UNIVERSITY OF CAPE COAST

EDUCATIONAL RESOURCE DEPRIVATION AND ITS EFFECT ON

ACCESS TO AND QUALITY BASIC EDUCATION IN GHANA

PETER ANTI PARTEY

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BY

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Thesis submitted to the Department of Business and Social Sciences

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:……………… ………. Date: ………………

Name: Peter Anti Partey

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: …………………… Date: …………………

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ABSTRACT

Basic schools in Ghana continue to contend with inadequate educational resources. This demands that the scarce educational resources available are deployed efficiently and effectively. This study, therefore, sought to develop an educational resource deprivation index, by simulating the Alkire-Foster Method for Multi-dimensional Poverty Index (MPI) termed the Multidimensional Educational Resource Deprivation Index (MERDI) to measure the extent of resource deprivation in Basic Schools in Ghana. It additionally evaluated the performance and importance of the indicators of the MERDI. Finally, the study examined the effect of the indicators of the MERDI on quality and access to education. The MERDI was developed using data from the Annual School Census (ASC Data) (2015/16 to 2018/19) to appreciate the trend in the distribution of education resources. Also, the Importance-Performance Map Analysis was carried out using the 2018/19 Education Census Data, while panel data analysis was used to estimate the effect of the variables of the MERDI on quality and access to Basic Education using the ASC data and BECE pass rate (2015/16 to 2018/19). The study revealed that the extent of educational resource deprivation has improved from 45.1% in 2015/16 to 35.4% in 2018/19 with higher regional disparities. The incidence has also improved from 83.6% to 77.9% while the intensity of the deprivation in Ghanaian basic schools changed from 49.6% to 46.7% with the northern sector of the country, especially the Brong Ahafo Region recording the highest levels of deprivation. Most public basic schools are more deprived as compared to private basic schools. Again, Textbooks (SFR6), Library books (SFR4), Teacher-Pupil Ratio (HR3), and Teacher Quality (HR2) depict higher performance and priority in influencing the MERDI. Moreover, the extent of educational resource deprivation affects the quality and access to basic education. The study recommends the adoption of the MERDI as a guiding index in the distribution of educational resources in Ghana.

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DEDICATION

To Nunya (My future), Aseye (My world), and Kekleli & Kekeli (My

blessings)

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CHAPTER ONE

INTRODUCTION

Education is key for the development of any society. The delivery of quality education is hinged on the provision of the needed educational resources equitably across the various communities in the country. With the country's target of achieving quality education by 2030 by improving access to basic education following the Sustainable Development Goal (SDG 4), it becomes imperative to find innovative ways to distribute educational resources which have empirically been identified as the panacea for ensuring quality education. One sure way to do this is the development of a comprehensive index to help assess the extent of educational resource deprivation in our basic schools – the Multidimensional Educational Resource Deprivation Index (MERDI) is an innovative index to help in the classification of schools as being deprived or not.

Background to the Study

There is global consensus on the important role of education in the world and across various economies. This assertion emanates from the fact that, over the years, efforts have been made by international bodies such as the United Nations (UN), United Nations Educational, Scientific and Cultural Organisation (UNESCO), United Nations Children's Emergency Fund (UNICEF), World Bank and Global Partnership for Education (GPE) among others to ensure an improvement in the level of literacy among the people in various countries. According to UNESCO (2014), the right of all children to education is emphasized in several international treaties and agreements and has been affirmed by both legally binding and non-binding instruments. This makes it obligatory for all countries to respect, protect and fulfill the right of all learners

to education. For instance, the introduction of the Dakar Framework for Action in 2000 and the Education for All (EFA) programme by UNESCO in 2005 were all targeted at ensuring equal access to quality basic education for all children by the year 2015.

According to the EFA Global Monitoring Report (2005) issued by UNESCO (2004), "in the many countries that are striving to guarantee all children the right to education, the focus on access often overshadows attention to quality. Yet quality determines how much and how well children learn and the extent to which their education translates into a range of personal, social and developmental benefits" (p. 4). The inability of most countries to achieve the target of education for all culminated in the introduction of the Sustainable Development Goals (SDGs), with theme four (4) focusing specifically on education. Therefore, programmes such as Millennium Development Goal (MDG) 2, the EFA goals, and the Sustainable Development Goal (SDG) 4 all focused on equitable, accessible, and universal quality basic education. According to UNESCO (2018), SDG 4 aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030. SDG 4 comprised seven outcome targets and three means of implementation. The central aim of SDG 4 is the realization of equitable quality primary and secondary education leading to relevant and effective learning outcomes.

In Africa, specifically, Sub-Saharan Africa, there is a long history of universal quality basic education. This dates back to the All-Africa States Conference in 1961, where it was pledged that free, universal, and compulsory primary education would be attained by 1980 (Eshiwani 1993, pp.132-33). But the progress made during the last several decades has been rather sluggish in

several countries in the Sub-Saharan African region. However, some momentum was gained after the Jomtien Conference (1990) and later the Dakar Conference (2000). According to UNESCO (2009) "Sub-Saharan Africa has made particularly impressive strides, with many governments increasing the priority attached to basic education" (p. 41). Despite these momentous achievements, several countries are far away from the goal of achieving universal quality basic education.

In the past, the region has experienced a variety of educational issues, with the primary education net enrollment rate at 54% in 2010 – markedly lower than the 78% average for other developing countries. Again, as many as 35.2 million children of the relevant age group in Sub-Saharan Africa, who should be in school, were actually outside the schools as recorded in 2010 (UNESCO, 2012). This is because the introduction of the Education for All programme ensured that remarkable efforts were made to guarantee that every child had access to quality basic education (UNESCO, 2015). These challenges are connected to the perspective that according to the World Education Forum (2012), access to education is limited, it is poor in quality and the curricula are often irrelevant to the needs of the learners and social, cultural, and economic development in SSA. This results in deepening the gap of inequality in accessing education in most countries in the region.

Ghana, one of the Anglophone countries in SSA has a fair history of basic education. Limiting the analysis to developments in the education front from the inception of the fourth republic, it can be ascertained that, by 1992, the right to free and compulsory education was enshrined in the new constitution. The right to education is assured in Ghana's 1992 Constitution which states in

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Article 38(2) that "The Government shall within two years after Parliament first meets after coming into force of this Constitution draw up a programme for the implementation within the following 10 years for the provision of a Free, Compulsory Universal Basic Education." Also, the Education Act, 2008 (Act 778) and the Children's Act, 1998 (Act 560) all give credence to the right to education for every Ghanaian child. These laws have served as the basis for all educational policies at the Basic level with the primary focus on increasing access to basic education.

There was an implementation push from 1995 through to 2005 of what was termed the "Free, Compulsory and Universal Basic Education" (FCUBE) programme through the World Bank Primary School Development Project (PSDP) with the sole aim of getting more children into school. As a cost-sharing scheme, the FCUBE was designed to cover non-tuition fees. Parents were expected to bear limited educational expenses. More importantly, no child was to be turned away from school for non-payment of fees. However, the country continued to record a persistent 40% of children between 6 and 11 years of age out of school as of 2003 (UNICEF, 2007). This resulted in the Government of Ghana rolling out two pilot primary education improvement policy initiatives; the Capitation Grant Scheme (CGS) and the School Feeding Program (SFP) in the 2004/05 academic year (MoE, 2005). These initiatives were aimed at helping poor parents meet the cost of primary education and improve the nutrition of children, especially poor children (African Education Watch, 2008). The essence of all these interventions was to ensure adequate access to basic education by all children in the country irrespective of their socioeconomic background. These efforts have culminated in ensuring that as of the 2017/2018

academic year, 8,304,598 pupils had been enrolled in basic education for both private and public schools. Figure 1 presents a bar graph showing the regional enrolment level for Basic Schools in Ghana for the 2017/2018 academic year. It is obvious from Fig. 1 that Ashanti, Northern and Western regions have the largest number of enrolments respectively.
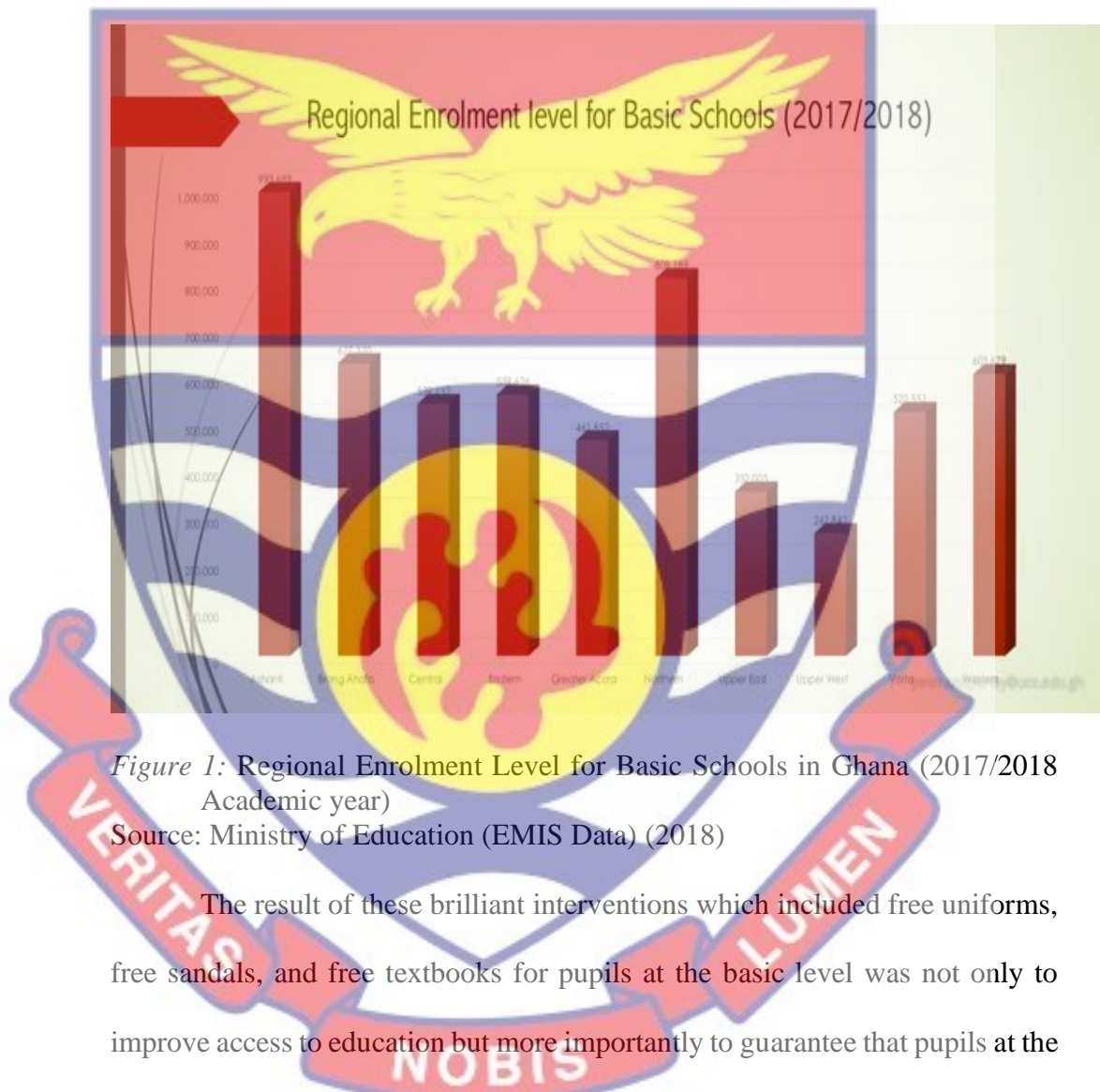
Figure 1: Regional Enrolment Level for Basic Schools in Ghana (2017/2018 Academic year)
Source: Ministry of Education (EMIS Data) (2018)

The result of these brilliant interventions which included free uniforms, free sandals, and free textbooks for pupils at the basic level was not only to improve access to education but more importantly to guarantee that pupils at the basic level were given equitable access to education which was of high quality.

Quality education as a concept has been explained by many scholars in diverse ways. According to the World Bank (2015) "quality in education is difficult to define and measure. An adequate definition must include student outcomes. Most educators would also include in the definition the nature of the

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educational experience that helps to produce this outcome - the learning environment." (World Bank, 2015, p. 46). Again, UNICEF identifies five dimensions of quality. These are the learners, the environment, content, processes and outcomes, and these are supposed to be founded on the rights of the whole child, and all children, to survival, protection, development and participation (UNICEF, 2000, in UNESCO, 2005). According to the Human Development Network (2002) the long-term goal in education is nothing less than to ensure everyone completes basic education which is of high quality, acquires foundation skills - literacy, numeracy, reasoning and social skills such as teamwork - and has further opportunities to learn advanced skills throughout life, in a range of post-basic education settings. The implication of these definitions is that, the educational inputs are as important as the outputs. That is, quality education implies that pupils are able to read, understand, write, perform basic mathematical calculations and apply what they have learnt to real life experiences. According to Ankomah (2005), the realization of quality education in Africa, specifically Ghana hinges on four important variables. These variables are called educational inputs. They consist of;

1. Educational Personnel
2. Instructional Content and Materials
3. Educational Facilities
4. Educational Finance

Some of these educational inputs identified by Ankomah (2005) have been captured by the Ministry of Education's Education Sector Performance Report (2015, 2016, 2017, 2018, 2019) as quality variables. These include;

1. Teacher-student ratio

2. Student-textbook ratio

3. Student-desk ratio

4. Student-classroom ratio

5. Student-Trained teacher ratio

6. Student to seating ratio

By this classification, Ghana Education Service does not only focus on the availability of these educational resources but also the quantity that can influence the delivery of quality education.

Educational resources are human and non-human resources that can be used to ease, encourage, improve and promote teaching and learning activities in an educational setting (Muraina, 2015). They are pecuniary and non-pecuniary in nature and are supposed to ensure the effective delivery of quality education in any educational setting. Pecuniary resources at the basic school include the payment of capitation grant and at the secondary school the absorption of all forms of fees as a result of the free SHS policy. Also, non-pecuniary resources include teachers, textbooks, availability of classrooms, desks among others. These resources are ideally supposed to be distributed evenly across the various basic schools across the length and breadth of the country.

However, the level of inequality between the urban centres and the rural areas has resulted in serious disparities in the distribution of educational resources. The Ministry of Education has the ultimate responsibility to manage education in Ghana. It does this through the Ghana Education Service. Each school in the country especially Basic and Secondary receive most of its resources from the central government including the allocation of teachers. The

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distribution of these resources seems to favour those in the urban areas more than the rural schools. For instance, in terms of teacher-student ratio, the Northern, Upper-East, and Upper-West regions recorded the highest level as compared to other regions (ESPR, 2016). It however seems that the provision of infrastructure, textbooks, desks, and other non-monetary resources are provided to all schools without properly laid down formulae taking into consideration other factors that might lead to widening the gap between the urban and the rural student, and might impact on the quality of education being delivered across these two geographical areas.

Quality in education is now crucial in Africa's strategic plans toward catching up with the developed world. While the notion of quality and priority foci may differ from country to country, the term has become a determining factor in facilitating international support for educational expansion and developmental initiatives. Understanding the geographical context of quality in education, what its indicators are, within the cultural milieu of particular countries, the challenges associated with implementing quality education are therefore significant. Increasingly successive governments in Ghana have sought and continue to seek strategies for quality delivery of education. Yet, in the country, locally research-based literature on issues related to the quality of education is limited.

The numerous efforts by the government over the years have resulted in the value of school enrollment at the basic level by 108% as of 2016. Over the past 45 years, the maximum value for school enrollment of 109.93% was recorded in 2015 (UNESCO, 2016). The implication of the improvement in the level of enrolment is that more children are being given access to education.

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This is a promising signal for possible improvement in the human capital base of the country, however, one needs to be concerned about the quality of education being offered to these children.

A cursory look at the performance of students at the Basic Education Certificate Examination (BECE) across the ten regions and the 216 districts (as at 2017/2018 academic year) corroborates the assertion that more needs to be done in terms of ensuring quality delivery of education in our basic schools. Figure 2 shows a regional breakdown of the results for the BECE 2017/2018 academic year.

Figure 2: Regional Breakdown of BECE results in English and Mathematics for 2017/2018

Source: Ministry of Education (EMIS Data) (2018)

These variations have been attributed to various factors by numerous researchers, prominent among them are educational resources. It can be observed that there is a broader level of disparity in terms of quality basic

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education (performance in BECE English and Mathematics) across the various regions.

Creating access through various policy interventions leads to an increase in enrolment at the Basic level (Ndeffo, Tagne & Makoudem, 2014). This brings education to the doorstep of each family irrespective of their socioeconomic status. The activities of creating access and improving the quality of education at the basic level should be carried out under the broader purview of the principle of equity in the Ghanaian context. According to Levin (2003) equity is measured along two dimensions:

a. the extent to which the education provided is sufficient;

b. the extent to which, in addition to participation, the educational

systems guarantee success for all.

Equity in basic education according to the World Bank (2004) implies equality between gender groups, people of different locations, and socioeconomic and linguistic backgrounds. This becomes critical in the Ghanaian context where there are disparities across the various districts. According to the Ghana Statistical Service (2015), inequality is highest in North Tongu District (46.0) followed by Nkwanta South (45.2), Biakoye (45.0) districts, and Kpando Municipal (44.4). Kwahu Afram Plains South District (59.7%) has the highest poverty incidence in the Eastern Region followed by Kwahu South (48.0%) and Upper Manya (43.6%) districts. This implies that the incidence of poverty and development varies across districts in the country. Equitable access to quality basic education would imply a calculated effort to adopt strategies, models, and measures that would appreciate the educational

needs of each district and provide the requisite resources instead of wholesale distribution of the educational resources.

Schultz (1963), a growth theorist, posited that human capital plays an important role in the long-term economic growth of any country. This implies that countries make conscious efforts to improve their human capital base. According to Becker (1964), the quality of human capital a country can boast of depends on its educational system. Again, the Global Partnership for Education (GPE) has been able to establish a relationship between poverty reduction and a country's secondary education completion rate. According to the GPE (2019), poverty will be reduced by 50% for all children who can complete secondary education. The result of these findings is the commitment of various governments to invest substantially in their education sector. In Africa, countries such as South Africa, Rwanda, Kenya, Ghana, and Egypt spend between 20% to 30% of their annual budget on education (OECD, 2016).

According to the GPE (2019), member countries should spend not less than 21% of their expenditure on education, this is evident from Figure 3 which shows that between 2009 and 2018, the government of Ghana has spent above 20% of its expenditure on education. The essence of these huge expenditures is to ensure that the needed educational resources are provided to all levels of education in Ghana irrespective of location.

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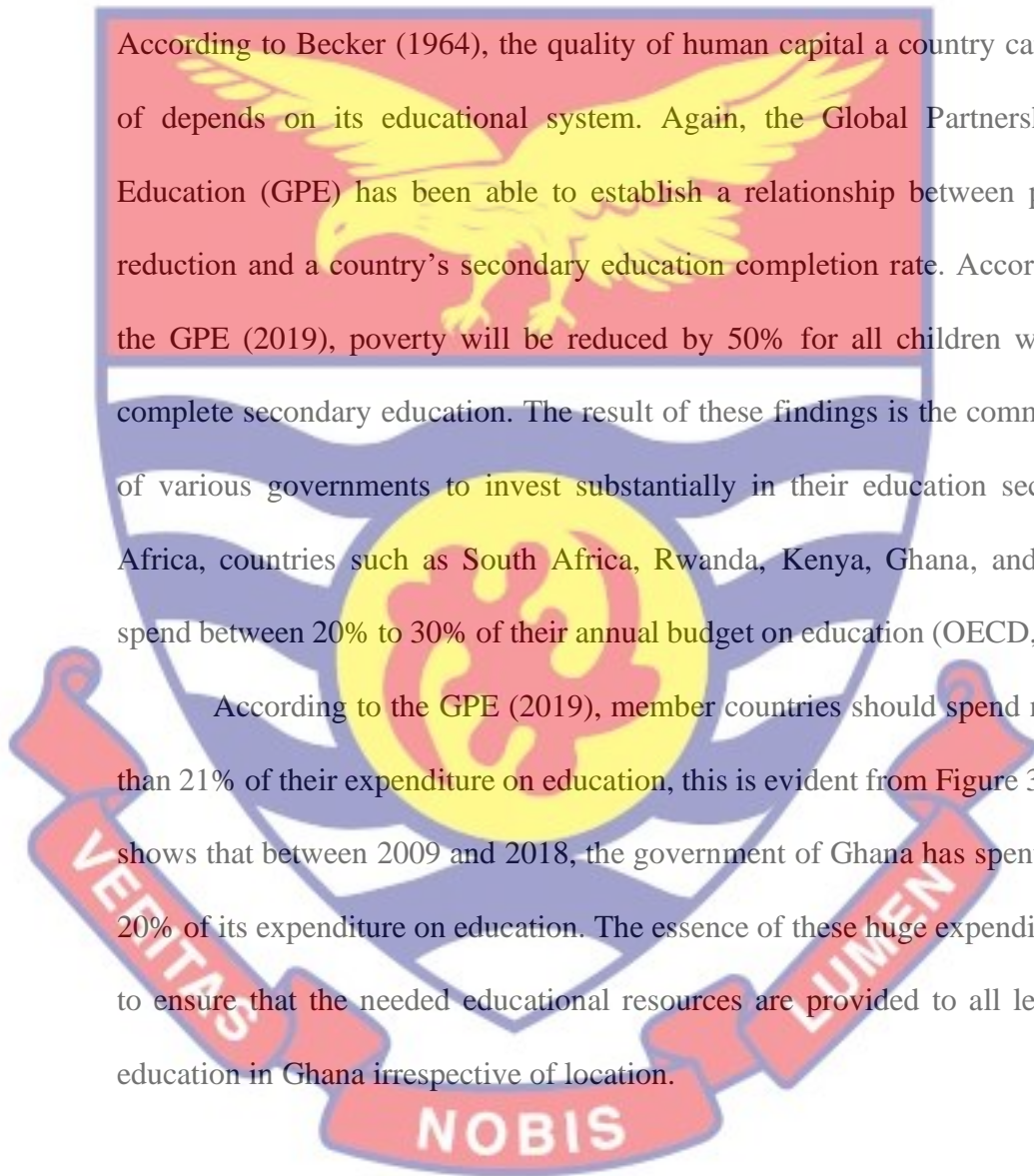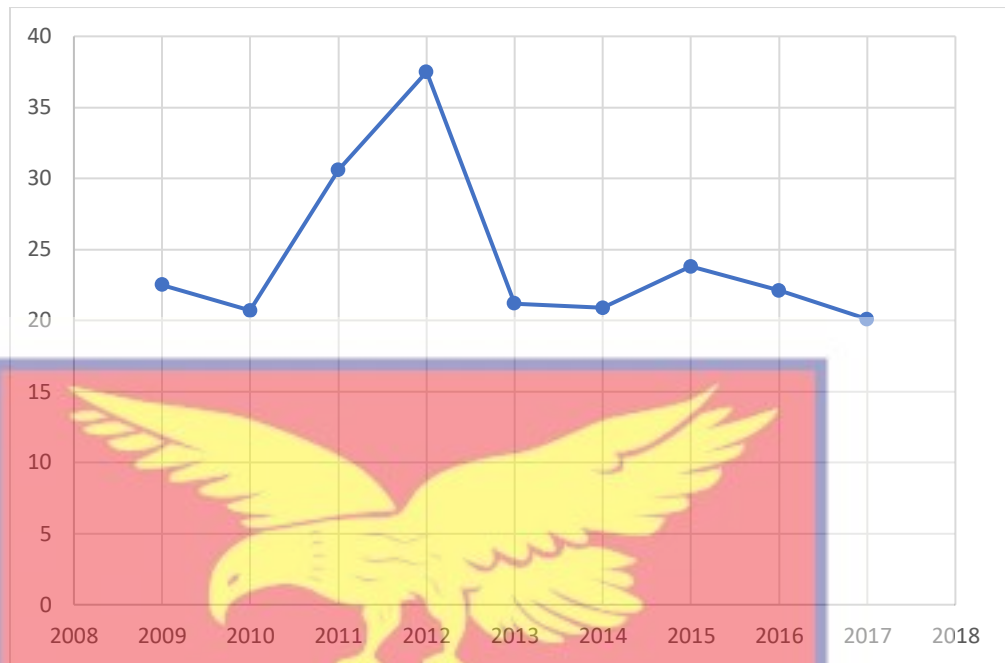
Figure 3: Government expenditure on Education as a Percentage of Total Government Expenditure (2009 – 2017)

Source: UNESCO (2019)

Statement of the Problem

The Ghana Education Strategic Plan (2018 – 2030) which ties in with the global goal of achieving inclusive and equitable quality education has as its focus:

1. improved equitable access to and participation in inclusive education at all levels

2. improved quality of teaching and learning

3. sustainable and efficient management, financing, and accountability of education service delivery.

To achieve these objectives, especially, one and two, there should be a deliberate and conscious effort on the part of the managers of education to be strategic in the distribution of education resources in the country. Figure 4 indicates that there seems to be a regional imbalance in the spread of certain educational resources in the country. This is evident in the Ghana Statistical

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Service's Residential Proximity to Essential Services Report (2021) which indicated that nearly one-third of rural residential clusters nationwide (6% of urban clusters nationwide) do not have any facility providing education services. Again, 73% of residential clusters in rural areas nationwide do not have all the 3 required levels of basic education (GSS 2021). From Figure 4, the Central region recorded the highest Gross Enrolment Rate (GER) of 103.4% with a Net Enrolment Rate (NER) of 57.1, however, the region has fewer trained teachers and recorded a 0.8 Pupil-Desk Ratio (PDR). However, the Eastern region which recorded the lowest GER (74.1) and NER (39.4) has each pupil having access to their desk (PDR = 1:1.1) with a Pupil-Teacher Ratio (PTR) of 19:1 and Pupil-Trained-Teacher Ratio (PTTR) of 22:1. These incidences have compelled educational researchers to have a look at the issues of educational resource distribution in Ghana.
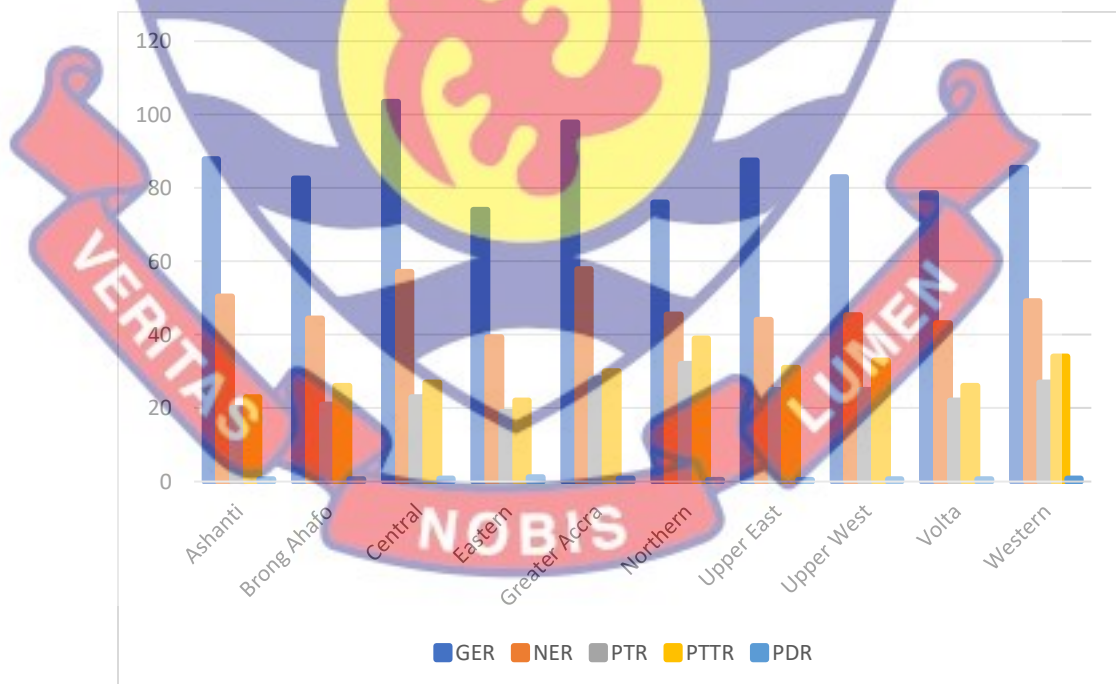
Figure 4: Gross Enrolment Rate (GER), Net Enrolment Rate (NER), Pupil-Teacher Ratio (PTR), Pupil-Trained Teacher Ratio (PTTR), and Pupil-Desk Ratio
Source: EMIS Data (2018)

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According to Anlimachie (2016), access to and quality education in Ghana is skewed in favour of urban Ghana. The inequities are orchestrated by two folds challenges. The first group is made up of some contextual geographical, economic, and socio-cultural challenges peculiar to rural Ghana. The other group is made up of some immediate challenges linked to the general loopholes in the designing and implementation of the various government of Ghana policies on education. Again, a study by Opoku-Asare and Siaw (2015) revealed that rural-urban disparity in economic and social development in Ghana has led to disparities in educational resources and variations in students' achievement in different parts of the country. Sogah (2016) using a stochastic frontier approach revealed that poverty and the geographical location of a school are significant determinants of technical efficiencies of the public primary schools in Ghana. Also, Hirsch (2007) found that poverty and deprivation lead to poor learning outcomes. According to a qualitative study by Care International (2003) in Ghana, there is an unequal distribution of non-pecuniary resources such as teachers, textbooks, and desks in the rural part of Ghana. More so, in terms of pecuniary resources, many prior studies have examined the determinants of household education financing (e.g., Tsang & Kidchanapanish, 1992; Tansel, 2002; Glick & Sahn, 2000; Brown & Park, 2002; Lokshin & Sawada, 1999; Zhou & Zhang (authors, 2015)). Studies by Apratwum and Armah-Attoh (2010), Osei-Fosu (2011), Osei, et al (2009) focused on the impact of the capitation grant on enrolment, attendance, and achievement. A World Bank study in 2009 also focused on the sustainability of the capitation grant.

Further studies have sought to look at the impact of educational inputs on students' achievement. For instance, Muvawala (2012) examined determinants of learning outcomes in primary schools using a Generalized Method of Moments (GMM) estimation technique. The study shows that some of the traditional educational inputs yield the expected positive influence on learning outcomes, notably, provision of textbooks, inspection frequency, teacher houses, teacher numbers, teacher training, and the proxy for the school environment. Again, the USAID commissioned a study in Ghana to investigate the delivery of educational resources in the districts in Ghana combining both qualitative and quantitative approaches. The study which was conducted by the Mitchell Group (2009) used data to provide a district-by-district snapshot of achievement and school input improvements over time by comparison to national averages for each of the districts in the country. The results of the data analyses suggested that the quality of basic education is at a crossroads. They found out that improving quality basic education will also require that new resources are allocated in new ways. Further, Usman (2016) ascertains that accessibility of education resources has always been regarded as an essential and integral part of school administration and geared towards the improvement of all other factors in the teaching and learning process thus ensuring quality service delivery by the school to the society.

Moreover, Handa & Simler (2000) found out that building more schools in places where there are none improves access by 56% in Mozambique. In a similar study, Kipng'etic, Boit & Bomett (2013) indicated that household-related factors such as parental income, number of children, and culture deter people from sending their wards to school in Kenya. Again, Ndeffo, Tagne &

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Makoudem (2014) posited that both monetary and non-monetary variables influence access to basic education in Cameroon. Similarly, Oluwatayo & Ayodeji (2017) cited factors such as location, age, gender, marital status of parent, household size, etc. as determinants of access to basic education in Nigeria. In Ghana, Amakyi & Ampah-Mensah (2016) found that there has been an improvement in access to basic education but that was not triggered by improvement in the educational facilities.

Analytically, a combination of various educational resources affects the twin variables of quality and access. This implies that a standard index is needed to identify the extent of resource deficiency among basic schools in Ghana and devise means of distributing these educational resources to help improve access and quality.

All the empirical works reviewed either looked at the distribution of pecuniary or/and non-pecuniary resources on access and/or quality education measured by the learning outcomes. Also, these studies did not estimate the extent of educational resource deprivation in Ghana. Again, the researchers either employed quantitative descriptive surveys and qualitative case studies or both to arrive at their findings. This study, therefore, seeks to develop a multidimensional educational resource deprivation index and estimate the effect of the indicator variables of the MERDI on quality and access to basic education in the Ghanaian education context.

Purpose of the Study

The United Nations General Assembly worked on the post-2015 development agenda in January 2015. The process culminated in the subsequent adoption of the 2030 Agenda for Sustainable Development, with 17 SDGs at its

core, at the UN Sustainable Development Summit in September 2015. The Ghana Education Strategic Plan (2018 – 2030) emanating from the 2030 Agenda for Sustainable Development also envisaged improved equitable access to and participation in inclusive education at all levels as well as improved quality of teaching and learning by 2030. The realization of this objective seems to hinge on the ability of the managers of Ghana's education to spread educational resources evenly across the country while prioritizing certain resources in the process. This study, therefore, seeks to develop an educational resource deprivation index to enable policymakers to have a standardized measure of what constitutes a deprived school in Ghana. Again, the study seeks to quantitatively estimate the extent to which the distribution of educational resources would enable the country to achieve the goals of access and quality in education at the Basic level.

Research Objectives

The objectives of the study are to:

1. measure the extent of educational resource deprivation (distribution) in Ghana.

2. evaluate the relative performance of each of the domains and indicators of the MERDI.

3. a.   examine the effect of the availability of educational resources on access to basic education.

   b.   determine the influence of educational resource distribution on the quality of education in basic schools in Ghana.

Research Questions

1. What is the extent of educational resource deprivation in Ghana?

2. What is the relative performance of each of the dimensions and indicators to the MERDI?

Research Hypotheses

The study tested these two hypotheses.

1. H_0:   There is no statistically significant effect of the *availability of educational resources* on *access* to basic education.

   H_1:   There is a statistically significant effect of the availability of educational resources on access to basic education.

2. H_0:   There is no statistically significant influence of *educational resources* on *quality* basic education.

   H_1:   There is a statistically significant influence of educational resources on quality basic education.

Significance of the Study

The study will be of importance to the Ministry of Education (MoE), Ghana Education Service (GES), Non-Governmental Organisations (NGOs), and the Regional Coordinating Councils. To the Ministry of Education and Ghana Education Service, the results will serve as a guide to the attainment of the global objective of SDG 4 and the country's education strategic plan helping them in re-strategizing to ensure an equitable distribution of educational resources and delivery of quality education in Ghana while improving access. NGOs and other International Education organizations will be informed on the extent of educational resource deprivation in Ghana. This will further reveal to them which areas to assist and with what resources.

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Moreover, when the country decides to decentralize Basic education and allow the regional and district education directorate to play a key role in the delivery of quality education at the basic level, the findings will be a valuable information pack to the leaders in the regions and districts in their planning and budgeting for education. Finally, the findings will add to the literature on issues of access and quality in basic education.

Delimitation

The study will be delimited to only educational resources, all other variables that do not constitute educational resources but are in the school system will not be considered. Basic schools refer to All Basic schools in Ghana that have up to JHS3 to estimate the effect of the educational resources on quality (measured by achievement in BECE). Furthermore, the study covers the academic years, 2015/16 to 2018/19.

Organisation of the Study

The study is organised into five chapters. Chapter one looked at the introduction issues about the study. Chapter two discusses the review of related literature. The third chapter deals with the research methods used. Chapter four presents the results and further discusses them. The last chapter, chapter five, comprises the summary, conclusions, and recommendations of the study. In this, the summary of the entire study, conclusions arrived at by the researcher, and suggestions offered are given.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The review of related literature is presented in four sections, with the first section looking at the historical antecedents of basic education in Ghana, this is followed by the theoretical background that underpins the study, an extensive empirical review informed by the hypotheses for the study and then a conceptual framework informed by the hypotheses.

History of Education in Ghana

Although Western formal education introduced by European trading merchants has made significant contributions to the history of education in Ghana, it is relevant to note that Ghana had a system of "education" before the inception of European education. This was known as traditional education. Its (traditional education) main purpose was to promote healthy living, knowledge in the industry, production, and culture and to produce the ideal human with its main agencies being the home, total community, occasions, religion, adults, and peer group. It was informal, non-literate, non-specialized, and very practical (Aissat & Djafri, 2011).

Attention shifted from traditional education to castle schools when European merchants established schools along the coast for the education of Africans and the mulattos. The castle schools were also to train Africans to help in European trading as well as to civilize them. It started with Portuguese at Elmina in 1467. The Portuguese were invaded by the Dutch in 1637 who introduced a new system of education by sending brilliant African students

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abroad including Jacobus Capitein and Antony Amo (Cogneau & Moradi, 2014).

In 1722, the Danes initiated its castle school system in the Christiansborg Castle under the authority of Governor Major de Richelieu (1822 –1825). The Danes like the Dutch also sent out a few Africans abroad including Frederick Pederson Svane and Christian Protten. The British started its castle school system in 1694 after establishing the Cape Coast Castle however admission was limited to Mullatos and a few Africans (Aissat & Djafri, 2011). The Castle schools would not have made any significant contributions to the educational development of Ghana without the help of missionary bodies.

A cursory analysis of the brief history of education in Ghana brings to the fore the changing reasons for the introduction of education in the country. An initial analysis of the literature suggests that the missionaries introduced education to achieve the purpose of spreading their religion to the local people by training interpreters. However subsequent changes in the governance structure of the Gold Coast resulted in a change in the reasons for providing education in the country. These are:

1. To enable the colonial government, to collaborate with the chiefs and the local people to develop laws from the customs and values of the people.

2. To educate some people to help the colonial government in the day-to-day running of the colony. A system that came to be known as an indirect rule".

It can be argued that the inception of inequality and the genesis of educational resource deprivation in the country emanated from the reasoning of

providing education to colonial masters. It can be observed from the literature that the earlier schools established were for the privilege in society. This explains the setting up of the castle schools which were technically for the "Mullatos" and few local people. This implied that the majority of the children of the local people had little or no access at all to formal education. Access to basic education was restrictive and equity was missing though those who accessed education had a certain level of quality education with some gaining scholarships to study abroad.

Historical antecedents of Educational Reforms/Policies in Ghana

Changes in the curriculum occur in two ways. First, there are instances where aspects of the school curriculum are improved or tilted to meet currents changes in society. This is termed curriculum innovation. According to Fullan (2008), innovation is not always synonymous with change and reform, as it refers to specific curricular change. Innovations can range from single subject changes, for example, a new coding programme, to more comprehensive changes, such as an integrated approach to teaching pupils of a certain age level. This implies that innovation has unique qualities such as novelty or deliberateness. In their view, Halpin, Dickson, Power, Whitty, and Gewritz (2004) believe that curriculum innovation refers to initiatives that are perceived to be new by those who introduce and experience them. On the other hand, curriculum reforms signal a total overhaul of the entire school curriculum. According to Meena (2009), educational reforms involve the restructuring of the school system, wholesale revision of the curriculum, and the like. It is based on major changes or redirections and is often initiated in the political system.

Various education reforms have been implemented before independence by successive colonial governors in light to provide an effective, efficient and workable system of education in Ghana. These come in the form of ordinances such as the 1852 Education Ordinance by Governor Sir Stephen Hill, the 1882 Education Ordinance under the governorship of Sir Rowe, the Education Ordinance of 1887 by sir Branford Griffith, 1925 Education Ordinance under the governorship of Sir Frederick Gordon Guggisberg. All these reforms, despite their fallbacks, improved the education system of Ghana.

Even though earlier governors have set the stage for educational reforms in the Gold Coast, it was Sir Gorden Guggisberg who saw the implementation of a reform that aimed at transforming the education system of the country. This is because, in the view of Bervell, Sam, & Boadu (2013), Sir Gorden Guggisberg set up a committee to investigate various past efforts that have been made into transforming education and analyse the success and failure while considering the whole educational policy. According to Antwi (1992) and McWilliam and Kwamena-Poh, (1975), Sir Gorden Guggisberg wanted an educational system that will equip its product with the knowledge necessary to succeed in all spheres of life. His plan for education which has become known as "The Gorden Guggisberg 16 principles of Education" suggested that basic education should be made accessible for all and be thorough in delivering quality education. To achieve this, the staff of teachers must be of the highest possible and the school environment should be conducive to learning. Aside from the educational policies and reforms initiated by the colonial authorities, there have been others initiated pre-and post-independence. These are:

1. The Accelerated Development Plan of Education of 1951

2. Education Act of 1961

3. Reforms of the National Liberation Council, The New Structure and Content of Education of 1974,

4. The 1987 Education reforms,

5. New Educational Reform of 2007 and the Free SHS programme.

The Accelerated Development Plan of Education (1951)

The Accelerated Development Plan (ADPE) was initiated under the leadership of Dr. Kwame Nkrumah with Mr. Kojo Botsio as the Minister of Education after the first general elections in 1951. The main objective of this plan was to help develop a balanced system working towards universal primary education as well as teacher training and ensuring proportionate facilities for further education for those most fitted to receive it. This plan also contributed immensely to the expansion of second-cycle education and technical institutions and universities to meet the needs of expanding industry, agriculture, and other sectors of the economy. The plan also introduced six (6) years of primary education (Graham, 2013).

The ADPE led to the introduction of free compulsory education. It brought about an increase in the number of secondary schools between 1951-1957 from 12 to 38. By February 1958, there were 10,143 students in secondary schools. By 1960 total enrolment had more than tripled and the number of institutions in both sectors (i.e., public and private had almost doubled. There was a simultaneous increase in enrolment in private schools by 1960. The plan increased the number of trained teachers. By 1958 teacher enrolment had shot up to 4,055. In 1959, the colony registered, 1,800 elementary schools with an enrolment of 128,000. In Trans Volta Togoland schools totaled 644 with an

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enrolment of 76,000. In the Northern Territories, there were 246 schools with an enrolment of 27,000 (Adu-Gyamfi, Donkoh & Addo, 2016).

Education Act of 1961

The Education Act of 1961 was established to give legal support to the Accelerated Development Plan of Education of 1951 (Refer to Figure 6). The Act paved way for measures that concern the responsibilities and authority of the Minister of Education, authorities of local education, compulsory education, institutions of higher education, teachers, and the link between schools and churches. Under the 1961 Act, recommendations were made to give power (examinations, appointment of teachers, curriculum, admission, and promotion) to the Ministry of Education which was backed by law. It also recommended that the salaries, terms, and conditions of service and discipline of teachers shall be prescribed by the regulations (Graham, 2013).

According to Graham (2013), on matters of discipline, the Act threw light on the proposal of the Erzuah Committee of 1952 which stated that the teaching profession itself should be responsible for disciplining teachers and maintaining high professional conduct rather than the education unit. Also, secondary school and teacher training colleges except government schools were to have a board of governors established by the Minister. Admission to education institutions was done irrespective of the parental background, religion, or language. Almost all schools under this Act became government schools because salaries were paid by the government. School enrolment increased tremendously.

Outline of the Educational System

SIX-YEAR BASIC PRIMARY COURSE
(entry at approximately 6 yrs.)

FOUR-YEAR MIDDLE SCHOOL COURSE

Middle Form I

Middle Form II
Middle Form III

Middle Form IV

SECONDARY SCHOOLS

SECONDARY TECHNICAL SCHOOL

S.1   TEACHER TRAINING COLLEGES   S.T.1

S.2   S.T.2

S.3   TECHNICAL INSTITUTES   2-yr. course for Certificate B   S.T.3

S.4   S.T.4

S.5 — — 2-yr. courses for Certificate A   S.T.5

S.6 (1)
S.6 (2)

VERITAS   LUMEN

UNIVERSITY OF GHANA (including Institute of Education)   KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

NOBIS

(Based on the chart published in Ministry of Education reports.)

Figure 5: Education System in Ghana in 1961

Source: McWilliam (1962: p. 115)

Numerous investments were made in the education sector to ensure that every child benefitted from quality education. However, challenges with world cocoa prices affected the government finances. This resulted in the decision to cut back on social expenditure which affected education. This also led to a review of the number of years for basic education by two (2) years. This was because a large amount of the education expenditure was spent on free compulsory basic education. Primary school, however, remained six (6) years while the common entrance examination was scheduled after 2 years of middle school (Braimah, Mbowura, & Seidu, 2014) (refer to Figure 6). Generally, the 1961 Education Act led to the restructuring and expansion of educational infrastructure in Ghana. New primary and middle schools were built to accommodate the increasing demand for education improving access and ensuring the delivery of quality education.

Education Reform of the National Liberation Council

The February 1966 coup that overthrew Dr. Kwame Nkrumah, brought in a new government called the National Liberation Council (NLC). The NLC scrapped Nkrumah's ADP to give way to a more comprehensive review of the educational system. Under the National liberation council, parents were made to pay part of the distribution cost of school books. One key goal of this education reform was to bring Ghana out of the economic crisis. This affected the education sector because, it slowed down the rate of primary school expansion, and the budget for university education was cut short (Morrison, 2000). The policy initiated in 1968 sought to correct the imbalances of the educational system by:

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1. expanding the secondary level (including technical and teacher education),

2. consolidating and improving the quality of primary education

3. controlling the growth of university education, and relating it more directly to development needs.

Under the national liberation council, basic education was structured to 8 years and 2 years for middle education. The secondary school was under 8 years duration after which students write the west African certificate examination to proceed to a university.

The 1974 New Structure and Content of Education

The New Structure and Content of Education of 1974 were implemented under the leadership of the National Redemption Council, led by Col. Ignatius Kutu Acheampong. A committee was formed called the Dzobo Committee to give recommendations aimed at improving the education system. It was out of the effort of the Dzobo Committee that the New Structure and Content of Education of 1974 emerged. The idea of Junior Secondary School and Senior Secondary School was a result of the report. the Ghana Education Service (GES) was set up in 1974 but it was then called Ghana Teaching Service. The 17 years of pre-tertiary education introduced by the previous government was reduced to 13 years under the National Redemption Council. The main objectives of the reform were to equip school leavers with the requisite skills to make them suitable, competitive, and productive in the job market. As such, topics such as Woodwork, Tailoring, Masonry, Catering, Auto-mobile, Technical Drawing, Dressmaking, and Metalwork were introduced. This contributed positively to the education system of Ghana (Pedley & Taylor, 2009).

The Education Reforms of 1987

The 1987 education reforms came to light after the then President, Dr. Hilla Limann, was overthrown by Flight Lieutenant Jerry John Rawlings. In 1987, education reform was set up to review the education system as well as give reconsiderations as to how to revamp the education sector. Similar to the objectives of the previous governments, the 1987 education reform seek to improve the quality of education as well as increase enrolment by making education mandatory and free. Under this reform, the number of years of school before one could reach tertiary was reduced from 17 years to 12 years. That is 9 years of primary education including 6 years from primary 1 to 6 and 3 years of Junior Secondary School. The remaining 3 years were under senior secondary school making 12 years. The 1987 education reform made provision for Basic Education Certificate Examination (BECE) after JSS which was a requirement to enter senior secondary school. Students of Senior secondary school also wrote the Secondary School Certificate Examination (SSSCE) to enter tertiary if they pass (Anamuah-Mensah, Effah, & Sarkodie, 2002).

Education Reform of 2007

The main objective of the reform was to improve and equip the human capital, value, and preservation of our culture and tradition as well as to boost science and technology. The reform also reviewed the content of education and raised the number of years for senior high schools from 3 years to 4 years. There was also a change of name of the Junior and Senior Secondary schools to Junior and Senior High schools. However, the four-year senior high school was reversed from its previous three years when the National Democratic government NDC came into power the following year. Education under

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kindergarten and lower primary was done using the Ghanaian language as a medium of instruction (Republic of Ghana, 2015).

Free Education Program

In 2015, the Ministry of Education (MoE) and Ghana Education Service (GES) under the National Democratic Congress government introduced a Free SHS that sought to subsidize the fees of day students by paying around Ghc 48 for each day student. There was also the ongoing construction of the E-blocks. That was the definition of progressive Free SHS. However, a change in government after the 2016 general elections in Ghana, the MoE and the GES announced Free SHS where all fees were absorbed for both day and boarding students. The NPP went ahead to even define the Free SHS as:

"By free SHS, we mean that in addition to tuition, which is already free, there will be no admission fees, no library fees, no science centre fees, no computer laboratory fees, no examination fees, no utility fees. There will be free textbooks, free boarding, and free meals and day students will get a meal at school for free." (Government of Ghana Budget, 2017).

These policies were in line with Sustainable Development Goal 4, target 1 which state that "by 2030, all boys and girls complete free equitable and quality primary and secondary education leading to relevant and effective learning outcomes" (UNESCO, 2018)

Implications of Educational Reforms on Access and Quality Education

From the various educational reforms discussed above, it could be inferred that educational policies in the country are by far driven by political party ideologies and determined by changes in government. Again, it can be

stated that all the educational reforms in Ghana have sought to improve access to basic education, improve educational infrastructure, and advance quality in education delivery. In helping to improve access to education, our reforms have focused on improvement in infrastructure and removing financial barriers. For instance, as far back as 1951, the ADP introduced free compulsory education. This was targeted at improving access by making education free and at the same time compulsory. Again, the educational reform of 1987 also had as one of its objectives to increase the level of enrolment. In achieving this, there was a massive improvement in school infrastructure. It is therefore not surprising that in 1995, Ghana introduced the Free Compulsory Universal Basic Education (FCUBE) which was to ensure that basic education is not just free but also compulsory for all children of school-going age. Further policies were undertaken in the early 2000s to ensure that access to education is not just improved but also that retention is enhanced. This explains the rationale for the introduction of capitation grants and school feeding programmes.

Regarding the quality of education, all the educational reforms in one way or the other made quality a central theme in their implementation. Ghana's educational reforms have sought to establish relevance by improving the quality of the teaching staff, infrastructure, and the overall curriculum.

Structure of Basic Education in Ghana

Currently, the structure of the education system in Ghana comprises six (6) years of primary education, three (3) years of Junior High School (JHS), and three (3) years of Senior High education. However, before one would be enrolled in primary one, the system requires that the pupil undergoes two (2) years of kindergarten education. This is to help the student to receive some level

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of fundamental education necessary for easy adaptation in primary one. Concerning primary education, divisions have been made into lower primary (3 - years) and upper primary (3 - years). With the implementation of the standard-based curriculum, the focus has shifted to achieving specific core competencies at each level of basic education.

At the JHS, it takes three (3) years for students to complete. It is at this level that students get the opportunity to pursue various programs at the senior high school upon passing their Basic Education Certificate Examination (BECE). Currently, the duration of our senior high school education is three (3) years. Major courses at this level are; General Sciences, General Arts, Visual Arts, Home Economics, Business, General Agriculture, and Technical Skills. Students at the senior high school level progress to various tertiary institutions after passing the West African Senior Secondary Certificate Examination (WASSCE).
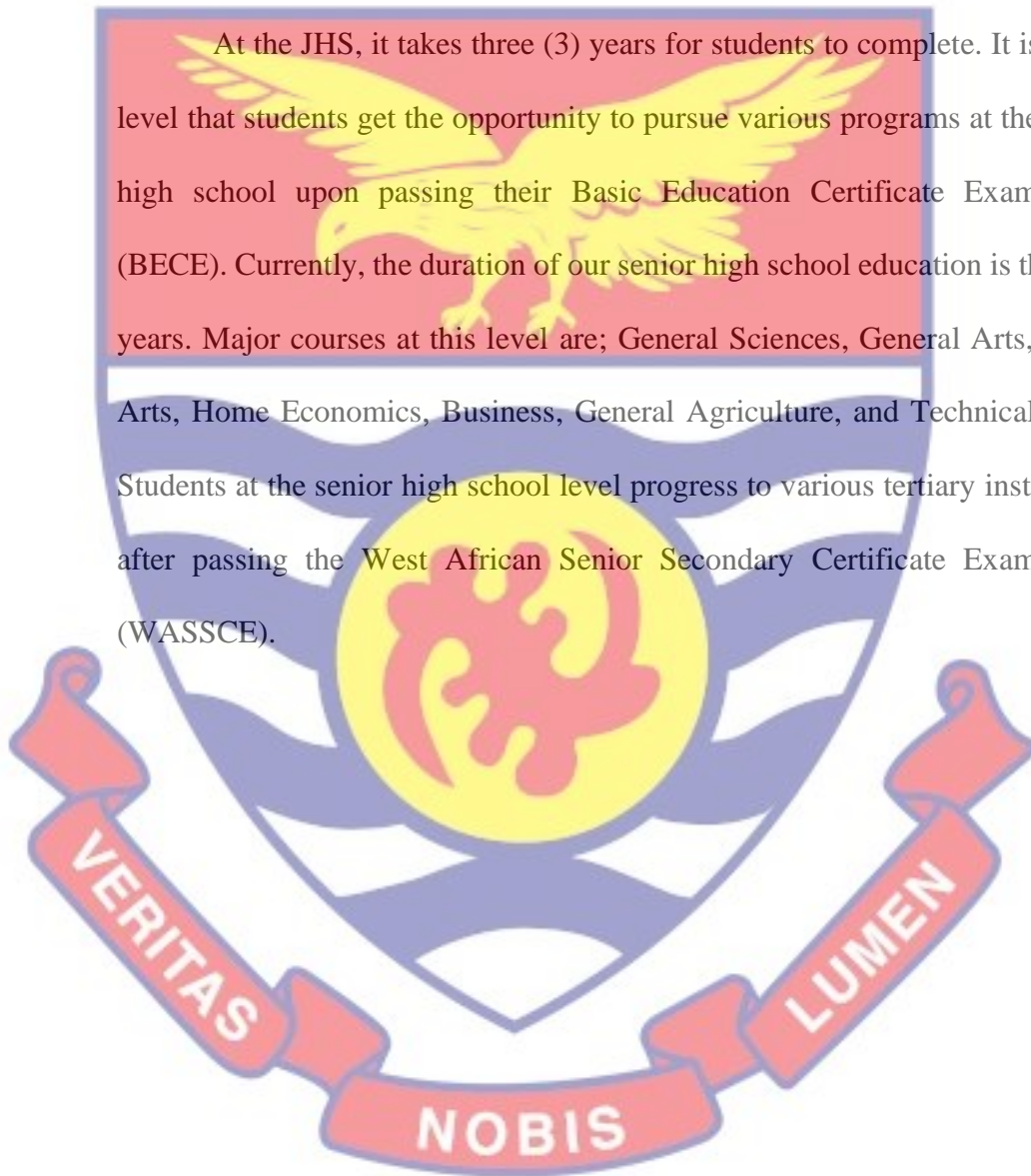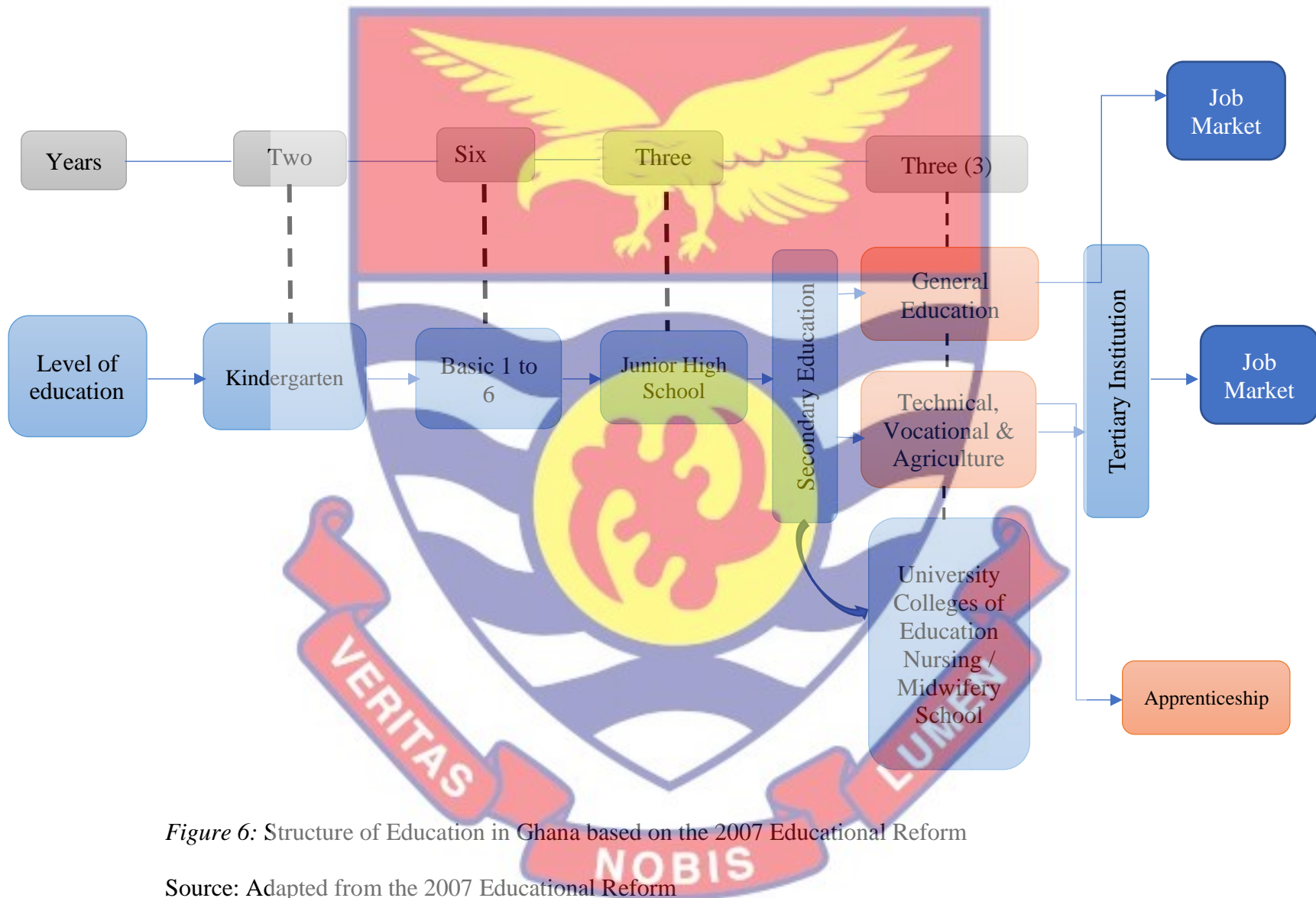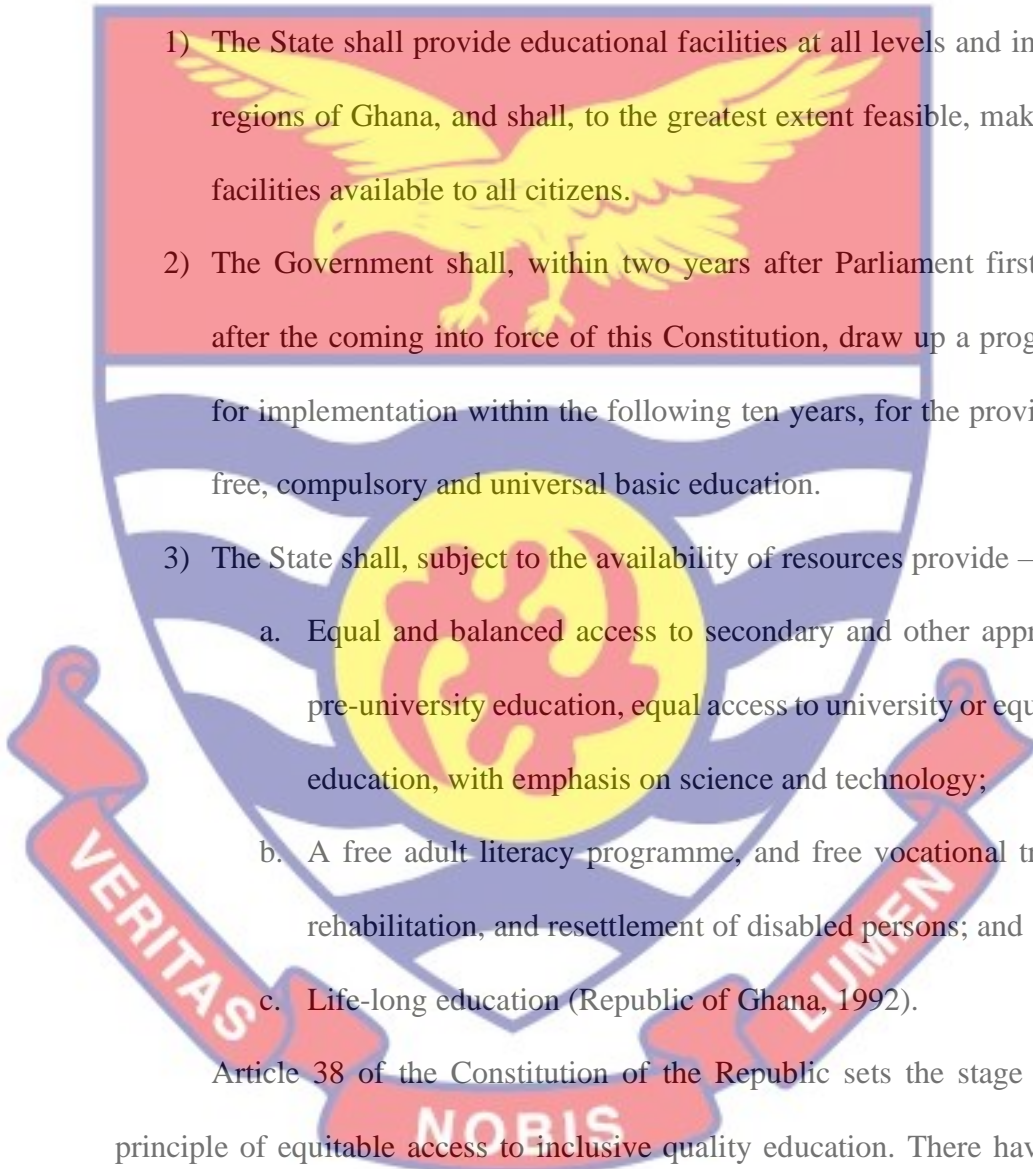
Figure 6: Structure of Education in Ghana based on the 2007 Educational Reform

Source: Adapted from the 2007 Educational Reform

Education Laws in Ghana

Education is a fundamental privilege that should not be taken for granted. The 1992 constitution made specific provisions on education that guide governments under the fourth republic. Article 38 of the 1992 constitution states:

1) The State shall provide educational facilities at all levels and in all the regions of Ghana, and shall, to the greatest extent feasible, make those facilities available to all citizens.

