing natural light during the day and variations in student alertness.

3.6 Research Instruments

The researcher used three types of instruments, aligned with the study objectives, conceptual framework, and literature review. These instruments included a structured questionnaire, an interview guide, and a documentary analysis guide (Kothari, 2004).

3.6.1 Structured Questionnaire

A structured questionnaire was used to collect quantitative data for this study. According to Kombo & Tromp (2010), a questionnaire is a set of pre-determined statements, typically printed or developed into Google form that participants respond to in a structured format. In this study, the questionnaire will be divided into two sections:

Section A: This section contained four items aimed at collecting demographic information about the respondents, such as their age, gender, teaching experience, and educational qualifications.

Section B: This section focused on questions related to the independent variables, namely classroom design features (such as seating arrangement, lighting, and learning materials), and dependent variables, such as learner engagement and academic achievement. The closed-ended questions were chosen due to the large number of participants, time constraints, cost

considerations, and the need for simplicity in administration (Bruce et al., 2019). These questions enabled the collection of quantifiable data that could be easily analyzed to identify patterns and relationships between classroom design and learner outcomes.

The structured questionnaire allowed for efficient data collection from a large number of teachers across multiple schools, ensuring that the study's findings were both representative and reliable.

3.6.2 Interview Guide

The study employed interviews to gather qualitative data from key stakeholders. In accordance with Amin's (2005) suggestions, the interview guide's open-ended questions allowed the researcher to gather detailed information. In contrast to the more constrictive structured questionnaires, these questions offered flexibility, enabling participants to express their opinions, beliefs, and perspectives in greater detail. Because they made it possible to gather descriptive data that the questionnaire alone was unable to, interviews were especially helpful in this study. Head teachers, who had extensive knowledge of the classroom environment and how it affects student outcomes, were given the interview questions. By using this approach, the researcher was able to investigate their values, beliefs, and comprehension of how classroom design affected student achievement (Malcolm, 2016).

A deeper comprehension of the connections between classroom design and student performance resulted from the interview process, which also gave the researcher the chance to clarify any unclear answers and to follow up on the information received. The flexibility of interviews made it possible to capture nuanced and contextual information, which added depth to the study's findings.

3.6.3 Observation Checklist

An observation checklist is a systematic tool used to collect data on specific variables in a structured manner. In this study on classroom design and learner achievement in public primary schools in Central Division, Arua City. The observation checklist was employed to evaluate significant elements of real classroom. The study was able to gather objective, up-to-date data by using the checklist, which demonstrated the practical effects of classroom design on student achievement. A comprehensive understanding of how classroom design affected educational outcomes was made possible by the data gathered from the observation checklist, which supplemented the data gathered from other sources.

3.7 Data Quality Control

This section ensures the validity and reliability of the instruments used in the study. Data quality control is essential for ensuring the accuracy, consistency, and trustworthiness of the findings. The researcher utilized a combination of structured closed-ended questionnaires, interviews, and the observation method to collect data. These instruments were carefully designed to ensure they capture valid and reliable data. The researcher, in collaboration with the supervisor, ensured that the instruments met the required standards of content validity and reliability. Furthermore, Cronbach's Alpha was employed to assess the internal consistency of the questionnaire items, ensuring they were reliable for capturing the necessary data regarding classroom design and its impact on learner achievement.

3.8.1 Validity

The researcher ensured that the instruments selected for the study collected accurate, relevant information that directly addressed the research objectives. The accuracy of a measurement tool,

known as validity, refers to its ability to precisely ascertain the intended construct (Howell, 2013). Within this research, validity was paramount to confirm that the classroom design elements evaluated by the instruments truly corresponded to the factors affecting student success. As emphasized by Surucu & Maslakci (2020), validity guarantees that measurement tools capture the specific behaviors or attributes relevant to the investigation. To uphold validity in this research, the researcher prioritized content validity, ensuring that the instruments thoroughly encompassed all facets of classroom design and their impact on learner achievement. Content validity was especially significant for this study, as it confirmed that the diverse physical aspects of classroom design, including arrangement, available materials and resources, and designated learning areas, were comprehensively addressed and aligned with the research aims.

3.8.2 Content Validity

To confirm the validity of the content, the researcher collaborated extensively with the supervisor and other specialists in classroom design and educational research. This partnership facilitated the creation of instrument items that were both thorough and suitable for the specific context. The feedback received from these experts was instrumental in refining the questions, ensuring their alignment with the research objective. Additionally, the researcher quantified the relevance of the instrument items by calculating the Content Validity Index (CVI). This index is derived by taking the count of items deemed relevant and dividing it by the total number of items within the instrument. The formula used is:

$$CVI = \frac{\text{Number of items rated relevant}}{\text{All items in the questionnaire}}$$

Table 3: Validity of Questionnaire

Raters	Items rated relevant	Items rated as not relevant	CVI
Rater 1	16/22	06	0.727
Rater 2	18/22	04	0.818
Rater 3	17/22	05	0.772
Average CVI			0.772

Source: Primary Data, (2025)

To ensure the content validity of the questionnaire, three experts were consulted to evaluate the relevance of each item. Table 3 illustrates that the Content Validity Index (CVI) for each evaluator was determined by the percentage of items they deemed relevant. Rater 1 achieved a CVI of 0.727, Rater 2 obtained a CVI of 0.818, and Rater 3 had a CVI of 0.772, leading to an average CVI of 0.772. Amin (2005) suggests that a CVI of 0.70 or higher is acceptable for instruments in their initial development stages, signifying that the questionnaire possesses content validity. The overall CVI suggests that the instrument is appropriate for data collection purposes.

3.6.3 Construct Validity

To assess construct validity, scores from different instruments were compared to confirm they accurately measured the intended concepts. Specifically, interview data was contrasted with responses from a structured questionnaire. The correlation coefficient for the combined effect was 0.822, exceeding the recommended threshold of 0.7, as noted by Amin (2005). This finding indicated that both instruments effectively measured the same constructs.

3.6.4 Face Validity

Face validity is determined by how well an instrument seems to measure its intended construct. For this research, the survey was modified from prior investigations, especially those examining

classroom design and its influence on student outcomes. The instrument's face validity was confirmed through a review by supervisors and experts in classroom design and educational research. Feedback from these individuals led to enhancements in the questionnaire, ensuring it more accurately represented the study's focus on the classroom's physical setting and its effect on student success. This process ensures that the research instruments meet the expectations of researchers, professionals, and stakeholders, thereby building confidence in the reliability and relevance of the findings (Coleman et al., 2022).

3.6.5 Criterion Validity

Criterion validity measures the extent to which an instrument's scores predict a specific criterion. The researcher in this study confirmed that the instruments were appropriate, unbiased, and could forecast student success by considering the classroom setting.. Pearson's correlation coefficient was used to measure criterion validity, which is calculated using SPSS. The correlation coefficient ranges from -1 to +1, where values closer to +1 indicate a stronger relationship between the classroom environment (design features) and learner achievement. This method of assessment ensured that the instruments could predict future academic performance based on the current classroom conditions (Zach, 2020). Validity was therefore crucial in determining whether a significant relationship exists between classroom design features and learner achievement in the primary schools in Arua City.

3.7 Reliability

Reliability referred to the consistency and stability of the research instruments used to collect data, ensuring they provided consistent and dependable results over time (Surucu & Maslakci, 2020). Mugenda and Mugenda (2005) define reliability as the degree to which a research tool produces

consistent outcomes when used multiple times. Kimberlin and Winterstein (2008) proposed that the Cronbach's alpha coefficient is especially valuable for instruments employing Likert scales, as it evaluates the internal consistency of the questions. In order to guarantee the reliability of the research tools for this investigation into how classroom design affects academic achievement, a preliminary test, or pilot study, was carried out at Muni Primary School and Arua Primary School prior to the main data gathering. The analysis yielded a Cronbach's alpha coefficient of 0.764, surpassing the generally accepted benchmark of 0.7 (Amin, 2005), thereby confirming the reliability of the instruments for the research. This outcome is also consistent with Picho (2013), who indicated that a Cronbach's alpha value exceeding 0.7 signifies that the items used to measure the research variables are dependable.

3.8 Data Collection Procedure

To initiate the data collection process for this study, a letter of introduction was obtained from the Office of Graduate Studies and Research at Muni University. To initiate the research, a formal request for authorization was dispatched to appropriate officials. This included the Town Clerk, the City Education Officer of Arua City, and the principals of the primary schools chosen for the investigation: Awindiri Primary School, Onzivu Primary School, Niva Primary School, Arua Public Primary School, and Arua Hill Primary School. The correspondence outlined the study's objectives and solicited approval for undertaking research within their institutions.

Upon receiving the necessary permissions, a supplementary letter detailing the study's aims was appended to the tools for data gathering. These tools comprised questionnaires, observation checklists, and interview protocols. These instruments were then disseminated to the selected

participants, namely teachers, students, and school leaders, with the support of a research assistant who aided in their distribution and subsequent collection.

3.9 Data Analysis

Organizing raw data to extract valuable information for making informed decisions is the essence of data analysis. This process utilized both quantitative and qualitative analytical approaches.

3.9.1 Quantitative Data Analysis

Quantitative data collected from the questionnaires administered to teachers were imported from Google Forms, thoroughly edited, and entered into a spreadsheet. The data were then processed and analysed using the Statistical Package for the Social Sciences (SPSS) version 22 (Amin, 2005).

Descriptive statistics were used to summarise participants' demographic characteristics, including frequency distributions and percentages. These statistics helped in understanding the distribution of responses across various classroom design features and their perceived impact on learner academic performance.

Pearson's correlation coefficient (r) was used to establish the strength and direction of the relationship between classroom design features (independent variable) and learner engagement and achievement (dependent variable). The correlation coefficient is interpreted as follows:

A value of +1 indicates a perfect positive correlation, meaning the two variables move in the same direction. A value of -1 indicates a perfect negative correlation, meaning the variables move in opposite directions. A value close to 0 indicates that there is no meaningful correlation between

the variables. The predictive ability of different aspects of classroom design, including learning zones, instructional materials, and classroom layout, on student achievement in the chosen schools in the Central Division of Arua City was also evaluated using regression analysis.

3.9.2 Qualitative Data Analysis

Content analysis was used to examine qualitative information gathered from head teacher interviews and observations of classroom settings. Using this approach, the data was arranged into relevant categories, and any themes or patterns that surfaced from the responses of the participants were identified. A thematic approach was employed to identify recurring themes and patterns concerning the impact of classroom design on learning. These themes were classified to illustrate how specific classroom features, such as illumination, air quality, and furniture layout, influence student engagement and academic outcomes.

