# EMBEDDING SUSTAINABLE DEVELOPMENT IN TEACHER EDUCATION
# IN THE CENTRAL REGION OF GHANA

Richard Opoku Agyemang
February 2020

Thesis submitted in partial fulfilment of
MS Environment and Natural Resources degree

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Faculty of Education and Diversity

UNIVERSITY OF ICELAND
SCHOOL OF EDUCATION

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**Supervisor**
Allyson Macdonald

**Specialist**
Anna Guðrún Edvarsdóttir

**Examiner**
Auður Pálsdóttir

Faculty of Education and Diversity

School of Education, University of Iceland

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# Preface

Writing is not an innocent task. It is demanding, yet enjoyable. In this endeavour, I was fortunate to have met some key personalities to call on when I needed advice. Indeed, these persons, whether being supervisors, mentors or teachers in the Environment and Natural Resources (ENR) programme, their contributions and suggestions cannot go unappreciated.

First and foremost, I am grateful to Allyson Macdonald. Allyson is the first teacher within the ENR programme that I got in touch with when I arrived in Iceland. Since that first day at the Sustainability and Leadership class, she has come to be the hand that guided me throughout my sustainability education journey. She gave me confidence, kept me focused, encouraged and motivated me to make my own decisions regarding what I wanted to do as far as this final project was concerned. I am truly indebted to her for the invaluable skills and knowledge that I have acquired, and which will be vital in my chosen career. Thank you very much for providing me the opportunity to learn from you.

I would also like to express my deepest appreciation to my mentor, Lára Jóhannsdóttir of the ENR programme. I am appreciative of the guidance. Thank you Lára.

I am equally grateful to all the research participants who granted me audience and contributed immensely to this project by way of sharing experiences in Ghanaian education.

Finally, to my wife, Mavis Owusu-Afriyie. The plight of Mavis and her teacher colleagues at the cluster of schools in Biemso No. 1 inspired me to take up the challenge to research into how to turn to become sustainability-oriented. Thank you, Mavis, for being there for me through these ups and downs.

This thesis was written solely by me, the undersigned. I have read and understand the University of Iceland Code of Ethics (https://english.hi.is/university/university_of_iceland_code_of_ethics) and have followed them to the best of my knowledge. I have correctly cited to all other works or previous work of my own, including, but not limited to, written works, figures, data or tables. I thank all who have worked with me and take full responsibility for any mistakes contained in this work. Signed:

Reykjavik, 20-02-2020

___Richard Opoku Agyemang___

# Abstract

Policy practitioners have acknowledged the imperative of reshaping education. Despite the campaign on the need to embed sustainability principles in education, there still exist gaps in studies which investigate teacher educators embedding the principles, knowledge and values of sustainability in their work.

The study begins with an investigation on how teacher educators in three Colleges in the Central Region of Ghana integrate the principles, knowledge and values of sustainability. It investigated transformative pedagogies that teacher educators rely on when working with students on sustainability concepts. Furthermore, it examined the drivers facilitating sustainability education and the impediments confronting approaches that teacher educators employed in implementing sustainability models.

A qualitative case study was adopted, relying on data from interviews and focus group interviews. Semi-structured interviews with 30 teacher educators from the colleges were conducted. Three focus group interviews of teacher educators, principals and personnel from the education directorates were conducted to seek their views on sustainability education.

Findings show teacher educators make minimum effort in embedding sustainability concerns in their work. Local sustainability initiatives, small-scale action research, multi-level collaborations and project-based pedagogy were used in embedding sustainability concepts in teaching. The lack of visionary sustainability leadership, overburdened curriculum, low financial capacity and lack of incentives are school-based impediments to sustainability in the colleges. Insufficient mainstreaming process of national actions on sustainability education, low community awareness, inappropriate institutional structures and resources unavailability inhibit any action towards embedding of sustainability at governmental and municipal education levels.

Education policy actors in the region, curriculum practitioners, leadership in teacher institutions and teacher educators will benefit from the study as it will influence their thoughts on policy and actions on sustainability.

Finally, this study adds to the discourse on sustainable development and the literature on sustainability education as it provides pedagogies that are essential in embedding sustainability matters in education.

# Ágrip

Stefnumótunaraðilar hafa gert sér grein fyrir mikilvægi þess að endurmóta menntun. Þrátt fyrir nauðsyn þess að fella meginþætti sjálfbærni inn í hefðbundið nám, er ekki mikið um rannsóknir á því hvernig meginreglur, þekking og gildi sjálfbærni eru hluti af kennaramenntun.

Rannsóknin hefst með könnun á því hvernig kennarar í þremur kennaraháskólum í Mið-Ghana samþætta meginreglur, þekkingu og gildi sjálfbærni í kennslu. Kannað er eðli og umfang umbreytandi kennsluhátta sem kennarar styðjast við í kennslu hugtaka í sjálfbærni. Ennfremur var kannað hvaða þættir hafa áhrif á aukna áherslu á sjáfbærnimenntun og þær hindranir sem kennarar standa andspænis við innleiðingu sjálfbærni í kennaranámið.

Stuðst var við huglæga tilviksrannsókn sem byggir á gögnum úr viðtölum við einstaklinga og rýnihópa. Tekin voru 30 hálfskipulögð viðtöl við 30 kennara úr þremur kennaraháskólunum. Þrjú rýnihópaviðtöl voru tekin við kennara, skólastjóra og annað starfsfólk kennaraháskólanna til að leita skoðana þeirra á sjálfbærnimenntun.

Kennarar virðast ekki leggja mikið á sig til að til að þræða málefni sjálfbærni inn í kennslu sína. Staðbundin átaksverkefni í sjálfbærni í nærsamfélaginu, aðgerðir í litlum mæli, samstarf á mörgum stigum og verkefnamiðuð kennslufræði var beitt til að fella sjálfbærnihugtök inn í kennslu. Skortur á framsýnni forystu um sjálfbærni, yfirhlaðin námskrá, takmarkað fjárhagslegt bolmagn, og skortur á hvata voru algengar hindranir sjálfbærnimenntunar í kennaraháskólunum. Ófullnægjandi samþættingarferli á landsvísu vegna sjálfbærnimenntunar, lítil samfélagsvitund, óviðunandi stofnanafyrirkomulag og takmarkaðar bjargir eru allt hindranir á vegi vinnu með sjálfbærni í námi, og eru á ábyrgð stjórnvalda og sveitarfélaga.

Aðilar sem móta stefnu í menntamálum á svæðinu, námskrárfræðingar, forysta og kennarar í kennaraháskólum munu njóta góðs af rannsókninni þar sem það hefur áhrif á hugsanir þeirra um stefnu og aðgerðir til sjálfbærni.

Þessi rannsókn er framlag í umræðuna um sjálfbæra þróun og rannsóknir á sjálfbærnimenntun þar sem hún bendir á kennsluhætti sem eru nauðsynleg forsenda þess að fella viðfangsefni sjálfbærni inn í menntun kennara.

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**List of Abbreviation**

| | |
|---|---|
| CoE | Colleges of education |
| CSO | Civil Society Organization |
| DESD | Decade of education for sustainable development |
| EE | Environmental education |
| EfS | Education for sustainability |
| EPA | Environmental protection agency |
| ESf | Education for sustainable futures |
| ESD | Education for sustainable development |
| ES | Environmental sustainability |
| FOSCO | Fosu college of education |
| GES | Ghana Education Service |
| GHG | Greenhouse gas |
| HE | Higher education |
| HEIs | Higher education institutions |
| ICT | Information and communication technology |
| ITT | Initial teacher training |
| KOMENCO | Komenda college of education |
| MoE | Ministry of education |
| OLA | Our Ladies of Apostle college of education |
| SD | Sustainable development |
| SE | Sustainable education |
| TE | Teacher education |
| TED | Teacher education division |
| SEPP | Sustainability in emerging pedagogic practice |
| UN | United Nations |
| UNCED | United Nations Conference on Environment and Development |
| UNCG | United Nations Communication Group |
| UNESCO | United Nations Organisation for Education, Science and Culture |

# 1 Introduction

## 1.1 My Story: The influence from Biemso No. 1

I have lived my life as a teacher for the past one and a half decades. Through this teaching-learning endeavour, I have talked to education leadership at local school level through to the national education stakeholders' level on how to improve teaching and learning in schools. My interactions with these various stakeholders have shaped my conception about the nature of the Ghanaian education system. Two main conceptions that I have had about the Ghanaian school system are the deplorable state of education facilities and poor teaching quality.

Regarding provision of education infrastructure, I realised that influencing national and municipal education officers to improve on education infrastructure was difficult unless I got close to the corridors of power. However, the discourse on how to improve teaching and students' learning was something that teacher educators could participate in and contribute effectively to. I therefore took interest in finding new ways of improving teacher educator-student interactions and to understand the kind of pedagogies that teacher educators could adopt to improve teaching and consequently students' academic outcomes.

The teacher's responsibility is to bring about learning. Thus, to teach students to learn. But he/she cannot teach effectively if he/she is not a continuous learner. Like the saying goes, "a candle cannot light another candle if it fails to burn its own flame." That is, a teacher cannot teach effectively to promote students' learning if he/she fails to continuously learn and adapt to new learning concepts to deal with contemporary issues.

This zeal to refine teaching and make it a catalyst for students' learning have led me into my sustainability journey. The journey has not been so rosy. There have been a lot of challenges. Crossing the South Atlantic Ocean to Iceland, from a comparatively warmer geographical region to a place so close to the North Pole, should tell that the need to improve learning in my country is very dear to my heart.

But why sustainability education (SE) or education for sustainable development (ESD)? As I went through the ENR programme at the University of Iceland, I realised that sustainable development (SD) emphasises an intersection between economic growth, environment and social well-being. The inextricably of these three cardinal pillars of SD is what experts say must propel development if we want to ensure the health of our planet Earth. Being privileged to teach in three rural areas in Ghana and having witnessed the level of degradation that has happened to the natural environment, I saw that SD is the way to help prevent further catastrophe in our natural environment. A deeper investigation into ways to safeguard the natural ecosystem from continuous destruction was therefore imperative.

As a teacher, I see education as key in the exchange of knowledge. Knowledge of SD is very important if we desire to create sustainable societies for ourselves and for our generations. Sensitizing community people and creating awareness in school children about sustainable lifestyle and practicing them is vital in the quest to make people think and act responsibly and sustainably.

There has been action to achieve the sustainability. However, the efforts of policy makers, national governments and the international community cannot suffice if the teacher's role is relegated to the background as it has been seen in many situations. My personal conviction about education is that the classroom teacher is essentially the key factor in education transformation. No education can rise above its teachers. Therefore, teacher education should be at the forefront of SD integration in education. Teacher trainees need to be equipped with the principles and practices of ESD so that when they begin their profession, they can perform the function of sensitising local community leaders on sustainable living and teaching school children ESD related concepts.

I have had several conversations on education policy and practice with teachers in Ghana. My wife and her teacher colleagues, in a cluster of school in Biemso No. 1 in Ghana, have endured quite a lot from me. I have become a resource person to them on ESD in the school, though I am still a novice in the subject.

In fact, most of the teachers in this town did not know about the ESD concept, though they were supposed to teach some elements of the concept which form part of Primary and Junior High School syllabus in Ghana. There are four Catholic primary and junior high schools that make up the cluster. In all, about 43 trained teachers, three headmasters and 647 students make up the population of this cluster of schools.

I have adopted these schools as my model sustainability education centre but for lack of resources we are yet to streamline our activities. Notwithstanding, we have had series of meaningful interactions by way of analysis of their syllabus and textbooks and suggested pedagogies to handle specific concepts in the syllabus. This group of teachers have motivated me a lot. Though they have limited understanding of ESD and pedagogical weaknesses relating to ESD, their understanding of the teaching enterprise is invaluable.

As I set out to find solutions to their problems, I found out that many of them had not received any meaningful form of tuition on ESD during their teacher training years. The initial training, they received as trainees did not factor in ESD theories and concepts. So, I realised the problem stems from the colleges of education where they were trained. This engineered my desire to investigate how teacher educators in three colleges of education in the Central Region of Ghana integrate the principles, knowledge and values of sustainability.

I also investigated transformative pedagogies that teacher educators rely on when working with students on sustainability concepts. Furthermore, it examined the drivers facilitating sustainability education and the impediments confronting approaches that teacher educators employed in implementing sustainability models. This I realised could help policymakers to have knowledge about how teacher educators are preparing teacher learners for our 21st century classroom where ESD is an integral part of school activities.

## 1.2 Why teachers and ESD?

The task of teacher colleges is to guide teachers in training and in graduating well-trained teachers. At the same time, teachers should have the facilities themselves to stay abreast of relevant research and development. One crucial area in the 21st century is sustainability education. In this dissertation I will analyse information from the staff of three colleges of education in the Central Region of Ghana and will evaluate whether teacher education is making progress towards adopting sustainable development (SD) in their training. I argued that the rate of unsustainable practices that have brought varying degrees of predicaments can only be eradicated through a shift in our thoughts and behaviours which can be achieved through sustainability education (SE) often referred to us Education for sustainable development (ESD).

Scholars across the planet have advanced knowledge of the concept of SD along the domains of environmental sustainability (ES), environmental education (EE), and education for sustainable development (ESD). They have gone further to fashion out modalities for its implementation in different contexts and have thus justified the necessity of embedding it in diverse fields of human endeavour. Also, there have been discussions on key pedagogies that are transformative enough to bring sustainability in institutions. In this study, findings from wide-ranging studies relating to the SD concepts are brought to bear in the discussion of education improvement in general and initial teacher training (ITT) and sustainability education specifically.

To have a valued assessment of how far teacher educators have kept abreast of sustainability education, I set off with the aim to investigate how teacher educators in three colleges of education in the Central Region of Ghana integrate the principles, knowledge and values of sustainability. The three colleges are Our Lady of Apostles (OLA) College of Education, Fosu College of Education (FOSCO) and Komenda College of Education (KOMENCO). I also examine the drivers facilitating sustainability education and the impediments confronting the approaches that teacher educators employed in implementing sustainability models.

Natural resources conservation and management is vital in addressing sustainability goals. School children ought to be aware of effective ways to manage and sustain the natural environment. To achieve this, teachers wielding sustainability competencies are needed.

There is a myriad of environmental challenges facing Ghana. Aside improper use of natural resources and destruction of the country's forest resources and wildlife, Ghana faces difficulty in delineating appropriate avenues to curtail greenhouse gas (GHGs) emissions and ways to safeguard Ghana's biodiversity which is declining at a rate faster than before (Ghana's Environmental Protection Agency (EPA), 2017).

The causative agent of environmental challenges is human activities. Human actions like woodcutting, bad farming practices, construction of roads and buildings, and mining have altered the shape and nature of the earth's ecosystems. These actions have moved our planet beyond its limits of natural carrying capacity. This situation is alarming and must be of grave concern to the global community. Because of this, the international community has challenged governments and stakeholders to find appropriate measures to curb the situation. Among the measures recommended are responsible lifestyle as well as efficient appropriate natural resources usage through education and awareness creation (Sterling, 2001).

The Rio Declaration on the need for environmental safety (United Nations, 1992) and other UN calls give impetus to the position of education in realisation of sustainability. The calls for education systems to implement concepts of teaching and processes that place the long-term future of our planet at the centre of decision making became paramount (Sterling, 2006). David Orr 's (2004) has put it as follows:

> The disorder we see all around us reflects a prior disorder grounded in the paradigm of human domination that has now nearly conquered the entire world. That paradigm must be replaced by one that places us in the web of life as citizens of the biotic community. We must come to see ourselves as implicated in the world, not simply isolated, self-maximizing individuals. This battle will be won or lost in the schools, colleges, and universities around the world (p. 7-8).

Society needs an investment in ESD to serve as a transformative tool that changes the thoughts of the citizenry on the natural environment and one that helps them to identify the natural environment as a part of their lives. An increase in educational opportunity commiserates with the increase in the volume of problems of natural resources destruction (Schumacher, 1974). Schumacher recommended an education paradigm that ''*takes us into the depth of things*'' (p. 7) for education to guide us towards sustainability. This type of education is what we call ESD or sustainability education (SE).

Various terminologies are used when working with sustainability education. These include the concept of 'sustainable education' introduced by Sterling (2001) to encompass the terms 'education for sustainable development' (ESD), 'environmental education' (EE), 'education for sustainable futures' (ESf) and 'education for sustainability' (EfS). In this study, though ESD is used often, these concepts are used interchangeably to mean the same thing.

There should however be a fundamental change in educational theory, methodology and epistemology (Corcoran, Walker, & Wals, 2004). This also demand education systems to shift focus from the western formal education's modus operandi to adopt teaching techniques, curricula and education policies that reflect the principles and values of SD (Sterling, 2004).

In summary, ESD is an educational approach that instils values that enable people to think holistically to find solutions to the most pressing environmental, social and economic challenges facing the world (Sterling, 2004). This type of education involves a shift in educational paradigm, a transformation instead of an entire modification in the existing educational structures.

## 1.3    Statement of the problem

Higher education (HE) have an important responsibility in providing avenues for sustainability education. To higher education institutions (HEIs), sustainability education is simply "changing our ways of being and working collaboratively to create regenerative, interconnected, just, and thriving systems and communities" (Burns, 2016a, p.250) with emphasis on relating the themes of SD in the various fields of teaching in colleges.

Like many HEIs, initial teacher preparation colleges help to instil values, principles and knowledge of sustainability in teacher learners who would in turn guide students in acquiring such knowledge and skills during their professional service. Teachers in general are important stakeholders in the attainment of sustainable society (Cortese, 2003) and as such it is expected of them to use their teaching engagement and research to promote SD. There is also the need to reform teaching pedagogies that teachers use to teach sustainability. Further, it is imperative to understand the kind of impediments that they face when implementing sustainability education in their colleges.

There are about 46 teacher preparation colleges which are scattered across the 16 administrative regions of Ghana. Central Region is one of these regions. Aside the faculties within the University of Cape Coast and the University of Education Winneba that train teachers, there are three public teacher institutions which train teachers for the region and Ghana. These three public colleges, namely OLA, FOSCO and KOMENCO provide the setting for this research.

Students admitted to these colleges are from different communities in the region and some parts of the country. The Central Region boasts of enormous human and natural resources and is regarded as the hub of quality education institutions in Ghana. Yet, these highly reputable schools have not been able to address the economic, social, and environmental problems facing communities in the Central Region sustainably.

The overarching concern of ESD is to address environmental needs of local communities through provision of relevant education. For these three teacher education institutions to meet this directive, they need to reshape their activities to respond to this call.

Several policy actions have been undertaken in the realms of teacher provision. These policies have resulted in efforts at making the teacher well-fashioned to meet current and future challenges. Consequently, several studies have reviewed the need for SD in HE. Some have looked at how HEIs report on their environmental measures towards sustainability whilst others have concentrated on how education could be managed under the lenses of SD (Ceulemans et al., 2015). Other reviews also highlighted the need for further inquiry into how to infuse schools (Lozano et al., 2015).

The local literature on HEIs in Ghana extensively discusses aspects such as education policy and quality in education. Reviews included the managerial support structures in teacher training, teacher education practice, teacher motivation and retention and teacher preparation policies (Opare, 2008).

However, these studies have not focused specifically on ESD in teacher education, particularly on the three colleges of education in the Central Region and ESD. There exists a gap in the literature on studies focusing on teacher educators and how they embed the principles, values and knowledge of SD in their teaching. There has also not being studies on this colleges on the sort of transformative pedagogies that teachers in the colleges us to teach sustainability related values.

This study therefore sought to investigate how teacher educators in three Colleges of education in the Central Region of Ghana integrate the principles, knowledge and values of sustainability. It investigated transformative pedagogies that teacher educators rely on when working with students on sustainability concepts. Furthermore, it examined the drivers facilitating sustainability education and the impediments confronting approaches that teacher educators employed in implementing sustainability models.