2) The Government shall, within two years after Parliament first meets after the coming into force of this Constitution, draw up a programme for implementation within the following ten years, for the provision of free, compulsory and universal basic education.

3) The State shall, subject to the availability of resources provide –

   a. Equal and balanced access to secondary and other appropriate pre-university education, equal access to university or equivalent education, with emphasis on science and technology;

   b. A free adult literacy programme, and free vocational training, rehabilitation, and resettlement of disabled persons; and

   c. Life-long education (Republic of Ghana, 1992).

Article 38 of the Constitution of the Republic sets the stage for the principle of equitable access to inclusive quality education. There have been other Acts before and after the 1992 constitution which have all sought to give the educational system a robust legal framework. Some of these are; the 1961 Act on Education, Education Act 581 (GetFund Act), Act 506 of the Ghana

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Education Service, Education Act 778, and Education Regulatory Bodies Act 2020 (Act 1023).

Education Act of 1961

The Unrestricted and Obligatory Primary and Basic Education Act of 1961 created a policy of free and compulsory primary and basic education for all school-aged children. Private schools were also allowed to be established under the Education Act, to supplement the government's efforts, and to dispose of enough schools to cater to the ever-growing demand for education, especially at the basic level. This led to the creation of the Private Schools Unit at the Ministry of Education in August 1973. In 1983, the Government enacted PNDC Law No. 42 to modify and reinforce the Education Act of 1961.

Education Act 581 (GetFund Act)

The Education Trust Fund of the nation of Ghana (GETFund), is a public trust fund set up by an Act of Parliament in the year 2000. Its core mandate is to provide funding to supplement government efforts for the provision of educational infrastructure and facilities within the public sector from the pre-tertiary to the tertiary level. GETFund also provides funding to support the procurement of educational equipment, and promotion of staff development and research, especially at the tertiary level. A portion of the revenue is also used to support areas of the activity of agencies and institutions over which the Ministry of Education has supervision and supervisory authority.

Ghana Education Service Act 506 and 778 Education Act

The Ghana Education Service Act, 1995 (Act 506) confirmed the Ghana Education Service as the centralised apex body for pre-tertiary education but

had provisions that decentralised some functions and powers to the regional and district levels by way of de-concentration.

Act 778 on Education, a legal product of the National Education Reform (2007) offers the education minister the incentive to initiate measures for implementing an effective decentralisation programme, where district assemblies shall have the executive duty to provide and manage basic and second-cycle schools in the country. This Education Act 778, which is still in operation, is purposed to provide for the establishment of an educational system intended to produce well-balanced individuals with the requisite knowledge, skills, values, aptitudes, and attitudes to become functional and productive citizens for the total development and democratic advancement of the nation. These have been replaced by Act 1023, the Education Regulatory Bodies Act, 2020.

Noting that the nature and structure of our laws have contributed either to the attainment of quality education and improved access to basic education or otherwise, is significant. An analysis of these laws depicts stringent efforts from the state to ensure that quality education delivery is carried out to the benefit of all.
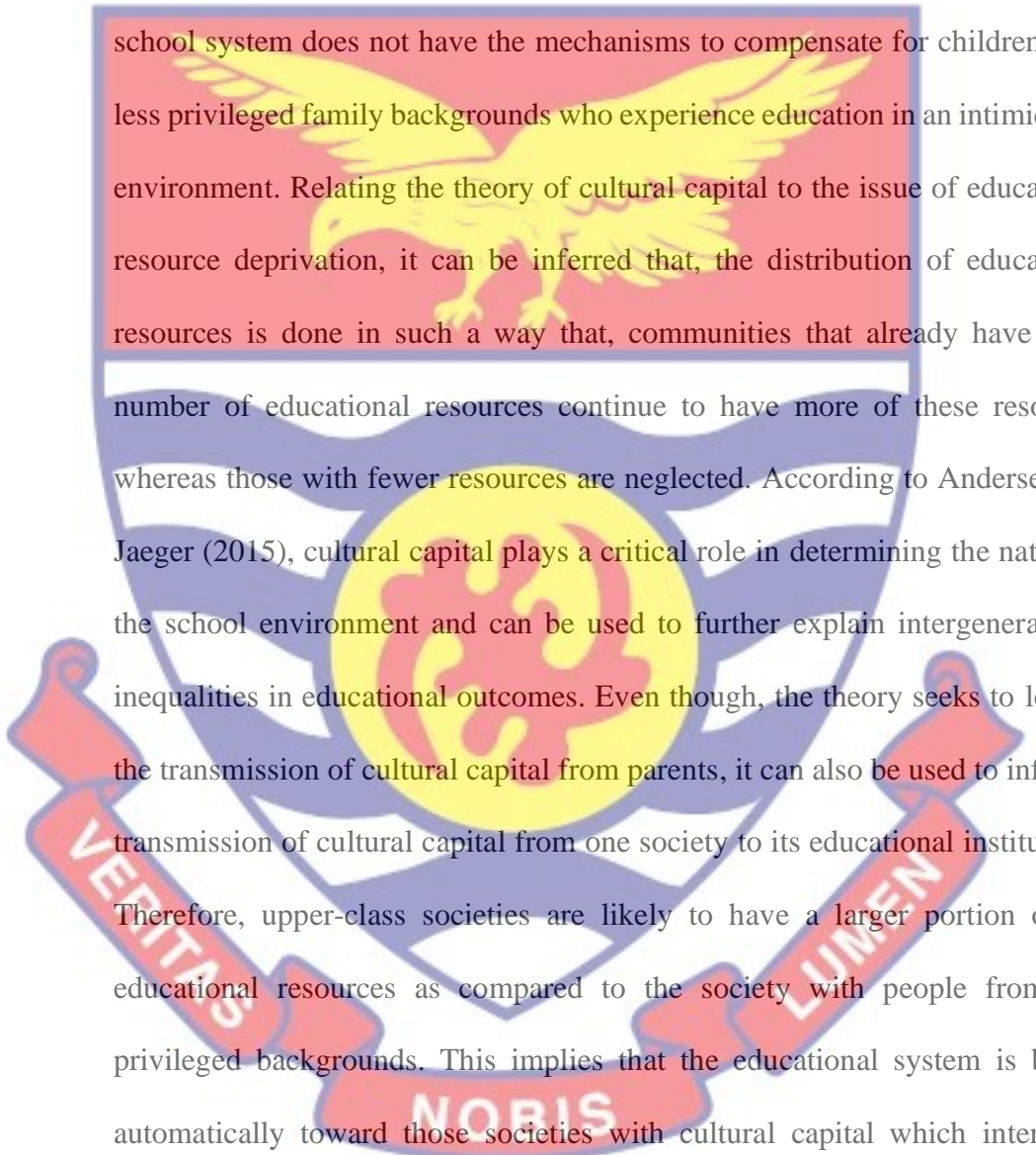
Theoretical Review

The theoretical framework of the study hinges on the theories of cultural capital, systems input and output model, and human capital.

Cultural capital

The theory of cultural capital as propounded by Bourdieu in his broader theory of social reproduction basically looked at how the disparities in the practices of society perpetuate into all other aspects of society's life, especially

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in terms of education, and as a result, lead to the continuous widening of the level of inequality in society. According to Bourdieu (1977), the educational system is crucial in determining the existing social structures and class relations because it axes on the desires of the upper class. Thus, the structure of an education system favours children from the upper class and unfortunately, the school system does not have the mechanisms to compensate for children from less privileged family backgrounds who experience education in an intimidating environment. Relating the theory of cultural capital to the issue of educational resource deprivation, it can be inferred that, the distribution of educational resources is done in such a way that, communities that already have some number of educational resources continue to have more of these resources whereas those with fewer resources are neglected. According to Andersen and Jaeger (2015), cultural capital plays a critical role in determining the nature of the school environment and can be used to further explain intergenerational inequalities in educational outcomes. Even though, the theory seeks to look at the transmission of cultural capital from parents, it can also be used to infer the transmission of cultural capital from one society to its educational institutions. Therefore, upper-class societies are likely to have a larger portion of the educational resources as compared to the society with people from less privileged backgrounds. This implies that the educational system is biased automatically toward those societies with cultural capital which intends to provide a better learning environment for children who possess an amount of cultural capital.

Systems input and output model

This theory was introduced by the biologist Ludwig von Bertalanffy in the 1930s on the need to integrate the various parts of a phenomenon in an attempt to solve the problem. To him, a system is a set of "*related components that work together* in a particular *environment* to perform whatever *functions* are required to achieve the system's *objective*" (Kenton, 2018). The system's input and output model emanated from the general systems theory. It submits that in the general systems theory, there are input variables and output variables. That the true functioning of the output variables depends solely on the kind of input variables that are provided. Invariably the evaluation of any system is based on the kind of output that emits from it. This theory is relevant to the study in that, the level of academic achievement which is measured by the performance of students in the Basic Education Certificate Examination (BECE) which is the output variable in this study, is intrinsically related to the various input variables in the form of educational resources (pecuniary and non-pecuniary). It might suffice to state that the level of potency of the varied educational resources provided to students plays a critical role in the overall performance of the students in their examinations. It is important to note that, the education system is seen as an open system that interacts with its environment and other supra-systems.

One key feature of this theory is that there is interdependence and interrelation of the various parts of the system, that is, the various parts or elements of the system are either interconnected or interrelated and work together to produce an expected outcome. The essence of this feature is that the various parts of the educational system that form the input variables are not self-

sufficient, hence their ability to contribute positively to an educational outcome relies on how well they interact and interconnect with each other. The working of this theory can be explained adequately by adopting a conceptual framework that summarises the results of school effectiveness research conducted by Scheerens, (1989).

Context
- achievement stimulants from higher administrative levels
- development of educational consumerism
- 'co-variables', such as school size, student-body composition, school category, urban/rural

Inputs
- teacher experience
- per pupil expenditure
- parent support

Process
school level
- degree of achievement-oriented policy
- educational leadership
- consensus, cooperative planning of teachers
- quality of school curricula in terms of content-covered and formal structure
- orderly atmosphere
- evaluative potential

classroom level
- time on task (including homework)
- structured teaching
- opportunity to learn
- high expectations of pupils' progress
- degree of evaluation and monitoring of pupils' progress
- reinforcement

Outputs
student achievement, adjusted for:
- previous achievement
- intelligence
- SES

Figure 7: A summary of the findings from school effectiveness research, from Scheerens, (1989)

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According to Scheerens, (1989), integrating Figure 5 with the input-process-output model implies that:

a. outputs are the basic criteria to judge educational quality;

b. to be able to properly evaluate output, achievement or attainment measures should be adjusted for prior achievement and other pupil intake characteristics; in this way, the value added by schooling can be assessed;

c. in selecting variables and indicators to assess processes and context one should look for those factors that are correlated with relatively high "added-value" factors.

Human capital theory

OECD (2001) defines human capital as "the knowledge, skills, competencies and other attributes embodied in an individual that is relevant to economic activity." This explains the underlying philosophy of the theory of human capital as proposed by Schultz (1961) and Becker (1964). Growth theories like Harold-Domar and Solow-Swan all ascribed the growth of the economy to the accumulation of physical capital. This position was contradicted in the seminal paper of Schultz in 1961 which sought to put human capital at the centre of economic development in any economy. The human capital theory seeks to emphasize the significant role, quality human resources, plays in an economy. That is, the economic growth of a country highly relies on the quality of human resources it can accumulate. This is captured succinctly by Becker (1964) when he stated that human capital improves workers' productivity and that it is seen as a valuable asset not only to an organization but the entire economy. This study partly relies on the theory of human capital because, to

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endogenous growth theorists, the key variables of a production function include education, training, and investment in the workforce. Therefore, the growth of the economy is a function of the quality of education that the human capital base of the country receives.

Quality education hinges on the provision of the needed educational resources. It must be stated that one of the important sources of the difference in human capital is the nature and quality of education a person receives. This implies that quality education is key to attaining the requisite human capital that is needed to drive the economic growth of any country. Hence, all the needed educational resources that propel quality education should be made available to schools in the country to ensure that there is mass production of quality human capital from our educational institutions. This was affirmed by Schultz (1961) when he suggested that primary and secondary level education is an important source of human capital production and improvement.

Concept of Educational Resources

According to Usman (2016), resources for teaching and learning refer to the entire human, material, non-material audio-visual school environment, and community materials available in an academic environment to facilitate school administration and simplify the teaching and learning process. To Usman, these resources embrace other fundamental materials used in the school to make teaching very easy and learning more meaningful and comprehensible to the learners. The National Open University (NOU) of Nigeria (2010) on the other hand, refers to resources for schooling as the tutors in the school, human beings in the community, real objects, specimens or models, chalk and display boards, school buildings, and layout, the community at large and other fundamental

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materials like pencils, pens, exercise books, etc. which the learners are expected to have at any point in time to facilitate learning.

In the view of the National Teachers Institute (NTI) (2006), these resources cover all those materials human and non-human, drawn or photographed, built manually or electronically operated, books, and all forms of related materials used in the teaching and learning process. From the perspective of these three definitions, it can be said that educational resources are essentially material/physical and non-material/human resources needed by a school to ensure the effective and efficient delivery of education.

Agabi (2010) also posits that educational resources can be categorised into four namely human, material, physical and financial resources. Usman (2016) also groups educational resources into four namely; material/physical, financial, human, and time. It should be stated that physical and material resources in the context of the school system can be classified as the same which makes Agabi's classification a little bit problematic. It is therefore not surprising that Usman (2016) combined physical and material resources as one and rather introduced time as the additional resource available in the school system. From these perspectives, educational resources can broadly be classified as two: Material/Physical and Non-material/Human. Financial resources technically come under material resources while time can be classified as non-material.

They are material/physical because they are visible and overt in any school system. These include the school structure, teaching and learning materials, roads, electricity, water, etc. which improves the institution's teaching and learning environment. On the other hand, educational resources can be classified as non-material or human. In the view of Becker (1962), human

resources have been the most vital resource in any institution. In the school setup, the teacher, school authorities, as well as other non-teaching staff and supervisors, form the non-material resources of the school. The human resource is responsible for seeing to the efficient consumption of other resources.

In the school system, the teacher needs to have access to well functional physical resources to ensure the productive use of instructional periods. The accessibility of educational resources is critical because it plays a key role in achieving educational objectives and goals. The extent to which an educational institution attains its objectives is directly proportional to the educational resources available and their utilization. This is because an environment suitable for teaching and learning is created when these resources are available in the proper amounts.

Arguments in favour of a Multidimensional Educational Deprivation Index (MERDI)

Deprivation according to Özmete (2015) is accepted to be explained as the result of a lack of income and other resources, which cumulatively can be perceived as living in poverty. The relative deprivation approach to poverty examines the indicators of deprivation, which are then related to income levels and resources. The work of Townsend (1979) had a great influence on this broad notion of deprivation. Townsend devised a 12-item "deprivation" index, which included six items related to physical necessities (e.g., no refrigerator in the house; gone without a cooked meal for one or more days in the last two weeks) and 6 items associated with social activities (e.g., a one-week vacation away from home in the last 12 months; a relative or friend to the house for a meal; child's friends over to play). (Cited in Mack, 2016).

According to Fisher (2001) and Short (2003), deprivation in a social context includes the lack or absence of social necessities as well as physical necessities. In the school setting, a basic school can be classified as deprived when the necessities of an educational institution are conspicuously missing in the school.

The OECD has a deprivation indicator for education which measures resources for school available to 15-year-old children in their homes. Data are taken from the PISA (Programme of International Student Assessment, OECD) surveys which asked children whether they could access: a desk to study, a quiet place to work, a computer for schoolwork, educational software, an internet connection, a dictionary, and school textbooks. Educational deprivation is defined here as having less than four of the seven items listed above (OECD, 2014). Its calculation is done using the answers given by students in the PISA study regarding their access to educational possessions in their homes.

Deprivation in education has a detrimental influence on educational attainment, leaving young people with fewer qualifications and skills, which has an impact on future career opportunities (DCSF, 2009). Estyn (2014) also proposed both poverty and low educational attainment have a strong statistical link. Learners from lower-income homes, on average, do not do as well as their peers. There is no clear explanation for the relationship between deprivation and underachievement, nor is there an easy way to break it. The importance of noting that, deprivation of a basic school about educational resources is not location-specific although the location of the school and the locality can be a major determinant of whether a basic school can be classified as deprived or not, cannot be overemphasized.

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It is also important to understand that deprivation of educational resources can be determined by the type of school ownership or the inequalities in government expenditure over the years. For example, Awan and Saeed (2014) argue that private educational institutions play pivotal roles not just in eradicating illiteracy, but also in improving the academic environment for students and instructors. Khatti, Munshi, and Mirza (2010) investigated the function of private schools in the Badin district in promoting education, concentrating on productive assets (physical, human, and other facilities) and output resources (education).

The study collected data from 49 different public as well as private institutions randomly through a questionnaire design. The study found that public schools are much better in physical and human resources while other facilities were better in private institutions. The study concluded that private schools of District Badin were playing better roles in the promotion of education as students who performed well (securing A1 to B grades) were more related to private institutions. Almani, Soomro, and Abro (2012) evaluated the behaviour of parents, students, teachers, and officers for assessment of the actual position of education in Private Schools of Sindh, identifying the role of parents, officers, teachers, and students in the promotion of the private schools. The private schools were believed to be the symbol of better education, strict discipline, hardworking, cooperation, mutual understanding, and a charming future. The data had been collected from the four important pillars of private schooling. A sample of 360 students, 220 teachers, 22 0 parents, and 80 officers from 90 schools was randomly selected. Four different types of questionnaires were developed. The study concluded that the stakeholders remained satisfied with

the quality and quantity of private school teachers, the performance of students (quality of education), cooperation by parents, quality of textbooks, and English as a medium of instruction. They remained dissatisfied with supervision by officers, school building, facilities, admission, and monthly fees.

Generally, privately run schools have greater autonomy, better resources, a better school climate, and higher performance levels than publicly managed schools, as per a study conducted in 18 OECD countries and 14 partner economies (OECD, 2012). According to studies, poor parents in Kenya bypass free public elementary schools, in preference for fee-paying low-cost private schools, because private schools are seen to be of higher quality (Tooley et al., 2008; Oketch & Ngware, 2010; Oketch et al., 2010).

Private schools as well, have an edge over their counterparts as they are more organized in terms of pupil enrolment and teaching/learning facilities (Rong'uno, 2017). The disparities between private and public schools, according to Dronkers and Peter (2003), are primarily due to the school environment. When choosing a school for their children, parents are primarily concerned with the academic staff and curriculum. Professional personnel of high quality can better educate pupils, which is why parents prefer schools with professional academic staff (Shah, Nair & Bennett, 2013). According to Badri and Mohaidat (2014), the nonviolent environment provided by the institution is the principal concern of parents. A benign environment provides confidence to both parents and children. Hence, parents pay more attention to the safe school environment as it generates their children's ability to perform well. Conferring to Leclercq, Ananga, Kageler, and Danquah (2017) in their education sector analysis on equity in Ghana, regions with the highest incidence of poverty tend

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to receive lower levels of per-student expenditure. In 2015, the Government of Ghana expended less per student on basic education in the Upper West and Northern regions than in the Central.

It is evident from the review so far that deprivation is attributed to and measured in terms of poverty at the household level. For example, the most recent multidimensional poverty index released by the Ghana Statistical Service treated education as one of the dimensions of deprivation. In that report, school attendance, school attainment, and school lag were the variables used to determine whether a particular individual or household is deprived in terms of education. The attainment or lack of these renders a person deprived and not the school. The gap in the literature is therefore the absence of a quantitative measure of what a deprived (poor) basic school is in terms of either the existence or absence of certain educational resources.

Education and Economic Development

Without substantial investments in human capital, nations will struggle to achieve long-term economic expansion (Ozturk, 2001). Ozturk further asserted that people's understanding of themselves and the world is enriched by education. It improves the quality of their lives and leads to broad social benefits for individuals and society. Education raises people's productivity and creativity and promotes entrepreneurship and technological advances. In addition, it plays a very crucial role in securing economic and social progress and improving income distribution. Education, according to Ozturk (2001), is essential for economic progress (and conversely, economic development is not possible without a good education); a balanced educational system promotes

not only economic development, but also an increase in productivity, generating higher individual incomes per capita.

Lumun (2020) investigated the importance of higher education on Nigeria's sustainable economic development. The Functionalist theoretical perspective was used as a cornerstone in analyzing the study. The study indicates that higher education is a cardinal tool for sustainable economic growth and development that creates a quality workforce, instills in individuals the value of achievement, promotes life learning, supports business and industries, carries out research, and promotes technologies as well as innovations. Higher education enhances upward socio-economic mobility and is an instrument for escaping poverty and unemployment.

In Mauritius, the effect of education on economic growth was also explored by Odit, Dookhan, and Fauzel (2010). The study revealed that human capital plays a major role in economic growth, primarily as a means of increasing output. There is solid evidence that human capital boosts productivity, implying that education is more than just a way for people to advertise their level of competence to their employers.

Also, in research by Toya, Skidmore, and Robertson (2010), they discovered a positive relationship between education and income growth in the world. Whether education was measured in years of finished education at all levels or years of completed secondary education, the positive and substantial relationship remained the same. Again, education, as measured by years of schooling completed by the adult population, has a significant growth impact, all things being equal (Barro & Lee, 2010). Similarly, Cohen and Soto (2007) investigate the effects of education on income growth and find that both initial

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years of schooling and change in years of schooling have a significant positive impact on income growth in the world.

Gyimah-Brempong (2010) investigated Africa's educational and economic progress. The study explored the influence of education on many development outcomes in African countries by utilising panel data from two new data sets on educational attainment. The study's result revealed education has a positive and significant impact on development outcomes. Also, it was found that different levels of education affect development outcomes differently; primary and secondary education may be more important than higher education for some development outcomes, whereas tertiary education may be more important for some development outcomes, such as income growth rate. These studies, therefore, suggest that different levels of educational attainment are relevant for increasing income levels however the higher the level of educational attainment the higher the level of income which will then mean less poverty in the end.

If considerable progress in terms of economic and social development is to be made, education must be prioritized. Thus, education increases the value and productivity of the labor force which subsequently leads to poverty reduction levels (Omoniyi, 2013). Pelinescu (2015) asserts that major investment in a country's population's education and human capital is critically provided the country wants to achieve steady or progressive economic development. Mounting evidence by researchers has shown valuable returns to several forms of human capital development through education, research, training, and aptitude building (Goldin, 2016). The lack of education among a country's population tends to hurt the country's per capita income which tends

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to increase poverty levels, especially in developing economies of which Ghana is no exception.

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2012) report, education results in higher wages for individuals. Thus, well-educated people have a greater probability of being employed, are economically more productive, and therefore earn a higher income. Throughout the world, it has been found that the probability of finding employment rises with higher levels of education and that earnings are higher for people with higher levels of education. Hence, households with highly educated individuals are less likely to be poor.

In Ghana, Dzidza, Jackson, Normanyo, Walsh & Ikejiaku (2018) assessed how policies on access to education influenced poverty reduction. They collected both primary and secondary data using a purposive sampling method to select at least two people from all ten regions of the country for the primary data and analyzed data from the 2010 Education Sector Performance Report collected by the Ministry of Education for the secondary data. Their study found that the level of educational attainment has invariably impacted the level of poverty in the country because better access to education has resulted in increased enrollment at all levels of education since the year 2005/2006. Their study further found that the annual Gross Domestic Production (GDP) growth rates of Ghana increased from 4.0 percent in 2005 to 15.0 percent in 2011 with the lowest growth rate recorded in 2009 and the highest in 2011 (GSS, 2014), indicating an inverse growth relationship between education and poverty. They concluded in their study that to reduce poverty and enhance development,

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Ghana needs to focus more on progressive policies aimed at improving quality and access to education.

Moreover, Awan, Malik, Sarwar, and Waqas (2011) used a logistic regression model to estimate the probability of being poor based on educational level and experience in Pakistan. Their study relied on secondary data from the Household Integrated Economic Survey. The results of their regression model showed a negative relationship between educational levels and poverty. Their results, therefore, suggested that higher levels of education reduce the probability of an individual being poor. They concluded that educational attainment and poverty had a negative correlation.

Uses of Education Expenditure

Government education spending is indicated, according to recent studies, to improve educational quality and result in improved economic outcomes. Most of these studies have analysed the situation of developing countries that have attempted to stimulate the accumulation of human capital through public education expenditure (Jung & Thorbecke, 2001). Only just recently these links have been analysed in developed contexts (Grimaccia & Lima, 2013) reporting similar outcomes. Hong-Sang and Thorbecke (2003) assessed the effect of education expenditure on human capital, labour skills, and economic growth in Tanzania and Zambia using the multi-sectoral Computable General Equilibrium model. The simulation results suggested that education can raise economic growth and that a well-targeted education expenditure can be effective for poverty alleviation.

Using the Vector Error Correction Model, Okubal (2005) investigated the relationship between economic growth, education spending, and human

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capital for the period 1962 to 2002. It was discovered that there is both a long-run and short-run relationship between education expenditures and economic growth in Uganda. Hussin et al. (2012) examined the long-run relationship and causality between government expenditure on education and economic growth in the Malaysian economy using a Vector Auto Regression model for the period 1970 to 2010. Findings from this study showed that economic growth (GDP) positively cointegrated with fixed capital formation, labor force participation, and government expenditure on education. About the short-run relation, it is found that there is a short-run bidirectional relationship between economic growth and education expenditures. The study indicates that education expenditure plays an important role in influencing Malaysia's economic growth.

Chandra (2010) studied the relationship between economic growth and education expenditures for India over the period 1951-2009 using the restricted vector autoregression method. The results indicate that there is a short-run bi-directional link between education expenditure and economic growth for India. Other studies consistent with this view include Afzal et al. (2010), Barro (2001), Zhang and Casagrande (1998), Lin (2003), Tamang (2011), Baldacci et al (2008), Ogujiuba and Adeniyi (2005), Jorgenson and Fraumeni (1992). In Ghana, Owusu-Nantwi (2015) looked into the relationship between education spending and economic growth. To test for a causal association between the variables from 1970 to 2012, vector error correction and cointegration analysis were employed. Results of the study showed a positive and significant long-run relationship between education expenditures and real GDP, gross capital formation as well labor force participation. The results indicated that education contributes meaningfully to the long-term growth of Ghana's economy. Also,

in the short-run, Granger causality runs both directions between economic growth and education expenditures. Pradhan (2009) investigated the connection between public education spending and economic growth in India between 1951and 2001. Error Correction Modeling was used to execute the empirical study, and the results imply that there is unidirectional causality between education spending and India's economic growth. Only from economic growth to education spending is there a causal relationship.

Quality as a concept in Education literature

In an attempt to define quality, Doherty (2008) said it is something that organisations do; a system for measuring the degree to which organizations' overarching goals, objectives, and outcomes have been realized. In a broader perspective, the term has been used to judge the worth of an activity, service, or product. In educational literature, quality seems to be a concept that has been abused considerably. In most public discourse, there is a talk about quality education either from the policymaker or various stakeholders in the education sector. This is because, quality education is a priority that every country strives to include among its national educational goals (Mphale & Mhlauli, 2014).

The level of prominence given to the word "quality" in education policy discourse reveals the extent to which the concept is important to stakeholders in the sector. Based on this, quality education is a function of the active engagement of instructors, learners, and the school environment, according to the Ministry of Education of Nepal (2003). This explanation of quality education places quality education at the doorsteps of the teaching skills of the teacher, student learning capacity, and the appropriateness of the school environment. It must be indicated that they further state that quality education

can be enhanced by resorting to improvements in institutional and human ability.

As stated by Coombs (2000), quality education pertains to the relevance of what is taught and learned and how well it fits the present and future needs of the particular learners in question, given their particular circumstances and prospects. Adams (1997) as cited in UNESCO (2017) presents a comprehensive understanding of what quality in school pertains to and how it should be measured. Table 1 presents a modification of his conceptualisation and measurement of quality education.

Table 1: Meaning of Quality in Educational Setting

Meaning of Quality	Measurement and Conceptualisation
Reputation	• Public perception about the educational institution • Measured informally, Socially • Difficulty to quantify despite general agreement
Inputs	• Variables needed to ensure a conducive school environment and effective teaching and learning • Measures include: number of teachers, qualification of teachers, class size, number of classrooms, nature of school building, number of textbooks, instructional materials, laboratories, libraries, and other facilities. • Easy to conceptualise and quantify
Process	• The mode by which elements in the school system interacts and influences each other • Measures include: interactions of students and teachers; teaching and learning activities; "quality of life" of the programme, school or system • Difficult to conceptualise and quantify
Content	• The relevance of the subject matter being learnt by students • Measures include: skills, attitudes, behaviours, and values to be transmitted through the intended curriculum • Easy to conceptualise and quantified formally espoused values; difficult to identify implicit values

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Outputs	• These are short deliverables of an educational system. • Measures typically include: cognitive achievement, completion rates, admission rate, transition rates, acquisition of desired skills, attitudes, behaviours and values • Easy conceptualise, more difficult to measure
Outcomes	• These are long term products of an educational system. • Typical measures include: income; employment; health; civic engagement; social cohesion; social levels of desirable attitudes, values, skills and behaviours • Some concepts easy to conceptualise, while others are more difficult, all are difficult to measure
Value-Added	• Focuses on the extent to which an educational system is able to add on to the state of life of a person (private benefit) and to the society (social benefit) • Measures extent of improvement • Relatively easy to conceptualise, depending on specifics, change is difficult to measure and requires baseline
Selectivity	• Deals with the extent to which an educational system is able to impact on the marginalise and deprived in the society. • Measures include: percentages of children excluded, or failed • Easy to conceptualise, easy to measure

Adapted from Adams (1997)

Based on the eight possible interpretations of quality in an educational context, it must be stated that most educational research works on quality centres on inputs, content, outputs, and outcomes. This implies that any definition of quality education must focus on the nature of inputs, the type of content, the outputs as well as outcomes, and all of these must produce positive results for that education to be classified as being of a certain level of quality.

Available quality education according to UNESCO (2012), is "one that is effective for purpose, has enduring development relevance, is equitable, is resource-efficient and translates into substantive rather than symbolic access". Inequity in access to high-quality education exacerbates social inequities associated with income, social advancement, income, and status (Kubow & Fossum, 2007). Additionally, identified by UNICEF (2000), are five determinants of quality of education and equity issues embedded in its base on the rights-based perspective. Student characteristics, the issue of environment and context, content and educational resource inputs, as well as quality processes and outcomes, represent these five determinants. The learner characteristics include the previously learned capabilities that the learner brings on board the learning process. It also takes into consideration the socio-economic background of the learner (UNICEF, 2000). It also includes laying a strong foundation for access and quality through Early Childhood Education (ECE) as well as the active involvement and the role of parents.

Context or environment, on the other hand, encompasses the physical and social surroundings including the safe, healthy democratic environment of the school as well as the available facilities and class size. It also includes the societal values and attitudes, social status, and national policies on education (UNICEF, 2000; UNESCO, 2009; Verger, 2014). These are necessary preconditions for equity and quality in basic education. Tikly and Barrett (2013), also identified three main determinants of equity in quality education about context including policy environment, school environment, and home/society environment. They argued that the policy environment which includes government reforms and policy strategies on curriculum, teachers, and

governance is the most powerful determinant of equity in quality. Tikly and Barrett (2013), also posited that quality of education can be defined in terms of the context when it hinges on the principles of inclusion, participation, and relevance. Hence equity in quality should take into consideration the values of effectiveness, efficiency, equality relevance, and sustainability condition of a particular milieu.

Also, quality issues relating to content encompass an effective, flexible and relevant, and learner-friendly curriculum as well as an efficient and responsive school timetabling system. Content is also viewed in the local context (UNICEF, 2000). Inputs also, deal with the availability and utilisation of educational resources. The success of teaching and learning is influenced by the availability of materials and human resources as well as their efficient management. Equity in quality, therefore, depends on the availability and fair distribution of these resources. Lastly, outcomes look at the measurable educational and learning objectives. They include achievement in tests and examinations, fulfillment of national goals and targets as well as the individuals' fulfilments as evident in indicators such as transition, completion, and literacy rates (Ibid). For this study, therefore, quality is operationally defined as the education of some reasonable standard that is available and accessible to all, which provides equal educational experiences and help to develop the capabilities (cognitive, communicative, and affective skills) of the individual so that the individual becomes useful to him or herself and the society.

Academic Achievement as a measure of Quality Education

Measuring quality education in the immediate to short term has always been debatable. Experts have proposed that for such short-term periods, quality

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education can be measured by the improvement in the cognitive development of the student which translates to respectable performance in an examination. Scheerens, Luyten, and van Ravens (2011) assert that yield indicators may be obtained through national examinations and international assessments. In the case of Ghana, measuring units often comprise the measuring of learning outcomes based on national tests or international assessments; the Basic Education Certificate Examination (BECE) and West African Secondary School Examination (WASSCE). They provide the most important data for understanding whether the educational quality and learning outcomes are improving as intended. It is therefore prudent that international organisations rely on national and international assessments such as Trends in International Mathematics and Science Study (TIMMS) and Program for International Student Assessment (PISA) to compare the quality of education among countries.

According to Blomeke, Olsen, and Suhl (2016), instructional quality predicts students' achievement. This implies that improvement in the cognitive achievement of the student is dependent on the quality of instruction delivered, hence, the focus on the teaching and learning process. According to Tamakloe, Amedahe, and Atta (2006) an effective teaching and learning process form a triadic relation with the principal agents being the subject matter, the teacher, and the student. They indicate that there should be constant interaction between these principal agents to ensure a quality instructional process which ultimately leads to improvement in learning outcomes. Figure 8 shows the triadic relationship of teaching according to Tamakloe et al., (2006).

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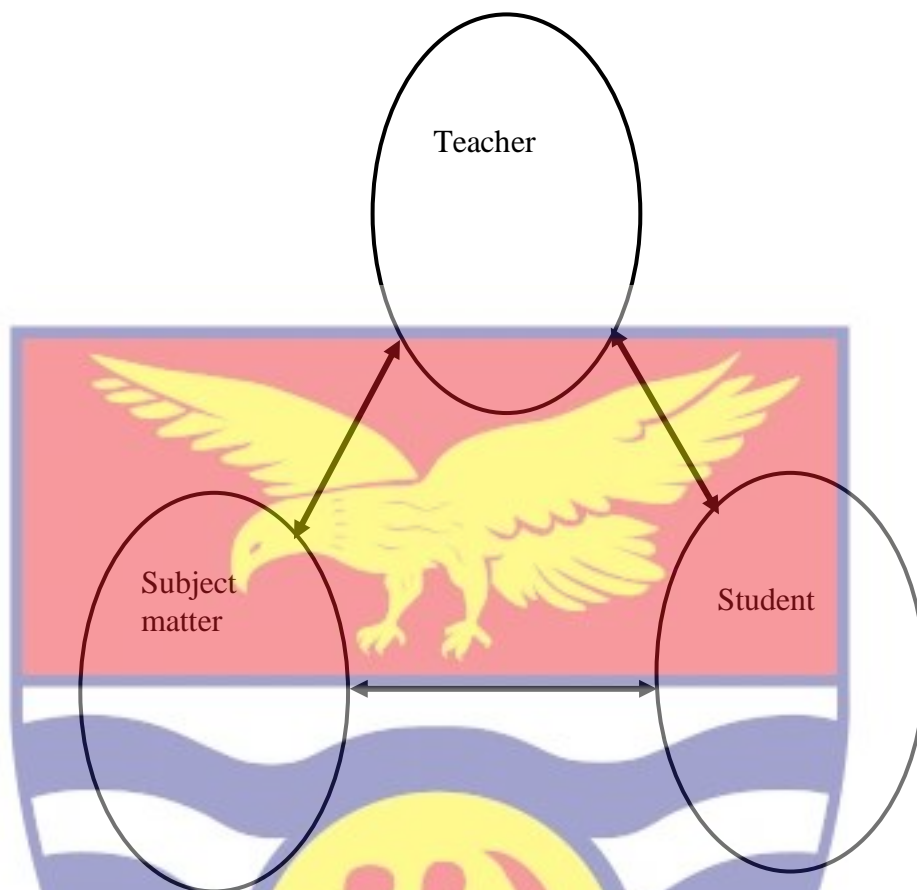
Figure 8: The Triadic Relationship of Teaching

Source: Tamakloe, Amedahe and Atta (2006).

However, in my proposition, quality instruction transcends these three principal agents. To ensure that the academic achievement of the student reflects the quality of education delivered in the school system, there should be detailed modeling of what constitutes quality instruction. Figure 9 presents a four-fold instructional model developed by the author to illustrate how quality delivery of instruction can be achieved.

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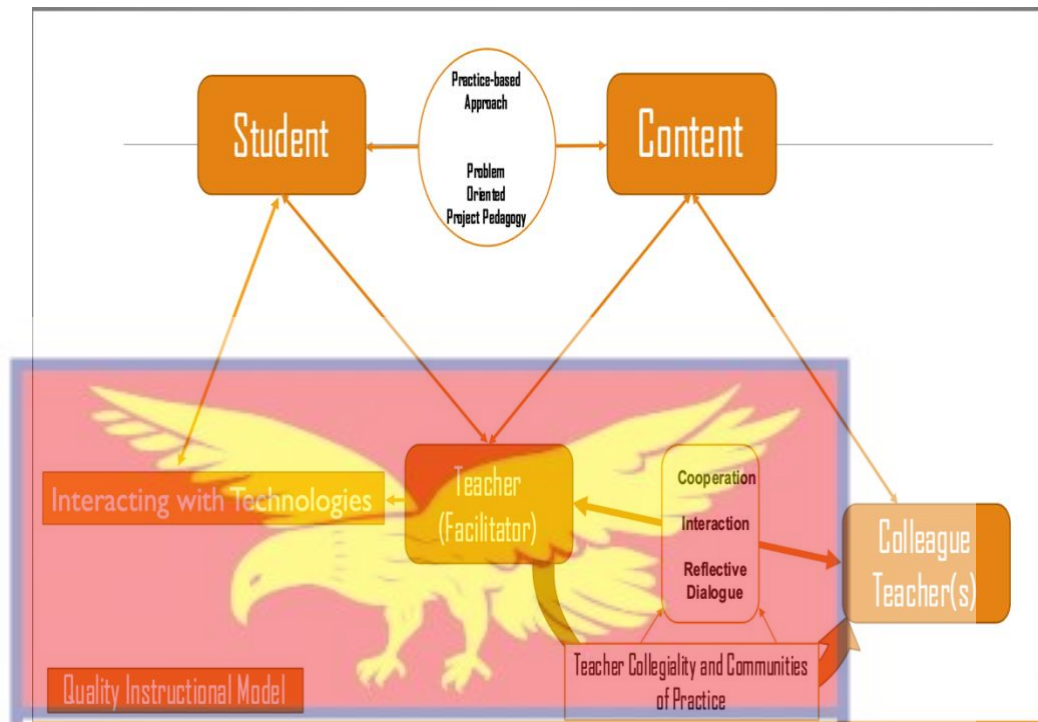
Figure 9: Four-fold Instructional Relationship

Source: Author's construct

In this model labelled a ***Four-fold Instructional Relationship***, there are four principal agents instead of three as espoused by Tamakloe et al., (2006). These principal agents are the teacher (who is considered a facilitator), the student, the content (referred to as the subject matter by Tamakloe et al., 2006), and colleague teachers (teaching the same subject) with technology playing a crucial role in the entire process. This, therefore, becomes a four-fold instructional relationship with the teacher and his other colleagues creating a deliberate Community of Practice (CoP) or Collegiality where there is cooperation, interaction, and reflective dialogue pre- and post-instruction or in most instances, with team teaching, these interactions are carried out during the instructional session.

Again, in assessing quality education through student performance, the interaction between the student and the content with the teacher as a facilitator

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is supposed to be through a practice-based and problem-oriented project pedagogy. These hands-on pedagogical practices enrich the instructional session, helping students to appreciate the relevance of the content they are interacting with. The modified model is therefore advocating for an instructional process that promotes teacher collegiality and teachers' communities of practice as an avenue for updating and improving the teacher's interaction with the content resulting in the delivery of quality instruction.

Determinants of Quality Education

Education as a system has inputs such as students, teachers, managers, administrators, other support staff, supervisors, inspectors, teaching and learning resources, and finances. All these and many others make up system inputs and outputs. In a school, inputs play a significant role in contributing to quality education, especially in terms of performance or outcomes. Leu and Price-Rom (2005), citing Fuller (1986) and Muskin (1999), observe that one way of looking at quality prevalence in both the research literature and reports of program implementation concerns the relationship between different inputs and a measure of student performance or outputs.

Quality of School Environment and Facilities

Numerous factors determine the quality of education that is delivered in any society. These factors at any point in time, can either help improve or deteriorate the education being provided in the school system. A study by Berry (2002) found that there is a clear link between the quality of the environment of schools and educational performance. The environmental quality here encompasses inside and outside the classroom. That is why a study by Vandiver (2011) also found that students in classrooms with large windows, natural

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lighting, and well-designed skylights performed 19% to 26% better than their peers in classrooms without these features. A conducive classroom environment tends to have a psychological effect on both the teachers and the students. In a similar study, Olson and Kellum (2003) concurred with Vandiver in their findings and argued that sustainable schools and the good qualities of lighting, site planning, indoor air quality, acoustics, healthy building materials, and the use of renewable energy are more beneficial to student achievement than those without.

Again, outside the classroom and the total school compound can also impact the quality of education being delivered. In a series of studies by Broome (2003), Hughes (2005), and Lyons (2001) it was found that student achievement also depended on the physical school facility such as the age of the school, its design, and other conditions applicable to teaching and learning. Similarly, Filardo (2008) in his findings on school facilities is of the view that the building design was associated with teacher motivation and student achievement, and thus, school facilities that provide safe, secure, comfortable, accessible, well-ventilated, well-lit, aesthetically pleasing settings are seen as integral components of the school's academic conditions favorable for learning.

Research by Earthman (2002) in California reveals that comfortable classroom temperature and smaller classes enhance teachers" effectiveness and provide opportunities for 64 students to receive more individual attention, ask more questions, participate more fully in discussions, reduce disciplinary problems and perform better than students in schools with substandard buildings by several percentage points. Cohen (2006) claims that the school environment affects more than just academic performance; it influences students' emotions

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and health behaviors as well. Several empirical studies done in developing countries concerning school facilities (Latin America), which included 50,000 students in grades three and four found that children whose schools lacked classroom materials and had an inadequate library returned significantly lower test scores and higher-grade repetition than those whose schools were well equipped (Williams, 2000).

Snel (2003) bemoans the hygiene expectation of school health and hygiene education programs. He notes that in many countries, schools are not safe for children due to neglect of the operation and maintenance of facilities. In addition, schools too often suffer from:

1. Non-existent or insufficient water supply, sanitation, and hand-washing facilities.

2. Toilets or latrines that are not adapted to the needs of children, particularly girls.

3. Broken, dirty, and unsafe water supply, sanitation, and hand-washing facilities.

4. Unhealthy and dirty classrooms and school compounds.

5. Children with poor hand-washing habits and practices.

Adams et al. (2009) argue that effective and clean learning environments support students' academic performance, increase enrolment, especially for girls; the lack of private sanitary facilities for girls can discourage parents from sending girls to school. Shah and Inamullah (2012) in their study state that over-crowded classes could have a direct impact on students' learning. According to Korir and Kipkemboi (2014), a healthy learning environment or a learner-friendly environment contributes to quality learning and high academic

achievements of students in schools. Barry (2013) also notes that students' academic performance and success in education are influenced by the kind of school they attend. Abudu and Fuseini (2013) noted that school infrastructure, furniture, and material resources are key factors for promoting quality education and academic performance in basic schools.

Nzabihimana (2010) on the nature of schools and academic performance of pupils in primary schools in the Gasabo District revealed that lack of basic school facilities such as classrooms, furniture, library, and toilet and urinal facilities in public schools accounted for the poor-quality learning of students. Korir et al. (2014) argue that school factors such as the school structure, school composition, and school climate are some of the main factors that influence students' academic performance in schools. Ramatu (2014) who conducted her study in Tamale on the effects of school infrastructure on the academic performance of students also came to the realization that school facilities such as classrooms, water, and toilet facilities are very crucial for improving quality education and academic performance of students.

According to UNESCO (2015), many children attend school in conditions that are not conducive to learning. The report indicated that many schools in SSA lack potable water, hand-washing facilities, toilets, and urinals. Etesy (2005) concludes that many students in the public basic schools who wrote the BECE performed poorly due to the lack of instructional materials. Sabitu, Babatunde, and Oluwole (2012) there is a statistically significant difference in school facilities of private and public schools but in terms of academic performance, there is no statistical difference. On the other hand, Owoye and Yara (2011) stress that school facilities are the most important

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determining factor of academic performance. Lawrence and Vimala (2012) found no statistically significant relationship between school environment and academic performance but other studies said otherwise. For example, Odeh, Oguche, and Dondo (2015) found that the school environment has a significant impact on academic performance. Duruji, Azuh, and Oviasogle (2014) also found that the school environment has a significant relationship with academic performance.

In developing countries, schools very seldom have basic equipment such as blackboards, cupboards, teachers' chairs, teacher's desks, desks, and chairs for the students (Chinapah, 2000). In Ethiopia for example, 72% of the students received their education in schools that needed basic repairs or had to be rebuilt (Schleicher, Siniscalco & Postlethwaite, 1992). In India, a survey by PROBE (1998) found that 31% of the schools surveyed or studied did not have any acceptable classroom conditions. Among the schools, only 16% did not need any repair. The MLA study also found that resources and services enabling teachers to enrich their classroom teaching were lacking in many countries. As a result, the project concluded that greater emphasis should be given to improving access to teacher resources to empower teachers to positively influence the teaching-learning environment of children (Chinapah, 2000). The MLA study recommended that critical problems such as scarcity of teaching and learning resources, multiple school shifts, large class size, long distance to school, and so on must seriously be re-addressed. Otherwise, most of the 999 African MLA countries surveyed suffer from a lack of such basic needs which must be met to attain reasonable quality education for all in the 21st century (Chinapah, 2000).

School Location and Students' Performance

Ekpenyong (2017) studied the influence of school location on students' academic achievement in Social Studies in colleges of education in Cross River State, Nigeria. The research design adopted for this study was the Ex-post facto design. The population of this study was made up of students in the College of Education Akamkpa and the Federal College of Education Obudu offering Social Studies in the 2016/2017 academic session, totaling one thousand, three hundred and forty-three students (1,343); out of which seven hundred and fifty-three (753) students were sampled for the study. The main instruments used for data collection were: a School Location Questionnaire (SLQ) and a Social Studies Achievement Test (SOSAT). The result of the study indicated that school location had no statistically significant influence on student's academic achievement in Social Studies.

Ellah and Ita (2017) examined the relationship between school location and students' academic performance in the English language in secondary schools in Ogoja Local Government Area. The study employed a survey research design through the use of a stratified random sampling technique to elicit responses from two hundred (200) students. The study's findings showed that there was a statistically significant difference in students' academic performance in the English language based on their school location.

Yusuf and Adigun (2017) conducted a study on the impact of school type, sex, and location on students' academic performance in Ekiti State secondary schools. The sample of the study consisted of forty (40) secondary schools. The results of the study revealed that school type, sex, and location had no significant influence on students' academic performance.

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Also, Titus, Dada, and Adu (2016) studied the relationship between school location and gender as correlates of students' academic achievement in Economics. The population of the study comprised all Senior Secondary School 1 and 2 students in Ogun State, Nigeria. Six hundred and forty (640) students selected through a stratified random sampling method constituted the sample for this study. A descriptive research design was adopted. Two instruments were used; student questionnaire on school location (SQSLG) and Economics Achievement Test (EAT) to collect data. The study's result showed that there is a positive significant relationship between school location and students' performance. Alokan (2010) had a contrary finding in his study; he asserted that students' poor performance is neither a function of gender (sex) nor school location. Also, it was found that gender (sex) and school location do not affect school performance.

Owoeye and Yara (2010) examined school location and academic achievement of secondary schools in Nigeria. The descriptive survey design of the ex-post facto type was used for the study. Final year students of schools in the rural and urban areas were used as the respondents of the study in Ekiti state, Nigeria. A total of 50 secondary schools formed the target population comprising 4 Federal Unity schools and 46 public schools. The study revealed that students in urban areas had better academic achievement than their rural counterparts. Similarly, Onah (2011), and Owoeye (2002) indicated that schools in the urban areas achieved more than schools in the rural areas in science subjects. However, in a different study, it was found that location does not affect students' academic achievement (Bosede, 2010).

Ezeudu and Obi (2013) studied the effect of gender and school location on students' achievement in chemistry in Nsukka Local Government Area of Enugu State, Nigeria. It was guided by three research questions and three hypotheses. The sample of the study was made up of 827 students comprising 473 males and 354 females. Eight secondary schools were sampled using simple random sampling techniques. The findings showed that male students achieved significantly better than female students in both urban and rural schools. Also, there was no significant difference in the academic achievement of students in urban and rural schools.

Textbooks and Other Teaching and Learning Materials

Department for International Development, DFID (2002) asserts that textbooks and other educational materials have great support in the poorest countries, where they can counterbalance the problems of poorly trained teachers and the lack of basic facilities in schools. UNESCO (2005), the attainment of quality education is greatly influenced and determined by the availability of teaching and learning resources in school and how well these resources are effectively and efficiently utilized in the teaching-learning processes. According to Oduro (2007), inadequate instructional materials and lack of teaching and learning materials affect quality education. Similarly, Casely-Hayford et al. (2013) also indicated that instructional and learning processes in basic schools in three northern regions of Ghana have shown a low level of learning effectiveness and efficiency.

Tety (2016) noticed that instructional materials have an impact on the academic performance of students in Tanzania. Awolaju (2016), Olayinka (2016), and Adipo (2015) also found that students who are taught with

instructional materials in Nigeria performed better than students taught without instructional materials. Similarly, Krukru (2015) found that in Nigeria, instructional materials have a significant impact on academic performance. Learners who are taught with instructional materials perform better than students taught without instructional materials (Adalikwu & Lorkpilgh, 2013).

School Human Resource (Teacher Quality and Quantity and Class Size)

Teachers are a critical education resource in every country (UNESCO, 2015). From early childhood programmes through primary and secondary school, the presence of qualified, well-motivated and supported teachers is vital for student learning. Effective teaching strongly influences what and how much students achieve in school. Sumra and Catabaro (2014) reveal that many factors determine the quality of teaching, including teacher qualifications and experiences, their level of motivation, and working conditions. SEDP II (2010/2011) pointed out that, the reason for poor performance in form four secondary school examinations is attributed to the shortage of teachers, unequal distribution of teachers between urban and rural areas as well as insufficient learning infrastructures such as classrooms, laboratories, and other instructional materials (URT, 2010).

Alderman, Orazem, and Paterno (2001) contributed to this discussion. Their study concluded that a higher student-teacher ratio has a consistently negative effect on student achievement. Levacic (2005) concluded in a study on Grade KS3 and found that a reduction in the student-teacher ratio had a statistically significant positive effect on mathematics achievement. A study by Waita (2012) on the pupil-teacher ratio and its impact on academic performance in public primary schools in Kenya found that Pupil-Teacher Ratio has a

statistically significant effect on pupils' performance in primary schools. The study shows that as PTR increases, average test scores in primary schools decrease. Likewise, a study by David (2014) in Sumbawanga District Tanzania found that one of the factors influencing students' academic performance is the low teachers to student ratio, especially in public schools. The teacher-student ratio stands at an average of 52:1 and as high as 72:1. UNESCO (2006) cited in Mulei et al (2016) found the same problem exists in Mozambique where the study found teacher shortages with an STR of 67.4:1. Williams (2000) contends that in 12 Latin American countries, it was found that children in schools where many teachers work in other jobs in addition to teaching were 1.2 times more likely to have lower test scores and/or higher-grade repetition.

Raychaudchuri et al. (2010) said that a low teacher-pupil ratio has a positive effect on the academic performance of students than those schools that have a high pupil-teacher ratio. Frempong (2011) also observes that overcrowded classes were one of the key factors that accounted for the poor academic performance of students in schools. Patrick (2012) who conducted a study to examine the inspirational packages and their effects on performance in the Asante Akyem Senior High Schools, Ghana, noted that inadequate inputs of educational resources both human and material resources, and inequitable distribution of these resources among districts are key factors affecting quality education outcomes in senior high schools.

UNESCO (2015) mentions that imbalances in teacher deployment are key factors that disable quality education. UNESCO (2010) in its global monitoring report on EFA, states that poor school management and bad school leadership styles greatly influence students' poor-quality learning. Also,

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UNESCO and UNICEF (2012) indicate that low teacher qualifications accounted for the low quality of education in SSA. Similarly, Manning and Patterson (2005) opine that the academic qualification, subject matter knowledge, pedagogy, commitments, techniques, and skills of a teacher are important factors in determining teachers' professionalism and competency. Etsey (2005) noted that teacher qualification is an important factor that determines quality education delivery. Again, in Nigeria, Akiri and Uborugbo (2009) found that teachers' teaching effectiveness has a negligible and insignificant influence on the academic performance of students in schools.

Hammond (2000) conducted a study to find out how teachers' quality and other inputs correlate to influence students' achievement. Data were collected from 50 states of the USA. The findings reveal that teacher quality appeared to be stronger when related to other school inputs, implying that the quality of educational outcomes depends heavily on the quality of the individual teacher. Recent research in the United States reported that teacher quality is the single most important variable in determining student achievement (AFT, 2000).

In their study, Ajani and Akinyele (2014) found that there is a significant relationship between the teacher-student ratio and a student's performance in Mathematics. Zyngier (2014) argued that if the class size is smaller and is combined with effective teaching, its impact on academic performance is positive. Similarly, Bakasa (2011) reveals that school factors such as effective teaching when combined with class size have a positive impact on academic performance. However, Owoeye and Olatunde (2011) found that there is no statistical difference between the class size of schools in the urban areas and

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rural areas on academic performance. Vandenberg (2012) corroborates that class size has no significant impact on academic performance.

Arnon and Reichel (2007) show that students see two types of images of teachers: the image of an ideal teacher and their own self-image as a teacher. Their study revealed that students perceive personal qualities and professional knowledge to be the most significant qualities needed to be an ideal teacher. The personal qualities include general personal qualities, kindness, leadership, and attitude towards profession; and professional qualities include knowledge of the subject matter and didactic knowledge. They also stated that other qualities like general knowledge, teacher as a socializing agent, and a person with a distinct social mission are perceived to be less important.

Fullan (2001) contends that the quality of leadership matters in determining the motivation of teachers and the quality of their teaching, which subsequently affects student performance. According to Atey and Arthur (2013), poor school supervision and monitoring and the lack of support from school managers affect the academic performance of students in schools. King (2013) explains that poor school supervision of teachers impacts the academic performance of students in schools. Shafiwu et al. (2013) noted that lack of teacher supervision and close monitoring build up the poor professional attitude and behaviour of teachers in schools.

Concept of Equity in Education

The equity approach in education research began to emerge in the 1990s and at the beginning of the 21st century. In the literature on the concept of equity, there are many debates as to what 'equity' actually means (Castelli, Ragazzi & Crescentini, 2012; Espinoza, 2007; Hutmacher, Cochrane & Bottani,

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2001). The concept has been interpreted in different ways by various authors. In the view of Castelli et al., (2012), the concept of equity should be interpreted to mean:

1. Opportunity - or legally recognised rights

2. Access – to school

3. Treatment – of educational models and measures

4. Results – opportunities for success

These propositions translate into conceptualizing equity to imply equal opportunities for all, equal treatment for all, and equal results for all. However, OECD and UNESCO seem to propose a different conceptualisation of equity in education literature. In the perspective of these international organisations, equity implies:

a) equity in learning opportunities and education results: supporting the disadvantaged;

b) equity in compensatory measures for resources: study support;

c) equity in access to education: participation in primary, secondary, and tertiary education; and

d) equity as inclusion (Castelli et al., 2012).

Demeuse, Crahay, and Monseur (2001) n the other hand proposed four basic interpretations of equity that can be applied to education policy and practice:

1. Equity of access or equality of opportunity: Do all individuals (or groups of individuals) have the same chance of progressing to a particular level in the education system?

2. Equity in terms of learning environment or equality of means: Do all individuals enjoy equivalent learning conditions?

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3. Equity in production or equality of achievement (or results): Do students all master, with the same degree of expertise, skills, or knowledge designated as goals of the education system?

4. Equity in using the results of education: Once they have left the education system, do individuals or groups of individuals have the same chances of using their acquired knowledge and skills in employment and wider community life?

It can therefore be deduced from these propositions that the concept of equity relates to fairness in the provision of education in society. This should be carried out to ensure that, challenges such as personal, social, and economic circumstances do not serve as obstacles to accessing education at all levels of society.

Relating the concept of Equity to fairness enables one to bring to the fore certain parameters of both moral obligations and ethical responsibilities as a community. The essence of equity is a focus on the distribution of valued resources, both tangible and intangible. In education finance, the concept of equity goes beyond the allocation of money to an educational institution but more importantly, how those resources are used, and who benefits from the resources.

Goal 4 of the Sustainable Development Goals (SDGs) seeks to ensure inclusive and equitable education and promote lifelong learning opportunities for all. Equity is a disputed term that is synonymous with fairness. Equity is generally defined as fairness, impartiality, and justice and is associated with equal opportunity (Sen, 2009). Equity in a different context is defined as a reassessment and redistribution of resources (human, institutional, and

financial) in education to reduce or eliminate systematic inequality in outcomes. In this sense, equity is a path to achieving equality. In the simplest terms, equity is fairness, or equal opportunity to achieve the same outcomes regardless of starting conditions and barriers. Equity considers needs and disparities and seeks to level opportunities to achieve the same outcome (The Education Trust).

Also, equity is explained as access to equal quality schools, equity as an equal educational opportunity, and equity as adequacy (Ladd & Loeb, 2007). Field, Kuczera, and Pont (2007) assert that equity in education can be seen through two dimensions. They further posited that equity as fairness suggests that personal or socio-economic circumstances, such as gender, ethnic origin, or family background are not obstacles to educational success. Educational equity takes the concept of equality further by focusing on the implementation of planned and systemic strategies providing individual students with the needed interventions that will, optimally, increase the possibility of equality of educational attainment (Field et al., 2007).