3.10 Measurement of Variables

The researcher's study focused on measuring two primary variables: student success and the arrangement of the classroom. These variables were assessed using specific metrics, employing measurement methods derived from relevant research and aligned with the study's objectives. Accurate measurement of these factors is crucial for understanding their influence on student results and for establishing a defined structure for the analysis.

Classroom design was measured through various factors that directly influence the learning environment such as classroom layout, materials and resources, and learning zones

The second major variable, learner achievement, was measured using several dimensions that reflect the holistic development of learners. These dimensions included academic Performance, Skill Development, Knowledge Retention and Application, Attendance and Participation,

Creativity and Innovation, Social and Emotional Development, Progress over Time, and Feedback from Stakeholders.

To measure these variables, the researcher used a Likert scale ranging from 1 to 4, where each response option was assigned a numerical value. The scale included: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Agree (A), 4 = Strongly Agree (SA)

This scale was applied in both the questionnaire and head teachers' interview guide, which is developed to gather data on the study's variables. The responses provided by the participants allowed the researcher to assess the relationship between classroom design and learner achievement. The data collected through these tools was processed using the Statistical Package for Social Sciences (SPSS) to draw meaningful conclusions and explore how the measured classroom design factors influence learner outcomes. By utilizing this structured approach, the researcher ensured that the measurement of variables was both rigorous and aligned with the study's theoretical framework.

3.11. Ethical considerations

Ethics in research was crucial for safeguarding the rights and well-being of participants. In this study, several key ethical principles were upheld to ensure that respondents were not exposed to any negative consequences as a result of their participation (Amin, 2005).

Informed Consent

The researcher sought informed consent from all participants after clearly explaining the purpose of the study and the nature of their involvement. Participants were made fully aware of their right to decide whether or not to participate in the study voluntarily. They were assured that their

participation was entirely free of coercion or pressure and that they could withdraw from the study at any point without any repercussions (Ishola, 2024).

Confidentiality

Participants were provided with detailed information about the study, including its purpose, potential risks and benefits, and the extent of privacy and confidentiality offered. Before agreeing to participate, respondents had the opportunity to ask questions and were free to withdraw from the study at any time. The researcher ensured that all data collected remained confidential and that no personal information was shared without explicit permission (Sadeghi & Smith, 2024)

Privacy

The researcher respected participants' privacy throughout the study. This involved safeguarding the confidentiality of the collected data and ensuring that personal information was handled with the utmost discretion. Participants had the right to control the sharing of their information and were assured that the researcher would uphold their privacy throughout the research process.

Anonymity

To ensure anonymity, no identifying information, such as names, addresses, or emails, was collected on the questionnaires or any other research instruments. The research findings did not include any information that could link individual participants to their responses. This approach ensured that participants' identities remained protected and their privacy was upheld in accordance with ethical standards (Polit & Beck, 2008). The use of anonymized data helped to maintain confidentiality while preserving the integrity of the research findings.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents, analyzes and interprets the results. It is divided into six sub-sections. The first sub-section presents result about the response rate. The second subsection presents results about background information. The third subsection presents results about the relationship between classroom layout and learner achievement in public primary schools in Arua City, Uganda. The fourth sub-section presents result about the relationship between instructional materials and learner achievement in public primary schools in Arua City, Uganda. The fifth subsection presents results about the relationship between learning zones and learner achievement in public primary schools in the Central Division of Arua City, Uganda. The sixth subsection presents results on the combined independent variables and the dependent variables.

4.2 Response rate

Response rate in survey research refers to the number of people who answered questionnaire divided by the number of people in the sample (Beehr, Kim, & Armstrong, 2024). It is usually expressed in the form of percentages and is very crucial for assessing the validity of research findings.

A low response rate can generate sampling bias if the non-response is unequal among participants regarding exposure and/or outcome. In this study, the sample was 101 respondents but the study managed to get 75% respondents. The breakdown is shown in table 4.

Table 4: Response Rate

Category of population	Target population	Sampled size	Response rate	Percentage
Head teachers	5	5	3	60
Teachers	95	76	73	96.0
Total	100	81	76	93.8

Source: Primary Data, (2025)

Table 4 shows response rate of 93.8% which was above the recommended 67 % response rate (Amin, 2005; Mugenda & Mugenda, 1999). Therefore, the results were considered representative of what would have been obtained from the target population of 100.

4.3 Background Results

In order to inform and explain certain phenomena, the researcher obtained relevant background information, including category: gender, age group, teaching experience, highest academic qualification and class level taught and the responses to them are as in Tables 3, 4, 5 and 6.

Table 5: Gender

Category	Frequency	Percent
Male	32	43.8
Female	41	56.2
Total	73	100.0

Source: Primary Data, (2025)

In the sampled population, females comprised 56.2%, while males accounted for 43.8%. This indicates a slight predominance of females over males in the study group.

Table 6: Age group

Category	Frequency	Percent
20-29 years	7	9.6
30-39 years	25	34.2
40-49 years	24	32.9
50 and above	17	23.3
Total	73	100.0

Source: Primary Data, (2025)

In terms of age distribution, the majority of respondents fall within the middle-age categories. Specifically, 34.2% are aged between 30 and 39 years, while 32.9% are between 40 and 49 years. A smaller proportion (23.3%) are aged 50 and above, and only 9.6% are in the 20–29 age group. This distribution suggests that the teaching staff is relatively mature, and can give credible information.

Table 7: Teaching Experience

Category	Frequency	Percent
less than 5 years	2	2.7
5-10 years	21	28.8
11-15 years	14	19.2
16 and above	36	49.3
Total	73	100.0

Source: Primary Data, (2025)

Table 7 reveals that nearly half of the participants (49.3%) have taught for 16 years or more, indicating a highly experienced group. An additional 28.8% have between 5 and 10 years of teaching experience, and 19.2% have 11 to 15 years of teaching experience. Only 2.7% of respondents are new to the profession, with less than 5 years of teaching experience. This high level of professional experience suggests a strong foundation of pedagogical knowledge and classroom management among the respondents.

Table 8: Highest Academic Qualification

Category	Frequency	Percent
Certificate	17	23.3
Diploma	39	53.4
Degree	17	23.3
Total	73	100.0

Source: Primary Data, (2025)

The table 8 shows that an overwhelming majority of teachers (53.4%) hold a Diploma, making it the most common qualification among the group. Both Certificate and Degree holders each account for 23.3% of the sample. This indicates that majority had sufficient knowledge of what happens regarding classroom layout in their schools, therefore they were the right source of information.

Table 8: Class Level Taught

Category	Frequency	Percent
lower primary 1-4	28	38.4
upper primary 5-7	45	61.6
Total	73	100.0

Source; Primary Data, (2025)

Lastly, regarding the class levels taught, a greater number of teachers (61.6%) were responsible for upper primary classes (grades 5–7), compared to 38.4% who taught lower primary (grades 1–4). This could suggest a higher concentration of teaching staff or demand in the upper primary levels within the sampled schools.

4.3 The Relationship Between Classroom Layout and Learner Achievement In Public Primary Schools In Central Division, In Arua City

Before establishing any relationship between classroom layout and learner achievement, it was necessary to first examine the results for each variable separately using descriptive statistics, which in this study included frequencies and percentages, given that the type of data used was ordinal. Therefore, the following subsection presents findings about classroom layout and learner achievement.

4.3.1 Descriptive Results On Classroom Lay Out

Teachers were requested to rate six items about classroom layout by indicating their agreement using a four–point Likert scale, as shown in Table 5. The items are presented in the first column, and the proportion of teachers responding to each item is presented in the form of frequencies and percentages in columns 2 to 5. The last column presents the total percentage of teachers for each

item. The key are: SD=strongly disagree, D=Disagree, A=Agree, SA=strongly agree. The analysis and interpretation of the findings regarding classroom layout follow the presentation of the findings in Table 9.

Table 9: Survey Results On Classroom Layout and Learning Achievement (N=76)

Statement	SD (%)	D (%)	A (%)	SA(%)
1.The classroom layout allows for effective teaching and learning	5 (6.8%)	4 (5.5%)	47 (64.4%)	17 (23.3%)
2.A well-organized seating arrangement improves learner engagement	1 (1.4%)	5 (6.8%)	28 (38.4%)	39 (53.4%)
3.I can easily rearrange my classroom layout based on learning activities	3 (4.1%)	8 (11.0%)	44 (60.3%)	18 (24.7%)
4.Group seating enhances collaborative learning and learner achievement	2 (2.7%)	1 (1.4%)	35 (47.9%)	35 (47.9%)
5.The current layout supports learners with diverse learning needs	7 (9.6%)	12 (16.4%)	40 (54.8%)	14 (19.2%)
6.My classroom has enough space for movement-based learning activities	9 (12.3%)	10 (13.7%)	32 (43.8%)	22 (30.1%)

Source: Primary Data, (2025)

This section presents a detailed interpretation of the data collected from 73 participants regarding their perceptions of classroom layout and its impact on teaching and learning. The responses have been analyzed based on both absolute frequencies and percentages to offer a comprehensive understanding of the findings

Regarding Classroom Layout, a total of 64 respondents (87.7%) agreed (47 respondents, 64.4%) or strongly agreed (17 respondents, 23.3%) that the current classroom layout facilitates effective teaching and learning. In contrast, only 9 respondents (12.3%) expressed disagreement, with 5 (6.8%) strongly disagreeing and 4 (5.5%) disagreeing. These results suggest a generally positive perception, indicating that most educators feel their classrooms are organized in a manner conducive to instructional effectiveness.

Regarding whether a well-organised seating arrangement improves learner achievement, an overwhelming 67 respondents (91.8%) agreed that a well-organised seating arrangement enhances learner engagement, with 28 (38.4%) agreeing and 39 (53.4%) strongly agreeing. Only 6 participants (8.2%) expressed disagreement (5 disagreed and 1 strongly disagreed). The high proportion of agreement highlights the perceived importance of seating design in fostering a more interactive and attentive learning environment.

Concerning the ability to rearrange the Classroom Layout Based on Learning Activities, a total of 62 participants (85.0%) reported that they could easily rearrange their classroom layout, including 44 (60.3%) who agreed and 18 (24.7%) who strongly agreed. Meanwhile, 11 respondents (15.1%) indicated some difficulty, with 8 (11.0%) disagreeing and 3 (4.1%) strongly disagreeing. These results suggest that a large majority of teachers have access to flexible classroom spaces that can support various instructional formats and learning activities.