## 1.4 Sustainable Development in the context of Ghana
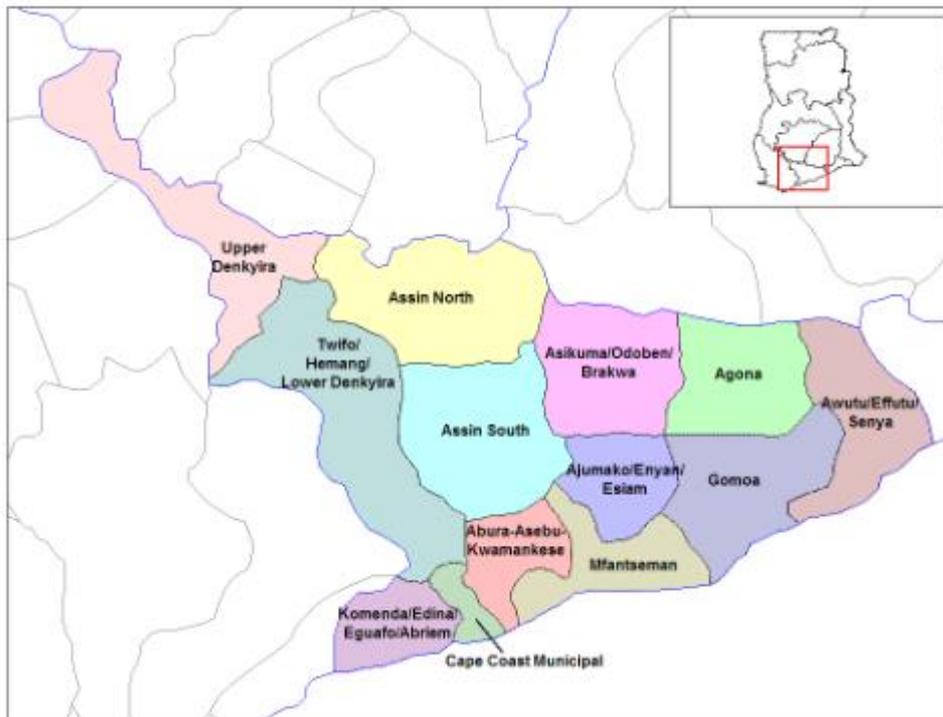


Figure 1: Map of Ghana depicting Central Region

Ghana is a country that lies on the west coast of Africa. Ghana gained its independence from Britain in 1957, becoming the first nation within sub-Saharan Africa to do so. The country covers a land mass of 238,535 km2 (92,099 sq. mi). It is bordered by the Ivory Coast and Togo in the west and east respectively and shares boundary with Burkina Faso in the north. The Gulf of Guinea and the Atlantic Ocean is in the south of Ghana. The population of Ghana is about 28,308,301.

The discussions on SD in Ghana has been raging for far too long. The country attained the Education for All agenda under the Millennium development Goals, ensuring parity in gender within the primary up to secondary education (United Nations Communication Group in Ghana & Civil Society Organizations platform on SDGs, 2017). To improve quality and ensure accessibility to education to meet SDG four: Quality education, the government has, since 2017 extended free education to the high school and provided improved infrastructure at this level of education. This has increased net enrolment.

In Ghana, environmental challenges have persisted since the colonial era. Many have raised red flags on the need to provide the country with mechanisms for preservation and protection of our natural ecosystem. In response to these growing concerns, successive governments have over the years-initiated measures by way of legislations to put the guardianship of the country's endowed resources at the top of the country's development agenda (Environmental Protection Agency, 2015).

From the colonial era to the post-colonial Ghana, the main objective of environmental policy of Ghana has been to ensure improvement in the environment and the living conditions and quality of life of its people (Appiah-Opoku & Mulamoottil, 1997). The aim is to reconcile the growth in the economy with natural resources conservation to promote SD.

The first elaborate environmental law, Beaches Obstruction Ordinance, enacted in 1897 was aimed at protecting beach sand and marine resources in the country (Agyarko, Gemadzie & Agyekum, 2016). As early as the 1930s, Ghanaians began raising concerns about the incessant deteriorating state of the country's natural resources and its natural environment (Benneh & Agyapong, 1990). The colonial government at the time instituted legislation to help in protecting and managing of specific components of the Ghanaian natural ecosystem. For example, the government passed the law on Wild Animals Preservation Ordinance and the Rivers Ordinance in 1901 and 1907 respectively (Amlalo & Ahiadeke, 2004).

In 1907, policies towards the reservation of Ghana's forests and resources were initiated. This was followed by the establishment of the Forestry Department in 1908, mandated to collaborate with other departments towards effective forest resources management. In 1925, a Mining Rights Regulation Act was passed into law to guide in the appropriation of the various natural resources of the country. The country's leadership at the thought it prudent to ensure that natural wealth of the country was used judiciously. The magnitude of soil degradation across the length and breadth of the country was increasing abnormally. Measures to plan land use, soil erosion and land appropriation were also institutionalized in response to the high level of soil degradation in the northern part of Ghana (Appiah-Opoku & Mulamoottil, 1997). This brought about the adoption of conservation methods in the use of land for agricultural purposes, water usage and grassland for grazing. The implementation of this policy saw a mainstreaming of the process from Department of Agriculture and Forestry to the local people in the hinterland.

These institutionalized systems that have continuously been developed in the course of time have been bequeathed to governmental agencies and units like the Geological Survey Department and the Forestry Department, granting them the responsibility of protecting some specific natural resources. These institutional and sectoral arrangements have become the feature of environmental governance in Ghana as far as the management and protection of environmental resources are concerned.

During the 1972 UN Conference on the Environment held in Stockholm, the world was made aware of the path the natural environment was heading and the socio-economic implications of the abuse of the environment. The international community became very much concerned about this and began the discourse on finding ageless solutions to them.

After the Stockholm Conference, discussions of number of global strategies and national environmental initiatives and policies were formulated. This is evidenced in the two important reports by the World Conservation Strategy (IUCN) in 1980) as well as the Brundtland Commission's ''Our Common Future'' report in 1987. The post-Stockholm saw UN established the United Nations Environment Program (UNEP) as a platform for discussing global environmental issues. Member countries responded to this and established departments and agencies to handle emerging environmental issues such as global warming and climate change.

On the recommendation of the Stockholm conference, Ghana established the Environmental Protection Council (EPC) in 1974 which was tasked to coordinate every environmental. circumstance in the country and to advise the national government on appropriate steps to take (Appiah-Opoku, 2001).

Ghana experienced harsh economic conditions in the early part of the 1980s caused by severe drought. This led to a shortage of food and widespread bushfire and wildfire across the length and breadth of the country. This condition changed the environmental management practices of the country from the sector-based and protectionist environmental management approach. The state of the countries environment started deteriorating at a rate faster than expected. Any prospect of future development was limited. The EPA responded by initiating programmes and plans such as the setting up of National Oil Spill Contingency Plan, National Plan of Action to Combat Desertification, the Draft National Conservation Strategy and National Environmental Protection Programme in 1985, 1986, and 1987 respectively (Appiah-Opoku (2001). These plans were made in 1980 when the World Conservation Strategy was inaugurated by the International Union for Conservation of Nature and Natural Resources (IUCN).

An important principle that SD is based on is the integration of socio-economic development with environment in accordance with national laws and institutional policies on conservation and environmental protection. To achieve this objective, the country organized a conference on resource conservation for SD in 1987. Scientists of different backgrounds, environmental planners, economists and policy makers attended the conference gathering ideas for implementing strategies for resource conservation and SD in Ghana. Since then, attention to natural resource management and environmental protection strategies, integration of economic, environmental and social matters has become the core elements of development policy in the country.

In the same breath, questions have been raised on the role of education and teachers in creating sustainability awareness in our communities. In education, government has

indicated modalities for schools and colleges to teach environmental matters. They have also been tasked to embed matters of the environment in their teaching.

## 1.5    Research questions and objectives

ESD demands that education institutions implement decisions and policies to make the ideas and principles of SD fundamental in every activity that they engage in. This makes it essential to understand how colleges of education which are mandated to train teachers embed the principles that underlie SD in their curriculum and activities.

The study sought to investigation how teacher educators in three Colleges of education in the Central Region of Ghana integrate the principles, knowledge and values of sustainability. It investigated transformative pedagogies that teacher educators rely on when working with students on sustainability concepts. Furthermore, it examined the drivers facilitating sustainability education and the impediments confronting approaches that teacher educators employed in implementing sustainability models.

In taking this stance, the accrued experiences of teacher educators in the three colleges of education, and principals were sourced. Personnel of the education department in the region were also contacted to seek their views on ESD.

The five main research questions and their related objectives (Table 1) are designed to give data on the views of teachers on ESD, their understandings of it, and how it can be integrated into their teaching.

Table 1: Research questions and objectives

| Questions | Objectives |
| --- | --- |
| What are the views of teacher educators on ESD? | To explore teacher educators understanding of the ESD concept. |
| In what ways do teacher educators in the colleges integrate SD related concepts in their teaching? | To examine the kind of models of ESD that teacher educators employ. |
| What types of teaching pedagogies do teacher educators in the three colleges use to address ESD concepts? | Investigate the different types of transformative teaching pedagogies used by the teacher educators. |

| What factors imped ESD implementation in the colleges? | Examine local, school-based barriers to ESD; Interrogate external impediments to ESD implementation in the colleges. |
| What factors can drive ESD in the three colleges? | Analyze factors that can promote sustainability education in the colleges. |

## 1.6    Contributions of the study to the field

An education system that underscores the need for integration of SD has become essential. However, issues of SD pose enormous challenges. There is a lot of complexity in the implementation of SD principles and as Palsdottir (2014, p. 36) puts it: ''While there is some agreement on basic principles of sustainability, there are nuanced differences in approaches according to contexts, problems and priorities.'' There is thus a multiplicity of processes and procedures in the implementation of ESD as it is carried out in different contexts.

Different methodologies towards ESD have been established but with an emphasis placed on looking at the concepts through the local lenses, with key consideration to the people's socio-cultural and environmental values. Policymakers and actors are therefore encouraged to look at local community contexts as far as ESD is concerned.

### 1.6.1   Teacher educators

Teachers are concerned about the potential differences or uniqueness of individuals in their classroom, so they try to tailor their teaching to suit the individual needs of each student. The teacher's knowledge of ESD concept is therefore vital. Their knowledge and experiences in the profession are very important and so is their experiences in teaching concepts and elements relating to SD. Within the CoE, there exist a lot of opportunities for knowledge and information sharing on SD and ESD specifically.

This study intends to harvest the knowledge of teacher educators and policy formulators within teacher education circles for the benefit and utilization of other teachers and those involved in school leadership in the Central Region and other jurisdictions in Ghana.

### 1.6.2   Practitioners in education policy

Education policy thinkers and experts also play a vital role in the move towards sustainability. Their views and understanding of the ESD concept go a long way in guiding SD policies and their implementation. I therefore see that there is much value in education policy makers sharing their experiences in the larger education sector. This research will thus

influence policymakers in education to rethink teacher education delivery and to formulate policies that correspond to current global trends.

### 1.6.3    Research in teacher education

The research findings are expected not to influence teaching practice and education policy alone, but also research on teacher education as well as influencing leadership practices in higher education institutions. I further anticipate that the findings from this study will influence the thinking of people and that there is going to be growth of initiatives and creative ideas in solving sustainability issues facing local communities.

### 1.6.4    SD and ESD literature

In addition to the above, it is anticipated that the findings would have the potential to contribute to the literature on ESD, SD and teacher education as little has been written on how the principles, values and knowledge of SD have become integrated in teacher education in Ghana and the entire sub-Saharan Africa.

### 1.6.5    Discourse on ESD implementation

It is my hope that this study will encourage a debate between policy makers and policy implementers in the teacher education circles about the need for education for sustainable development and the need to deepen sustainability education if Ghana aims at achieving the UN sustainable development goals (SDGs).

## 1.7    Organization of the study

The thesis is divided into five chapters with chapter one being the initial section that introduces the background and rationale for the study. This chapter discusses studies that help to explain the impetus of the research, the research questions and objectives. The context of sustainability in Ghana, the statement of the problem, contributions of the study and are discussed in this section.

Chapter two of the study focuses on reviewing the literature that are related to the topic of sustainability education. The concept of SD and ESD and the complex understanding of transformational learning are discussed. ESD in teacher education is also examined under this section of the study. Furthermore, initial teacher education in Ghana are examined in relation to various key reforms that have occurred in Ghana.

Chapter three discusses details of the research design and methodology for this study. Reasons behind the choice of methodology, sample and sampling techniques and ethical factors are discussed.

Chapter four looked at the presentation of the findings from the interviews and focus group interviews.

Finally, chapter five is the section for summary of findings as they are related and discussed in the context of the literature reviewed. Conclusions and recommendation are presented at this section. The chapter concludes with a section containing all the references that were used in the study.

# 2 Literature review

Having taught in various levels in Ghana's education system and having involved myself in various formal and informal discourses on education policy regarding how to shape education delivery to improve the quality of teaching and learning, I have come to the realisation that issues of sustainability education present a challenge to teacher educators and stakeholders alike. In most of the deliberations with teachers and education leadership in Ghana, I have come to understand that for schools and their communities to achieve sustainability, new ways of doing the things they do must be adopted. Innovative and creative ways of dealing with environmental problems have become essential and urgent.

To create a more sustainable schools, there should occur a revision in the way we teach our students to learn. There should be a different mode of looking at education and a change in thinking that moves humanity to ''ecological sustainability'' (Sterling, 2001, p.12). This places education and the teacher at the centre when dealing with sustainability issues.

Various studies have sought to establish modalities and procedures for implementing sustainability principles in education. Some have also theorised and proposed teaching pedagogies that are appropriate for teaching sustainability related concepts. I have sought to review some of these studies under this chapter of my research.

## 2.1   Organization of the review

In reviewing the literature, I found a range of studies that seek to establish modalities and procedures for implementing sustainability principles in education. Some have also theorized and proposed teaching pedagogies that are appropriate for teaching sustainability related concepts.  It is these two fields, sustainability and pedagogy that are now investigated further. Literature reviews are an important part of the research process. A good literature review fulfils two main purposes. It provides a summary of existing research studies through identification of themes, patterns and issues serving as a starting point of a research study (Easterby-Smith et al., 2002). Secondly, any contribution to research, be it from conceptual or empirical work, must be interpreted within existing theories (Saunders et al 2003) and as a means of thought organization (Brewerton & Millward, 2001).

The first part of the review discusses global perspectives of SD and ESD in the context of its evolution in general and application education specifically. Key theory of transformative learning and the intersection with ESD are discussed. Finally, the section ends with a discussion of ESD in teacher education. See figure 2 for schematic layout of the literature review.
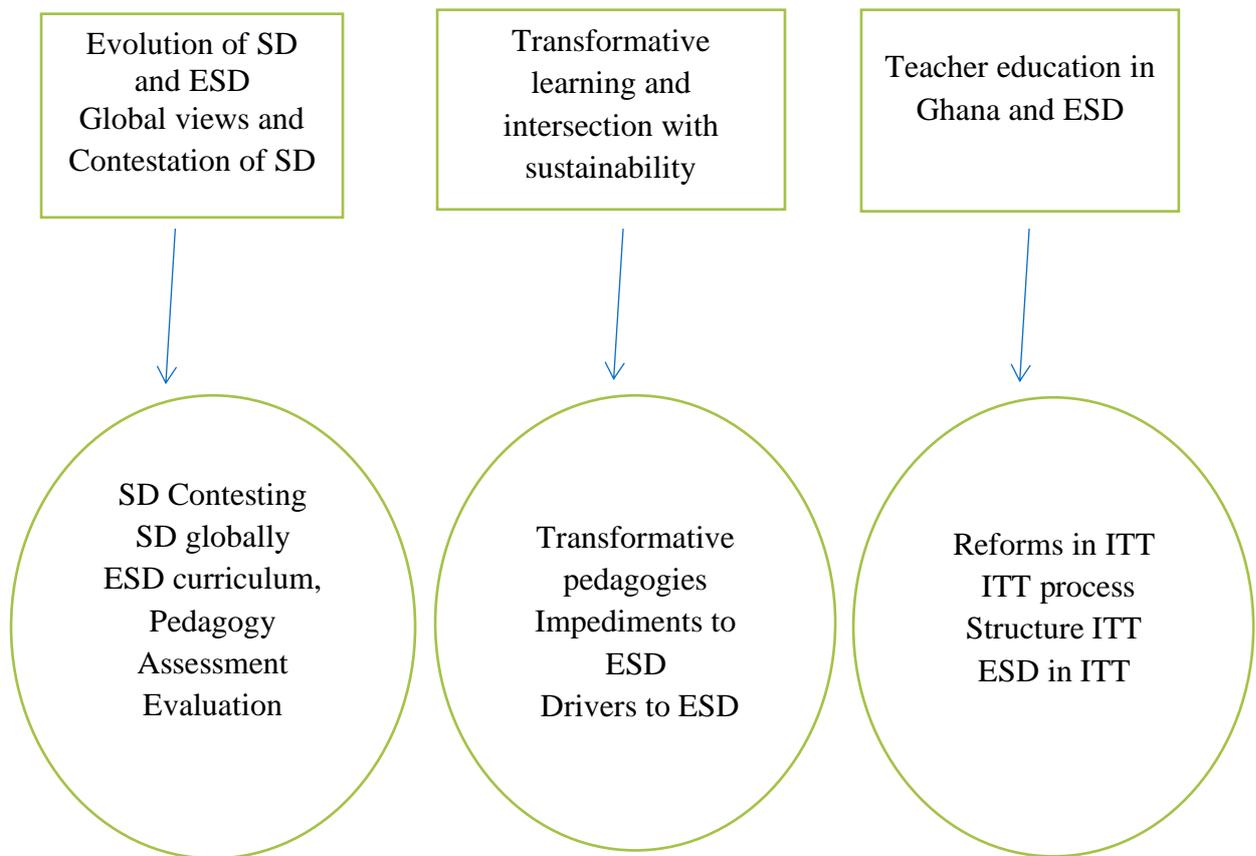
Figure 2: Schematic layout of the literature review

## 2.2    SD as a contesting concept

There is a vast literature on the concept of SD. But to make any meaningful discussion on the concept, it is important to communicate to people what this concept of SD really means before any discussion of the various modalities and dimensions in which SD has been implemented (Ede, 2007). The scale of this study therefore makes it very essential to delineate the meaning of the concept of SD.

Different definitions of the concept abound in the literature, with many of them having been defined in the context of the political, environmental, social as well as the economic (Curran, 2009; Rosen, 2009). Diversity of perspective of the widely acclaimed concept, SD, have been emphasised because of the surge in research on its integration (Liu, 2009). Diverse areas such as energy production, conservation management studies, demographics, and agriculture are among some of the themes that have provoked inquiry within the arena of SD (Losada et al., 2001; Rosen, 2009). These diverse fields under study have given rise to different accounts in relation to the meaning and implementation of SD.

SD facilitates studies of the interrelationship between nature and society as well the idea of integration of social, economic and environmental elements of development (Zimmerer, 2000). The Brundtland report (1987) added that, SD is characterized by the overlapping functions of these elements, which specify that sustainability is achievable in a situation where all these elements work together into a single but unobstructed agenda.

Several authors have used the definition of SD given by the Brundtland Commission's Report (Cerin, 2006; Dernbach, 2003; Stoddart, 2011). The commission defined SD as the type of developmental process which allows the current generation to satisfy their needs and at the same time protects environmental resources for the coming generations. The central idea behind the definition provided by Gro Harlem Brundtland and her commission was conservation and protection of resources for the future. It is about the long-term sanity of global ecosystem and the physical environment, achievable through the integration of economic, environmental, and social concerns.

## 2.3   Agreed principles towards SD

Several key issues have emerged in the wake of the Brundtland Report which have garnered important level of consensus among scholars.

### 2.3.1   Intergenerational equity

The "principle of intergenerational equity" recognizes the long-term scale of SD to address the needs of future generations (Dernbach, 1998; Stoddart, 2011). The "polluter pays" principle states that "Governments should require polluting entities to bear the cost of their pollution actions rather than imposing those costs on others or on the environment" (Dernbach, 1998, p. 58).

### 2.3.2   Precautionary principle

This principle of sustainability blends with the polluter pays principle. The precautionary principle establishes that when there has been an irreversible threat or damage on the environment, there should be no postponement of cost-effective measures simply because there is no adequate scientific proof (Jordan & O'Riordan, 2004; United Nations Conference on the Human Environment, 1992).

### 2.3.3   Differentiated responsibilities

In the guiding principle of the Rio Declaration, the role of the state towards sustainability of our environment is espoused. The notion of concept of differentiated responsibilities outlines that each nation must play their part on issues of SD. A look at the different contributions to environmental degradation by developed and developing nations is

analyzed, while appreciating the future development needs of developing countries (Brodhag & Taliere, 2006).

But, unlike developing states, developed economies should be made to bear a greater responsibility of curbing global environmental menace considering the resources they require for their livelihood and the magnitude of pressures they exert on the environment.

### 2.3.4  Integration of social, economic and environmental variables

Notwithstanding the importance of the above discussed principles, the key principle underlying all of them is how environmental factors can interlink with social, economic and environmental concerns in every frontiers of the processes of development. This is because all the principles in sustainability act in an integrated manner which should be at core of national actions (Dernbach, 2003; Stoddart, 2011). It is this enduring concept of integration that distinguishes sustainability from other forms of policy in the context of development.

## 2.4    SD in perspective

The concept of ESD has gained recognition in both advanced and developing economies in the past decades. It has become an important issue among many countries within which sustainability could be achieved. ESD is thus very central to SD. However, to clearly understand how and why the concept of ESD has gained such prominence in the urge towards creating a sustainable society, it is important to discuss the evolvement of SD, which ESD focuses on.