Again, Field et al. (2007) opine that equity as inclusion implies ensuring that all students reach at least a basic minimum level of skills. This definition suggests that equitable education systems are fair and inclusive and support their students to reach their learning potential without either formally or informally pre-setting barriers or lowering expectations. Additionally, it can be inferred that educational equity means that the educational system gives each student what he or she needs to perform at an acceptable level.

Equity in education denotes that personal or social circumstances such as gender, ethnic origin, or family background, are not obstacles to achieving educational potential and that all individuals reach at least a basic minimum

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level of skills (Field et al., 2007). An equitable education system can redress the impact of social and economic inequalities. In the context of learning, an equitable education system allows individuals to take absolute advantage of education and training regardless of their background (Faubert, 2012; Field et al., 2007; Woessmann & Schutz, 2006). However, Stromquist (2005) asserts that equity in education is generally connected to equal access to formal education opportunities and resources.

Educational equity includes both fair and inclusive education as defining elements. Fairness ensures that neither personal nor social circumstances will inhibit the attainment of a student's academic potential. Inclusion guarantees a minimum standard of education for every student (Bitters, 1997; Field et al., 2007). Educational equity is making sure that students have all of the resources necessary to both meet their individual needs and access every opportunity that will allow them to reach their fullest potential. This should be done in an environment that fosters mutual respect of all stakeholders while honoring each person's individuality and diversity including race, socioeconomic status, religion, gender identity, sexual orientation, language, and ethnicity.

Educational equity is a broad term that can serve as a representation to a variety of fair practices within a school and/or system of education. For instance, this term could represent the discrepancies within achievement in a school or local or state-ran system or the fairness within a school or system. It could also simply be defined as an opportunity within these systems as well. Educational equity is ensuring that all students have the tools and resources they need to learn and succeed no matter where they live or what their life

circumstances. It means ensuring that all students have access to high-quality teachers and safe learning environments.

Unterhalter (2009) contends that our understanding of equality in education has been developed by conceptual writing and literature. However, the same cannot be said about our understanding of 'equity' in education (Unterhalter, 2009). Unterhalter draws from Sen's (1992) idea of "equality in the space of capabilities" to describe three forms of equity that are essential to expand capabilities in education and achieve equality, stressing the aspect of human diversity (2009, p. 416). These are equity from above, equity from below, and equity from the middle in education. She argues fair and reasonable legislation or rules that come into existence due to consultations and negotiations in widely recognised powerful bodies such as parliaments and courts are an example of 'equity from above'. 'Equity from the middle' is the flow "of ideas, time, money, skill, organization or artifacts" (Unterhalter, 2009, p. 421) that enables the professional development and learning of children. "Equity from below entails dialogue and discussion about the expansion of a capability set" across myriad points of view and personal heterogeneity (Unterhalter, 2009, p. 421). Unterhalter stresses the importance of the co-existence of all three forms of equity as they are closely intertwined.

Equity in basic education focuses on equality between gender groups, people of different locations, and socioeconomic and linguistic backgrounds (World Bank, 2004). However, the parameters for measuring equity and strategies for uprooting inequity must be country and area-specific to reach out to the most excluded segment of the society (UNESCO, 2010). According to

International Commission on Education Twenty-first Century (1996) report presented to UNESCO (1996):

> *"Basic education is the first step in attempting to attenuate the enormous disparities affecting many groups- women, children, rural population, the urban poor, marginalised ethnic minorities and millions of children not attending school and working'' (p.118).*

Generally, equity in basic education requires strategies that seek to create the right environment in schools and the classroom for inclusive quality teaching and learning as well as an equal supply of educational inputs for all irrespective of location and status for the attainment of equal outcomes (UNESCO, 2012; UNICEF, 2000). Here, a deliberate strategy that attracts and maintains quality teachers in disadvantaged schools where teachers are likely to refuse postings due to remoteness and isolation, ethnicity, language, and gender is very crucial (UNESCO, 2015).

This study, therefore, defines equity in education as fairness in distribution and equal access to educational inputs, opportunities, experiences, and outcomes between rural and urban milieus. It also entails equal participation in the quality of education for all irrespective of location. Indicators that were explored include comparisons of the selected indicators for access and quality.

Principles/Dimensions of Equity in Education

The Organisation for Economic Cooperation and Development (OECD) asserted that equity in education has two dimensions that are closely intertwined that is fairness and inclusion. The fairness dimension of equity means making sure that personal and social circumstances are not obstacles to achieving educational potential. It prohibits discrimination based on gender, ethnic origin,

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or socioeconomic status. Concerning inclusion, it ensures a basic minimum standard of education for all. The seminal work of Berne and Stiefel (1984) embodies three principles: horizontal equity, vertical equity, and equal educational opportunity.

Maitzegui-Onate and Santibanez-Gruber (2008), and Sherman and Poirier (2007) adopt this view that distinguishes between three principles of equity to discuss recent institutional policies. Horizontal equity concerns "treating all those who are in the same situation equally" (Maiztegui-Oñate & Santibáñez-Gruber, 2008, p.375), which is not the ideal scenario in our society. Social, economic, and cultural differences influence our situation and position in society. "Vertical equity recognises that starting points differ and that it can be necessary to equip certain children with extra resources to eventually obtain horizontal equity" (Maiztegui-Oñate & Santibáñez-Gruber, 2008, p.375). For instance, governments adopt certain "equalising measures" to benefit the most vulnerable groups like women, minorities, and immigrants or those belonging to lower social status in society (Maiztegui-Oñate & Santibáñez-Gruber, 2008). Berne and Stiefel (1984) opine that there are three principles of equity:

a) horizontal equity: equality of treatment for those who start from the same point; Horizontal equity specifies that equally situated students should be treated equally

b) vertical equity: educational differentiation to bring everyone to the same level; Vertical equity focuses on the treatment of differently situated students, implicitly assuming that students require different amounts of resources to achieve set levels of performance.

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c) equal educational opportunity (EEO): compensatory measures regarding the lack of resources or the existence of disadvantageous situations that prevent the possibility of the same results being achieved. Equal opportunity in resource allocation is seen in two ways.

A neutral formulation posits that equal opportunity exists if there is a lack of association between per-pupil resources and characteristics associated with historically disadvantaged groups, while an affirmative action formulation posits that equal opportunity is achieved if there is a positive association in the relationship. Also, Maitzegui-Onate and Santibanez-Gruber (2008) assert that there is the existence of three principles of equity, namely:

a) horizontal equity: equality of treatment for those who start from the same point;

b) vertical equity: the series of compensatory measures directed toward minority groups or groups at risk of disadvantage (such as, women, ethnic minorities, or the less affluent social classes);

c) equal education opportunity: the series of initiatives designed to ensure that everyone has the same opportunities for success, starting from different conditions and resources.

Equity in Distribution of Resources in Schools

Equity in resource distribution requires that individuals with the same need have access to the same resources (horizontal equity) and that individuals with greater need have access to more resources (vertical equity). Resource equity refers to the allocation and use of resources (people, time, and money) to create student experiences that enable all children to reach empowering and

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rigorous learning outcomes no matter their race or income (Travers, 2018). Iatarola and Stiefel (2003) examined intra-district equity of public education resources and performance. The study's result showed that the horizontal equity distributions were more disparate than what would be expected relative to the results of other studies. Also, it was revealed that vertical equity was lacking, especially in elementary schools, and equality of opportunity was at best neutral but more often absent. However, middle schools exhibit more equity than elementary schools.

Allocation of resource has been considered as part of the pooling function (Kutzinn 2001; McIntyre & Kutzin, 2012), as part of the purchasing function (Rice & Smith, 2002), or defined as meso-level purchasing (Robinson, Jakubowski & Figueras, 2005). In practice, resource allocation bridges the resource pooling and service purchasing functions, as governments typically have to make practical decisions about where to allocate their financial resources before they decide how to use them through various purchasing mechanisms. The allocation of resources across the country is crucial to redress inequities in the purchasing power of those institutions in charge of providing service to different population groups. Broadly speaking, governments decide how to allocate resources between different geographic entities and across the different levels of education (primary, secondary, and tertiary) and this is supposed to be carried out fairly and transparently.

Concept of Access to Education

Access to education is the equal opportunity for individuals to participate in education irrespective of location, gender, and status (UNICEF & UNESCO, 2007). UNESCO Institute of Statistics defines access to basic

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education by analysing input indicators such as Gross Enrolment Ratio (GER), percentage of new Grade 1 intake with preschool (ECCE) intake, Net Intake Rate (NIR), Gross Percentage of Girls Enrolment, public expenditure on education as a percentage of GDP among others. In addition, the OECD includes indicators such as enrolment rate by age, and transition characteristics from age 15 to 20 by the level of education as some of the indicators for access.

However, this study operationally defines access as the ability to enter and complete the full cycle of basic education, that is, two years of kindergarten (KG), six years of primary, and three years of lower secondary. Invariably, creating access does end with just making an entry to a school, but it is an ongoing process of gaining entry at all levels or grades of basic education. The key variables of access that were explored included availability (number) of schools, accessibility (proximity) to school, affordability, enrolments attendance, and completion rates.

Access to basic education is a demand and supply process. In most countries, children are not able to access education because of inadequate schools or the inability to afford it (UNESCO, 2007). This is not the case in Ghanaian basic schools. In Ghana, the FCUBE was enacted into law in 1995 which required that basic education should not only be free but also compulsory. Again, in 2002, the government introduced the capitation grant which sort to eliminate the financial or affordability problem in accessing basic education in Ghana (MoE, 2004).

Barriers to Access to Basic Education

Remoteness has made rural communities across the globe susceptible to dwindling socio-economic opportunities including equitable access to quality

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education (Cobbold, 2006). This has created a huge gap in access to and quality of basic education between the rural and urban milieus, especially, in the developing world (UNESCO, 2015). Numerous empirical works in Africa and Asia have shown that long school distance has a major barrier to equitable access to basic education in remote rural areas (Humphes & Crawfurd, 2014; Muralidharan & Prakash, 2013). Rural areas are mostly remote isolated farming; pastoral and fishing communities hence are relatively farther away from schools and are also inaccessible due to poor transportation networks (Amoako, 2010; Miller, 2015). Also, the availability of schools has a direct impact on access and quality as insufficient supply to meet demand leads to geographical inaccessibility as well as over-crowded classrooms (Humphes & Crawfurd, 2014).

Hunt (2008) asserted that poverty interacts with other points of social disadvantage to further increase the likelihood of vulnerable children dropping out of school (Hunt, 2008). Poverty has been found to force children into paid labour which poses a threat to their schooling as it creates pressure on their time (Hunt, 2008). Lyon and Rosati (2008), as cited in Akorfa and Charles (2011), observed that globally, child labour is the main impediment to achieving universal primary education. In the view of Edward and Armah-Attoh (2010), parents' inability to afford to pay the levies charged by the schools is one of the main reasons why children did not attend school in Ghana. Despite the policy of fee-free tuition in basic schools, many district education directorates charged levies as a means of raising funds to finance, for example, school repairs, cultural and sporting activities. This had the effect of deterring many families, particularly the poorest, from sending their children, especially, girls to school.

There are a lot of factors influencing access to basic education in Ghana, may comprise health; disability, HIV/AIDS, households, migration, child labour, educational costs, geographical differences and divisions, gender and access, supply of schools, teachers, non-state providers, and schooling practices (Acheampong et al., 2007).   Also, supply-driven policies to improve access are inadequate to enroll the hard-to-reach children who are out of school for economic or cultural reasons. This is particularly true for children in rural areas.

Availability of Educational Resources and Access to Basic Education

Anlimachie (2016) examined the contextual factors for the rural-urban inequities to access and quality in basic education in Ghana and the relevant strategies to narrow the gap to achieve SDG (4) on inclusive equitable quality education. The methodological paradigm used in this study is quantitative whereas a descriptive survey was used as the design. The bulk of data was from responses elicited through a questionnaire. These were supplemented with secondary data sources. Stratified, simple random, and incidental sampling methods were combined to select the site (Basic schools in the Asunafo North Municipal of Ghana) and participants (teachers and headteachers) for the study.

The findings revealed that access to and quality of basic education in Ghana is skewed in favour of urban Ghana. The inequities were orchestrated by two folds challenges. The first group is made up of some contextual geographical, economic, and socio-cultural challenges peculiar to rural Ghana. The other group was made up of some immediate challenges linked to the general loopholes in the designing and implementation of the various government of Ghana policies on education.

Educational resources play an important role in the achievement of educational objectives and goals by enhancing effective teaching and learning which is central to the education process (Usman, 2007). According to Adeogun and Osifila (2008), physical resources include laboratories, libraries, classrooms, and a host of other physical infrastructure while material resources include textbooks, charts, maps among others. Akisanya (2010) commenting on educational resources thinks that they are important because the goal of any school depends on adequate supply and utilization of physical and material resources among others as they enhance proper teaching and learning the reason why this study is important.

Conceptual Framework

Based on the theories and hypotheses used for the study, a conceptual framework was developed. The framework looked at the three-tier variable of Access, Quality, and Equity as output variables while educational resources which serve as the input variable are classified into two. The input variables are:

1. Pecuniary (School infrastructure, Teaching and Functional equipment, textbooks, teachers, furniture, classroom, etc.)

2. Non-pecuniary (Capitation grant, BECE subsidies, PTA levy, Examination levy)

Figure 10 presents the conceptual framework.
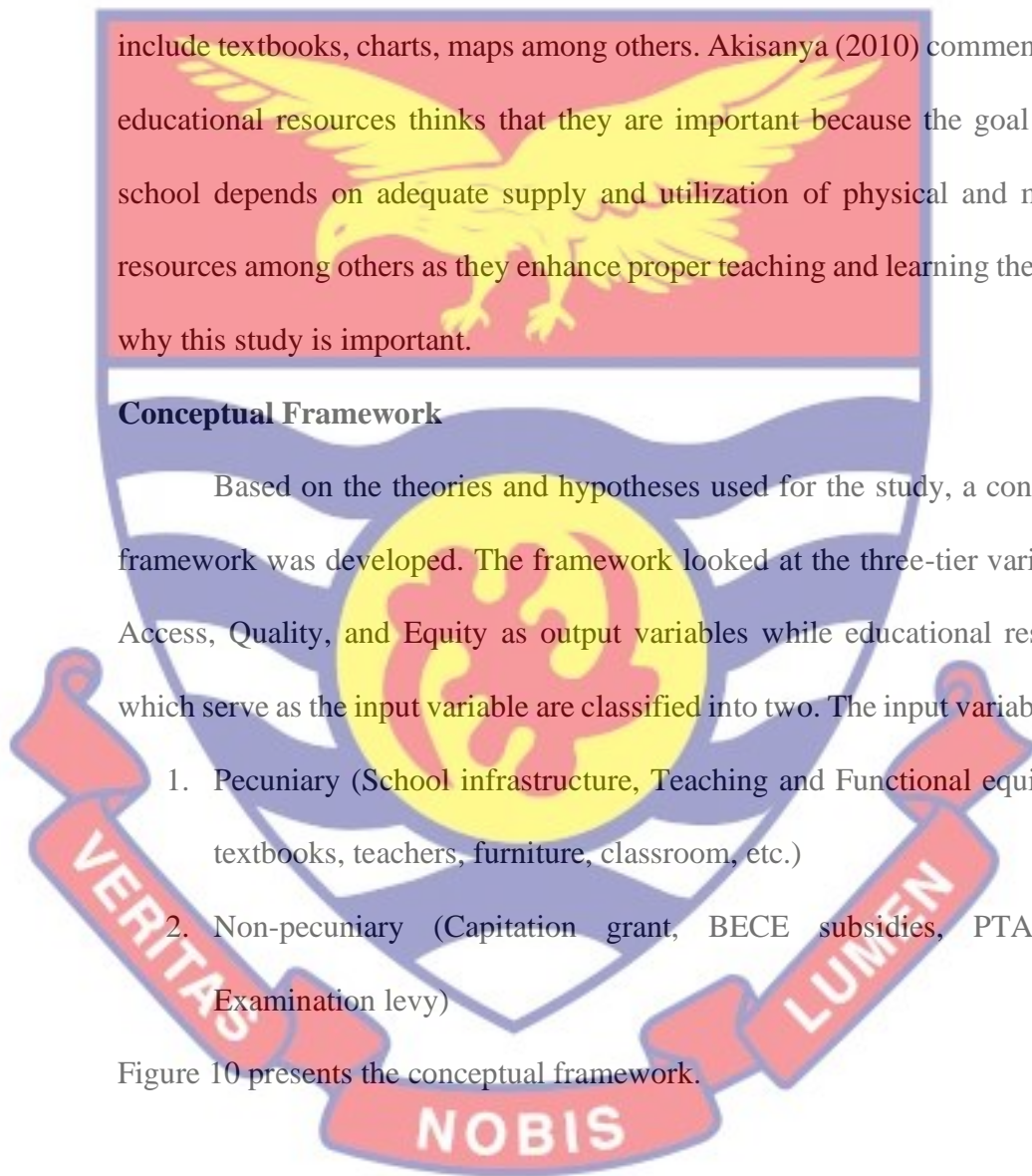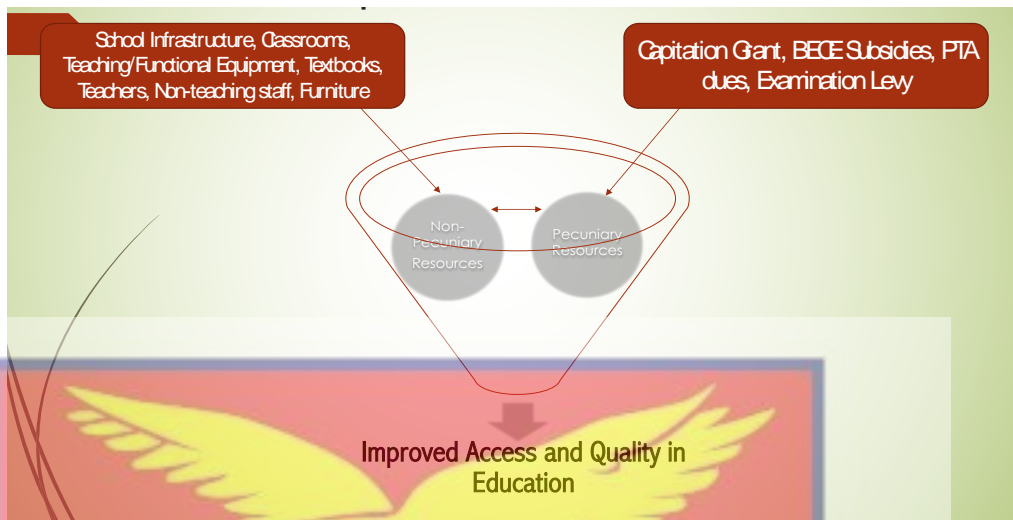
Figure 10: Conceptual Framework for Input-Output mechanism of achieving Access and Quality in Education.

Figure 10 presents the conceptual framework developed for this study. It can be observed that there is an inter-relationship between pecuniary and non-pecuniary educational resources. It is assumed that a correct mix of these resources for any public basic school will result in the achievement of the two-twin variables in education (access and quality). The input of educational resources interrelates to produce a certain level of output. Basic schools are supposed to have an adequate and perfect combination of the two groups of inputs (pecuniary and non-pecuniary). In ensuring a perfect mix of these two groups of educational inputs, educational managers and authorities are supposed to be guided by the theories of human and cultural capital.

The human capital theory indicates that a country's most valuable asset is its human capital and hence, to enrich it, substantial investment needs to be made in providing quality educational inputs for all its educational institutions irrespective of the cultural capital that has been accumulated by a specific section of the society. The theory of cultural capital highlights the inequities in our social structure and prompts educational managers on how to correctly

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distribute the mixed educational inputs to different educational institutions based on their accumulated cultural capital. For instance, schools with less or no cultural capital should not be treated the same as schools with an amount of cultural capital in the distribution of educational resources. The output of such a well-thought-through mix of educational input is improved access to education by all and the provision of quality education for all students in Ghanaian basic schools.

Summary of Literature Review

The review begins with an attempt to position the study within the three theories of human capital, cultural capital, and the systems theory of input-output. While relying on the systems theory of input-output to determine the nature of output that is obtained in our educational system, the other two theories guide the process of mixing the inputs and how they should be distributed. The review further presents the historical antecedents of education delivery in Ghana's pre-and post-colonial periods and takes a look at various education acts. There is an attempt to draw out the implications of past educational policies, reforms, and laws on the issues of access, equity, and quality in basic education delivery in Ghana. The literature then delves into sub-topics of education resources, the concept of quality in education, determinants of quality education, concepts of equity and access, barriers to access, and the issue of deprivation of educational resources.

The review brings to the fore, the lack of clarity in determining what a deprived basic school is, in most instances, the deprivation is attributed to and measured in terms of poverty at the household level. For example, the most recent multidimensional poverty index released by the Ghana Statistical Service

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treated education as one of the dimensions of deprivation. In that report, school attendance, school attainment, and school lag were the variables used to determine whether a particular individual or household is deprived in terms of education. The attainment or lack of these renders a person deprived and not the school. The gap in the literature is therefore the absence of a quantitative measure of what a deprived (poor) basic school is in terms of either the existence or absence of certain educational resources.

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CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter presents the research methods used in undertaking the study. It begins with an insight into the research philosophy underpinning the study, this is followed by the research approach adopted which of course is influenced by the research philosophy and then the research design. There is a look at the data types and sources as well as model specifications. The rest of the chapter covers an explanation of the variables used, theoretical and a priori expectations, and the estimation technique and data analysis procedures employed.

Research Paradigm

According to Grix (2004: 58) "ontology and epistemology can be considered as the foundations upon which research is built." It is the researcher's ontological and epistemological assumptions that inform the choice of methodology and methods of research. This implies that the researcher's intentions, goals, and philosophical assumptions are indistinguishably related to the research they do. Grix, (2004) posits that people who want to conduct clear, precise research and evaluate others' research need to understand the philosophical bedrocks that inform their choice of research questions, methodology, methods, and intentions (p. 57). There are three common paradigms. These are positivism, interpretivism, and pragmatism. This study hinges on the positivist paradigm. This is because the study aims at establishing cause and effect relationship (Grix, (2004).

Positivism, according to Richards (2003) is traced to the works of Auguste Comte, a French philosopher. In the view of Descartes (1998), positivism believes that only scientific knowledge can reveal the truth about reality. This implies that events can be observed and measured empirically and explained with logical analysis. That is, the positivist is committed to value neutrality, statistical measurement, quantifiable elements, and observable events to establish causal laws (Seale, 2000). The focus of the study was to establish a causal relationship between educational resource distribution and the triadic variables of access, quality, and equity. To ascertain this, hypotheses were formulated. Positivism is clothed with tenets of the scientific method, statistical analysis, and generalizability of research findings which are based on the decision to prove or disprove hypotheses. The study fundamentally assumes that the achievement of quality education coupled with improved equitable access to basic education is intrinsically linked to the availability of educational resources and this can be proven scientifically, hence the choice of the positivism paradigm.

Research Approach

The research paradigm underpinning this study gives credence to the use of the quantitative approach to research. Aliaga, and Gunderson (2002), describe quantitative research methods as the explaining of an issue or phenomenon through gathering data in numerical form and analyzing with the aid of mathematical methods; in particular statistics. To collect quantitative data on variables such as; educational resources, performance in BECE, and enrolment, statistical analysis was carried out to test the hypotheses formulated to guide the study.

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Research Design

The causal-comparative design is a method of teasing out possible antecedents of events that have happened and cannot, therefore, be controlled, engineered, or manipulated by the investigator (Cooper & Schindler 2001). This design was used because there was no manipulation of variables as the phenomenon under investigation had already taken place. Furthermore, performance at BECE (quality education), equity, and access as dependent variables are affected by a multiplicity of factors respectively, making it impossible to directly control all the independent variables that are likely to confound the findings.

The researcher was therefore concerned with the situation as it was. This design has the advantage of being a good explanatory instrument for changes that take place in the dependent variables. If the set of independent variables are carefully selected and proper techniques adopted for analysis, meaningful insights can be gained into the changing pattern of dependent variables. According to Cohen, Manion & Morrison (2007), causal-comparative research is particularly appropriate when simple cause and effect relationships are being explored but maintains that one of the weaknesses of this design is the fact that when a relationship has been discovered, there is the problem of deciding which is the cause and which is the effect, thus, the possibility of reverse causation must be considered.

Data Type and Source

Two different types of secondary data were used for the study. These were:

1. Annual School Census Data (EMIS Data from 2015/16 to 2018/19) – Ministry of Education

2. BECE results for all Basic Schools in Ghana from 2015/16 to 2018/19 (WAEC)

The Annual School Census Data from the Ministry of Education is popularly referred to as the EMIS Data. This data contains information from all Basic schools in Ghana. The data which is gathered by the Ministry of Education annually captures information on all aspects of individual basic schools in Ghana. For this study, data gathered from 2015/16 to the 2018/19 academic year was used. Finally, data from WAEC on the performance of all basic schools in Ghana that sat for the BECE from 2015/16 to 2018/19 academic year were accessed and used.

Data Analysis: Research Objective 1

Alkire-Foster Method

The Alkire-Foster method was used to generate the Ghana national Multidimensional Educational Resource Deprivation Index (MERDI). This index is designed to measure the level of deprivation of a public basic school about educational resources. Deprivation in this context is defined as the lack of or inadequacy of educational resources in a public basic school which could affect the delivery of quality education and access in a basic school.

This method is built on the Foster-Greer-Thorbecks (FGT) indices introduced in Foster, Greer, and Thorbecks (1984). The A – F method allows for the construction of individual or school level deprivation profiles in respect of educational resources. It first identifies which school is deprived, by summing up the deprivation in educational resources that each public basic school experiences in a weighted deprivation score and then aggregates this information into a headline and associated information platform for a given

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population (in this case, public basic schools in Ghana). This methodology is adapted because it is simple yet a very specific approach.

Measuring MERDI using Alkire-Foster Method

According to Pacifico and Poege (2017), the simplex index of the multidimensional poverty in the A-F framework is the multidimensional headcount ratio which measures the incidence of poverty in the population. However, in the context of this work, the multidimensional headcount ratio measures the incidence of educational resource deprivation in basic schools in Ghana. That is the lack of or inadequacy of these resources which renders a school poor in terms of teaching and learning. Hence, the numerator of Eqn. 1 represents the number of educational resources in deprived public basic schools while the N is the number of public basic schools used for the study.

$$H = \frac{\sum_{i=1}^{N} pk\ (y_i, z)}{N} = \frac{q}{N} \ldots \ldots \ldots \ldots . Eqn\ (1)$$

In adapting the index, it must be stated that H does not have the requisite properties to respond to changes in the deprivation status of a public basic school. That is, the level of deprivation does not increase with the introduction of a new dimension. An index that increases the number of deprivations experienced by the public basic school can be derived from the censored deprivation matrix, $g^0\ (k)$

Let $|g^0\ (k)|$ be the sum of all entries of matrix $g^0\ (k)$: $|g^0\ (k)| = \sum_{i=1}^{N} \sum_{j=1}^{D} g_{ij}^0(k)$

According to Alkire and Foster (2011), index A is defined as the ratio between the number of deprivations faced by a public basic school, $|g^0\ (k)|$, and the number of deprived basic schools (q); $A = \frac{\{|g^0\ (k)|\}}{q}$.

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A deprived measure that takes into consideration both the incidence (H) and the extent (breadth) (A) of concurrent deprivations can be derived from the product of H and A.

$$M_0 = H \times A = \frac{|g^0(k)|}{N} \ldots \ldots \ldots \ldots . Eqn\ (2)$$

Alkire and Foster (2011) defined M_0 as the adjusted multidimensional headcount ratio, also known as the Multidimensional Educational Resource Deprivation Index (MERDI) in the context of this study.

It must be noted that M_0 can be complemented with other indices that can also account for the deepness and severity of each deprivation. A poverty measure that equally considers the incidence of poverty (H), the average range of deprivation (A), and the average depth across deprived dimensions (G) can be computed as:

$$M_1 = M_0 \times G = \frac{|g^1(k)|}{N} \ldots \ldots \ldots \ldots . Eqn\ (3)$$

The principal function of M_1 is that it increases as the deprived basic school becomes more deprived in a given dimension. However, to be able to capture the rate of increase of a worsened deprived school, there is the need to measure the average severity of deprivation which is given as $S = \{|g^2(k)|\}/\{|g^0(k)|\}$. This measure is important because according to Foster, et al. (1984), an ideal measure of deprivation should respect the transfer principle, which basically means that an already highly deprived school will have its deprivation measures increase at a faster rate when the depth of deprivation gets worse.

Hence, by combining M_0 and S, we develop a multidimensional educational resource deprivation measure M_2.

$$M_2 = M_0 \times S = \frac{|g^2(k)|}{N} \dots\dots\dots\dots. Eqn\ (4)$$

Generally, the A – F class of multidimensional deprivation measures is given as:

$$M_\propto = \frac{|g^\propto(k)|}{N}, \dots\dots\dots\dots. Eqn\ (5) \text{ where } \propto\ \geq 0$$

However, to be able to carry an in-depth analysis of the extent of deprivation across subgroups in the population such as location, regions, type of school, etc. and within indicators, $Eqn\ (6)$ is adopted and used.

$$M_\propto = \sum_{g=1}^{G} \frac{N_g}{N} M_{\propto,\ g} \dots\dots\dots\dots. Eqn\ (6)$$

Where $M_{\propto,g}$ is the index for subgroups g and N_g is the corresponding population size.

Structure of the MERDI

The MERDI has three (3) dimensions: School Operational Utilities (SOU), Human Resource (HR), and School Functional Resources (SFR) and fourteen (14) indicators. These dimensions and indicators are developed based on globally acceptable standards in terms of input variables needed to make a school very functional in providing quality education and then adapted to suit the unique situation of the Ghanaian education system at the basic level.

Unit of Identification and Analysis

The unit of identification denotes the entity that is identified as deprived or not deprived – normally the individual or the household but could also be a community, **SCHOOL**, clinic, firm, district, or other units (MPPN/OPHI, 2018). In the case of the Ghana MERDI, the unit of identification is the Basic school.

The unit of analysis which refers to how the results were reported and analysed is the distinct basic school. It forms the basis of the analysis and the succeeding reporting of results. This implies that, for example, the headcount ratio is the percentage of basic schools that are identified as deprived in the provision of educational resources.

Dimensions, Indicators, and Deprivation Cut-Offs

The MERDI employs three (3) dimensions which are the groupings of the various input variables identified for quality education in the Ghanaian context as presented in Table 2. Dimension 1 classified as School Operational Utilities (SOUs) have indicators such as availability of toilet (urinal) facility, safe drinking water, access to road, access to functional electricity and nature of school building. The indicator, nature of school building looks at the extent of repairs needed to be carried out on the school building and hence the school is classified as being deprived if the building has deteriorated or it needs major repairs.

The Human Resource dimension focuses on three main indicators. These are basically, visitation of supervisors from the education office as well as the National School Inspectorate Authority (NaSIA), teacher quality measured by the ratio of professionally trained teachers to untrained teachers and Teacher-Student Ratio (TSR).

The School Functional Resources (SFRs) dimension has six indicators: Number of Computers, Printers, Pupil to desk ratio (Number of desks), number of library books, ICT Infrastructure (access to internet) and number of core textbooks (Pupil to Textbook ratio). Table 2 presents the definitions of the various indicators used in the MERDI.

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Table 2: Ghana's National MERDI – Dimensions, Indicators and Definition

Dimension	Indicator	Definition of Indicator
School Operation Utilities	Availability of toilet facility	The basic school should have a place of convenience for teachers and students. Toilet facility includes the presence of urinals. According to UNESCO (2017) and WaterAid (2019), attaining safe school environment and achieving SDG4 require efforts in achieving SDG6. Schools are supposed to have toilet facilities (SDG4. a.1)
	Safe water	This is defined as a functional drinking water source (MDG 'improved' categories) on or near the premises and water points accessible to all users during school hours (SDG4. a.1)
	Access to road	This implies the presence of a motorable road network to and from the location of the school. This is a key variable since it impacts on attendance, enrolment and teacher retention and attrition.
	Electricity	Regularly and readily available sources of power (e.g., grid/mains connection, wind, water, solar and fuel-powered generator, etc.) that enable the adequate and sustainable use of ICT infrastructure for educational purposes (SDG 4.a.1)
	Nature of School Building	School building is the physical structure where teaching and learning takes place. Teaching and learning are supposed to take place in a safe environment. According to World Bank (2017), school buildings should be safe havens for teachers and students.
Human resource	Supervisor	School supervision is a key variable in education literature. Supervision can be internal or external. In Ghana, there is a body responsible for inspecting the school environment and making sure teaching and learning are carried out in the best conducive atmosphere. The supervisor indicator captures this activity in the basic school
	Teacher Quality	Proportion of teachers with the minimum required qualifications, by education level. A teacher's quality can be defined by receiving at least the minimum organized pedagogical teacher training pre-service and in-service required for teaching at the relevant level in a given country (SDG4. c.1).
	Teacher-Pupil ratio	Average number of pupils per qualified teacher at each level of education (pre-primary, primary, lower and upper secondary education) in a given academic year ((SDG4. c.4).
School Functional Resources	Number of Computers	A computer is a programmable electronic device that can store, retrieve and process data, as well as share information in a highly-structured manner. Use of computers to support course delivery or independent teaching and learning

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	needs. This may include activities using computers or the Internet to meet information needs for research purposes; develop presentations; perform hands-on exercises and experiments; share information; and participate in online discussion forums for educational purposes. (SDG 4.a.1).
Printers	A printer is an output device. A printer is a piece of hardware, often connected to a computer directly or through a local area network (LAN). Users can print text and pictures on to paper. A printer can also work with digital cameras to print directly without the use of a computer. Schools use printers in printing official documents, teaching and learning resources and in some instances examination questions.
Pupil-desk ratio	This is the ratio of the number of pupils to the number of desks available. This indicator is one of the very important indicators captured under school infrastructure in SDG 4.a. Ideally each student is supposed to have a single desk for his or her academic activities in the classroom.
Library books	These are reading materials available in schools to help pupils improve on their reading habit and also have access to extra resources for learning. SDG 4.a.1 demands that schools will have a designated space for books and learning resources.
ICT infrastructure (Access to internet)	This is the availability of internet for pedagogical purposes. Internet that is available for enhancing teaching and learning and is accessible by pupils. Internet is defined as a worldwide interconnected computer network, which provides pupils access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used.
Textbooks (Core)	A written source of information, designed specifically for the use of students, on a particular subject or field of study that is usually developed based on a syllabus and geared towards meeting specific quality and learning requirements. School textbooks pertain to an instructional sequence based on an organized curriculum. Ideally, they serve as a complement to a good teacher and an inquiring learner. (UNESCO 2003a and UNESCO IBE 2006)

Table 3 presents Ghana's National MERDI with its dimensions, indicators,

deprivation cut-offs, and weights.

Table 3: Ghana's national MERDI – indicators, deprivation cut-offs, and weights

Dimension	Indicator	Deprivation cut-off definition	Weight
School Operation utilities	Availability of toilet facility	Deprived if there is no toilet facility available	1/15
	Safe water	Deprived if there is no source of safe water facility available	1/15
	Access to road	Deprived if there is no access to a good road	1/15
	Electricity	Deprived if there is no access to electricity	1/15
	Nature of School Building	Deprived if repairs are major or building is deteriorated	1/15
Human resource	Supervisor	Deprived if supervisors visit less than two times in a term	1/9
	Teacher Quality	Deprived if there are more non-trained teachers than trained teachers	1/9
	Teacher-Pupil ratio	Deprived if teacher-pupil ratio is greater than 1:25	1/9
School Functional Equipment/Resources	Number of Computers	Deprived if computer to student ratio is greater than 1:2	1/18
	Printers	Deprived if there are no printers	1/18
	Pupil-desk ratio	Deprived if the pupil-desk ratio is greater than 1:1	1/18
	Library books	Deprived if there are NO library books in the school	1/18
	ICT infrastructure	Deprived if school have no access to internet	1/18
	Core Textbooks	Deprived if not 1:1	1/18

Source: Author's construct (2021)

Weights and Deprivation Scores

The "nested weights" approach was adopted for the MERDI. This implied that each of the three dimensions is equally weighted, that is, one-third of the total weight is assigned to SOU, HR, and SFR and each component indicator is equally weighted within its dimension. As a result of the possible variation in the number of indicators for each dimension, SOU's indicators received a weight of 1/15, each HR indicator has a weight of 1/9 and that of SFR is weighted 1/18. In all, the weights add up to 100 percent. The deprivation score is the sum of the weights of the indicators in which a basic school is deprived and shows the percentage of total possible deprivations that the school experiences.

Deprivation Cut-Off

The MERDI adopts the Multidimensional Poverty Index (MPI) cut off which is specified at one-third of the indicators; that is, a school whose deprivation constitutes at least 33 percent of the weighted indicators is classified as multidimensionally deprived (Alkire, 2008). According to Alkire (2008), a person must be deprived of at least one full dimension's worth of indicators to be classified as multidimensionally poor. In our case, this is applied at the school level. A school deprived in **20 – 33.3 percent** of the weighted indicators is considered **"vulnerable to deprivation"** while a school deprived in at least **50 percent** of the weighted indicators is identified as being **highly deprived**.

MERDI Changes over time

One of the robust incentives for calculating the multidimensional educational resource deprivation is its ability to track and analyse changes in the provision of these educational resources over time. This can be carried out

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with either repeated cross-sectional data or longitudinal data. In comparing the MERDI and its corresponding partial indices over a period of time, longitudinal data are used. First of all, the absolute rate of change is computed. The Absolute Rate of Change is the difference in deprivation levels between two periods. The initial period was represented by t_1 and the final period by t_2. This is linked to the equivalent achievement matrices for the two periods by Xt_1 and Xt_2 one-to-one. It must be indicated that the same set of parameters is used in each period. That is the deprivation cutoff vector (z), weight vector (w), and the deprivation cutoff point (k) (Alkire, Roche, & Vaz, 2017).

Computing the **Absolute Rate of Change (Δ)** for the MERDI:

$$\Delta MERDI = MERDI(X_{t2}) - MERDI(X_{t1})$$

Similarly, for H and A:

$$\Delta H = H(X_{t2}) - H(X_{t1})$$

$$\Delta A = A(X_{t2}) - A(X_{t1})$$

The absolute rate of change is indifferent to the initial level. The significance of the difference is determined by t-tests or chi-square and is reported at 90% (*), 95% (**), and 99% (***) confidence levels.

Data Analysis: Research Objectives 2

Importance-Performance Map Analysis (IPMA)

Research objective two sought to estimate the relative performance of each of the domains and indicators of the MERDI. To be able to achieve this, an Important-Performance Map Analysis (IPMA) was carried out. IPMA is a Partial Least Squares Second-generation Structural Equation Modelling (PLS-SEM) technique that offers important intuitions into the role of precursor constructs and indicators and their relevance (e.g., Höck et al.,

2010; Martensen and Grønholdt, 2010, Grønholdt et al., 2015). The IPMA also becomes particularly useful when contrasting PLS-SEM results from a multigroup analysis (Sarstedt et al., 2011; Hair et al., 2017), as several studies illustrate (Rigdon et al., 2011; Schloderer et al., 2014).

Using 2018/19 Annual School Census data and focusing on the three domains and fourteen indicators of the MERDI, a structural model was developed using SmartPLS (version 3.3.7). Figure 11 presents the structural model developed for performing the IPMA. The structural model basically depicts the relationship between the indicators and the constructs. For the purposes of the IPMA, the target construct is the MERDI while the constructs (School Functioning Resources, School Operating Utilities, and Human Resources) interact to affect the MERDI, directly or indirectly. Table 4 and Figure 11 present the constructs table and structural model respectively.

Table 4: Constructs and their indicators

Construct	Indicator	Symbol
School Operation Utilities	Availability of toilet facility	SOU1
	Safe water	SOU2
	Access to road	SOU3
	Electricity	SOU4
	Nature of School Building	SOU5
Human resource	Supervisor	HR1
	Teacher Quality	HR2
	Teacher-Pupil ratio	HR3
School Functional Resources	Number of Computers	SFR1
	Printers	SFR2
	Pupil-desk ratio	SFR3
	Library books	SFR4
	ICT infrastructure (Access to internet)	SFR5
	Textbooks (Core)	SFR6

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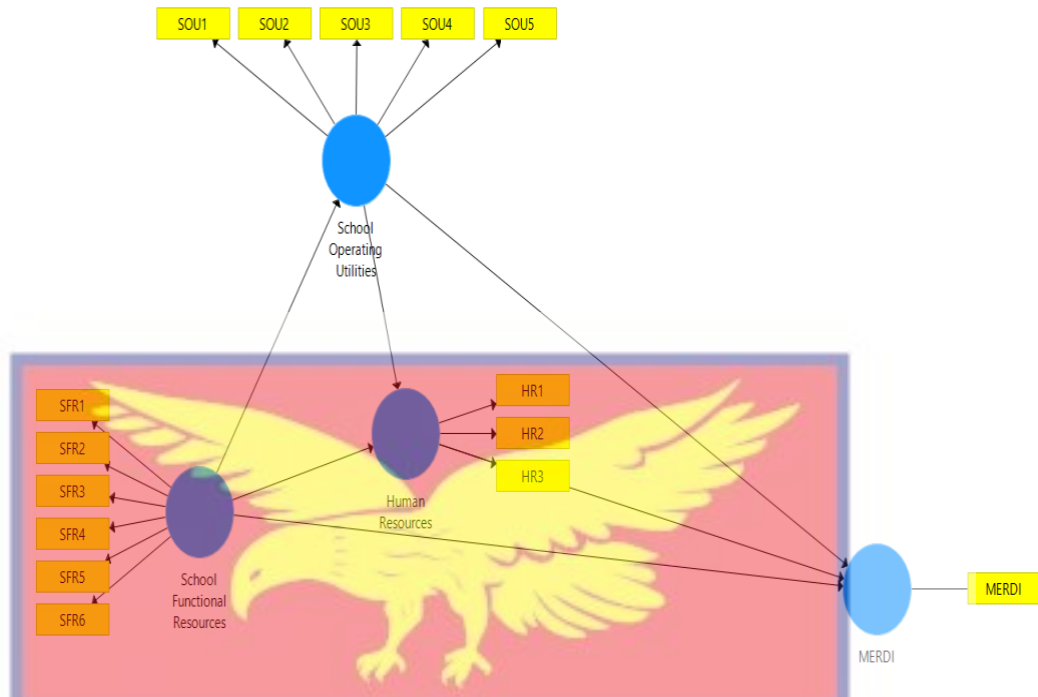
Figure 11: Structural Model for MERDI

The IPMA is carried out to evaluate the relative performance and importance of the constructs and indicators to the MERDI to enable managers of education in Ghana to understand which variables need improvement to reduce the extent of educational resource deprivation in basic schools in Ghana. The IPMA goes through five main steps as presented in Figure 12.

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┌─────────────────────────────────────────────────────┐
│              Step 1: Requirement Check                │
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│       Step 2: Computation of Performance Values       │
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│        Step 3: Computation of Importance Values       │
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│      Step 4: Importance-Performance Map Creation      │
└─────────────────────────────────────────────────────┘
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┌─────────────────────────────────────────────────────┐
│    Step 5: Extension of the IPMA on the Indicator Level │
└─────────────────────────────────────────────────────┘
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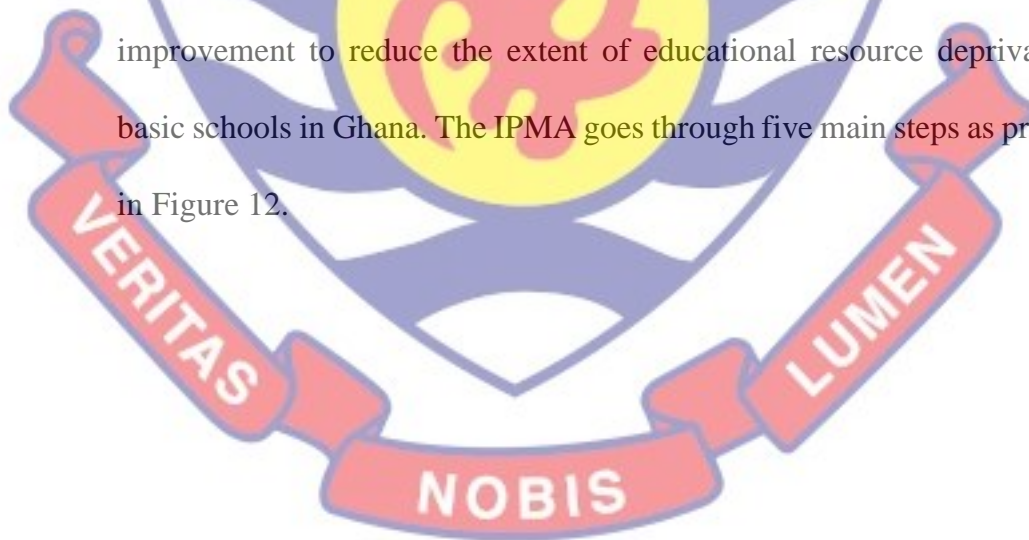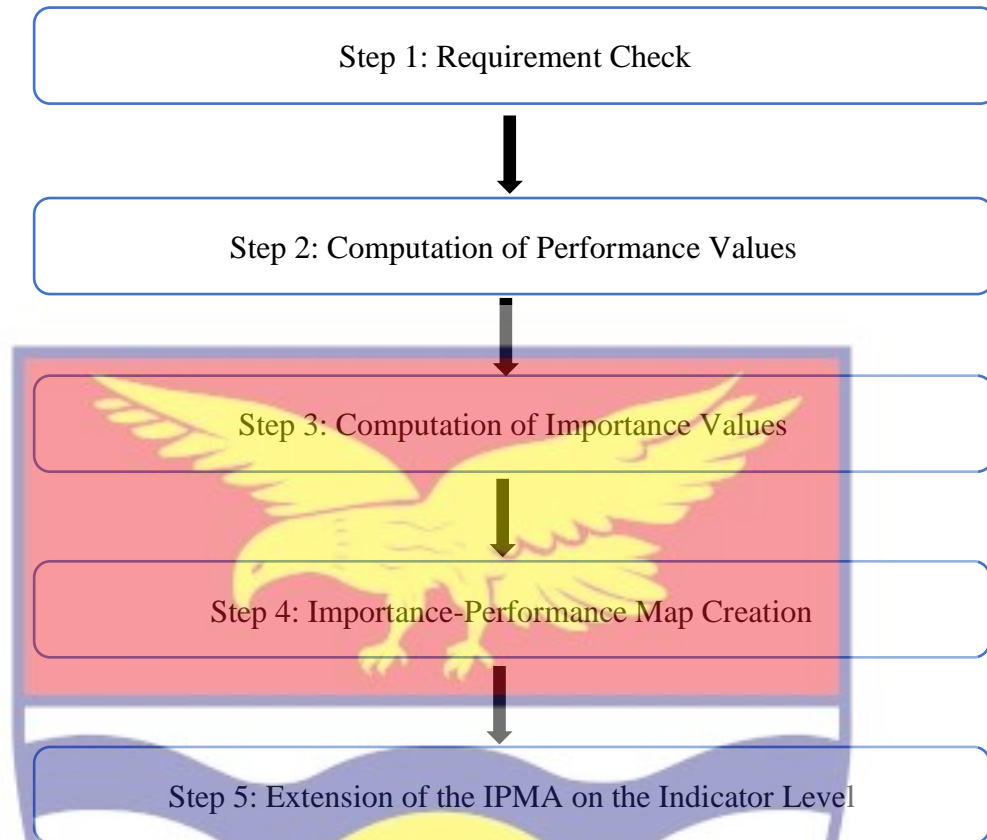
Figure 12: Steps in conducting an IPMA

Step 1: Requirement Check

The first step in IPMA is to carry out a requirement check of the data to ensure that they satisfy three standardized criteria (Hair et al., 2017). These are:

1. There should be a standard measurement for all indicators

2. Coding or re-coding should be done in the same scale direction

3. The outer-weight estimates must be positive (Appendix C)

Step 2: Computation of Performance Values

In conducting IPMA, it is important to note that, the indicator data determine the latent variable scores and, consequently, their performance (Sarstedt et al., 2011). For easy interpretation and comparison, the IPMA rescales indicator scores on a range between 0 and 100, with 0 being the lowest performance and 100 representing maximum performance.

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According to Ringle and Sarstedt (2016) the rescaling of observation, j, with respect to indicator, i, proceeds by:

$$X_{ij}^{rescaled} = \frac{E[X_{ij}] - \min[X_i]}{\max[X_i] - \min[X_i]} \cdot 100$$

where X_i is the ith indicator in the PLS path model, $E[.]$ Is indicator i's actual score of respondents (basic schools), j and $\max[.]$ and $\min[.]$ is the minimum and maximum values of the indicator.

Step 3: Computation of Importance Values

The importance of a construct and its ability to help predict directly or indirectly another target construct in a structural model is derived from the Total Effect of the relationship between the two constructs. The Total Effect is given as:

$$Total\ Effect = Ditrect\ Effect + Indirect\ Effect$$

According to Hair et al., (2017), the computation of the Total Effect by using both the Direct and Indirect Effects enables the researcher to estimate the importance of the construct in predicting the target construct, in this case, the MERDI.

Step 4: Importance-Performance Map Creation

The focus of the IPMA is on the target construct (MERDI) in the PLS path model, this implies that in creating an Importance-Performance map, the first step is to select the target construct. SmartPLS generates a scatter plot that communicates the importance and performance of the other constructs in relation to the target construct (Refer to Figure xx). The map serves as an avenue for prioritisation for managerial decision-making.

Step 5: Extension of the IPMA on the Indicator Level

The final step in the IPMA is to evaluate the performance and value of the indicators to check their relative relevance and identify areas of improvement. This is done by rescaling the outer weights. The outer weights mostly represent each indicator's contribution to establishing the composite variable that denotes the construct in the PLS path model (Refer to Appendix D). Again, the indicators Total Effects signify their importance to the construct. This is derived by finding the product of the rescaled outer weights of a predecessors' construct's indicators and its unstandardized Total Effect on the target construct (Ringle & Sarstedt, 2016).

Data Analysis: Research Objectives 3

Panel Model

To be able to answer research objective 3 (a & b), the effect of the independent variables on the dependent variable, quality, and access were analysed. In order to do so, a combination of Time-Series and Cross-Sectional data were used in which the data of the independent variables and the dependent variables were collected repeatedly over four academic years. This means that the type of data in this study is longitudinal or panel data, hence, panel data analysis was conducted for research objectives 3a and 3b. According to Stock and Watson (2015) panel data analysis is the most effective analytical method to handle panel data set, which consists of data for **n** different entities observed at **T** different time periods, this is represented as:

$$(X_{it}Y_{it}), i = 1, \ldots n \; and \; t = 1, \ldots T \qquad (1)$$

in the event where the independent variable is only one, a simple linear panel model is represented as:

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$$Y_{it} = \alpha + \beta X_{it} + \mu_{it} \tag{2}$$

In this study, the data for all basic schools, where each entity is observed in T = 4 for the basic schools from 2015 to 2019. In the view of Stock and Watson (2015), panel data can be balanced or unbalanced depending on the completeness of the observations. If the dataset has all observations complete, it is termed balanced data while incomplete observations in the data set make it unbalanced data. The data set in this study exhibit unbalanced panel data because there are missing data on school functional equipment.

The advantage of using panel data analysis according to Hsiao (2000) includes increasing reliability regardless of the given sample size, boosting the degree of freedom, coping with multicollinearity among independent variables, reducing the effects of variable bias even with unbalanced panel data, and providing more complex analysis in comparison to stand-alone time-series or cross-sectional data analysis. Again, Greene (2012) posits that panel data analysis does not only capture the behaviour of the variables but also provides a more efficient estimation and information of the variables. Further, it also allows greater flexibility in modeling differences in behavior across individuals within a group compared to ordinary least square (OLS) regression analysis. However, heterogeneity and selection bias may occur if the panel data analysis model is not chosen correctly (Greene, 2012; Gujarti & Porter, 2009). It must be indicated that panel regression methods enable individual heterogeneity to be controlled to avoid the risk of producing biased results. This can be achieved by identifying and dealing with entity-invariant and time-invariant variables (Baltagi, 2005, pp. 4-7).

Fixed Effects Model

The fixed-effects model is used if the investigation is limited to the effect of variables that change over time. Every entity has its characteristics which are generally referred to as time-invariant variables, and these may affect the quantitative relationship between the dependent and the independent variables. The underlying assumption is that these characteristics are fixed over time. These variables are sometimes unobservable and introduce bias to the parameter estimates hence there is a need to control for them within the model estimation process (Greene, 2018). This is achieved by taking μt as a fixed parameter (Greene, 2018). Since every entity will have these unique characteristics, the expectation is that the error terms and the constants will not be correlated, and if these conditions are met, the fixed effects model can be applied in the model estimation process to control for the unobserved heterogeneity. In other words, if the error terms are correlated then the 'fixed effects' model would not be suitable (Torres-Reyna, 2007). The fixed-effects model can be represented by the following equation (recall equation 2) which controls for both entities and time:

$$Y_{it} = \alpha_i + \beta X_{it} + \mu_{it}$$

Where:

Y_{it} represents the dependent variables which are Enrolment (Objective 2) and BECE Pass Rate (Objective 3).

α_i is the intercept for the ith entity,

β is a k x 1 vector of parameters to be estimated,

X_{it} is a 1 x k vector of observations of the explanatory variables

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μ_{it} is the remainder disturbance i.e., the error term without the effect of the time-invariant variables (Brooks, 2008)

Random Effects Model

In the random-effects model, the variation across the entities is generally assumed to be random and uncorrelated with the independent variables included in the model. Further, the model will need to include all the possible variables including the invariant time fixed characteristics otherwise the model will be exposed to bias due to omitted variables. In essence, if there is a likelihood that the differences across the entities have a significant influence on the model output values for the dependent variable then one should consider using the random-effects model. Therefore, one can include time-invariant variables in the model but the obvious disadvantage is that the data for such variables may not be available. The random-effects model has the advantage of producing results that can be inferred beyond the sample (Torres-Reyna, 2007). The advantage that the random-effects model has over the fixed effects model is that it has fewer parameters and the fact that the error component is assumed to be random means that this model avoids losing degrees of freedom (Greene, 2018). The following model represents a random effects panel data regression model:

$$Y_{it} = \alpha + \beta_{1it}X_{1it} + \cdots + \beta k_{it}Xk_{it} + U_{it} + \varepsilon_{it} \qquad (4)$$

Where:

ε_{it} is the error term for the within-entity error for the ith independent variable at time t;

U_{it} is the error term for the between – entity error for the ith independent variable at time t (Torres-Reyna, 2007).

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Estimation Techniques

Panel data regression model is made up of both fixed and random effects. According to Greene (2018), the difference between these two-panel models is the fact that fixed effects assume that the differences across units can be captured in differences in the constant term which needs to be estimated as parameters. However, Ogunwale et al. (2011) opine that random effect models assume that the individual-specific effects are uncorrelated with the explaining variables and their specific effects are treated as part of the error term.

$$Y_{it} = \alpha + \beta X_{it} + \mu_{it} \qquad (1)$$

In the fixed effects a disturbance term (u_{it}) is considered to affect the dependent variable (y_{it}) cross-sectionally in different ways depending on the entities. The disturbance term is defined as:

$$u_{it} = \mu_i + v_{it} \qquad (2)$$

Where μ_i is the individual-specific effect and v_{it} is the time-varying disturbance term.

It is important to remember that μ_i remains constant over time. This model (which is called the Least Squares Dummy Variable (LSDV) approach) can be shown as a function of different dummy variables, which are different depending on the entity.

$$y_{it} = \beta x_{it} + \mu_1 D1 + \mu_2 D2 + \mu_3 D3 + ... + \mu_x DN + v_{it} \qquad (3)$$

For the first entity D1 is 1 and 0 for all other dummies. Using this equation one can test whether pooled regression is suitable for the dataset. It is also possible to have a fixed-effects model in the time series (Brooks, 2014).

The random-effects model has different intercepts for different entities, and the intercepts are constant over time. The big difference with the fixed

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effects is that the intercept for every cross-sectional entity is affected by another intercept (α) that affects every entity. What varies cross-sectionally is a random term (ϵ), which in this case will show the heterogeneity across the entities. Heterogeneity can be defined as the variation in the cross-sectional element (in the LSDV fixed effects model the dummy variables show the heterogeneity).

The following equation explains how the random effects work in Panel data (Brooks, 2014):

$$y_{it} = \alpha + \beta x_{it} + \omega_{it} \qquad (4)$$

where $\omega_{it} = \epsilon_i + v_{it}$

Both mentioned models are ways to address endogeneity problems, which can be described as correlation between the explanatory variable and the error term.

Model Specification

Research Objective 3a

The general form of a panel model for research objective 2 is specified as follows:

$$Y_{it} = \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \qquad (1)$$

Where Y_{it} represents the dependent variable (access) to school, i, in time, t.

X_{it} is the vector of independent variables for school, i, in time, t.

μ_i, λ_t are the unobserved school-specific and time-specific variables

respectively that are controlled for in the study

ε_{it} is the error term

Specifically, the empirical model for research objective 2 is specified as follows:

$$ACCESS_{it} = \alpha + \beta_1 PT_{it} + \beta_2 LB_{it} + \beta_3 Prn_{it} + \beta_4 Comp_{it} + \beta_5 ICTq_{it}$$

$$+ \beta_6 Tbk_{it} + \beta_7 Toi_{it} + \beta_8 Wat_{it} + \beta_9 SB_{it}$$

$$+ \beta_{10} Sup_{it} - \beta_{11} TPR_{it} + \beta_{12} CapG_{it} + e_{it} \qquad (2)$$

Table 5 presents the names of the variables in equation (2) under research objective 2, how they were measured and a prior assumption for each of the variables.

Table 5: Description of variables

Variable	Variable Name	Measurement	A prior Assumption
Access	Access (Enrolment)	Total number of pupils enrolled in the years used for the study	
PT	Professional Teachers	Total number of teachers with a minimum qualification in education pedagogy	This is supposed to have a positive (+) relationship with enrolment
LB	Number of Library Books	Total number of library book recorded for each academic year	Schools with good library facilities are likely to attract a larger number of students. It is expected that availability of library books will have a positive effect on access.
Prn	Number of Printers	Total number of printing machines including photocopiers	Empirical literature is indifferent on the real effect of number of printers on school enrolment. It is however expected that, there will be a positive relationship between printers and access to basic education.
Comp	Number of Computers	Total number of computers	Computers are teaching aids. In

			recent times, they have become an integral part of the teaching and learning process. It is expected that basic schools with computers will attract more pupils.
ICT	Access to Internet	Dummy variable to measure the ability to access internet in the school (Yes = 1, No = 0)	Internets have become a useful tool in the teaching and learning process. Schools with access to internet and ICT infrastructure will have increased enrolment.
Tbk	Textbooks	Total number of core textbooks available in the school	Availability of teaching materials especially textbooks has proven empirically to have a positive relationship with enrolment
Toi	Toilet	Availability of toilet facilities (this includes urinal) is treated as a dummy variable (Yes = 1, No = 0).	Availability of toilet facilities improve the hygienic conditions of any basic school. Empirically, good hygiene and sanitation influences level of enrolment. It is expected that availability of toilet facilities will impact positively on access.
Wat	Safe Water	Availability of potable safe drinking water in the school. Treated as a dummy variable (Yes = 1, No = 0)	Safe potable drinking water is one of the key variables under sanitation and good hygiene in the SDGs. It is expected that the availability of safe water will improve (+) enrolment level.
SB	School Building	This is dummy variable measuring the current state of	The nature of school building attracts pupils. Schools with

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		the school building. Nature of school building is looked at by indicating whether the school needs major repairs or not (Yes = 1, No = 0).	nice building are more likely to have higher enrolment as compared to school buildings with minor and major repairs.
Sup	Supervision	This is measured by the number of times that school inspectors, supervisors and other education officials visited the school during the academic year	Robust internal and external supervision has a positive (+) impact on enrolment
TPR	Teacher-Pupil Ratio	This is measured by the average class size in the school per teacher	There is a negative (-) impact of teacher-pupil ratio on enrolment
CapG	Capitation Grant	This is measured by the extent to which capitation grants are paid to the school within an academic year. The options were: Not Available (N/A) = 0 No = 1 Only Partially = 2 Yes = 3	Payment of capitation grant is supposed to have a positive relationship with enrolment

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Research Objective 3b

This objective focused on only basic schools that have up to Junior High School 3. The general form of a panel model for research objective 2 is specified as follows:

$$Y_{it} = \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \tag{1}$$

Where Y_{it} represents the dependent variable (quality) for school, i, in time, t.