Group Seating Enhances Collaborative Learning and Achievement. Responses to this item revealed near-universal agreement, with 70 respondents (95.8%) stating that group seating improves collaborative learning. This includes 35 (47.9%) who agreed and another 35 (47.9%) who strongly agreed. Only 3 participants (4.1%) expressed disagreement (2 strongly disagreed, 1

disagreed). These findings reflect the widely accepted belief among teachers that group seating arrangements encourage peer interaction and cooperation, which in turn contribute to learner achievement.

On item five, the Current Classroom Layout Supports learners with Diverse Learning Needs. 54 participants (74.0%) believed that the layout supports learners with diverse needs (40 agreed, 14 strongly agreed), a significant 19 respondents (26.0%) disagreed, including 12 (16.4%) who disagreed and 7 (9.6%) who strongly disagreed. These results suggest that although most teachers are satisfied, over a quarter of them recognize limitations in the classroom setup when it comes to accommodating various learning differences or special needs.

The Classroom Has Enough Space for Movement-Based Learning Activities. In this area, 54 respondents (73.9%) agreed that their classroom has sufficient space for movement-based learning activities (32 agreed, 43.8%; 22 strongly agreed, 30.1%). However, 19 respondents (26.0%) reported insufficient space, with 10 disagreeing (13.7%) and 9 strongly disagreeing (12.3%). This distribution suggests that while most classrooms permit some level of physical activity, spatial constraints still affect a significant portion of teachers, potentially limiting the implementation of kinesthetic and interactive teaching strategies.

The interview findings provided deeper insight into the nature and practical implications of classroom layouts in public primary schools in the Central Division of Arua City. These qualitative perspectives complement and reinforce the quantitative survey data.

Several headteachers, including Headteachers A, B, and C, shared that their classrooms are typically arranged in rows with adequate spacing between desks, allowing for clear visibility and learner focus. As Headteacher A noted, *“Our classrooms are arranged in rows with sufficient*

spacing, enabling clear teacher visibility and learner focus” (Interview, 10th April 2025). Observation further reveals that Classroom is spacious enough for all learners in school X.

According to the participants, this structured layout reduces distractions and enhances classroom discipline. These sentiments align with the survey results, where 87.7% of respondents agreed that the current classroom layout supports effective teaching and learning.

In addition to traditional layouts, some schools have adopted more adaptable seating designs. Headteacher B explained, *“We often shift between U-shaped and group arrangements depending on the lesson”* (Interview, 10th April 2025). Observation in W reveals that the seating arrangements allow for the free movement of teachers and learners.

This flexible approach reflects the responses of 85% of surveyed teachers who reported that they are able to rearrange classroom layouts to support different instructional activities.

Headteacher D reinforced this notion, stating, *“We don't use one fixed layout all term. Flexibility is essential to keep learners active”* (Interview, 11th April 2025). These practices demonstrate a proactive approach by educators to optimise classroom space in accordance with pedagogical needs. In school X, observation showed that desks and tables are arranged to promote interaction and group learning (fig. 2)

However, some constraints to flexibility were also noted. For example, Headteacher E mentioned challenges such as immovable furniture and limited classroom space, which at times hinder the reconfiguration of seating arrangements. This concern echoes the 15.1% of survey respondents who indicated difficulty in adjusting classroom layouts. In the same way, when a classroom is congested, even with movable furniture, there will still be no ease in both movement and interaction.

Interview data also supported the survey finding that 91.8% of respondents believed organized seating improves learner engagement. Headteacher C remarked, *“When learners sit in well-structured groups, they participate more, especially in discussions and peer teaching”* (Interview, 10th April 2025). This observation highlights the importance of organised seating in promoting learner involvement and interaction.

All interviewed headteachers acknowledged the importance of group seating in enhancing collaborative learning. Headteacher A emphasized, *“Group work builds social and problem-solving skills.”* (Interview 11th April, 2025) This qualitative feedback reinforces the quantitative result where 95.8% of respondents agreed that group seating promotes learner collaboration and contributes to academic achievement. Although all interviewed head teachers agreed, not all schools had this into practice.

Although many headteachers reported satisfaction with current classroom layouts, there was a shared awareness of existing limitations in catering to diverse learning needs. Headteacher D noted, *“Children with special needs sometimes require assistive furniture or quieter zones which are lacking.”* (Interview 11th April, 2025). This statement aligns with the views of 26% of survey participants who disagreed that the current classroom design sufficiently supports learners with varied educational needs. Observation in school Z agreed with quantitative and qualitative findings as in this school there was no presence of a designated teacher’s area for desks and materials.

Regarding movement-based learning activities, interview responses were mixed. While Headteacher C described efforts to integrate physical activity into lessons for younger learners *“For lower primary, we integrate games and songs with movement. They also acknowledged spatial limitations, particularly in upper primary classes”*. (Interview, 10th April 2025). This

nuanced perspective aligns with the survey data, which shows that 73.9% of teachers agree there is adequate space for such activities, while 26% express concerns about space constraints.

4.3.2 Inferential Statistical Results On Classroom Lay Out And Learner Achievement

The first hypothesis, ‘‘*There is no significant relationship between classroom layout and learner achievement in public primary schools in Central Division in Arua City*’’, was tested.

The Pearson correlation coefficient was used to determine the relationship between classroom layout and learner achievement in public primary schools in Arua City, Uganda.

Table 10 presents the test results for the first hypothesis.

Table 10: Correlation and Coefficient of Determination On Classroom Lay Out and Learner Achievement

Variable Pair	r	p-value	Interpretation
Classroom Lay out & Learner Achievement	0.070	0.554	Very weak not-significant

Source: Primary Data, (2025)

Table 5 presents the correlation and coefficient of determination between classroom layout and learner achievement. The Pearson correlation coefficient (r) was found to be 0.070, indicating a very weak positive relationship between the two variables. This suggests that as the classroom layout improves or changes, there is only a slight and negligible increase in learner achievement. However, this relationship is not statistically significant, as indicated by the p-value of 0.554, which is far above the commonly accepted alpha level of 0.05. This means that only 0.49% of the variation in learner achievement can be explained by the classroom layout.

Given the high p-value, the result fails to provide sufficient evidence to reject the null hypothesis. Therefore, we conclude that there is no statistically significant relationship between classroom layout and learner achievement in this study.

4.4.1 Descriptive Results on Instructional Materials (N=76)

Source: Primary Data, (2025)

Statement	SD (%)	D (%)	A (%)	SA (%)
1.The availability of instructional materials enhances learner learning outcomes	4 (5.5%)	2 (2.7%)	25 (34.2%)	42 (57.5%)
2.My school provides sufficient textbooks for all subjects	2 (2.7%)	20 (27.4%)	39 (53.4%)	12 (16.4%)
3.The use of visual aids (charts, posters, diagrams) improves learner understanding	–	4 (5.5%)	29 (39.7%)	40 (54.8%)
4.Digital resources (videos, projectors-learning) are integrated into my teaching	19 (26.0%)	20 (27.4%)	27 (37.0%)	7 (9.6%)
5.Hands-on learning materials (science kits, math manipulatives) enhance learner achievement	–	5 (6.8%)	43 (58.9%)	25 (34.2%)
6.I receive adequate training on how to use instructional materials effectively	9 (12.3%)	11 (15.1%)	43 (58.9%)	10 (13.7%)

Teachers responded to six items about Instructional materials and learner achievement in public primary schools in Arua City, Uganda, by indicating their level of agreement using a four-point Likert scale, as shown in Table 10. The analysis and interpretation of the findings follows the presentation

Table 11: Survey Results On Instructional Materials and Learner Achievement

Source: Primary Data, (2025)

The findings presented in Table 10 indicate that the majority of respondents hold positive views regarding the availability and impact of instructional materials on learner achievement. A significant proportion of participants (57.5%) strongly agreed, and 34.2% agreed, that the availability of instructional materials enhances learner achievements. This suggests a widespread

belief among teachers that such materials play a critical role in improving educational performance.

However, when asked whether their schools provide sufficient textbooks for all subjects, responses were more mixed. While a combined 69.8% agreed or strongly agreed, a notable 27.4% disagreed, suggesting that access to textbooks may not be consistently adequate across all classrooms. This inconsistency may hinder efforts to ensure equitable access to learning resources.

The use of visual aids such as charts, posters, and diagrams was also seen as beneficial, with 54.8% strongly agreeing and 39.7% agreeing that such aids improve learner understanding. These findings demonstrate the broad agreement regarding the educational benefits of visual aids in improving understanding. Responses to the incorporation of digital resources, however, showed less positive opinions. Just 37.0% of respondents agreed and 9.6% strongly agreed that their instruction included digital resources. Notably, 27.4% disagreed and 26.0% strongly disagreed, suggesting that many classrooms do not use digital tools to their full potential or do not have access to them. 58.9% of respondents agreed and 34.2% strongly agreed that hands-on learning resources, like science kits and math manipulatives, improve student achievement. This shows that interactive and experiential learning methods are strongly supported.

Finally, in terms of professional development, 58.9% agreed and 13.7% strongly agreed that they receive adequate training on how to use instructional materials effectively. Nonetheless, 15.1% disagreed and 12.3% strongly disagreed, indicating a lack of training options for certain teachers.

All things considered, the data highlight the value of educational resources in promoting learning while also highlighting areas that need work, most notably the equitable distribution of training and textbooks and the incorporation of digital tools. School administrators and legislators looking

to improve learner engagement and instructional quality will find these insights to be helpful. Deeper understanding of the themes identified in the quantitative findings was made possible by the interview data collected from a sample of headteachers from different schools. The statistical trends were generally supported by the qualitative responses, which also highlighted the difficulties and situational elements that affect the use of instructional materials while reaffirming their importance in the teaching and learning process. The majority of headteachers surveyed strongly agreed that instructional materials improve students' learning outcomes.

. One headteacher remarked, *“When I use teaching aids, especially real-life examples or visual tools, the learners are more engaged and tend to grasp the concepts better. It really makes a difference in their performance.”*(Interview 10th April, 2025) This sentiment was widespread, validating the 91.7% of survey respondents who agreed or strongly agreed with this statement. Observation in school V revealed that the availability of adequate textbooks and learning materials facilitated learners' grasp of concepts. (fig.5)

Despite recognising the value of instructional materials, several head teachers highlighted persistent issues with the availability of basic resources such as textbooks. One participant explained, *“We often have to share textbooks among learners, especially in larger classes. It’s hard to manage lessons effectively when not everyone has access to the same materials.”* (Interview 11th April, 2025) .This aligns with the 27.4% of survey participants who disagreed that their schools provided sufficient textbooks. Observation in school Y highlighted that locally made materials and text books were not adequate for the learners.