The discourse on the physical environment and development began to change after the publication of ''Our common future.''  Stakeholders, i.e. politicians, policy makers, non-governmental organizations and national governments were to initiate policy actions and strategies to promote the kind of socio-economic development that safeguards the planet we inhabit (WCED, 1987).

Many criticisms have been levelled against the meaning by the Brundtland's commission. The definition has been criticised as breeding implementation problems because of its vagueness (Robinson, 2004). Others contended that the concept combines two contradictory terms viz sustainable and development (Frazier, 1997). Barring any negativity associated with the definition such as its vagueness, complexity and contradiction, the concept provides the platform for people who think about the negative impacts that our actions and inactions have had on the ecological structure and foundation of our living on this planet to act (Hattingh, 2002). Therefore, the definitions claim a starting point in thinking about development process and natural resources exploitation holistically and responsibly.

In the global perspective and in most of the debates on the environment, education became a topical issue and subsequently a part of the discourse on SD. During the Earth Summit in 1992, the platform for education to become an inextricable part and significant tool for attainment of SD was created. Though the member states represented at the Rio summit showed ambition and the willingness to embark on measures to achieve sustainability, it appeared that in 2002, i.e. 10 years later, the agreed goals and targets were far-fetched (UNESCO, 2015). The concerns raised in the conference suggested a rethinking of the process of education. There was calls for a shift in education delivery. This need for a new paradigm of education brought about the concept of ESD.

Thus, the need for reshaping the theories of teaching and learning to correspond to the need for developmental processes that safeguard the health of the natural environment was proposed. The proposition combined two core areas of the United Nations, namely; SD and quality education. The call was to urge education planners to integrate the basic rudiments of SD into school curriculum. That is, schools and colleges were admonished to teach ESD to help create awareness in people about the need to preserve the natural environment.

To further strengthening the call for ESD, UNESCO (2015) reiterated the essence of ESD by stating that it promotes environmental awareness and enables people to acquire relevant SD related values and knowledge that are important in the quest to create a sustainable society. In 2002, the United Nations decided during the Johannesburg Conference that the year 2005 to 2014 was the UN Decade for Education for Sustainable Development (UNDESD). The decision was prompted by countries like Japan, Canada, The Netherlands, Germany and Sweden, with the main objective underlining the Decade according to UNESCO (2005) was among other things "to provide an opportunity for refining and promoting the vision of, and transition to, sustainable development – through all forms of education, public awareness and training; and to give an enhanced profile to the important role of education and learning in sustainable development." (p. 6). Education is thus central to achieving the SDGs and environmental protection and preservation. The clarion call was for all states to improve on the education they provide to their citizenry to impart sustainability values and tenets.

While sustainability education is important to Ghana and its socio-economic development, it is equally important to understand the context of the concept and how the concept has come to generate such considerable debates among stakeholders.

### 2.4.1   What context is SD appropriate?

The ''Our common future'' report by the Brundtland's commission (1987) opened the doors to the evolvement of SD (Daly, 1990). Looking at the concept normatively, it opens the way

for people to eschew negative behaviours that affect the environment and embrace responsible and healthy lifestyle that promoted environmental safety. However, there is disagreement about operationalization of the concept and varying contradictions have been identified when it comes to its implementation. Indeed, many sectors and disciplines have adopted the term but have also went further to give their own individual definitions.

After a few years of publication by the WCED, over 70 descriptions were given to the concept in the literature (Holmberg & Sandbrook, 1992). The many different meanings alluded to the term were the result of the dualistic views that arises in the discourse on the nature of the environment's resources: the conundrum of weak sustainability and strong sustainability (Dietz & Neumayer, 2007; Neumayer, 2003) which relates to the neo-classical economic theories.

The important difference existing between weak and strong sustainability is founded on substitutability between natural and manufactured capital resources (Biely, Chiesura & de Groot, 2003; Maes & Van Passel, 2018). The weak environmental sustainability concept advanced by Pearce (1995) is founded on the integration of environmental resources and economic growth. The concept was borne out of the perception that human welfare is not solely depended on a specific capital resources and that they can be maintained by substituting natural capital with man-made capital (Ekins et al., 2003). The assumption here is that, there exist no differences between the different forms of capital, viz natural (ecological), human, social, manufactured capital, or there are no key variations in the well-being services that they produce (Ekins et al., 2003; Neumayer, 2003). What is important, according to Slow (1993), is the ability to maintain or increase the total value of capital stock for the benefit of future generations.

The weak sustainability proponents therefore have the view that the total value of economic growth and resources of the environment must be allowed to remain unchanged and that a change in environment should be allowed only if it leads to a rise in economic growth. Pearce (1995) says that SD is attainable within the context of economic growth which must consider economic cost. This suggests a possibility of evaluating resources of the environment in economic terms. Natural resources of our environment are finite in nature. Weak sustainability therefore demands maximum efficiency in the economic process in terms of input-output ratio. They demand that activities geared towards economic growth must be maintained constantly since natural resources and manufactured capital are substitutable. To this end, they canvass for an integration of the three pillars of sustainable development: environmental or ecological resources, economic growth and social justice. (Figure 3 below). This is also known as the "nested view" where the economy is nested with society which is bounded by the environment
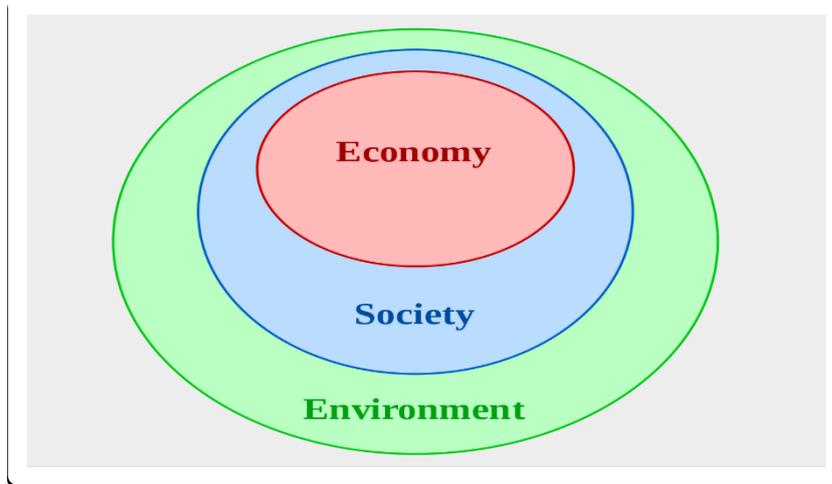
Figure 3: Bull's eye depiction of weak sustainability (Cato, 2009).

On the other hand, the strong sustainability, which is preferred by many ecological economists, insists on the separation of the different stocks of capital, stating for example that natural capital and human capital are not substitutable, instead they complement each other (Constanza & Daly, 1992). They advance that a prerequisite for sound economic growth is possible but through the protection of our natural environment. The strong sustainability concept in this quest supports the idea of maintaining the state of natural capital instead of depleting them and hence urges stakeholders to keep economic activity at certain ecological limits. It rejects strongly substitutability of natural capital by manufactured products. In their view, substituting natural capital with manufactured ones possess critical limitations since natural capital is irreversible and its contributions to welfare is unique and cannot be replicated by the other capitals (Ekins et al., 2003).

The proponents of weak sustainability further argue for a replacement of natural capital by an economic activity done at certain minimal degrees but on condition that such activity would not disturb the material base of the resources. Strong sustainability falls in line with the diverse range of values and knowledge developed by the Stockholm Resilience Centre on Planetary Boundaries which calls for an overhaul of values of our societies so that economic activities they engage in do not go beyond the ecological limits (Rockstrom et al., 2009). See figure 4 for strong sustainability.
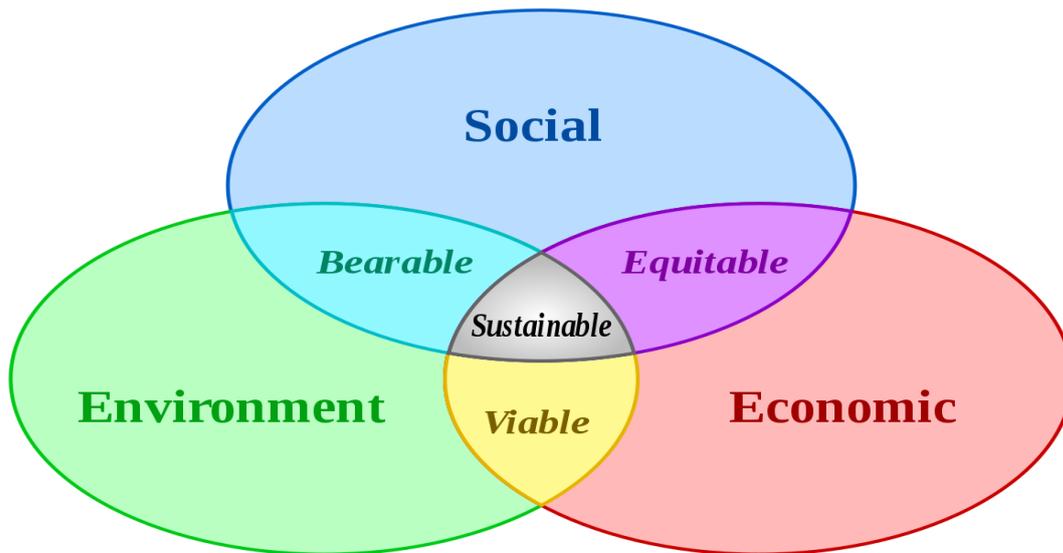
Figure 4. Inextricability of three pillars of strong sustainability. Source (Cato, 2009; Mann, 2009)

Ideologically, these two descriptions of SD are not neutral. They bear a kind of perceptions which are different in terms of the nature of the debate on environment-development issues. There is rejection of a group of values and acceptance of others that reflect their philosophical orientations. Looking at these two positions critically, one can deduce that these two concepts will hold diverging perspectives on the benefits of components such as satisfaction of basic physical needs of humans, physical resources and economic growth, how natural capital can be substituted by human capital, conservation of the environment, respect towards life of diverse community on earth, value change and realization of self (Hatting, 2003). It is however important to note that the two explanations of SD give an inevitable conception about education for sustainability (Armstrong, 2011).

### 2.4.2   Approaches of implementing ESD

Different conceptualization regarding ESD in terms of curriculum content, pedagogy, skills, attitudes and values that learners should acquire have been discussed in the literature (Tilbury & Mulà, 2009; Wals & Kieft, 2010). The argument on ESD is inevitable because the concept of SD, the functions of education and societal issues are themselves contestable (Landorf, Doscher & Rocco, 2008). Clearly, and as stated earlier, the notion of SD is complicated and has a multiplicity of interpretations because it can satisfy diverse interests and viewpoints. This feature of SD enables it to become more easily adoptable than a concept with very rigid definitions and interpretations.

However, the complexity is compounded by the fact that the process and role of education itself is guided by some basic values and principles. The complexity has come out

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of the disagreement on whether the social reproduction or social transformation function should be of concern to the process of education (Wals & Kieft, 2010). Whilst the social reproduction function of education encourages students to accept the roles assigned to them by the society and to obey standards already set by authorities and the delineated power structure of the society (Ibid), the social transformation role of education encourages learners to actively involve themselves in society's democratic processes. These two functions of education thus assigned different roles to the teacher educator and the learner in relation to societal values and aspirations.

Two approaches to ESD in education have been identified (Vare & Scott, 2007). The two approaches are interrelated and complement each other. They explain the different interpretations and views associated with ESD. These two approaches, Vere and Scott referred to them as ESD 1 and ESD 2, denoting learning for SD and learning as SD respectively.
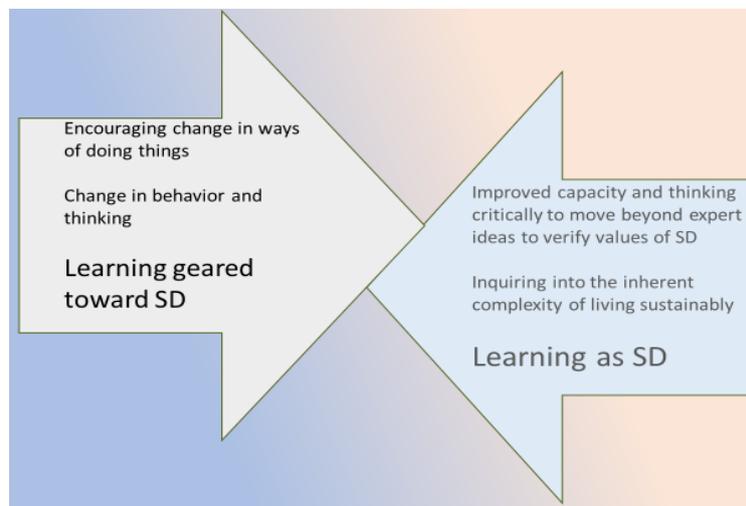


Figure 5: Complementary role of ESD 1 and ESD 2

ESD 1 involves sensitizing people on the essential change in attitude and consumption of goods that will reduce the impact we are seeing on the environment (Vere & Scott, 2007). The role of education in this context is to guide learners to reduce their impacts on the ecology. The relevant type will demand that both the teacher and the learner become active participants in the process of change. Therefore, the teacher is not a provider of knowledge and the learner not a passive receiver of knowledge, rather they both are active participants and exchange ideas and knowledge. This approach is hinged on the supposition that definitive social and environmental benefits could be possible when learners are motivated through incentives. Education plays an instrumental role in this regard.

ESD 2 on the other hand, is based on a complete overhauling of the role that education plays in respect to in achieving sustainability. This means that ESD is a process of learning rather than being dependent on learning (Vare & Scott, 2007). This implies that, the motive

of ESD is to provide learners with the moment to reflect on the multiplicity of the concept of ESD 2 so that they can move beyond what experts say about ESD 1. Through this reflection, the approach to education becomes one of reframing learning as SD. This encourages learners step up initiatives about their future in relation to the ways in which the conditions that better human living.

The understanding from figure 5 is that the two ESDs complement each other and are relevant to ensuring ESD in education. Some governmental organizations and education policy makers accept ESD 1 as more elaborate especially in promoting a sense of sustainable living among the people. However, exploring ESD 2 more will help harness the choices people make and the long-term effects if they do not reject an irresponsible lifestyle.

### 2.4.3   Focal areas of sustainability influenced by education

Three focal areas of SD have been identified. These are implementation, decision making and quality of life. These areas of sustainability are affected by education (McKeown, 2002). The broad-gauged principles intrinsic to SD rely on citizens that are well educated to take expedient decisions which promote SD that are feasible. The level of education of the population in a country is very important in the achievement of the country's sustainability strategies. An uneducated population will impede the strategies for SD in country.

There is hope that when people are well informed and aware of sustainability issues, they can contribute immensely to SD implementation process. An educated public is more capable to make viable social, economic and environmental decision towards SD.

Quality of life recognizes the impacts that education in the context of economic status, a better life opportunity, a reduction in the rate at which children die, and educational attainment. Put together, these factors determine the extent of successful life of future generation. High and improved education benefits both the individual and that nation (Hill, Hofman & Rex, 2005).

### 2.4.4 Sustainability in teacher education
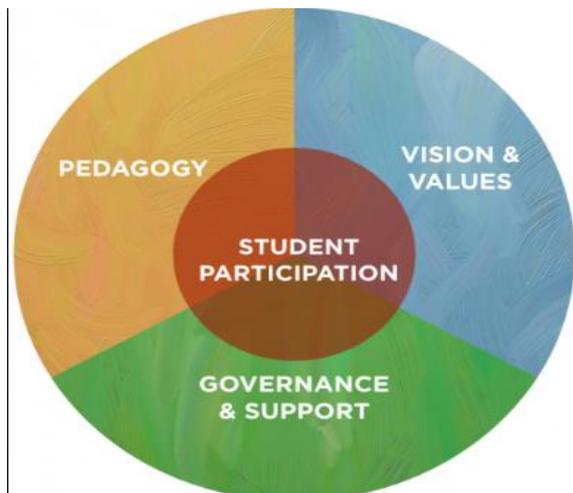


Figure 6: The future of ESD classroom

In student led ESD, students should be placed at the core of the learning situation (Sterling & Vesterinen, 2016). Researchers in a recent Nordic project which emphasized student participation in ESD at the tertiary level was carried out by researchers in Iceland, Sweden and Finland. They concluded that there were three important areas to emphasize when developing ESD with students: Vision and values of education, the policy guidance and support structures as well as teaching pedagogies that the teacher explores and uses during the teaching learning exchange. The teaching context should not lose sight of the importance of the place of learners. The learner is at the center of learning in ESD and every decision revolves around the needs of him/her. Whilst the classroom teacher is found everywhere, it becomes clearer that every policy actions towards ESD in the school must recognise the teacher as key actor. In delivering quality education, the teacher should be involved in the early stages of setting of educational visions, planning for education policy and adoption of appropriate teaching pedagogies to enable him/her to function effectively.

As sustainability becomes a topic for wide discussions among educators and policymakers, the question of how to teach sustainability competences keeps cropping up in the discourse. Developing teaching pedagogies for teachers to teach learners to influence societies holistically and to bring about sustainable change in society have become necessary.

There exist varied forms of approaches to SD implementation and teaching within the education system. This is the result of the vagueness and complex nature of the concepts which have given rise to different but difficult meanings and understanding to it. The complex nature of SD explains why we find it difficult to clearly outline solutions to the diverse environmental problems that humanity faces (Palsdottir, 2014).

Teaching sustainability means integrating relevant sustainability related concepts in both curricular and co-curricular programs of schools. The essence of doing this is to produce graduates who will be able to act as change catalysts in their communities and address prime challenges of sustainability (Jones, Selby, & Sterling, 2010; UNESCO, 2014).

The pedagogy adopted for sustainability class should be more transformative, i.e. focusing on addressing themes and essentially questioning of morals and standards in the society. The learning process must be interconnected and incorporated in perspectives of subjects of study, it must encourage participation, be relationally focused and directed towards a context of ecological relevance (Burns, 2009). Learners should thus be made to understand how their actions within their local environment could propel huge environmental catastrophes at the global stage. It is important to stress that it is imperative for teachers to make transformative tenet a useful guide as they go through sustainability transformation journey in their schools. The whole school enterprise should be involved in this process of transformation.

In the work built on Bernstein's pedagogic ideas, Macdonald (2016) applied a four-part model to science education based on:

Disciplinary – science as expertise

cross disciplinary – education for sustainable development (thematic)

interdisciplinary – participatory work in integrated science

transdisciplinary activities – in which a product arises which is not possible to allocate to any existing class of activities.

The work done by Bernstein on knowledge and power helps to identify the nature of interactions ensuing between teachers and students in such a complex and contested work that sustainability education proves to be. Teacher educators in sustainability classroom are expected to integrate knowledge to execute innovative interactions with students. These four-knowledge levels extracted from modes of teaching are in a continuum with respect to the kind of interactions that exist in subjects (Kysilka, 1998).

### 2.4.5   Dimensions of ESD in initial teacher education

One can relate different dimensions of ESD in the literature (Amaral et al., 2015; Godemann et al., 2015; Samalisto et al., 2015; Waas et al.,2011). One among these which has been used many times is the one that brings economic, social and environmental pillars under one accord (Leal Filho et al., 2015). There are other dimensions of sustainability that one can consider, for institutional linkages and cultural tenets of sustainability (Disterheft et al., 2013; Leal Filho et al., 2015). The cultural aspect is often part of the social one, and recently authors describe four main pillars. As regards, Lozano (2011) has proposed four dimensions. The economic dimension which promotes economic development but includes ways to improve usage of energy decisively and budgetary allocation for enterprises that promote SD in the school. For the environment, sustainability exercises should link matters of the environment into the strategies being pursued by every units, e.g. construction of structures

that have sustainable character in the school; separation and finding means to recycle wastes; and implements needed to bring renewable energy (Aleixo, Azeiteiro, & Leal, 2018).

The social facet of SD is related to decisions taken by actors in the organization or by the related communities for example on actions towards ensuring equality and concerns for diverse groups, creating viable means for participation in competitive activities and measures that seek to involve everyone in the society.

ESD must consider relevant interventions to review outcomes of what student learn and how contents in curriculum are expressed (Disterheft et al., 2016). SD concepts should be introduced in diverse fields and activities inside and outside of the school. Models of different features can be utilized to embed ESD in the curriculum. For example, by infusing SD into courses that are align to sustainability or integrating SD into unrelated lessons (Stough et al., 2017).

Research embarked to address challenges we face in our societies are important for SD, whereas motivating groups from different fields to advances approaches that are sustainable is also vital for ESD in schools (Popescu & Beleau, 2014). Research can also encompass reaching out to the society so that the institution takes the front seat in creating an all-embracing environment where both top and lower level stakeholders are considered. (Popescu & Beleau, 2014). This will mean that, every sector of society is involved in SD implementation.