X_{it} is the vector of independent variables for school, i, in time, t.

μ_i, λ_t are the unobserved school-specific and time-specific variables respectively that are controlled for in the model

ε_{it} is the error term

$$QBE_{it} = \alpha - \beta_1 \, EEnr_{it} + \beta_2 LB_{it} + \beta_3 Prn_{it} + \beta_4 Comp_{it} + \beta_5 ICTq_{it}$$
$$+ \beta_6 Tbk_{it} + \beta_7 Toi_{it} + \beta_8 Wat_{it} + \beta_9 SB_{it} + \beta_{10} Sup_{it}$$
$$+ \beta_{11} TPR_{it} + \beta_{12} CapG_{it} + \beta_{13} PT_{it} + e_{it} \tag{2}$$

Table 6 presents the names of the variables in equation (2) under research objective 3, how they were measured and a prior assumption for each of the variables.
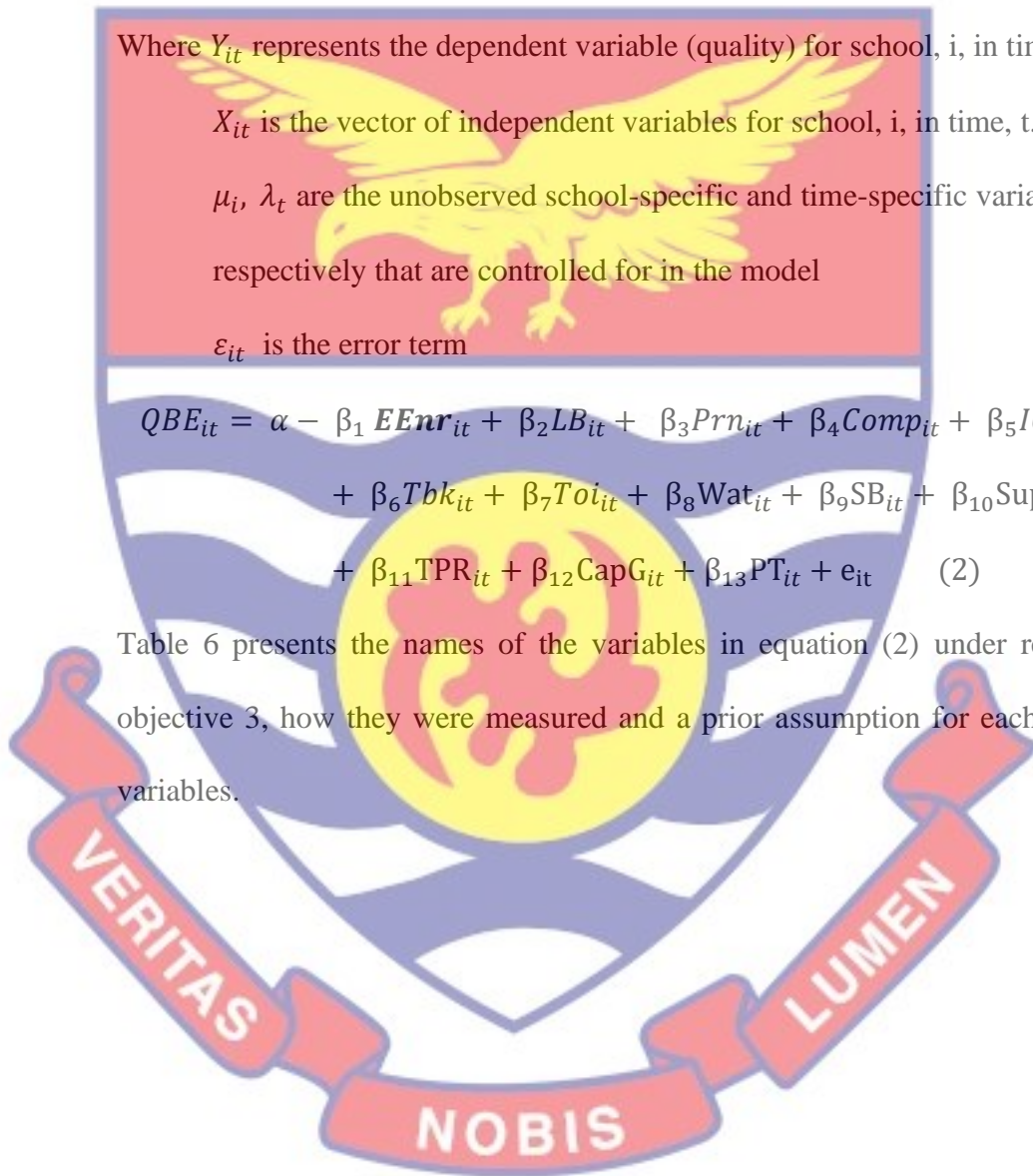
Table 6: Description of variables

Variable	Variable Name	Measurement	A prior Assumption
QBE	Quality Basic Education	BECE Pass rate	
EEnr	Estimated Enrolment	Number of students enrolled in the school during the academic year	Enrolment is supposed to have a negative relationship with quality education
PT	Professional Teachers	Total number of teachers with a minimum qualification in education pedagogy	This is supposed to have a positive (+) relationship with quality education
LB	Number of Library Books	Total number of library book recorded for each academic year	Schools with good library facilities are likely to perform well in BECE. It is expected that availability of library books will have a positive effect on quality basic education.
Prn	Number of Printers	Total number of printing machines including photocopiers	Empirical literature is indifferent on the real effect of number of printers on students' performance. It is however expected that, there will be a positive relationship between printers and quality basic education.
Comp	Number of Computers	Total number of computers	Computers are teaching aids. In recent times, they have become an integral part of the teaching and learning process. It is expected that basic schools with computers will have a higher BECE pass rate.

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ICT	Access to Internet	Dummy variable to measure the ability to access internet in the school (Yes = 1, No = 0)	Internets have become a useful tool in the teaching and learning process. Schools with access to internet and ICT infrastructure will have increased performance in BECE
Tbk	Textbooks	Total number of core textbooks available in the school	Availability of teaching materials especially textbooks has proven empirically to have a positive relationship with students' performance.
Toi	Toilet	Availability of toilet facilities (this includes urinal) is treated as a dummy variable (Yes = 1, No = 0).	Availability of toilet facilities improve the hygienic conditions of any basic school. Empirically, good hygiene and sanitation influences quality education. It is expected that availability of toilet facilities will impact positively on BECE pass rate.
Wat	Safe Water	Availability of potable safe drinking water in the school. Treated as a dummy variable (Yes = 1, No = 0)	Safe potable drinking water is one of the key variables under sanitation and good hygiene in the SDGs. It is expected that the availability of safe water will improve (+) quality basic education
SB	School Building	This is dummy variable measuring the current state of the school building. Nature of school building is looked at by indicating whether the school needs major repairs	The nature of school building attracts plays a critical role in classifying the school environment as being conducive for teaching and learning. It is anticipated that school buildings will have a positive (+)

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		or not (Yes = 1, No = 0).	impact on BECE pass rate
Sup	Supervision	This is measured by the number of times that school inspectors, supervisors and other education officials visited the school during the academic year	Robust internal and external supervision has a positive (+) impact on students' performance
TPR	Teacher-Pupil Ratio	This is measured by the average class size in the school per teacher	There is a negative (- impact of teacher-pupil ratio on BECE pass rate
CapG	Capitation Grant	This is measured by the extent to which capitation grants are paid to the school within an academic year. The options were: Not Available (N/A) = 0 No = 1 Only Partially = 2 Yes = 3	Payment of capitation grant is supposed to have a positive relationship with performance in BECE

Model Specification Test

While using panel data has many advantages, in order to study an empirical phenomenon, one needs to decide if to use a fixed effects model or a random effects model. Whether to use one or the other depends on the correlation between the unit effects and the independent variables (Bole & Rebec, 2013). The standard test to distinguish which model to use is the specification test developed by Hausman (1978). Hausman's (1978) specification test essentially suggests to compare $\hat{\hat{\beta}}_{GLS}$ and $\hat{\hat{\beta}}_{Within}$ which are both consistent with the null hypothesis when H_1: $E(u_{it} \mid X_{it}) = 0$ is true, but with $\hat{\hat{\beta}}_{GLS}$ being inconsistent when H_0 is false (Greene, 2018). The absence of

correlation between the independent variable(s) and the unit effects means that estimates of β should be similar for both fixed-effects and random-effects models. Hausman test statistic H (given in the equation below) is, therefore, a comparison between the two (Clark & Linzer, 2012).

$$H = (\hat{\hat{\beta}}_{RE} - \hat{\hat{\beta}}_{FE})'[Var(\hat{\hat{\beta}}_{FE}) - Var(\hat{\hat{\beta}}_{RE})]^{-1}(\hat{\hat{\beta}}_{RE} - \hat{\hat{\beta}}_{FE}) \tag{5}$$

The hypothesis for Hausman specification test is formulated as:

H_0 = *Random-effects model is appropriate (p-value > α)*

H_1 = *Fixed effects model is appropriate (p-value < α)*

In the statistical analysis, a significance test must be conducted within a significance level, symbolized as α, with the value of 10 % (0.1), 5 % (0.05), and 1 % (0.01). If a significance test gives a lower p-value than the significance level α, then the null hypothesis is rejected, which is known as statistically significant (Saunders et al, 2012). As the significance level within studies are based upon the choice for this study the chosen level of significance is at 5 percent as it is the most common level of significance for research (Stock & Watson, 2015)

Summary of Data Analysis

Stata (version 15), Quantum Geographic Information System (QGIS 3.18), SmartPLS (version 3.3.7), and Microsoft Excel were used to process and analyse the data. The study employed descriptive statistics, namely; frequencies, percentage, means, and standard deviation to analyse data for research objective 1. Infographics and maps were used to vividly describe the extent of educational resource distribution across the country. Research objective 2 was carried out using Importance-Performance Map Analysis

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(IPMA) and research objectives 3a and 3b were analysed using Panel regression

(Fixed and Random Effects).

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter is organised into four sections. Each section presents a detailed analysis of the objectives of the study. Section one provides a detailed analysis of the national MERDI results for Ghana using the Annual School Census Survey for 2015/16, to 2018/2019 academic years. The section specifically presents results on the three main statistics of the MERDI; namely, the headcount (H), intensity (A), and the adjusted headcount ratio (MERDI). The results are presented on the national level and across two main group variables; school ownership (status) and regional level. The percentage contributions of each indicator to MERDI are also discussed. There is also an analysis of the MERDI over the period. Sections two and three focus on presenting the results of the effect of the availability of educational resources on access and quality. It establishes the probable effect of the deprivation of educational resources on the twin variables of access, and quality in the Ghanaian basic school system. The last section discusses the findings of the analysis from the three objectives. It links the findings to empirical literature to establish the veracity or otherwise of previous empirical works on the issues discussed.

Research Objective 1: Profile the extent of educational resource deprivation (distribution) in Ghana (2015/16 – 2018/19)

The focus of this objective was to use the Multidimensional Educational Resource Deprivation Index (MERDI) to profile the extent of educational resource deprivation in Ghana by classifying basic schools as deprived (poor)

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or not deprived (not poor) based on the index. This section first presents the results on the level of multidimensional educational resource deprivation in Ghana, it then decomposes the data based on the type of basic school (private, public and private unregistered). This is followed by a regional and district-level analysis of the extent of deprivation.

Level of Multidimensional Educational Resource Deprivation in Ghana from 2015/16 – 2018/19

Table 7 shows Ghana's National MERDI for the 2015/16 academic year, as well as its partial indices: the incidence of poverty (the proportion of schools identified as multidimensionally deprived (poor) – H) and the intensity of poverty (the average proportion of weighted indicators in which the poor are deprived – A). The incidence of multidimensional educational resource deprivation is 86.3 percent. This means that at least eight out of every ten basic schools in Ghana are identified as multidimensionally deprived (poor). Based on the 95 percent confidence interval, the true multidimensional deprivation headcount ratio is between 82.2 percent and 84.9 percent of the population. The intensity of deprivation, which reflects the share of deprivations each poor basic school experiences on average, is 49.6 percent. That is, each deprived basic school is, on average, deprived in about 50 percent of the weighted indicators.

This implies that a multidimensionally deprived basic school is deprived in seven of the 14 weighted indicators, on average. The National MERDI, which is the product of the incidence and intensity of poverty, has a value of 0.415.

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Table 7: Incidence, Intensity, and MERDI (2015/16 – 2018/19)

Deprivation Cut-off (k)	Index	2015/2016			2016/2017			2017/2018			2018/2019		
		Value	95% CI		Value	95% CI		Value	95% CI		Value	95% CI	
k-value = 33%	MERDI	.415	.407	.422	.375	.372	.378	.291	.288	.294	.364	.360	.367
	Headcount ratio (H)	.836	.822	.849	.780	.775	.786	.653	.646	.660	.779	.772	.786
	Intensity (A)	.496	.492	.500	.481	.479	.483	.446	.444	.448	.467	.465	.469
k = 20% to 33.3%	Proportion of population vulnerable to deprivation	.454	.448	.459	.425	.423	.427	.367	.365	.369	.416	.413	.418
k-value = 50%	Proportion of population severe to deprivation	.221	.210	.231	.174	.170	.178	.090	.087	.093	.145	.140	.149

Source: Annual School Census Data, 2015/16 – 2018/19

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This means that multidimensionally deprived basic schools in Ghana experience about 41.5 percent of the weighted deprivations out of the total possible deprivations that could be experienced. The percentage of the population that is vulnerable to multidimensional educational resource deprivation is 45 percent and 22 percent of the population is considered to be in severe deprivation in terms of the distribution of educational resources.

For Ghana's National MERDI for the 2016/17 academic year, the incidence of multidimensional educational resource deprivation is 78 percent. This means that at least seven out of every ten basic schools in Ghana are identified as multidimensionally deprived (poor). Based on the 95 percent confidence interval, the true multidimensional deprivation headcount ratio is between 77.5 percent and 78.6 percent of the population. The intensity of deprivation, which reflects the share of deprivations each poor basic school experiences on average, is 48.1 percent. That is, each deprived basic school is, on average, deprived in about 48 percent of the weighted indicators. This implies that a multidimensionally deprived basic school is deprived in seven (6.7) of the 14 weighted indicators, on average. The National MERDI, which is the product of the incidence and intensity of poverty, has a value of 0.375. This means that multidimensionally deprived basic schools in Ghana experience about 37.5 percent of the weighted deprivations out of the total possible deprivations that could be experienced. The percentage of the population that is vulnerable to multidimensional educational resource deprivation is 42.5 percent and 17.4 percent of the population is considered to be in severe deprivation in terms of the distribution of educational resources.

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For 2017/18, the incidence of multidimensional educational resource deprivation is 65.3 percent. This means that at least six out of every ten basic schools in Ghana are identified as multidimensionally deprived (poor). Based on the 95 percent confidence interval, the true multidimensional deprivation headcount ratio is between 64.6 percent and 66 percent of the population. The intensity of deprivation, which reflects the share of deprivations each poor basic school experiences on average, is 44.6 percent. That is, each deprived basic school is, on average, deprived in about 45 percent of the weighted indicators. This implies that a multidimensionally deprived basic school is deprived in six of the 14 weighted indicators, on average. The National MERDI, which is the product of the incidence and intensity of poverty, has a value of 0.291. This means that multidimensionally deprived basic schools in Ghana experience about 29.1 percent of the weighted deprivations out of the total possible deprivations that could be experienced. The percentage of the population that is vulnerable to multidimensional educational resource deprivation is 36.7 percent and 9 percent of the populations are considered to be in severe deprivation in terms of the distribution of educational resources.

Referencing the 2018/19 academic year, the incidence of multidimensional educational resource deprivation is 77.9 percent. This means that at least seven out of every ten basic schools in Ghana are identified as multidimensionally deprived (poor). Based on the 95 percent confidence interval, the true multidimensional deprivation headcount ratio is between 77.2 percent and 78.6 percent of the population. The intensity of deprivation, which reflects the share of deprivations each poor basic school experiences on average, is 46.7 percent. That is, each deprived basic school is, on average, deprived in

about 47 percent of the weighted indicators. This implies that a multidimensionally deprived basic school is deprived in seven of the 14 weighted indicators, on average. The National MERDI, which is the product of the incidence and intensity of poverty, has a value of 0.364. This means that multidimensionally deprived basic schools in Ghana experience about 36.4 percent of the weighted deprivations out of the total possible deprivations that could be experienced. The percentage of the population that is vulnerable to multidimensional educational resource deprivation is 41.6 percent and 14.5 percent of the population is considered to be in severe deprivation in terms of the distribution of educational resources.

Figure 13 presents a line graph that captures the MERDI, Incidence, and Intensity of multidimensional educational resource deprivation among Basic schools in Ghana between 2015/16 to 2018/19 academic years.

Figure 13: MERDI, Incidence, and Intensity

It can be observed from Figure 13 that, all the three-line graphs are downward sloping exhibiting an improvement in the state of educational

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resource deprivation among basic schools in Ghana from 2015/16 to 2017. However, the graph experienced a slight upward slope in the 2018/19 academic year. Figure 14 shows the National censored headcount ratios for 2015/16.
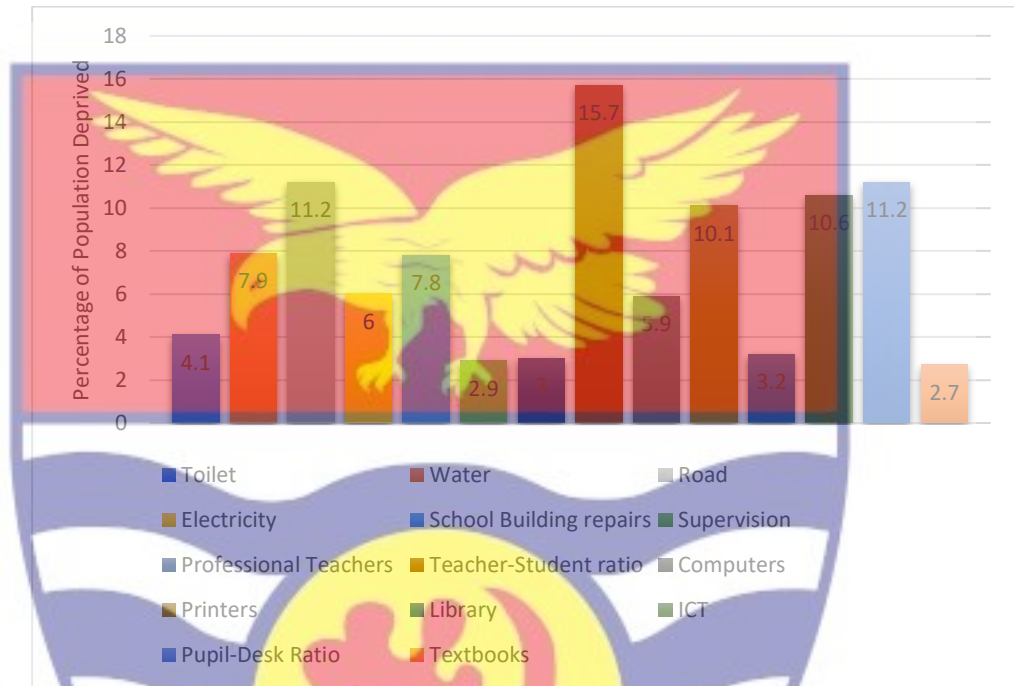
Figure 14: National censored headcount ratios, 2015/16

The MERDI like its parent index, the Multidimensional Poverty Index (MPI) can be described as a composite index. This implies that to determine the specific indicators contributing the most to deprivation, the index is examined at a disaggregated level. Figure 14 presents the censored headcount ratio of each indicator used in the composite index for 2015/16. Each bar represents the share of the population that is multidimensionally poor and also deprived in that indicator. From Figure 14, it is evident that the largest censored headcount ratio is found in the Teacher-Student ratio (15.7%). About 11 percent of the population are multidimensionally deprived and do not meet the set standard of 1:1 Pupil-Desk ratio and do not have good road access. Additionally, 10.6

percent are multidimensionally poor and deprived in terms of ICT infrastructure in their school. Again, 10.1% are multidimensionally deprived in terms of the availability of printers in the school. However, it is evident that few basic schools are multidimensionally poor and deprived in terms of textbooks (2.7%), supervision (2.9%), and availability of professional teachers (3%).

Figure 15: Contribution of each Domain/Dimension to MERDI for 2015/16

Figure 15 illustrates the contribution of each of the three dimensions in to into the overall MERDI obtained. It is evident that School Functional Resources (SFR) recorded the highest percent (41%), followed by School Operational Utilities and then Human Resources.

Figure 16 presents the censored headcount ratio of each indicator used in the composite index for the 2016/17 academic year. Each bar represents the share of the population that is multidimensionally poor and also deprived in that indicator. It is evident from Figure 16 that the largest censored headcount ratio is found in the access to road (11.6%).
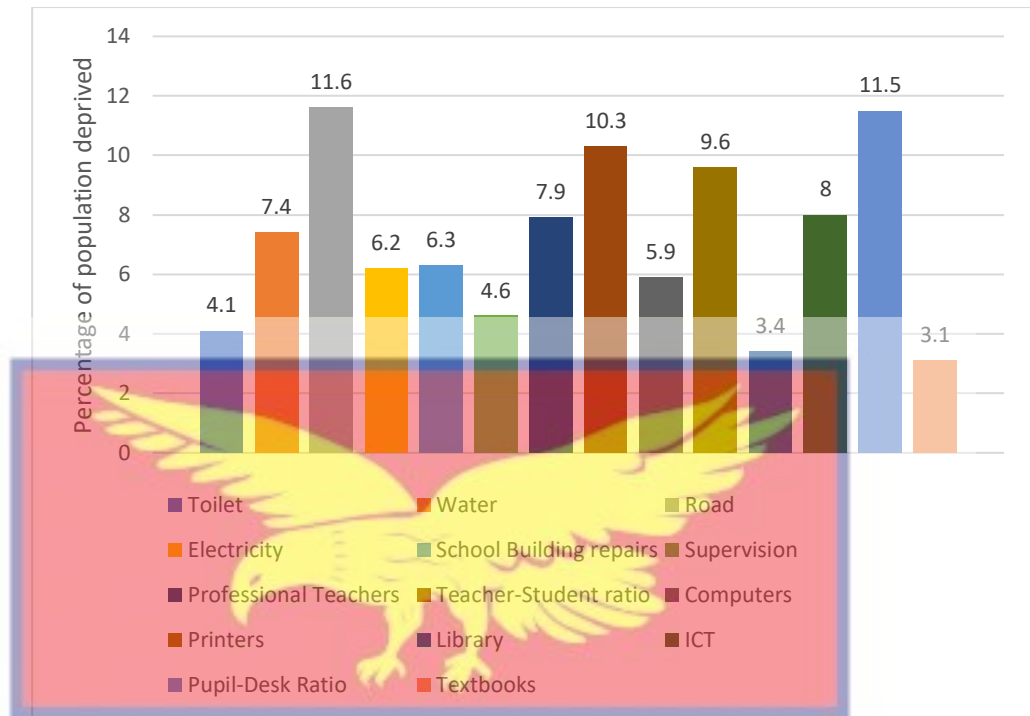
Figure 16: National censored headcount ratios, 2016/17

This is keenly followed by the Pupil-Desk ratio (11.5%) and Teacher-Student ratio (10.3%). However, few basic schools are multidimensionally poor and deprived in terms of textbooks (3.1%) and libraries (3.4%).

Figure 17: Contribution of each Domain/Dimension to MERDI for 2016/17

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Figure 17 illustrates the contribution of each of the three dimensions into the overall MERDI obtained. It is evident that, School Functional Resources (SFR) recorded the highest percent (42%), followed by School Operational Utilities (35%) and then Human Resources (23%).

Figure 18: National censored headcount ratios, 2017/18

Figure 18 presents the censored headcount ratio of each indicator used in the composite index for 2017/18. Each bar represents the share of the population that is multidimensionally poor and also deprived in that indicator. The largest censored headcount ratio is found in the access to road (12.6%). This is followed by the pupil-desk ratio (12.4%) and availability of printers in the school (10.4%). Additionally, 8.4 percent are multidimensionally poor and deprived in terms of ICT infrastructure in their school. However, it is evident that few basic schools are multidimensionally poor and deprived in terms of textbooks (1.8%).

Figure 19 illustrates the contribution of each of the three dimensions into the overall MERDI obtained.

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Figure 19: Contribution of each Domain/Dimension to MERDI for 2017/18

It is evident that School Functional Resources (SFR) recorded the highest percent (45%), followed by School Operational Utilities and then Human Resources. Figure 20 presents the national censored headcount ratios for 2018/19.
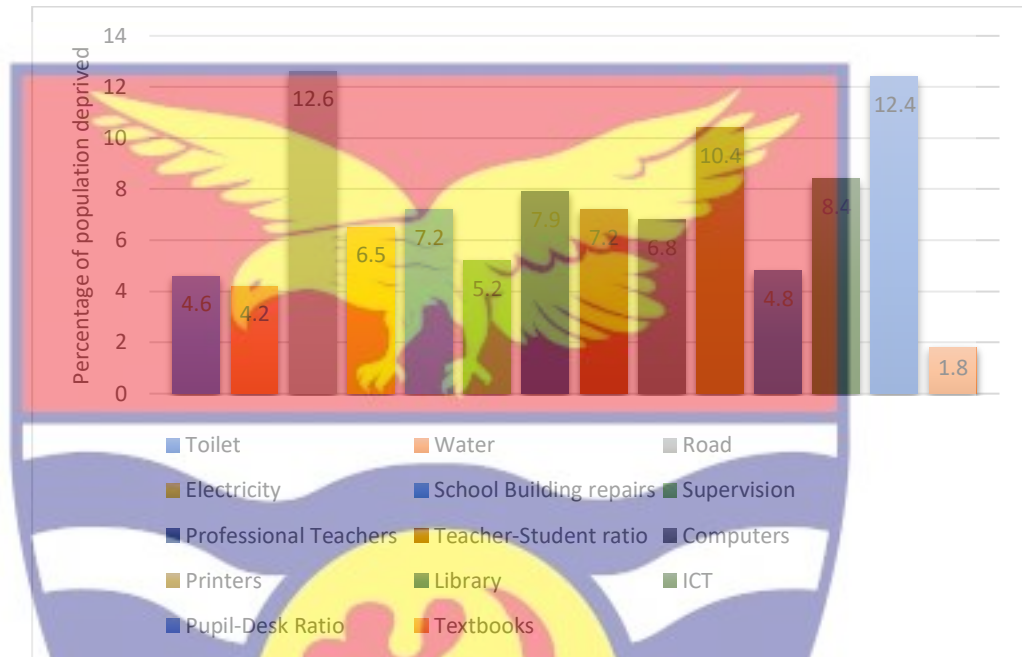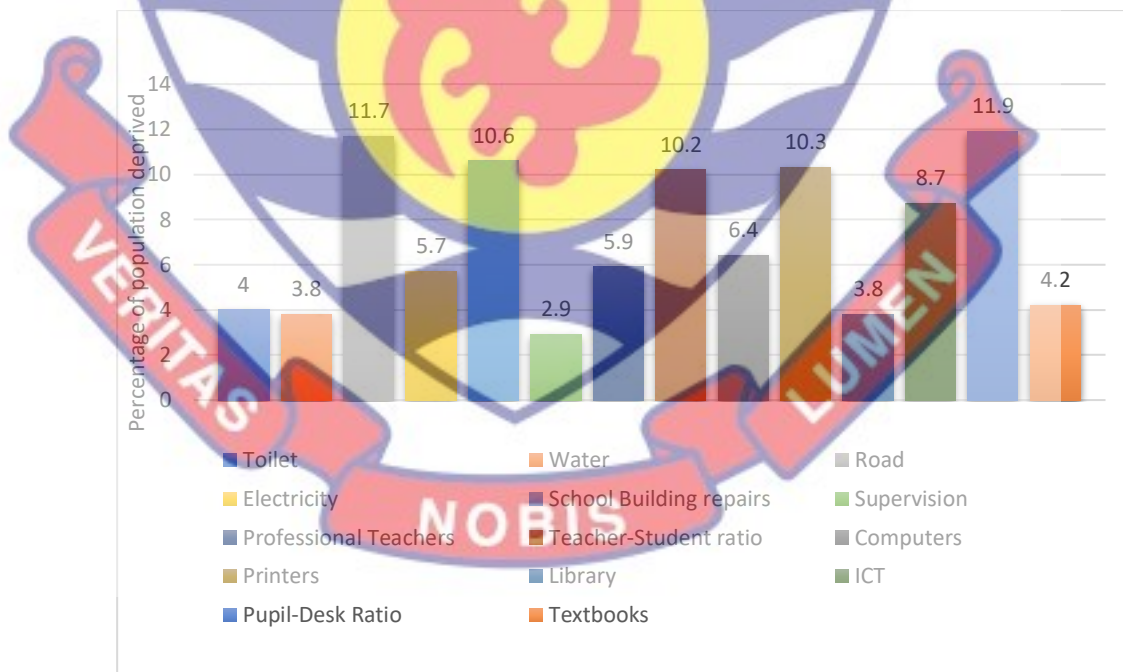

Figure 20: National censored headcount ratios, 2018/19

Figure 20 presents the censored headcount ratio of each indicator used in the composite index for 2018/19. Each bar represents the share of the population that is multidimensionally poor and also deprived in that indicator. The largest censored headcount ratio is found in the pupil-desk ratio (11.9%). This is followed by access to motorable roads (11.7%) and school building repairs (10.6%). Additionally, 10.3 percent are multidimensionally poor and deprived in terms of availability of printers in their school while 10.2 percent are deprived based on the teacher-student ratio. However, it is evident that few basic schools are multidimensionally poor and deprived in terms of supervision (2.9%).

Figure 21 illustrates the contribution of each of the three dimensions into the overall MERDI obtained.
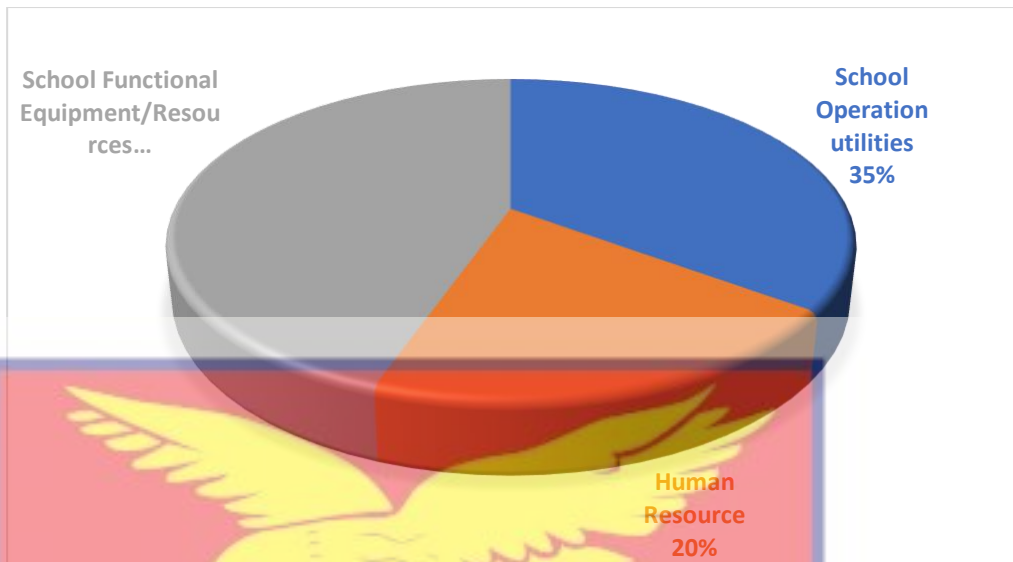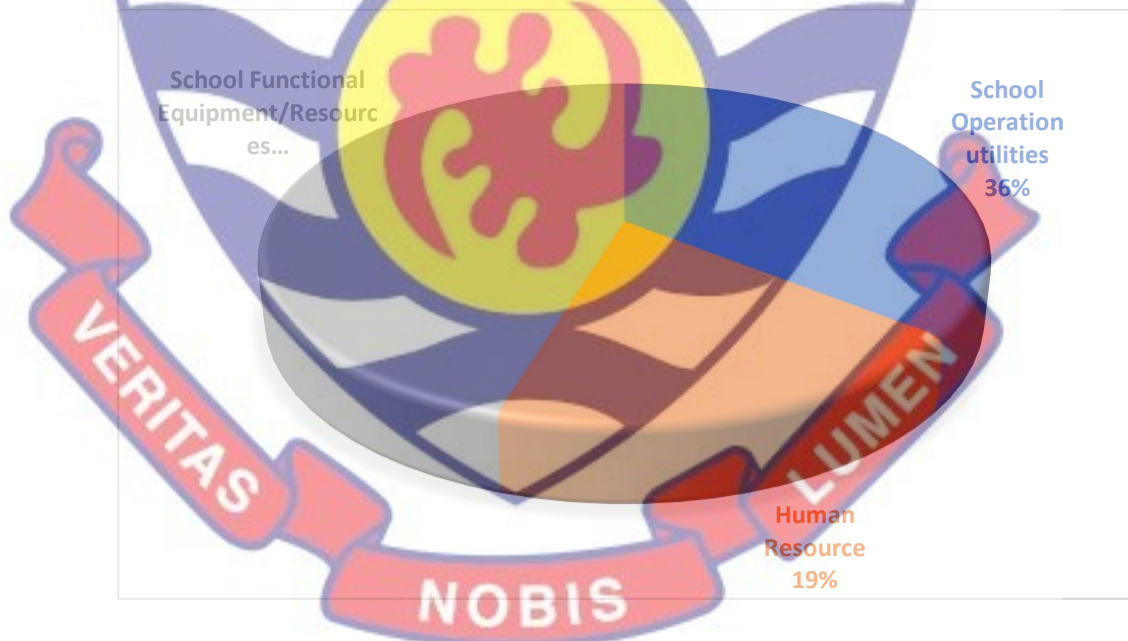

Figure 21: Contribution of each Domain/Dimension to MERDI for 2018/19

It is evident that School Functional Resources (SFR) recorded the highest percentage (45%), followed by School Operational Utilities and then Human Resources.

Figure 22 presents the trend analysis for the dimensions of the MERDI for the period under study.
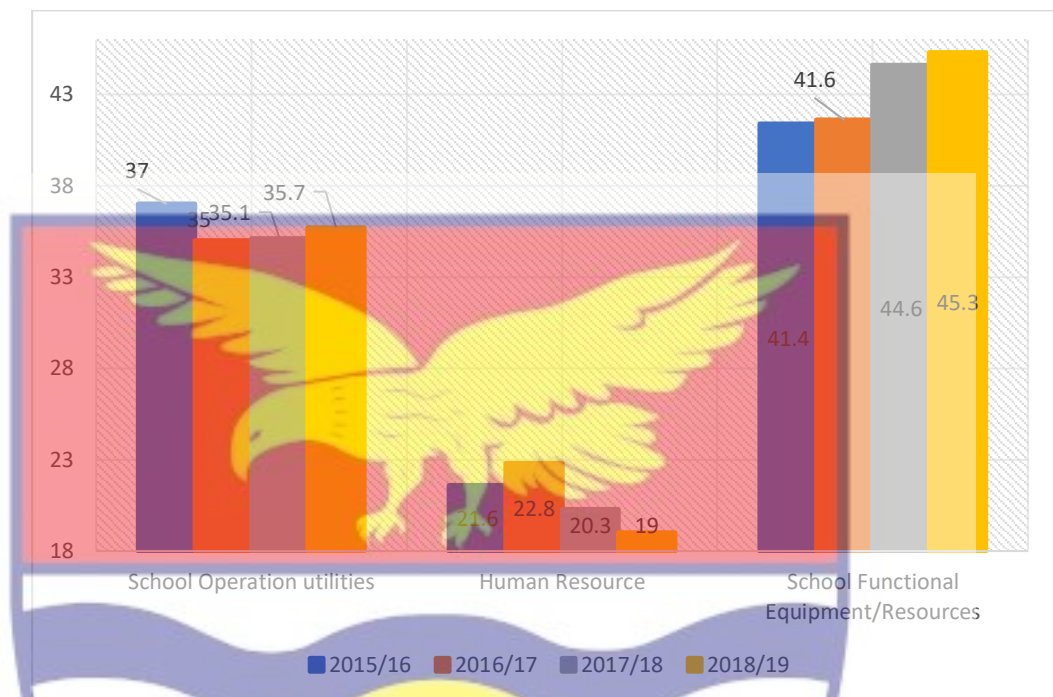
Figure 22: Trend analysis of Dimensions for MERDI (2015/16 – 2018/19)

It is obvious that school functional resources continue to contribute highly to the level of deprivation of basic schools in Ghana by increasing from 41% in the 2015/16 academic year to 45.3% in the 2018/19 academic year. Figure 23 presents the trend analysis for the MERDI indicators.

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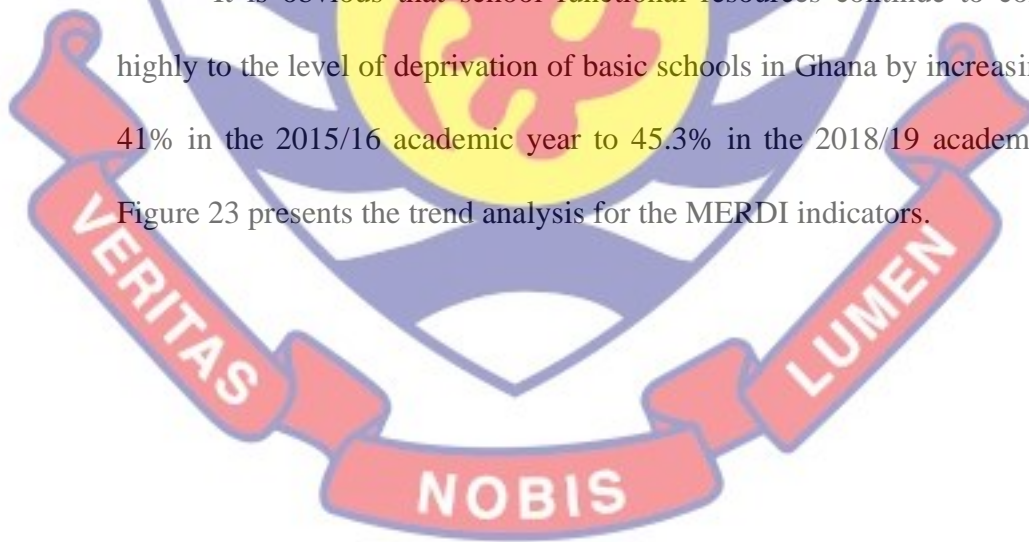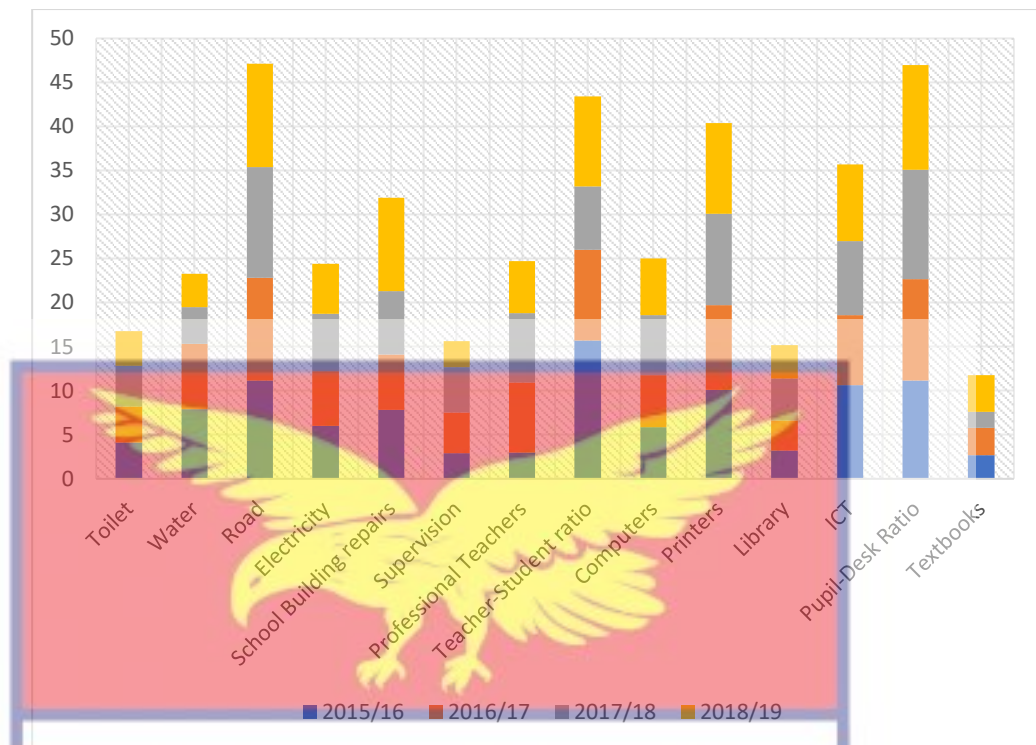
Figure 23: Trend Analysis of Indicators for MERDI

From Figure 23, it is evident that there have been substantial improvement in the Teacher-student ratio over the years, although it seems to be on the ascendency in 2018/19. This is also true for access to water and availability of professional teachers, and supervision. However, indicators such as availability of core textbooks, school building repairs, and pupil-desk ratio seem to be deteriorating over the period under study. Unpredictably, access to the road network, availability of printers, and availability of toilet facilities have not seen any significant change over the years.

MERDI across Type of School Ownership

To appreciate the disparities in the distribution of multidimensional educational resource deprivation in Basic schools across Ghana, the profile disaggregated the levels of deprivation by type of school ownership (private unregistered, private and public) from 2015/16 to 2018/19.

Table 8 shows the estimates for the National MERDI, the incidence of poverty, and the intensity of poverty by school ownership for 2015/16. The distribution suggests that the private unregistered basic schools have the highest level of MERDI (.523), the incidence of deprivation (90%), and intensity (58.1%) but with a lesser population share.

Table 8: Multidimensional Educational Resource Deprivation by School Ownership (2015/16)

Status	Population Share (%)	MERDI		Incidence (H, %)		Intensity (A, %)	
		Value	CI	Value	CI	Value	CI
Private Unregistered	.3	.523	.392 - .655	90	.704 – 1.096	58.1	.509 - .654
Private Registered	6.3	.415	.386 - .445	84.6	.794 - .898	49.1	.473 - .509
Public	93.4	.414	.406 - .422	83.5	.821 - .848	49.6	.492 - .500
National	100	.415	.407 - .422	83.6	.822 - .849	49.6	.492 - .500

Source: Annual School Census Data, 2015/16

Private registered basic schools recorded a MERDI of (41.5%), incidence (84.6%), and intensity (49.1%) of educational resource deprivation. Public basic schools with a population share of 93.4% recorded MERDI of 41.4% which is .1% lower than the National MERDI. Private registered basic schools recorded a MERDI of (41.5%), incidence (84.6%), and intensity (49.1%) of educational resource deprivation. Public basic schools with a population share of 93.4% recorded MERDI of 41.4% which is .1% lower than

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the National MERDI. The distribution suggests that the private unregistered basic schools have the highest level of MERDI (.539), incidence of deprivation (96.7%) and intensity (55.7%) but with a lesser population share. Figure 24 presents the indicators across school ownership.
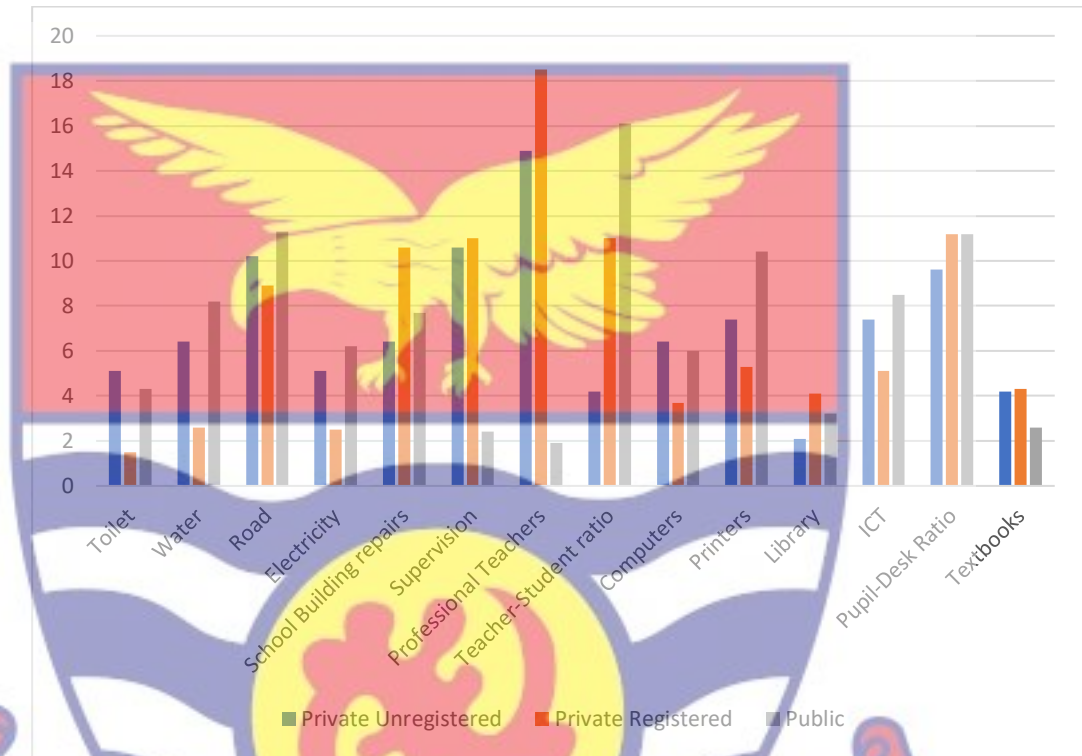
Figure 24: Censored headcount of indicators across School Ownership (2015/16)

From Figure 24, it can be observed that, Private schools (registered and unregistered) are highly deprived in terms of professional teachers as compared to public schools. Again, in terms of teacher-student ratio, public schools are deprived as compared to private registered and unregistered schools. Also, all three types of school suffer higher deprivation in terms of pupil-desk ratio. Finally, it is evident from Figure 24 that, private registered and unregistered schools are deprived in terms of supervision from the Ghana Education Service as compared to the public schools. Figure 25 presents the percentage contributions of each indicator for school ownership in 2015/16 academic year.

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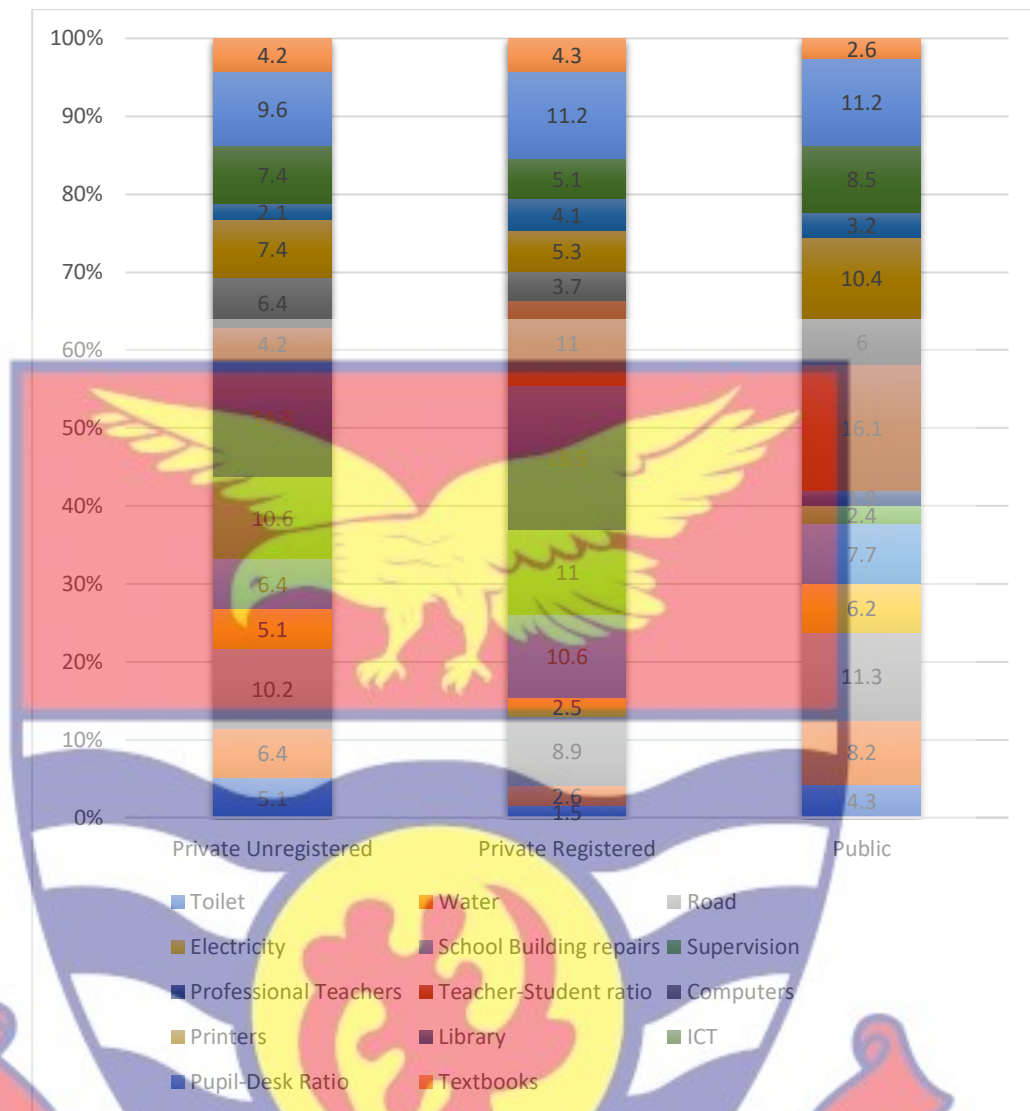
Figure 25: Percentage contribution of each indicator to MERDI for School Ownership, 2015/16

From Figure 25, the top 3 indicators that contribute largely to the level of deprivation are Professional teachers, supervision, and access to road for unregistered private basic schools. For registered private basic schools, professional teachers, pupil-desk ratio, and teacher-student ratio contribute immensely to the level of deprivation. Finally, teacher-student ratio, pupil-desk ratio, and access to road are the top three indicators of deprivation in public basic schools. Figure 26 presents the contribution of each dimension to MERDI.

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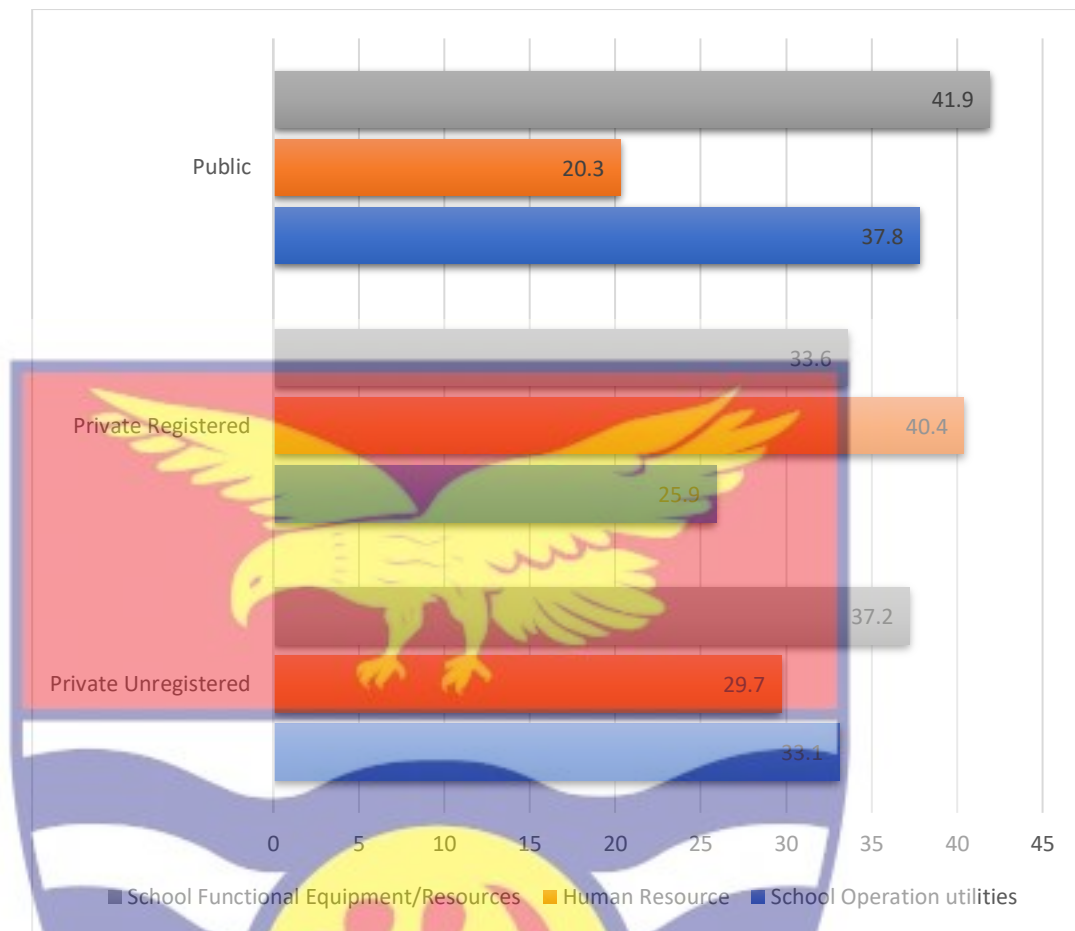
Figure 26: Contribution of each Dimension to MERDI by School Ownership (2015/16)

From Figure 26, it is evident that, the highest contributing dimension to the deprivation of public basic schools is School Functional Resources. This is the same for unregistered private basic schools. However, for registered private basic schools, human resources are the predominant contributing dimension to their level of deprivation. Table 9 presents the Multidimensional Educational Resource Deprivation by School Ownership for 2016/17.

Table 9: Multidimensional Educational Resource Deprivation by School

Ownership (2016/17)

Status	Population Share (%)	MERDI		Incidence (H, %)		Intensity (A, %)	
		Value	CI	Value	CI	Value	CI
Private Unregistered	3.7	.539	.528 - .550	96.7	.954 - .980	55.7	.549 - .566
Private Registered	18.5	.467	.461 - .473	90.7	.897 - .916	51.5	.511 - .519
Public	77.8	.346	.342 - .349	74.2	.735 - .749	46.6	.465 - .468
National	100	.375	.372 - .378	78	.775 - .786	48.1	.479 - .483

Source: Annual School Census Data, 2016/17

Table 9 shows the estimates for the National MERDI, incidence of poverty, and intensity of poverty by school ownership for 2016/17. The distribution suggests that the private unregistered basic schools have the highest level of MERDI (.539), incidence of deprivation (96.7%) and intensity (55.7%) but with a lesser population share.

Private registered basic schools also recorded a MERDI of (46.7%), incidence (90.7%) and intensity (51.5%) of educational resource deprivation. Public basic schools with a population share of 77.8% recorded MERDI of 34.6% which is approximately 3% lower than the National MERDI.

From Figure 27, it can be observed that, Private schools (registered and unregistered) are highly deprived in terms of professional teachers as compared

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to public schools. Again, in terms of teacher-student ratio, public schools are deprived as compared to private registered and unregistered schools. Also, all three types of school suffer higher deprivation in terms of pupil-desk ratio with the public basic school being slightly ahead. Figure 27 shows the censored headcount of indicators across school ownership for 2016/17 academic year.

Figure 27: Censored headcount of indicators across School Ownership (2016/17)

Finally, it is evident from Figure 27 that, private registered and unregistered schools are deprived in terms of supervision from the Ghana Education Service as compared to the public schools while most of the public basic schools do not have access to road.

Figure 28 shows the percentage contributions of each indicator to MERDI for school ownership in 2016/17.

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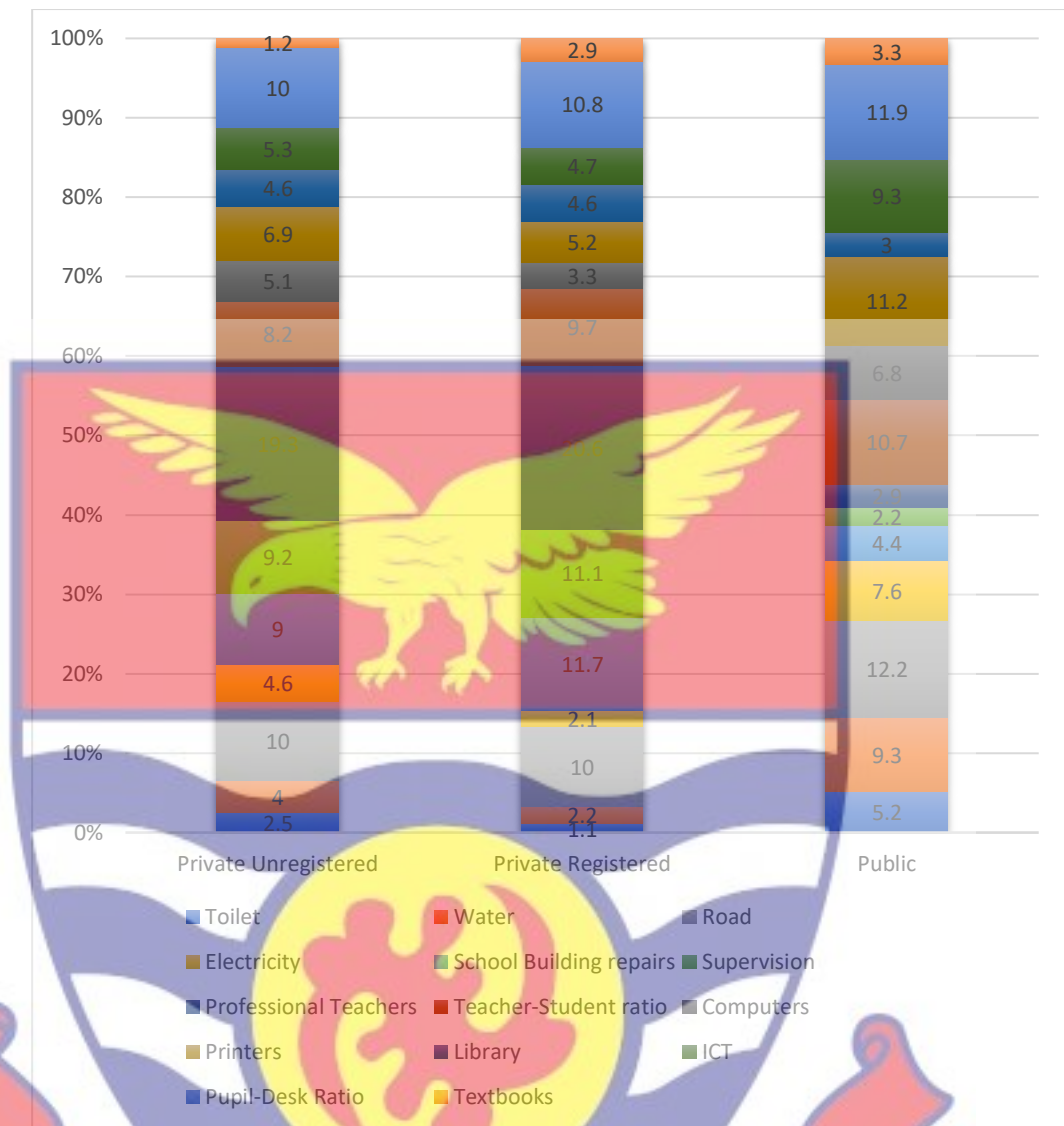
Figure 28: Percentage contribution of each indicator to MERDI for School Ownership, 2016/17

From Figure 28, the top 3 indicators that contributes largely to the level of deprivation in unregistered private basic schools are Professional teachers, supervision and pupil-desk ratio for. For registered private basic school, school building repairs, professional teachers, and supervision contributes immensely to the level of deprivation. Finally, pupil-desk ratio, access to road and availability of printers are the top three indicators of deprivation in public basic schools. Figure 29 shows the contribution of each dimension to MERDI by school ownership.