The interviews also affirmed the high regard for visual aids. Teachers emphasized their utility in simplifying complex concepts and maintaining learner interest. A science teacher stated, *“Charts and diagrams help me explain difficult topics like the human body systems. Learners remember better when they see something visual.”* (Interview 11th April, 2025). These qualitative insights support the 94.5% of respondents who acknowledged the value of visual materials. Observations in school X demonstrated that visual aids, such as charts, maps, and posters, were factors that enhanced learner achievement. (fig.6)

The interviews revealed significant barriers to the use of digital tools in instruction. Many headteachers cited inadequate infrastructure and lack of training as major obstacles. One interviewee noted, *“We don’t have reliable internet or enough devices. Even when we want to use digital content, it’s not always feasible.”* (Interview 11th April, 2025). Such responses explain why only 46.6% of surveyed teachers felt digital resources were integrated into their teaching, with over half expressing disagreement or strong disagreement. Observations in all the schools, V, W, X, Y, and Z, affirmed that there were no digital learning resources or materials, such as projectors and computers, in any of the schools.

Teachers were particularly enthusiastic about using hands-on materials, especially in STEM subjects. As one teacher described, *“Using manipulatives in math has changed how my learners understand abstract concepts. It makes learning more concrete and enjoyable.”* (Interview 10th April, 2025). This reinforces the strong support found in the survey, where 93.1% agreed or strongly agreed on the value of these tools. Observation in school Y confirmed that engaging directly with tangible resources enables learners to actively participate in the educational process, fostering a deeper understanding and retention of concepts.

While many headteachers acknowledged receiving some training on using instructional materials, others pointed to gaps in both frequency and quality. One participant said, *“We get some training, but it’s not consistent. Sometimes we are just handed materials with no guidance on how to use them effectively.”*(Interview 10th April, 2025). These comments correspond with the 27.4% of respondents who disagreed or strongly disagreed that they receive adequate training.

4.4.2 Inferential Statistical Results On Instructional Materials and Learner Achievement

The second hypothesis, *“There is no significant relationship between Instructional materials and learner achievement in public primary schools in Central Division in Arua City, Uganda”*, was tested using the Pearson correlation coefficient and the coefficient of determination. Table 11 presents the test results.

Table 12 Correlation And Coefficient of Determination On Instructional Materials and Learner Achievement

Variable Pair	r	p-value	Interpretation
Instructional Materials & Learner Achievement	0.372	0.001	Moderate statistically significant

Source: Primary Data (2025)

There is a moderate positive correlation ($r = 0.372$) between instructional materials and learner achievement. This suggests that higher-quality instructional materials are associated with improved student performance. 13.84% of the variation in learner achievement can be attributed to instructional materials. With a p-value of 0.001, this result is statistically significant.

The null hypothesis that, *“there is no significant relationship between instructional materials and learner achievement”* was tested.

Given that the p-value is 0.001, which is less than 0.01, the null hypothesis is rejected.

4.5 The Relationship Between Learning Zone and Learner Achievement In Public Primary Schools In Central Division Arua City, Uganda

Before determining the relationship between Learning zones and learner achievement, descriptive statistics for learning zones are presented to show the respondents views on this variable.

4.5.1 Descriptive Results On Learning Zones

Teachers were requested to respond to six items about learning zones by indicating their level of agreement using a four-point Likert scale, as shown in Table 12. The analysis and interpretation of the findings about learning zones follows a presentation of findings.

Table 13: Learning Zone Descriptive Statistics (N=76)

Statement	SD (%)	D (%)	A (%)	SA (%)
1.My school has well-defined learning zones that support different learning activities	8 (11.0%)	17 (23.3%)	44 (60.3%)	4 (5.5%)
2.The reading zone/library is well-equipped and accessible to learners	3 (4.1%)	19 (26.0%)	37 (50.7%)	14 (19.2%)
3.Group work areas enhance learner collaboration and problem-solving skills	1 (1.4%)	1 (1.4%)	46 (63.0%)	25 (34.2%)
4.Outdoor learning spaces are used regularly for teaching and learning	4 (5.5%)	14 (19.2%)	46 (63.0%)	9 (12.3%)
5.Access to technology-based learning zones improves learner engagement	10 (13.7%)	14 (19.2%)	33 (45.2%)	16 (21.9%)
6.Learning zones accommodate learners with different learning needs	5 (6.8%)	11 (15.1%)	38 (52.1%)	19 (26.0%)

Source: Primary Data, (2025)

The survey findings reveal generally positive perceptions of the learning zones in the school, although some areas highlight inconsistencies and potential for improvement. The majority of respondents (60.3%) agreed, and a smaller proportion (5.5%) strongly agreed, that the school has well-defined learning zones that support different learning activities. This suggests that for a significant portion of participants, the spatial organization and functional zoning within the school are conducive to learning. However, a notable minority (34.3%) expressed disagreement or strong disagreement, indicating that some stakeholders may be either unaware of or dissatisfied with the current zoning arrangements. These conflicting opinions suggest that learning zones should be more clearly defined, communicated, and applied uniformly throughout the school.

50.7% of respondents agreed and 19.2% strongly agreed that the library or reading zone is well-equipped and easily accessible to students. Although this shows that almost 70% of respondents have a positive opinion of the state and usability of the library, the 30.1% who disagreed or strongly disagreed raise concerns. These worries might be caused by a lack of resources, restricted access hours, or problems with the way the space is designed. This finding emphasizes the significance of continuous investment in library facilities and fair access for all students, as literacy and self-directed learning are based on having access to print and digital resources.

Out of all the assessed learning zones, group work areas were thought to be the most favorable. 97.2% of participants agreed (63.0%) or strongly agreed (34.2%) that these areas improve students' ability to collaborate and solve problems. This resounding support implies that the school's instructional practices successfully incorporate collaborative learning environments. The importance of social constructivist methods has long been highlighted in research, and this finding

confirms that physical areas that encourage collaboration and interaction are in line with best practices for teaching in the educational setting.

A more moderate but still positive assessment was given to outdoor learning areas. Outdoor spaces are regularly used for teaching and learning, according to the majority of respondents (63.0%), with an additional 12.3% strongly agreeing. Nonetheless, 24.7% disagreed or strongly disagreed, indicating that although outdoor learning is used, its application might vary depending on the subject or grade level. This inconsistent implementation may be the result of curriculum limitations, teacher readiness, or logistical issues. This finding, however, points to ways to broaden and incorporate outdoor pedagogy more regularly into regular teaching routines, especially in light of the growing emphasis on experiential and nature-based learning.

There were more differing opinions about technology-based learning zones. Although 21.9% strongly agreed and 45.2% agreed that having access to these zones increases learner engagement, a sizeable percentage (32.9%) disagreed. This division might be a sign of unequal access to digital tools, differences in teachers' ability to effectively integrate technology, or irregular upkeep and updating of digital infrastructure. To maximize the pedagogical use of educational technology in these zones, the data clearly shows that improving digital readiness, guaranteeing fair access, and offering professional development are necessary.

There were more differing opinions about technology-based learning zones. Although 21.9% strongly agreed and 45.2% agreed that having access to these zones increases learner engagement, a sizeable percentage (32.9%) disagreed. This division might be a sign of unequal access to digital tools, differences in teachers' ability to effectively integrate technology, or irregular upkeep and updating of digital infrastructure. To maximize the pedagogical use of educational technology in

these zones, the data clearly shows that improving digital readiness, guaranteeing fair access, and offering professional development are necessary.

Finally, the inclusiveness of learning zones in accommodating learners with different learning needs was affirmed by most respondents. A combined 78.1% agreed or strongly agreed that learning spaces are responsive to the diverse needs of learners. This finding reflects positively on the school's efforts to create adaptable and inclusive environments. However, the 21.9% of participants who disagreed or strongly disagreed suggest that certain groups of learners such as those with disabilities, language barriers, or specific learning difficulties may still face challenges. Ensuring full inclusivity requires continuous monitoring, differentiated instructional materials, and ongoing support for both learners and educators.

This section presents the perspectives of five headteachers (referred to as Headteachers A, B, C, D, and E) on the implementation and functioning of learning zones within their schools. Their experiences offer insight into the practicalities and effectiveness of using classroom space to enhance learning.

The headteacher shared that their classrooms include clearly defined areas, such as a reading corner, discussion tables, and a quiet zone for individual work. *“We’ve found that younger pupils in particular respond very well to having specific spaces for different tasks,”* they noted. Observation in school Z demonstrated that the designated reading corner and group work area enhanced the learners' grasping capacity. Headteacher B offered a different experience: *“Our classrooms aren’t traditionally zoned, but teachers often set up temporary areas for specific lessons, such as science projects or group debates.”* They explained that while this provides some flexibility, it lacks the consistency of permanent zones. (Interview 10th April, 2025). Observation in school W indicated that hands-on materials facilitate experiential learning, allowing learners to explore, experiment, and apply knowledge in meaningful ways that foster deeper cognitive connections.