Cross-disciplinary learning and research is important in realizing ESD (Dyer & Dyer, 2017). An emphasis here will be for schools to engage teachers from various fields to learn together and share knowledge. This deepens understanding and creates sharing of ideas from different perspectives.

A lot of strategies are available for evaluating how HEIs are faring in the context of ESD. HEIs can through sustainability assessment create changes regarding the safety of their environment by responding to environment matters in responsible manner. They can also improve their performance, and ultimately obtain certifications when they are abiding by the laid down sustainability practices (Disterheft et al., 2012).

The relevancy of HEI rankings and how that can be a factor to distinguish on HEIS from another has also been discussed. Providing ranking gives to a tertiary institution how it is doing in regard to acceptable level of performance and where it has to do something to improve (Lukman et al., 2010). Apart from academic laurels, other criteria which distinguish one university from another within the ranking has been how the university's research is impacting society, and how it is meeting its sustainability related matters. There are thus mutltiple factors to comply with in other to do well on the ranking. (Popescu & Beleau, 2014).

## 2.5    Stages of development of ESD in teacher education institutions

The theory that espouses the process of adaptation and how innovation could be diffused which was propounded by Rogers in 1995 is important when it comes to how to integrate SD and how teachers, students and all schools' participants act. SD can be actualized in HE education under five related faces: (i) innovators, (ii) early adopters, (iii) early majority, (iv) late majority and (v) laggards (Lozano et al., 2013 cited in Aleixio et al., 2018; Lozano, 2006,).

This theory is relevant to examine variables that influence how SD can become adaptable in an institution (Lozano, 2006; Lozano et al., 2013). There should be a model that can interpret the various variables and facets when implementing ESD in teacher training. See table two for the five stages of the theory in a teacher education frontier.

Table 2: Approaches to working with ESD in teacher education (Wals & Corcoran, 2006)

| Modes towards Transformation | Description of Learning for SD | Example |
|---|---|---|
| Total embedded | Encouraging direct experience with a real-world phenomenon | Sustainability impacts Observation and monitoring Issue-specific management |
| Diversity in learning | Showing sensitivity towards unique modes of learning | Giving variety of lucid approaches Reflecting with the learner |
| Active participation selection | Use learners' stock of ideas to develop discourse | Soliciting the learner's own ideas Learning involved in content |
| The value of valuing | Revealing through self Confronting the learner | Learners' value expression Creating viable situation for learning |
| Balancing the far and the near | Learners understanding remote and local problems | Relating issues of biodiversity during dinner |
| A case study approach terrain | In-depth learning | Showing examples of people Successfully impacting local |
| Social dimension of learning | Mirroring the learner's ideas, experiences and feelings | Taking time for discussions |
| Learning for action | Making the development of action and action competences an integral part of the learning process. | Allowing learners to develop their own course of action and follow through with it. |

Sources: Wals & Corcoran (2007)

## 2.6    Impediments to sustainability transformation in teacher education

Teacher educators of all school subjects are expected to incorporate elements of SD in their teaching. They are also expected to teach in relation to ESD tenets, but they are constraint

by certain factors. Efforts to embedd ESD by HEIs has not been encouraging at all (Leal Filho, 2011; Tilbury, 2011). HE has also failed to play a leading role in the discourse on ESD integration in HE curriculum (Gale et al., 2015). Apart from these, other structural barriers hinder the implementation of ESD in HE. Four have been identified. They include disciplinary factors, institutional framework fragmentation, globalization of HE for promoting economic growth, and task-specific reasoning and decision making among policymakers (Gale et al., 2015).

### 2.6.1 Disciplinary contestation

Disciplinary contestation has arisen out of the perceived vagueness and complexity of SD. Some actors in universities have called for teaching SD as a stand-alone subject whilst others have proposed for an integration SD either in the traditional SD related subjects like Biology, Physics and Geography or in all subjects taught in schools. This has compounded the issue even more. In the literature the concept of SD has continually be contestable in the context of the meanings ascribed to it. It has been continually given new definitions even after the Brundtland commission 's definitions.

This readily reflects the politics associated with the concept and the hidden complexity that comes with it (Redclift, 2005). Some have treated the term as vague, but its meaning can be manifested as very short and at some instances various suppositions portray the concept as having multiple interpretations. The multiple definitions have deepened the disciplinary contestations and the sort of disciplinary fields that ought to be studied in schools and colleges. Several disciplinary areas have resulted from the concept and so actors in HEIs have found in difficult to come to consensus and adduce approaches that are coherent enough to deepen understanding.

### 2.6.2 Institutional framework fragmentation

Institutions are the foundation of every workable system. Institutions mandated to implement SD policies are expected to forge together a wide-ranging concerned entities and actors to formulate and monitor implementation of plans. They are mandated to monitor laws, conventions and practices that guide the path through which the objective of SD could be attained. In Ghana, there exist no adequate legal regime to guide the implementation of SD and its related concepts like ESD even though there exist a National Strategies for Sustainable Development (NSSD). However, an examination of the Ghanaian constitution raises issues regarding institutional progress on matters of social, economic and environmental concerns, the familiar trio of issues regarding sustainability (Witoszek, 2017). The emphasis in our society, however, is on environmental issues.

Within HEIs, one cardinal problem that confront actors when working with students on ESD is fragmented units and roles in the schools. HEIs consist of a network of institutions and units whose functions sometimes overlap with one another. These institutions work together to promote learning, research and dissemination of research outcomes. Most often, the structures and units in the HE has loose fitting networks without full autonomy or authority to influence how decisions and policies are made.

In addition to this, undue competition among these institutions, disciplinary antipathy, unclear initiatives and policies, inappropriate criteria of evaluation, wrong decisions (Moore, 2005) affect their effective functioning. A lot of actors in HEIs argued of the disciplinary nature of SD. Some have kicked against the idea of interdisciplinary and cross-disciplinary nature of teaching-learning associated with ESD with many arguing that it is better for learners to master the disciplinary aspects of subjects before looking at the various facets of linkages that go with it. This does not promote the desired sustainability that has been campaigned for regarding nature of the various sustainability nuisances that have become interlinked with one another.

### 2.6.3  Commodification of HEI

The aim of HE education has been to propel national development. However, in the past few decades, this aim of HE has shifted. There is a move to commoditize HE. This works against ESD in HEIs. Currently, towards the move to commoditize HE, states make huge budgetary allocation to support institutions for research, establish programs which do not only promote growth of state's economy, but to serve the needs of industries. The industrial actors require adequate manpower to produce up to the optimum.

Governmental institutions need high level skilled people to manage national economies. These have made HEIs competing in this regard. They seek to admit more students as possible as they can. The focus is to remain competitive to drive national economies and to build-up capital (Molesworth, Nixon & Scullion, 2009). However, the era of sustainability seems to undermine this competitive quest of HEIs. Experts are calling for alternative modalities which focus on creating wealth without increasing economic growth. This means universities should promote ecological thinking towards SD. Many universities have been caught in the conundrum of promote sustainability and economic growth.

The caveat here is that, in  seeking to speed up efforts at achieving SD, governments financing of HE have declined in recent years, and attention of HE leaders have turned to students to finance their studies which in many cases have been in the form of student loans, students have also turned attention to studying subjects and fields that could potential yield maximum returns on completion. HEIs have also responded in this regard and

are providing programs and courses that suit students' interest. The reality therefore is that our students have become inundated in the reality of global market dynamics which meant that if we are to achieve anything in SD, we must begin changing the rhetoric of ESD. Gradually, but clearly, there is increased partnership between HEIs and industries with students interns and attachments with corporate industries and universities sourcing their teachers from these industries (Molesworth, Nixon & Scullion, 2009). The factors discussed above are reinforcing what Sterling (2004) refers to as the mechanistic orientation of education and thereby inhibiting any attempt at preventing any unsustainable actions.

### 2.6.4 Enjoyment of academic freedom

The concept of academic freedom in HE is tailored towards knowledge advancement to back student analytical thoughts and critical reasoning (Barton, 2018). In many tertiary institutions, many academics regard themselves as being umpires of correct reasoning and this tends to impede progress at initiating new projects (Butler, 2018) such as the integration of sustainability values in education. The situation among many actors within HEIs is that many tend to think they know it all and may be found very difficult in accepting new changes especially regarding decisions on ESD. The principles of ESD at HE is basically arrived at on intellectual discussions that actors have engaged. But you have situations where biased researches and discourses by some actors try to impede progress at integrating ESD (Ekwueme, Ekon & Ezenwa-Nabifie, 2016).

### 2.6.5 Policy driven curriculum

An examination of the 2004 National Report of Ghana on Development of Education spelt out clearly the government of Ghana's policy directives on ESD (Ministry of Education, 2004). By way of curriculum and syllabus the state encourages schools and colleges to infuse elements of SD in their teaching activities. As early as 2001, the government-initiated measures to make education institutions support an understanding of principles such as biodiversity conservation, pollution prevention, and sustainable management of natural resources. Government sees education institutions as key to success and therefore calls on them to deepen the awareness and sensitization sustainable development brings through teaching of its values and principles.

The 2004 report also suggests that a formal embedding of SD concepts in education in Ghana began in 2002 when a syllabus development workshop was held in Ajumako in the Central region. Though the school's curriculum does not lay emphasis on the teaching of SD as a separate field of study or as a separate subject, it rather allows concepts of SD to be nurtured within the various subjects that are studied in schools. This has not been

successfully implemented as many Ghanaians are not aware of climate change impacts and adaptation mechanisms (USAID, 2017).

The discussion called for cross-disciplinary climatic issues to be embedded in subjects for teachers at the primary and high school levels to develop in their students. From primary schools through the high school level up to the tertiary levels, subjects like Agricultural Science, Geography, Integrated Science, Religious Studies, Biology, Physics, and Social Studies have elements of SD.

There were suggestions that the core sustainability competences that help learners to navigate their ways through their immediate cultural, social and physical environment have been embedded in the school syllabus. Through this, learners develop the knowledge and capacity to identify and analyse critically both local and global environmental problems to effectively contribute to finding lasting solutions to them.

### 2.6.6  Other internal and external challenges

Apart from the structural impediments discussed above, there are other potential challenges confronting the quest to integrated SD related elements in schools. Such impediments could be internal and external barriers to sustainability integration (Ferrer-Balas et al., 2008). The internal barriers which are normally school based are related to the school culture and school structures. The enjoyment of academic freedom by teacher educators in tertiary education institutions for example can be affected by institutionalized arrangements. Faculty members make decisions regarding topics for their research and what to teach or not to teach.  They enjoy that freedom and right to disseminate their findings without any political interference. The enjoyment of academic freedom by teachers in universities and other HEIs makes it difficult for university leadership to propose institutional changes to champion sustainability course (Scott & Gough, 2004). Even though academic freedom empowers teachers, it may turn out to inhibit any initiatives to embed SD in the institution.

Oftentimes, institutional changes are prompted by the community. Universities act when they understand that the aspirations of the society has changed. However, the lack of pressure from the society and industry for schools to act has led schools to renege on its mandate of embedding ESD principles, knowledge and values in their actions.

Inadequate incentives for sustainability actors, and the lack of desire by key members of the school community like teacher educators and administrators to take up sustainability tasks could also hinder sustainability and transformation of learning in schools.

## 2.7    Theory of transformative learning

A transformative lifestyle has been recommended as vital to implementing ESD. Educational institutions need to build new paradigms and pathways in teaching and learning to bring about understandings of ESD to help overcome the obstacles that impede against the efforts in addressing today's and future problems (Tilbury, 2011). Sterling and Thomas (2006) added that, this will demand more transformative learning pedagogies rather than reformative and confirmative learning styles.

Transformative learning regarding ESD is what Wals (2007) referred to as a learning approach which provides opportunity for young people to make resolutions regarding ''alternative and new kinds of thinking and solutions'' that are collaboratively created by citizens who chart their own lives and make differences whilst residing in ''a more reflexive and resilient society.''

Transformative learning (TL) emerged through the study on adult education by Mezirow. Mezirow (2000) refers to transformative learning as a shift in focus of ''our taken-for-granted frames of reference (vis-a-vis perspectives, habits of mind, mind-sets) to make them more inclusive'' (p. 7). The author went further to outline that, as adult learners develop over time, the tendency is that they reject some ideas that they see as incompatible with current frames of reference. However, with and through an appropriate learning environment transformative learning helps learners to move to a more inclusive frame of reference that is self-reflective in nature and enables them to discriminate and assimilate experience (Mezirow, 1997). Though having a firm grasp and understanding of an issue may occur at a personal individual level, its advent is more likely to be influenced within the broader social and interpersonal situation as in social learning theory.

The theory of transformative learning has been criticized since its early development. It has been criticized for some shortcomings regarding the nature of the transformation itself. But there has not been an alternative theory or perspective in place to replace the framework by Mezirow (Kokkos, 2012; Taylor, 2008) to deter its application or use. Indeed, about adult learning perspective, the theory of transformative learning has been used in an array of fields such as workplace education and community development (Taylor, 2008), volunteerism in the tourism industry (Coghlan & Gooch, 2011), of natural resources (Diduck et al., 2012) and in creative writing (Hunt, 2013). Considerable attention has been on transformational learning in the context of sustainability especially in teaching and learning within the field of education.

As transformative learning emphasizes processes of learning and learning outcomes, it has enabled the role of education to be re-framed in relation to sustainability. Indeed, some have argued that the complexity of the concept of sustainability along with the pluralistic

nature of our world, characterized by different enduring interests and values as well as stakeholders have required the need for a method of learning that address divergent needs (Sterling, 2011; Wals, 2010; Sterling, 2005).

Labelled as a diversity of thoughts, transformative learning put more emphasis on critical thinking, problem-based, processes and methods and reflective education practice (Thomas, 2009). Transformative learning enables critical, reflective thinking and creative, imaginative, problem-solving techniques to thrive. An educational setting is learner-centered and encourages participation and viable interactions. The deliberations and problem solving within groups are valued in transformative learning (Mezirow, 2000).

In another twist, Wals and Corcoran (2006) corroborated with Wals and Jickling (2002) in emphasizing that transformative learning in the context of sustainability should not be the objective of the education system, rather ESD. It becomes the condition that arises through transformative learning processes. So, the objective of ESD in the context of sustainability, transformative learning is thus a learning process which opens new modes of thinking and allows for alternative solutions which are "co-created and co-owned by more reflexive citizens, living in a more reflexive and resilient society" (Wals, 2007, p. 42). Extensive list of principles identified by Wals and Corcoran (2007) when integrated into teacher education settings will help foster individual autonomous thinking and an inclination towards systematic learning for both learners and teacher educators.

We have seen in the last few sections that the concept of ESD is complex due to the differences in meaning and promotion strategies that groups and people have adopted. In Africa, Ghana has been among the countries at the forefront of the fight against climate change and other related environmental problems confronting the African continent. It has embarked on several policy initiatives in its quest to promote SD.

## 2.8    Development of teacher education in Ghana

In this section of the review, a brief description of the teacher education system in Ghana. Key reforms in education sector from 1957 that have shaped the nature and form of teacher education in the country are considered. The process of initial teacher education, taking into consideration the structure and the mode of training of teachers is also discussed.

### 2.8.1   Perspectives of teacher education reforms in Ghana

The following paragraphs discuss some of the major reforms that have shaped the course of teacher education delivery in Ghana. As stated previously, Ghana's education system has gone through different faces of modification. Modifications in the Ghanaian education were

the result of changes in education brought about by various educational reforms initiated by successive colonial and Ghanaian governments.

Education reforms are important policy measures that are undertaken to restructure an educational system to make it respond to the changing socio-economic needs and aspirations of a country. Education reforms are the changes in education system driven by initiatives by the government after analysis of the current political, social and economic situation of the country, suggesting a shift in the paradigm of the education system (Young & Levin, 1997).

Among other reasons, an education system is reformed to make education provision relevant to the overarching needs of the country and to equip participants with relevant skills and knowledge for the world of work. Also, an education system is reformed to create access to education, provide schools with required resources, equip teachers with new pedagogies and content knowledge and to impart new technological skills. Thus, education reform should strive to create viable opportunities for school children, and promote national and global goals (Airini et al., 2007).

Historically, education reforms in the country dates to the 1590s where education establishment were housed in castles owned by the European Missionaries. Schools began in these castles by the Danes and Portuguese when they arrived in what was then called the Gold Coast (Adu-Gyamfi, Donkor & Addo, 2016). Since then, education in the country has gone through various stages and has had different objectives from the propagation of the gospel of Christ to the training of teachers and training of specialized, scientific human resource requirements of the country.

Immediately after independence from the British in 1957, the government saw the need to bring some changes in the education system of the country which was then modelled on the British socio-cultural system. The changes by way of reforms were to make education relevant to the social, economic and cultural values of the Ghanaian people. Successive governments have affirmed this stand and have made different education policies to that effect, to make it responsive to the needs of the people of Ghana (Agbemabiese, 2007).

The focus of the various education reforms has been to create access to education for all school-age children and to address gaps in literacy and numeracy. They have also aimed at improving quality delivery of education and to promote equity as well as to address the issue of funding in the education sector. It is worthy to note that all these reforms contributed significantly towards the structural improvement and transformation of the Ghanaian education system since independence. Some of these reforms, which are discussed under this section of the study, include: The Accelerated Development Plan of 1951 and Education

Act of 1961, and the Education reforms by the National Liberation Council. The accelerated development plan and the 1961 Education Act

This marks the beginning of educational reforms of Ghana when governance of the country was given to Ghanaians. It was the first education policy instrument that specified how the Ghanaian education system should be organized and managed in the country. The Education Act was initiated by Ghana's first president Dr. Kwame Nkrumah when he assumed the mantle of presidency of the country. The initiative of new education organization, that was approved in August 1951, was aimed at expanding the frontiers of education rapidly to all nooks and cranny of the nation. The reform brought about six years primary schooling and training of quality local teachers to teach in the various levels of education in the country (George, 1976). The idea behind this reform was that the President wanted an education system that ensures the relevancy of the African identity and so he advocated for a type teacher training system to that effect. This probably was to do away with the mindset of the Ghanaian that still hinged on the European thoughts and culture (George, 1976).

Dr. Nkrumah also introduced subjects that relate to local African cultural values and norms. Whilst English was used as a tool for communication at the upper primary school level and the second cycles, local Ghanaian languages were used as a medium of interactions in schools in the lower primary schools to inculcate African culture in children (George, 1976).

The Accelerated Plan led to an expansion in secondary school education across the country. The government built 15 new secondary schools. Technical education was boosted with the establishment of technical schools in Takoradi, Tarkwa and Kumasi. These schools were to train students to acquire employable skills in carpentry and joinery, masonry, metal work, etc.  In the second year of its introduction, specifically in 1952, the second phase of the reform started. This was a seven-year educational reconstruction and development program which involved expansion in elementary schools and teacher training programmes across the country. Emphasis was laid on post-secondary education with references made to technological and leadership training in universities to meet the growing industrial and agricultural needs at the time.

In February 1966, the National Liberation Council (NLC), comprising of both military and civilians overthrew the government of Dr. Kwame Nkrumah in a coup d'état. The group was headed by General Akwasi Amankwah Afrifa and General E.K Kotoka. This served as the first route for acquisition of power to govern in Ghana (Buah, 1998). To bring sanity in the harsh economic situation facing the country at the time, the NLC made some changes with regards to the education sector. The government appointed an education review committee to have

a comprehensive review and analysis of the education sector and makes recommendations for improvement in March 1966 (George, 1976). However, even without the committee to finish their work, the government scrapped off Nkrumah's seven year accelerated development plan whilst asking parents to pay for their wards textbooks which initially was free under the first reform (Braimah, Mbowura & Siedu, 2014).

### 2.8.2 Aim of teacher preparation in Ghana

"Education is a condition for development and the teacher is the ultimate definer of its reality" (Adegoke, 2003, p. 5). The role of the teacher in nation building is so essential that no nation can afford to neglect the training and quality of its teachers. In this regard, a careful analysis of the contemporary teacher education system in Ghana and the structure of initial teacher training (ITT) programs, as well as the approaches that are employed in training teachers in the country, is relevant particulary for this type of study that aims to find out how institutions mandated to train teachers in Ghana, called colleges of education, incorporate sustainability principles, ideals and knowledge in their activities and programs.

The main aim of teacher education in Ghana is to provide relevant teacher education programs to train teachers with high competences, knowledge and skills to effectively manage and improve the process of teaching and learning in our schools (Adegoke, 2003; Benneh, 2006). Just like the general education system of Ghana has gone through series of modification, so have teacher education in the country. The changes in initial teacher programs have been in response to governmental policies to make the training of teacher educators respond to socio-economic changes in Ghana and globally. Also, the quest to train efficient and qualified teacher educators to train human resources for Ghana has led to different types of teacher educators with variety of certification (Asare-Bediako & Nti, 2014).

The training of teacher educators is in the hands of 43 public and private colleges of education (formerly teacher educator training colleges) and five public universities that have faculties for training teacher educators for both first and second cycle institutions (Armah, 2017).