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Figure 29: Contribution of each Dimension to MERDI by School Ownership (2016/17)

From Figure 29, it is evident that, the highest contributing dimension to the deprivation of public basic schools is School Functional Resources. However, for registered and unregistered private basic schools, human resources are the predominant contributing dimension to their level of deprivation.

Again, Table 10 shows the estimates for the National MERDI, incidence of poverty, and intensity of poverty by school ownership for 2017/18. The distribution suggests that the private unregistered basic schools have the highest level of MERDI (.466), incidence of deprivation (90.7%) and intensity (51.4%) but with a lesser population share.

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Table 10: Multidimensional Educational Resource Deprivation by School Ownership (2017/18)

Status	Population Share (%)	MERDI		Incidence (H, %)		Intensity (A, %)	
		Value	CI	Value	CI	Value	CI
Private	3.1	.466	.451 -	90.7	.883 –	51.4	.504 -
Unregistered			.480		.931		.523
Private	18.8	.400	.393 -	84.4	.832 -	47.4	.470 -
Registered			.406		.856		.477
Public	78.1	.258	.254 -	59.7	.589 -	43.2	.431 -
			.262		.605		.434
National	100	.291	.288 -	65.3	.646 -	44.6	.444 -
			.294		.660		.448

Source: Annual School Census Data, 2017/18

Private registered basic schools recorded a MERDI of (40%), incidence (84.4%) and intensity (47.4%) of educational resource deprivation. Public basic schools with a population share of 78.1% recorded MERDI of 25.8% which is 3.3% lower than the National MERDI.

From Figure 30, it can be evident that, Private schools (registered and unregistered) are highly deprived in terms of professional teachers as compared to public schools. Again, in terms of teacher-student ratio, public schools are deprived as compared to private registered and unregistered schools. Also, all three types of school suffer higher deprivation in terms of pupil-desk ratio with the public basic schools being slightly ahead.
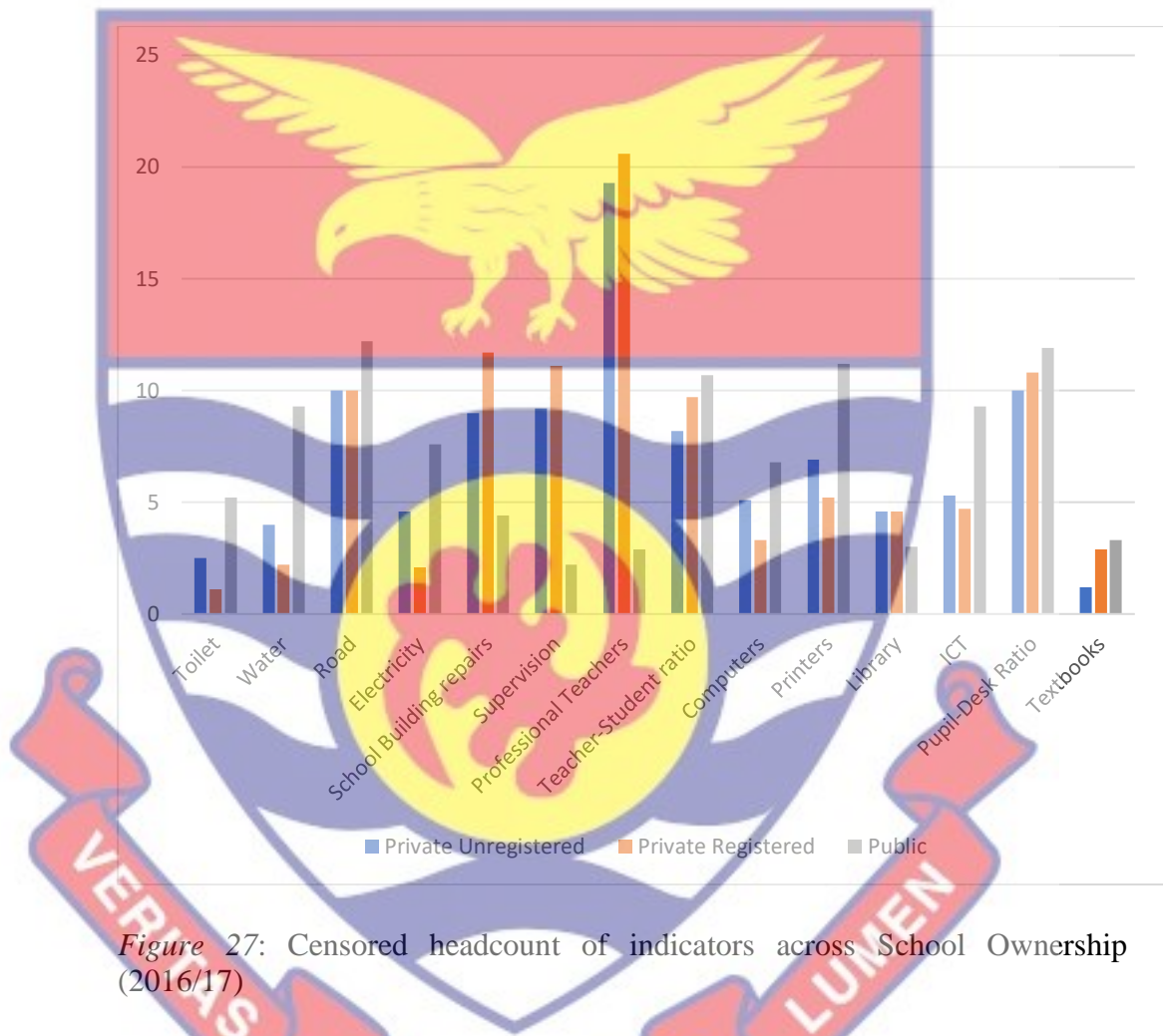
143

Figure 30: Censored headcount of indicators across School Ownership (2017/18)

Finally, it is evident from Figure 30 that, private registered and unregistered schools are deprived in terms of supervision from the Ghana Education Service as compared to the public schools while public basic schools are deprived in terms of textbooks as compared to the other two types of school ownership.

From Figure 31, in 2017/18 academic year, professional teachers, access to road and pupil-desk ratio are the top 3 indicators that contribute largely to the level of deprivation in unregistered private basic schools. For registered private basic school, professional teachers, teacher-student ratio, and school building repairs largely account for their level of deprivation.

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Figure 31: Percentage contribution of each indicator to MERDI for School Ownership, 2017/18

Finally, pupil-desk ratio, printers, and access to the road are the top three indicators of deprivation in public basic schools. Figure 32 presents the contribution of each dimension to MERDI by school ownership in 2017/18.
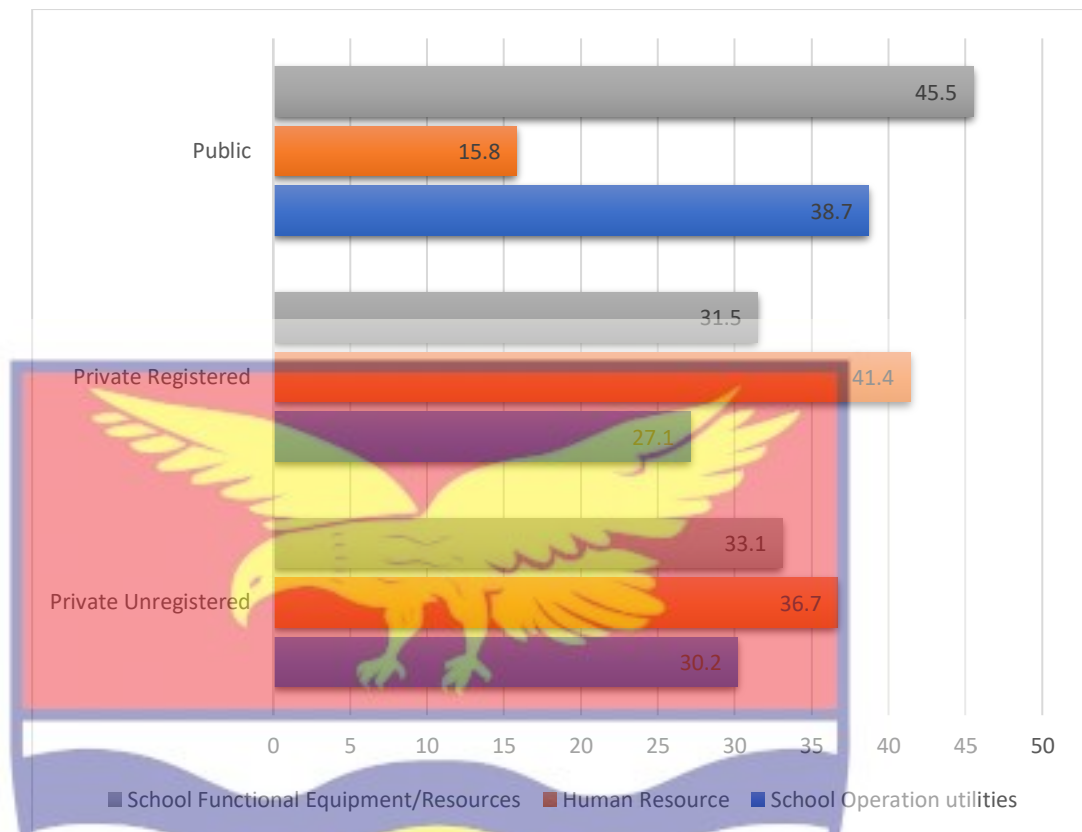
145

Figure 32: Contribution of each Dimension to MERDI by School Ownership (2017/18)

From Figure 32, it is noticeable that the highest contributing dimension to the deprivation of public basic schools remains School Functional Resources for the 2017/18 academic year. However, for registered and unregistered private basic schools, human resources are the predominant contributing dimension to their level of deprivation.

Again, Table 11 shows the estimates for the National MERDI, the incidence of poverty, and intensity of poverty by school ownership for 2018/19. The distribution suggests that the private unregistered basic schools have the highest level of MERDI (.457), incidence of deprivation (85.4%), and intensity (53.5%) but with a lesser population share.

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Table 11: Multidimensional Educational Resource Deprivation by School Ownership (2018/19)

Status	Population Share (%)	MERDI		Incidence (H, %)		Intensity (A, %)	
		Value	CI	Value	CI	Value	CI
Private Unregistered	.7	.457	.413 - .501	85.4	.783 – .925	53.5	.508 - .561
Private Registered	18.7	.451	.443 - .459	90.4	.890 - .917	49.9	.454 - .505
Public	80.6	.350	.346 - .354	76	.752 - .767	46.1	.459 - .463
National	100	.364	.360 - .367	77.9	.772 - .786	46.7	.465 - .469

Source: Annual School Census Data, 2018/19

Private registered basic schools recorded a MERDI of (45.1%), incidence (90.4%) and intensity (49.9%) of educational resource deprivation. Public basic schools with a population share of 80.6% recorded MERDI of 35% which is 1.4% lower than the National MERDI.

From Figure 33, it can be evident that Private schools (registered and unregistered) are highly deprived in terms of professional teachers as compared to public schools. Again, in terms of teacher-student ratio, public schools are deprived as compared to private registered and unregistered schools. Also, all three types of schools suffer higher deprivation in terms of pupil-desk ratio with the public basic schools being slightly ahead.
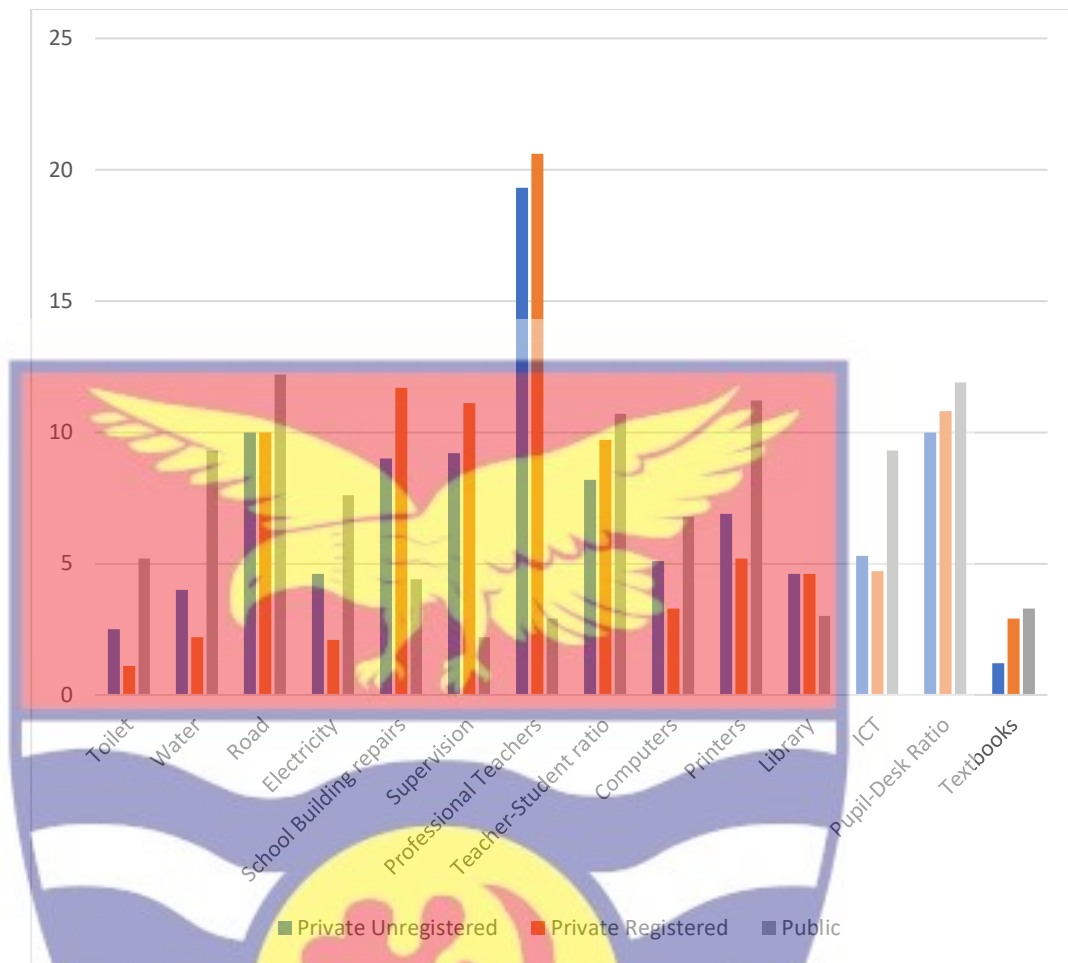
147
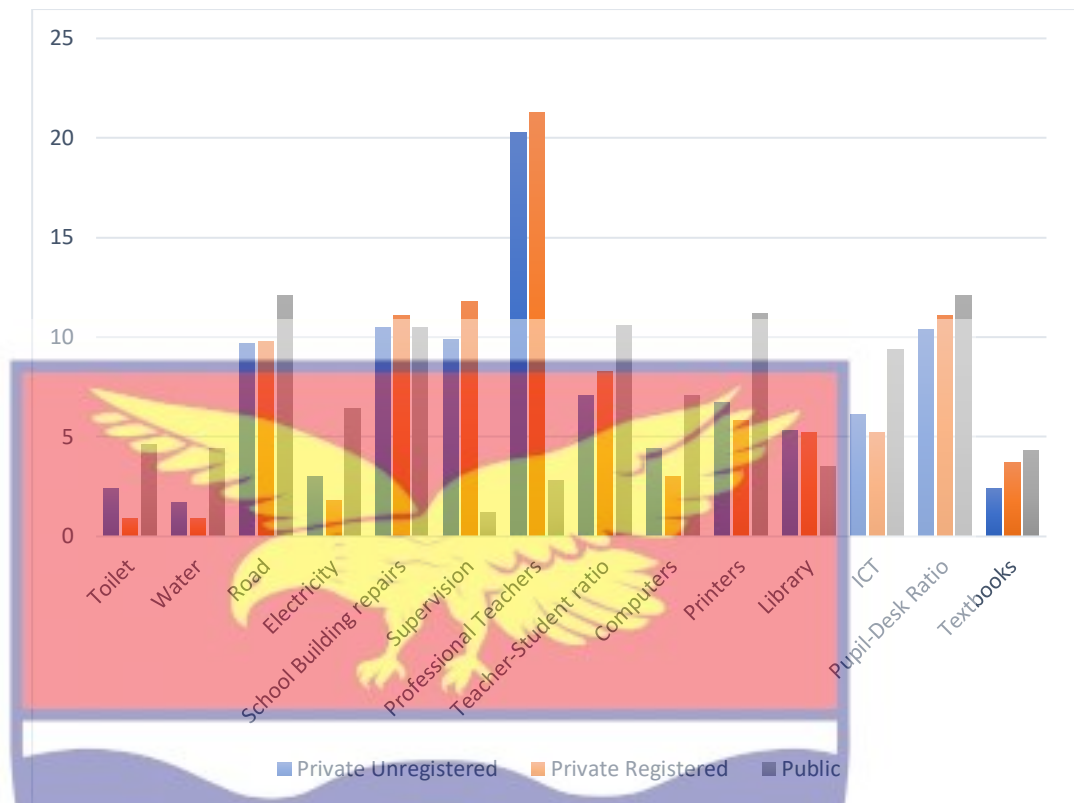
Figure 33: Censored headcount of indicators across School Ownership (2018/19)

Finally, it is evident from Figure 33 that, private registered and unregistered schools are deprived in terms of supervision from the Ghana Education Service as compared to the public schools while public basic schools are deprived in terms of textbooks and ICT infrastructure as compared to the other two types of school ownership.

From Figure 34, in the 2018/19 academic year, professional teachers, school building repairs, and pupil-desk ratio are the top 3 indicators that contribute largely to the level of deprivation in unregistered private basic schools. For registered private basic school, professional teachers, school building repairs, supervision, and pupil-desk ratio largely accounts for their level of deprivation.
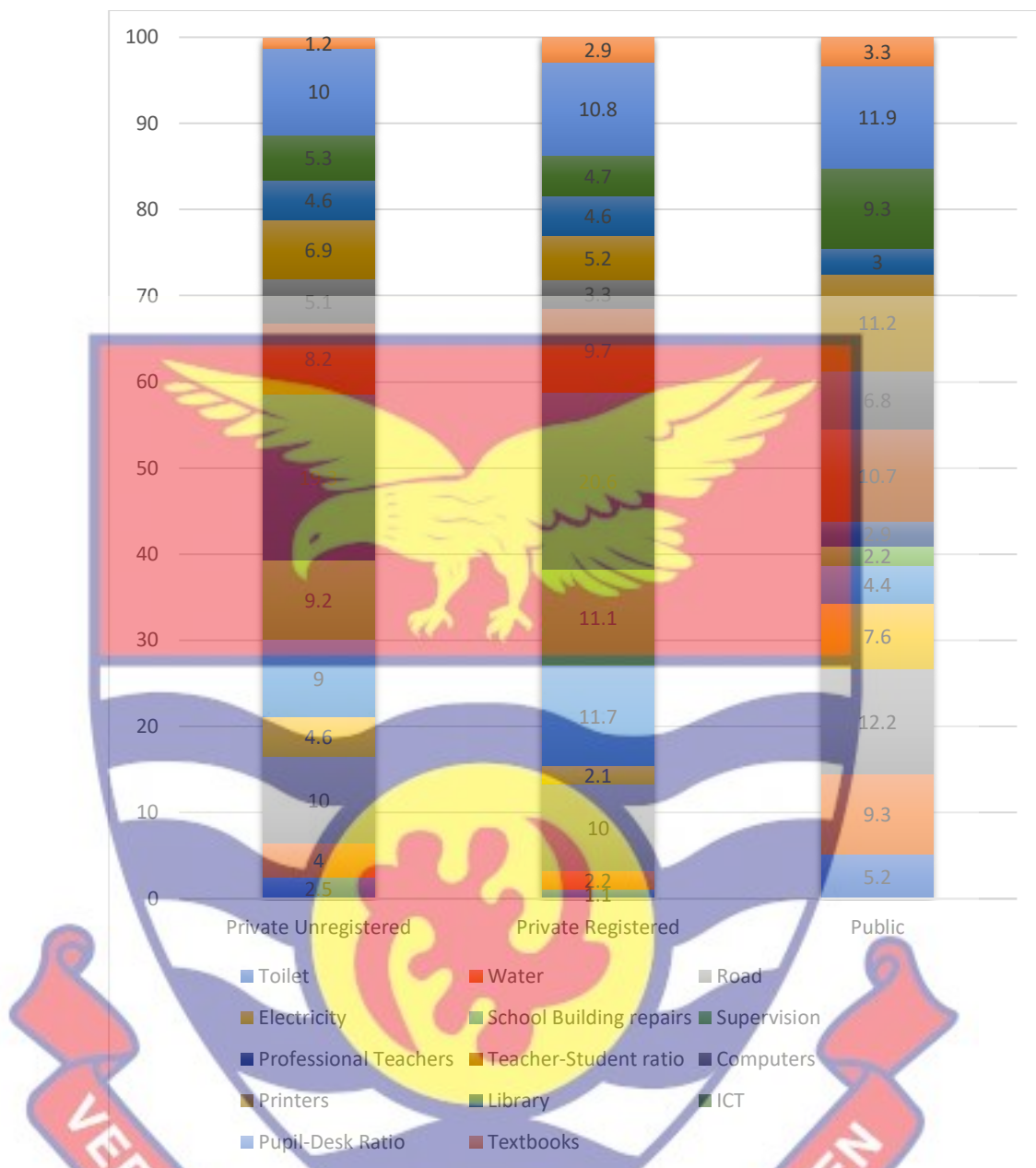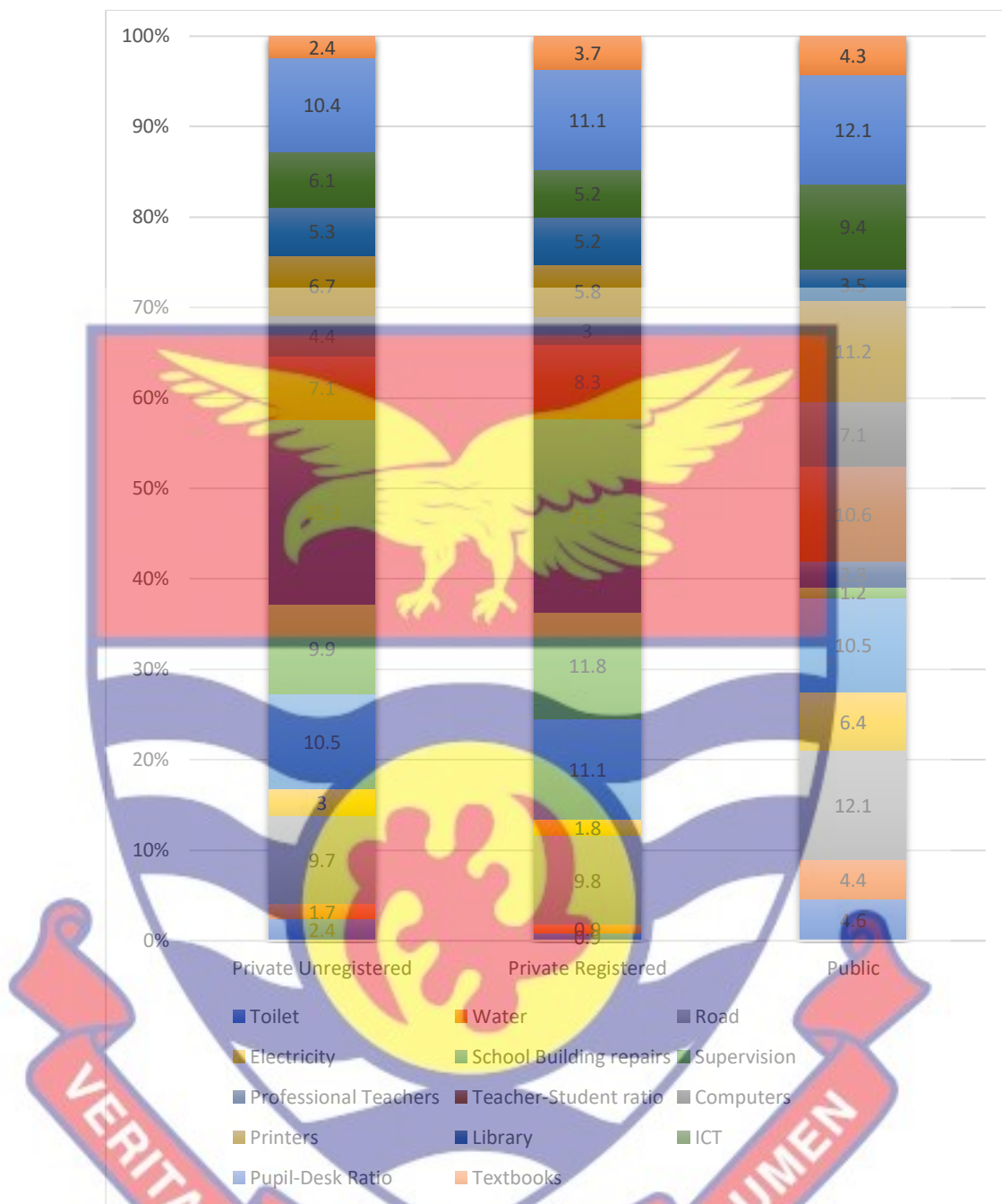
Figure 34: Percentage contribution of each indicator to MERDI for School Ownership, 2018/19

Finally, pupil-desk ratio, printers, and access to the road are the top three indicators of deprivation in public basic schools. Figure 35 presents the contribution of each dimension to MERDI by school ownership in 2018/19.
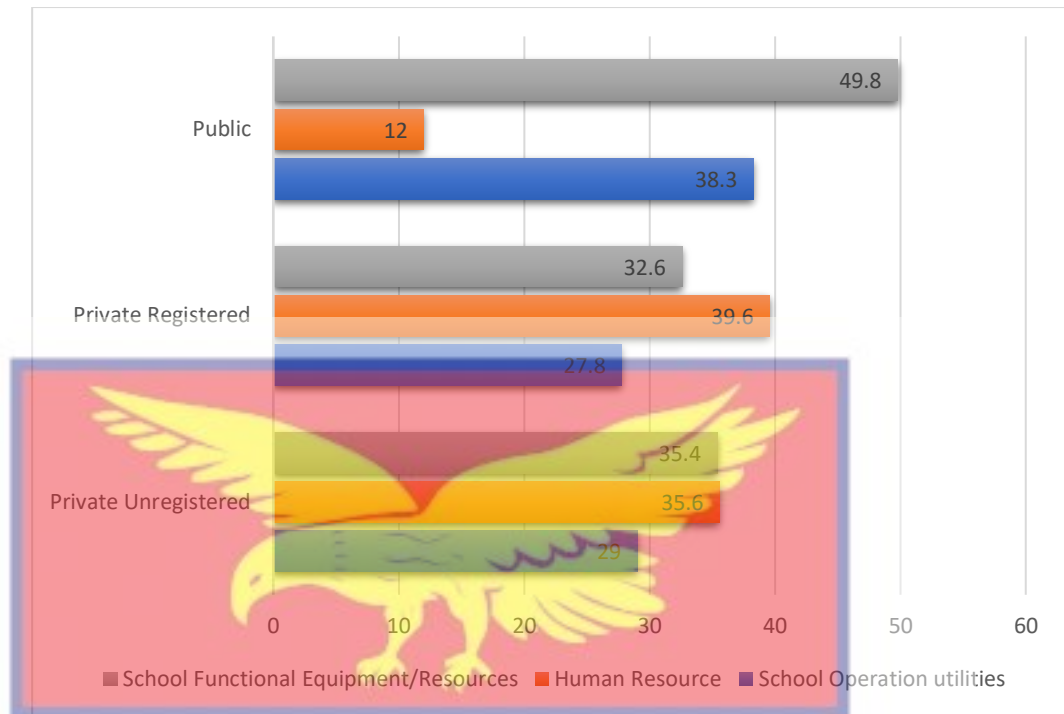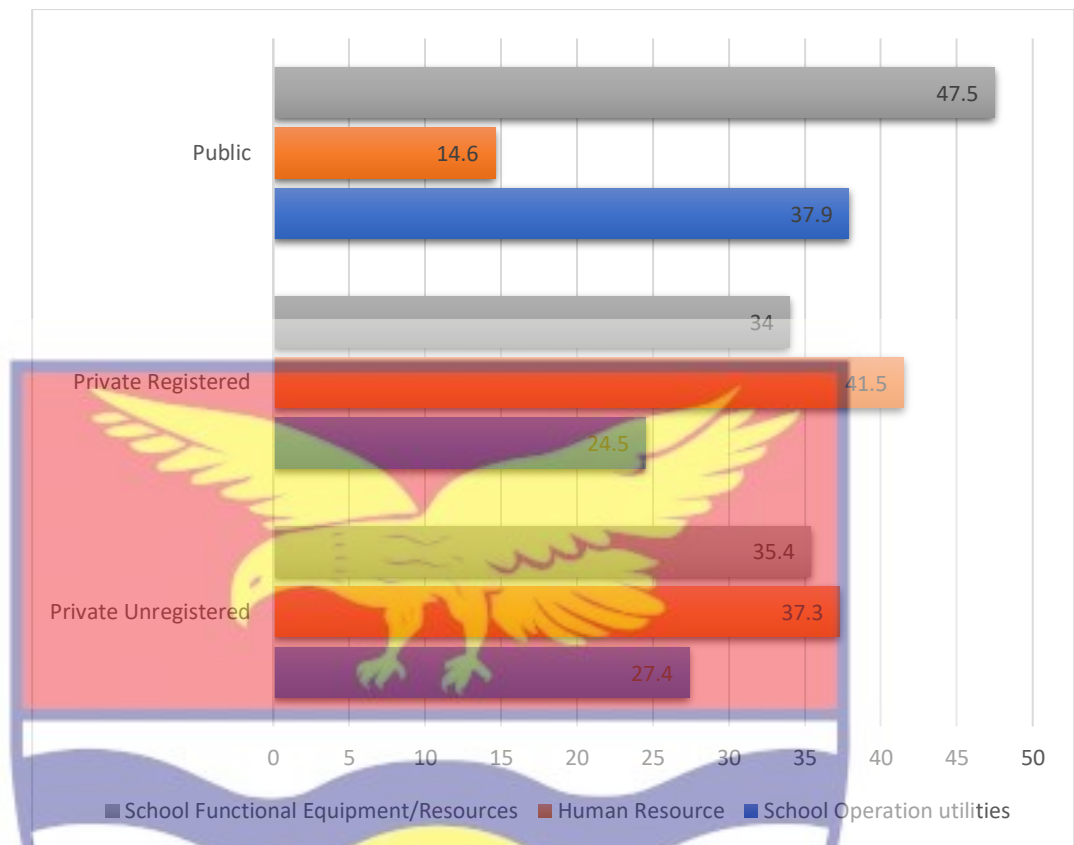
Figure 35: Contribution of each Dimension to MERDI by School Ownership (2018/19)

From Figure 35, it is obvious that the highest contributing dimension to the deprivation of public basic schools remains School Functional Resources for the 2018/19 academic year. However, for registered and unregistered private basic schools, human resources are the predominant contributing dimension to their level of deprivation.

MERDI across Administrative Regions

To ascertain the spatial distribution of MERDI as well as the incidence and intensity of educational resource deprivation among basic schools in Ghana, a regional analysis was carried out for the years under study (2015/16 – 2018/19).

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1. *2015/16 Academic Year*

The regional distribution of incidence and intensity of educational resource deprivation in 2015/16 are presented in Table 1A (Refer to Appendix A) and Figure 36. It presents the spatial distribution of MERDI by region for the 2015/16 academic year. It consists of three different maps of Ghana each illustrating the extent of educational resource deprivation through MERDI, incidence, and intensity.

The incidence of multidimensional educational resource deprivation is highest in the Brong Ahafo (89%) with an index of .426. Further analysis suggests that, basic schools in Upper West, Upper East, Volta, and Eastern regions have higher levels of incidence of educational resource deprivation. For these regions, their MERDI were .399, .407, .374 and .384.

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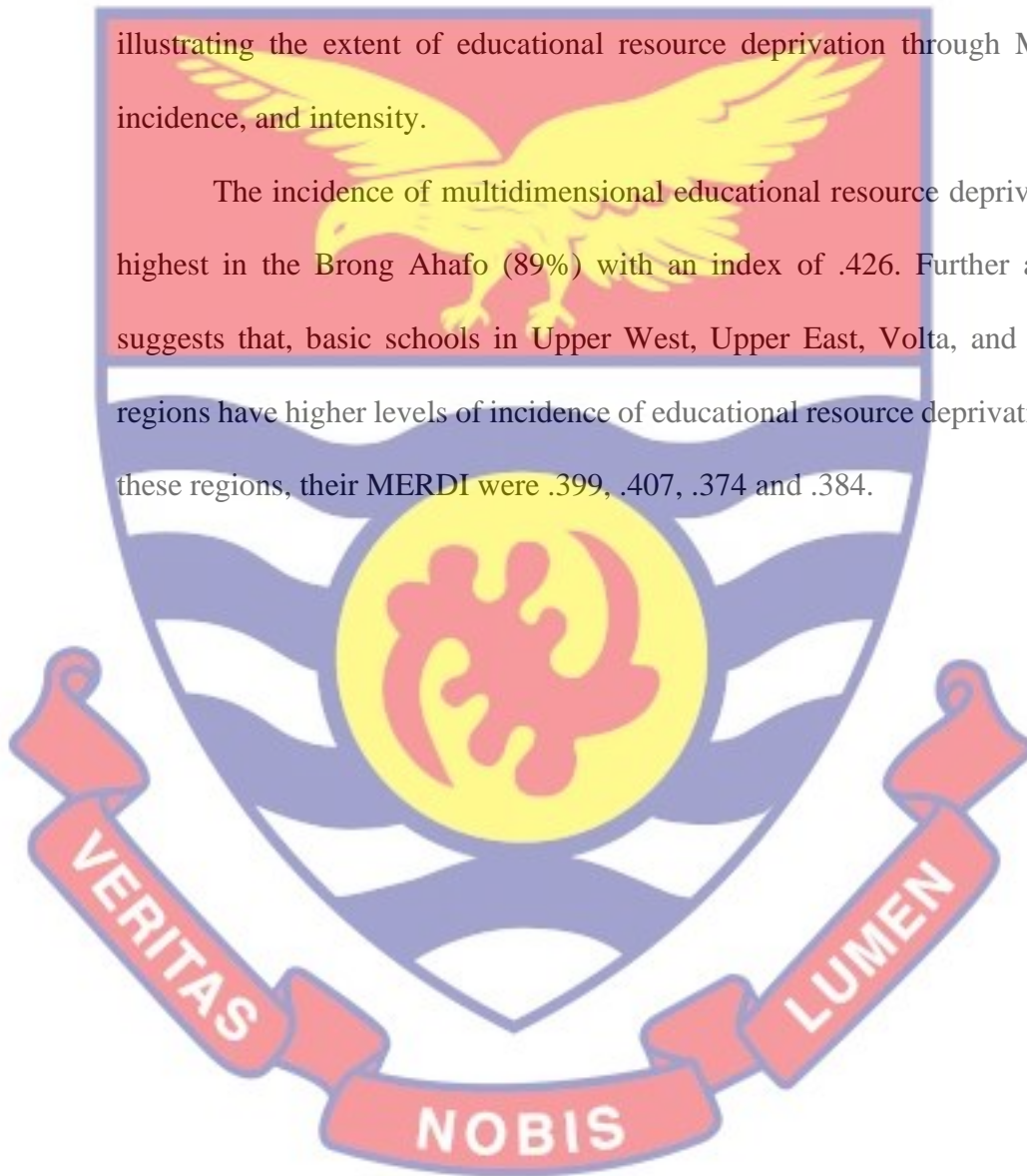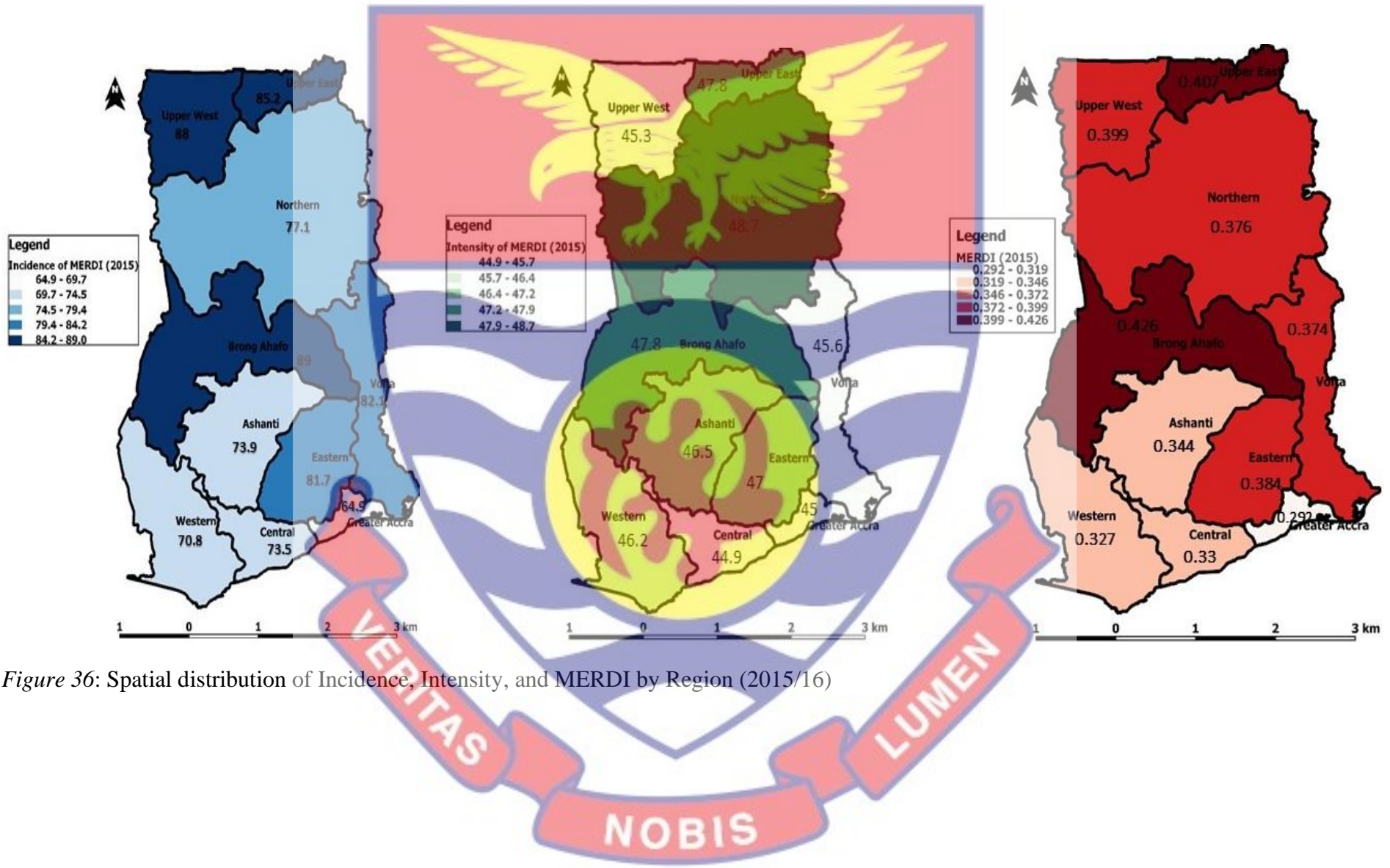
Figure 36: Spatial distribution of Incidence, Intensity, and MERDI by Region (2015/16)

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However, Greater Accra recorded the lowest incidence of educational resource deprivation (64.9%) followed by Western (70.8%) and Central (73.5%). Figure 37 presents the contribution of each dimension to MERDI by region for 2015/16.
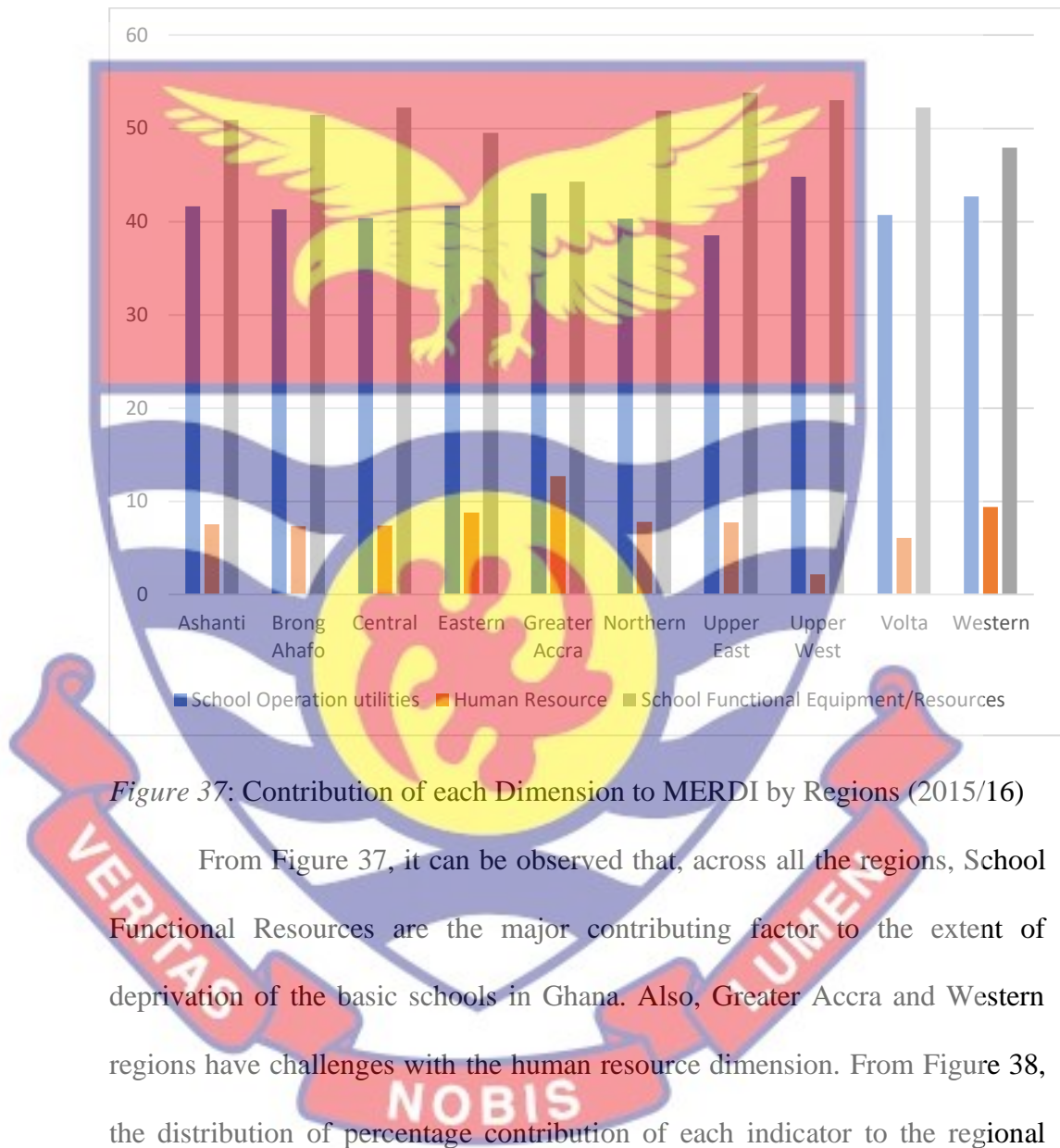
Figure 37: Contribution of each Dimension to MERDI by Regions (2015/16)

From Figure 37, it can be observed that, across all the regions, School Functional Resources are the major contributing factor to the extent of deprivation of the basic schools in Ghana. Also, Greater Accra and Western regions have challenges with the human resource dimension. From Figure 38, the distribution of percentage contribution of each indicator to the regional MERDI reveals a similar pattern across all the ten regions.

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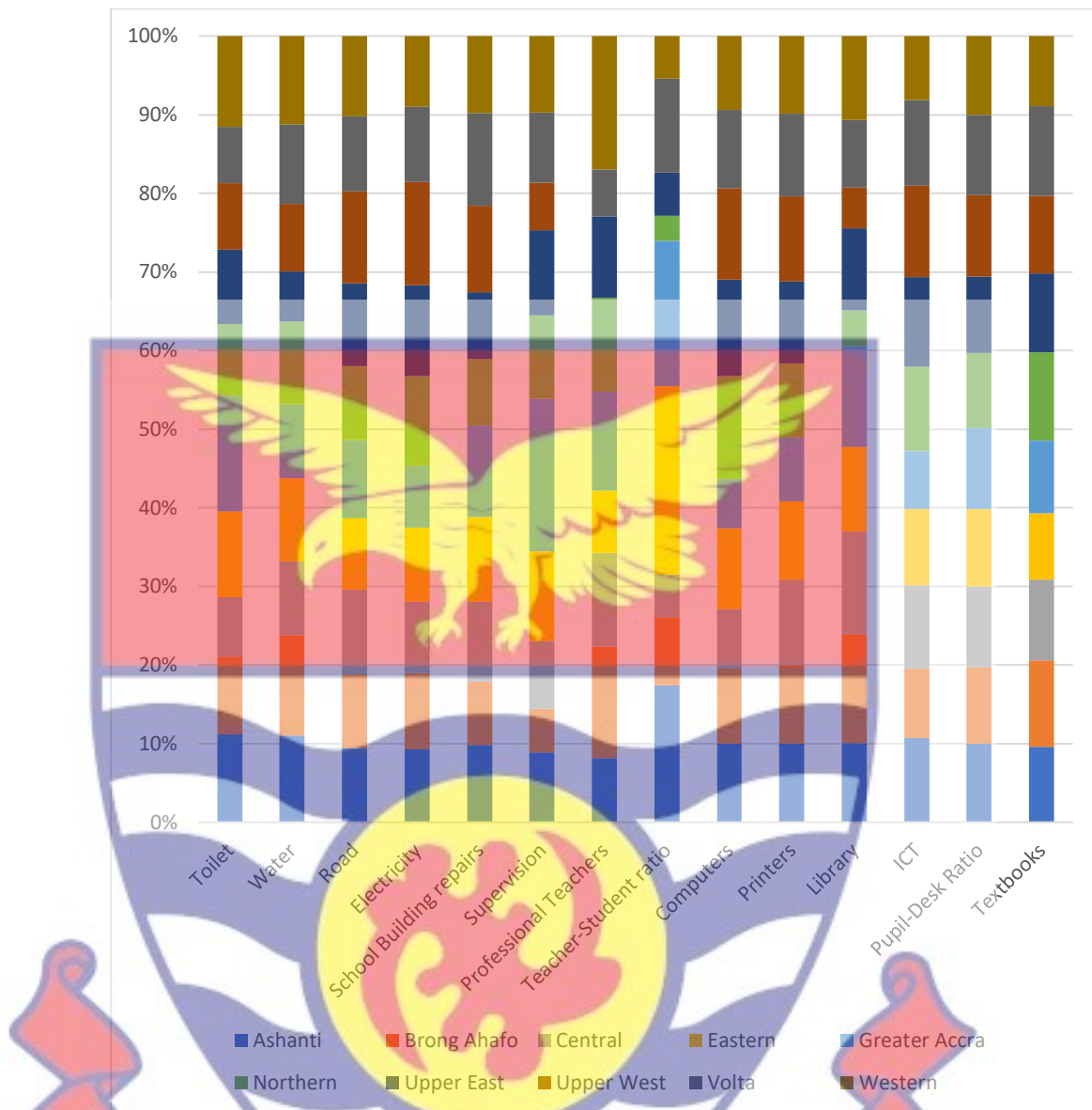
Figure 38: Percentage contribution of each indicator to Regional MERDI for 2015/16

The pattern generally indicates that access to motorable roads, availability of printers, pupil-desk ratio, and school building repairs are the indicators that contribute most to MERDI in each of the ten regions. On the other hand, supervision, a number of professional teachers, and library contribute less to the MERDI across all the ten administrative regions.

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2. *2016/17 Academic Year*

The regional distribution of incidence and intensity of educational resource deprivation in 2016/17 are presented in Table 1A (Refer to Appendix A) and Figure 36. It presents the spatial distribution of MERDI by region for the 2016/17 academic year. It consists of three different maps of Ghana each illustrating the extent of educational resource deprivation through MERDI, incidence, and intensity.

The incidence of multidimensional educational resource deprivation remains highest in the Brong Ahafo (85.7%) with an index of .425. This is an improvement over the previous academic year (2016/17) of 3.3 percent. Further analysis of Table 1A (Appendix A) suggests that basic schools in Eastern, Western, Ashanti, and Upper West regions have higher levels of incidence of educational resource deprivation in 2016/17. For these regions, their MERDI were .405, .396, .375 and .374. However, for 2016/17, the Central region recorded the lowest incidence of educational resource deprivation (70%) followed by Greater Accra (73.4%) and Volta (74.2%).

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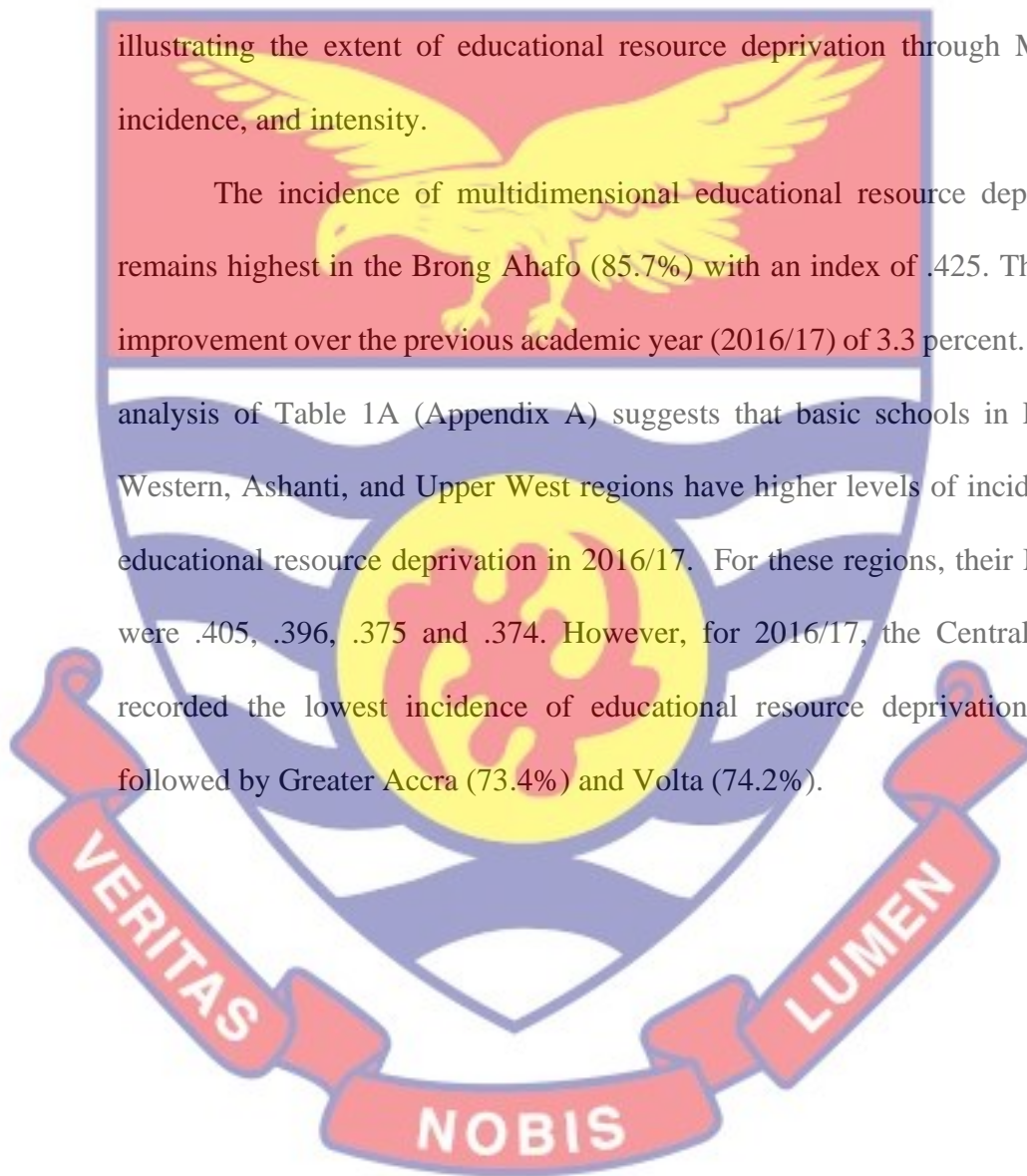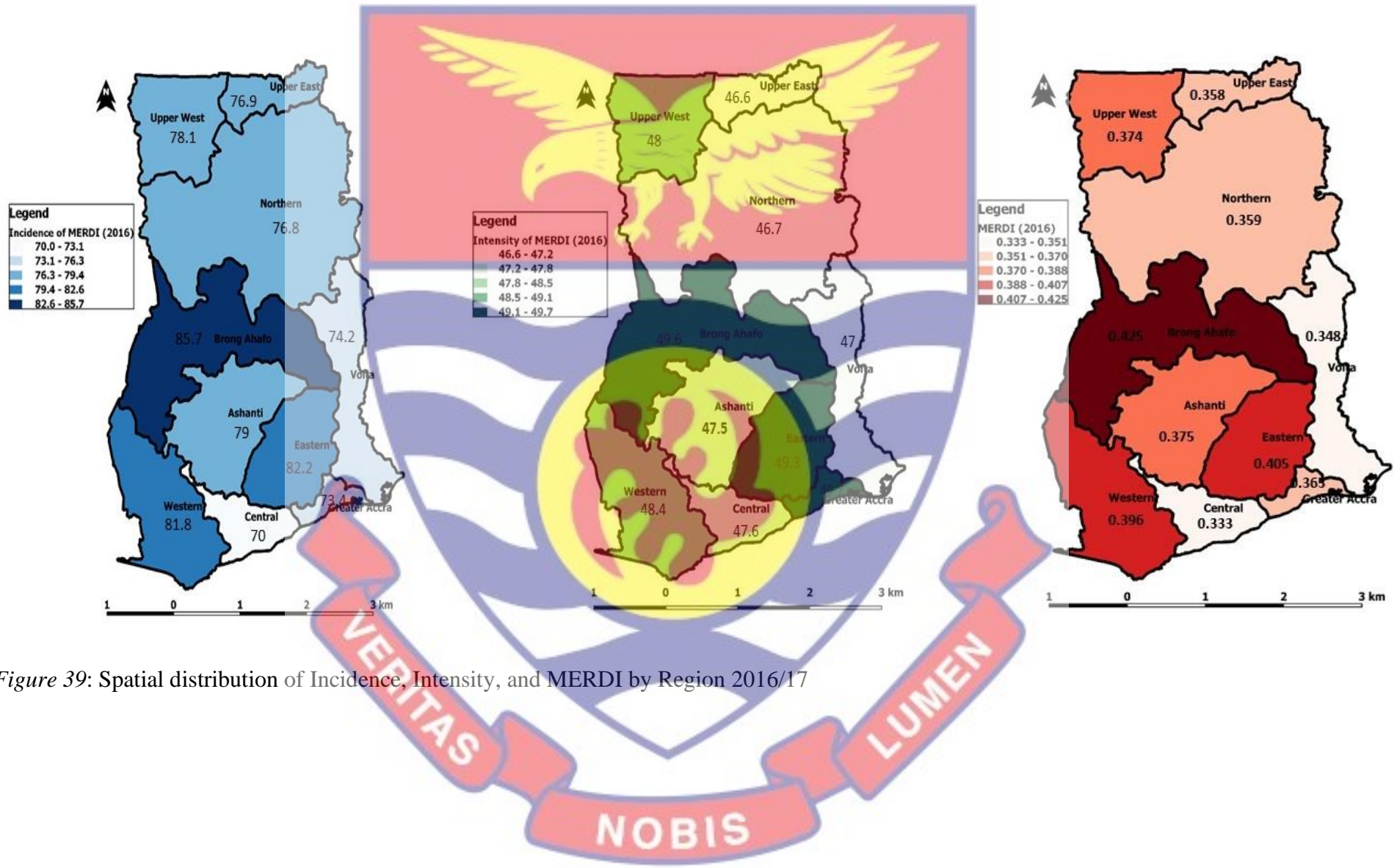
Figure 39: Spatial distribution of Incidence, Intensity, and MERDI by Region 2016/17

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Figure 40 presents the contribution of each dimension to MERDI by regions for the 2016/17 academic year.

Figure 40: Contribution of each Dimension to MERDI by Regions (2016/17)

From Figure 40, it can be observed that with the exception of Greater Accra where the human resource dimension is contributing highly to the educational resource deprivation, all the other regions have School Functional Resources as the major contributing factor to the level of educational resource deprivation of basic schools in the regions.

From Figure 41, the distribution of percentage contribution of each indicator to the regional MERDI reveals a similar pattern across all the ten regions.

Figure 41: Percentage contribution of each indicator to Regional MERDI for 2016/17

The pattern generally indicates that access to motorable roads, teacher-student ratio, pupil-desk ratio, ICT infrastructure (access to the internet), and school building repairs are the indicators that contribute most to MERDI in each of the ten regions. On the other hand, supervision, textbooks, and availability of toilet facilities contribute less to the MERDI across all the ten administrative regions.

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3. *2017/18 Academic Year*

The 2017/18 regional distribution of incidence and intensity of educational resource deprivation are presented in Table 2A (Appendix A) and Figure 42. Figure 42 presents the spatial distribution of MERDI by region for the 2017/18 academic year. It consists of three different maps of Ghana each illustrating the extent of educational resource deprivation through MERDI, incidence, and intensity.

The incidence of multidimensional educational resource deprivation is highest in the Upper West (74.2%) with an index of .326. Additional analysis of Table 2A (Appendix A) reveals that basic schools in Upper East, Brong Ahafo, Western, and Northern regions have higher levels of incidence of educational resource deprivation. For these regions, their MERDI were .315, .324, .304, and .303. Nevertheless, Central recorded the lowest incidence of educational resource deprivation (54.5%) followed by Volta (56.4%) and Greater Accra (61.2%).