Headteacher C highlighted a structured and intentional approach: *“Yes, we have well-defined zones for group discussions, and independent work. They are designed to be functional and visually distinct to help learners transition between different modes of learning.”* Headteacher D emphasized the importance of zoning in special education settings: *“We use sensory areas, quiet corners, and spaces for movement-based learning. These are vital for meeting the diverse needs of our learners.”* Headteacher E added: *“We have multiple learning stations, including a maker space, reading zone, and collaborative learning areas. Learners are often involved in designing these zones, which increases their engagement.”* (Interview 10th April, 2025)

Headteachers A, C, and D emphasized that their learning zones are clearly marked and accessible. *“We use signs and visuals so that learners know exactly what each zone are for,”* said Headteacher A. Headteacher D added, *“In our context, we also use tactile markers and consistent layouts to support accessibility for all learners.”* By contrast, Headteacher B mentioned, *“Since our zones are set up temporarily, learners sometimes need reminders about expectations in those areas.”* Observation in school Z affirmed that, outdoor spaces promote physical movement and reduce cognitive fatigue, factors that contribute to improved concentration and information processing. Headteacher E noted, *“Because our zones are part of the classroom culture and co-designed, learners know how to use them effectively.”* (Interview 10th April, 2025)

Headteachers C and E agreed that well-designed learning zones significantly enhance learner collaboration. Headteacher A noted, *“Round tables and discussion zones really help learners work together effectively.”* Similarly, Headteacher B observed that *“when we set up the space intentionally, peer interaction improves noticeably”* (Interview, April 10, 2025). Observations at School W supported these insights, indicating that purposeful spatial organization reduces

communication barriers and fosters a sense of community among learners, enabling them to share ideas, ask questions, and support one another more effectively. (fig.7)

Headteacher C emphasized the importance of a learner-centered approach: *“Our zones are designed to promote interaction; learners often choose where they want to work based on the task.”* Echoing this sentiment, Headteacher D explained, *“Zones are designed to promote both independence and supported interaction, especially for learners who need structured peer engagement.”* Finally, Headteacher E highlighted the connection between flexible learning spaces and pedagogy: *“Inquiry-based learning is central to our approach, and our flexible spaces support teamwork and creativity”* (Interview, April 11, 2025).

4.5.2: Inferential Statistical Results On Learning Zones and Learner Achievement

The third hypothesis, *“There is no significant relationship between learning zones and learner achievement in public primary schools in Central Division in Arua City”* was tested. Table 14 below presents the test results

Table 14: Correlation And Coefficient of Determination On Learning Zones and Learner Achievement In Public Primary Schools In Central Division In Arua City, Uganda

Variables	r	p-value	Interpretation
<i>Learning Zones & Learner Achievement</i>	<i>0.380</i>	<i>0.001</i>	<i>Moderate statistically significant</i>

Source: Primary Data, (2025)

The findings presented in Table 13 reveal a statistically significant relationship between learning zones and learner achievement in public primary schools in the Central Division of Arua City, Uganda.

A moderate positive correlation ($r = 0.380$) was found between learning zones and learner achievement. This indicated that improvements in the design or use of learning zones were associated with increases in learner achievement. 14.44% of the variation in learner achievement was explained by learning zones, while the remaining 85.56% was due to other factors. The p-value was 0.001, which meant the result was statistically significant. As a result, the null hypothesis, which stated that there is no significant relationship between learning zones and learner achievement, was rejected.

4.6 Descriptive Result On Learner Achievement

Teachers responded to five items about learning achievements in public primary schools in the central division of Arua City, Uganda, by indicating their agreements using a four-point Likert scale, as shown in Table 14. The analysis and interpretation of the findings follow the presentation in Table 15:

Table 15: Descriptive Statistics On Learner Achievement

Statement	SD (%)	D (%)	A (%)	SA (%)
1. The classroom design in my school has a direct impact on learner achievement	1 (1.4%)	5 (6.8%)	51 (69.9%)	16 (21.9%)
2. Learners are more engaged and perform better when classroom design elements (layout, materials, learning zones) are well-structured	3 (4.1%)	6 (8.2%)	28 (38.4%)	36 (49.3%)
3. Schools with well-designed classrooms achieve better academic results than those with poorly designed classrooms	1 (1.4%)	7 (9.6%)	32 (43.8%)	33 (45.2%)

Statement	SD (%)	D (%)	A (%)	SA (%)
4. A flexible and interactive classroom environment enhances creativity and critical thinking among learners	2 (2.7%)	2 (2.7%)	42 (57.5%)	27 (37.0%)
5. There is a need for more improvements in my school's classroom design to enhance learner achievement	1 (1.4%)	7 (9.6%)	32 (43.8%)	33 (45.2%)

Source: Primary Data, (2025)

The findings presented in Table 14 highlight the perceived influence of classroom design on learner achievement among respondents. A significant majority of participants (69.9% agreeing and 21.9% strongly agreeing) acknowledged that the classroom design in their schools directly impacts learner achievement. This suggests that the physical layout and structure of learning spaces are widely recognised as significant contributors to academic performance. Furthermore, 87.7% of the respondents agreed or strongly agreed that learners are more engaged and perform better when classroom design elements such as layout, materials, and learning zones are well-structured. This high level of agreement underscores the role of a thoughtfully organized classroom environment in fostering learner motivation and participation.

Additionally, respondents expressed strong belief in the academic advantages of well-designed learning spaces. A combined 89% of the participants agreed or strongly agreed that schools with well-designed classrooms tend to achieve better academic results compared to those with poorly designed ones. This sentiment reflects a consensus that educational outcomes are closely linked to the physical learning environment. Similarly, the notion that a flexible and interactive classroom environment enhances learners' creativity and critical thinking was strongly supported, with 94.5%

of respondents either agreeing or strongly agreeing. This highlights the importance of adaptive learning spaces that foster learner interaction, innovation, and engagement with the content.

4.7 Regression Statistics

After determining how each of the independent variables affected the dependent variable, a regression analysis was conducted to identify which independent variable had the greatest impact on the dependent variable. Findings are presented in table 15.

Table 16: Regression Analysis Results

Variable	Coefficient (B)	Standard Error	Standardized Coefficient (Beta)	t-value	p-value
Constant	7.757	2.287	—	3.391	0.001
Classroom lay out (CL)	-0.103	0.097	-0.119	-1.055	0.295
Instructional Materials (IM)	0.325	0.100	0.367	3.263	0.002
Learning Zones (LZ)	0.270	0.083	0.343	3.262	0.002

Source: Primary Data, (2025)

Table 16 presents the results of the multiple regression analysis conducted to investigate the influence of the independent variables CL, IM, and LZ on the dependent variable. The regression model's summary reveals that it accounts for about 25.9% of the variation in the dependent

variable, as shown by the R-squared value of 0.259. When accounting for the number of predictors, the adjusted R-squared value stands at 0.226, suggesting a moderate capacity to explain the data. The standard error of the estimate, which measures the typical difference between observed and predicted values, is 1.80567. The ANOVA findings confirm that the overall regression model is statistically significant. The F-test produced a value of 8.026 with a p-value of 0.000, indicating that the model effectively predicts the dependent variable at the 1% significance level. This implies that the predictors CL, IM, and LZ, as a group, contribute to explaining the variations in the dependent variable. Looking at the individual predictors, the intercept term is 7.757 and is statistically significant ($p = 0.001$). This implies that when all independent variables are zero, the expected value of the dependent variable is 7.757. Among the predictors, CL has a negative coefficient of -0.103, but this effect is not statistically significant ($p = 0.295$). Therefore, CL does not have a meaningful impact on the dependent variable within this model.

In contrast, both IM and LZ have positive and statistically significant effects on the dependent variable. The coefficient for IM is 0.325 ($p = 0.002$), with a standardised beta of 0.367, indicating that IM is a strong predictor of the outcome. Similarly, LZ has a coefficient of 0.270 ($p = 0.002$) and a standardised beta of 0.343, indicating that it also significantly contributes to predicting the dependent variable. These results suggest that increases in IM and LZ are associated with increases in the dependent variable.

CHAPTER FIVE

SUMMARY, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary, discussion, conclusions, recommendations, limitations, and areas for further study. It is divided into four sub-sections. The first section presents a summary of findings. The second subsection presents the discussions in accordance with the study's objectives. The third sub-section presents the conclusions. The fourth sub-section presents the recommendations. The fifth subsection presents the limitations of the study, and the sixth subsection outlines areas for further study.

5.2 Summary of Findings

5.2.1 Classroom Layout and Learner Achievement In Public Primary Schools In Central Division, Arua City, Uganda

The findings revealed a very weak positive correlation ($r = 0.070$) between classroom layout and learner achievement, with a p-value of 0.554, indicating that the relationship was not statistically significant. This suggests that while classroom layout such as the arrangement of desks, space for movement, lighting, and ventilation may play a role in creating a supportive learning atmosphere, it does not have a meaningful impact on learner achievement within the context of this study. As such, the null hypothesis, which stated that there is no significant relationship between classroom layout and learner achievement, was not rejected. These findings imply that classroom layout, although a factor in the broader learning environment is not a strong predictor of academic performance when considered independently.

5.2.2 Instructional Materials and Learner Achievement In Public Primary Schools In Central Division, Arua City, Uganda

The study found a moderate positive and statistically significant correlation ($r = 0.372$, $p = 0.001$) between instructional materials and learner achievement. This indicates that an increase in the availability and effective utilization of instructional materials such as textbooks, charts, visual aids, and hands-on learning resources is associated with improved learner performance. The result suggests that learners benefit significantly from diverse and engaging teaching resources that enhance understanding and retention. Therefore, the null hypothesis was rejected, confirming that instructional materials have a positive and moderate influence on learner achievement. This highlights the importance of ongoing investment in instructional resources to enhance educational outcomes.

5.2.3 Learning Zones and Learner Achievement In Public Primary Schools In Central Division, Arua City, Uganda

The analysis revealed a moderate positive and statistically significant correlation ($r = 0.380$, $p = 0.001$) between learning zones and learner achievement. This means that the existence and quality of learning zones such as reading corners, group work areas, outdoor learning spaces, and technology-enhanced zones have a moderate influence on learners' academic performance. The findings imply that well-defined, functional, and inclusive learning zones support various learning styles and activities, thereby enhancing engagement, collaboration, and academic outcomes. As a result, the null hypothesis was rejected, confirming that learning zones play a meaningful role in promoting learner achievement in the study area.

5.3 Discussion

5.3.1 Classroom Layout and Learner Achievement In Public Primary Schools In Central Division, Arua City

This objective examined the influence of classroom layout on learner academic achievement. The descriptive findings indicated a strong positive perception among teachers regarding the role of classroom layout in facilitating effective teaching and learning. Specifically, 87.7% of teachers agreed that their classroom layout supports instructional effectiveness, while 91.8% acknowledged that a well-organized seating arrangement enhances learner engagement. Furthermore, nearly all teachers (95.8%) agreed that group seating arrangements promote collaborative learning and learner achievement. These results resonate with the qualitative data where headteachers reported flexible classroom setups, with Headteacher B stating, *“We often shift between U-shaped and group arrangements depending on the lesson”* (Interview, 10th April 2025). Such flexibility fosters learner interaction, a key element of social constructivist pedagogy, which argues that knowledge construction is deeply social and context-dependent (Vygotsky, 1978).