### 2.8.3 Structure of teacher training

Currently, there are 43 public and private colleges of education and five universities that run the teacher educator education programs in Ghana. They provide the following routes for persons to become teacher educators in first and second cycle schools (Anamuah-Mensah & Benneh, 2005; Armah, 2017; Institute of Education, 2005; Institute of Education, 2003):

A four-year teacher educator education program, qualifying participants for a bachelor's degree.

A three-year diploma in Basic education organized by the CoE targeting preparation of teacher educators for preschool, primary and junior high schools in the country.

The University of Cape Coast and the University of Education each run a two-year post diploma and basic education for teacher educators teaching in public basic schools

There is also a four-year program that awards a Bachelor of Education certificates for persons to fill basic and second cycle schools. This program is organized by the University of Cape Coast and the University of Education Winneba.

The universities of Cape Coast and University of Education further offer master's degree programs for teacher educators for second cycle schools and CoE.

Teacher educators in the field who already have the teacher educator's Certificate 'A' also have the chance to enter a two-year sandwich program organized by the University of Cape Coast through the colleges of education for a diploma in Basic Education certificate.

There are a lot of untrained teacher educators teaching in the system, most of them practicing in villages and remote areas in the country. The Untrained Teacher Diploma in Basic Education (UTDBE) provided a four-year teacher educator education program for such non-professional teacher educators to upgrade their competences in teaching pedagogy and content knowledge. This program is an *ad hoc* measure to increase the number of qualified teacher educators teaching in basic schools in rural Ghana. It is organized in the CoE with support from the Teacher educator Education Division (TED) of the Ghana Education Service (GES).

Finally, the CoE in partnership with TED and GES offer a three-year distance education program for the untrained teacher educators who were unable to meet the required grades for professional status it in the UTDBE program. This program awards teacher educator's certificate "A". The teacher educators have not received initial teacher educator training but are still in the field working as teacher educators. The aim here is to increase the number of teacher educators in schools in rural communities.

### 2.8.4   Forms of training of teacher

The objectives of teacher educator education programs are categorized into three, a) increasing the teacher educators subject matter knowledge to a level far beyond what she/he is most likely to teach, b) provision of general knowledge and understanding of the fundamental principles of teaching the curriculum, and c) understanding the approaches for instruction and evaluation techniques that are appropriate for first and second cycle schools (Armah, 2017).

Initial teacher educator education programs are thus relevant in helping student teachers to understand the principles and practices of education, curriculum and instruction and

assessment strategies for managing classroom situations. Ghana have adopted a uniform mode of training of teachers for the pre-tertiary sector (Anamuah-Mensah & Benneh, n.d). Although colleges of education are found in different locations across all the regions in Ghana, the training procedure has a national focus. The generalist approach for kindergarten to grade 6, subject-training approach, training of specialist teachers to handle junior and senior high school levels, training undertaking through the distance learning system and internship programs are the approaches to teacher training adopted in all these colleges and universities that train teachers in the country.

## 2.9    Summary of chapter

HEIs and institutions working on sustainability initiatives recognize the diversity in processes applied in implementing sustainable education. Both local and national initiatives vary because they are contingent on the appropriateness and relevancy of local cultural situations (McKeown & Nolet, 2012). Education institutions shoukd therefore consider their local situation in teaching sustainability. Teachers working with teacher learners are key in integrating sustainability knowledge, values and principles. However, they must do this within the appropriate cultural and social context. The appropriate transformational pedagogies must therefore open the doors for learners to realize the immediate needs of their immediate situation as well as the other distant sustainability issues. The processes of learning that encourage active and direct connection between students and issues relating to sustainability have become useful when teachers engage with student in sustainability class.

The literature review has also pointed to the many challenges that HEIs like teacher institutions are grappling with when they implement sustainability in their field. We have seen the issues with contradiction of the disciplinarily of the ESD as a field of study. There is also the problem on how teachers in HEIs could balance the enjoyment of freedom to pursue their research and teaching with no intimidation, and the need to accept new policies like ESD.

The study seeks to investigate how teacher educators in three colleges of education the Central Region of Ghana integrate the principles, knowledge and values of sustainability. It further examines the drivers that facilitate sustainability education and the impediments confronting approaches that teacher educators employed in implementing sustainability models. The literature review has shown the imperative of integrating ESD in teacher education and have drawn attention to the need to up the efforts at sustainability implementation.

In my search, I have found that there is no study that have discussed the integration of sustainability principles, knowledge and values in teacher education particularly in the Central Region of Ghana. There has also not been studies investigating the drivers and the impediments of ESD in teacher education in the region.

# 3 Methodology

The research procedures followed in conducting the study are examined in this chapter. This includes establishing the rationale behind the choice of research design, data sources, data collection and analysis. Measures taken to ensure credibility and rigor of the study, data analysis strategies, ethical considerations, and the methodological challenges that were faced during the study are described and discussed.

The chapter is organized as follows: (a) Purpose of research and questions, (b) research design or methodology; and (c) conducting the qualitative study.

## 3.1 Purpose of the study and research questions

The teacher educator is an important factor in the process of education and hence education for sustainability. Efforts to introduce education for sustainability cannot be done without the teacher. Therefore, teacher educator's competences on sustainability is key in the push towards the attainment of global SDGs.

The main aim of the study is therefore to investigation how teacher educators in three Colleges in the Central Region of Ghana integrate the principles, knowledge and values of sustainability. It investigated transformative pedagogies that teacher educators rely on when working with students on sustainability concepts. Furthermore, it examined the drivers facilitating sustainability education and the impediments confronting approaches that teacher educators employed in implementing sustainability models.

## 3.2 Research design

Research design is the glue that holds all the basic questions of the research together. It is the overall strategy employed by a researcher to find answers to the research questions as well as testing hypotheses (Burns & Grove, 2001). This includes specified structure within which a research project is implemented (Burns & Grove, 2001).

The choice of a specific research methodology or design depends on several factors. The theoretical, methodological and ethical factors are very key in deciding on which design to adopt in a study. The researcher must also decide whether to take a positivist or interpretivist theoretical positions and make room for ethical considerations in terms of the impacts of the study on the participants involved. This includes making sure that participants or respondents are protected from harm, both physically and psychologically that may occur during the research process (Fraenkel & Wallen, 2009). In this study, I was guided by the ethical antecedent in designing the procedure of data collection in order not to trample on the rights of the participants.

The literature describes many different types of research designs. However, qualitative and quantitative research paradigms were the two most used research methodologies. There is however also a third approach, the mixed method approach, which has become increasingly popular within the social sciences in recent times.

Whilst the proponents of quantitative research paradigm, linked with the positivists' epistemology, have emphasized the strength of numerical data with the advantage of providing objectivity of numbers in the explanation of reality, the qualitative researchers associate their thoughts within the interpretative epistemology. They explain that qualitative research relies mostly on "contextual data" which they believe gives subjective understanding of reality (Goodhand, 2001). The debate about which of the two paradigms is preferable has also centred on why one is more effective and suitable than the other (Neill, 2007; Trochim, 2006; Walonick, 2003; Westmarland, 2001).

This rigorous and robust discourse of the positivist-interpretivists dichotomy has been ongoing for a long time. Several authors in their quest to provide clarity have written extensively about these two research designs, advancing arguments with different forms of summary charts (Lincoln & Guba, 2000), discussions and assortment of groupings of research paradigms in advancing their positions (Creswell, 2009; Neuman, 2000).

Whereas the positions alluded to by these authors could be right, there are others, belonging to another group who have called for an end to this debate claiming that these two approaches are just two faces of the same coin and thus describe the same principle and story. In their views, these two methodologies contribute enormously to the understanding of social phenomena and thus have advocated for researchers to overcome the shortcomings of the two by combining them (Neil, 2007; Walonick, 2003; Westmorland, 2001), hence the idea of the mixed method, involving the use of both qualitative and quantitative elements.

Questions about how people see reality is considered when making decisions on the right research methodology. Questions relevant in this regard included: What is epistemology or what kind of relationship permeates between the known and the knower? Or, is reality or knowledge constructed or acquired? (Bryman & Bell, 2007; Merriam, 2002) or is reality or knowledge an objective concept that is external to people? How certain the researcher is about what he/she knows also becomes prominent because this influences the decision that the researcher makes regarding the type of research methodology that he/she selected.

From the above arguments, one can conclude that, a researcher adopts quantitative research design when he/she perceives knowledge or reality as an objective or tangible phenomenon. On the other hand, he/she adopts a qualitative methodology when his conclusion is that reality or knowledge is a subjective phenomenon.

I have sided with the proponents of the qualitative or interpretive research paradigm due to the reasons I have outlined above. The epistemological stance of my study fits within the interpretive paradigm. The interpretive paradigm was appropriate as it helped me to understand reality by giving me enough valuable interaction with the research participants.

To describe reality as a real-life exposure that could be certified and analysed, I drew conclusions based on the day-to-day teaching processes that teacher educators in the three colleges engage with their students as far as sustainability is concerned.

I needed an understanding of the types of teaching-learning pedagogies adopted by teacher educators in colleges of education in promoting SD. Furthermore, I wanted to consider the role of transformational learning pedagogies, then to find how what impediments have prevented them from doing so. Some of these impediments could be local or are within the context of the school or some structures within the larger context of teacher education in the country.

Morrison et al. (2002) reiterated this view shared by the constructivist/interpretive paradigm, stating unequivocally that qualitative methodology is appropriate for educational research and that "…educational research needs to be grounded in people's experience…" (p. 18). In Morrison's view, the essence of educational research for the researcher is to conceive the research participants as research subjects that must be explored to gain "meanings" of phenomena and events from their stock of knowledge and from what Patton (1990) referred to as "information-rich" experience.

## 3.3    Conducting the study

To achieve my objectives, I employed a qualitative research methodology involving investigation of a phenomena when they occur in their natural context (Gall et al., 2007). Creswell (2003) adds that qualitative research designs are best in eliciting a deeper understanding of social phenomena. This research sought to elicit qualitative responses from experts in the field of teacher education on a subject that demands experts understanding and professional competences.

In a qualitative research, information received from participants perspectives and experiences are based on their social and natural setting (Silverman, 2005). Studies of this nature requires an inquiry based on the situational context with an interpretation of the real lives of the participants involved in the research (Denzin & Lincoln, 2011).

Since sustainability issues raised a lot of concerns among educationists, education policy makers, teacher educators, researchers and school leadership alike, it was appropriate to explore the shared views and experiences of these professionals. A case study approach in

qualitative research in this context provides a deeper understanding of experiences, views and perspectives of the research participants (Flick, Kardorff & Ines, 2004).

### 3.3.1   The qualitative case studies

The case study research approach provides pragmatic avenues that can influence policy strategies and initiatives. It is appropriate and accepted standard for conducting research in education. The approach is an effective paradigm of research for investigating and exploring complex issues in a real-life setting (Harrison et al., 2017). The diversity of issues relating to education in the context of SD makes case study the appropriate choice of research method (Corcoran et al., 2004). Case studies provide the platform for conducting exploratory studies into the sustainability concept.

Apart from the support for case study as appropriate for research in subject of ESD, a plethora of literature continue to demand this kind of research within the field of education for sustainability. The demand in the literature for education institutions and education policy formulators to include evidence in school programmes and activities that back the arguments raised by experts in the field of sustainability and the scientific community have also increased. What is particularly interesting to note is that these demands have coincided with the efforts in making the case study approach a viable research tool for studying local initiatives in education for sustainability. The literature review indicates that there is still a demand for more studies in the field using the case study approach.

Case study brings to bear the diversity of factors that interact to make the characteristics of subjects under study become more unique (Yin, 2014). Case study opens the window for the investigator to have in-depth, all-round information about the subject being studied. "The case study approach allows the researcher to go deep, to learn what works and what does not" (Corcoran, 2004, p. 9). That is, in contrast with other approaches like survey, the case study is recommended for studies that hope to find in-depth information about the subject under study.

The expectation of researchers, policymakers and stakeholders in education is not to produce research to fill the shelves in libraries. They want result-oriented research that benefits society and influence the thinking of government officials, college leadership and the general public on societal problems. This is achievable when research speaks to them in a manner that promotes their thinking. Case studies provide robust and result oriented. It is essential in studying human related issues because they enable "down-to-earth and attention-holding" (Stake 1978, p.5). The case study method can thus help to unearth issues relating to ESD and pinpoint areas for further studies. This is imperative because in the education sector, researchers who employ the case study do not only profess solutions but

also uncover and clarify problems for the attention of interested actors in the sector (Steiner & Posch, 2006).

Despite the advantages of the case study research approach discussed above, the literature is not shy of some potential bottlenecks. Merriam (2002) raised concerns about the ambiguity with regards to the meaning of case study itself, whilst Creswell (2007, 2009) talks about problems of representativeness and selective bias associated with case studies. Also, Yin (2014) reflects on the inability to have a scientific basis for generalizing the findings from researchers that employ case study as they lack rigor.

The case study approach allows researchers to gain access to quality data which are essential for cross and interdisciplinary understanding of sustainable development. However, there is a potential limitation of findings in terms of capability to generalize over a larger population, especially in relation to different academic disciplines (Cotton et al., 2007). Corcoran (2004) further corroborated with this assertion and stated that case studies often do not contain information regarding the theoretical basis of the chosen research approach or theoretical backing of data collection strategies.

In the same vein, Dillon and Reid (2004) reminded us that there is a high risk among researchers and beneficiaries misinterpreting and over-hyping findings of studies that employ case study if the epistemological and ontological orientations are not clearly explained. Kyburz-Graber (2004) agreed with these criticisms of case studies and added that case studies can end up in drawing conclusions that are inadequate and lack full rigor.

To counter these criticisms against case studies, some researchers have taken measures that assure quality in case study methodology. Yin (2014) maintains that case studies can be made rigorous and be fully accepted as scientific approach when certain standards are followed. Objectivity, validity and reliability are key factors that must be adhered to. Yin further argued that, to achieve these three key criteria, it is important that the qualitative researcher justifies and describes the theoretical basis of his research questions and to ensure triangulation through the application of multiple data sources. A series of evidence whose reasons are traceable and are fully documented is equally imperative to ensure the credibility of the process. An interview process which is iteratively reviewed as well as written again is very crucial in reporting case studies.

Triangulation is understood to be essential in clarifying and confirming research findings, providing data comprehensiveness and increase validity as well as promoting understanding of the subject under study (Casey & Murphy, 2009; Halcomb & Andrews, 2005).

## 3.4    Participating colleges

To fully understand how colleges of education integrate SD in their activities, teacher educators in the three CoE in the Central Region of Ghana were interviewed to solicit their views and grasp of the concept of ESD. They were asked questions on their understanding of the SD and ESD concepts, the pedagogies they use to embed SD in their teaching and the several impediments that hinder their attempts to teach SD related concepts in their schools. Focus group interviews were also conducted with the principals of the CoE, teacher educators and personnel of the Ghana Education Service to seek their views and perspectives on ESD related matters in their schools and departments.

The Central Region is one of the 16 administrative regions in Ghana (Wikipedia). Geographically, the Central Region is bordered in the northern part of Ghana by the Ashanti and Eastern regions. It shares boundaries in the west and east by the Western Region and Western North regions, and Greater Accra region respectively. In the south of the region is the Gulf of Guinea and the Atlantic Ocean. The size of the region is 9,826 square kilometres, covering 6.6% of Ghana's land area. One of the historical cities of Ghana, Cape Coast, serves as its capital (Wikipedia)

The region is noted for many elite education institutions and an economy based on tourism, fishing and primary industrialization. Tourist attractions centre on the many castles, forts and beaches that are found along the coast.

Education in the region dates to the colonial era with educational objectives mainly to train people for trading activities and missionary work. Currently, the region boasts three fully fledged universities, viz University of Cape Coast, University of Education, and Technical University of Cape Coast. There are also three private university colleges. The region is also renowned for elite high schools which include Adisadel College, Mfantsiman High School, Wesley Girls, St. Augustine College, and Aggrey Memorial High School.

The three colleges of education, OLA College of Education, Fosu College of Education and Komenda College of Education, which are the area of focus of this study, are the public assisted teacher colleges in the region apart from the faculties and schools of education in two public universities in the region.

Institutions that prepare teachers in Ghana, referred to as Colleges of Education (CoE) have specialize in different areas (Bosomtwe, 2010). Though there are different modes of training, two basic forms of training can be identified, academic and professional (Asare & Nti, 2014). The academic aspect of the training is specifically classroom engagement that lecturers in the colleges have with students. It involves the teaching of the content areas of the various subjects of study and the pedagogies that are relevant in teaching those content areas. Themes such as early childhood psychology, psychology of educating children with

special needs, educational assessment, principles and methods of education, the physical environment, climate change and pollution, are examples of content areas that are taught in the colleges. Students practice how to teach themes in the basic and high school curriculum during the teaching practice component of their training. The professional component of the training is grouped into two categories which include on-campus and off-campus teaching practice which occurs in the colleges and primary, junior and senior high schools in the catchment area of the college (Bosomtwe, 2010).

### 3.4.1 OLA College of Education

OLA college of education was established in Cape Coast in 1924, becoming the first women teacher training institution in Ghana and in sub-Saharan Africa. The college was established by the Roman Catholic Church through the Missionary Sisters of Our Lady of Apostles. It trains teachers in both degree and diploma programmes for the Ghana Education Service (OLA College of Education Graduation, 2017). Some sandwich programmes, which are basically courses organised outside the normal school periods for teachers having some experience in the teaching enterprise, take place in the college. These programmes that are organised by the  Institute of Education at the University of Cape Coast are also offered in the college during vacations.

The educational model of the college is based on Christian Humanism orientation. This model views education as holistic, focusing on developing the all-round personality of the students to enable them to take up potential leadership roles in society. They consider the spiritual needs of students built on principles of Roman Catholicism. The school focuses on educating teachers as a lifelong learning therefore instilling the desire and willingness to keep on learning and the joy in keeping what is learnt in them even beyond college years. These values that students acquire, it is hoped, will help them to contribute to society to make the world a better place to live in.

### 3.4.2 Fosu College of Education

FOSCO as it is commonly known is in the town that it is named after, Assin Fosu. The college was established in 1965 with an initial enrolment of 240 students which were handled by nine teacher educators. The vision of FOSCO, which revolves around its motto of Character, Wisdom and Knowledge is aimed at training quality teachers for its surrounding towns and villages and for Ghana as a whole. The College aspires to be a centre of excellence for the development of teachers who are competent and proficient to help propel the development of Ghana's education sector.

The current enrolment in the college is over 1000 with students pursuing different diploma and Bachelor of Education programmes. It has five departments responsible for

offering programmes in General Science, Mathematics, Information and Communication Technology (ICT), Social Studies, and Education Studies.

The main occupation of the people in the district in which the college is located is farming. Fosu is within the forest belt with huge mineral deposit. Illegal logging and small-scale mining of gold is common along the Pra River which meanders its way through the forest to Praso, a town in the municipality. This has affected the quality of the river, which serves as a source of water for homes and farming activities (Wikipedia).

### 3.4.3   Komenda College of Education

Located in Komenda, in the Komenda-Edina-Eguafo-Abirem District in Central Region, the KOMENCO is one of the three colleges in the region mandated to train teachers for its local communities and Ghana. The facilities at the college, which have recently been upgraded, was built by the British colonial government as its Navy base during World War II. Through the dynamism and diplomacy of the regent of Komenda at the time the facility was handed over to the people of Komenda. Through the Methodist Church in the area, who had initially gotten a lease agreement with the British government, the facility was converted into a training college in 1947.

The only unique feature of KOMENCO as compared to the other two colleges under study is that it has a department offering technology education degrees. Otherwise it runs the same programmes as OLA and FOSCO.


## 3.5     Research participants

A research population is the totality of the persons that satisfy a particular criteria (Polit & Beck, 2005). The teacher educators in the three colleges and their principals as well as officers of Ghana Education Service were targeted to participate in the research. These groups of participants were deemed important for the study because they possess information, knowledge and experiences in Ghana's education. A portion of these group of professionals were sampled.

### 3.5.1   Sampling and sample size

Sampling implies the method of selecting a part of the participants that conform to the standard specifications of the population that are to be studied (Burns & Grove, 2009). The basic sampling technique that I saw appropriate for sampling experts within the education sector who have the valuable experiences and knowledge related to the topic for this research was the purposive sampling. Purposive sampling is where the researcher relies on his personal judgement in selecting members of the population for participation in a

research study. The researcher in this regard holds the view that a representative sample can be obtained through his or her sound judgement (Black, 2010).

Purposive sampling involves the selection of participants that have the required knowledge and experience and are willing to share them to help the researcher to understand the research problem and the questions (Creswell, 2003). Teacher educators and principal in the CoE as well as officers of the Ghana education service within the three districts where the colleges are located form the population from which participants for this study were chosen. The selection criteria were based on requisite knowledge and experience on the phenomenon under study and for their ability to share such knowledge with the researcher (Streubert & Carpenter, 1999). In the context of a qualitative research paradigm, sample size used in a study does not really matter. However what matters most are indices like saturation of data, repeatability of data and sample size adequacy (Gall et al., 2004).