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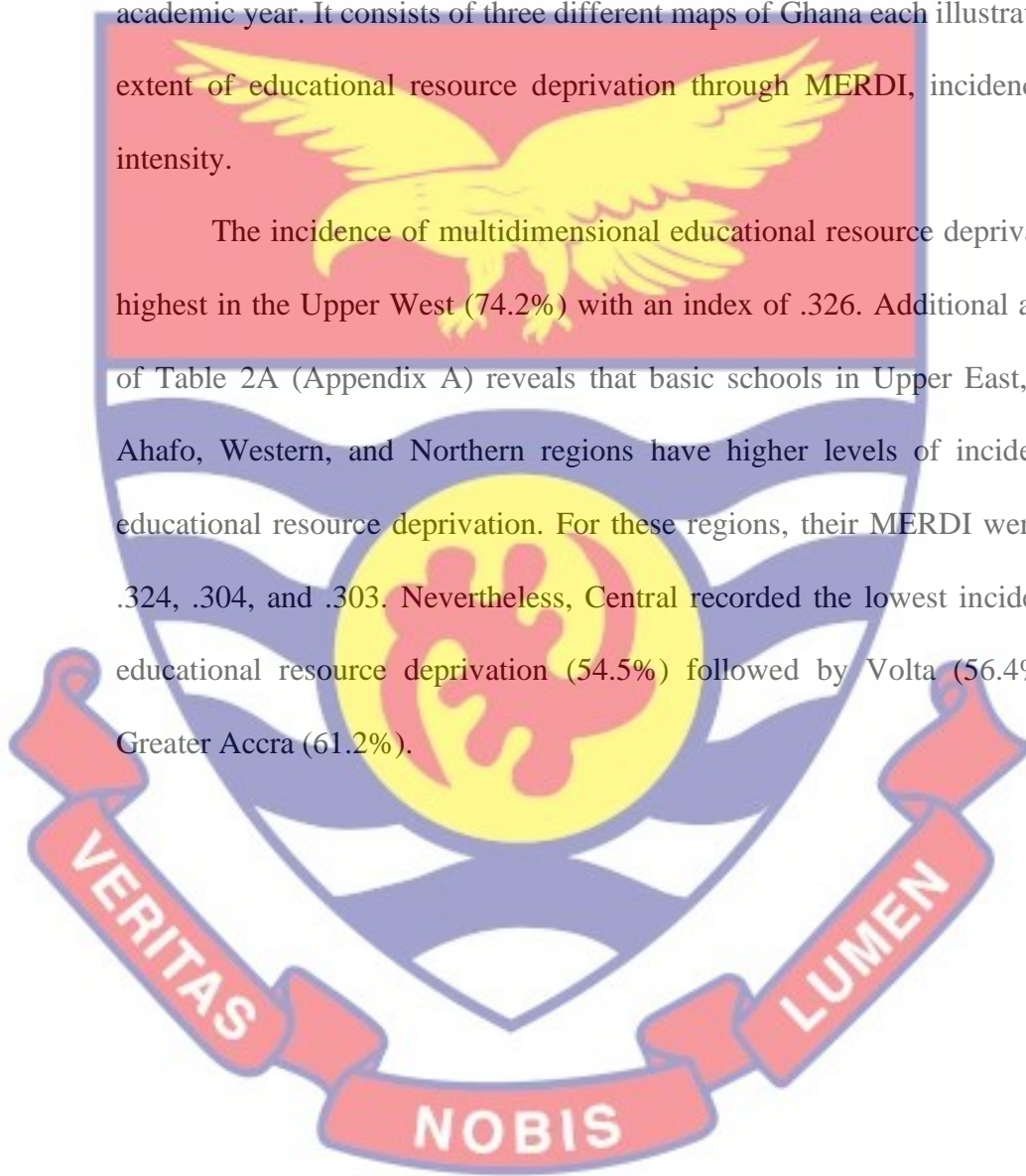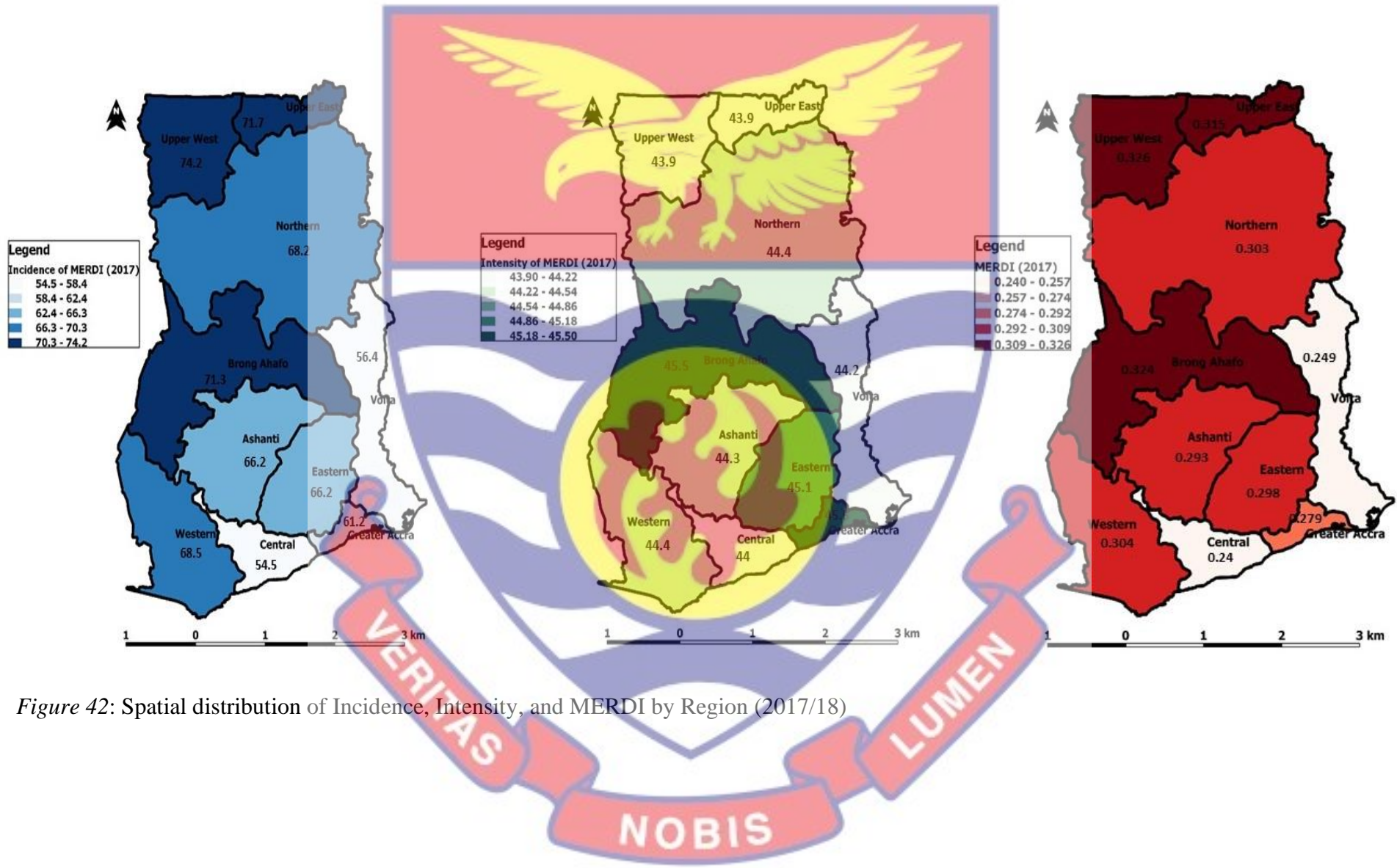
Figure 42: Spatial distribution of Incidence, Intensity, and MERDI by Region (2017/18)

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Figure 43 presents the contribution of each dimension to MERDI by regions for the 2017/18 academic year.
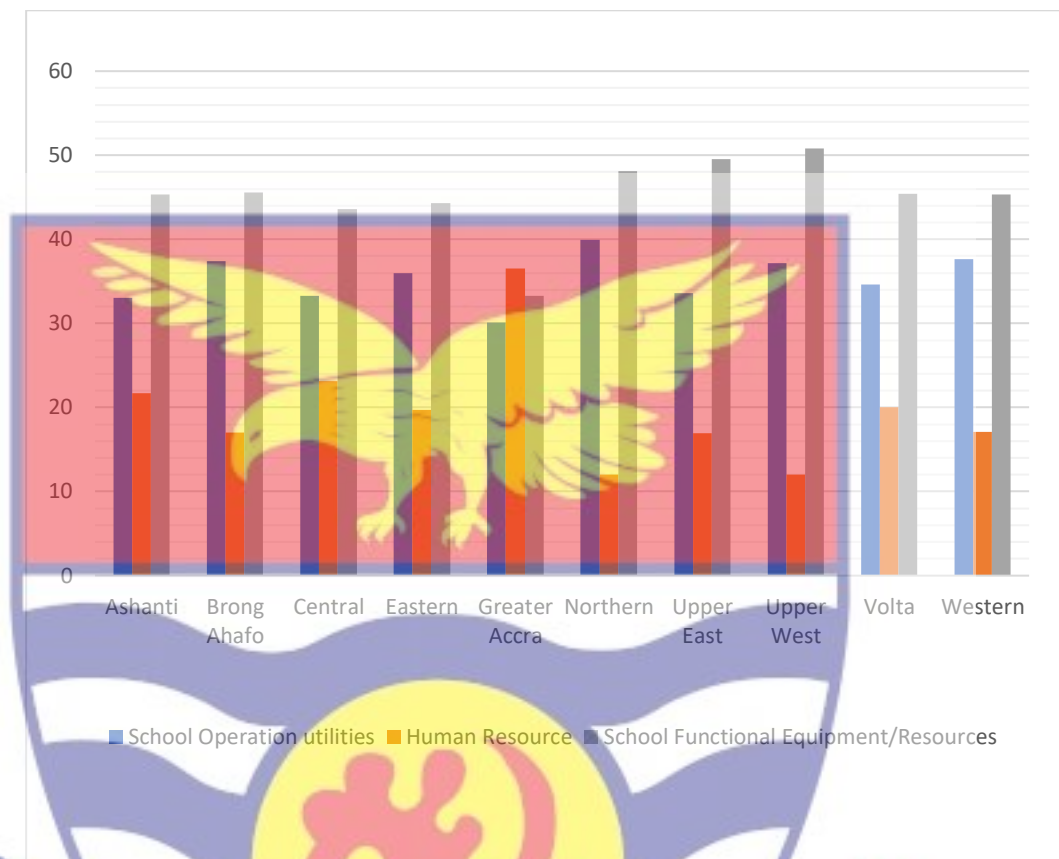
Figure 43: Contribution of each Dimension to MERDI by Regions (2017/18)

From Figure 43, it can be observed that with the exception of Greater Accra where the human resource dimension is contributing extremely to the educational resource deprivation, all the other regions have School Functional Resources as the major contributing factor to the level of educational resource deprivation of basic schools in the regions.

From Figure 44, the distribution of percentage contribution of each indicator to the regional MERDI reveals a similar pattern across all the ten regions. The pattern generally indicates that access to motorable roads, availability of printers, pupil-desk ratio, ICT system, and teacher-student ratio are the indicators that contribute most to MERDI in each of the ten regions.

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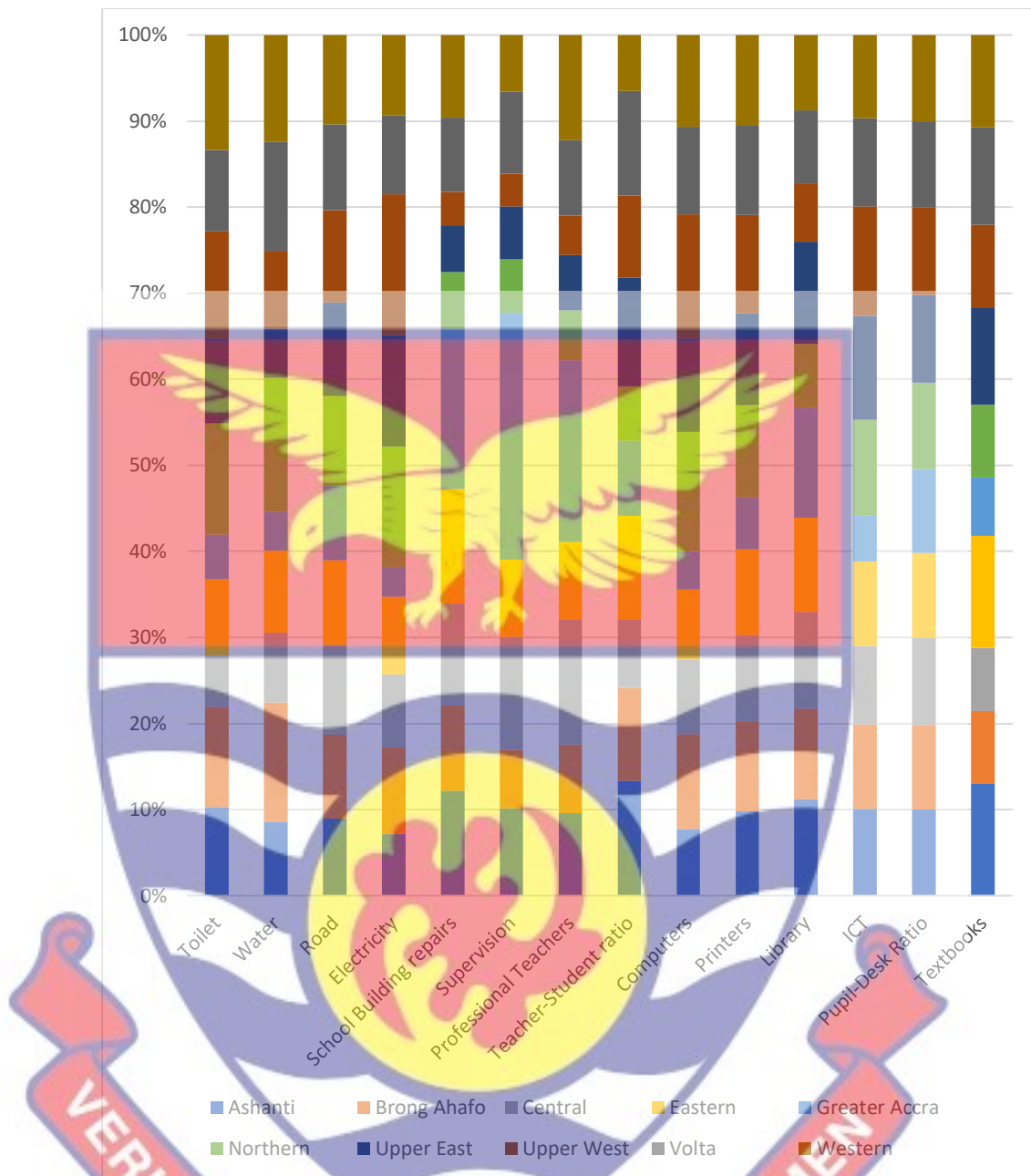
Figure 44: Percentage contribution of each indicator to Regional MERDI for 2017/18

On the other hand, supervision, availability of potable drinking water, and textbooks contribute less to the MERDI across all the ten administrative regions.

4. *2018/19 Academic Year*

The 2018/19 regional distribution of incidence and intensity of educational resource deprivation are presented in Table 3A (Appendix A) and Figure 45. Figure 45 presents the spatial distribution of MERDI by region for the 2018/19 academic

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year. It consists of three different maps of Ghana each illustrating the extent of educational resource deprivation through MERDI, incidence and intensity. The incidence of multidimensional educational resource deprivation is highest in the Brong Ahafo Region (74.2%) with an index of .401.

Additional analysis of Table 3A (Appendix A) reveals that basic schools in Upper East, Upper West, Western, and Northern regions have higher levels of incidence of educational resource deprivation. For these regions, their MERDI were .377, .391, .386, and .372. Nonetheless, Greater Accra recorded the lowest incidence of educational resource deprivation (60.7%) followed by Central (71.3%).

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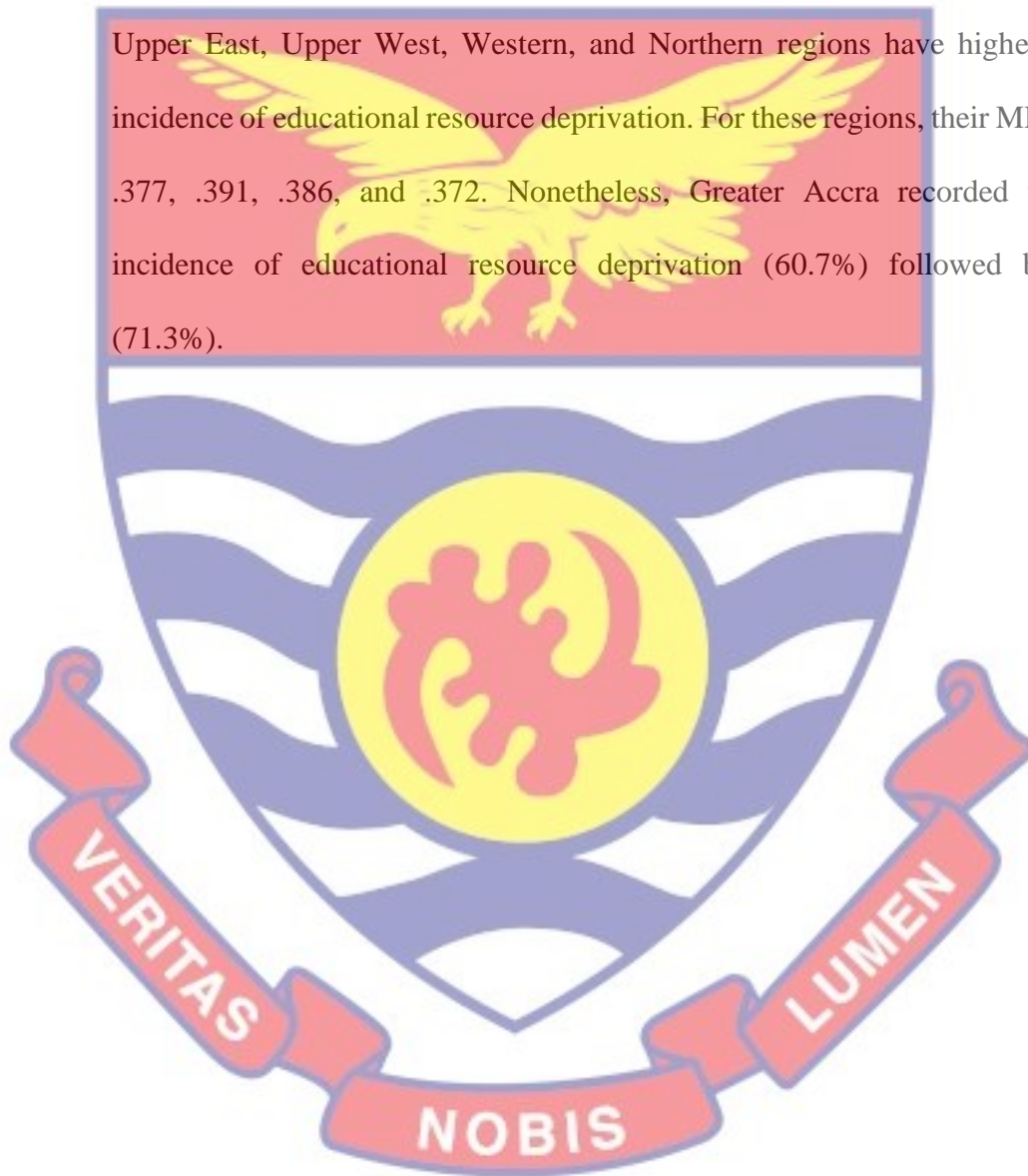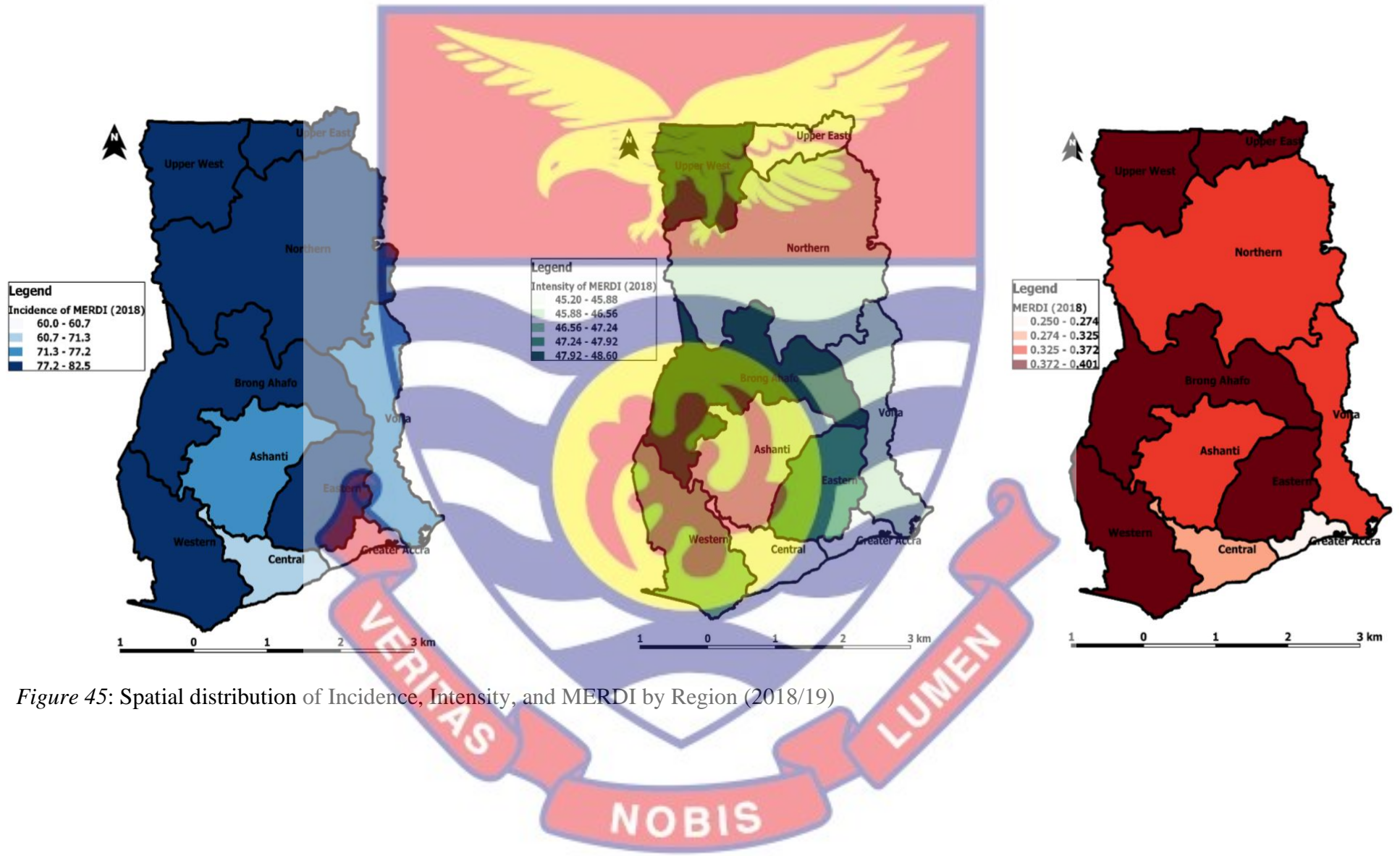
Figure 45: Spatial distribution of Incidence, Intensity, and MERDI by Region (2018/19)

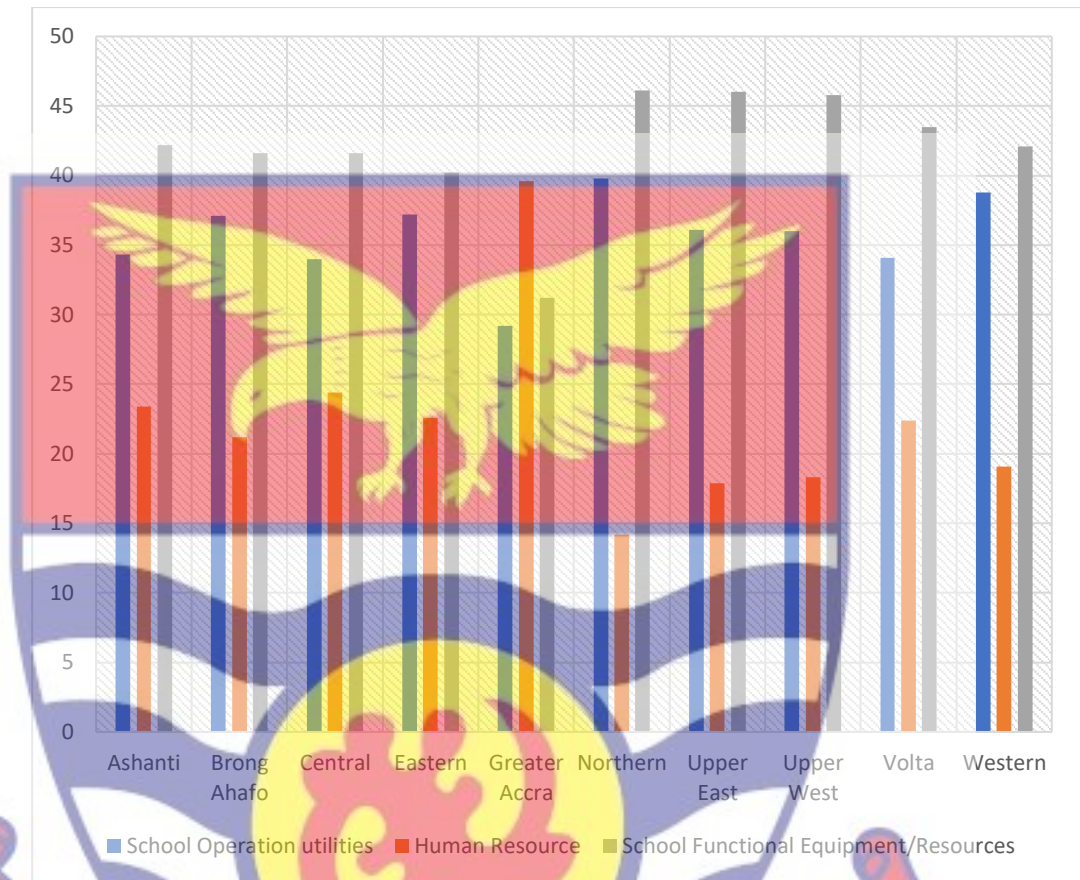Figure 46 presents the contribution of each dimension to MERDI by regions for the 2018/19 academic year.
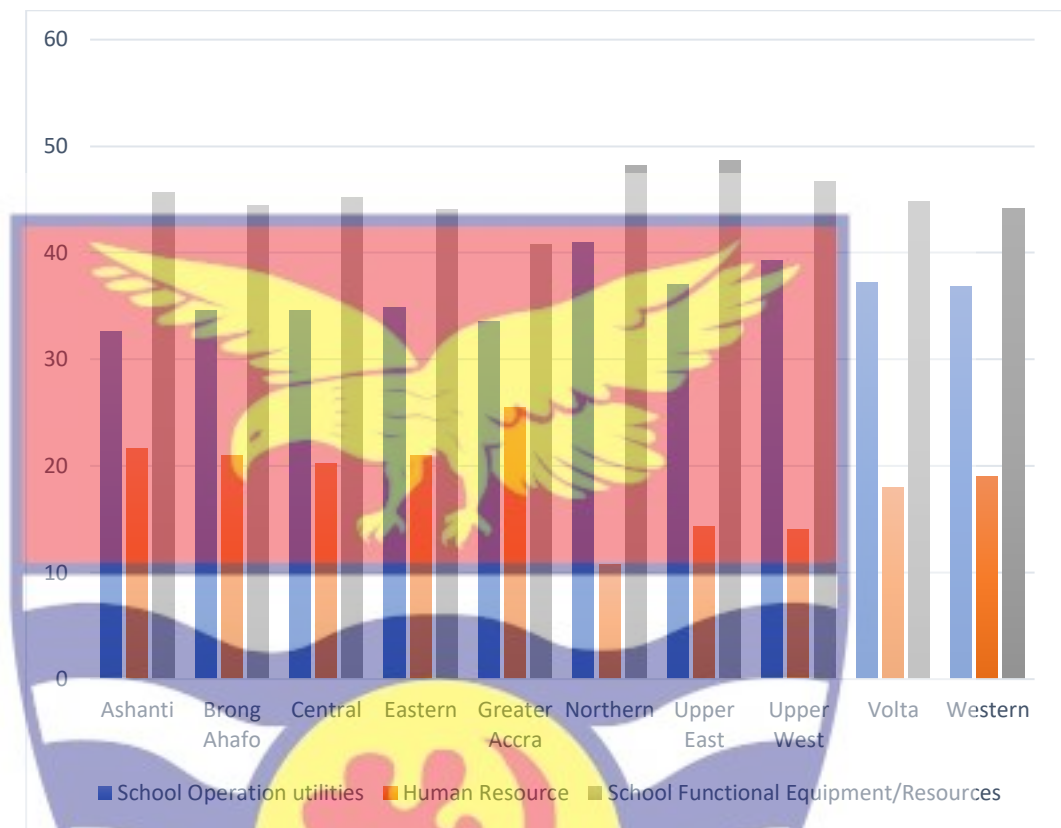
Figure 46: Contribution of each Dimension to MERDI by Regions (2018/19)

From Figure 46, it can be observed that all the regions have School Functional Resources as the major contributing factor to the level of educational resource deprivation of basic schools in the regions.

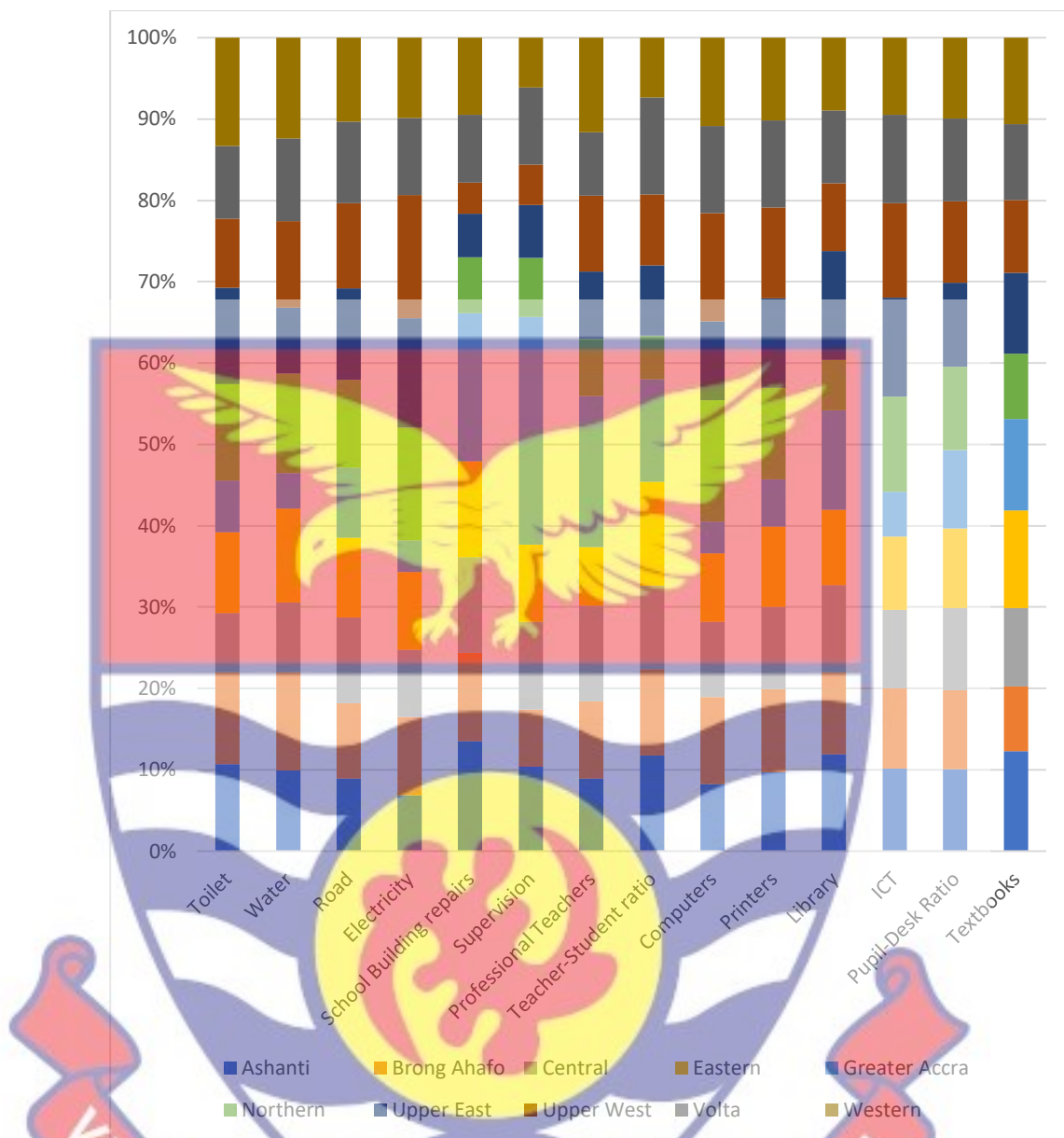From Figure 47, the distribution of percentage contribution of each indicator to the regional MERDI reveals a similar trend across all the ten regions. The trend generally indicates that access to motorable roads, school building repairs, availability of printers, pupil-desk ratio, ICT infrastructure, and teacher-student ratio are the indicators that contribute most to MERDI in each of the ten regions.
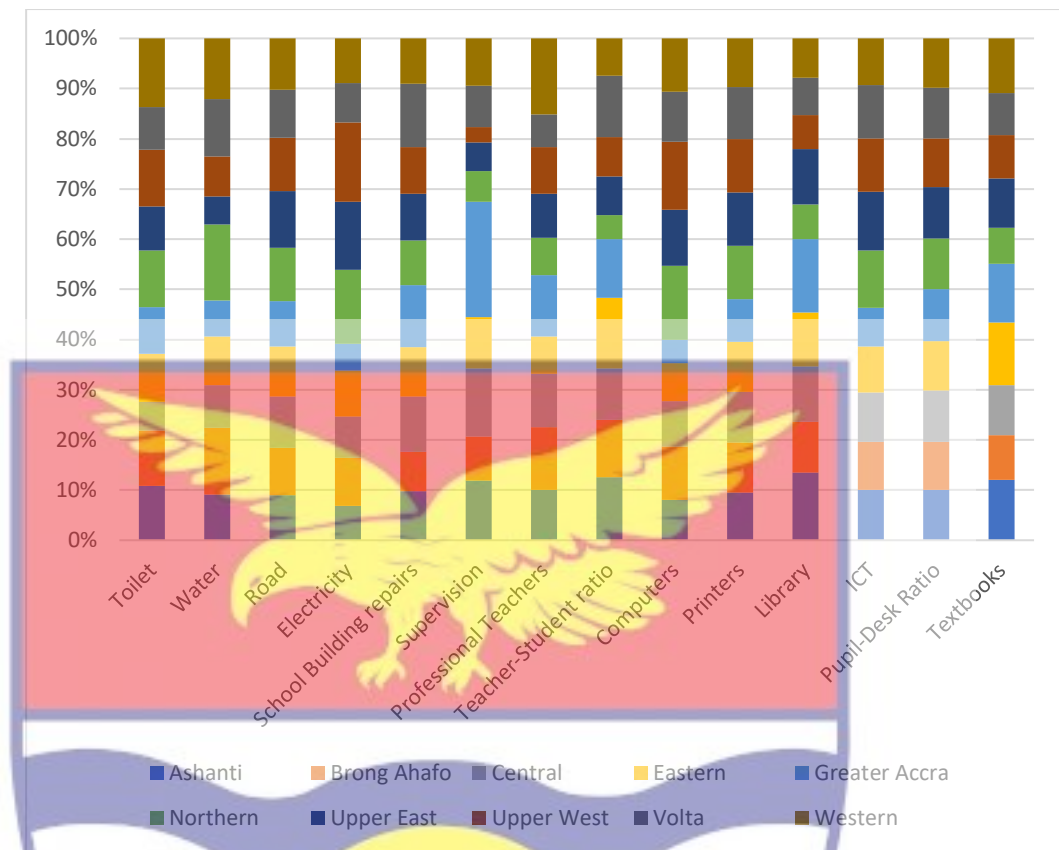
Figure 47: Percentage contribution of each indicator to Regional MERDI for 2017/18

On the other hand, supervision, availability of potable drinking water, and textbooks contribute less to the MERDI across all the ten administrative regions.

Regional Analysis

This sub-section takes an in-depth look at the distribution of multidimensional educational resource deprivation across the ten regions of Ghana. It presents a general picture of the extent of educational resource deprivation over four years (2015/16 – 2018/19). The analysis under each region focuses on the three indexes (MERDI, Incidence, and Intensity). It further delves into changes in the various indicators over the four years. Table 12 presents a summary of the results.

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Table 12: Summary of MERDI, Incidence, and Intensity across Regions over four years (2015/16 – 2018/19)

Region	MERDI				Incidence (H)				Intensity (A)			
	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19	2015/16	2016/17	2017/18	2018/19
Ashanti	0.344	0.375	0.293	0.356	73.9	79	66.2	77	46.5	47.5	44.3	46.3
Brong Ahafo	0.426	0.425	0.324	0.401	89	85.7	71.3	82.5	47.8	49.6	45.5	48.6
Central	0.33	0.333	0.24	0.325	73.5	70	54.5	71.3	44.9	47.6	44	45.6
Eastern	0.384	0.405	0.298	0.378	81.7	82.2	66.2	79.7	47	49.3	45.1	47.5
Greater Accra	0.292	0.365	0.279	0.274	64.9	73.4	61.2	60.7	45	49.7	45.5	45.2
Northern	0.376	0.359	0.303	0.372	77.1	76.8	68.2	81.1	48.7	46.7	44.4	45.9
Upper East	0.407	0.358	0.315	0.377	85.2	76.9	71.7	82.2	47.8	46.6	43.9	45.8
Upper West	0.399	0.374	0.326	0.391	88	78.1	74.2	81.3	45.3	48	43.9	48.1
Volta	0.374	0.348	0.249	0.359	82.1	74.2	56.4	77.2	45.6	47	44.2	46.5
Western	0.327	0.396	0.304	0.386	70.8	81.8	68.5	82	46.2	48.4	44.4	47

Source: Annual School Census Data, 2015 - 2019

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Ashanti Region

The Ashanti region recorded its lowest MERDI (a measure that reflects the multiple deprivations that basic schools face in the areas of school operating utilities, human resources, and school functional resources) in the 2017/18 academic year (MERDI = 0.293) while its highest MERDI value was recorded 2016/17 academic year. The results are presented in Table 13.

Table 13: MERDI, Incidence, and Intensity - Ashanti Region

Index	2015/16	2016/17	2017/18	2018/19
MERDI	0.344	0.375	0.293	0.356
Incidence (H)	73.9	79	66.2	77
Intensity (A)	46.5	47.5	44.3	46.3

Source: Annual School Census Data, 2015 - 2019

The highest incidence of educational resource deprivation was also recorded in the 2016/17 academic year while the intensity of the deprivation was felt minimally in the 2017/18.

Figure 47 presents a trend analysis of the percentage contributions of the indicators to the extent of educational resource deprivation in the Ashanti region over the four-year period. Over the four-year period, indicators such as textbooks, electricity, access to motorable road, toilet facilities and availability of potable water. On the other hand, school building repairs, teacher-student ratio, library facility and professional teachers have worsened over this same period.

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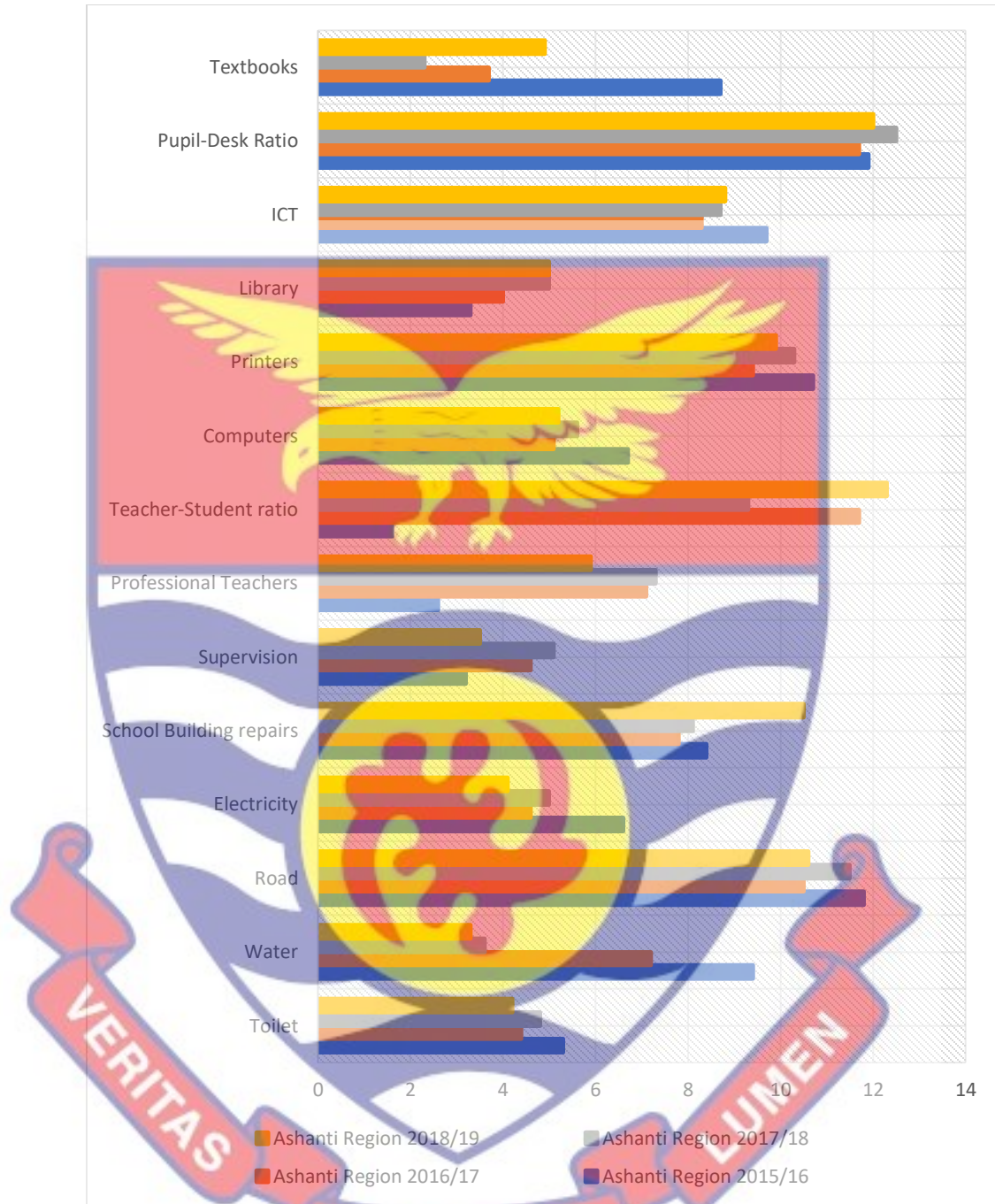
Figure 47: Percentage Contribution by indicators – Ashanti Region (2015/16 – 2017/18)

Four other indicators have either remained stagnant or seen an inconsiderable improvement over the period. These are ICT infrastructure, pupil-desk ratio, availability of printers, and supervision.

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Brong Ahafo Region

The trend analysis in the Brong Ahafo region indicates that the extent of educational resource deprivation improved from 2015/16 (MERDI = 0.426) till 2017/18 (MERDI = 0.324). However, in 2018/19 the region experienced deterioration of 0.077. Also, 2015/16 had the highest level of incidence of educational resource deprivation (89%) with the highest level of intensity in 2016/17. Table 14 presents a summary of the results.

Table 14: MERDI, Incidence, and Intensity – Brong Ahafo Region

Index	2015/16	2016/17	2017/18	2018/19
MERDI	0.426	0.425	0.324	0.401
Incidence (H)	89	85.7	71.3	82.5
Intensity (A)	47.8	49.6	45.5	48.6

Source: Annual School Census Data, 2015 - 2019

Figure 48 presents a line graph showing the percentage contribution by indicators over the four-year period in the Brong Ahafo region.

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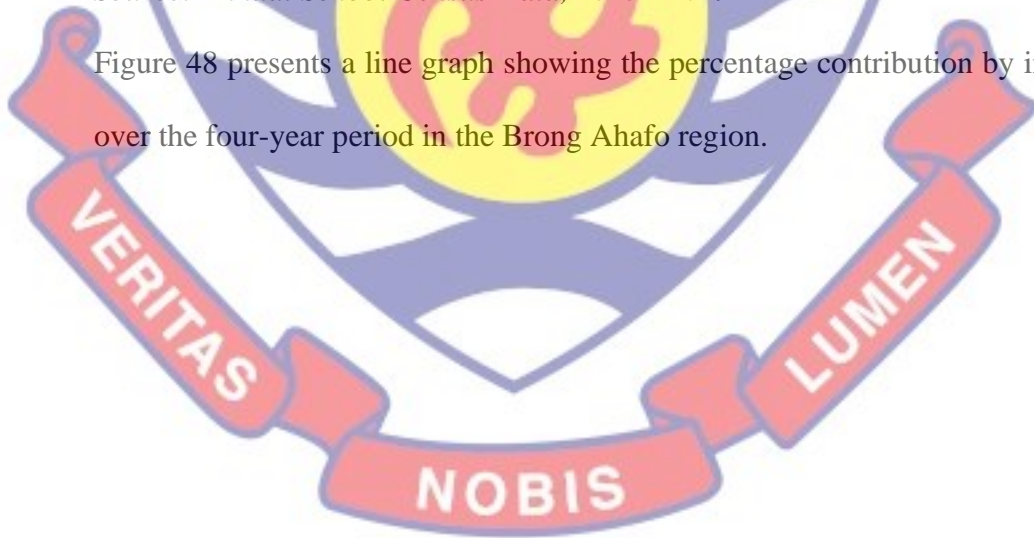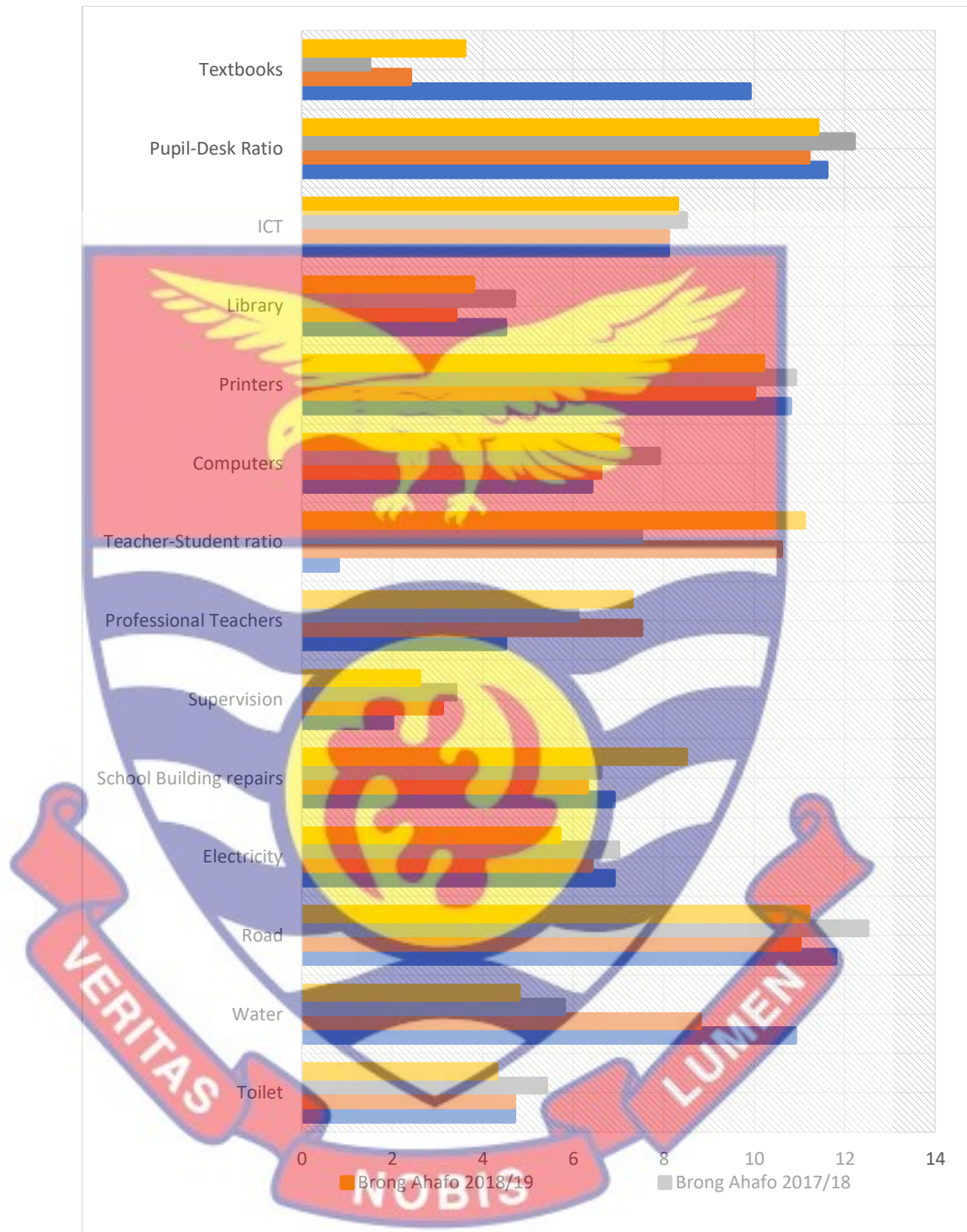
Figure 48: Percentage Contribution by indicators – Brong Ahafo Region (2015/16 – 2017/18)

From Figure 48, it can be observed that over the four-year period, access to water, textbooks, and availability of toilet facilities have improved in the region.

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On the other hand, more school buildings have deteriorated, professional teachers and teacher-student ratio. Availability of printers, pupil-desk ratio, and computers have received a minimal level of improvement.

Central Region

The extent of educational resource deprivation in this region has remained moderately low ranging between 0.3 and 0.2. it remains one of the few regions with a low level of MERDI. The highest MERDI was recorded in 2016/17, an increment of 0.003 from the previous year. The prevalence of educational resource deprivation in the region was highest in the 2015/16 academic year, improving up to 2017/18 which recorded the least level of incidence of deprivation.

Table 15: MERDI, Incidence, and Intensity – Central Region

Index	2015/16	2016/17	2017/18	2018/19
MERDI	0.33	0.333	0.24	0.325
Incidence (H)	73.5	70	54.5	71.3
Intensity (A)	44.9	47.6	44	45.6

Source: Annual School Census Data, 2015 - 2019

However, the succeeding year recorded an increase signaling a further deterioration by almost 17 percentage points in the 2018/19 academic year. The concentration of educational resource deprivation in the region was highest in the 2016/17 academic year. Figure 49 presents the percentage contribution by indicators.

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Figure 49: Percentage Contribution by indicators – Central Region (2015/16 – 2018/19)

Between 2015/16 and 2018/19, indicators such as toilet facilities, availability of potable water, availability of textbooks, and electricity in basic schools in the region have seen an improvement. Within the same period, indicators

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such as teacher-student ratio, professional teachers, supervision, and school buildings have declined while access to roads, library facility, and pupil-desk ratio remained the same or seen an infinitesimal improvement.

Eastern Region

The highest MERDI (0.405) was recorded in the 2016/17 academic year. The least MERDI (0.298) in the region was in the 2017/18 academic year. Between the period under study, the state of educational resource deprivation in the region has improved by 0.6%. Again, in terms of the prevalence of educational resource deprivation, the Eastern region has seen an improvement of 2%, reducing from 81.7% in the 2015/16 academic year to 79.7% in the 2018/19 academic year.

Table 16: MERDI, Incidence, and Intensity – Eastern Region

Index	2015/16	2016/17	2017/18	2018/19
MERDI	0.384	0.405	0.298	0.378
Incidence (H)	81.7	82.2	66.2	79.7
Intensity (A)	47	49.3	45.1	47.5

Source: Annual School Census Data, 2015 - 2019

The concentration of the deprivation of the educational resources in the basic schools in the region has rather worsened by 0.5%. That is, in the 2015/16 academic year, the region experienced an intensity of 47%, this, however, has increased to 47.5% in 2018/19. It however worth noting that, the highest level of intensity was recorded in the 2016/17 academic year, which remains the year where all the indexes performed poorly.

Figure 50 further presents the contribution of the indicators to the extent of educational resource deprivation in the region over the four-year period.

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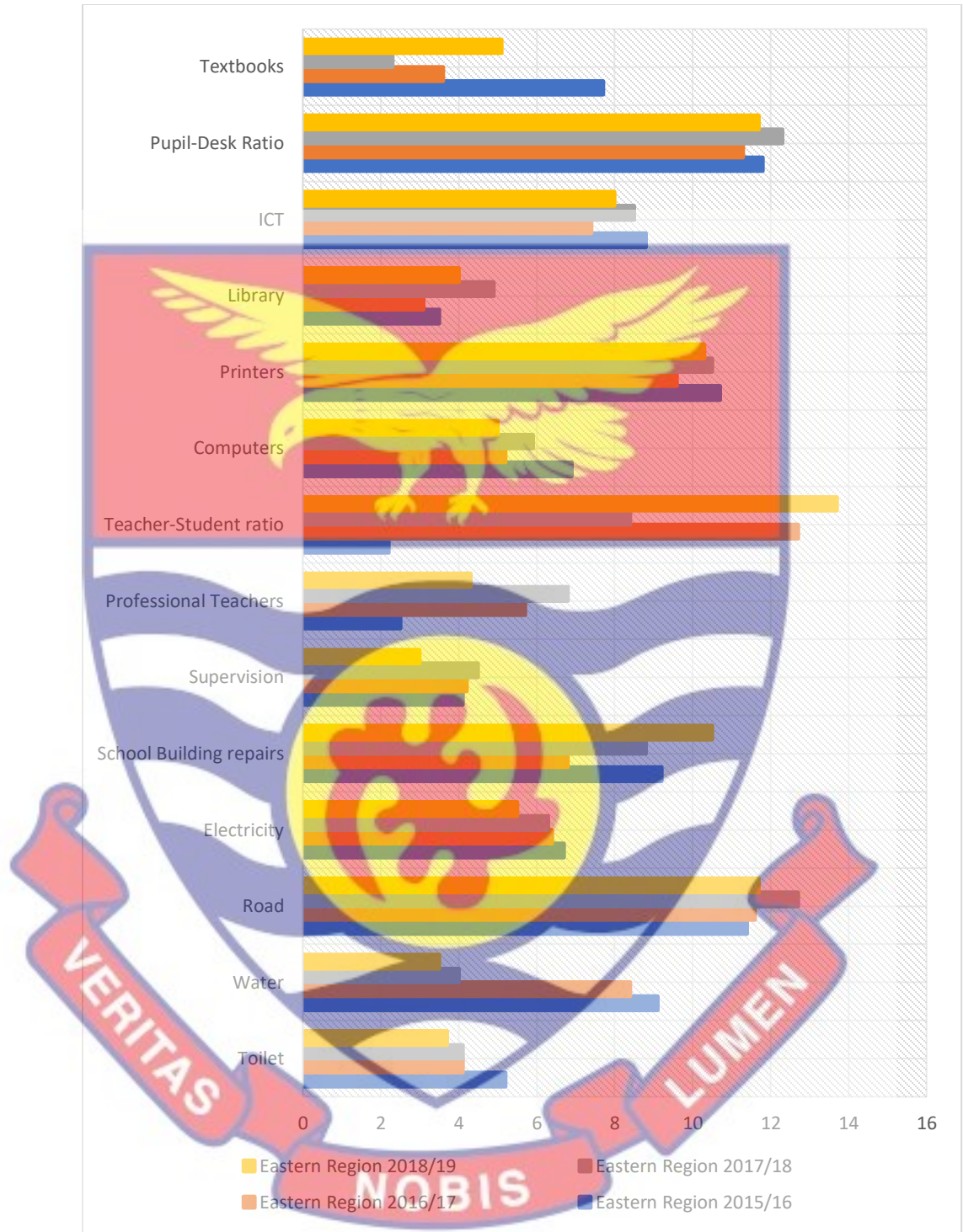
Figure 50: Percentage Contribution by indicators – Eastern Region (2015/16 – 2018/19)

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In terms of how the various indicators have felt over the period under study in the Eastern region, toilet facilities, availability of potable drinking water, electricity, supervision, text books and computers have all seen some level of improvement. On the other hand, availability of professional teachers, teacher-student ratio and school buildings have all worsened during this four-year period. Availability of printers, access to motorable roads, library facilities and pupil-desk ratio have recorded either marginal or no improvement between 2015/16 – 2018/19.

Greater Accra Region

The Greater Accra region is one of the two regions which have consistently recorded lower levels of deprivation in its basic schools. From Table 17, it can be observed that, with the exception of 2016/17 academic year, the extent of educational resource deprivation in this region remains low. In fact, there has been 1.8% improvement in the educational resources in basic schools in the region between 2015/16 to 2018/19.

Table 17: MERDI, Incidence and Intensity – Greater Accra Region

Index	2015/16	2016/17	2017/18	2018/19
MERDI	0.292	0.365	0.279	0.274
Incidence (H)	64.9	73.4	61.2	60.7
Intensity (A)	45	49.7	45.5	45.2

Source: Annual School Census Data, 2015 - 2019

The occurrence of educational resource deprivation in the region was highest in the 2016/17 academic year, improving up to 2018/19 which recorded the least level of incidence of deprivation. In terms of intensity, the region has gain

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0.2% in the average number of educational resource deprivations that each basic school in the region experiences of the period under study. Figure 51 shows the percentage contributions of the various indicators to the level of deprivation in basic schools during the period under study.

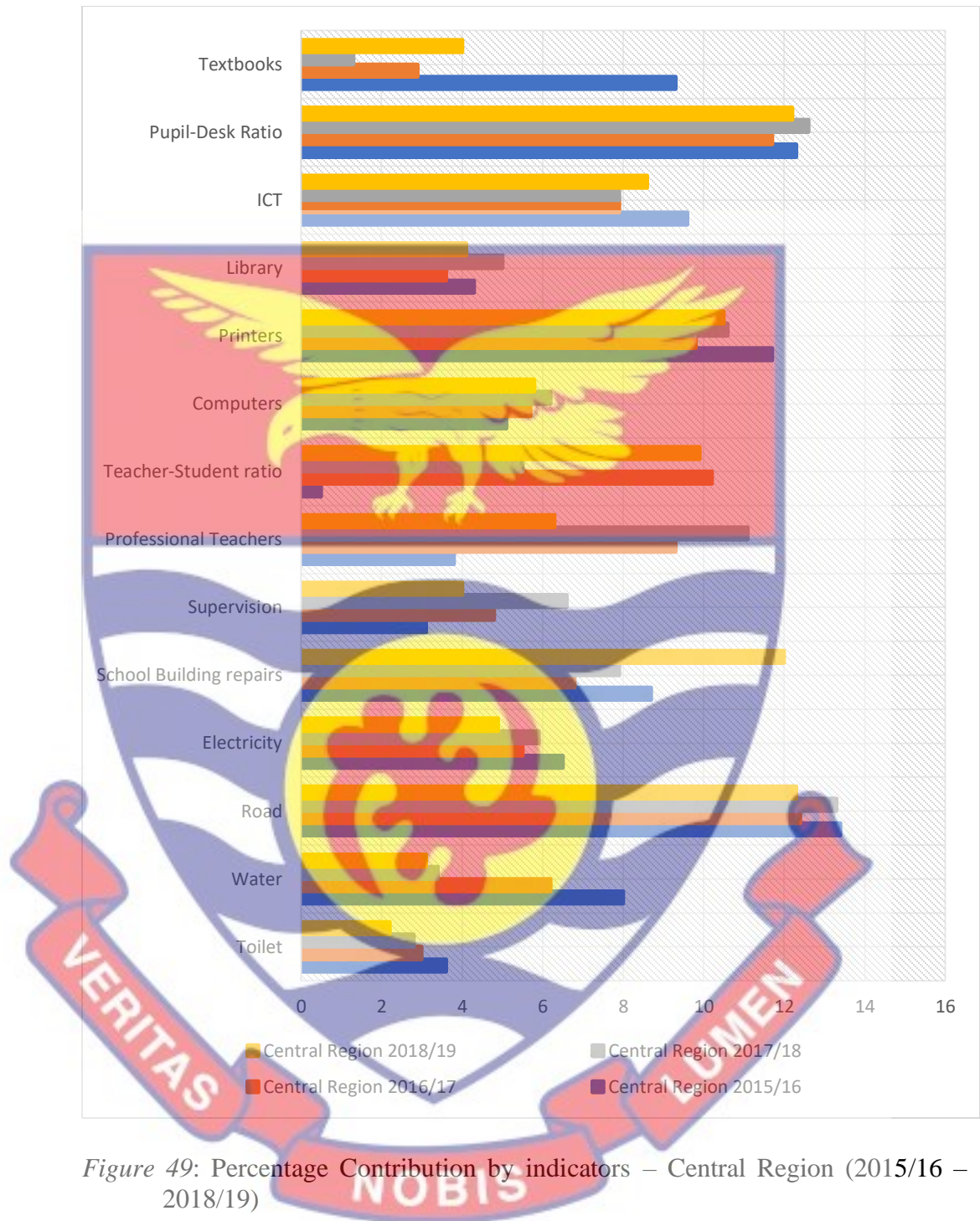*Figure 51*: Percentage Contribution by indicators – Greater Accra Region (2015/16 –2018/19)

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Between 2015/16 to 2018/19, indicators such as availability of toilet facilities, availability of potable drinking water, electricity, access to motorable roads, textbooks, and computers have seen significant improvement in the various basic schools in the region. However, within this same period, school buildings have deteriorated, professional teachers have declined, teacher-student ratio have worsened and library facilities have degenerated. Other indicators such as supervision, availability of printers, ICT infrastructure, and pupil-desk ratio have not recorded any remarkable change.