Literature supports the positive impact of well-organized classroom spaces on learner engagement and collaborative learning (Baker, 2017; Auman, 2024). These findings align with the theoretical underpinnings of Bronfenbrenner’s Ecological Systems Theory (1979), which posits that the immediate environment, or microsystem (classroom), plays a pivotal role in learner development. An enabling classroom layout can enhance the quality of interactions between teachers and learners, thus fostering cognitive and social growth.

However, the inferential statistical analysis demonstrated that the relationship between classroom layout and learner achievement was weak and statistically insignificant ($r = 0.070$, $p = 0.554$). This

suggests that while teachers perceive classroom layout positively, it does not strongly predict learner academic outcomes in this context. This finding aligns with the mixed evidence in the literature, where some studies suggest strong links between the environment and learning outcomes (Tellier, 2024), while others emphasise the predominance of factors such as teaching quality, curriculum, and learner socioeconomic status (Jacob et al., 2020; Kim et al., 2023).

Qualitative data highlighted some barriers to fully optimizing classroom layouts. Headteacher E noted, *“Immovable furniture and limited classroom space sometimes hinder reconfiguration”* (Interview, 11th April 2025). This observation supports the quantitative finding that 15.1% of teachers reported difficulty rearranging the classroom, limiting the practical benefits of flexible seating. Moreover, about 26% of teachers disagreed that the layout supports learners with diverse needs, consistent with Headteacher D’s remark, *“Children with special needs sometimes require assistive furniture or quieter zones which are lacking”* (Interview, 11th April 2025). These challenges illustrate how physical constraints may moderate the impact of layout on learning, as postulated in the Ecological Systems Theory, where multiple contextual layers influence development.

Furthermore, space limitations for movement-based learning activities were noted by 26% of teachers and echoed in interviews. Headteacher C explained, *“For lower primary, we integrate games and songs with movement, but upper classes face spatial constraints”* (Interview, 10th April 2025). Such spatial limitations can reduce opportunities for kinesthetic learning styles, which Gardner’s Multiple Intelligences Theory highlights as essential for diverse learners (Gardner, 1983).

Numerous studies affirm that well-structured learning environments promote engagement and collaboration. Baker (2017) and Auman (2024), as noted earlier, link flexible classroom arrangements with higher student interaction and participation. Rands and Gansemer-Topf (2017) emphasized that active learning environments are characterized by mobility and adaptable seating which encourage deeper cognitive processing. In such contexts, learners become active participants rather than passive recipients of knowledge.

However, the weak correlation in this study between layout and actual learner achievement reflects wider debates in literature. For instance, Jacob et al. (2020) and Kim et al. (2023) argue that factors such as teacher effectiveness, curriculum relevance, parental involvement, and socio-economic background have a more profound and measurable impact on learner outcomes than classroom configuration alone. Thus, layout may function more as a supporting condition rather than a primary driver of achievement.

Empirical evidence remains mixed. Tellier (2024) found strong associations between flexible learning spaces and improved performance in science subjects, especially where inquiry-based learning was emphasized. Conversely, Wang and Deggs (2018) found no significant improvement in test scores after implementing open and collaborative classroom designs in low-resource schools, highlighting that context matters, resource availability, teacher training, and school leadership significantly mediate outcomes.

The qualitative data from this study reveal practical barriers to maximizing layout benefits such as immovable furniture, limited space, and inadequate provisions for learners with special needs. This aligns with Blackmore et al. (2011), who emphasised that without attention to design equity, learning environments risk reinforcing educational exclusion. Woolner et al. (2012) similarly

argued that the affordances of classroom spaces can either enhance or limit inclusive practices, depending on how well the space supports learners with varied needs.

The overall findings support the notion that classroom layout acts more as a moderating variable, facilitating or constraining teaching and learning processes rather than directly predicting learner achievement. This perspective is shared by Barrett et al. (2015) in their *Clever Classrooms* report, which found that layout features (e.g., flexibility, lighting, acoustics) had an indirect impact on learning by influencing mood, motivation, and focus.

5.3.2 Instructional Materials and Learner Achievement In Public Primary Schools In Central Division, Arua City, Uganda

The findings from both quantitative and qualitative data consistently highlight the crucial role that instructional materials play in enhancing learner achievement. A substantial majority of teachers (91.7%) agreed that the availability of instructional materials improves learner learning outcomes, reinforcing the constructivist view that learners build understanding most effectively through interaction with tangible resources (Piaget, 1954; Vygotsky, 1978). This was echoed by Headteacher A, who stated, *“When I use teaching aids, especially real-life examples or visual tools, the learners are more engaged and tend to grasp the concepts better. It really makes a difference in their performance”* (Interview, 10th April 2025). Such perspectives strongly validate the quantitative findings and align with established educational theory, emphasising the importance of contextualised learning aids.

The moderate positive correlation between instructional materials and learner achievement ($r = 0.372$, $p = 0.001$) further confirms that enhanced access and effective use of these materials

correlate with improved academic performance. This supports prior research suggesting that resource availability is fundamental to academic success (UNESCO, 2017; Banerjee et al., 2007).

However, despite the overall positive sentiment, several participants expressed concerns over resource limitations. For instance, 27.4% of teachers reported insufficient access to textbooks, which impacts lesson delivery and learner engagement. This was poignantly described by Headteacher B, who remarked, *“We often have to share textbooks among learners, especially in larger classes. It’s hard to manage lessons effectively when not everyone has access to the same materials”* (Interview, 11th April 2025). Observation in School Y corroborated this, noting that *“locally made materials and textbooks were not adequate for the learners”*, indicating tangible resource shortages.

Visual aids such as charts and diagrams received strong support from 94.5% of respondents, who agreed that these tools improve learner understanding. One science teacher observed, *“Charts and diagrams help me explain difficult topics like the human body systems. Learners remember better when they see something visual”* (Interview, 11th April 2025). Observations in School X showed classrooms richly adorned with visual aids, posters, maps, and charts, which appeared to stimulate learner interest and facilitate comprehension, illustrating the practical impact of these tools and supporting Dual Coding Theory (Paivio, 1986).

On the other hand, digital resources remain underutilized. Less than half of teachers reported integration of digital tools into their teaching, and interviews revealed infrastructural challenges. Headteacher C lamented, *“We don’t have reliable internet or enough devices. Even when we want to use digital content, it’s not always feasible”* (Interview, 11th April 2025). Observations across Schools V, W, X, Y, and Z confirmed the absence of digital learning tools such as projectors or

computers. These findings highlight a significant gap in ICT integration consistent with global challenges in low-resource settings (World Bank, 2021).

Hands-on learning materials, such as science kits and math manipulatives, were enthusiastically endorsed, with 93.1% agreement on their benefits. A math teacher noted, *“Using manipulatives in math has changed how my learners understand abstract concepts. It makes learning more concrete and enjoyable”* (Interview, April 10, 2025). Observations in School Y demonstrated active learner participation when students were engaged with these materials, confirming Kolb’s (1984) Experiential Learning Theory, which emphasises learning through direct experience. Training on the effective use of instructional materials showed mixed results. While many teachers received some training, gaps remain. Headteacher D noted, *“We get some training, but it’s not consistent. Sometimes we are just handed materials with no guidance on how to use them effectively”* (Interview, 10th April 2025). This echoes the survey finding that 27.4% of teachers felt inadequately trained, underscoring the critical need for ongoing professional development to maximize the benefits of instructional resources (Guskey, 2002).

The findings align strongly with Constructivist Learning Theory (Piaget, 1954; Vygotsky, 1978), which posits that learners actively construct knowledge through interaction with their environment, including concrete and symbolic instructional tools. Vygotsky’s concept of tools and signs highlights the central role of mediated learning, where visual, tactile, or representational aids help learners transition from everyday to scientific concepts. Similarly, Kolb’s Experiential Learning Theory (1984) emphasizes learning through active, hands-on experiences, reinforcing the observed benefits of manipulatives and science kits in deepening conceptual understanding. Additionally, Paivio’s Dual Coding Theory (1986) offers a cognitive explanation for the effectiveness of visual aids. According to this theory, learners process information through two

channels; verbal and visual. When both are engaged simultaneously, retention and understanding improve. This was clearly illustrated in your findings, where charts, diagrams, and posters were noted to enhance student comprehension.

Instructional materials are most effective when they are contextually relevant and locally adapted. Akyeampong (2009) highlighted the importance of culturally and linguistically responsive materials in promoting learner inclusion and improving outcomes. Locally made materials observed in your study are commendable; however, as noted, they were insufficient in quantity and quality, reducing their impact. While digital tools offer transformative potential, their absence in many of the observed schools reflects broader systemic challenges. The World Bank (2021) notes that in low-income countries, fewer than 20% of schools have adequate ICT infrastructure, which limits opportunities for digital integration in classrooms. Trucano (2015) further argues that the introduction of technology without adequate training, maintenance, and pedagogical alignment tends to have minimal or even negative impact. While availability of materials is crucial, teacher competency in using them effectively is equally important. The mixed findings on training in your study reflect a global challenge. Guskey (2002) emphasized that professional development must be ongoing, practical, and tied to classroom practice to yield measurable improvements in teaching and learning. Similarly, O'Sullivan (2006) notes that instructional materials are underutilized or misused in many African contexts due to lack of targeted training and support.

The issue of inequitable distribution and access such as textbook shortages reported by 27.4% of teachers is a persistent barrier. According to Mulkeen (2005), disparities in resource allocation often exacerbate educational inequalities, especially in rural or underserved areas. The shared textbooks and under-resourced schools you observed exemplify how instructional material gaps widen the achievement gap across learners.

5.3.3 Learning Zones and Learner Achievement In Public Primary Schools In Central Division, Arua City

The findings from this study reveal a statistically significant and moderately positive relationship between the organization of learning zones and learner achievement ($r = 0.380$, $p = 0.001$). This suggests that well-defined and effectively utilised learning zones make a meaningful contribution to academic performance. These results are consistent with theories of environmental psychology and constructivist learning (Bronfenbrenner, 1979; Vygotsky, 1978), which emphasize the importance of spatial arrangement and physical context in shaping learner engagement and achievement.

Quantitatively, 65.8% of teachers agreed or strongly agreed that their schools have well-defined learning zones supporting various activities. This suggests general institutional recognition of zoning as a pedagogical strategy. However, a notable 34.3% expressed dissatisfaction, reflecting disparities in implementation. As Headteacher B noted, *“Our classrooms aren’t traditionally zoned, but teachers often set up temporary areas for specific lessons, such as science projects or group debates”* (Interview, 10th April 2025). This inconsistency may explain the moderate rather than strong correlation between learning zones and academic outcomes.