To limit and give a sense of education for sustainability I conducted a case study within the three CoE, focusing on teacher educators. One other reason for selecting these colleges in Ghana for this study was the fact that I live in this part of Ghana. In this study, I interviewed and had focus group interview with 50 experts who are teacher educators, principals and education officers in the three above mentioned municipalities in Central Region. Data saturation was achieved after a semi-structured interview were conducted with the 50 participants. I personally recruited all the 50 participants of which 30 were teacher educators, three were principals and three vice principals. In addition to the above, 14 senior officers from the GES were purposively selected to participate in the study. Although it was difficult having access to these participants, they all agreed to take part in the research after I have explained the objectives and the need for this study to them.

A total of 14 females and 16 male teacher educators were interviewed aged between 38-53 years. Twelve of these participants were part of the focus group interviews. Four of the them were heads of department in the colleges. The officials of the GES consisted of eight males and six females. Participants were asked to sign a consent form (See further Appendix 1 for criteria for selecting participants).

Burns and Grove (2001) outline sampling criteria as factors that delimit the target population. For the purposes of this study, the sampling criteria were as follows.

A participant must be a teacher educator in one of the five major departments in the three CoE. That is, General science, Social science, Technical and vocational, ICT and mathematics, and Education sciences or must be a principal/vice principal in the college or an education officer within the three municipalities and districts/municipalities where the colleges are located.

A participant should have taught in the college or worked in the education directorate for not less than three years; Participants should have had an exposure to the surrounding forest and coastal communities and main environmental issues. This means that, from this point onwards, wherever the study mentions ''participants'', ''teacher educators'' or ''interviewees'' they embodied these categories of persons that participated in the interviews. For information regarding the participants quoted in the findings section of the study see table 3 below.

Table 3: Research participants quoted in the findings

| Participants | Profession/Qualification | Department | College of education |
|---|---|---|---|
| Alex | Teacher educator, M.Ed Science | General Science<br>Chemistry tutor | OLA |
| Agyapong | Teacher educator | Educational Sciences | OLA |
| Gyimah | Teacher educator<br>MA Educational Administration,<br>MPhil Science Education | General Science<br>Biology tutor | OLA |
| Jennifer | Teacher Educator<br>B.Sc Computer Science<br>M.Ed. Science | ICT tutor | OLA |
| Nartey | Teacher educator, MSc IT Education | Mathematics and ICT<br>ICT tutor | FOSCO |
| Nartey | Teacher educator, MSc IT Education | Mathematics and ICT<br>ICT tutor | FOSCO |
| Bobie | Teacher educator<br>MPhil Science | HOD of General Science | FOSCO |
| Naana | Teacher educator<br>B. Ed Social Studies<br>MPhil Administration in Higher Education | Social Sciences<br>Social Studies tutor | FOSCO |
| Josephine | B. Ed Psychology<br>MPhil Educational Planning | | FOSCO |
| Lisa | Teacher educator, MPhil Science Education | General Science<br>Biology tutor | KOMENCO |
| Clara | Teacher educator<br>B. Ed Mathematics<br>MSc Mathematics and Statistics | Mathematics and ICT<br>Mathematics tutor | KOMENCO |
| Agyei | Teacher educator<br>BSc Physical Science<br>MPhil Educational Planning<br>PhD Science | General Science<br>Physics, Method of teaching General Science | KOMENCO |
| Amevor | Principal<br>PhD Educational Administration | Principal | KOMENCO |
| Malik | PhD Educational Leadership<br>MPhil Educational Administration<br>Primary education | Educational Sciences<br>School Leadership | KOMENCO |

| Nancy | Personnel from GES, In-charge of inspectorate | Head of inspectorate team | GES |
|---|---|---|---|
| Cynthia | B. Ed Early Childhood Education MPhil Science | Head of STEM Educational Sciences Pedagogy | GES |

### 3.5.2 Meeting with participants

Participants agreed on appropriate venues and time for the interviews. I established familiarity with most of the participants long before I left Iceland to Ghana for data collection. This was very important because in qualitative interviews, establishing good rapport and relationship with participants is very key specially to get their cooperation and willingness to reveal the right information.

In some of the schools, the private bungalows of the respondents served as a meeting point for the interviews, with the occasional disruption by students who came to them for some assistance. In one of the colleges visited, the office of the head of the science department was used for the interviews. At the district and municipal offices of the Ghana education service, their conference rooms were used.

## 3.6 Ethical considerations

Research ethics simply involves a researcher's adherence to social, professional and legal obligations to the participants. Research ethics refers to how the quality of the research resonates with these obligations towards the people contacted for information during data collection. Polit and Beck (2004) argued that ethics is a philosophical paradigm that concerns morality. In this research, the following principles of ethics were adhered to.

### 3.6.1 Confidentiality right

Confidentiality, according to Burns and Grove (2001), is how the researchers can manage the information from participants so that he or she does not share that private information with other people. Due to this, I protected all the information shared with me by the participants, whether in the form of hard materials or audio from any unauthorized access and the data collected is only accessible by myself and my supervisor. Pseudonyms were used to protect the anonymity of the persons which were contacted so that in the study, the names used do not in any way shows the real names of the participants. However, pseudonyms indicate the number of males (Agyei, Nartey, Amevor, and Malik) and females (e.g., Jennifer, Naana, Lisa, and Clara) that took part in the study.

### 3.6.2   Informed consent

The informed consent clarifies how and what the data collected is going to be used. To this end, I made sure that the participants have clear understanding of what the information they provided me through the interviews were going to be used in the context of the research study.

To achieve this, at the early stages of my engagement with the participants, I explained to them the aims of the research and sought from them their consent. They signed the consent form before I started interviewing them.

## 3.7   Data collection and analysis

Different varieties of data techniques for data collection are utilised in the qualitative research paradigm. These different procedures include interviews, focus groups, observation, and document or textual techniques (Silverman, 2000).

In this study, qualitative research interviews and focus group interviews were employed to collect information for the study.

### 3.7.1   Interviews for individual participants

Interview is one of the important techniques of collecting research data in qualitative studies (Yeo et al., 2014). The main purpose of the interview is to explore the views, experiences, beliefs and/or motivations of individuals on specific matters (Gill et al., 2008). There main qualitative research interviews are identified in the literature: structured, unstructured and semi-structured interviews (Gall et al., 2008).

To answer the questions for this study and to achieve the set objectives, semi-structured interviews were used because it helped in realising a clearer understanding of the research problem. Semi-structured interviews involve using a series of questions important in unfolding the perspectives and experiences of the participants (Gill et al., 2008).

The utilization of semi-structured interviews allowed for more flexibility and possibility in generating a comfortable environment. Rapport and trust were developed between the researcher and the participants where participants' viewpoints and invisible factors related to the research topics and understanding emerged from the participants' perspectives (Minichiello et al., 1990). Indeed, the semi-structured interview was considered appropriate due to its capability to portray the daily conversations in addition to focusing on the selected subject of study.

In line with this, I created an interview protocol based on the research questions. This was made up of three sections (Appendix 2). The first section consisted of instructions on how to appropriately use the guide whilst the second section is made up of series of

questions used to elicit responses. The consent form (Appendix 1) was read to the participants for their agreement before the commencement of the interviews. Since the medium of instruction and communication in the colleges of education is English, the English language served as the medium of conversation throughout the process.

The interviews were structured with the key subject for interaction, using questions that were open-ended in nature. Prompts were used to allow the participants to give exhaustive explanation on SD-related factors that were of relevancy to them. The participants' experiences, understanding and views of ESD were explored using the questions. Their views on impediments to ESD in their colleges were also sought. In terms of how to incorporate sustainability knowledge, principles and values in teacher education, the respondents were asked to state how to encourage curricular and extracurricular activities that can promote ESD in their schools and the education system in general.

The semi-structured interviews were very essential in eliciting the views and perspectives of the participants on the research subject. This corroborated with Cotton et al. (2009) that interviews provide a more comprehensive way to explore sustainability in education and the complexities and controversies associated with it.

A total of 21 teacher educators, two vice principals, two principals and five personnel from the Ghana education service were interviewed. In all, a total of 30 interviews were conducted in the study. The interviews were recorded, transcribed and the transcript sent back to the participants for clarity and verification.

### 3.7.2   Focus group interview

A focus group consists of individuals who possessed certain qualities and experiences who are brought together to talk about a specific topic. The number is usually between five and nine and these people are deemed to have accumulated experiences and information on a specific field or subject who a researcher brought together to source for their views, experiences and knowledge on the subject. The number of people that form the group should not exceed 12 (Patton, 2002). Characteristically, a focus group provides a more natural environment for the participants than one can find with an interview. Participants find themselves in a real-world conversational mode as they become influenced and can influence others to think or change views.

Patton (2002) outlined that the main purpose of a focus group interviews is to gain access to valuable data in a social interactive context. This helps to obtain in-depth perspectives and understanding of the participants.

In this study, I conducted three focus group interviews, one in each of the three colleges. Each group consisted of four teacher educators, a principal or his/her vice, and two officers

from GES. I chose these group of persons, even though they all come from within the education service, they have different portfolios and functions and so I wanted to understand their different views about the ESD concept. None of these participants participated in the individual interviews, except the principals.

Participants were made to adhere to the rules that I set for the interviews. In fact, getting access to the principals to participate in this process was very difficult but, in the end, I was able to get the principals to attend the session. The interactions were lively. Participants shared their views, corroborated what other panellists said and sometimes argued among themselves too. Because most of them have accumulated a lot of experience in the education sector, the depth of knowledge and information they gave was invaluable.

## 3.8    Summary

In this chapter, I have outlined a detailed description of the research approach that I employed for this study. I have described the various processes I went through in eliciting responses from the research participants. This included a description of the various methods of data collection and procedures for ethical consideration.  Because the research questions that was used were open-ended there was flexibility in exploring the perspectives of teacher educators, principals and GES personnel on ESD using interviews, focus group interviews and document analysis.

In the process of data collection, my views and assumptions of ESD changed as I went through the process step by step. This possibly influenced my decision to use qualitative case study approach because this methodology allowed me to have in-depth conversations with the participants.

# 4 Results

The organization of this chapter is in relation to the information collected through the interviews and the focus group interviews. The findings are presented in a thematic narrative format and it is done in five different sections, with each section corresponding to one of the five research questions that guided the study.

## 4.1 Views of teachers on ESD

Although teacher educators support the idea of incorporating sustainability values and skills into education, most of them had limited knowledge on how to incorporate it into the teaching curriculum. However, majority of them exhibited in-depth knowledge on ESD and SD concepts. The three colleges have all started SD projects and perhaps these initiatives have influenced their understanding of ESD.

Following are some of the themes that emerged during my engagement with participants which relate to their views and understanding of the ESD concept.

### 4.1.1 ESD as a complex phenomenon

Most of the participants expressed worry about the nature of SD and its associated ESD concept. They saw them as being complex in nature. More than half of the respondents viewed ESD as vague and presented a multiplicity of meanings and implementations.

They however were optimistic that vagueness could be overcome if ESD was addressed properly. Nartey, is an ICT teacher educator at FOSCO. He felt that despite its complexity and vagueness, it was about time that the concept becomes mainstreamed into the entire education system. He observed that:

> It is not so difficult talking about ESD within the context of our curriculum. Even though we understand the concept, infusing it into the curriculum presents some difficulty. Some colleagues even think this will overburden our work for now, so they feel it can wait. But I saw it is very important if we think about the natural world as a part of us then we should start talking about it and to our future teachers.

At this point, I decided to find out if their understanding of ESD had been influenced by some studies that have been done. When I asked if they had, during their studies to become teacher educators, taken SD or ESD related courses, 20 out of the 30 participants interviewed responded they had. They mentioned climate change, ecological degradation, HIV/AIDs, citizenship education, gender equality, human rights as some of the areas related

to ESD that they have had the chance to study which they also stressed that they studied them under different subject areas. Others explained that they have undertaken small-scale research and presented papers on SD related concepts during their graduate studies. However, some of them admitted having limited understanding on how to integrate the ESD concept as its mother term SD is too obtuse and complicated.

Other participants clarified that ESD is a new phenomenon in education and it needs no urgency regarding embedding them into the curriculum. Indeed, half of the teacher educators that participated in the study admitted that although incorporating ESD concerns in ITT is very important, they however were not clear about the models for implementing ESD policies in education.

### 4.1.2   Interdisciplinary work

When probed further, teacher educators described ESD as an interdisciplinary concept relevant to all subjects and disciplines that are studied in their colleges. They were of the view that ESD is only a semblance of environmental education that most of them studied in their college years.

The participants shared the view that every school subject relates to an aspect of the environment. ESD to the teacher educators, involves infusing environmental components in all fields of study to make people think about their relationship with the natural environment and see themselves as part of it. Alex is a general science teacher educator at OLA. He noted that:

> SD is synonymous to environmental study which touches on all subjects. There is an environmental component in every subject we teach here. The only difference is that SD basically stresses beyond the need to protect the physical environment to include psychosocial values...In biology, for example, we teach ecosystems and ecological factors. We teach how several elements in our environment are linked together and I think in other fields like psychology, physics and sociology will have sustainability areas.

Regarding their views on the ESD concept, most of the participants from KOMENCO observed that environmental issues are infused into different school subjects or disciplines. For them, ESD is an interdisciplinary concept in that the values and knowledge that it emphasizes cut across all teaching fields. As noted by Lisa, a biology teacher from KOMENCO who showed significant prowess in the subject added that:

> Whether it is environmental education or ESD, what we must bear in mind is that the domain of knowledge, skills, and values that are learned from

sustainability are practiced and shared by different fields of study in our colleges and society. The values and skills are transferable through all subjects we teach. For example, in Biology and Geography or even subjects that do not traditionally emphasis SD issues like Social Studies and Physical education, we could still see traces of this SD concept we were discussing in these subjects.

The participants further noted that concepts like climate change, greening of the environment, and building sustainable cities could be directly linked to all subjects. Collaborating with this, Bobie, a head of department for science at FOSCO insisted that:

In the subject of Biology for example, students must be taught the causes of land, air and water pollution for them to understand and appreciate the causes and consequences of such nuisances on our environment.

### 4.1.3 Reshaping educational practice

An understanding that was created during the focus group interviews was that the teacher educators in the CoE saw ESD as a new educational practice that is meant to change the way teacher educator training should be conceived.

The wider consensus that emerged in the conversation as part of the interview process was that ESD is an innovative education paradigm focusing on teaching various aspects of environmental related themes like climate change, biodiversity, disaster-risk management et cetera. Agyapong, who teaches courses in educational psychology and teaching methodology at OLA observed that:

As education systems are changing in response to ESD, teaching pedagogies are also evolving. The objectives of teacher educators in the context of ESD therefore is not only to promote students' learning but also to promote an understanding of the links that exist between humans, their activities and how they impacted their natural environment.

ESD is hence viewed as a way of shaping education practice to enable students to better comprehend sustainability principles and apply them to solve local environmental problems.

### 4.1.4 Teaching environment related concepts

Most of the participants indicated that their understanding of ESD is to teach students about the principles behind efficient management of natural resources to maintain the health of the environment. This view expressed by the teacher educators was based on their conception of SD as basically a subject involving the efficient utilisation of natural resources

for today's people and generations unborn. They also see ESD as teaching environmental issues such as land degradation, vegetation loss and water pollution.

For example, this learning objectives was extracted from the Biology course unit of the college:

Topic: Land degradation

Objectives: i. Describe the causes of land degradation

ii. Explain the effects of land degradation

iii. State ways of preventing land degradation

The above is demonstrated effort by teacher educator in working with teacher learners on ESD to depict knowledge that underpins destruction of land and environmental management procedures. But it just portrays teacher educator-students engagement as experts-receiver relation which ESD 1 seeks to espouse. This approach, interestingly, permeates all the teaching processes and course units of all subjects in the three colleges. Teaching in this way, recognises learners as not having the capability to explore learning avenues to construct their own meanings. However, there were other avenues where the teachers created a sense of confidence in teacher learners to make sense out of the learning content and materials.

At OLA, mention was made of environmental problems confronting the immediate surroundings of the college. Since the school is only a few meters away from the Atlantic Ocean, it has become a living witness to the degradation of beaches, for example, illegal sand extraction, seafood pollution, erosion, defecation, and the like. Gyimah is a science teacher educator from the department of General science noted:

> ESD should perhaps be concerned with the teaching of environmental matters that are affecting our existence on this planet. These are the aspects of our lives that seem to be neglected but they are affecting our environment. ESD is infusing environmental matters like climate issues, land degradation problems, and natural resources degradation in school syllabus. It also gives the teacher the chance to explain to students and local communities the effects of negative habits.

The teacher educators were of the view that ESD revolves around the campaign towards environmental sanity. They maintained that environmental concerns are at the heart of ESD, so it is important to offer programmes and activities that take such matters like climate change, biodiversity, or pollution into account.

### 4.1.5 Co-curricular activities

Questions were also asked about the activities that are being embedded in ESD in their schools, bearing in mind that most of these activities have influenced their understanding of the concept. All the colleges engage in at least one form of sustainability related activities. A proportion of the teacher educators suggested that ESD can also be conceived as an extracurricular activity, mostly done outside normal school schedules.

Teacher educators mentioned related activities like, greening of campuses, tree planting, trimming of grasses and flower plants, utilizing green buildings and altering consumption styles of school community. Teachers and students, in their spare time, have initiated some comprehensive models to create an understanding of how natural systems sustain life and promote sustainable communities. Example, using one durable water bottle rather than buying water packed in plastic sachet bags and making campus garden.

## 4.2    Integration of ESD concepts in teaching

In this part of the study I sought responses from the participants on the modes through which they integrated ESD concept in their teaching. Thus, the analysis was influenced by this research question: *In what ways do teacher educators in the CoE integrate SD in their teaching?* I therefore analysed this question on the information I gathered through the interviews. Examples of models used by the teachers include collaboration, action research plans, innovative models and vision-oriented models.

### 4.2.1    Collaboration with other departments

Teacher educators in all the colleges stated that their various departments collaborate to carry on ESD projects. In KOMENCO, for example, the head of the technical and vocational department noted that the driving force behind the few activities they have carried out with success is teamwork between his department, the departments of Science and ICT and Mathematics. He also noted an instance where they worked in close cooperation with municipal environmental agencies when they were designing eco-friendly refuse collection system for the school.

### 4.2.2    Small-scale action research

Teacher educators in CoE contribute immensely in supporting the process of implementation of SD through their teaching engagement. The Ghanaian education system makes it clear the extent at which teacher educators and their colleges can integrate SD in their teaching. In the interviews, it was revealed that most of the teacher educators collaborated with each other through research and interdisciplinary engagements on SD activities and try to advise schools and community leadership on good models for sustainability.

Another head of department, Florence, of the Education and Counselling department at KOMENCO was very positive on her views about ways in which teacher educators in her college impart SD values in students. However, she feared that the setting up of institutional structures for SD is delaying any meaningful step towards ESD in schools. She warned that school-based strategies aimed at accomplishing SD integration tends to focus more on building hierarchical and institutional structures that could impede progress if care was not taken. She noted that:

> Putting all efforts at institutionalizing sustainability programs often inhibit transdisciplinary and interdisciplinary studies and research within our colleges. Don't forget that as teacher training institutions, the process for SD integration begins from us. We train teachers for schools and communities and they must first receive sustainability education from here before they begin their professional endeavours.

In fact, most of the colleges are still lagging in implementing SD activities like greening, sustainable waste management practices, clean energy adoption, et cetera because they are still waiting for formal institutional structures to be established before they engage themselves, their students and their communities on finding solutions to SD challenges.

### 4.2.3   Innovative models

Interviewees raised concern that harnessing the potentials of students for innovation to address environmental problems is key to SD. They said due to technological advances, their students can be said to have acquired ESD imperatives even when they are not aware of the value of such innovative ideas or knowledge. They were optimistic about which kind of innovative ideals and models will serve the SD's integration purposes. The three colleges have different kinds of SD innovative projects. One teacher educator, Naana, who teaches Social Studies at FOSCO threw light on some efforts that her college has been making for the past three years:

> Our SD project is called ''Sustainability Managers.'' The focus of this project is to train teachers with capability to solve environmental challenges. We want critical, reflective and thought-provoking graduates who can rally local community resources, both natural and man-made for the creation of a sustainable society. We want to send such teachers out there. Teachers that will be more proactive to ecological problems. The approach is more of a school-community-based sustainability management approach where the focus on SD integration is directed by students.''

I learned there are similar projects in the other two colleges. The projects are community driven with students acting as researchers. The students are encouraged to find out the impacts of mixing innovative and actionable task-based research with the numerous SD challenges within the local environment and find ways in which they can suggest viable solutions for them. Students are thus at the centre of problem identification and designing solutions for the identified problems. Students are not supposed to be taught but rather be supported and given the space to manage their learning and to bring out innovative sustainability models. Later, they encourage community members to model the solutions.