Northern Region

The Northern region has recorded a minimal improvement in its MERDI within the period under study. In the 2015/16 academic year, the index for educational resource deprivation was 0.376, this however has reduced by 0.4% by the 2018/19 academic year. This is against the fact that in 2017/18, the region recorded its lowest deprivation value of 0.303. This reveals a downward sloping trend between 2015/16 to 2017/18. Beyond this period, basic schools in the region are witnessing an increase in their educational resource deprivation index. Table 18 presents a summary of the results.

Table 18: MERDI, Incidence and Intensity – Greater Accra Region

Index	2015/16	2016/17	2017/18	2018/19
MERDI	0.376	0.359	0.303	0.372
Incidence (H)	77.1	76.8	68.2	81.1
Intensity (A)	48.7	46.7	44.4	45.9

Source: Annual School Census Data, 2015 - 2019

From Table 18, it can be observed that, the incidence of educational resource deprivation is highest in the 2018/19 academic year while intensity is highest in the 2015/16 academic year. Figure 52 presents the percentage contributions of the various indicators to the level of deprivation in basic schools during the period under study.

Figure 52: Percentage Contribution by indicators – Northern Region (2015/16 – 2018/19)

From Figure 52, it is evident that only three indicators have seen some level of improvement over the period under study. These are availability of potable drinking water, supervision and provision of textbooks. This is comparable to about seven other indicators that have worsened over the period. The indicators that have degenerated include access to motorable roads, school building, teacher-student ratio, availability of computers and printing machines, library facilities and professional teachers. However, availability of toilet facilities, ICT infrastructure and pupil-desk ratio have not seen any substantial upgrading in the region during the period in focus.

Upper East Region

The Upper East region has also recorded significant improvement in its MERDI within the period under focus. In the 2015/16 academic year, the index for educational resource deprivation was 0.407, this however has been reduced by 3% by the 2018/19 academic year. This is against the fact that in 2017/18, the region recorded its lowest deprivation value of 0.315. This shows a descending trend between 2015/16 to 2017/18. Beyond this period, basic schools in the region are witnessing an upsurge in their educational resource deprivation index. Table 19 presents a summary of the results.

Table 19: MERDI, Incidence, and Intensity – Upper East Region

Index	2015/16	2016/17	2017/18	2018/19
MERDI	0.407	0.358	0.315	0.377
Incidence (H)	85.2	76.9	71.7	82.2
Intensity (A)	47.8	46.6	43.9	45.8

Source: Annual School Census Data, 2015 - 2019

From Table 19, it is obvious that the incidence of educational resource deprivation is highest in the 2015/16 academic year with intensity being highest in the same academic year. Figure 53 presents the percentage contributions of the various indicators to the level of deprivation in basic schools during the period under study.
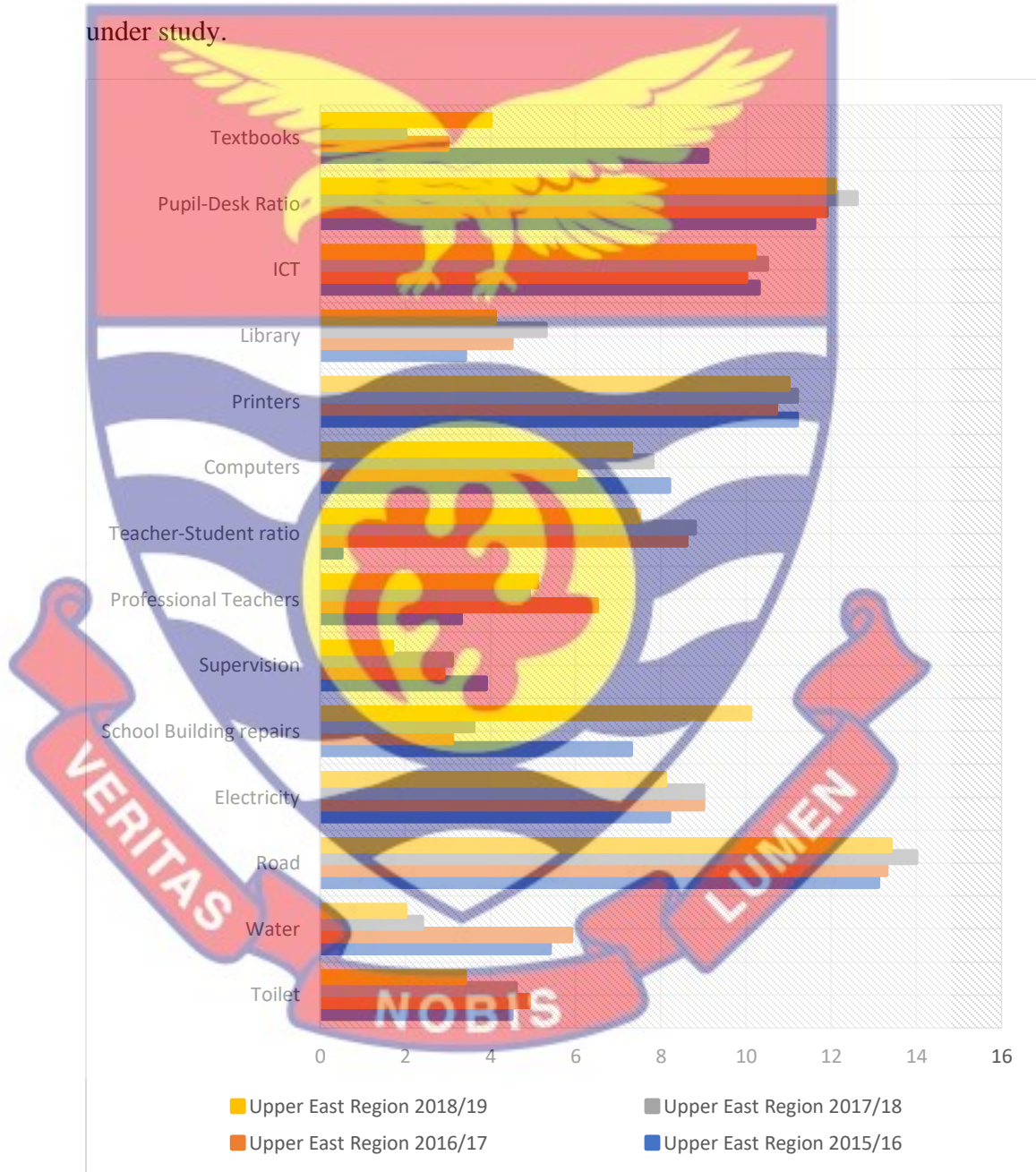
Figure 53: Percentage Contribution by indicators – Upper East Region (2015/16 – 2018/19)

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From Figure 53, it is noticeable that five indicators have recorded some level of improvement over the period. These are availability of potable drinking water, availability of toilet facilities, supervision, provision of textbooks and computers. On the other hand, four indicators have worsened over the period. These are school building, professional teachers, teacher-student ratio and availability of library facilities. Nevertheless, availability of printing machines, ICT infrastructure and pupil-desk ratio and electricity remains the same during the period in focus.

Upper West Region

The regions highest MERDI (0.405) was recorded in the 2015/16 academic year. The least MERDI (0.326) in the region was in the 2017/18 academic year. Between the period under study, the state of educational resource deprivation in the region has improved by 0.8%. Again, in terms of the incidence of the educational resource deprivation, the Upper West region has seen an improvement of 6.7%, that is, from 88% in the 2015/16 academic year to 81.3% in the 2018/19 academic year. Table 20 presents summary of results.

Table 20: MERDI, Incidence and Intensity – Upper West Region

Indicators	2015/16	2016/17	2017/18	2018/19
MERDI	0.399	0.374	0.326	0.391
Incidence (H)	88	78.1	74.2	81.3
Intensity (A)	45.3	48	43.9	48.1

Source: Annual School Census Data, 2015 - 2019

The concentration of the deprivation of the educational resources in the basic schools in the region has rather worsened by 2.8%. That is, in 2015/16 academic year, the region experienced an intensity of 45.3%, this however, increased to 48.1% by 2018/19. It however worth noting that, the highest level of

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intensity was recorded in the 2016/17 academic year. Figure 54 further presents the contribution of the indicators to the extent of educational resource deprivation in the region over the four-year period.

Figure 54: Percentage Contribution by indicators – Upper West Region (2015/16 – 2018/19)

In relation to how the various indicators have felt over the period under study in the Upper West region, availability of potable drinking water, access to

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motorable roads, supervision, availability of printing machines, text books and ICT infrastructure and pupil-desk ratio have all seen some level of improvement. Conversely, library facilities, availability of professional teachers, teacher-student ratio and school buildings have all worsened during this four-year period. Availability of toilet facilities and electricity have recorded either marginal or no improvement between 2015/16 – 2018/19.

Volta Region

The Volta region recorded its lowest MERDI (measure that reflects the multiple deprivations that basic schools face in the areas of school operating utilities, human resources and school functional resources) in the 2017/18 academic year (MERDI = 0.249) while its highest MERDI value was recorded 2015/16 academic year. The highest incidence of educational resource deprivation was also recorded in the 2015/16 academic year while the intensity of the deprivation was felt minimally in the 2017/18. Table 21 presents a summary of the results.

Table 21: MERDI, Incidence and Intensity – Volta Region

Indicators	2015/16	2016/17	2017/18	2018/19
MERDI	0.374	0.348	0.249	0.359
Incidence (H)	82.1	74.2	56.4	77.2
Intensity (A)	45.6	47	44.2	46.5

Source: Annual School Census Data, 2015 - 2019

Figure 55 presents a trend analysis of the percentage contributions of the indicators to the extent of educational resource deprivation in the Volta region over the four-year period.

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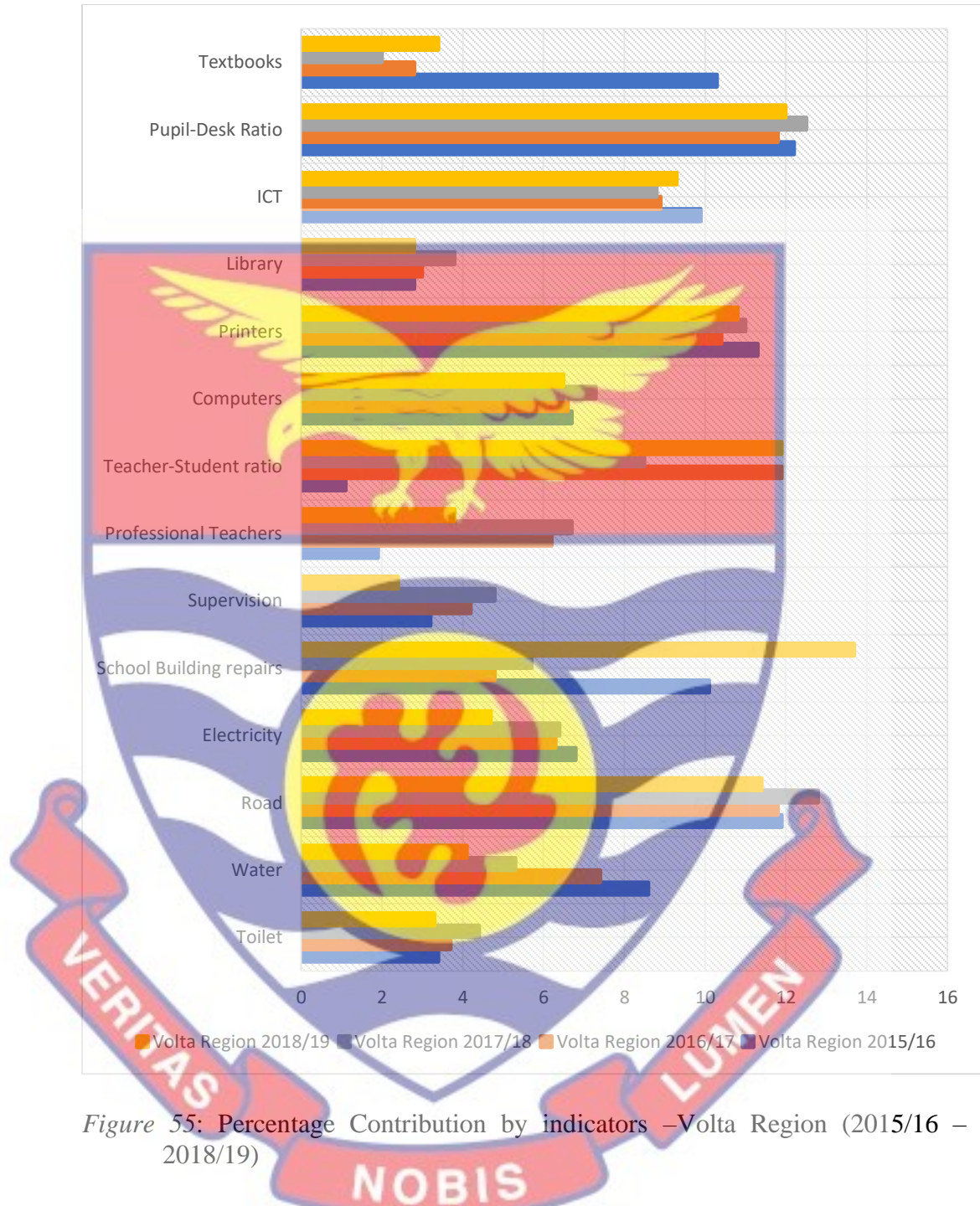
Figure 55: Percentage Contribution by indicators –Volta Region (2015/16 – 2018/19)

Over the four-year period, indicators such as textbooks, supervision, and availability of potable water and ICT infrastructure. On the other hand, school building repairs, teacher-student ratio, and professional teachers have worsened over this same period. Five other indicators have either remained stagnant or seen

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an inconsiderable improvement over the period. These are motorable roads, availability of toilet facilities, pupil-desk ratio, availability of printers and computers.

Western Region

The extent of educational resource deprivation in this region has remain between 0.3 and 0.39. The highest MERDI was recorded in 2016/17, an increment of 0.069 from the previous year. The prevalence of educational resource deprivation in the region was highest in the 2018/19 academic year, a difference of 13.5% from the previous year (2017/18) which is also the least level of incidence of deprivation recorded in the region. Table 22 presents a summary of the results.

Table 22: MERDI, Incidence and Intensity – Western Region

Indicators	2015/16	2016/17	2017/18	2018/19
MERDI	0.327	0.396	0.304	0.386
Incidence (H)	70.8	81.8	68.5	82
Intensity (A)	46.2	48.4	44.4	47

Source: Annual School Census Data, 2015 - 2019

The MERDI recorded for 2018/19 signals a deterioration of almost 14 percentage points in the 2018/19 academic year. The concentration of educational resource deprivation in the region was highest in the 2016/17 academic year. Figure 54 presents the percentage contribution by indicators. From Figure 56, it can be observed that between 2015/16 and 2018/19, indicators such as availability of potable water, availability of textbooks, electricity, access to motorable roads,

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printing machines as well as library facilities in basic schools in the region have seen some significant improvement.
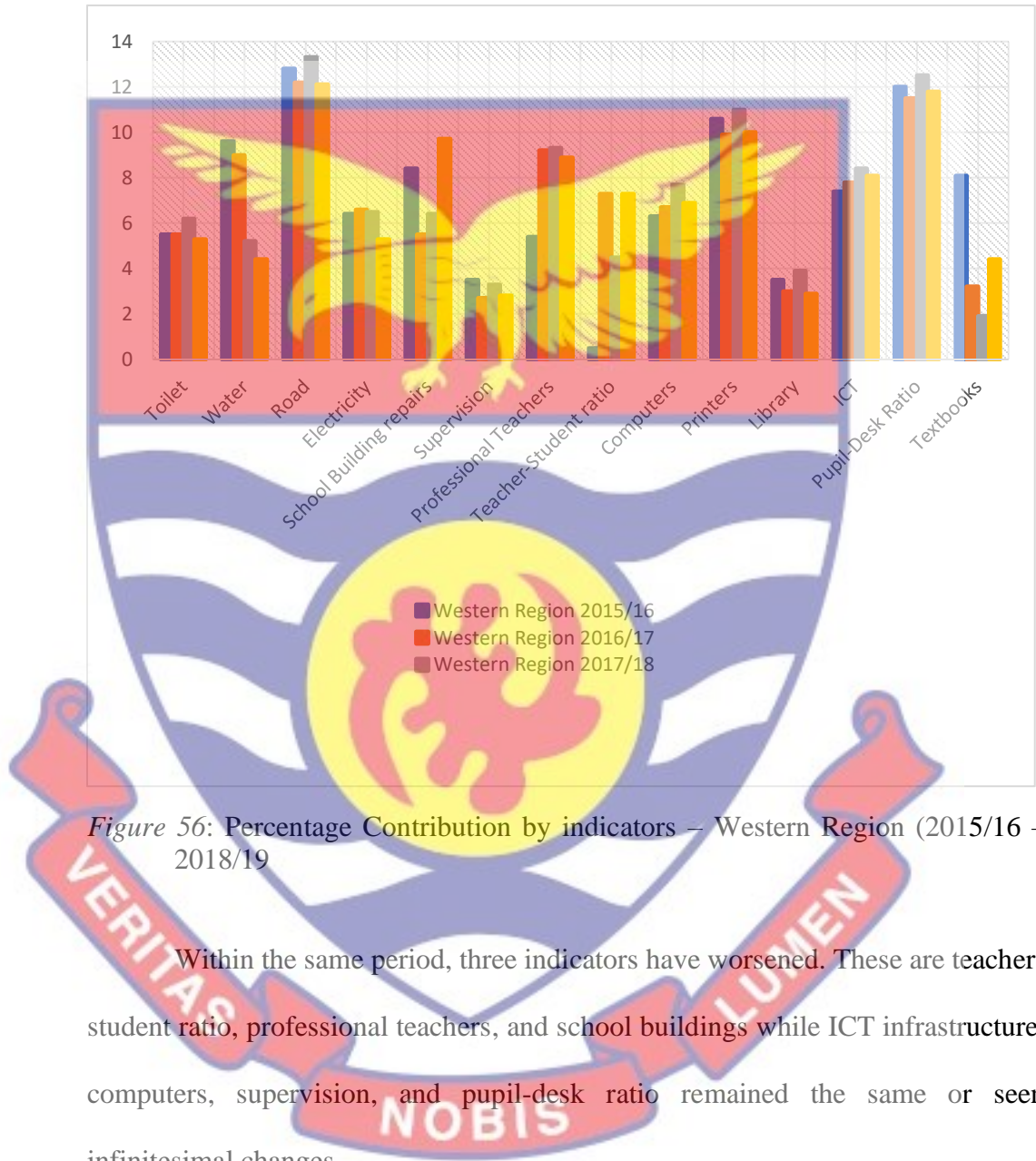
Figure 56: Percentage Contribution by indicators – Western Region (2015/16 – 2018/19

Within the same period, three indicators have worsened. These are teacher-student ratio, professional teachers, and school buildings while ICT infrastructure, computers, supervision, and pupil-desk ratio remained the same or seen infinitesimal changes.

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Multidimensional Educational Resource Deprivation Over Time (2015/16 –

2018/19)

This section explains the trend of multidimensional educational resource

deprivation in basic schools in Ghana between 2015/16 academic year to 2018/19

academic year. It is an attempt to explain the thoughtful query on the evolution of

deprived basic schools in terms of educational resources over time. Four different

academic years are used in this section. Table 23 presents the summary of the

results.

Table 23: Change in incidence, intensity, and MERDI, 2015/16 to 2018/19

Cut-off (k=33%)	MERDI	Incidence (H)	Intensity (A)
2015/16	.415	83.6	49.6
2016/17	.375	78	48.1
2017/18	.291	65.3	44.6
2018/19	.364	77.9	46.7
Change 2016/17 - 2015/16	-0.04	-5.6	-1.5
Combined SE	.006	.01	.003
Test Statistic	132.15.	199.84	45.67
Prob > chi2	.00	.00	.00
Change 2017/18 - 2015/16	-0.124	-18.3	-5
Combined SE	.008	.03	.013
Test Statistic	580.85	899.89	71.08
Prob > chi2	.00	.00	.00
Change 2018/19 - 2015/16	-0.051	-5.7	-.2.9
Combined SE	.09	.05	.21
Test Statistic	143.85	377.38	211.23
Prob > chi2	.00	.00	.00

Source: Annual School Census Data, 2015 – 2019

It is observable from Table 23 that the multidimensional educational

resource deprivation declined between 2015/16 and 2017/18. The MERDI

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decreased from 0.415 to 0.291 between 2015/6 and 2017/18 and the difference is statistically significant at the one percent alpha value. However, between 2017/18 to 2018/19, the MERDI increased from 0.291 to 0.364. Again, the MERDI increased by 0.073 between 2017/18 and 2018/19, the increment is also statistically significant. The headcount ratio decreased from 83.6 percent in 2015/16 to 65.3 percent in 2017/18. This however changes between 2017/18 and 2018/19 resulting in an increase of 12.6 percent which is statistically significant. Also, the intensity of the educational resource deprivation (A) declined between 2015/16 and 2017/18 by 5% but increased by 2.1% from 2017/18 to 2018/19. These changes in the intensity are all statistically significant. Figures 57 and 58 presents a bar chart for MERDI and Incidence and Intensity.

Figure 57: Incidence and Intensity of educational resource deprivation in Ghana, 2015/6-2018/19
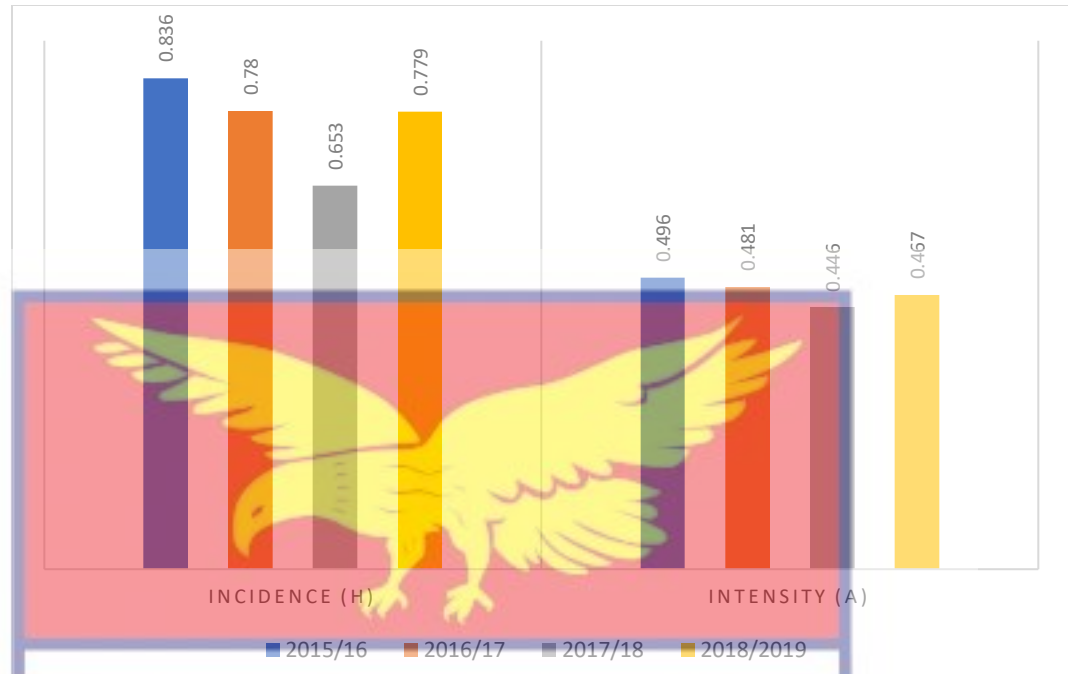
Figure 58: National Censored Headcount Ratios – 2015/16 to 2018/19

In appreciating the changing aspects of the MERDI over a period of time, a critical attention is paid to the indicators and how they have performed between the periods under study. Figure 59 demonstrates the drivers of the considerable changes in multidimensional educational resource deprivation over time. Censored headcount ratios, which measure the percentage of basic schools which are deprived in the given indicator, are represented for each of the four survey periods. Figure 59 presents the national headcount ratios for all indicators for the period under study. It is evident that, there have been considerable fluctuations in the indicators over the period with indicators such as access to motorable roads, teacher-student ratio, availability of printers, ICT (access to internet) and pupil-desk ratio remaining substantially high over time (that is between 2015/16 – 2018/19).

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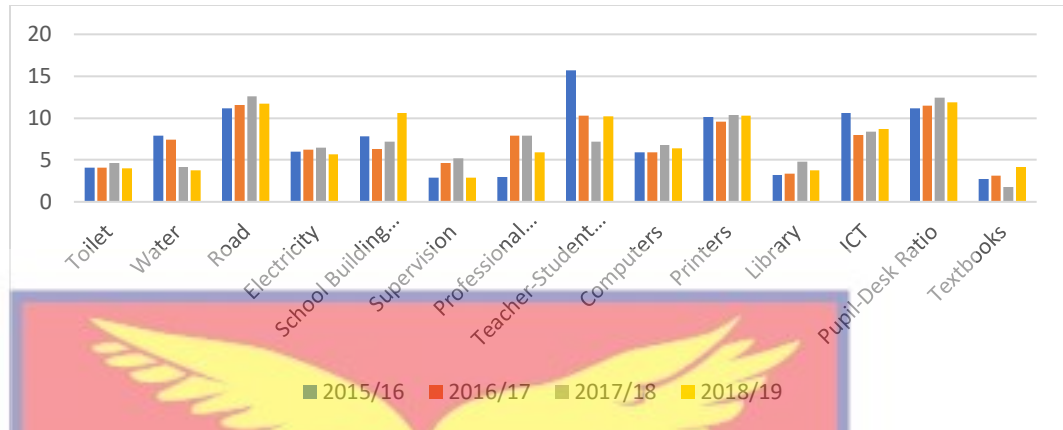
Figure 59: National headcount ratios, 2015/16 – 2018/19

It is observable that, availability of potable drinking water seems to be the only indicator that have seen a consistent decrease between 2015/16 and 2018/19. Figure 60 presents the absolute change in the uncensored headcount ratio between 2015/16 and 2018/19.

Figure 60: Absolute change in uncensored headcount ratios 2015/16 and 2018/19

From Figure 60, it is obvious that, five indicators have recorded an improvement over time. These are toilet facilities, potable drinking water, electricity, teacher-student ratio and ICT. However, school buildings, professional teachers and textbooks have worsened over time.

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The maps for all the three statistics of the MERDI, shown in Figures 61a, 61b and 61c indicate changing dynamics of educational resource deprivation across various regions in Ghana.
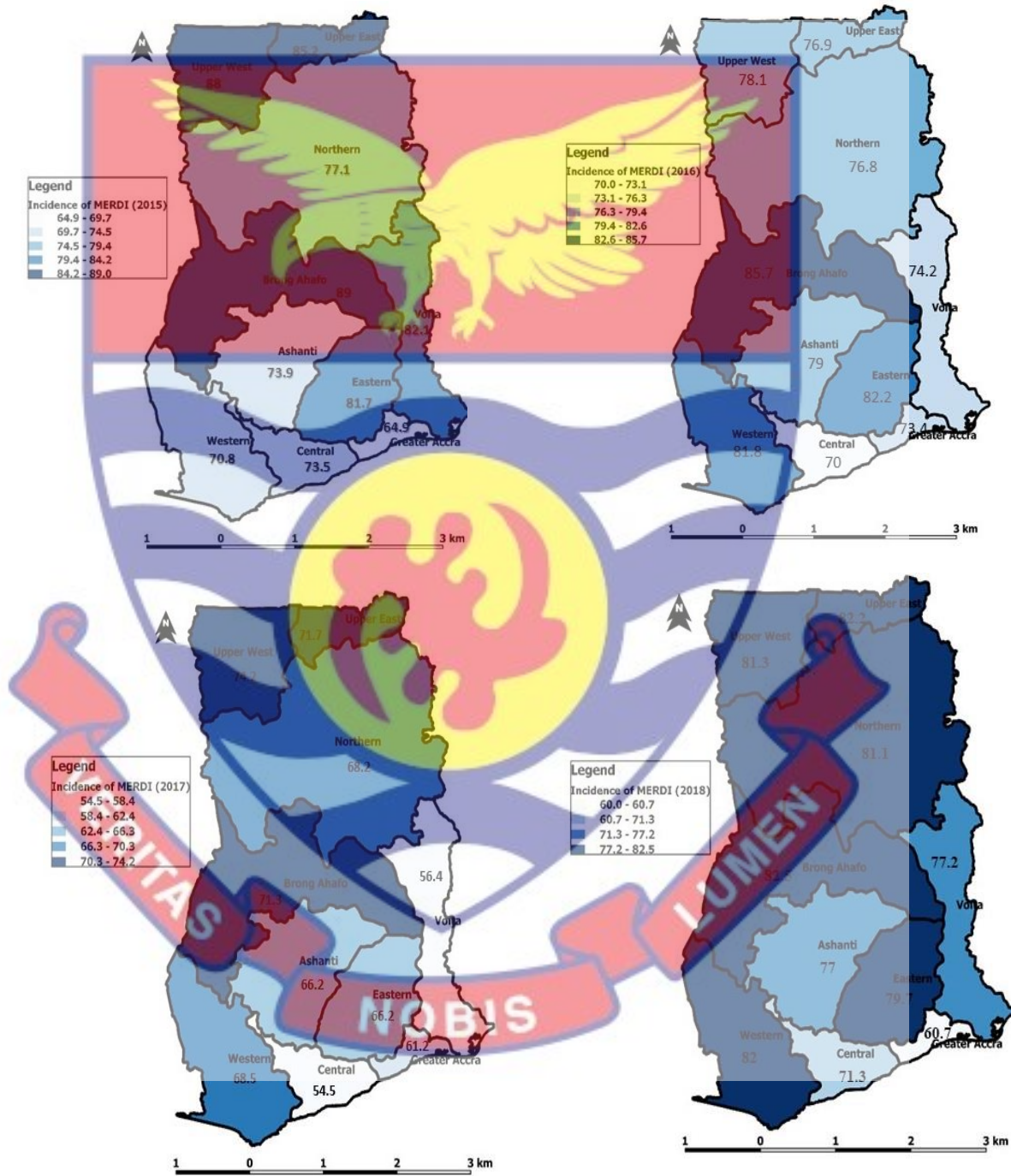
Figure 61a: Incidence of Multidimensional Educational resource deprivation 2015/16 – 2018/19

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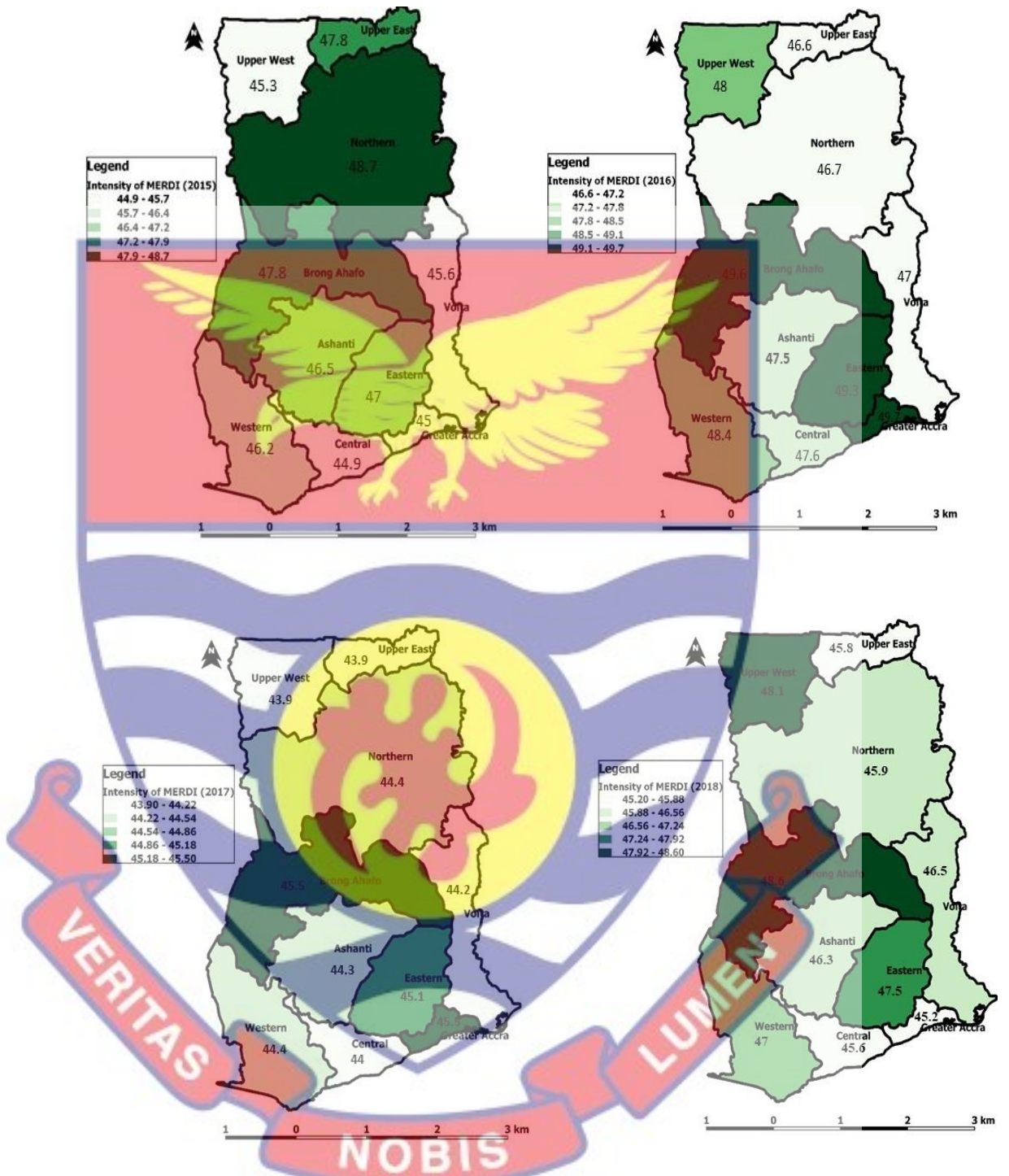
Figure 61b: Intensity of Multidimensional Educational resource deprivation

2015/16 –2018/19

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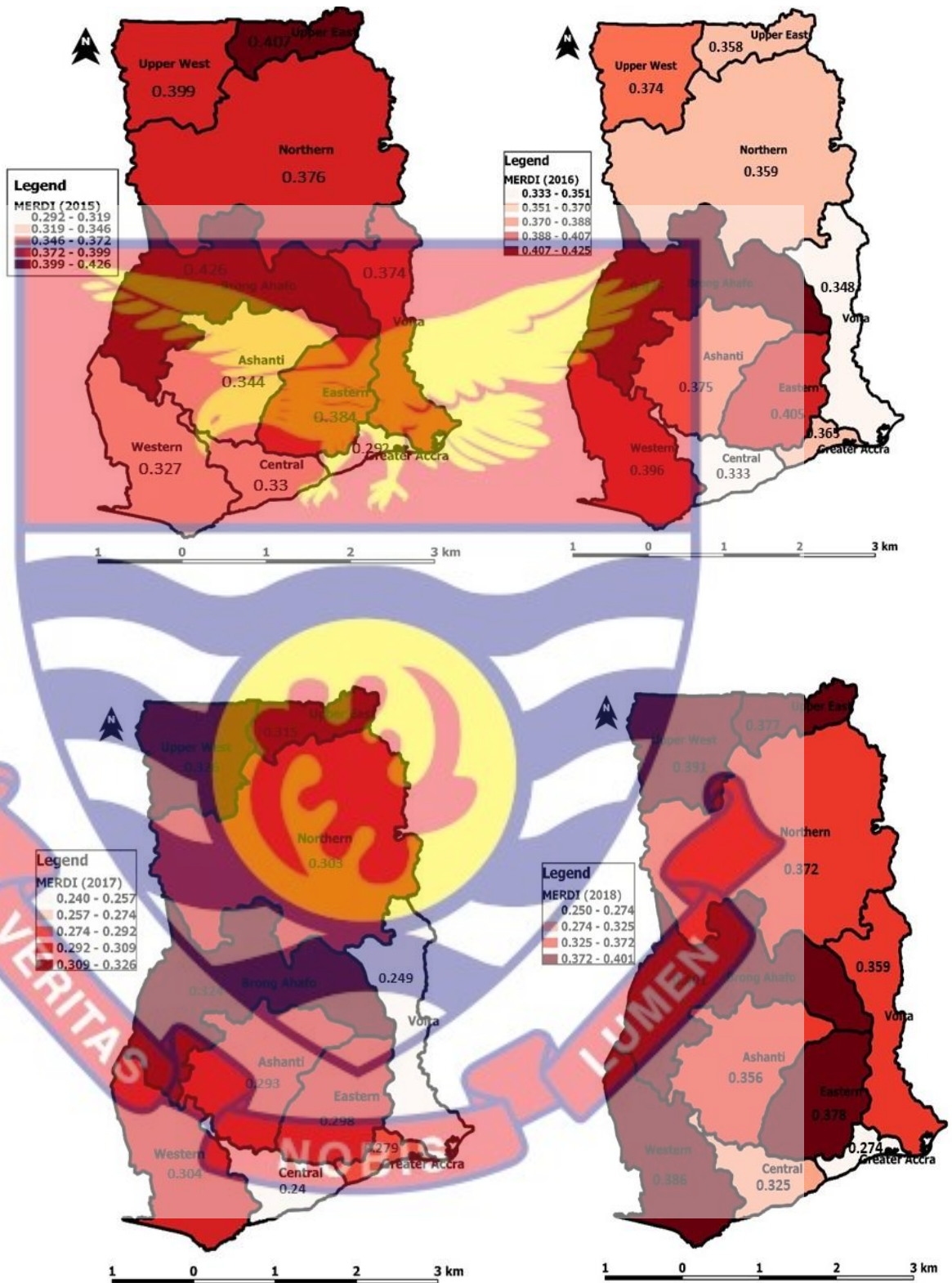
Figure 61c: Multidimensional Educational resource deprivation index 2015/16 –
    2018/19

To specify how the educational resources in these regions have changed over time, Figure 62 and 63 displays the percentage change in regional multidimensional educational resource deprivation index (MERDI), incidence (H) and intensity (A) of the educational resource deprivation between 2015/16 and 2018/19.
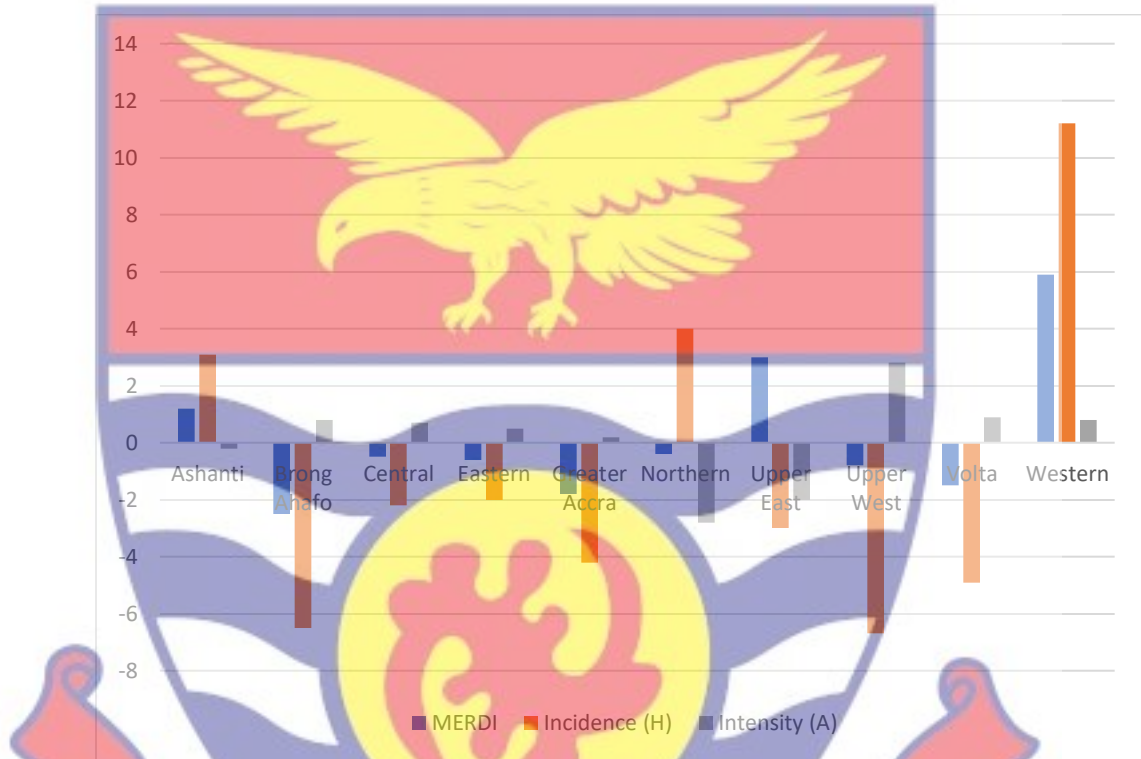
Figure 62: Percentage change across regions - 2015/16 to 2018/19

Seven out of the ten regions have recorded an improvement in their incidence of educational resource deprivation with the Upper West recording the highest level of improvement, followed by Brong Ahafo, Volta, Greater Accra, Upper East, Central and Eastern. Again, six regions recorded an improvement in both the incidence and intensity of educational resource deprivation in the basic schools in the region. These are Brong Ahafo, Volta, Upper West, Greater Accra, Eastern and Central.

Figure 63 displays the absolute change in indicators across regions.
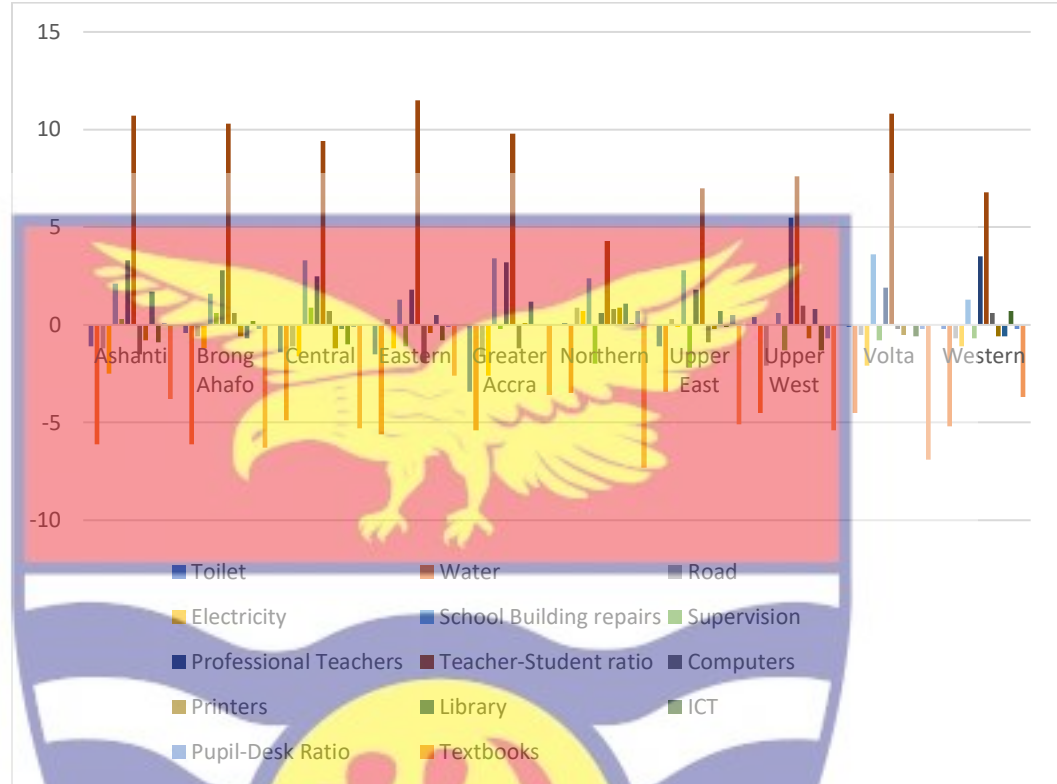
Figure 63: Absolute change in indicators across regions - 2015/16 to 2018/19

From Figure 62, it can be observed that teacher-student ratio has deteriorated across the 10 regions over the period between 2015/16 to 2018/19 academic years. This is the same for school building repairs and professional teachers. On the other hand, the availability of potable water and textbooks have seen a significant improvement over the period under the study across all regions. Figure 64 presents the absolute change in indicators across school ownership between 2015/16 and 2018/19 academic years.

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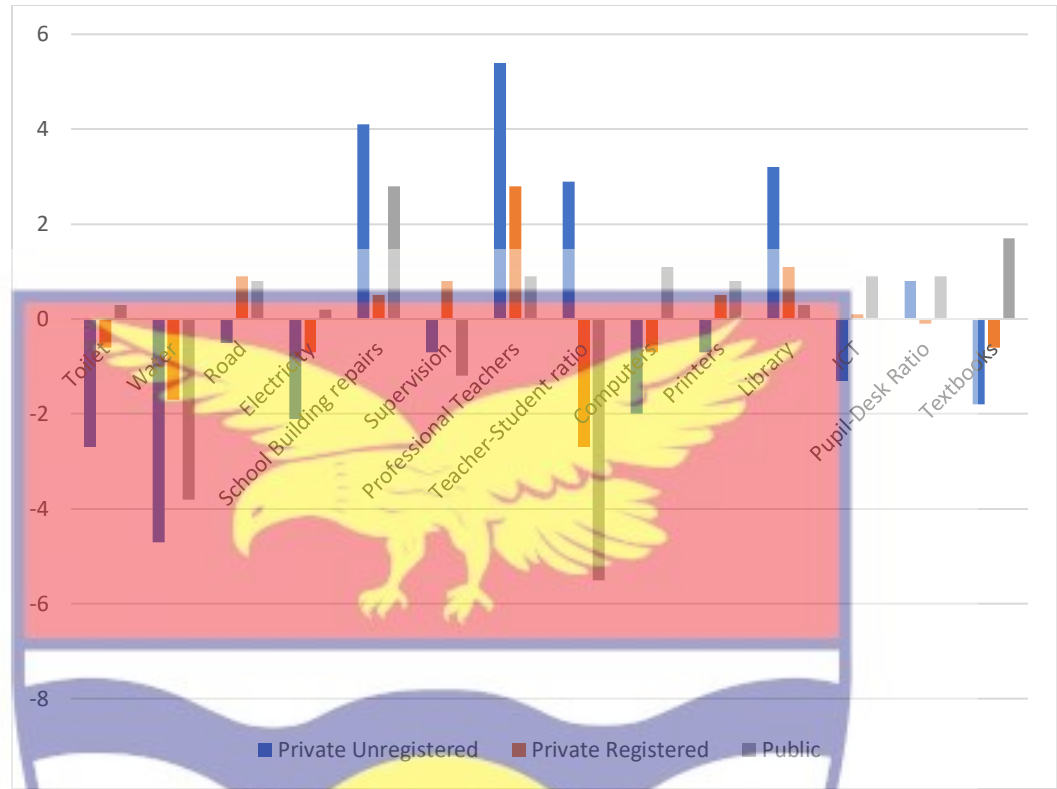
Figure 64: Absolute change in indicators across school ownership - 2015/16 to 2018/19

Figure 64 shows that private unregistered schools have recorded improvements in the availability of toilet facilities, potable drinking water, accessible roads, electricity supply, supervision, computers, printers, ICT (accessible to internet), and provision of textbooks. Concerning private registered schools, indicators such as toilet facilities, potable drinking water, electricity supply, teacher-student ratio, computers, and textbooks have improved over time while public basic schools have recorded positive changes in only potable drinking water, supervision, and teacher-student ratio.

Conversely, eleven (11) indicators have worsened in public basic schools with school building repairs being the highest followed by textbooks, computers, ICT, and pupil-desk ratio. Private unregistered basic schools have seen

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deterioration in five (5) indicators whereas private registered basic schools have seven indicators worsening over time.

Research Objective 2: Evaluate the relative performance of each of the domains and indicators of the MERDI.

The IPMA procedure brings to the fore the importance and performance of the three constructs that ultimately affect the MERDI. According to, Silva and Fernandes (2010) the IPMA assesses not only the performance of an item but also the importance of that item as a defining factor of the variable of interest. Hence, the IPMA graphical tool is a valuable method for unearthing the extent to which both the constructs and indicators perform regarding the MERDI.

IPMA Results for the Constructs

The researcher performed an Importance-Performance Map Analysis (IPMA) to distinguish the structural model total effects and the average values of the latent variable scores. By this, the domains (constructs) that generate the largest effect on the MERDI were identified (Hair et al., 2017). When a construct's importance is high, but performance is low, there is a need for improvement. Table 24 presents the results of the total effects (importance) and the average values of the latent variable scores (performance) used for our Importance-Performance Matrix Analysis.

Table 24: IPMA estimation results

Latent Constructs	Total Effect (Importance)	Average Values (Performance)
MERDI		85.210
Human Resources	.132	80.716
School Functional Resources	.770	90.741
School Operating Utilities	.115	82.206

Source: Annual School Census Data 2018/19

It is evident from the IPMA in Table 24 that the highest performance belongs to School Functional Resources (SFR), this is followed by School Operating Utilities (SOU) and then Human Resources (HR). However, in terms of importance, SFRs demonstrate a superb level of importance to the MERDI. Again, although, the performance of SOU is high as compared to HR, it is evident that HRs are of a higher level of importance when it comes to its effect on the MERDI as compared to SOU. This is further illustrated in Figure 65.

It is important to note that, the IPMA can be said to have four quadrants, variables in the first quadrant implies that policymakers need to pay serious attention to them, that is there should be thoughtful concentration on those variables because their performance might be high but they depict relatively low importance to the target variable. Items in the second quadrant indicate low priority, while those in the third quadrant signify good work. The last quadrant is described as a possible overkill.
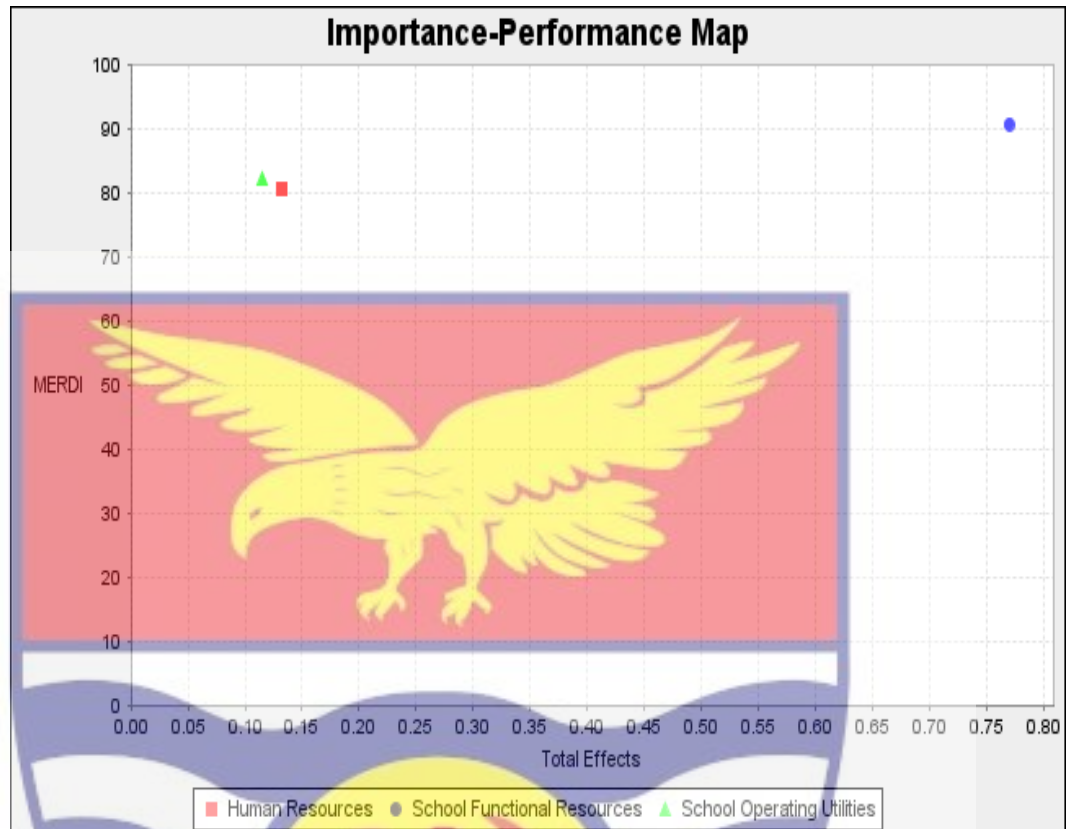
Figure 65: Importance-Performance Map

From Figure 65, it is evident that the dimensions find themselves in the first and third quadrants. Human Resources (HR) lag slightly behind School Operating Utilities in terms of performance though HR plays a more important role in impacting the MERDI and hence should be prioritized. Figure 66 presents the structural model with indication of the Latent Constructs Performance and Latent Construct Values.

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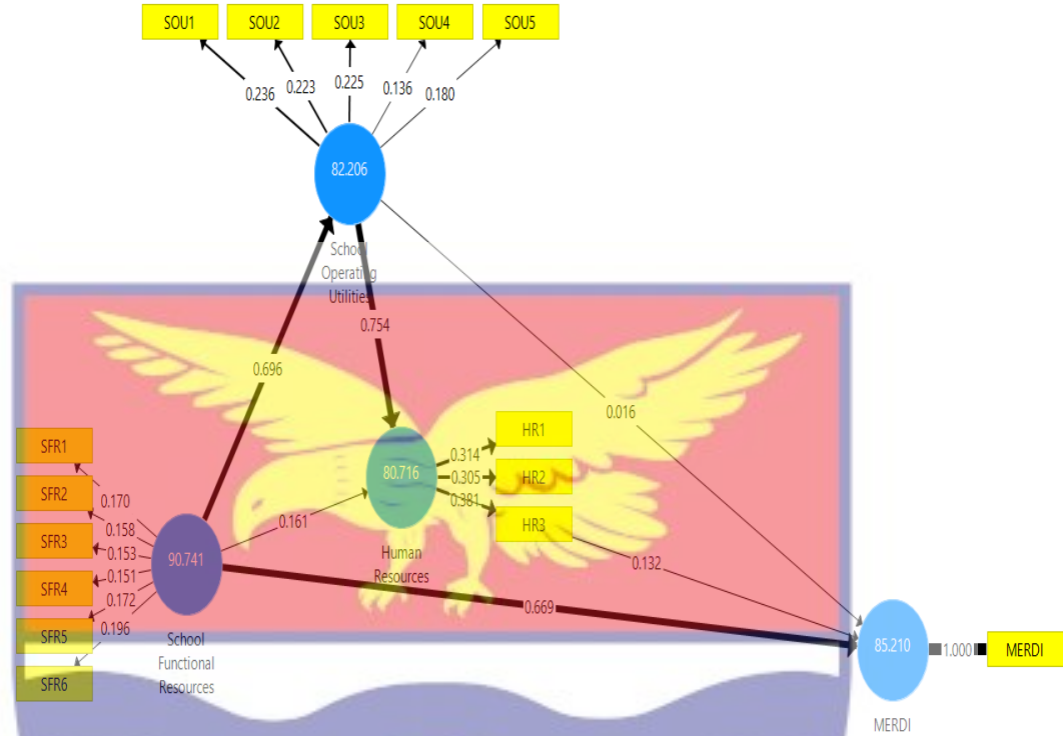
Figure 66: Estimated Structural model for the MERDI

IPMA Results for the Indicators

The IPMA results for indicators reveal that, the indicators find themselves in first and third quadrants. It technically implies that, while the indicators in the third quadrant are performing well and exhibiting relatively high level of importance, there is the need to keep up the good work and improve further. On the other hand, indicators in the first quadrant deserves maximum attention. The most important indicator is textbooks (SFR6), though it lags behind all the other indicators for School Functional Resources. Again, the most significant indicator with the Human Resource construct is Pupil-Teacher Ratio, however, its performance within the model is low as compared to HR1 (Supervision). Finally, within the IPMA, SOU4 (Electricity) recorded the least in terms of both performance and importance.

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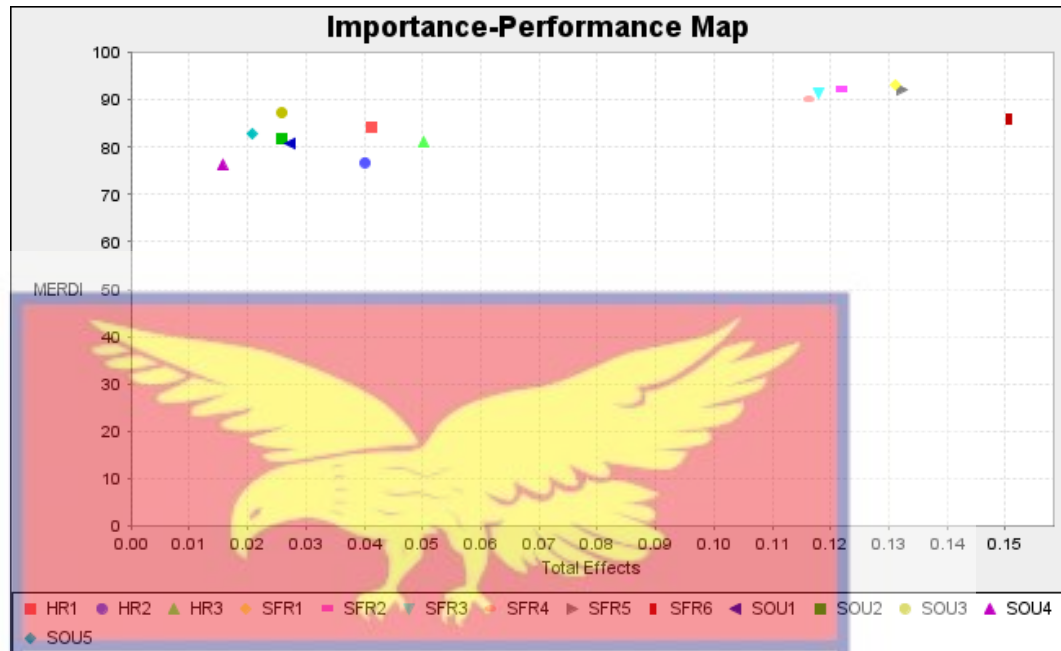
Figure 67: IPMA for Indicators

Research Objective 3a: Examine the effect of the availability of educational resources on access to basic education.

Empirically, the availability of educational resources seems to have an effect on the number of pupils that are able to access basic education. Access, as measured by enrolment, is the number of pupils that got admitted into a basic school during an academic year. This objective aims at testing the hypothesis that:

Ho: There is no statistically significant effect of the availability of educational resources on access to basic education.

Table 24 presents the summary statistics of the variables used for the panel data analysis. Enrolment which was used as a proxy for access had a mean value of 37 (SD = .67), the average number of professional teachers recorded was 11 (SD = .21), however, the maximum number of professional teachers recorded was 105. Table 25 presents the descriptive statistics for the 13 variables used for the analysis.

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Table 25: Descriptive Statistics (A)

Variable	Mean	Std. Dev.	Min.	Max.
Enrolment (Access)	37	.67	2	526
Professional Teachers	11	.21	0	105
Library Books	234	8.56	10	649
Printers	3	.07	0	15
Computers	6	.22	0	79
ICT (Access to Internet)	.33	.47	0	1
Textbooks	21	5.11	1	594
Toilet	.34	.47	0	1
Safe Water	.49	.50	0	1
School Building	.32	.47	0	1
Supervision	17	.38	0	179
Teacher-Pupil Ratio	.20	.40	0	1
Capitation Grant	4	1.23	1	5

Again, on the average 17 supervisions were recorded for the period under study with a standard deviation of .38. Also, the average teacher-pupil ratio was .20 (SD = .40). In terms of library books, a mean of 234 was recorded with a standard deviation of 8.56. the average number of computers recorded for the period under study was 6 (SD = .22) while for printers (M = 3, SD = .07). Table 25 presents the correlation matrix for the dependent and independent variables.