Reading zones or libraries were viewed favorably by 69.9% of respondents, yet a significant 30.1% expressed concern. This mirrors Headteacher A’s observation: *“We’ve found that younger pupils in particular respond very well to having specific spaces for different tasks,”* highlighting that zoning benefits may be more evident in early year’s education. Observation in School Z confirmed this, showing that *“the designated reading corner and group work area enhanced the grasping*

capacity of the learners.” These observations support research indicating that structured reading spaces foster independent learning and literacy growth (Krashen, 2004).

Group work areas stood out as the most positively received, with 97.2% of respondents endorsing them. Headteacher A remarked, *“Round tables and discussion zones really help learners work together effectively,”* and Headteacher C emphasized learner autonomy: *“Our zones are designed to promote interaction. Learners often choose where they want to work based on the task”* (Interview, 10th April 2025). These findings strongly support social constructivist theory, which emphasises the importance of peer interaction and collaboration in cognitive development (Vygotsky, 1978). Observation in School W further confirmed that *“purposeful organization reduces barriers to communication and promotes a sense of community among learners.”*

Outdoor learning spaces were also appreciated, with 75.3% of respondents agreeing. However, a quarter of participants expressed concerns about irregular or limited use. Headteacher D acknowledged, *“We use sensory areas, quiet corners, and spaces for movement-based learning. These are vital for meeting the diverse needs of our learners.”* Observation in School Z reinforced this, noting that *“outdoor spaces promote physical movement and reduce cognitive fatigue, factors that contribute to improved concentration and information processing.”* These insights align with research promoting nature-based and kinesthetic learning as valuable components of holistic education (Louv, 2008).

Technology-based learning zones received more mixed responses, with only 67.1% of respondents in agreement. Headteacher C highlighted infrastructural barriers: *“We don’t have reliable internet or enough devices. Even when we want to use digital content, it’s not always feasible”* (Interview, 11th April 2025). Observations in Schools V, W, X, Y, and Z confirmed the general absence of

digital resources, such as computers and projectors. These findings point to a digital divide that risk undermining efforts to modernize instruction and promote 21st-century skills.

Notably, 78.1% of teachers reported that their learning zones effectively accommodate diverse learning needs. Headteacher D emphasized inclusivity, stating, *“We use tactile markers and consistent layouts to support accessibility for all learners.”* However, the 21.9% expressing disagreement indicates a need for further investment in differentiated spatial planning and resources. Observation data further showed that inclusive design such as quiet zones or movement-friendly areas helps reduce behavioral issues and supports concentration.

The qualitative data complement the quantitative results by providing context-specific narratives that clarify how learning zones contribute to academic outcomes. Headteacher E encapsulated the synergy between spaces and learning when they stated, *“Inquiry-based learning is central to our approach, and our flexible spaces support teamwork and creativity”* (Interview, 11th April 2025). This echoes the central tenets of experiential learning theory (Kolb, 1984), emphasising the importance of adaptable spaces in fostering learner engagement and promoting a deeper understanding.

The positive relationship between spatial organization and academic achievement aligns with theories of environmental psychology and constructivist learning. According to Bronfenbrenner’s Ecological Systems Theory (1979), the microsystem which includes the physical classroom environment has a direct influence on the child’s development. A well-structured space enables more meaningful interactions, improved focus, and enhanced learning opportunities.

In a similar vein, peer interaction and the environment's role in scaffolding learning are highly valued in Vygotsky's Social Constructivist Theory (1978). Effective classroom zone design, such

as reading nooks, group work areas, or outdoor learning areas, promotes social learning and differentiated instruction, both of which improve knowledge construction. By clearly allocating functions to particular spaces, physical zoning of classroom spaces may help reduce cognitive overload and improve task focus, according to an increasing amount of research. Because students comprehend spatial cues associated with particular tasks, well-defined zones increase attention spans and decrease behavioral distractions (Fisher, 2005). For example, your data supports Krashen's (2004) assertion that reading corners and libraries promote critical thinking, self-directed learning, and literacy growth, especially among younger students. Additionally, according to Lippman (2010), learning environments must "afford" particular behaviors, which means that their purpose must be implied by their design. While a discussion area should encourage verbal cooperation, a reading area should encourage introspection. Your qualitative findings, such as those from Headteachers A and C, are consistent with the idea that purposeful design drives behaviour and outcomes. The strong teacher endorsement of group work areas (97.2%) reflects well-documented benefits of collaborative zones. According to studies like Gillies (2016) and Johnson & Johnson (2009), students perform better and acquire critical social and emotional skills when they are placed in groups that encourage communication, cooperative learning, and role-based learning. These results support the social constructivist theory that cooperative problem-solving and group discussion in encouraging settings are the most effective ways to promote learning. Additionally, Caine and Caine (1997) contend that collaborative zones enhance cognitive receptivity by assisting in meeting emotional needs for security and connection. This all-encompassing approach to education is consistent with your finding from School W that zoning "reduces communication barriers and promotes a sense of community." Your observations

regarding outdoor learning areas are consistent with studies that support kinesthetic and nature-based learning as essential components of student growth.

Outdoor spaces enhance executive function, lessen cognitive fatigue, and enhance mental and physical health (Louv, 2008; Dymont & Bell, 2008). According to Gardner's Multiple Intelligences Theory (1983), outdoor spaces accommodate naturalistic and bodily-kinesthetic intelligences, promoting more inclusive participation. But as your data shows, uneven outdoor space use represents a missed chance to promote holistic development. Although digital zones have promise, your research emphasizes the digital divide, where access and infrastructure continue to be major obstacles. The World Bank (2021) and Trucano (2015) both report that in many low-resource settings, a lack of access to devices, training, and the internet limits the impact of technology. This problem undermines efforts to integrate 21st-century digital competencies into daily instruction. Nonetheless, OECD (2018) argues that where technology zones are adequately supported and integrated with pedagogy, they enhance student autonomy, support differentiated learning, and improve digital literacy. To realize this, investment in both infrastructure and teacher digital skills is essential. The fact that 78.1% of teachers in your study believe learning zones support diverse needs is encouraging and is reflected in the literature. Florian and Black-Hawkins (2011) emphasise the importance of universal design for learning (UDL), which promotes flexible classroom structures to accommodate learner variability. Use of quiet zones, sensory-friendly areas, and consistent spatial layouts supports neurodivergent learners, including those with autism or sensory processing disorders. Your qualitative findings from Headteacher D echo these points, and align with Tomlinson (2014) who advocates for differentiated spatial and instructional strategies as part of inclusive pedagogy.

5.4 Conclusion

5.4.1 Classroom Lay Out and Learner Achievement In Central Division, Arua City

The study found that while teachers perceive classroom layout as important for effective teaching, the statistical relationship between classroom layout and learner achievement was weak and not significant. Teachers appreciated flexible seating and space for movement, and interviews emphasized the value of adaptable arrangements. However, limitations such as overcrowding and fixed furniture constrained effectiveness. Thus, while classroom layout supports instructional delivery, its direct impact on academic outcomes may be limited unless paired with other pedagogical strategies.

5.4.2 Instructional Materials and Learner Achievement In Public Primary Schools In Central Division, Arua City

The study concludes that instructional materials play a significant and direct role in enhancing learner achievement. The findings revealed a moderate and statistically significant relationship between the use of instructional materials and learner performance. Most teachers affirmed that resources such as visual aids, textbooks, and hands-on materials substantially improve learners' understanding, engagement, and retention.

Qualitative insights from headteachers and teachers reinforced this, with tools like science kits, charts, and manipulatives being described as essential in making abstract concepts more tangible and enjoyable. As one headteacher noted, "learners grasp better when visual and physical materials are used." However, critical challenges emerged, particularly in access to digital instructional tools and consistent teacher training. Respondents noted that "we often have to share textbooks" and

“we get materials with no guidance on how to use them,” highlighting gaps in both resource distribution and capacity building.

5.4.3 Learning Zones and Learner Achievement In Public Primary Schools In Central Division, Arua City

The study concludes that learning zones plays a critical role in enhancing learner achievement by supporting differentiated instruction, collaboration, and active learning. Scaling up this practice requires investment in infrastructure, inclusive design, and teacher training.

The results indicated a moderate and statistically significant positive relationship between learning zones and learner achievement. Teachers overwhelmingly agreed that well-defined spaces for group work, reading, and hands-on activities foster collaboration, deeper learning, and learner independence.

Headteachers reinforced this finding through interviews, noting that “*round tables and discussion zones really help learners work together effectively*” and that zoning is “*vital for meeting the diverse needs of our learners.*” Observations revealed that learners were more engaged and better able to transition between tasks in well-zoned environments. However, access to technology zones and the inclusivity of spaces for learners with special needs remain areas of concern.

5.5 Recommendation

5.5.1 Classroom Lay Out and Learner Achievement In Public Primary Schools In Central Division, Arua City

It is therefore recommended that schools reorganise their classrooms to reduce congestion by using flexible seating and optimising available space. Where possible, extend learning activities

outdoors. Teacher training must include strategies for adapting classroom layouts to different lesson needs. Policymakers should update infrastructure standards to prioritise adequate and well-organised classroom space.

5.5.2 Instructional Materials and Learner Achievement

It is recommended that immediate action should be taken to provide enough textbooks and locally made visual aids for all subjects. Schools should establish resource centers with hands-on materials like science kits. Pilot affordable digital resources and ensure teachers receive ongoing training on effective material use. Education policies must enforce minimum resource standards and equitable distribution.

5.5.3 Learning Zones and Learner Achievement

The study recommends that schools clearly label and maintain designated zones for group work, reading, and quiet study, ensuring these areas accommodate learners with special needs. Outdoor learning should be integrated regularly. Schools should invest in cost-effective technology tools and provide teacher training on their use. Education authorities must revise guidelines to require inclusive learning zones and fund their development.

5.6 Contribution of the study

The study initially confirmed Jean Piaget's Constructivist Theory and Lev Vygotsky's Sociocultural Theory, which the researcher used to underpin the study. Secondly, it has contributed to the body of existing knowledge through the findings on the study variables, namely classroom layout, Instructional materials, and Learning zones, which affect learner achievement in public primary schools in the Central Division, Arua City, Uganda. Although the findings of this study

are specific to public primary schools in the central division of Arua City, they can be generalised to both public and private primary schools elsewhere, provided similar conditions exist.