### 4.2.4   Vision-oriented education policies

Ghana government's strategic framework for achieving the SDG calls for policies that are far-sighted enough to enable the attainment of the 2030 targets. National policies conversations encourage the integration of SD in areas studied in schools. Teacher colleges have been urged to establish structures that direct innovative thinking towards the achievement of SD targets. The curricula of CoE encourages teaching practices and principles that adopt interdisciplinary and cross-disciplinary teaching-learning processes, teaching that emphasizes democratic participation and empower students to be innovative.

## 4.3   Transformative learning pedagogies

It was revealed during the interviews that varieties of teaching-learning techniques have been employed by teacher educators in OLA, FOSU and KOMENCO in the past decade when the colleges assumed tertiary status. Project oriented teaching methods, outcome-based learning strategies and collaborative learning methods were examples used by the teacher educators.

### 4.3.1   Multiple teaching techniques

From the conversation with the teacher educators and their heads, they admitted using multiple teaching-learning pedagogies during their interactions with students. One of them, Clara from KOMENCO, noted that:

> Experience has told me the danger of relying on a single teaching method. It is impossible to rely on one method to achieve learning objectives. Using different pedagogies complement each other as they make the learning process very interactive, creative and make it more practical to enhance understanding. The learners have the advantage of interacting with each other and with the teacher. They also exchange knowledge.

A substantial number of the interviewees further admitted using a combination of projects, demonstrations, competence-based techniques, experiential learning methods and activity-focused teaching in their sustainability classrooms.

These pedagogies make teacher learners active as they enabled direction connections with learning resources. The approaches also allow for reflective and intuitive understanding as teacher learners think about learning resources and create their creative relationship with the learning materials respectively.

### 4.3.2 Teacher educator as facilitator of learning

Majority of the teacher educators interviewed pointed out that the role that they play during the teaching-learning engagement is that of support. They admitted that their role has mainly been to facilitate students' learning by encouraging active participation by all students. To encourage learner's involvement, they give both group and individual assignments and projects. Topics are given to each group or individual for them to research and make a presentation in class. The teacher educator, together with students, set conditions for each student to take part in the presentation and add their inputs and views after the presentation.

I found out that none of the colleges specify teaching pedagogies to be used by teacher educators in the colleges. The teacher educators can choose a pedagogy based on their own discretion or judgement. One of the teacher educators from FOSCO, Mireku, was of the view that:

> The colleges or each department in the college should undertake research to develop its teaching pedagogies that must be practiced and used in teacher educator preparation in the colleges and departments.

In OLA, teacher learners were exposed to different teaching techniques and methods, and their advantages and disadvantages so that they can make decisions on when and how to use them in their future teaching profession.

### 4.3.3 Learners as owners of change process

Teacher learners in sustainability classes are expected to show initiative through informed decisions and through rethinking of their personal behaviour towards the environment. Through ESD, they are inspired to take responsibility over their actions towards the environment. Students are supposed to uphold the value of the environment so that they can maintain it and bring about the changes that are needed.

From the conversations with teacher educators, they saw ESD as the process of empowering students to protect the physical environment for future generations. As Lisa outlined:

> SD calls for empowerment of learners in managing the change processes that
> are essential in activating local environmental initiatives.

The theme of empowerment thus was apparent during the conversation with the teacher educators as they saw it as one of the surest ways of urging stakeholder support and further improving the skills of people in finding sustainable ways to address environmental problems in our societies.

### 4.3.4   Project-based learning

Most of the teacher educators want to create a dynamic classroom for teacher learners to actively explore real world challenges to help them get a deeper understanding of sustainability issues. To do this, they share with me that they apply project-based learning. Again, Lisa retorted that:

> Real-world problems are best confronted when people can develop a deeper
> understanding of theories and skills.

The teacher educators hold the view that local environmental issues are best confronted when people are given skills and the opportunity to reflect practically on options available to solve local challenges. Project-oriented methods give teacher learners the opportunity to have a first-hand experience of the real environmental problems by visiting the sites of the problems and discussing the causes and possible solutions that should be applied.

The teacher educators in the three colleges were very particular about the use of projects in bringing about learning when working with teacher learners on ESD. There was consensus that the use of group work was relevant in enhancing socialization and team work as well as building teacher learners' confidence. However, they feel uncomfortable using this method. Agyei, a science teacher educator from KOMENCO outlined why:

> Often, I don't like to use project-based methods in teaching. Because of the large
> class size, you are tempted to give group work instead of individual projects and
> when this happens you found out that there are few students who normally
> involved themselves actively in completing the project. Many hides behind the
> few brilliant students and gain marks at their expense. Group projects do not
> really allow all members to exhibit their potential leadership for learning.

At the colleges, the teacher educators were concerned about leadership towards students' academic achievement. So, they lead by example to encourage the student trainees to be leaders for learning after completion of their training. They admitted that they have not seen any leadership towards SD implementation in their schools and departments apart from the usual environmental cleaning.

### 4.3.5   Cultural and local context as ESD drivers

Like many other African countries, Ghanaians emphasized cultural context as very significant in the drive towards socio-economic development. Inferring from the interviewees, I realized that the cultural fabric of the Ghanaian is an important catalyst to any meaningful strategies for achieving SD goals. ESD in Ghanaian schools should thus be built on the country's socio-cultural elements. Ghana's Standard-Based curriculum for primary schools emphasize that relevant cultural heritage forms part of the various disciplines that are taught in schools (GES, 2019).

Participants in interviews said that to make ESD important to schools and other actors, it is imperative to have system wide ESD policies that consider the culture and traditional background of schools and their participants.

Most of the teacher educators engaged students in traditional music and folklores as extra-curricular activities. They stated that most of the cultural artefacts of the region form part of their interactions with students, especially subjects like School-Community Participation in Education.

## 4.4   Internal, school-based impediments

The impediments faced by teacher educators and colleges in implementing ESD in their local schools was the fourth research question. From focus group interviews with teacher educators, principals and officers from Ghana Education Service, it was clear that the principals and teacher educators in these colleges were grappling with a lot of challenges in implementing sustainability models in their schools.

Issues like school-based policy shortfalls, institutional framework, limited knowledge and skills for ESD evaluation and poor leadership are some of the impediments that surfaced during my interactions with teachers, principals and education officers.

### 4.4.1   Policy inadequacy

There are strong views in Ghana that the problem with education in Ghana is about policy implementation, mostly in the context of extending access and improving quality. In the conversation, the participants felt that school-based policy initiatives to govern activities

that are related to SD have been inadequate. In some cases, there is weak policy backing activities that are initiated as extra-curricular activities. They blame the national government for its inability to mainstream policies to the local school levels. This they view as impeding efforts at the local level as far as ESD initiatives are concerned.

The complexity of sustainability impedes implementation since at the higher levels of government there is disagreement on whether to teach sustainability first according to the disciplines and only move on to an integrated approach with older students or to begin an interdisciplinary approach early on. One of the principals, from FOSCO called Amevor, laid the problem at the doorsteps of the government who has centralized SD policies:

> Discussions have been held on SD at both national and institutional levels. Workshops have been organized for curriculum experts, teacher educators and school leadership in the past, but at the regional and district education levels, emphasis have not been laid on the way forward at providing units within schools with the responsibility towards ensuring sustainability practices in schools.

All the heads of science departments in the colleges admitted that just like all national policies, implementation problems make realization of goals unlikely. They were bemused by the government́s lackadaisical attitude towards localizing SD and environmental issues because to them environmental problems are local issues which can be solved best when local authorities, chiefs and their people are involved. Nancy is an officer from the GES. She retorted that:

> There is lack of willingness on the part of national government to institute measures to make an elaborate plan for environmental issues to be localized so that local people will actively own the process and get involved.

### 4.4.2   Lack of sustainability leadership

The participants also observed that, they are yet to see a deliberate attempt by their leaders to establish portfolios or assign teacher educators to take charge of SD related activities that drives environmental safety. Apart from the usual environmental masters and prefects assigned to ensure school labourers and students clean the school compound, in the views of the participants they have not seen adequate actions pushing the school towards greening, clean energy, reduction in waste generation and consumption of resources. An ICT teacher educator from OLA, Jennifer had this to say:

Leadership is very important in any educational drive. We lack leaders that have foresight and can encourage all of us to take part in sustainability-oriented programmes. This is very important because school leadership controls the resources of our colleges and since implementation of SD programmes is capital intensive, school leaders must be at the forefront in championing sustainability plans.

### 4.4.3   Limited understanding of evaluative mechanisms for ESD

Teacher educators, upon further interrogations pointed out that there are no appropriate procedures for measuring progress towards ESD in their schools. The raised concerns about how to evaluate the effectiveness and importance of ESD activities in their schools. They were key on this because they saw this is relevant to improve upon this system or make changes on models they have adopted. Malik outlined that:

''We do not have measurement criteria for us to determine the effectiveness of our activities. No national standard so every school does what it likes. I have heard that in some countries, schools and institutions try to lower their energy consumption. Others also have mechanisms to check waste generation by individuals and departments and how to lower waste generation level.''

It was also apparent that in many situations, they have been able to evaluate the number of teacher learners involved in environmental related projects like recycling of waste clubs, cleaner energy club, tree planting groups, and marine clubs. However, they have often found it very difficult to evaluate the successes of these clubs because the basic questions, aims and important strategies for reaching the goals are complex to define. This is compounded by the fact that ESD involves an adoption of new lifestyle and new behaviour by the people which is very hard to evaluate.

## 4.5    Education system-wide impediments

This section focuses on collecting the views of teacher educators and principals in the three colleges as well as personnel from the GES in the districts and municipalities in which the colleges are located on factors that impede the efforts of the teacher educators and their colleges in embedding ESD in their teaching and programmes. Information from the focus group and interviews that were analysed gave birth to the following themes.

### 4.5.1   Lack of strong Institution and framework

When asked what policy challenges confront teacher educators in their quest to integrate sustainability teacher educators admitted that Ghana does not have a well-fashioned out policy framework for ESD implementation in schools. There is no single ESD implementation

except individual policies on the various environmental challenges like climate change, or waste management. Cynthia from the Ghana Education Service had this to say:

> Most of the discussions we have had with our Schools, heads of department, principals, local community actors and the education directorates themselves have revealed that there is inadequate SD ownership at the local level and low commitments on the part of government to mainstream SD related policies. There is also poor integration and coordination structures as well as weak technical support from the ministries.

Teacher educators, principals and personnel from the GES were of the view that inadequate support for dealing with capacity challenges and institutional support for schools and colleges can be attributed to the fact that policies have not been well articulated and implemented. That is, there exist a weak foundation for further development towards ESD.

### 4.5.2   Low level of Awareness of ESD

Discussions with the teacher educators also revealed that in addition to policy challenges mentioned above, political and policy inconsistencies have led to low level of awareness amongst the populace. There is a lack of harmony between national, regional and district policies which have led to the inability to monitor and evaluate the process with a view to increasing teaching-learning relationships that take ESD into account. They revealed that there is insufficient understanding of the concept of SD and ESD among teacher educators and policy makers which have led to the inability to formulate appropriate integration tool for schools.

Josephine is a psychology teacher within the Education department in FOSCO. She explained that there is the need for cooperation between schools, communities and education policymakers to broaden the communication on ESD. She added that communities look at the schools for implementation models that transcend into the society. The lack of this synergistic relationship, she said is ruining any efforts at making ESD an elaborate part of schools and community system. She pointed out that:

> We have seen insufficient synergy and communication between the different agencies implementing SDGs in our part of the world, especially when it comes to SDG 4: Quality education. And as you know, ESD is part of education improvement. However, what we see today is poor communication about policy and implementation. Coupled with this are political interference, poor incentives for policy makers and adequate staff and community engagement.

The participants therefore saw that, due to a lack of proper communication between the main actors involved in ESD processes, the campaign to create awareness on SD and ESD has not gone down to the local people who have a day-to-day contact with all the surrounding environmental problems. Malik, Physics teacher also added that:

> The absence of a clear national climate change research agenda means that there is a lack of coordination and communication between different research institutes. Hence, project information remains as grey literature rather than being made properly available to other research institutions. Current capacity for climate change research remains low, especially in universities and their research institutes.

From the views of the interviewee, the government of Ghana and institutions mandated must harmonise their activities and policy strands to move actions from top to the grassroot sectors of the society. They should cooperate and build synergistic communication to streamline their activities for local communities to abreast themselves with sustainability matters.

### 4.5.3 Financial impediments

Ghana requires substantial capital funding to respond adequately to its environmental challenges like climate change, pollution, ecosystem destruction. In the same breadth, ESD demands huge capital investment with respect to greening of schools, changing energy systems in schools, innovative classroom designs which are but a few of the changes that education must made to respond to climate change and other SD-related challenges.

With respect to the transition to a green economy, for example, the challenge identified by the teacher educators was how to get the initial investment. They felt that, most education policies in Ghana do not factor in the poverty nature of our societies in which schools are located so that even if there is a policy prescription for greening of schools and communities, such a policy would be not accompanied with the funding requirements. Rather, what we see are policy documents, many of which do not have financial backing for their proper implementation.  In fact, almost all the participants agreed with this difficulty of raising financial resources for sustainability projects in their schools. Indeed, Alex added that:

> We have a project where we decided to visit our adopted communities and schools where our students have their teaching practice component of their training. We visited them once every month to talk with the communities on environmental cleanliness and planting of trees. We started brightly but now we

have not been able to continue because we are short of funds.....Insufficient financial support from donor agencies and benevolent organisations also impedes long-term sustainability projects initiated in the country.

Bobie, also added the problem of finances which has also become a problem cutting across the education system. He remarked that:

Inadequate financial commitment is a key impediment to anything we do here. I have read somewhere that green economy travels through paths that have long-term objectives. How can we achieve the green policy in Ghana with environmental policies driven by short term objectives?

This means that institutions like CoE need to take responsibility for coordinating research activities on SD and ESD. However, the teacher educators and principals indicate that colleges lack the required financial resources to embark on such a venture. Teacher in Ghanaian universities and other tertiary institutions have always demanded that the government inject more money into research into areas like science, environment, technology and agriculture. Yet, this has not been adequately been addressed or responded to by government.

## 4.6 Summary

In this chapter, I have described the views and understanding of teacher educators in the three CoE regarding integration of SD in their activities. It became clear that teacher educators have a fair understanding of the ESD concept. They equally showed valuable and deep understanding of the challenges that confront them in their quest at ESD integration in their teaching. In the next section of the study, I discuss these findings in the context of the literature that the study hinges on.

# 5   DISCUSSIONS AND CONCLUSION

The idea behind this study emanated from my desire to improve classroom teacher-learner engagement in the context of sustainability education. The idea was to find out whether the engagement between teacher educators and teacher learners was one which embedded sustainability principles. I therefore sought to investigate whether teacher educators in the three CoE were integrating the principles, knowledge and values of SD in their teaching and programmes. I realised that embedding the principles, values and knowledge of SD is the basis of any quality education and very essential in improving teaching and learning in teacher training for 21st century classroom. I therefore had questions that begged for answers.

Questions on whether teacher educators were applying sustainable and transformative pedagogies in the classroom and whether they were teaching for sustainability by embedding SD were quite intriguing. Scientific evidence points out that if our current generation do not act in creating a just and sustained communities by educating people to live responsible and sustainable lifestyle, the incoming generations will have to grapple with the problems of pollution, climate change, ecosystem destruction, inequalities and poverty. What compounds their situation is the projection that they will have to deal with these nuances with about 50% more people than the current people in the globe (Hopkins, 2010). The future people will in addition to the above, must deal with these problems having less of the resources of water, quality and fertile land, depleted fish stock and forest resources. These concerns kept me questioned the current nature of the Ghanaian teacher education set up. I began to ponder whether teachers being trained will have the competences to work with students on sustainability.

I have, under this section of the study examined the importance of the findings of the study in the context of the literature that I reviewed in chapter two. I also discuss the implications of the research in the field of ESD and finally offer some key recommendations for teacher education to thrive in sustainability classroom and professional practice of teacher educators with respect to ESD.

## 5.1    Findings and their importance to the study

The literature on sustainable development stresses the imperative of incorporating sustainability principles, knowledge and values in school curricula. Education is seen as the tool through which the ideal of striving towards sustainable societies which is free from poverty, inequality and climate change nuisances can be achieved (Sterling, 2003; Disterheft et al., 2013). Through the support from global agencies like the United Nations and the SDGs

and the Association for the Advancement of Sustainability in Higher Education (AASHE), HEIs can initiate and implement feasible policies in integrating SD in their curriculum and programmes. These agencies empower HEIs and their faculties to work with their students and stakeholders on the various techniques and competences required to tackle global sustainability problems (Buckler & Creech, 2014; Filho et al., 2015; Lozano et al., 2015).

Going through the processes of information seeking, I have been able to reconstruct my personal views and understanding of ESD concepts. In the introductory chapter of this research, I expressed the wish that this study would build on and contribute to local and global discourses on SD and ESD. I hope too that it will contribute to policy on teacher education in Ghana and help teacher educators and teachers in general to frame their own local initiatives on how to teach their students to think and act with sustainability mindset

The findings from this study have confirmed several of the key issues noted in the literature. Perspective of the pedagogies that teacher educators rely on to drive sustainability education in their schools which had been noted in the literature were confirmed. Some findings also extended the literature on ESD, especially the impediments that worked against the incorporation of values of SD in schools.

### 5.1.1    Varieties of teaching pedagogies for ESD

Embedding sustainability in education also emphasises the need for teacher educators to employ interactive teaching techniques to address sustainability issues. In the study, I found out that teacher educators in the three colleges employ teaching pedagogies like those expressed in the literature. For example, the mode of teaching-learning interventions that enable sustainability transformation in the schools are the ones that engage students actively in the learning situation.

The teacher educators employ methodologies like collaborative learning, project-based learning, action research which engage students actively during classroom work. This confirmed what Sterling (2005), Wals and Corcoran (2006) espoused. The authors refer to a two-way teacher-student engagement and encourage a more extensive interactive platform in the classroom characterized by exchange of ideas. That is, the classroom should be a place that the value of learning is on critical and reflective thinking. Teacher educators in the three colleges admitted of guiding their students to participate during class sessions and allow students the chance to interact with various learning resources.

In the classroom, the role of the teacher educator is more of a facilitator learning than being a provider of knowledge. They engage with teacher learners and teacher educators from different departments in interdisciplinary, transdisciplinary and cross-disciplinary action research, and disseminate their findings and share knowledge among themselves.

Max Neef (2005) corroborated with this when they argued that transforming schools through integrating SD values and principles demands strong emphasis on cutting edge transdisciplinary research.

The study also concurs with suggestions in the literature by Vare and Scott (2007) that ESD have two approaches which complement each other. ESD 1 involves short-term promotion of skills and behaviours and ESD 2 emphasises building the capacity of students to make them capable of verifying new knowledge, ideas and implicit contradictions in living responsibly. In the second portion of the training modality of the student-teacher in these colleges, students encounter reality of situations in the classroom. This encounter engineers the students to decipher the various skills they have been taught during the initial two years in college so that they finally make their own decisions.

I identified some approaches of ESD 1 in policies by leadership in the three colleges. The colleges have been urged to embrace expert-motivators ideas of ESD where they are encouraged to do things in a manner different from what they are used to. For example, they have been asked to help in bringing awareness on SD by integrating elements of SD across all school units. They understand that the call for teacher educators and stakeholders to alter their understanding and embrace the new paradigm of ESD is vital. Isolating ESD 1 will not help in the achievement of sustainable living rather work with the two conceptions side by side as ESD 2 served as an important complement of ESD 1 (Vare and Gough, 2003).

Most of the activities that teacher educators employed to bring about sustainability education lead to learning outcomes that Vare and Scott (2007) outlined as ESD 1.

One aspect of developing ESD in schools is to encourage teachers to give pupils the chance to take part in participatory activities outside the classroom (Macdonald & Jónsdóttir, 2014). Teacher learners therefore are expected to be trained on how to engage students in participatory activities as this concept is integral to teaching in primary and high schools. In the classroom, teachers are expected to expose pupils to experiences outside the classroom. The new Standard-Based Curriculum by the GES cajoling teachers to visit museums, district courts, chief palaces, Zoos, indigenous companies and local cultural sites. In the context of ESD in schools, participatory activities encourage students to actively respond to their local environment as they become embroidered in problems within their locality. Participatory events out of the classroom stimulates thinking and allow pupils to verbally participate in the learning process.

Many of the teachers that are produced by these CoE teach in basic schools in the Central Region and other municipalities in Ghana. It is important that these trainees imbibe the basic pedagogies that are required to teach SD at this level. Teacher educators can adopt participatory method which provides a window for them to move away from the traditional

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lecture approach and tutorial methodology which have become synonymous with HE pedagogy.