Table 26: Correlation matrix for dependent and independent variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
Access	1.00												
Professional Teachers	-.07	1.00											
Library	.01	.09	1.00										
Printers	.02	.03	.05	1.00									
Computers	.02	.06	.11	.03	1.00								
ICT	.09	.01	-.09	-.00	-.05	1.00							
Textbooks	.89	-.06	.03	.03	.03	.08	1.00						
Toilet	.00	-.09	-.10	-.05	-.07	.24	.01	1.00					
Water	-.01	.09	-.12	-.04	-.07	.29	-.01	.28	1.00				
School Building	.13	-.06	-.04	-.01	-.02	.05	.13	-.07	-.04	1.00			
Supervision	-.20	.44	.21	.04	.12	-.12	-.19	-.11	-.07	.31	1.00		
Teacher-Pupil Ratio	-.09	.02	.09	.02	.06	-.00	-.08	-.11	-.07	.31	-.11	1.00	
Capitation Grant	.02	.46	-.16	-.05	-.07	.14	-.02	.09	.33	-.00	-.02	-.01	1.00

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Two panel analyses have been generated: Fixed effect and Random effect (Appendix B). Table 28 presents the fixed effects results for objective 3a. The Hausman test was used to make a decision as to which of the two effects was suitable for the panel model. To decide between fixed and random effect, the null hypothesis which states that: the preferred model is random effects is tested. The Hausman test basically test whether the unique errors (u_i) are correlated with the regressors, the null hypothesis states that they are not. Table 27 presents the results of the Hausman test.

Table 27: Hausman test

	fixed	random	Difference	S. E
Professional Teachers	-.068	.441	-.509	.187
Library Books	.014	-.000	.014	.002
Printers	.330	.037	.293	1.147
Computers	.019	.048	-.029	.
ICT	7.916	6.430	1.186	.539
Textbooks	.159	.931	-.771	.008
Toilet	2.804	-8.632	11.436	2.362
Water	-.707	-.321	-0.386	.
School Building	15.852	7.264	8.588	.
Supervision	-2.725	-.161	-2.564	.027
Teacher-Pupil Ratio	-1.731	.675	-2.407	.
Capitation Grant	2.858	-.137	2.996	1.002

b = consistent under H_0 and H_a; obtained from "xtreg"

B = inconsistent under H_a, efficient under H_0; obtained from "xtreg"

Test: H0: differences in coefficient not systematic

Chi Sq. (12)   = 8877.61

Prob > ChiSq = 0.000

The results from the Hausman test indicates that the null hypothesis is rejected (Prob > ChiSq = 0.000) hence, the results is significant at 5% suggesting that the Fixed effect model be used for analysing objective 3a.

Three R-squares were generated, for within the model (R^2 = .95), between had an r-square of .03 while the overall r-square was .07. This is from a total number of 54, 951 observations. The F statistics was significant [F (12, 3872) = 5633.75, Prob > F = .00] with correlation (u_i, Xb) = -.91.

Table 28: Fixed Effect Regression Results

Variable	Coef.	Std. Err.
Professional Teachers	-.068	.288
Library Books	.014*	.002
Printers	.330	1.171
Computers	.019	.021
ICT	7.916*	2.962
Textbooks	.159*	.009
Toilet	2.804	3.975
Water	-.707	1.874
School Building	15.852*	2.718
Supervision	-2.725*	.029
Teacher-Pupil Ratio	-1.731	2.358
Capitation Grant	2.858*	1.448
Constant	575.142	8.923

From Table 28, out of the 12 independent variables, six (6) variables were statistically significant at 5% alpha level, with a sigma_u = 426.1333, sigma_e = 47.018, rho = .988. F test that all u_i = 0: F (5035, 3872) = 5.21; Prob > F = .000.

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From Table 27, it can be observed that an overall r-square of 7% indicates that, almost 7% of the changes in access to basic education can be explained by the independent variables. Also, the F-test [F (12, 3872) = 5633.75, Prob > F = 0.00] implies that the coefficients in the model were different from zero. Again, the intraclass correlation (rho = .988) implies that 98.8% of the variance is due to differences across the panel.

From the Access to Basic Education model in equation (ii), it can be observed that there is a positive significant relationship between the availability of library books and access to basic education. That is, if the number of library materials increases by 100, it will result in a .01 improvement in the level of enrolment. This relationship is significant at 5%. Also, a basic school with an ICT infrastructure (access to internet) has a positive significant relationship with access to basic education. This implies that an improvement in the ICT infrastructure of any basic school results in an improvement in the level of enrolment. That is, a basic school with ICT facilities has an enrolment of 7.921 more than a basic without an ICT facility. This relationship is significant at 5%.

In relation to textbooks, the results show a positive significant relationship between the availability of textbooks and access to basic education. From Eqn. (ii), an increase in the number of textbooks by 1 resulted in a .16 improvement in the number of pupils who enrolled in the basic level. This relationship is significant at 5%.

The nature of school buildings also plays an important role in improving access to basic education. From Eqn. (ii), there is a positive relationship between the nature

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of school building and access to basic education. That is, a basic school with an improvement in school building has 15.85 improvement in enrolment as compared to a basic school with a deployable school building. The relationship is significant at 5%.

Furthermore, supervision which was anticipated to have a positive relationship with enrolment rather had an inverse relationship with access. The result indicates that, a school deprived in supervision has increased levels of enrolment. From the panel Eqn. (ii), it can be inferred that, schools deprived in supervision will have .072 increment in enrolment than a non-deprived school. The relationship is significant at 5%.

Finally, the model assessed the effect of the payment of capitation grant on improving access to basic education. A correlation coefficient of .02 indicates a low positive relationship between payment of capitation grant and level of enrolment. The positive relationship implies that, an improvement in the amount of capitation grant by 1 Ghana Cedi results in an over 2.86 increase in the level of enrolment. This relationship is significant at 5%.

Research Objective 3b: determine the influence of educational resource distribution on quality education in basic schools in Ghana.

Students' academic performance has been a function of various factors such as teacher factors, school environmental factors, student factors among others. The objective 3b for this study sought to find out the influence of selected educational resources on the performance of pupils in the BECE, which was used as a proxy for quality basic education.

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This objective aims at testing the hypothesis that:

H0: There is no statistically significant effect of availability of educational resources on quality basic education.

Table 29 presents the summary statistics of the variables use for the panel data analysis. Enrolment which was used as a proxy for access had a mean value of 37 (SD = .67), the average number of professional teachers recorded was 11 (SD = .21), however, the maximum number of professional teachers recorded was 105. Again, on the average 17 supervisions were recorded for the period under study with a standard deviation of .38. Also, the average teacher-pupil ratio was .20 (SD = .40). In terms of library books, a mean of 234 was recorded with a standard deviation of 8.56. the average number of computers recorded for the period under study was 6 (SD = .22) while for printers (M = 3, SD = .07).

Table 29 presents the descriptive statistics for the panel regression analysis.

Table 29: Descriptive Statistics (B)

Variable	Mean	Std. Dev.	Min.	Max.
QBE	12.102	6.450	0	100
Enrolment	37	.67	2	526
Professional Teachers	11	.21	0	105
Library Books	234	8.56	10	649
Printers	3	.07	0	15
Computers	6	.22	0	79
ICT (Access to Internet)	.33	.47	0	1
Textbooks	21	5.11	1	594
Toilet	.34	.47	0	1
Safe Water	.49	.50	0	1
School Building	.32	.47	0	1
Supervision	17	.38	0	179
Teacher-Pupil Ratio	.20	.40	0	1
Capitation Grant	4	1.23	1	5

Table 30 presents the correlation matrix for the dependent and independent variable

Table 30: Correlation matrix for dependent and independent variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
QBE	1.00													
Enrolment	-.15	1.00												
Professional Teachers	.59	-.07	1.00											
Library Books	.30	.01	.09	1.00										
Printers	.08	.02	.03	.05	1.00									
Computers	.15	.02	.06	.11	.03	1.00								
ICT	.17	.09	.01	-.09	-.00	-.05	1.00							
Textbooks	-.14	.89	-.06	.03	.03	.03	.08	1.00						
Toilet	-.23	.01	-.09	-.10	-.05	-.07	.24	.01	1.00					
Safe Water	-.19	-.01	.09	-.12	-.04	-.07	.29	-.01	.28	1.00				
School Building	.27	.13	-.06	-.04	-.01	-.02	.05	.13	-.07	-.04	1.00			
Supervision	.72	-.20	.44	.21	.04	.12	-.12	-.19	-.11	-.07	.31	1.00		
Teacher-Pupil Ratio	-.04	-.09	.02	.09	.02	.06	-.00	-.08	-.11	-.07	.31	-.11	1.00	
Capitation Grant	-.10	-.02	.46	-.16	-.05	-.07	.14	-.02	.09	.33	-.00	-.02	-.01	1.00

Two separate results were run for the panel model. These are the Fixed effect and Random effect. The Hausman test was used to make a decision as to which of the two effects was suitable for the panel model. To decide between fixed and random effect, the null hypothesis which states that: the preferred model is random effects is tested. The Hausman test basically test whether the unique errors (u_i) are correlated with the regressors, the null hypothesis states that they are not. Table 31 presents the results of the Hausman test.

Table 31: Hausman test

	fixed	random	Difference	S. E
Enrolment	-.003	-.002	-.001	.001
Professional Teachers	.419	.435	-.017	.010
Library Books	.001	.001	-.000	.000
Printers	.021	.030	-.010	.051
Computers	-.001	.001	-.002	.000
ICT (Access to Internet)	-.315	-.729	.414	.083
Textbooks	.001	.000	.000	.000
Toilet	.050	-1.153	1.203	.133
Safe Water	.058	-.454	.512	.036
School Building	1.174	1.576	-.402	.072
Supervision	.024	.026	-.002	.002
Teacher-Pupil Ratio	.353	.412	-.059	.055
Capitation Grant	-.041	-1.019	.979	.052

b = consistent under H0 and Ha; obtained from "xtreg"

B = inconsistent under Ha, efficient under H0; obtained from "xtreg"

Test: H0: differences in coefficient not systematic

Chi Sq. (13)   = 548.54

Prob > ChiSq = 0.000

The results from the Hausman test indicates that the null hypothesis is rejected (Prob > ChiSq = 0.000) hence, the results is significant at 5% suggesting that the Fixed effect model be used for analysing objective 3b.

From Table 32 the fixed effects results for objective 3b are presented. Three R-squares were generated, for within (R^2 = .673), between (R^2 = .643) while the overall r-square was .644. this is from a total number of 40, 359 observations. The F statistics was significant [F = 613.80, Prob > F = .00] with correlation (u_i, Xb) = .030

Table 32: Fixed Effect Regression Results

QBE	Coef.	Std. Err.
Enrolment	-.003*	.001
Professional Teachers	.419*	.013
Library Books	.001*	.000
Printers	.021	.052
Computers	-.001	.001
ICT (Access to Internet)	-.315*	.131
Textbooks	.001	.000
Toilet	.050	.176
Safe Water	.058	.083
School Building	1.174*	.121
Supervision	.024*	.002
Teacher-Pupil Ratio	-.353*	.104
Capitation Grant	-.041	.064
Constant	5.281	.567

model, a prior assumed sign of school building is positive. A correlation coefficient of .27 implies that there is a weak positive relationship between quality basic education and school building. A $\beta = 1.174$ indicates that, a school with a good school building will have an improved quality education of 17% more than a school deprived in terms of its building. The relationship is significant at 5%.

Another key variable in the QBE model is supervision. The number of times supervisors visit basic schools have an effect on the delivery of quality basic education. From the correlation matrix, an $r = .72$ indicates a strong positive correlation between supervision and quality basic education. In the fixed effect model, $\beta = .024$, implying that, an improvement in the supervision rendered in a basic school result in .024 improvement in the delivery of quality basic education at 5% significant level.

Teacher-Pupil ratio also have a weak negative correlation with quality basic education ($r = .04$). With a beta coefficient (β) of -.353, it implies that, a school deprived in teacher-pupil ratio will have quality education declined by 35.3% as compared to a school not deprived in teacher-pupil ratio. The relationship is significant at 5%. The final significant independent variable in the model is Professional Teachers (PT). The availability of professional teachers in a basic school is estimated to have a positive impact on the delivery of quality education in the school. From the analysis, $r = .59$ indicates a strong positive relationship between availability of professional teachers and quality basic education. From the fixed effect model, $\beta = .419$, which implies that, an increase in the number of

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professional teachers in a basic school will result in .419% improvement in the delivery of quality basic education. This is significant at 5% alpha level.

Discussion of Results

Research Objective 1: Profile the extent of educational resource deprivation (distribution) in Ghana (2015/16 – 2018/19)

The development of the Multidimensional Educational Resource Deprivation Index (MERDI) is premise on the fact that, up to date, there is no clear-cut criteria in classifying a school as either deprived or not deprived. It is evident in literature, that the deprivation status of a school is mostly tied to the location of the school or the poverty status of pupils in the school (OECD, 2011; Ansah, 2011). Hence, profiling schools in order to determine their level of deprivation based on specific indicators most of which are from the SDG 4 becomes very important.

The analysis looked at MERDI, the incidence and intensity of the deprivation over the four academic years understudy. The base year (2015/16 academic year) recorded the highest for all the indexes across the four-year period. This implies that, in 2015/16, basic schools in Ghana experienced higher deprivation in the fourteen identified resources. In the year under discussion, the intensity as well as the incidence of the lack or inadequacy of these resources were profound. Most of the basic schools had higher teacher-student ratio. This exceeded the prescribed standard set by the Ghana Education Service which is 1:35. The higher number of students might be attributed to the increment in enrolment occasioned by the global target of Education for All by 2015. Since 1995, there has been deliberate target to improve access to basic education in Ghana. This is what

occasioned the introduction of FCUBE and the subsequent introduction of the capitation grant and school feeding programmes. All these interventions were introduced to improve access to basic education. It, however, seems that similar attention was not given to the recruitment of teachers to match the increasing number of students in the basic schools. Again, the increasing level of enrolment also meant that the pupil-desk ratio would also be affected. This simply means that, in the 2015/16 academic year, though all the interventions to ensure an improvement in access to basic education seem to have yielded fruit, the authorities paid less or no attention to the provision of other equally important educational resources needed to ensure the delivery of quality education.

Again, trend analysis for dimensions revealed, under the period of understudy, School Functional Resources (SFRs) which comprised the number of computers, printers, pupil-desk ratio, library books, ICT infrastructure, and textbooks. These are resources needed in the day-to-day teaching and learning process. A higher level of deprivation in these resources can impact the teaching and learning process. It is also important to note that, SFRs have deteriorated over the years implying lesser investment in these resources. According to UNESCO (2017), these resources are key in helping to improve quality teaching and learning. It is therefore not surprising that these were listed as key indicators of quality education for Sustainable Development Goal 4 and when provided can improve the level of deprivation of a basic school.

The next dimension of the MERDI that follows the same trend as the SFRs is School Operational Utilities (SOUs). These are resources not related to direct

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classroom teaching and learning but are needed to ensure the smooth running of the school. It is imperative to note that these resources which comprised the availability of toilet facilities, safe water, access to road, electricity, and the nature or state of the school building. In identifying school resources required to make the school environment conducive to learning UNESCO (2019) and the World Bank (2017) listed these operational utilities as key in terms of access and delivery of quality education hence improving the level of deprivation of a basic school.

The final dimension that recorded the least score in the MERDI and has shown some level of improvement over the four-year period is Human Resources. Human Resources in the MERDI are measured using three indicators. These are Supervisor, Teacher Quality, and Teacher-Pupil ratio. It is important to note that, between 2016 and 2019, there has been massive recruitment of teachers by the Ghana Education Service, which has the tendency to improve the teacher-pupil ratio. SDG 4 projects human resources as a very important dimension in the delivery of education (UNESCO, 2017). This implies that consistent improvement in the human resource dimension has the potential of improving the deprivation status of the basic school. The MERDI consisted of the dimensions and the indicators. In all, fourteen (14) indicators were tracked for the period of four (4) years. These indicators recorded different scores indicating an improvement or deterioration in the said indicator.

Again, in analysing the educational resource deprivation in relation to the type of school, it is evident that school ownership eventually is a determining factor in the extent of deprivation a school experiences. Even though there is a larger

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number of public schools than private schools in the country, it is pretty obvious that private schools stand a little bit taller in terms of availability of educational resources as compared to public basic schools although the latter had a lesser number of schools represented in the study. According to Khatti, Munshi, and Mirza (2010) private schools focuses on improving their input resources which include physical resources, human resource, and other facilities. They do this to ensure that they can attract the needed number of students to meet their operational costs and make the needed profit. The availability of better educational resources in private schools seems to be a determining factor in school choice as postulated by Almani, Soomro and Abro (2012) in their study which found that private schools were believed to be the symbol of better school resources. Again, a study conducted in eighteen (18) countries and fourteen (14) partner economies found out that in general, privately managed schools tend to have better resources and better school climate than publicly managed schools (OECD, 2012) while Rong'uno (2017) revealed that private schools have an edge over their counterparts as they are more organized in terms of pupil enrolment and teaching/learning facilities. All these buttresses the fact that in looking at educational resource deprivation in Ghana, the number of registered private schools captured for the study over the four-year period have relatively good resources as compared to the public basic schools.

Another key area of interest is assessing the extent of deprivation across regions in Ghana. Until 2020, there were ten (10) administrative regions in Ghana, and the analysis revealed the extent of educational resource deprivation across the regions. According to Cooke, Hague, and McKay, (2016), there is a strong

correlation between regional patterns of poverty, the proportion of the population living in urban areas, and the proportion of educationally deprived districts. This implies that the researchers have sought to relate poverty dynamics in a region with the extent of urbanization in that region and how educationally deprived the districts are. The results from the MERDI analysis revealed that on average, the region with a higher MERDI was the Brong Ahafo region, this is followed by Upper West, Eastern, Upper East, and Northern regions. These regions coincidentally have challenges in terms of socio-economic development which seems to confirm the findings of Cooke, Hague, and McKay, (2016). According to Ghana Statistical Service (2015), more than half (15 out of 27) of the districts in the Brong Ahafo region have poverty incidence higher than the regional average. Also, according to Ghana Statistical Service (GSS) (2020) the Brong Ahafo region is multidimensionally poor. In fact, it is the fifth largest region in Ghana and almost 1.44 million MPI poor people reside in the region. This represents 10.2 percent of all the multidimensionally poor people in the country (GSS, 2020). It can be inferred that the extent of poverty in the region which can be traced to different factors such as the inadequate provision of essential services contributed to the extent of educational resource deprivation in the region.

It is worth noting that, the three regions in the north of Ghana (Northern, Upper East, and Upper West) were among the top five (5) regions where deprivation of educational resources is high. According to the National Development Planning Commission (NDPC) (2012), the depth of poverty is still highest in the three northern savannah regions with a poverty gap ratio of

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over 40 percent. This corroborates the assertion by Cooke, Hague, and McKay, (2016) citing a strong correlation between regional patterns of poverty, and the proportion of educationally deprived districts. In this instance, the regions with a higher incidence of poverty in Ghana seem to have serious challenges with the nature, state, and distribution of educational resources. MERDI revealed that, on average, the Upper West is the second region with the highest level of deprivation in terms of educational resources. For instance, according to USAID (2014), 47% of pupils in basic schools in the Upper West region take 21 minutes or more to get to school which is the highest among the ten regions. This relates to the proximity of basic schools to the communities and more importantly access to road. According to Derkong-Dery (2016) 65.5%; 39.6% and 24.1% of the students for the KG, primary and JHSs respectively in the Nandom district in the Upper West lack classrooms for studies or learning in dilapidated structures. Again, classroom-pupil-ratios stood at 1:101; 1:58, and 1:46 for KG, primary and JHSs. Also, the study finding established that the core textbooks in the district were very low with the English Language textbook-pupil-ratio stood 1:8, Mathematics at 1:6, Integrated Science at 1:8, and social studies also standing at 1:8. This finding supports the MERDI for the Upper West region revealing how deprived the region is in terms of educational resources.

On the other hand, two regions that recorded on the average very low MERDI indicating a level of improvement of MERDI during the four-year period are the Greater Accra and the Central regions. With Greater Accra being the capital of Ghana, it is expected most of the basic schools will have the needed educational

resources however, the dynamics in the MERDI for the Central region need attention. According to GSS (2020), there has been an improvement in the socioeconomic status of the people in the region with their poverty levels reducing from 56.9 in 2011 to 47.6 in 2017. This overall improvement might have been reflected in the provision of educational resources in the region. Again, the region is seen mostly as a citadel of education in Ghana with the historical antecedents of education in the region.

Another tangent to explain these regional disparities will be to look at the expenditure patterns by the government toward education. According to Leclercq, Ananga, Kageler, and Danquah (2017) in their education sector analysis of equity in Ghana, regions with the highest incidence of poverty tend to receive lower levels of per-student expenditure. In 2015, per student expenditure by the Government of Ghana at the primary level was particularly low in the Upper West and Northern regions, compared with the Central region. This implies that government seems to spend less per student in regions that technically need more assistance than regions that are relatively doing well in terms of their socioeconomic status. It also connotes that; more educational resources are pushed to regions that already have them as compared to regions that do not have them at all. This corroborates the discrepancies in the extent of educational resource deprivation between a region like the Upper West and Central.

Furthermore, an attempt to track the changes in the MERDI over time suggests that the improvement in the deprivation index spread from 2015/16 to the 2017/18 academic year. These periods seem to have witnessed a level of increase

in the distribution of educational resources in the basic schools. According to Leclercq et. al. (2017) government's education expenditure favours higher levels of education as compared to the lower level. This is supported by the fact that; the allocation of education sector expenditure has declined from 55% in 2008 to 37% in 2018. This is a reduction of over 18% while secondary education has seen a surge in its expenditure from 9.8% in 2008 to 25% in 2018, an increase of 15% (Ministry of Education, 2018). This implies that, over the years, the commitment by governments to improve the resources at the basic education level has declined to render most of our basic schools deprived. These resources have found themselves in other levels of education, particularly secondary education.

Research Objective 2: Evaluate the relative performance of each of the domains and indicators of the MERDI.

The IPMA can also be described as a priority index. It technically helps the researcher to ascertain which dimensions and indicators have high performance in relation to the target variable. In this study, it was established that School Functional Resources were the most important and high-performing dimension. This was followed by Human Resources which was of higher importance but relatively low performance as compared to School Operational Utilities. Again, in terms of the indicators, Textbooks had the highest level of importance but lagged in their performance as compared to all the other indicators in the SFR domain. Other indicators of high performance include the number of computers and pupil-desk ratio. It was evident that both the dimensions and the indicators founds themselves either in the first or third quadrants.

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The implication of the results from the IPMA is that, in the quest to reduce the score of the MERDI, managers of our educational system need to pay attention to key dimensions and indicators used in the index. It is possible that by improving the number of textbooks in a particular basic school, proving them with qualified teachers, and improving the teacher-pupil ratio, the deprivation score of the basic school will reduce. This finding is in sync with the views of Holmlund et al., (2008), Levačić et al., (2006), and Jenkins et al., (2007) who indicated that the provision of school resources such as qualified teachers and learning materials has the potential of reducing the deprivation status of students and by extension schools. Specifically, Brugeilles and Cromer (2009) have illustrated how the provision of textbooks could serve as a booster for disadvantaged students in a country. To them, the important role of textbooks in the overall academic achievement of pupils requires that they are made available more to the disadvantaged and less privileged in society.

Research Objective 3a: Examine the effect of the availability of educational resources on access to basic education.

Access to education is very important in achieving both the global target of SDG4 and the Education Strategic Plan (2018 – 2030) for Ghana. Access to education does not only mean identifying the barriers but also providing the needed resources to eliminate the identified barriers. The study identified twelve (12) variables that affect access to basic education in Ghana based on empirical data. However, only six (6) variables were statistically significant after the analysis.

First of all, the study revealed that there is a positive significant relationship between the availability of library books and access to basic education. Library books are reference materials that students and teachers use for teaching and learning. In any educational system, these library books are key especially at the basic level to enable students to cultivate the attitude of reading and researching at an early age. Adeogun and Osifila (2008) and Akisanya (2010) are of the view that learning materials especially books play a role in improving access to basic education. That is in terms of school choice, it is evident that to increase enrolment in basic schools, more reading materials should be made available.

Also, the availability of ICT infrastructure which was measured by the variable "access to internet" has a positive significant relationship with access to basic education. The current trends in global education suggest that ICT tools for education should be prioritised. The study revealed that providing ICT infrastructure in basic schools can increase enrolment by over 100 percent. Proving ICT infrastructure which is one of the indicators of quality education according to UNESCO (2018) has the tendency to attract pupils to school and its efficient usage can lead to improved retention and reduce absenteeism. Again, integrating ICT into teaching and learning makes the class lively and interactive. In relation to textbooks, the results show a positive significant relationship between the availability of textbooks and access to basic education. Textbooks just like library books are an integral part of the teaching and learning process. The absence of these textbooks might imply abysmal teaching and learning in any school. Parents and pupils will tend not to want to access these basic schools that lack such an important

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variable in the arsenals of quality education. Adeogun and Osifila (2008) in identifying material resources that improve access to basic education mentioned textbooks.

The safety of pupils is key not only to parents but also to the community. The study revealed that the nature of school buildings is essential in improving access to education. Anlimachie (2016) investigated the contextual factors for the rural-urban inequities to access and quality of basic education in Ghana. The findings revealed that access to basic education in Ghana is skewed in favour of urban Ghana citing the quality nature of educational infrastructure in these urban centers. Also, Miller (2015) cites school building as one of the key variables that can affect enrolment. These results are obvious since the safety of the school environment is a key component according to the World Bank (2017). They opine that school buildings should be a haven for teachers and students. The indirect implication of the poor nature of school buildings is the fact that such schools lack teachers and other important resources making it unattractive for pupils to enroll.

Furthermore, supervision which was anticipated to have a positive relationship with enrolment rather had an inverse relationship with access. The result indicates that a school deprived of supervision has increased levels of enrolment. School supervision is carried out to ensure that schools stick to the standards set by the education authorities. In Ghana, basic schools are supposed to have a teacher-pupil ratio of 1:35. This if strictly applied would mean that schools with a lesser number of teachers would have to reduce their enrolment to meet this standard. It is therefore revealing that schools, where supervision is lacking, seem

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to have higher levels of enrolment as compared to schools with intense supervision. The thought that intense supervision might impede access should be looked at from the perspectives of improving quality standards and providing the needed resources to help improve access. For instance, schools the National School Inspectorate Authority (NaSIA) in a 2021 publication has listed some schools that need urgent attention in terms of the nature of their school building. In that report NaSIA (2021; p.9):

"Although out of the thousand (1000) schools inspected, **75.6% (756)** operate in structures made of cement blocks (Figure 4.9), most of the structures were found to be in various stages of deterioration and were not conducive for teaching and learning. However, **19.5% (195)** of schools inspected have mixed structures made of some form of cement block, mud, wooden, tent, or under a tree (Figure 4.10). Thirty-one **(3.1%)** schools were entirely made of mud structures, **6 (0.6%)** schools were entirely made of wooden structures, **2 (0.2%) operated** fully under trees and **1 (0.1%)** school operate in a tent. The remaining **9 (0.9%)** schools operate under either thatched shed, open pavilion, or dwarf wall buildings."

These results implied that these basic schools should be closed down due to the danger they posed to teachers and students, applying the standards in this light impedes access to basic education which is technically called an infrastructural barrier to accessing education.

Finally, the model assessed the effect of the payment of capitation grant on improving access to basic education. A positive relationship implies that an

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improvement in the amount of capitation grant increases the level of enrolment. The financial barrier is one of the foremost barriers to access to education. It is evident in the view of Edward and Armah-Attoh (2010), that one of the main reasons why children did not attend school in Ghana was that their parents could not afford to pay the levies charged by the schools. According to Hunt (2008), poverty interacts with other points of social disadvantage to further increase the likelihood of vulnerable children dropping out of school. In the view of Osei-Fosu (2011) the capitation grant caused an instantaneous increase in enrollment because it brought a one-time sharp increase. This position was corroborated by Pajibo and Tamanja (2017) who found that the capitation grant was very relevant and has led to an increase in enrolment in basic schools. This cements the important role of the payment of capitation grant to improving access and achieving universal basic education for all in Ghana.

Research Objective 3b: determine the influence of educational resource distribution on quality education in basic schools in Ghana.

The essence of pushing for the equitable provision and distribution of educational resources in the country at the basic level is to ensure that each basic school is equipped with the needed inputs for achieving quality outputs. These educational resources play an enormous role in ensuring that quality education is delivered to the pupils. Essentially, the study modeled a relationship between quality basic education measured by performance in BECE and thirteen (13)

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independent variables. The analysis revealed that seven (7) variables were significant in influencing quality education.

The first variable that had an inverse relationship with QBE was enrolment. The study revealed that quality education reduces as enrolment increases. Enrolment pertains to the number of pupils in the school and by extension in each classroom. Anti Partey and Obeng (2015) found out that class size affects students' performance. They intimated that the larger the class the more difficulty the teacher faces in implementing student-centered teaching skills that positively influence the teaching and learning process resulting in better understanding and improved learning outcomes. This is supported by the views of Frempong (2011) who also observed that overcrowded classes were one of the key factors that accounted for the poor academic performance of students in schools. This implies that increasing enrolment in basic schools without the corresponding improvement in other educational resources will go a long way to compromise the delivery of quality basic education. Another factor that positively affects quality education at the basic level is the availability of library facilities. Willimas. (2000) indicated that several empirical studies done in developing countries concerning school facilities (Latin America), found that children whose schools had an inadequate library returned significantly lower test scores and higher-grade repetition than those whose schools were well equipped. Again, Nzabihimana (2010) on the nature of schools and academic performance of pupils in primary schools in the Gasabo District revealed that the lack of basic school facilities such as the library in public schools accounted for the poor-quality learning of students. In Tanzania, Tety (2016) noticed that

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instructional materials have an impact on academic performance. Awolaju (2016), Olayinka (2016), and Adipo (2015) also found that students who are taught with instructional materials in Nigeria perform better than students taught without instructional materials. Similarly, Krukru (2015) found that in Nigeria, instructional materials have a significant impact on academic performance. Students who are taught with instructional materials perform better than students taught without instructional materials (Adalikwu & Lorkpilgh, 2013). These findings buttress the view that library facilities are important in the education of the child. In a system where reading and comprehension are a challenge, it is worthwhile to provide the needed library resources in schools to improve the overall performance of students.

More so, the Teacher-Pupil ratio also has a weak negative correlation with quality basic education which implies that a school deprived in the teacher-pupil ratio will have quality education decline as compared to a school not deprived in the teacher-pupil ratio. This pertains to schools where enrolment is high with a lesser number of teachers. Various studies have found a positive effect of a lower teacher-pupil ratio on academic performance. For instance, A study by Waita (2012) on the pupil-teacher ratio and its impact on academic performance in public primary schools in Kenya found that the Pupil-Teacher Ratio has a statistically significant effect on pupils' performance in primary schools. The study showed that as PTR increases, average test scores in primary schools decrease. Likewise, a study by David (2014) in Sumbawanga District Tanzania found that one of the factors influencing students' academic performance is the low number of teachers to students ratio, especially in public schools. The teacher-student ratio stands at an

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average of 52:1 and as high as 72:1. UNESCO (2006) cited in Mulei et al (2016) found the same problem exists in Mozambique where the study found teacher shortages with an STR of 67.4:1. Raychaudchuri et al. (2010) said that a low teacher-pupil ratio has a positive influence on the academic performance of students than those schools that have a high pupil-teacher ratio. According to Ajani and Akinyele (2014), there is a significant relationship between teacher to students ratio and a student's performance in Mathematics. The import of these empirical findings is that, in basic schools where there are enough teachers to attend to the needs of each student, there is a higher tendency to see an improvement in the academic performance of the students in that school.

However, it is imperative to state that, the focus is not just on the presence of just any teacher but rather on a qualified professional teacher. This study again found that the availability of professional teachers in a basic school is estimated to have a positive impact on the delivery of quality education in the school. Professional teachers are those who have gone through training in both pedagogy and content and have been certified to teach at a certain level of education in the country. These teachers technically understand student psychology, are equipped with pedagogical content knowledge, and hence know how to handle the classroom environment and bring out the best in the student. International education organisations such as UNESCO and UNICEF (2012), have indicated that low teacher qualifications accounted for the low quality of education in Sub-Saharan Africa. Etsey (2005) noted that teacher qualification is an important factor that determines quality education delivery. These are clear indications that one cannot

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compromise on the quality of teachers when it comes to the delivery of quality education.

Also, there is a weak positive relationship between quality basic education and school building, a school with a good school building will have an improved quality education. Vandiver (2011) found that students in classrooms with large windows, natural lighting, and well-designed skylights performed 19% to 26% better than their peers in classrooms without these features. This is because a conducive classroom environment tends to have a psychological effect on both the teachers and the students. According to Korir and Kipkemboi (2014), a healthy learning environment or a learner-friendly environment contributes to quality learning and high academic achievements of students in schools. Barry (2013) also noted that students' academic performance and success in education are influenced by the kind of school that they attend. In talking about the kind of school, the focus was on the nature of the school building and the whole school environment. Abudu and Fuseini (2013) noted that school infrastructure, furniture, and material resources are key factors for promoting quality education and academic performance in basic schools.

Nzabihimana (2010) on the nature of schools and academic performance of pupils in primary schools in the Gasabo District revealed that lack of basic school facilities such as classrooms, furniture, library, and toilet and urinal facilities in public schools accounted for the poor-quality learning of students. Korir et al. (2014) argued that school factors such as the school structure, school composition, and school climate are some of the main factors that influence students' academic

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performance in schools. Ramatu (2014) who conducted her study in Tamale on the effects of school infrastructure on the academic performance of students also realise that school facilities such as classrooms, water, and toilet facilities are very crucial for improving the quality of education and academic performance of students.

Finally, the study revealed a strong positive correlation between supervision and quality basic education. The study found that school supervision plays a key role in improving quality education in basic schools. This position is confirmed by Fullan (2001) who contends that the quality of leadership matters in determining the motivation of teachers and the quality of their teaching, which subsequently affects student performance. Also, according to Atey and Arthur (2013), low school supervision and monitoring and lack of support from school managers affect the academic performance of students in schools. King (2013) explained that poor school supervision of teachers shackles the academic performance of students in schools. Shafiwu et al. (2013) noted that lack of teacher supervision and close monitoring build up the poor professional attitude and behaviour of teachers in schools. The fact is, supervision ensures that standards are not compromised and everything is done in a way to improve the learning environment, support the teacher and help improve learning outcomes.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Introduction

This chapter presents the summary, conclusion, and recommendation for policy and practice. The summary of the work is presented in two steps; first, there is a summary of the purpose and focus of the research which is followed by a summary of the research process. Then, there is a presentation of the striking findings of the study. The chapter further presents the conclusions drawn from the findings of the study and proceeds to present recommendations for policy and practice.

Summary

The quest of policymakers in the education sector to achieve the global target of SDG4 and the subsequent development of the Education Strategic Plan (2018 – 2030) demands that innovative measures are employed to leapfrog as we seek to implement measures targeted at achieving quality and accessible basic education. The study hinged on three objectives:

1. profile the extent of educational resource deprivation (distribution) in Ghana.

2. evaluate the relative performance of each of the domains and indicators of the MERDI.

3.   a.   examine the impact of the availability of educational resources on access to basic education.

b. determine the influence of educational resource distribution on quality education in basic schools in Ghana.

The study was situated in the theoretical lenses of the human capital theory, the theory of cultural capital, and the systems theory of input and output. The positivist paradigm formed the methodological backbone of this study out of which the ex-post facto design was employed. The unit of measurement is the basic school. The study used data from the Annual School Census Survey for four academic years (2015/16 to 2018/19) as well as the BECE performance of basic schools captured under the survey. The Alkire-Foster Method was used to develop the Multidimensional Educational Resource Deprivation Index (MERDI) which comes with the capacity to determine both the incidence and intensity of the deprivation about a basic school. The MERDI is made up of three-dimension and 14 indicators. Also, an Importance-Performance Map Analysis was carried out to ascertain the constructs and indicators that need to be prioritised within the MERDI, and panel data analysis was used to determine the impact of selected indicators on access and quality of basic education.

Summary of Findings

The study revealed that:

1. the extent of educational resource deprivation in basic schools is improved from 45.1% in the 2015/16 academic year to 36.4% in 2018/19. During the four academic years, there was a considerable improvement in providing resources for basic schools in the country, however, the 2018/19 academic saw a worsening of the MERDI resulting in further deteriorating the

incidence and intensity across the country. That is, there was a changed in incidence from 83.6% in 2015/16 to 77.9% in 2018/19 while the severity of the deprivation changed from 49.6% in 2015/16 to 46.7% in 2018/19.

2. registered private basic schools have improved educational resources as compared to public basic schools.

3. the deprivation in the education resources across regions is severe in the Brong Ahafo, Northern, Upper West, Upper East, and Eastern regions while Greater Accra and Central regions scored better in the MERDI.

4. School Functional Resources is the most important dimension/construct/domain within the MERDI system. It also recorded the highest performance indicating a high level of influence on the MERDI.

5. Textbooks (SFR6) and Library books (SFR4) for SFR, Teacher-Pupil Ratio (HR3), and Teacher Quality (HR2) for HR depict higher performance in influencing the MERDI.

6. access to basic education in Ghana is influenced by the availability of library books, availability of ICT infrastructure, textbooks, nature school buildings, supervision, and payment of capitation grants.

7. quality basic education as evident in performance in BECE is determined by the level of enrolment, availability of library facilities and ICT infrastructure, nature of school building, supervision, teacher-pupil ratio, and availability of professional teachers.

Conclusions

Basic education is an important level of education in Ghana. For a student to excel very well in his or her education, the foundation which is the basic level is key. As a country, we have set for ourselves the target of improving quality teaching and learning and extending the same to all schools in the country by 2030. These targets cannot be realized with the current level of educational resource deprivation. The profile of education resources in our basic schools using the MERDI indicates that basic schools in Ghana are deteriorating in terms of specific indicators (as approved by SDG4). The deterioration seems to align with the poverty regions indicating that the provision of educational resources seems to be concentrated in regions which are have seen some level of improvement in terms of infrastructure and urbanization. Again, to reduce the extent of deprivation in our basic school system, priority should be given to the provision of textbooks and the deployment of qualified teachers. It is instructive to note that, the extent of deprivation of a basic school goes a long way to affecting access and quality of basic education. It can be concluded therefore that the realization of both SDG4 and ESP (2018 – 2030) depends on the ability of the managers of our education to ensure that deprived basic schools are given the needed attention and provided with the needed resources.

Recommendations

Based on the findings of the study, the following recommendations are made.

1. The Ministry of Education should adopt the MERDI as the mother index in the classification of basic schools as deprived or not deprived. The adoption

and usage of the index will imply a shift from the use of school location as a cardinal variable in determining whether a school is deprived or not. It should be integrated into their data management system to inform policy decisions at the basic level.

2. The Ghana Education Service should institute a policy of model basic schools and an affiliate system to in the immediate to short term link deprived basic schools to non-deprived basic schools to enable them to access some of the educational resources needed. There can also be a collaboration between private and public basic schools in the same area to learn from each other in terms of best practices.

3. The Ministry of Education should as a matter of urgency apply the principle of equity in the allocation of education expenditure. First of all, within the education sector, there should be a rationalization of education budget allocation to ensure that, the basic level receives the needed budgetary allocation in the attempt to improve the deprivation index.

4. The regional disparities in the education sector imply that the Ministry of Education adopts a **Quasi-Decentralisation Policy and Deprived Basic Schools Policy** in the distribution of educational resources. Regions and districts after applying the MERDI and noting the extent of educational resource deprivations in their area can qualify for special budgetary support which will be designated for improving resources in deprived basic schools. The regions and districts can also use Internally Generated Funds (IGFs) to support basic schools that will be classified as deprived under the MERDI.

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5. The Ghana Education Service should prioritise the deployment of quality teachers and the distribution of textbooks and other reading materials. This should be done to ensure that indicators that help in reducing the MERDI are given the needed attention.

6. To improve access to basic education, the Government of Ghana should increase the capitation every academic year to reflect the extent of deprivation in a basic school.

7. To achieve quality outcomes, the Ministry of Education and the Ghana Education Service as well as Non-Governmental Organisations in the education sector should provide library facilities and ICT infrastructure, improve the nature of school buildings, teacher-pupil ratio, and availability of professional teachers.

8. The National School Inspectorate Authority (NaSIA) should ensure that basic schools in the country both private and public meet the set standards required for operation. By paying attention to the fourteen indicators of the MERDI, NaSIA through their supervision would be helping in improving the quality of education provided in the basic schools in the country.

Areas for Further Research

Educational researchers need to apply the MERDI at other levels of education, specifically, the secondary and tertiary levels. Again, an extensive district-level analysis could be carried out to ascertain the extent of deprivation of educational resources at the district level. Finally, other countries can apply the

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MERDI to their unique circumstance to identify the extent of educational resource

deprivation in their country.

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APPENDICES

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APPENDIX 1A

MULTIDIMENSIONAL EDUCATIONAL RESOURCE DEPRIVATION

BY REGIONS (2015/16)

Region	MERDI		Incidence (%)		Intensity (%)	
	Value	CI	Value	CI	Value	CI
Ashanti	0.344	.328 - .359	73.9	70.8 – 76.9	46.5	45.8 – 47.2
Brong Ahafo	0.426	.407 - .445	89	85.6 – 92.3	47.8	46.8 – 48.9
Central	0.33	.312 - .348	73.5	69.8 – 77.1	44.9	44.1 – 45.8
Eastern	0.384	.358 - .409	81.7	76.8 – 86.6	47	45.7 – 48.3
Greater Accra	0.292	.251 - .334	64.9	56.1 – 73.7	45	43 – 47.1
Northern	0.376	.345 - .406	77.1	71.3 – 82.8	48.7	47.2 – 50.2
Upper East	0.407	.381 - .433	85.2	80.3 – 90	47.8	46.4 – 49.2
Upper West	0.399	.332 - .466	88	75 – 101	45.3	41.7 – 48.9
Volta	0.374	.348 - .400	82.1	77 – 87.1	45.6	44.2 – 46.9
Western	0.327	.303 - .352	70.8	65.8 – 75.8	46.2	45 – 47.5

Source: Annual School Census Data, 2015/16

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APPENDIX 1B

MULTIDIMENSIONAL EDUCATIONAL RESOURCE DEPRIVATION

BY REGIONS (2016/17)

Region	MERDI Value	MERDI CI	Incidence (%) Value	Incidence (%) CI	Intensity (%) Value	Intensity (%) CI
Ashanti	0.375	.368 - .382	79	77.7 – 80.3	47.5	47.1 – 47.8
Brong Ahafo	0.425	.416 - .434	85.7	84.1 – 87.3	49.6	49.1 – 50.1
Central	0.333	.323 - .344	70	68 – 72	47.6	47 – 48.1
Eastern	0.405	.396 - .413	82.2	80.6 – 83.7	49.3	48.8 – 49.7
Greater Accra	0.365	.354 - .375	73.4	71.4 – 75.4	49.7	49.1 – 50.3
Northern	0.359	.349 - .368	76.8	74.8 – 78.7	46.7	46.2 – 47.2
Upper East	0.358	.346 - .371	76.9	74.5 – 79.3	46.6	45.9 – 47.2
Upper West	0.374	.359 - .390	78.1	75.1 – 81	48	47.1 – 48.8
Volta	0.348	.338 - .359	74.2	72.1 – 76.2	47	46.4 – 47.5
Western	0.396	.387 - .405	81.8	80 – 83.5	48.4	47.9 – 48.9

Source: Annual School Census Data, 2016/17

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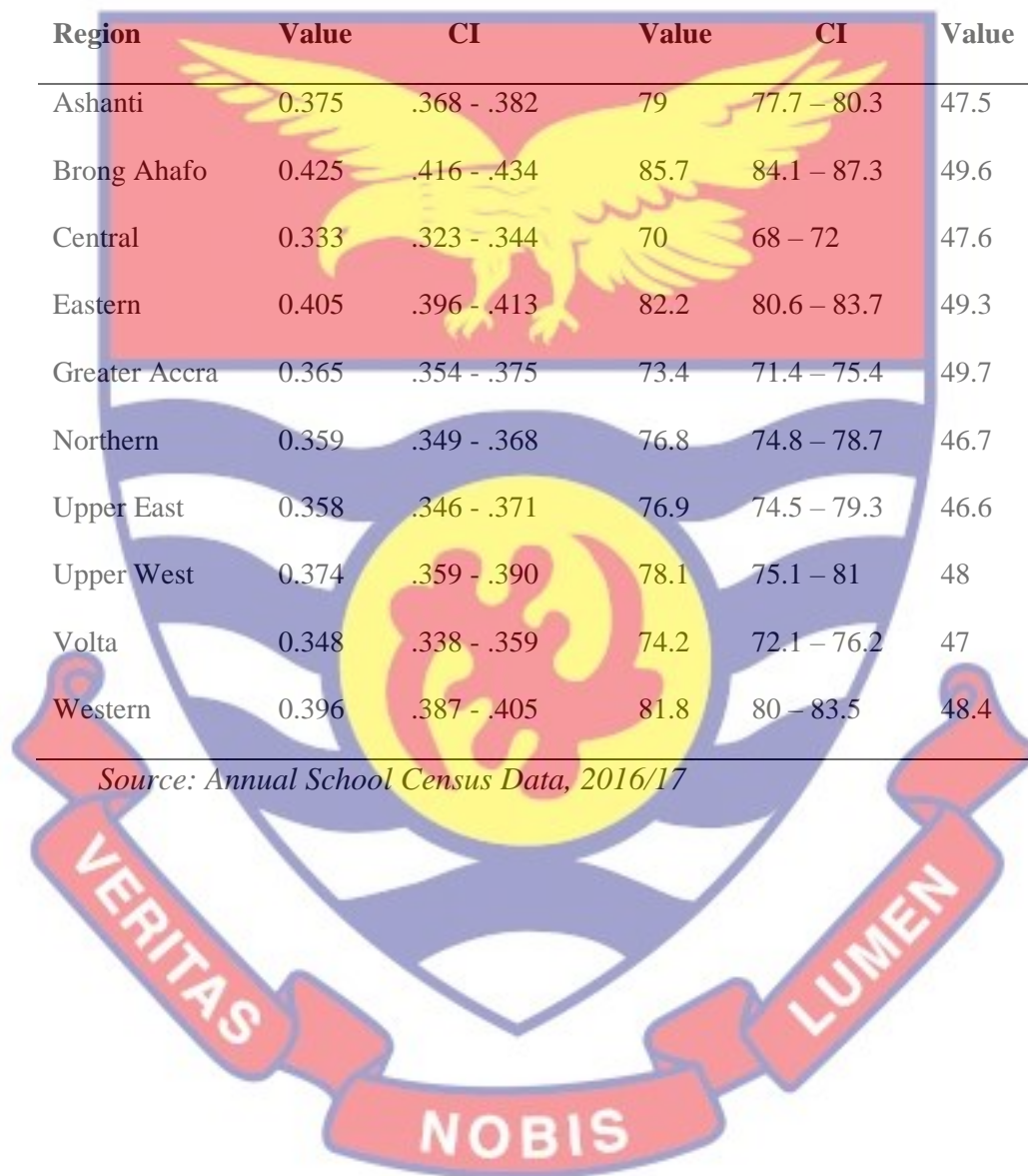
APPENDIX 1C

MULTIDIMENSIONAL EDUCATIONAL RESOURCE DEPRIVATION

BY REGIONS (2017/18)

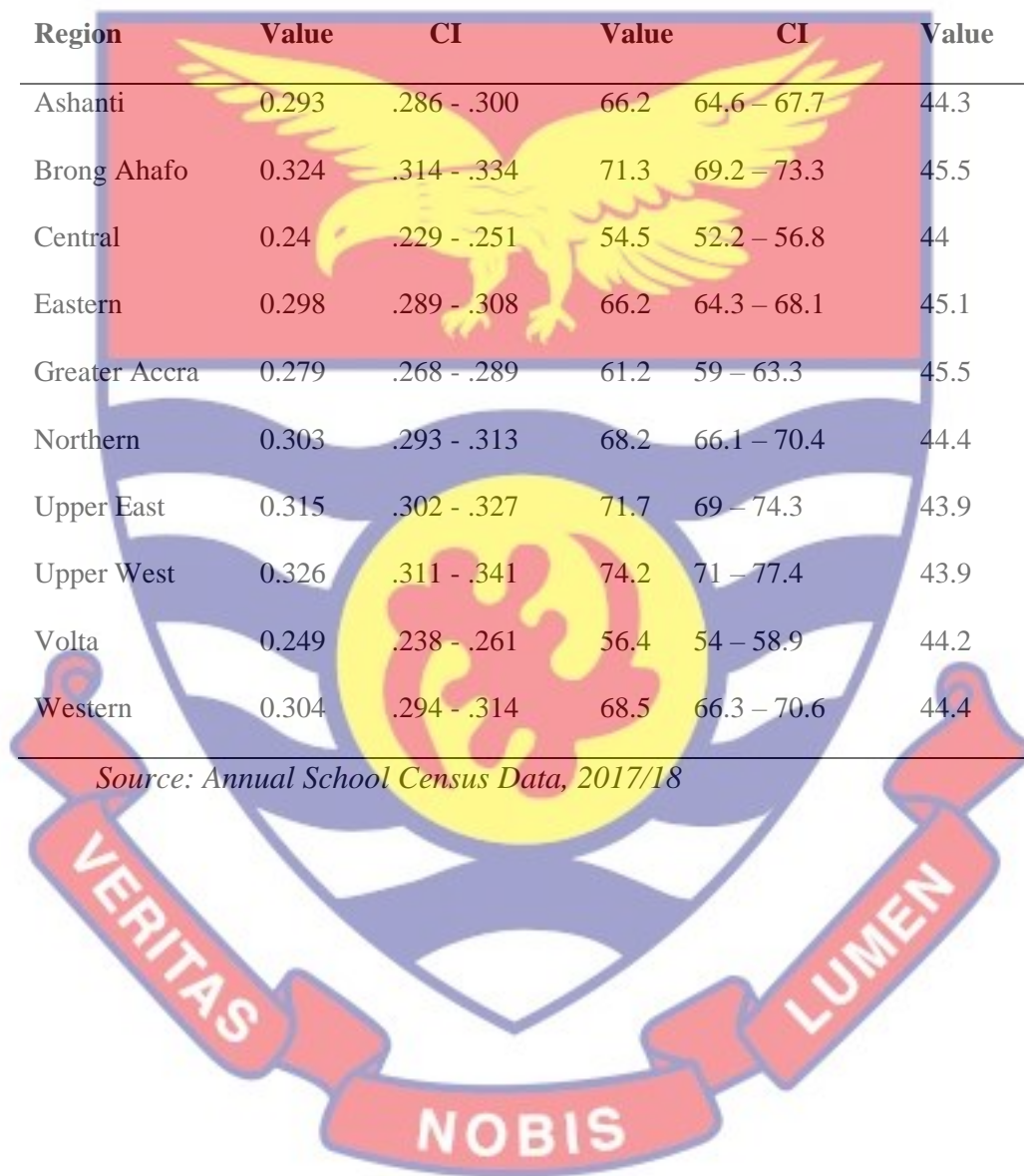| Region	MERDI		Incidence (%)		Intensity (%)	
	Value	CI	Value	CI	Value	CI
Ashanti	0.293	.286 - .300	66.2	64.6 – 67.7	44.3	44 – 44.7
Brong Ahafo	0.324	.314 - .334	71.3	69.2 – 73.3	45.5	45 – 46
Central	0.24	.229 - .251	54.5	52.2 – 56.8	44	43.5 – 44.6
Eastern	0.298	.289 - .308	66.2	64.3 – 68.1	45.1	44.6 – 45.5
Greater Accra	0.279	.268 - .289	61.2	59 – 63.3	45.5	45 – 46
Northern	0.303	.293 - .313	68.2	66.1 – 70.4	44.4	43.9 – 44.8
Upper East	0.315	.302 - .327	71.7	69 – 74.3	43.9	43.3 – 44.6
Upper West	0.326	.311 - .341	74.2	71 – 77.4	43.9	43.2 – 44.6
Volta	0.249	.238 - .261	56.4	54 – 58.9	44.2	43.6 – 44.7
Western	0.304	.294 - .314	68.5	66.3 – 70.6	44.4	43.9 – 44.8

Source: Annual School Census Data, 2017/18

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APPENDIX 1D

MULTIDIMENSIONAL EDUCATIONAL RESOURCE DEPRIVATION

BY REGIONS (2018/19)

Region	MERDI Value	MERDI CI	Incidence (%) Value	Incidence (%) CI	Intensity (%) Value	Intensity (%) CI
Ashanti	0.356	.349 - .364	77	75.5 – 78.5	46.3	45.9 – 46.7
Brong Ahafo	0.401	.391 - .412	82.5	80.6 – 84.4	48.6	48.1 – 49.2
Central	0.325	.313 - .336	71.3	68.8 – 73.7	45.6	44.9 – 46.2
Eastern	0.378	.369 - .388	79.7	77.8 – 81.5	47.5	47 – 48
Greater Accra	0.274	.258 - .290	60.7	57.3 – 64	45.2	44.4 – 45.9
Northern	0.372	.362 - .382	81.1	79 – 83.1	45.9	45.4 – 46.4
Upper East	0.377	.363 - .390	82.2	79.5 – 84.9	45.8	45.1 – 46.5
Upper West	0.391	.374 - .408	81.3	78.1 – 84.6	48.1	47.1 – 49
Volta	0.359	.347 - .370	77.2	75 – 79.5	46.5	45.9 – 47.1
Western	0.386	.376 - .396	82	80.1 – 84	47	46.5 – 47.6

Source: Annual School Census Data, 2018/19

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APPENDIX 2A

RANDOM EFFECT REGRESSION RESULT

Variable	Coef.	Std. Err.	z	p> |z|	95%	Conf. Interval
PT	.441	.218	2.02	.043	.013	.869
LB	-.000	.002	-.07	.942	-.003	.003
Pr	.037	.239	.16	.876	-.432	.507
Comp	.048	.026	1.83	.067	-.003	.100
ICT	6.430	2.913	2.21	.027	.722	12.139
Tbk	.931	.006	163.20	.000	.920	.942
Toi	-8.632	3.197	-2.70	.007	-14.898	-2.366
Wat	-.321	2.198	-.15	.884	-4.628	3.987
SB	7.264	2.791	2.60	.009	1.794	12.735
Sup	-.161	.113	-14.24	.000	-.183	-.139
TPR	.675	2.570	.26	.793	-4.363	5.712
CapG	-.137	1.046	-.13	.896	-2.187	1.912
Constant	32.752	4.741	6.91	.000	23.459	42.045
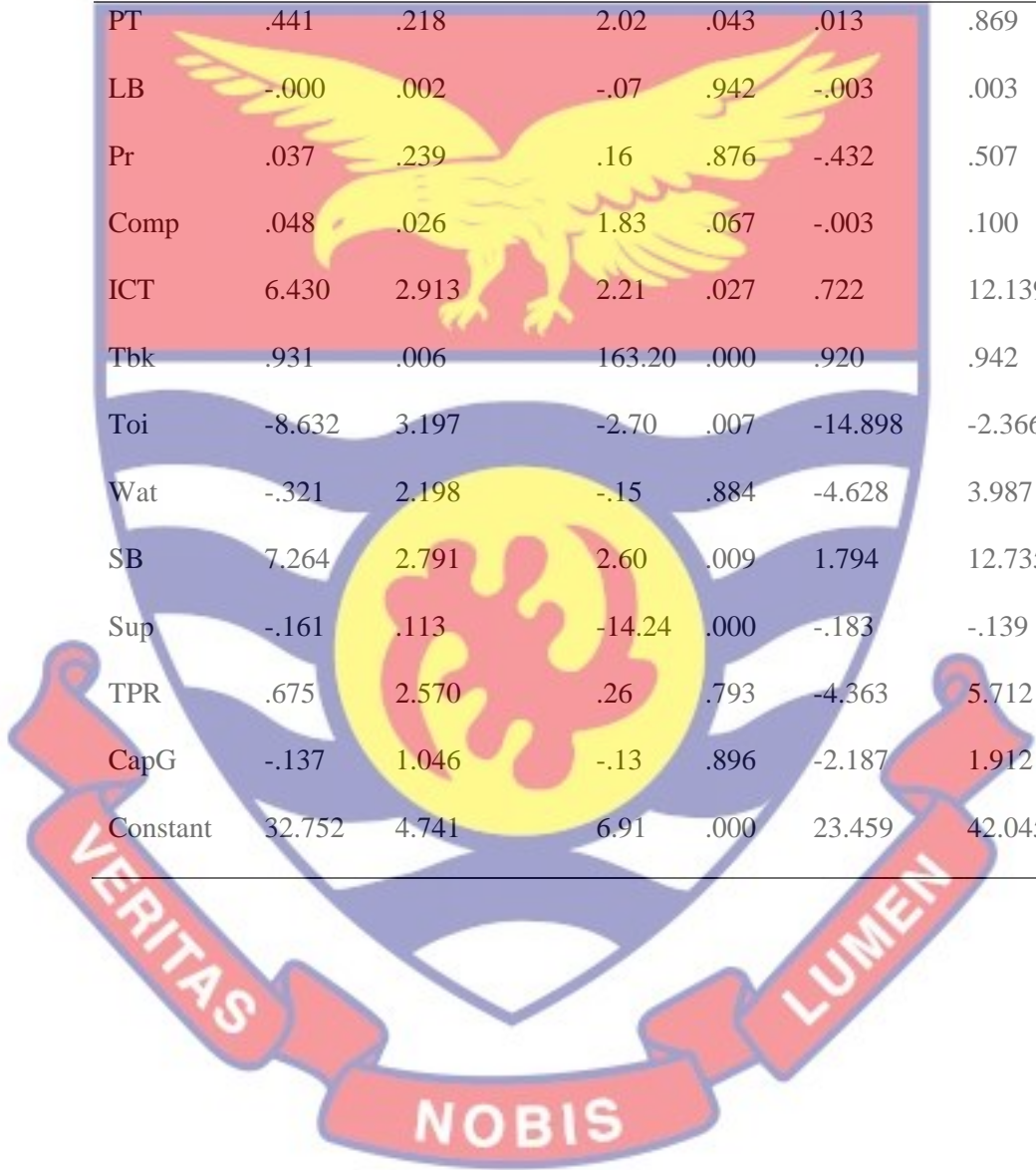
APPENDIX 2B

RANDOM EFFECT REGRESSION

QBE	Coef.	Std. Err.	z	p> |z|	95%	Conf. Interval
Enr	-.002	.000	-6.07	0.000	-.003	-.001
PT	.435	.008	55.59	0.000	.420	.451
LB	.001	.000	17.33	0.000	.001	.001
Pr	.030	.009	3.32	0.001	.012	.048
Comp	.001	.001	1.27	0.205	-.001	.002
ICT	.729	.102	-7.17	0.000	-.928	-.530
Tbk	.000	.000	0.51	0.608	-.001	.001
Toi	-1.153	.114	-10.08	0.000	-1.377	-.929
Wat	-.454	.074	-6.11	0.000	-.600	-.309
SB	1.576	.097	16.26	0.000	1.386	1.766
Sup	.026	.000	61.63	0.000	.025	.027
TPR	.412	.088	4.67	0.000	.239	.586
CapG	-1.019	.037	-27.28	0.000	-1.093	-.946
Constant	8.645	.174	49.78	0.000	8.305	8.986

APPENDIX C

QUALITY CRITERIA

Importance-Performance Map [MERDI] (constructs, unstandardized effects)

Construct Total Effects
for [MERDI]

	MERDI
Human Resources	0.132
School Functional Resources	0.770
School Operating Utilities	0.115

Construct Performances
for [MERDI]

	Performances
Human Resources	80.716
School Functional Resources	90.741
School Operating Utilities	82.206

MV Performances

	MV Performances

HR1		84.076
HR2		76.793
HR3		81.092
MERDI		85.210
SFR1		93.235
SFR2		92.213
SFR3		91.303
SFR4		90.224
SFR5		92.269
SFR6		85.994
SOU1		80.812
SOU2		81.723
SOU3		87.269
SOU4		76.232
SOU5		82.829