5.7 Limitations of The Study

While this study provides valuable insights into the relationship between classroom environment and learner achievement in public primary schools in Arua City, it is important to acknowledge several limitations that may have influenced the findings.

Firstly, the study was geographically limited to the Central Division of Arua City. This narrow scope may limit the generalizability of the findings to other districts or urban-rural contexts in Uganda where school infrastructure, teacher training, and resource availability may differ significantly.

Secondly, the study relied heavily on self-reported data from teachers and head teachers through questionnaires and interviews. While these instruments provided rich insights, they are subject to personal bias, social desirability, and individual interpretation, which may affect the accuracy or objectivity of responses.

Thirdly, the quantitative aspect used correlation analysis, which can only establish the strength and direction of a relationship not causality. As a result, while significant associations were found between classroom layout, instructional materials, learning zones, and learner achievement, the study cannot definitively conclude that these factors directly cause performance improvements.

Fourth, the availability and use of digital instructional materials were found to be low. However, this study did not explore in-depth the reasons behind this, such as systemic ICT challenges, teacher competence in using technology, or infrastructural constraints leaving an area for future investigation.

Lastly, time and resource constraints limited the depth of classroom observations and the number of schools involved. A larger sample size and longer observational periods might have provided even richer and more reliable findings.

5.8 Areas For Further Study

The study found that digital instructional materials are not widely integrated into classroom teaching. It is recommended that further research should investigate the key barriers to ICT adoption, including inadequate infrastructure, limited digital literacy, gaps in policy implementation, and teacher attitudes.

This research was limited to the perspectives of teachers and headteachers. Future studies should include learners' viewpoints to better understand how learners experience classroom layout, instructional materials, and learning zones and how these factors affect their engagement, motivation, and academic performance.

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Appendix 1: Informed Consent Form

Dear Respondent,

My name is **Bako Alima Caroline** a learner of Muni University pursuing a Master of Education Degree in Educational Planning and Management. I am conducting academic research on the topic “*Classroom Design and Learner Achievement in Public Primary Schools in Central Division Arua City, Uganda*”. You are invited to participate in this research study. Before you decide, please read this form carefully. It explains the purpose of the study, your rights, and how your data will be used. You will be asked to describe tasks, such as answering a questionnaire or interview. The study will take approximately [5-10 minutes]. Participation is voluntary, and you may withdraw at any time without consequences.

Your responses will be kept *confidential* and used only for research purposes. No personally identifiable information will be shared. There are no significant risks associated with participating in this study. Your input will help improve the study. Your participation is completely voluntary. You can refuse to answer any question or withdraw at any time without penalty.

By signing below, you confirm that you have read and understood this consent form. You voluntarily agree to participate in this study.

Signature: _____

Date: _____

Researcher’s Name: Bako Alima Caroline

APPENDIX 11: Teacher Questionnaire On Classroom Design and Learner Achievement

Dear Respondent,

My name is **Bako Alima Caroline** a learner of Muni University pursuing a Master of Education Degree in Educational Planning and Management. I am conducting academic research on the topic ***“Classroom Design and Learner Achievement in Public Primary Schools in Central Division Arua City, Uganda”***. I hereby request you to respond to the questionnaire. All the information given here will be used for academic purposes and shall be treated with utmost confidentiality.

Yours faithfully,

Bako Alima Caroline

2023/U/MED/00728

Section A: Demographic Information

1. Gender:

1. Male 2. Female

2. Age Group:

1. 20–29 years 2. 30–39 years 3. 40–49 years 4. 50+ years

3. Teaching Experience (Years):

1. Less than 5 2. 5–10 3. 11–15 4. 16+

4. Highest Academic Qualification:

1. Certificate

2. Diploma

3. Degree

4. Postgraduate

5. Class Level You Currently Teach:

1. Lower Primary 1–4

2. Upper Primary 5–7

Section B: Classroom Layout and Learner Achievement

Please rate by ticking the following statements based on your level of agreement:

(1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree)

SN	Statement on Classroom Layout (CL)	SD	D	A	SA
		1	2	3	4
CL1	The classroom layout in my school allows for effective teaching and learning.				
CL2	A well-organized seating arrangement improves learner engagement.				
CL3	I can easily rearrange my classroom layout based on learning activities.				
CL4	Group seating arrangements enhance collaborative learning and learner achievement.				
CL5	The current classroom layout supports learners with diverse learning needs.				
CL6	My classroom has enough space to accommodate movement-based learning activities.				

Section C: Instructional Materials and Learner Achievement

Please rate by ticking the following statements based on your observations:

(1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree)

SN	Statement on Instructional Materials (IM)	SD	D	A	SA
		1	2	3	4
IM1	The availability of instructional materials enhances learner learning outcomes				
IM2	My school provides sufficient textbooks for all subjects.				

IM3	The use of visual aids (charts, posters, diagrams) improves learner understanding.				
IM4	Digital resources (videos, projectors, e-learning) are integrated into my teaching.				
IM5	Hands-on learning materials (science kits, math manipulatives) enhance learner achievement.				
IM6	I receive adequate training on how to use instructional materials effectively				

Section D: Learning Zones and Learner Achievement

Please rate by ticking the following statements regarding learning zones in your school:

(1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree)

SN	Statement on Learning Zones (LZ)	SD	D	A	SA
		1	2	3	4
LZ1	My school has well-defined learning zones that support different learning activities				
LZ2	The reading zone/library is well-equipped and accessible to learners				
LZ3	Group work areas enhance learner collaboration and problem-solving skills				
LZ4	Outdoor learning spaces are used regularly for teaching and learning				
LZ5	Access to technology-based learning zones (computer labs, e-learning platforms) improves learner engagement				
LZ6	The learning zones in my school accommodate learners with different learning needs.				

Section E: Learner Achievement

Please rate by ticking the following statements based on your experiences:

(1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree)

SN	Statement on Learner Achievement (LA)	SD	D	A	SA
		1	2	3	4
LA1	The learner demonstrates a strong understanding and mastery of the academic content presented in class.				
LA2	The learner actively participates in class discussions and collaborates effectively with peers.				
LA3	The learner applies critical thinking and creativity to solve problems and develop original ideas.				

LA4	The learner consistently manages time and completes assignments with high quality and responsibility.				
LA5	The learner exhibits positive social-emotional skills, including stress management and respectful communication.				

6. Based on your experience, which aspect of classroom design has the greatest impact on learner achievement? (Select only one)

- 1. Classroom Layout
- 2. Instructional Materials
- 3. Learning Zones

7. What improvements would you suggest to enhance classroom design in your school? (Select all that apply)

- 1. More flexible and spacious classroom layouts
- 2. Increased access to textbooks and instructional materials
- 3. More digital learning resources and technology integration
- 4. Creation of more structured learning zones
- 5. Regular teacher training on classroom design best practices
- 6. Others (please specify) _____

Thanks so much for taking your precious time

Appendix III: Interview Guide for Head teachers

Dear Respondent,

My name is **Bako Alima Caroline** a learner of Muni University pursuing a Master of Education Degree in Educational Planning and Management. I am conducting academic research on the topic *“Classroom Design and Learner Achievement in Public Primary Schools in Central Division Arua City, Uganda”*. I hereby request you to respond to the questionnaire. All the information given here will be used for academic purposes and shall be treated with utmost confidentiality.

Yours faithfully,

Bako Alima Caroline

2023/U/MED/00728

Section A: Classroom Layout and Learner Achievement

4. How your classroom is typically arranged?
5. How does the current classroom layout impact learner engagement and participation?
6. In your opinion, what is the most effective classroom arrangement for promoting learner achievement? Why?
7. Are you able to adjust the classroom layout based on different teaching needs? If so, how often do you do this?
8. What challenges do you face in optimizing classroom layout for better learning?

Section B: Instructional Materials and Learner Achievement

9. What types of instructional materials are available in your classroom? (e.g., textbooks, charts, digital resources, science kits)
10. How do you incorporate instructional materials into your daily teaching?
11. In your experience, how do different types of instructional materials influence learner achievement?
12. Are there sufficient instructional materials for all learners? If not, how does this impact their learning?
13. What improvements do you think should be made in the availability and use of instructional materials?

Section C: Learning Zones and Learner Achievement

14. What learning zones exist in your school?
15. How do learners utilize these learning zones in their learning process?
16. In your view, which learning zones are most effective in enhancing learner achievement?
Why?
17. Are there any challenges in maintaining or accessing these learning zones?
18. What recommendations would you suggest for improving the use of learning zones to support learner learning?

Thanks so much for taking your precious time

Appendix IV: Observation Checklist

1. **School Name:** _____

2. **Class Observed:** _____
3. **Date of Observation:** _____
4. **Observer's Name:** _____

1. Classroom Layout

SN	Criteria	Yes (✓)	No (X)	Remarks
1	Classroom is spacious enough for all learners			
2	Seating arrangement allows free movement of teacher and learners			
3	Desks/tables are arranged to promote interaction and group learning			
4	Adequate lighting (natural/artificial) is available			
5	Proper ventilation is maintained in the classroom			
6	Presence of designated teacher's area (desk, board, materials)			

2. Instructional Materials

SN	Criteria	Yes (✓)	No (X)	Remarks
1	Availability of adequate textbooks and learning materials			
2	Presence of visual aids (charts, posters, maps, models)			
3	Availability of digital learning resources (projector, computers, etc.)			
4	Use of locally available materials in teaching			
5	Learners have access to reading and writing materials			
6	Condition of instructional materials (new, well-maintained, outdated, damaged)			

3. Learning Zones

SN	Criteria	Yes (✓)	No (X)	Remarks
1	Presence of designated learning zones (reading corner, play area, group work area)			
2	Learning zones are well-organized and accessible to all learners			
3	Availability of a library or resource center within the school			
4	Presence of outdoor learning spaces (gardens, playgrounds, science corners)			
5	Learners actively engage with materials in different learning zones			

4. Learner Engagement and Achievement

SN	Criteria	Yes (✓)	No (X)	Remarks
1	Learners show interest and actively participate in lessons			
2	Teacher uses varied instructional methods to enhance learning			
3	Learners demonstrate understanding through discussions and responses			
4	Evidence of completed classwork, assignments, and assessments			
5	Display of learners' work in the classroom			

Thanks so much for taking your precious time

Appendix V. Table For Determining Sample Population and Sample Size

Sample size (s) required for the given population sizes (N)

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	256	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351

APPENDIX VI: Plagiarism Test Result



The Report is Generated by DrillBit Plagiarism Detection Software

Submission Information