Sometimes, ideas can be fragmented and hidden in subjects but learning through interdisciplinary approach can help in unravelling complex environmental challenges (Eagan, Cook & Joeres, 2002). Though interdisciplinary approaches work in an integrative field, SD has no limited boundaries when we look at it as a discipline and can be learned both from interdisciplinary point of view and from a transdisciplinary approach.

Teacher educators in the colleges rarely rely on cross disciplinary and transdisciplinary approaches. From the discussions with the teacher educators, they mostly do more of disciplinary and a little of interdisciplinary approaches. Disciplinary approach means that SD related contents are taught as a single subject with students promoting integration, if there is any. With this, the teacher educator takes centre stage in the learning engagement and allow for little contribution from learners. The interdisciplinary approaches which put content as the central point of the curriculum, with deliberate attempts by the teacher educator to connect learning to the social life of the learner is more essential in bringing about learning in the context of ESD. Teacher educators in the colleges do engage teacher learners in interdisciplinary learning, though this is not often done. Moore (2005) maintain that research activities and teaching in the transdisciplinary essential for any implementation of SD in HEIs. However, little of transdisciplinary learning is done in the schools.

Barth et al (2007) in exploring competences that are needed for SD in HE observed that when teachers and education institutions create a culture of teaching-learning which respects both formal and informal context of the learner's learning, the tendency for students to be responsible and ownership of their learning is high. This learning culture advances interdisciplinarity in learning for sustainability. Ownership of learning was very much common among the three colleges. Students were allowed some significant level of freedom to explore and find answers to their own identified problems. Though they were quite deficient in conducting small scale research, the nature of guidance that they receive from their teaches when they go out for their teaching practice component of their studies was encouraging.

### 5.1.2    Impediments to ESD in schools

Ghana's teacher education process is one which is evolving and like many social institutions in many African countries, it is challenged with numerous problems. Several structural, internal and external impediments confront the process of embedding sustainability related strands in teaching actions by teachers in the three colleges. Gale et al. (2015) espoused four structural barriers that work against integration of concepts that are aligned to SD. Teacher

educators and personnel within the circles of training of teachers confront similar challenges as Gale et al. (2015). These impediments, outlined by Gale et al (2015) are associated with the contestability of ESD as a discipline with many school actors arguing for students to be allowed to study their traditional subjects and later when they are ready for other fields, they can choose to study ESD. Globalisation and commoditization of HE, fragmentations of departments and units and their roles are but a few of the structural and administrative challenges confronting ESD in HEIs.

Others have also contested that the subject of ESD and its mother concept SD are breeds complex understanding. This pose problems of implementation as there seems to be no clear modalities of making ESD work. In this study, the complexity and multiplicity of processes involved in implementing ESD in teacher education provision was laid bare. The findings confirmed Gale et al (2015) inclination to the nature of the subject as being problematic in the context of what and how to teach as well as the end results of ESD.

Gale et al. (2015) also talked about breach of autonomy of the several units and institutions within colleges and universities as impediments to ESD embeddedness. The argument is that there is role overlap among the many divisions within HEIs which tend to impede decision and processes among such units and departments. This result in an initiation of impracticable policies by actors who contravene and circumvent policies that aim at promoting sustainability actions in the school. It was found from this study that, teacher educators in the colleges liaise with one another in conducting research studies and engaging in practical sustainability matters. Within their schools, the different departments and divisions are expected to work cooperatively but due to overlap of roles other groups feels their power to act are been trampling on and hence decide to stay aloof.

The study further revealed many key barriers and impediments towards sustainability integration in education. In the literature (e.g., Holmberg & Samuelsson, 2006, Lozano, 2006; Velazquez et al., 2005) outline some internal and external barriers that teacher educators and school administrators face and need to overcome when they implement SD policies. Impediments like lack of desire to reorient and change their thoughts and conceptions of actors to adopt innovative sustainability models, lack of incentives system to remunerate teacher educators that take it upon themselves to canvas students for SD activities and freedoms enjoyed by academics to conduct and disseminate their findings without intimidation or interference.

In the study, information from the interviews conducted and documents reviewed suggested that teacher educators and principals in the three colleges faced similar problems when they engaged in SD projects and teaching. They faced problems like financial inadequacy, unaligned policies and inadequate infrastructure which were also mentioned in the literature. However, they study extends the literature when it found that the CoE in the

Central Region were impaired by the lack of free connections and communication network to engage professionals in formulating SD policies.

### 5.1.3  Teaching related ESD concepts

Cortese (2003) admonishes HEIs to embed sustainability in their activities. The author observed that, for universities and colleges to build sustainability thinking they should integrate within their curriculum the values of research to create understanding of both local and national communities to bring about sustainable socio-economic values and environmentally prudent principles. He emphasised a type of learning based on enquiry and real-world exposure to connect students with their local communities.

The three colleges do this but in different ways. They partner with surrounding localities by way of sending students to undertake a one-year teaching practice component of their studies in the communities. During their stay, the student-teacher educators in their mentorship programme engage with the communities in varying forms of sustainability related actions like campaign on girl-child education, environmental cleanliness and safety, pollution, or climate change.

Though ESD was somehow new to most of the teacher educators, they were conversant with environmental education and alluded to some of the concepts like climate change, ecological destruction, environmental pollution and marine resource depletion as SD related areas that they have known and taught teacher educator trainees.

Colleges that prepare teachers for primary and high schools in Ghana teach various subjects which can be categorised as traditional sustainability related subjects. Example of such subjects include Biology, Integrated Science and Geography. They also prepare teacher learners to master content areas of subjects like Mathematics, Information and Communication Technology (ICT), Physical Education, Psychology, and Languages. These subjects traditionally do not emphasis SD. However, teachers are expected to mainstream SD related contents in these subjects. For example, in Mathematics, teachers are expected to work with students on how to calculate carbon footprint. As many teachers in the colleges admitted teaching or involving their students in related SD programmes and activities, it is important to say that, such efforts must be reinforced.

Banjerjee (2004) gave a succinct account of the different elucidation of the ESD concept and their implications on schools and teaching of subjects. He analysed ESD and gave a frowning perspective of how it has been handled in schools. He argued that, sustainability related subjects must be taught in ways that invigorate critical and reflective thoughts in students. He sides with the proponents of multidisciplinary tactic of teaching related SD themes in schools (e.g. Kysilka, 1998). He thus consented with the view that SD must arouse meaningful debates in the classroom, with viable exchanges between students and their

teacher educator and among students. The three colleges have adopted some different stratagem for teaching SD courses and contents in their curriculum through the perspectives of ESD as taught are quite narrow.

## 5.2    Lesson learned

### 5.2.1    The use of transformative teaching pedagogies

Transformative learning by Mezirow (2009; 2000; 1991) explains the development of and application of self-consciousness by people to critically re-examined their personal beliefs and the stock of experiences they have assembled so that in the cause of time they refashioned the dysfunctional modes of understanding the world. Mezirow (2009) aptly expounds that transformative learning involves a type of ''learning that transforms problematic frames of reference to make them more inclusive, discriminating, reflective, open and emotionally able to change.''

This basically means a reflection of whether accumulated orientations since childhood remains functional and applicable in the current global world. The basic principles underlying this theory is that, as adult learners go through the process of learning, they adopt two learning paradigms which are either instrumental or communicative. The learning that occurs causes change in already accumulated scheme or perspectives to trigger a change in meanings that have been ascribes to structures when reflecting on the content and the learning process. The theory applies what Mezirow (2009) refers to as a "Disorienting Dilemmas" as a catalyst to promote students' capability to assess whether their perspectives about the world are canonical.

Relating this to the findings from the study, it was concluded that teacher educators in the colleges rely on transformative teaching tactics to bring about learning. The teacher educators provide their students the avenues to critically examine sustainability related contents like climate change, pollution, bad fishing practice and sand excavation as they introduce teachable units, they thus open the doors for discussions with the students. They give enough room for open dialogue and discourse with other students and motivate them to question their stock of assumptions and beliefs.

Though not enough opportunities are provided for students to act on the set of novelty skills and ideas that they are imbibing as they go through the sustainability class, there is more hope that some transformation is taking place as most of the students have begun taking the initiatives to do away with how they used to perceive nature and the natural world in general.

It was also clear that, teacher educators in the colleges employ transformative pedagogies like problem-based learning which stimulates students to find in depth views

and understanding of concepts. The pedagogies that teacher educator educators in the three colleges utilize in teaching SD, were interdisciplinary approach. In the literature, Kysilka (1998), cited in Palsdottir (2014) provided alternative modes of teaching SD related subjects, namely; disciplinary, multidisciplinary, interdisciplinary, and transdisciplinary approaches.

These approaches are relevant for teacher educators when teaching SD, but each comes with different forms of strengths. In the discussion with the teacher educators, it became clear that the teacher educators relied mostly on disciplinary approach and less on interdisciplinary approach in teaching SD courses to teacher educator trainees, but sustainability values and principles are transmitted best when teacher educators engage in interdisciplinary and transdisciplinary models of teaching pedagogies (UNESCO, 2006; Macdonald cited in Palsdottir, 2014).

### 5.2.2   Local initiatives as drivers of ESD

To cater for the vagueness and complexity of sustainability initiatives (Robinson, 2004), it is recommended in the literature that ESD must be thought about within the social and cultural context. Local sustainability drivers included services that allow students and their teacher educators to explore local community problems by way of conducting small-scale research to delineate causal effects of various environmental predicaments facing surrounding communities.

Most of the topics that are taught in the colleges which are sustainability related were contextualized. They were considered under the lenses of local Ghanaian fabrics, with local solutions proposed. Students could diagnose the local community to identify inherent environmental problems, examined potential solutions and selected feasible once as final solutions. Also, traditional concepts in music and arts are taught, which gives impetus to multicultural principles of teaching.

Local traditional and indigenous beliefs, knowledge and values are relevant in sustainability. The Ghanaian has hopes in understanding nature based on laid down belief systems that have been handed down from generation to generation. Innovation in native knowledge is valuable in responding to climate issues confronting society.

### 5.2.3   Teacher educators understanding of the ESD concept

As outlined in the previous sections, ESD concept has been found to be difficult to delineate because people have viewed it from different perspectives. However, the study found out that, many of the teacher educators have firm grip of the SD and ESD. Their articulation of the viewpoints was great even though the adventure of SD/ESD have not endured much in Ghana.

## 5.3    Conclusions

I have stated that, through this research study, I have constructed and reconstructed my personal conceptions about SD and ESD. I have come to understand how different people perceive these concepts differently.

The ENR programme at the University of Iceland gives students opportunity to associate themselves with any of the school and department within the university. I chose the School of Education's Faculty of Education and Diversity with which my supervisor is affiliated. My examiner is based in the Faculty of Subject Teacher Education. The inspiration, enlightenment and the perspectives of SD and ESD from the teachers and experts at these departments have been great. The discourse on SD from the point of view of these experts inspired me a lot. I have come to understand how the task of embedding SD into curriculum could be managed despite the complexity and multiplicity of implementation of ESD as alluded to in the literature. I have hence accumulated enough during this quest and can return to Ghana knowing that I can influence policy on ESD and teacher education.

Teacher educators in Ghana could learn from the Icelandic way. In the conversations with the teacher educators and principals in the three colleges as well as personnel from the GES, during the interview sessions and focus group interviews, I realised that the Ghanaian teacher educator is not so far behind in his/her understanding of SD and ESD. They are quite abreast with the various tenets of ESD, although they need to regarding the application of the right pedagogies in teaching SD concepts.

In the various interactions, from FOSCO through OLA to KOMENDA, the consensus was that, education and SD are inseparable, i.e. ESD and SD concepts are inextricably intertwined. ESD is hinged on SD. It is therefore impossible to achieve SD without ESD (Gale, et al., 2015). Sterling (2001) emphasizes a paradigm shift in education; a re-orienting process in education provision to inculcate ecological principles that shape how people view their relationship with the natural environment. This is the purpose of ESD, i.e. emphasising teaching-learning direction with interventions full of values and competences that change the negative dispositions of people about the environment.

Like all HEIs, CoE in Ghana have been tasked to provide opportunities through their teaching, research and stakeholder engagements to help teacher learners acquire the attitudes and competences that are needing to create sustainable societies. They are expected to use their classroom engagement to provide teaching-learning experiences that motivate teacher learners to understand such SD related concepts like biodiversity, climate change, poverty alleviation, sustainable lifestyle and management of natural catastrophes.

On this journey to find answers to my research questions, I had at the back of my mind some expectations, especially regarding how teacher educators integrate sustainability and

the kind of pedagogies the use to their sustainability journey. These expectations were based on the literature on ESD that have enlightened those that want to know about ESD like me. The literature is full of innovative sustainability pedagogies which are identified as very essential in implementing the tenets of ESD (For e.g. Banjerjee, 2004; Barth, et al., 2007; Blewitt & Cullingford, 2004; Cotton et al., 2009; Corcoran & Wals, 2004; Cortese, 2004; Macdonald, 2011; Palsdottir, 2014).

Whilst admonishing teacher educators to be patient and that SD is a new concept which will require time to be assimilated, Palsdottir (2014) argued on the importance of teacher educators adopting what is termed as sustainability in emerging pedagogical practices (SEPP) in their teaching. Through this, teacher educators can work together collaboratively by conducting action research and engaging in inter- and transdisciplinary learning approaches which are integrative enough and consider the needs of students in the teaching learning process.

## 5.4    Recommendations

Teacher preparation colleges arguably play important role in sustainability education because they produce generation of teachers with deeper perspective on ESD. The conversation with teacher educators, principals and officers of education directorate has provided clear understanding of the many challenges that teachers in CoE are going through when working with teacher learners on ESD. I see that there is the potential in these three colleges for the enhancement of ESD. I therefore provide the following recommendations.

### 5.4.1    Long-term ESD vision

To achieve any meaningful progress regarding ESD, the colleges must have long term sustainability agenda and engage teacher educators, college leadership, education officials, community leaders and students. ESD activities could flourish if long term reward and incentive structures are in place to motivate persons involved in ESD related activities in the colleges and communities. Colleges should have future actions and strategies as important guidance for ESD.

### 5.4.2    Institution-wide approach

A holistic, institution-wide approach to ESD is desirable in embedding SD tenets in colleges. It is therefore imperative that programmes aiming at sustainability education be nurtured with interdisciplinary and cross-disciplinary focus. Place-based, project-based, outcome-inclined and activity oriented transformative teaching modes which connect learners and the learning content with their local environment are employed by teacher educators when working with teacher learners. These approaches recognise the value of learning that takes

place outside of the classroom because it enables learners to envision sustainability as not confined in the school alone.

Widespread knowledge on ESD to all units and departments of the university should be undertaken. The whole school, from administration, teaching faculties, environment departments, transport section, sports, canteen to the infirmary must be doing sustainability. By coordinating activities, publications of research, and communicating of sustainability news to local communities, the colleges would be inadvertently modelling to its publics how sustainable schools operate.

### 5.4.3   Curriculum renewal

Efforts should be in place to reform teacher preparation curriculum to make it more responsive to ESD. An interdisciplinary, multidisciplinary and cross disciplinary sustainability models should be embedded in the curriculum of teacher preparation. Teaching models on climate change, conservation, GHG emission, ecosystem analysis, and coastal and marine management and human rights should be articulated in the curriculum. Stakeholders like teacher educators, researchers, and local leadership must be engaged in designing or making changes in the curriculum.

The need to teach preservice teachers about ESD has become more imperative today because of the place of the teacher in our society. Teacher educators therefore must abreast themselves with ESD values, pedagogies and models that are relevant to unearth innovativeness in teacher learners. The 21$^{st}$ century education must be filled with teachers whose ambitions in the school are to guide students to think and operate sustainably.  An obvious fact is that the transition from preserve teacher college to the professional, real school situation if often a difficult one.

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# APPENDIXES

## Appendix A: Consent form for participation in interview

I volunteer to participate in a research project conducted by Richard Opoku Agyemang from University of Iceland. I understand that the project is designed to gather information about embedment of sustainable development in selected teacher educator education institutions, hitherto known as Colleges of Education in Central Region of Ghana.

I will be one of approximately 35 people being interviewed for this research.

My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one in my school will be told.

I understand that most interviewees will find the discussion interesting and thought-provoking. If, however, I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

Participation involves being interviewed by researcher from the University of Iceland. The interview will last approximately 30-45 minutes. Notes will be written during the interview. An audio tape of the interview and subsequent dialogue will be made. If I don't want to be taped, I will not be able to participate in the study.

I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

Teacher educators and administrators from my school will neither be present at the interview nor have access to raw notes or transcripts. This precaution will prevent my individual comments from having any negative repercussions.

I understand that this research study has been reviewed and approved by the School of Education, University of Iceland. For research problems or questions regarding subjects, institutions and departments may contact Allyson MacDonald (Professor of educational sciences and sustainability and supervisor of this thesis project) and Bjargey Anna Gudbrandsdottir, programme coordinator for the Environment and Natural Resources.

 I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

I have signed and given a copy of this consent form.

…………………………………………………..
…………………………………………..

  Participant's name            Date and signature

…………………………………………………..
..............................................
  Researcher's name            Date and signature

# Appendix B: Interview protocol (45 minutes to 1 hour)

**Research Question 1:** What are the views of teacher educators in the three colleges of education on education for sustainable development?

**Interview questions for teacher educators**

How do you understand sustainable development?

Explain briefly how the concept of sustainable development evolved?

What concepts or content knowledge you think are related to sustainable development?

How will you describe the concept of education for sustainable development?

*Research question two:* In what ways do teacher educators in the three colleges integrate SD related concepts in their teaching?

**Interview questions for teacher educators**

Mention examples of concepts of SD which are found in the subjects or courses that you teach?

Not specific methodology, but how do you carry on embedding these elements of ESD in your subjects especially non sustainability related subjects, e.g., Psychology.

What role do you play in research activities that are sustainability related?

**Research question three:** What types of teaching pedagogies do teacher educators in the three colleges employ in teaching SD?

**Interview questions for teacher educators**

How do you organise or prepare your class for teaching learning encounter?

What teaching style do you often employ?

Do you think the same teaching technique or method is applicable to teaching all content areas?

Which is the best teaching method for teaching teacher educator trainees' concepts like climate change, land degradation, erosion, flooding, et cetera?

How do you use such pedagogies in class?

**Research question four:** What do teacher educators in the three colleges think are the factors that can drive ESD?

**Interview questions for teacher educators**

Do you think ESD as an educational paradigm is relevant in contemporary Ghana?

In what ways do you think ESD can be made to workable in our schools?

What specific actions do you think can propel integration of SD concerns in your school?

Research question five: What factors hinder ESD promotion in your college?

Do you see any support from your school towards sustainability programmes?

What about from the ministry of municipal education directorate?

What are impeding progress in implementing ESD policies in schools?

Are the problems from your school or government agencies?

Interview questions for principals/vice principals (35 to 45 minutes)

Have you any ESD policy for your school?

Are they a reflection of the national SD policies?

How is SD related activities funded in your school?

Any school-local community engagement?

What problems confront your administration regarding ESD implementation?

**Interview questions for GES officials (35 minutes)**

Have you taken part in any sustainable development programme or activity before?

What policy/policies guide teacher educators in teaching sustainable development in CoE?

What kinds of support do your outfit provides for SD programmes in CoE?

How well do you relate with teacher educator training institutions as far as SD integration is concerned?

**Appendix C: Focus group interviews**

**Introduction:** Thank you very much for accepting to be part of this discussion. I am grateful for your willingness to take part.

**Moderator:** Richard Opoku Agyemang. This is followed with a brief background introduction and past credentials.

**Aim of the focus group interview:** The main purpose of this discussion is to find out about your views on ESD especially regarding the various impediments that confront you and your efforts at integrating sustainable development in your work.

In the first 15 minutes, I would like to find out from you about your understanding of the ESD concept and how in your view could it be supported in our colleges in the region.

I will respectfully, use the rest of the 45 minutes to discuss with you what in your views you consider as the barriers to sustainability embedment in the three colleges.

**Enduring rules**

Before we start, I think it is essential that we put in place some rules to guide our conversation

I would want you to be active and contribute effectively. I may decide to prompt your attention to talk if I find that you are not talking.

All answers are deemed relevant to me and the project. There are, thus, no answer which is right or wrong. I appreciate everyone's experience and views as they are relevant for the study.

Whatever is said by any of us stay in this conference room. This is to enable participants to share their views freely especially on sensitive issues.

I will be recording our discussion. I prefer to capture what everyone says. However, whatever you say remain anonymous as I will not identify anyone here with his/her name.

**Questions for focus group interviews**

What is your understanding of the SD and ESD concepts?

Briefly, how is ESD implemented in your jurisdictions?

What factors challenge you and your department from implementing ESD?

Do you see system-wide and school-based factors?

Can you share with us some of the problems/impediments?

How can schools and municipalities promote ESD?